Equity Premium Events*

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Abstract: Using daily S&P 500 option expirations, we develop a methodology for determining which days are "equity premium events": days with significantly elevated ex-ante equity premium relative to the daily equity term structure. Using a data-driven approach, we find that a variety of macroeconomic and political events exhibit significantly elevated premia. Among macro releases, FOMC, nonfarm payrolls and CPI have the largest abnormal equity premia and these increase substantially between June 2022 and June 2023. However, the elevated equity premia on macro release days account for a significantly smaller share of total ex-ante equity premia compared to previous estimates using realized excess returns. To provide intuition for the significant variation in equity premia across announcement types and time, we propose an asset pricing framework that decomposes the equity premium for a given event into components due to news variance and sensitivities of the stock market and the SDF to the news released.

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A fundamental question in finance is what drives the equity risk premium. Recent work has highlighted the importance of prescheduled economic releases containing information about cash flows and discount rates for which investors may demand risk compensation (Savor and Wilson (2013); Lucca and Moench (2015)). Most existing evidence is based on realized excess returns around these events. However, realized returns are a noisy estimate of expected returns, and can contain economically large non-zero unexpected returns even averaged over multiple decades of data (Elton (1999); Fama and French (2002)). Analysis using realized excess returns to measure risk premia for macro announcements is therefore potentially subject to small-sample problems (Cieslak, Morse, and Vissing-Jorgensen (2019); Ernst, Gilbert, and Hrdlicka (2019); Ghaderi and Seo (2024)).

In this paper, we propose a new and complementary approach to studying what types of prescheduled events are associated with a higher equity premium. Our approach does not require realized returns. It instead exploits the rich forward term structure of S&P 500 option prices observed each trading day along with option-implied models of the equity premium to obtain ex ante estimates of the equity premium over daily (or, in some periods, 2-day) forward periods up to one month in the future. Since end-of-week S&P 500 option expirations became available in 2008 (Andersen, Fusari, and Todorov (2017)), Cboe added Monday and Wednesday expirations on the S&P 500 in 2016 and Tuesday and Thursday expirations in 2022, resulting in an option expiration at the end of each trading day. Because these options trade for about one month prior to expiration, we can estimate ex-ante equity premia separately for each upcoming day (forward period) using adjacent option expirations available on a given trade date. We estimate a panel of forward daily equity premia for trade dates from October 2016 through December 2023 using forward analogs of option-implied measures of the equity premium (Gandhi, Gormsen, and Lazarus (2022); Londono and Samadi (2023)). We use the Martin (2017) SVIX, Chabi-Yo and Loudis (2020) Restricted Lower Bound (LBR), and Tetlock, McCoy, and Shah (2024) Implied Equity Premium (IEP). While these option-implied equity premium measures differ in their underlying assumptions and estimation, our main conclusions remain qualitatively similar.

We develop a methodology to determine which days are associated with an abnormally high equity premium relative to nearby dates, referring to such days as "equity premium events". To identify equity premium events, we calculate residuals from a quantile (median) regression of forward equity premia on term, term squared, and a dummy for the first expiration of the calendar week, estimated for each day. The use of quantile regression ensures that events do not affect the estimated term structure for non-event days, enabling an accurate measure of abnormal forward equity premia on event days. By contrast, traditional yield curve fitting methods (Nelson and Siegel (1987); Svensson (1994)) would try to fit events (outliers) if they are not removed prior to estimation (often in ad-hoc ways, see Fama and Bliss (1987); Gürkaynak, Sack, and Wright (2007); among others).

Our first research question is simple: Are there equity premium events? We decompose the variation of our trade date-forward period panel of equity premia to assess the relative role of time-series variation versus variation across forward periods on a given trade date. We find that former is more important. The time series standard deviation of trade date-level median forward premia is 3.57 basis points (bp) using the forward IEP. However, there is also significant variation in forward equity premia within trade date. The average of within trade date standard deviations is 0.98 bp, with a significant share of this variation coming from outliers on the equity term structure, serving as evidence of economically important variation in equity premia across forward periods.

We next ask: what happens on days that are equity premium events? We let the data speak regarding which forward periods are associated with statistically significant abnormal equity premia. While a large literature has examined the drivers of large realized moves in equity markets (Niederhoffer (1971); Cutler, Poterba, and Summers (1988); Kapadia and Zekhnini (2019); Baker, Bloom, Davis, and Sammon (2021); among others), our data-driven analysis provides an ex-ante counterpart to these papers. The forward periods identified by our data-driven approach as having the most abnormally high equity premia include types of events extensively studied in the literature using realized returns. The 39 most significant events in our sample include 13 Federal Open Markets Committee (FOMC) meetings (Savor and Wilson (2013); Lucca and Moench (2015); among others), 9 U.S. consumer price index (CPI) releases, 7 nonfarm payroll (NFP) releases, and the 2016 and 2020 U.S. presidential elections (Niederhoffer, Gibbs, and Bullock (1970); Li and Born (2006); Kelly, Pástor, and Veronesi (2016); among others). Our approach also identifies other events less explored in the literature, such as the 2018 and 2022 U.S. Midterm elections, the 2017 French Presidential election and subsequent runoff, the 2021 Georgia Congressional runoff, the 2019 Trump-Xi G-20 Bilateral meeting, and the release of the January 2018 FOMC minutes. Of the recurring events with significant abnormal risk pricing, U.S. presidential elections are associated with the largest average abnormal equity premia, though elections comprise a small proportion of total expected returns in our sample as these events occur much less frequently than macroeconomic (including monetary policy) announcement days.

Our third research question is whether options-implied equity premia lead to different conclusions regarding the additional equity premium investors require for FOMC and other macroeconomic announcement days compared to previous estimates based on average excess returns (Savor and Wilson (2013); Lucca and Moench (2015); among others). We consider this question both qualitatively and quantitatively. When examining the full cross-section of U.S. economic releases tracked by the Bloomberg Economic Calendar, options-implied equity premium measures indicate that FOMC, NFP and CPI releases are the most important in our sample based on economic magnitudes as well as statistical significance. However, option-implied FOMC, NFP, and CPI release premiums are significantly lower than previous estimates based on realized excess returns. To reconcile this difference in magnitudes, we consider two potential explanations: First, ex-post good news could be driving up average excess returns over the samples used in Savor and Wilson (2013), Lucca and Moench (2015). Second, the options-implied measures of equity premiums may be inaccurate. We find some support for both of these explanations. Notably, we hand-collect data for an extended sample of FOMC, NFP, and CPI releases from 1928-2024 (starting in 1928 for NFP, 1936 for FOMC, and

1941 for CPI) prior to the sample periods of previous studies examining realized excess returns. In this extended sample, FOMC meetings are associated with a 12 bps higher average excess return, which is substantially lower than the 22 bps effect in Savor and Wilson's 1958-2009 sample and the 34 bps effect in Lucca and Moench (2015) 1994-2011 sample, suggesting that those estimates are partly driven by unexpectedly good news, rather than entirely reflecting ex-ante risk compensation. By contrast, the average excess return of NFP releases in the long sample are comparable to that of the original sample of Savor and Wilson (2013). While we find some evidence that options-implied measures of the equity premium don't vary as much as realized excess returns at daily forecast horizons, this is not enough to fully reconcile the difference in magnitudes between option-implied macro release premiums and previous estimates based on realized excess returns.

The final part of our analysis focuses on the time-series evolution of abnormal equity premia for macroeconomic releases and monetary policy announcements. A key strength of the options-implied approach is that one can estimate the equity premium for each individual release date. We find that abnormal equity premia for FOMC and CPI releases became particularly elevated during 2022 and 2023. To understand the drivers of equity premium events and, in particular, the variation in abnormal CPI premia in 2022 and 2023, we derive an asset pricing framework that decomposes the equity premium for a given economic release into components due to (i) the variance of the news in the upcoming release, (ii) the beta of the stock market with respect to the news, and (iii) the beta of the stochastic discount factor (SDF) with respect to the news. We find a role for both increased risk with respect to release news and time-varying betas when explaining the elevated CPI release premia during 2022 and 2023.

Because our estimates of forward equity premia can be obtained in real time using end of day option prices, the empirical framework proposed in this paper can be used to examine equity premia for upcoming events on the economic and political calendar. Given the significant variation in forward premia across release types and through time, our approach can identify which upcoming events equity markets perceive to be important on any given day and how large the premia for these events are. We provide an example of how to price the upcoming economic calendar. We also use the 2024 presidential election as an example of how to price a given event over time. Forward premia for the upcoming month of daily forward periods are available at www.pricingthecalendar.com.

While our focus is on equity premia, our work is related to papers examining option prices around specific types of events, including the implied volatility, volatility slope, and variance risk premia of international presidential elections and political summits (Kelly et al. (2016)), the implied volatility of earnings releases (Patell and Wolfson (1981); Dubinsky, Johannes, Kaeck, and Seeger (2019)), and variance risk premia of U.S. FOMC and NFP releases (Wright (2020)); among others. We also build upon prior work estimating equity premia for FOMC meetings by imposing specific forms of investor preferences (Liu, Tang, and Zhou (2022)) and work estimating forward equity premia for CPI, GDP, FOMC, and NFP releases (Londono and Samadi (2023)).

The novelty of our work relative to this literature is as follows. Using the entire forward term structure of daily equity premia up to one month out, we develop a methodology for estimating the abnormal equity premium for a given forward period relative to other forward periods observed on the same trade date. Using data for all trading days between October 2016 and December 2023, we determine all events with significantly elevated risk pricing using a data-driven approach, also quantifying the importance of equity premium events in our trade date-forward period panel. Furthermore, we provide novel ex ante estimates of macroeconomic release premiums using the full cross-section of U.S. macroeconomic releases tracked in the Bloomberg economic calendar, also examining what share of the total equity premium CPI, FOMC, and NFP releases account for during our sample (Savor and Wilson (2013); Lucca and Moench (2015)). We also hand-collect novel pre-publication-sample data for FOMC, NFP and CPI releases to construct an extended analysis of realized excess returns. Finally, to better understand the variation in abnormal event premia across events types and time, we introduce a novel asset pricing methodology for decomposing the equity premium for a given event.

This paper proceeds as follows: Section I describes the data; Section II describes the estimation of forward daily equity premia, explains our methodology to identify abnormal forward daily equity premia, and decomposes the variance of our trade date-forward period equity premium panel; Section III presents results for a data-driven analysis that examines which forward periods are associated with significant abnormal forward premia; Section IV extends the analysis to consider realized excess returns and equity premia on U.S. macroeconomic releases; Section V develops an asset pricing framework for abnormal release premia; Section VI provides examples of how the empirical framework can be used to price the economic and political calendar; and Section VII concludes.

I. Data

Our sample consists of end of day prices for options on the S&P 500 for trade dates from October 2016 through December 2023. For this time period, we construct forward periods one or two trading days long based on data availability. Cboe added Monday and Wednesday expirations to Friday expirations in October 2016, then added Tuesday and Thursday expirations in May 2022 resulting in a full set of Monday-Friday daily expirations. Otherwise known as SPX "Weeklys," these are cash settled European options that settle to the market closing price. Daily options trade for one month prior to expiration during our sample period.[1]

Data for option prices, S&P 500 prices, forward prices, and interest rates are obtained from Optionmetrics. We use out of the money options with product code "SPXW". We use option expirations with at least 10 distinct strike prices. We remove options with missing implied volatility, which occurs when the option midquote is below the intrinsic value or when the Optionmetrics implied volatility calculation fails to converge. We use option expirations with a minimum moneyness range of 95% to 105% (moneyness

[1]SPX Weeklys end of week expirations are not available on the same days as SPX monthly expirations with a.m. settlement (last trade day of the third week of the month) until May 2017. Results are qualitatively similar when we add SPX Monthly options to the sample for which SPX Weeklys are unavailable. SPX Tuesday and Thursday expirations initially traded for two weeks prior to expiration following their introduction until October 2022.

is defined as K/P_t, where K is the option's strike price and P_t is the close price of the S&P 500 on trading day t). For each trade date, we use a common moneyness range, which is calculated as the minimum moneyness range across forward periods.

We remove option expirations with more than 28 calendar days to expiration. We also remove a small subset of forward periods with negative expected returns. These initial filters result in 24,698 trade date-forward period observations and forward premia for 1,319 unique forward periods. Expiration-level (i.e., forward period level) descriptive statistics for the daily option expirations in our sample are reported in Appendix Table A1. These statistics indicate a large number of strikes, large moneyness range, and suggest that these options are actively traded. After estimating raw and abnormal forward premia, for our main tests, we further require that options have at least one week to expiration following the prior literature (Beber and Brandt (2006); Kelly et al. (2016)).[2] This filter results in 19,705 trade date-forward period observations covering 1,317 unique expirations.

Table 1 summarizes option expiration dates by year and expiration day of the week. Panel A reports the number of unique option expiration dates, e, while Panel B reports the number of trade date-expiration, (t, e), observations. From October 2016 through 2021, nearly all option expiration dates fall on Mondays, Wednesdays, and Fridays. The limited number of Tuesday and Thursday expirations during this period are the result of exchange holidays for which the Cboe shifts the option expiration date to an adjacent trading day. From June 2022, there are option expirations on every trading day. Accordingly, the bottom rows of Table 1 show that expirations are approximately equally distributed across Mondays through Fridays in 2023.

[2]During the onset of Covid-19 in the U.S., options with less than one week to expiration became significantly more expensive even in the absence of key prescheduled economic releases, highlighting issues with only using "zero-day" options to examine risk pricing of prescheduled events. Furthermore, consistent with the findings of Bryzgalova, Pavlova, and Sikorskaya (2023) and Bogousslavsky and Muravyev (2024), we find that retail trading is most concentrated in options within 48 hours to expiration in Appendix Table A2, with the proxy of retail trading likely understating the extent of retail trader activity in very-short-dated S&P 500 options. Nonetheless, results during our sample period are qualitatively similar when examining the shortest dated options available.

[Insert Table 1 here]

We also collect all 124 U.S. macroeconomic variables for which releases are tracked in the Bloomberg Economic Calendar. Because a given release may contain information about several macroeconomic variables, we group variables released together, and we examine equity premia at the release level. For example, information about the Unemployment Rate is contained in the same release as NFP, so any abnormal equity premium on the release date is the combined compensation for both variables' releases. Our procedure to group 124 macroeconomic variables into 50 releases is detailed in Appendix A.

II. Abnormal Forward Equity Premia

In this section, we first discuss approaches to calculate raw forward equity premia using S&P 500 options, introduce a methodology to estimate abnormal equity premia with respect to the daily forward term structure, and finally decompose the variance of both forward raw equity premia and abnormal equity premia.

II.A. Forward Equity Premia

We construct a panel of trade date-forward period-level expected excess returns using three distinct option-implied measures of expected returns. While these measures empirically reflect risk neutral variance and higher order risk neutral moments, under additional assumptions they also provide information about expected returns. To construct the panel, we approximate forward rates of daily expected excess returns using adjacent daily option expirations, $E_t(\tilde{R}_{T_{n+m}})$ and $E_t(\tilde{R}_{T_n})$ (Londono and Samadi (2023)):

$$F_{t,T_{n:m}} \approx \frac{(1 + E_t(\tilde{R}_{T_{n+m}}))}{(1 + E_t(\tilde{R}_{T_n}))} - 1 \tag{1}$$

The first option-implied measure of equity premia that we examine is the Martin

(2017) SVIX:

$$E_t^{SVIX}(\tilde{R}_{T_n}) = \frac{2}{P_t^2}\left[\int_0^{F_{t,T_n}} p_{t,T_n}(K)\,dK + \int_{F_{t,T_n}}^{\infty} c_{t,T_n}(K)\,dK\right], \tag{2}$$

where P_t is the price of the S&P 500 index on trade date t, F_{t,T_n} is the forward price on trade date t for horizon T_n, and $p_{t,T_n}(K)$ ($c_{t,T_n}(K)$) are the midquote prices of out-of-the-money put (call) options with strike price K and expiration date T_n, resulting in one observation per trade date-forward period.[3] In the case of an unconstrained investor with log utility over terminal wealth who is fully invested in the stock market, the equity premium equals SVIX. More generally, SVIX provides a lower bound subject to Martin's negative correlation condition (NCC). In terms of forward equity premia, the forward SVIX provides a lower bound on expected future excess returns under a relative negative correlation condition (NCC): $\text{cov}_t(M_{t,T_{n+m}}R_{t,T_{n+m}}, R_{t,T_{n+m}}) \leq \text{cov}_t(M_{t,T_n}R_{t,T_n}, R_{t,T_n})$, for all stochastic discount factors M_t, where R_{t,T_n} is the return on the market portfolio from time t to time T_n.[4]

The second option-implied measure of equity premia that we examine is the Chabi-Yo and Loudis (2020) Restricted Lower Bound (LBR):

$$E_t^{LBR}(\tilde{R}_{T_n}) = \frac{\frac{E_t^*(\tilde{R}_{T_n}^2)}{R_{f,T_n}} - \frac{E_t^*(\tilde{R}_{T_n}^3)}{R_{f,T_n}^2} + \frac{E_t^*(\tilde{R}_{T_n}^4)}{R_{f,T_n}^3}}{1 - \frac{E_t^*(\tilde{R}_{T_n}^2)}{R_{f,T_n}^2} + \frac{E_t^*(\tilde{R}_{T_n}^3)}{R_{f,T_n}^3}}. \tag{3}$$

This measure does not assume log utility, but retains the assumption of a 100% portfolio weight in the stock market. It incorporates additional information from the third and fourth risk neutral moments of expected excess returns $E_t^*(\tilde{R}_{T_n}^k)$ and provides a tighter lower bound subject to assumptions on the signs of risk neutral moments and the rep-

[3] To implement the integrals in (2), we numerically integrate across option strike prices using the approach of Martin (2017), among others.

[4] Results are qualitatively similar when applying the SVIX to short-dated options which provides a lower bound on the equity premium subject to the more common Negative Correlation Condition: $\text{cov}_t(M_{t,T_n}R_{t,T_n}, R_{t,T_n}) \leq 0$.

resentative investor's tolerance for risk, skewness, and kurtosis.[5] Using the approach of Boudoukh, Richardson, and Smith (1993), Back, Crotty, and Kazempour (2022) generally fail to reject validity for these lower bounds.

The third option-implied measure of equity premia that we examine is the Tetlock et al. (2024) implied equity premium (IEP). This measure assumes log utility, but does not restrict the portfolio weight in the stock market to 100%. IEP is defined as:

$$E_t^{IEP}(\tilde{R}_{T_n}) = R_{f,t,T_n}^{-1} \sum_{k=1}^{4} w_{k,t} E_t^*(\tilde{R}_{T_n}^{k+1}), \tag{4}$$

where $E_t^*(\tilde{R}_{T_n}^{k+1})$ are risk neutral expected excess market returns raised to the $k+1$ power and $w_{k,t}$ are growth optimal (GO) portfolio weights on trade date t. These weights are time-varying and estimated using regressions of the variance premium on higher order risk neutral moments. The IEP approach thus incorporates additional information from estimates of expected physical market variance (used in the variance premium) to estimate portfolio weights, thereby enabling approximate recovery with less restrictive assumptions on portfolio weights (Ross (2015) and Borovička, Hansen, and Scheinkman (2016)). The SVIX ($E_{t,T_{n:m}}^{SVIX}$) is nested in the IEP framework, with SVIX amounting to setting $w_{1,t} = 1$ and $w_{k,t} = 0$ for $k \geq 2$.

$$E_t^{IEP}(\tilde{R}_{T_n}) = E_t^{SVIX}(\tilde{R}_{T_n}) = R_{f,t,T_n}^{-1} E_t^*(\tilde{R}_{T_n}^2), \tag{5}$$

We compute risk-neutral moments of expected excess returns following the methodologies for each equity premium measure, as detailed in Appendix B. For comparability with Tetlock et al. (2024)'s estimates of expected returns, we use a similar approach to estimate GO portfolio weights, and these estimations are also detailed in Appendix B. While the IEP requires additional estimates of expected physical variance, variance risk premia, and GO portfolio weights relative to the SVIX and LBR, the IEP provides

[5]The main results in our paper are qualitatively similar when estimating the restricted upper bound and unrestricted bounds of Chabi-Yo and Loudis (2020).

a point estimate of the equity premium rather than a lower bound. While we report certain results for only the SVIX, those results are qualitatively similar for the LBR and IEP.

Our approximations of forward expected returns can differ from investors' expected forward return on the market portfolio if investors perceive there to be autocorrelation in daily market returns between horizons T_n and T_{n+m}. This approximation error is likely very small in practice as results are qualitatively similar when we construct a forward expected log return analog using the Gao and Martin (2021) LVIX.

Panel A of Table 2 reports summary statistics of forward risk premium per day for the SVIX, LBR, IEP measures. The average forward risk premium is 1.48 bp per day for the SVIX measure with a standard deviation of 1.47. Both the mean and standard deviations are higher for the LBR and IEP measures. The IEP mean and standard deviation are 4.05 and 4.02, respectively. A larger average forward risk premium for the LBR and IEP measures is consistent with the LBR representing a tighter lower bound of the equity premium and the IEP representing a point estimate. There is significant variation in forward expected returns across the trade date-forward period-level observations in our sample, with IEP forward premia ranging from 1.08 bp for the 5th percentile to 9.91 bp for the 95th percentile. Since the LBR and IEP use information from higher order risk neutral moments, they tend to increase more than the SVIX during stress periods (Chabi-Yo and Loudis (2020); Tetlock et al. (2024)). In subsequent tests estimating abnormal equity premia for events, we adjust for the number of trading days per forward interval.

[Insert Table 2 here]

To illustrate the variation in our panel, Figure 1 reports the distribution of forward premia (blue points) and the median forward premia (orange series) each trade day for the SVIX. There is significant time series variation in the level of the daily forward equity term structure, as evidenced by the variation in the daily median, with median forward premia increasing notably during the onset of the Covid-19 pandemic. There is also significant variation in forward premia across forward periods within each trade date, as evidenced by the dispersion of blue points around the daily median. While some of this dispersion is due to the slope and curvature of the forward term structure, we will show that there are also many events with abnormally high forward equity premia relative to the equity premium term structure on a particular trading day. We develop the methodology to measure abnormal forward equity premia in Section II.B and decompose the variance of our trade date-forward period panel in Section II.C.

[Insert Figure 1 here]

II.B. Abnormal Forward Equity Premia

We define the abnormal forward equity premium as the deviation from the fitted forward term structure. On each trade date t, we observe a term structure of forward expected daily returns across forward periods indexed by $e = 1, 2, \ldots, E$ up to one month in the future, where $F_{t,e}$ denotes the expected return per trade day over forward period e. From this term-structure of forward expected returns, we estimate a quantile regression (QR) on each trade date t:

$$Q_{F_{t,e}|x_{t,e}}(\mathcal{T}) = x_{t,e}\beta_{t,\mathcal{T}}, \tag{6}$$

where $Q_{F_{t,e}|x_{t,e}}(\mathcal{T})$ is the $\mathcal{T}$'th quantile of forward expected returns on date t and $x_{t,e}$ is a vector containing the conditioning variables. The QR slope $\beta_{t,\mathcal{T}}$ is chosen to minimize the quantile weighted absolute value of errors across E forward periods:

$$\hat{\beta}_{t,\mathcal{T}} = \underset{\beta_{t,\mathcal{T}} \in R^k}{\arg\min} \sum_{e=1}^{E} \left(\mathcal{T} \cdot I_{(F_{t,e} > x_{t,e}\beta_t)} |F_{t,e} - x_{t,e}\beta_{t,\mathcal{T}}| + (1 - \mathcal{T}) \cdot I_{(F_{t,e} < x_{t,e}\beta_t)} |F_{t,e} - x_{t,e}\beta_{t,\mathcal{T}}| \right), \tag{7}$$

where $I_{(.)}$ denotes the indicator function.

The abnormal forward expected returns ($A_{t,e}$) on trade date t for forward period e

are then defined as the residual from the QR estimation:

$$A_{t,e} = F_{t,e} - \hat{Q}_{F_{t,e}|x_{t,e}} (\mathcal{T}) , \tag{8}$$

where $\hat{Q}_{F_{t,e}|x_{t,e}} (\mathcal{T})$ is the predicted quantile value of the forward expected return conditional on $x_{t,e}$.

In our baseline estimation, we implement a QR on each trade date using the median quantile ($\mathcal{T} = 0.5$) and condition on the vector $x_{t,e} = \left(a_t, I_{e=fow}, T_{t,e}, T^2_{t,e}\right)$, where a is a constant, $I_{e=fow}$ is an indicator variable equal to one if the option expiration e is the first expiration of the calendar week and equal to zero otherwise, $T_{t,e}$ is the time to expiration of the further dated option expiration for forward period e, and $T^2_{t,e}$ is the time to expiration squared. The first expiration of the week indicator variable accounts for the first forward period of the week also spanning weekends, the time to expiration variable absorbs variation that may come from a slope in the term structure of forward expected returns, and the time to expiration squared variable also absorbs curvature in the term structure.

Appendix Table A4 reports the distribution of coefficient estimates for our main specification and goodness of fit statistics for alternative QR specifications estimated on each trade date for the SVIX. We use the pseudo-R^2 as the goodness of fit measure, which is estimated as 1 minus the ratio between the sum of absolute deviations in the fully parameterized models and the sum of absolute deviations in the null (non-conditional) quantile model. In our baseline specification, the average pseudo-R^2 across all trade dates is 50 percent, indicating that about half of the variation in the term-structure of forward premia is attributable to the conditioning variables in our approach for the average trade date. The conditioning variables are meant to fit the forward term structure, which varies across trade dates and particularly during stress periods such as the onset of the Covid-19 pandemic. The forward equity term structure exhibits negative slopes and pronounced curvature during stress periods, consistent with previous findings examining constant-maturity equity premia (Chabi-Yo and Loudis (2020); Tetlock et al.

(2024)). Accordingly, there is significant variation in the daily level, slope, and curvature coefficient estimates during our sample period.[6]

The QR estimation approach differs from traditional yield curve fitting methods (Nelson and Siegel (1987); Svensson (1994)) in that these traditional methods would fit outliers if they are not removed prior to estimation. Outliers are often removed in ad-hoc ways, see Fama and Bliss (1987); and Gürkaynak et al. (2007).

Figure 2 illustrates the data and our approach on two example trade dates using the forward SVIX. In all panels, weekend days are excluded when constructing the timeline on the horizontal axis. The first forward periods of the week are marked with white circles. The left and right panels in the top row of the figure show the cumulative equity risk premium through each expiration date observed on October 19, 2020, and January 18, 2023, respectively. The panels in the middle row show the raw forward equity risk premium per trade day over each forward period. According to these middle-row panels, forward equity risk premia are approximately 2 bp per trade day on October 19, 2020 (middle-left panel) and approximately 1 bp per trade day on January 18, 2023 (middle-right panel). However, forward risk premia are significantly larger over certain forward periods (marked with vertical lines); in particular, the forward period spanning the 2020 presidential election in the left panel and those spanning the FOMC, NFP, and CPI releases in the right panel. The bottom row of Figure 2 reports abnormal forward expected returns per day over each forward period. Most forward periods have an abnormal equity risk premium close to zero, where the abnormal equity risk premium for each forward period is measured as the deviation from the fitted forward term structure based on the data in the middle row. The QR methodology identifies forward periods that are outliers, and these outliers reflect equity premium events in our empirical setting. We use forward premia per trade day to fit the forward term structure to account for

[6] The QR approach is robust when estimated using the median quantile so long as no more than half of the forward periods on a given trade date are abnormally priced. However, one can allow for a greater fraction of forward periods to have abnormal equity risk premia by estimating the QR at a lower percentile, e.g., with $\mathcal{T} < 0.3$. Results are qualitatively similar using this alternative approach.

forward periods of unequal length on a given day. In particular, during the period from October 2016 to May 2022 where only Monday, Wednesday and Friday expirations are available, the forward periods ending on Wednesdays and Fridays are two trading days long while those ending on Mondays are one trading day long. Following Section II, we re-scale abnormal forward premia per day by the length of the forward period (red series in bottom-left panel), capturing the full abnormal equity premium for any event that takes place during the interval.[7]

[Insert Figure 2 here]

Panel B of Table 2 reports summary statistics of abnormal equity premia estimated using the baseline QR specification. As in Panel A of the same table, we report equity premium estimates using the SVIX, LBR, and IEP measures of expected returns. Median abnormal risk premia are, by design, zero across measures of equity premia. However, mean abnormal risk premia are positive, reflecting that some forward periods consistently exhibit positive abnormal risk pricing across trade dates.

Panel C of Table 2 presents summary statistics of abnormal equity premium estimated using alternative QR specifications for the forward SVIX. Irrespective of the specification, median abnormal forward equity premia are consistently zero, while mean abnormal equity premia are positive. Moving down the rows, we see that the standard deviation of the abnormal equity premium falls as we include additional conditioning variables in the QR model. The last two rows of Panel C indicate that the abnormal equity premium displays similar distributional statistics when estimating the QR model at the 50th or 30th percentile.

Panel A of Figure 3 shows the full time series of average abnormal forward equity premia, with values for each forward period in our sample averaged across available trade dates. While most forward periods have near-zero abnormal forward premia,

[7] Lucca and Moench (2015) find that most of the excess returns earned leading up to FOMC releases are earned after the pre-release days' market close. Similarly, in our subsample of daily option expirations, we do not find statistically significant abnormal forward premia for days preceding FOMC releases.

many equity premium events appear in the data, with the frequency of these events significantly increasing since 2022. We identify several forward periods with negative abnormal premia in our sample, some of which correspond to periods spanning exchange holidays with lower risk pricing and periods during the onset of the Covid-19 pandemic, where the negative abnormal forward premia could be due to data quality and liquidity issues (Hu, Pan, and Wang (2013)).

[Insert Figure 3 here]

To better understand the sources of variation in our trade date-forward period-level panel of expected returns, in Section II.C, we decompose the variation in our panel of forward premia.

II.C. Variance Decomposition of Forward Equity Premia

We explore the sources of variation in the trade date-forward period panel of expected returns. Table 3 reports results for a variance decomposition. We report the standard deviation of the time series of trade date-level median forward premia over our sample period and the time series average of trade date-level standard deviations of forward premia. The latter measures the typical amount of dispersion of forward premia on a given trade day. Time series variation in median forward premia accounts for the majority of the variation in our panel for all option-implied measures of the equity premium (standard deviation of 1.31, 1.72, and 3.57 bp for the SVIX, LBR, and IEP, respectively). However, there is also significant variation within trade date, with the average of daily standard deviations being 0.36, 0.43, and 0.98 bp for the SVIX, LBR, and IEP, respectively.

Some of the within trade date variation is due to the slope and curvature of the forward equity term structure each day. Consequently, we also report results for abnormal forward premia, which measures the deviation from a fitted forward term structure each day using QR. The time series average of daily standard deviations of abnormal forward premia is 0.25, 0.29, and 0.69 bp for the SVIX, LBR, and IEP, respectively, amounting to about 1/5 of the time series variation. By design, this variation captures events in the forward equity term structure, or forward periods with significant abnormal premia. In Section III, we employ a data-driven approach to identify forward periods with the most significant abnormal premia.

[Insert Table 3 here]

III. Which Forward Periods are Significantly Priced?

We employ a data-driven approach to identify forward periods with the most significant abnormal premia in our October 2016 to December 2023 sample.[8] While a large literature has examined the drivers of large realized moves in equity markets ((Niederhoffer (1971); Cutler et al. (1988); Kapadia and Zekhnini (2019); Baker et al. (2021); among others), we provide an ex ante analog to these papers, identifying forward periods which require significant additional risk compensation relative to the daily equity term structure. To do so, we first average abnormal premia for each forward period e across available trade dates. With this time series of 1,317 average abnormal forward premia, A_e^{SVIX}, we estimate a series of 1,317 separate regressions with an indicator variable I_e that is equal to one for one forward period in a given regression, and equal to zero for all other forward periods in the time series of average abnormal premia. In each regression, we vary the forward period for which the indicator variable is equal to one:

$$A_e^{SVIX} \times H_e = \alpha + \beta I_e + \epsilon_e, \tag{9}$$

where H_e is the length of the forward period in trade days.[9]

[8]Data-driven approaches have been employed in cross-sectional asset pricing, where researchers look for variables that explain stock returns (Chordia, Goyal, and Saretto (2020)) and in corporate finance, where researchers search for outcome variables that are impacted by a given right-hand side variable (Heath, Ringgenberg, Samadi, and Werner (2023)).

[9]Results are qualitatively similar when we estimate these regressions using the abnormal forward LBR and IEP.

Since the regressions are estimated using average abnormal forward premia, this empirical approach identifies forward periods with consistently significantly larger abnormal risk pricing relative to the rest of the sample. Results are reported in Table 4. Statistically significant forward periods are sorted in descending order of economic significance measured by $\hat{\beta}$ in column (4), which represents the difference between the abnormal forward premia of a given forward period and other forward periods. For statistically significant forward periods which do not fall on days with CPI, FOMC, and NFP releases, we search the online archives of the Wall Street Journal for scheduled events.

[Insert Table 4 here]

We also report the average total forward premium over each forward period for the forward SVIX, LBR, and IEP measures. These are larger than $\hat{\beta}$ which is the estimated abnormal component of the total forward premium for the forward period.

Forward periods associated with statistically significant abnormal risk pricing span a wide variety of events, including those extensively studied in the literature, such as FOMC announcements, CPI releases, NFP releases, and U.S. presidential elections.

Abnormal forward premia over these forward periods are a significant proportion of corresponding raw forward premia. The forward period with the largest regression estimate in magnitude spans the 2020 presidential election, with an estimated abnormal equity premium of 7.90 bp, compared to the corresponding SVIX forward premia of 13.43 bp. The estimated abnormal equity premium for the forward period spanning the January 12, 2023, CPI release is proportionally the largest, with a regression estimate of 4.98 bp relative to the corresponding SVIX forward equity premium of 6.61 bp.

Forward periods spanning 9 CPI releases, all during the 2022-2023 inflationary period and monetary tightening cycle, are significantly priced in our sample. The CPI release with the largest abnormal and raw risk premium in our sample is the January 12, 2023, release.

7 NFP releases taking place between 2020 and 2023 have significantly higher equity

premia in our sample. The NFP release in April 2020 had the largest abnormal and raw equity premium (regression estimate of 2.85 bp, SVIX premium of 20.69 bp, LBR premium of 26.52 bp, and IEP premium of 57.64 bp).

13 FOMC meetings are associated with significant abnormal forward premia, making FOMC meetings the most frequently priced event type in our sample. The March 2023 FOMC meeting exhibits the largest abnormal premium (regression estimate of 3.23 bp, SVIX premium of 4.65 bp, LBR premium of 5.08 bp, and IEP premium of 12.15), while the March 2022 meeting exhibits the largest premium (SVIX premium of 8.01 bp and IEP premium of 21.92 bp).

Of the recurring events with significant abnormal risk pricing, presidential elections are associated with the largest average abnormal premia in our sample, with risk pricing multiple times larger than the average forward equity premium in our sample. In particular, the forward period spanning the 2016 presidential election has a regression estimate of 3.34 bp, SVIX premium of 4.95 bp, LBR premium of 5.39 bp, and IEP premium of 13.73 bp. However, these elections still comprise a small portion of the total expected returns in our sample, as these events occur much less frequently than macroeconomic releases and monetary policy announcements.

Our data-driven approach also detects several less studied events in the literature as having abnormal U.S. equity risk pricing. These events include U.S. Midterm elections (1.34 bp abnormal equity premium regression estimate, 4.52 bp SVIX premium, and 12.85 bp IEP premium for the 2018 Midterms), the 2021 Georgia Congressional runoff (2.49 bp regression estimate, 6.39 bp SVIX, and 17.31 bp IEP premium), the June 2019 Trump-Xi G-20 Bilateral (regression estimate of 1.52 bp, SVIX premium of 2.65 bp, and IEP premium of 7.55 bp), the January 2018 FOMC minutes (1.22 bp regression estimate, 2.84 bp SVIX, and 8.16 bp IEP premium), and the 2017 French presidential election first round and subsequent runoff (1.61 bp regression estimate, 2.31 bp SVIX premium, and 6.48 bp IEP premium for the runoff).

Two additional forward periods ending on April 1, 2020, and April 8, 2020, during the onset of the Covid-19 pandemic in the U.S. are also associated with statistically significant abnormal risk premia. These dates, however, do not seem to be explained by events that could have been anticipated by markets sufficiently in advance.

While market participants and policymakers may not want to miss potentially important events, we also account for multiple testing concerns (Harvey, Liu, and Zhu (2016); Heath et al. (2023)) in light of our data-driven approach, by reporting multiple testing adjusted p-values in Appendix Table A5. We control both the Family-wise Error Rate (FWER), defined as the probability of making one or more false rejections given all tests considered, and the False Discovery Rate (FDR), which controls for the expected value of the ratio of false rejections to total rejections across all tests considered. We use the Holm (1979) correction for the FWER and the Benjamini and Hochberg (1995) correction for the FDR.[10] Since the number of tests under consideration in our data is large (> 1000), the FWER is relatively conservative as it controls for the probability of even one false positive. We find that the 17 (20) forward horizons with the largest regression estimates in our sample are statistically significant after controlling the FWER (FDR).

Panel B of Figure 3 reports average abnormal forward premia for different event types using the SVIX across all forward periods. Forward periods spanning CPI (red dots), FOMC (green dots), NFP (yellow dots), and U.S. Elections (purple dots) are marked separately. This figure indicates that CPI, FOMC, and NFP releases do not comprise all releases with significant abnormal forward premia. Furthermore, not all CPI, FOMC, and NFP are significantly abnormally priced, with substantial variation in the abnormal equity premium for macroeconomic releases across release dates. We examine the full cross-section of macroeconomic releases in Section IV and, in Section V, we introduce a conceptual framework further exploring the determinants of abnormal risk premia across macroeconomic release dates.

[10]Since the indicator variables across regressions are uncorrelated, bootstrap-based methods (Romano and Wolf (2005) and Romano and Wolf (2016)) do not improve power.

IV. Realized Excess Returns and Options-Implied Equity Premia on U.S. Macroeconomic Release Dates

Considering that realized excess returns are a noisy proxy of expected returns, an important use of options-implied equity premia is to assess whether they lead to different conclusions regarding the additional equity premium investors require for FOMC and other macroeconomic announcement days compared to previous estimates based on average excess returns (Savor and Wilson (2013); Lucca and Moench (2015); Ai and Bansal (2018); Hu, Pan, Wang, and Zhu (2022)). Rather than take a stand on which macroeconomic releases matter for the stock market a priori, we first examine the full cross-section of U.S. macroeconomic releases tracked in the Bloomberg U.S. economic calendar to assess which macroeconomic releases are associated with larger option-implied equity premiums relative to surrounding days. We next compare estimated magnitudes of options-implied macroeconomic release equity premiums to average excess realized returns.

While post-publication analyses using noisy realized excess returns in smaller samples have found limited support for an FOMC announcement premium (Cieslak et al. (2019); Kurov, Wolfe, and Gilbert (2021)), we confirm the choice of Savor and Wilson (2013) to focus on FOMC, NFP and CPI announcements. However, while options-implied equity premium measures are elevated on these macro announcement days, the effect is substantially smaller than what the prior literature has found based on realized excess returns. We consider several potential explanations to reconcile this difference and provide some supporting evidence for each explanation. Ultimately, while we conclude that the higher returns earned on macro release dates documented in the previous literature in part reflect risk compensation, they also likely reflect ex-post good news.

IV.A. Which macroeconomic announcements are important for the equity premium?

It is possible that the realized return literature on macro announcements has focused on announcements for which average excess returns happened to be abnormally high due to good stock market news ex post for reasons unrelated to the announcements (Ernst et al. (2019); Ghaderi and Seo (2024)) or due to the announcements on average containing good news about the variable announced (Cieslak et al. (2019) regarding FOMC meetings). To further explore these issues, we first examine realized excess returns and option-implied equity premia for the full cross-section of U.S. macroeconomic variables tracked by the Bloomberg Economic Calendar.[11] We first estimate the following regression using the time series of daily excess returns:

$$r_t^{mkt} - r_t^f = \alpha + \Sigma_{m=1}^{M} \left(\gamma_m I_{m,t}\right) + \delta I_t^{election} + \epsilon_t, \tag{10}$$

where $r_t^{mkt} - r_t^f$ is the excess return of the market on date t, $I_{m,t}$ for $m = 1, ..., M$ are separate indicator variables for all 50 macroeconomic releases in our sample, and $I_t^{election}$ is an additional indicator variable for Presidential and Midterm Elections.

Regression estimates for all 50 macroeconomic release indicators are reported in Figure 4 based on daily data from October 1996 to December 2023. Releases that are statistically significant at the 5% level are labeled by name, while statistically insignificant releases are labeled by number as indexed in Appendix Table A3. Panel A reports the additional excess returns per release, $\widehat{\gamma_m}$, and Panel B reports additional excess returns per year ($\widehat{\gamma_m}$ times the number of releases per year for release m), with releases sorted on the x-axis by their Bloomberg relevance rank (1=most relevant).

[Insert Figure 4 here]

[11]Since several variables are released at the same time as part of a given release, we group the 124 U.S. variables tracked in the Bloomberg Economic Calendar into the 50 underlying releases and perform our analysis at the release level. Our grouping methodology is detailed in Appendix A. We use GDP release dates from the the Fed's ALFRED database to capture both the advance, second and third releases.

A key takeaway from Figure 4 is the wide dispersion in average returns across release-types within what is a relatively long sample of 27 years of data. There are several announcements with realized excess returns that average over 19 basis points per release more than excess returns on non-announcement dates — FOMC, ISM, and Pending Home Sales. On first inspection this may be consistent with a quantitatively large macroeconomic announcement equity premium previously documented in the literature. However, Pending Home Sales is not a highly ranked release based on the Bloomberg relevance score, making it unlikely that this release would have a substantially larger equity premium than non-announcement dates. Furthermore, there are several announcements with equally large negative average excess return effects, below 19 basis points per release. Of these, the effect for Wholesale Inventories is estimated to be statistically significant. These findings suggests that the high volatility of realized returns make it challenging to estimate abnormal equity premia for macro releases from realized excess returns and that multiple testing may be an issue when estimating equation (10). Consistent with this concern, we find that with multiple testing adjusted p-values (Holm p-values), none of the announcements in Figure 4 are significant. The lowest Holm p-value is 0.21 for FOMC.

The options-implied equity premium measures that we apply provide a useful alternative from which to guide researchers and practitioners on the individual releases, and release types on average, that are ex-ante priced. Subject to the underlying assumptions made for these measures, We obtain observable measures of the equity premium, thus avoiding a need for averaging realized returns. Using the options-implied equity premium measures, we estimate a similar regression to that in Equation (10), but instead using the time series of average abnormal forward equity premia as the dependent variable instead of realized excess returns over our sample period:

$$A_e^{EP} \times H_e = \alpha + \Sigma_{m=1}^{M} \left(\gamma_m I_{m,e}\right) + \delta I_e^{election} + \epsilon_e \tag{11}$$

A_e^{EP} is the average abnormal forward equity premium for either the SVIX, LBR, or IEP measure of expected returns for forward period e, H_e is the length of the forward period in trade days (one day or two days), and, as before, $I_{m,t}$ for $m = 1, ..., M$ correspond to separate indicator variables for all 50 macroeconomic releases in our sample and $I_e^{election}$ is an additional indicator variable for Presidential and Midterm Elections.

[Insert Figure 5 here]

Figure 5 reports regression estimates for all 50 macroeconomic release indicators for the regression using abnormal equity premia based on the SVIX and IEP options-implied equity premium measures.[12] As with Figure 4, statistically significant releases are labeled by name while statistically insignificant releases are labeled by Bloomberg relevance rank.

FOMC, NFP and CPI releases are highly statistically significant in our sample, indicating that these releases have elevated equity premia relative to the daily equity term structure, with t-statistics of 5.63, 4.24 and 3.32 respectively (see Appendix Table A6). Unlike the realized return analysis, each of these announcements are also still significant using Holm p-values to adjust for multiple hypothesis testing with Holm p-values below 0.001 for FOMC and NFP and Holm p-value of 0.043 for CPI.[13] The evidence from option prices thus suggests that the three releases — FOMC, NFP and inflation — considered in the seminal realized return study of Savor and Wilson (2013) are the most economically important and statistically robust. In contrast, while ISM and Pending Home Sales appear important for the equity premium based on realized excess returns in the post-1996 sample, options-implied equity premium measures do not support an interpretation of these releases as equity premium events.

[12] For reference, tabular results for the SVIX are also presented in Appendix Table A6

[13] While a few other announcements appear statistically significant with raw p-values, they are neither economically significant nor statically robust when adjusting for multiple hypothesis testing.

IV.B. How large is the equity premium for the important macroeconomic announcements?

Beyond the question of which releases are priced, a comparison between Figure 4 and Figure 5 also sheds light on the quantitative magnitude of the release premium. For example, while the additional average realized excess returns on FOMC days is estimated to be 25 basis points per release from regression (10), the regression coefficient for FOMC days is a much smaller 0.65 basis points (1.76 basis points) using the forward SVIX (IEP) measure when estimating regression (11). The large wedge between the realized and ex-ante excess returns effects suggests that the initial finding of Savor and Wilson (2013) that over 50 percent of equity premium is realized on just FOMC, NFP and inflation release days and the finding of Lucca and Moench (2015) that 80 percent of the equity premium is realized around FOMC meetings may not fully reflect risk compensation.

To explore quantitative magnitudes further, Table 5 examines what proportion of total forward equity premia is due to forward periods spanning CPI, FOMC, and NFP releases. We average forward equity premia across available trade dates separately for each forward period. We then calculate the proportion of total equity premia in our sample that forward periods spanning CPI, FOMC, and NFP releases account for. We also report the average total forward equity premium per period for each release type and for all three release types pooled together. These results are presented in Panel A for the SVIX, Panel B for the LBR, and Panel C for the IEP of Table 5.

[Insert Table 5 here]

For the full sample, the average forward premia across forward periods are 2.04, 2.42, and 5.58 bp for the SVIX, LBR, and IEP measures, respectively. Of these releases, FOMC releases are associated with the largest average forward premia (7.93 basis points per forward period, 63 bp per year for the IEP).

For all measures of forward equity premia, equity premia for forward periods spanning CPI, FOMC, and NFP releases comprise approximately 23% of total expected daily returns across all forward periods in our sample. These proportions are larger than the 17% of all forward periods which span these releases though only modestly so. Both the average magnitude of equity premia for these releases and the share of total equity premia in our sample accounted for by these releases are quantitatively far from fully explaining previous results in the realized return literature.[14]

We explore possible explanations to potentially reconcile the differing magnitudes of macro announcement release effects on equity premia across the realized excess return approach and the options-implied equity premium approach. First, good news ex-post could be driving up average excess return effects over the samples used in Savor and Wilson (2013), Lucca and Moench (2015), and subsequent papers. Second, the three options-implied equity premium measures may be inaccurate.

IV.B.1. Nearly a century of macroeconomic releases

To test the representativeness of previous samples examining realized excess returns around macroeconomic announcements, we provide novel out-of-sample evidence based on both post-publication and pre-publication samples.[15] For the latter, we hand-collect historical data for FOMC meetings and NFP and CPI releases dating as far back as 1928. We obtain FOMC meeting dates back to 1936 from the Federal Reserve Board webpage. NFP release dates back to 1928 and CPI release dates back to 1941 are obtained from historical newspapers via ProQuest as well as documents from the National Archives. Appendix D describes of our data collection methodology in more detail.

Table 6 column (1) summarizes the results from the 1958-2009 sample of Savor and Wilson (2013). FOMC announcements from 1978-2009 were used based on data availability while CPI releases from 1958-1971 and PPI releases from 1971-2009 were used because PPI was typically released before CPI in a given month over 1971-2009.

[14]Results are qualitatively similar for the sub sample following the introduction of option expirations for every trading day. Our results are also robust to adding neighboring forward periods which precede and follow releases.

[15]This analysis is similar in spirit to the approach taken by Linnainmaa and Roberts (2018) in their analysis of the cross-section equity returns.

Consistent with Savor and Wilson (2013), excess returns on days with macroeconomic releases are substantially higher than on other days. To better understand the role of each of the three release types, we report separate effects rather than pooling the three release types as in Savor and Wilson (2013). FOMC have the highest excess returns announcements with average realized excess returns being 21.66 bps larger per day larger, followed by nonfarm payroll announcements (7.36 bps larger per day), and CPI/PPI announcements (4.59 bps larger per day, though statistically insignificant). Table 6 column (2) shows that the extra excess return on FOMC announcement days is even larger at 34 bps per day over the shorter sample of Lucca and Moench (2015) from September 1994 through March 2011.

[Insert Table 6 here]

Extended sample results are reported in Table 6 column (3) with out-of-sample results decomposed in columns (4) to (6). For the extended FOMC sample in column (3) (using meetings from 1936-2024), average realized excess returns are 11.84 bps per day larger, with these average returns being 6.85 to 9.55 bps higher per day in the pre- and post-publication samples. These findings suggest that the magnitudes of FOMC premiums estimated in the Savor and Wilson (2013) sample and especially the Lucca and Moench (2015) sample are unrepresentative. On the other hand, over the the period 1928-2024 we find the NFP release day excess returns are 7.16 bps per day higher, which is consistent with Savor and Wilson (2013) sample period of 7.36 basis points per day. The results hold in both the pre and post out-of-sample estimates, with effects of 7.47 basis points and 5.16 basis points per day respectively. For inflation days, we do not find evidence of materially higher average excess returns over the full sample period and these releases were not statistically significant in the Savor and Wilson (2013) sample period.

In summary, the results presented in Table 6 are consistent with a long-run NFP equity premium magnitude consistent with that in Savor and Wilson (2013), while some of FOMC effect in Savor and Wilson (2013) and especially Lucca and Moench (2015) does not extend out of sample and may be due in part to unexpected good news. This novel evidence complements that of Cieslak et al. (2019) who provide evidence that Fed unexpectedly reduced the equity premium, and Knox and Vissing-Jorgensen (2025) who show that the post-FOMC declines in equity premia for longer maturities exceed declines for shorter maturities on FOMC days by 5 to 12 bps, further highlighting a role for good news ex post on FOMC days rather than declines in equity premium measures solely reflecting the run-off in the equity premium for the FOMC day itself (Savor and Wilson (2013); Hu et al. (2022)).[16] Ghaderi and Seo (2024) also provide evidence using Markov chain Monte Carlo estimation suggesting that previous estimates of the macroeconomic release premium may reflect ex-post good news for the stock market. That said, the FOMC and NFP effects are 12 bps and 7 bps even in the long sample back to 1928, much larger than the corresponding effects based on options-implied equity premium measured summarized in Table 7 and all 1.5 bps or smaller.

[Insert Table 7 here]

IV.B.2. Predictive Regressions

Another potential explanation for the gap between previous realized excess return-based estimates of the macroeconomic release premium and our ex-ante option-implied expected return estimates is the inaccuracy of the latter, which rely on various underlying assumptions and require quality options price data to estimate. In particular, it could be the case that the options-implied equity premia we use do not vary enough with the true equity premium, and thus these measures do not increase enough on macroeconomic release dates (Back et al. (2022)).

To further explore this possibility, we run regressions of realized excess returns on ex-ante option-implied equity premium measures with results reported in Table 8. In contrast to the previous literature, we focus on relatively short-investment horizons (1-month, 1-week and 2-days). We report results for various samples based on available

[16] In unreported analysis, we extend the analysis of post-FOMC moves in the equity term structure to NFP and CPI releases in Appendix Table 7 find that FOMC announcements are the only release associated with relative equity premium declines at longer horizons.

options expirations. Tetlock et al. (2024) remove days associated with market stress where the assumption of costless arbitrage underlying their measure is likely violated. Similarly, we winsorize the sample's dependent and independent variables at the 5th and 95 percentile to reduce the influence of extreme outliers on parameter estimates.

[Insert Table 8 here]

Table 8 Panel A documents that the coefficient from predicting realized excess returns with the SVIX is in the range of 1.73 to 3.38 across table columns. Estimates greater than one support the interpretation that true equity premia do indeed move more than the SVIX at these short horizons (this has been documented for longer horizons, see Back et al. (2022); Martin (2025)). Taking our estimates at face value, Table 8 suggests that we should multiply estimated FOMC effects in Table 7 for SVIX by a factor of 2 to 4.[17] With an average FOMC effect of 0.6 basis points per meeting based on the SVIX measure, this would still leave an additional estimated equity premium on FOMC days of 2.4 bp or less, substantially below the 12 basis points estimate from realized excess returns in the long sample. The conclusion is also similar using the estimates based on the LBR measure, as presented in Table 8 Panel B.

Table 8 Panel C presents the results with the IEP measure of expected returns results, with estimated coefficients in this case much closer to 1, ranging from 1.12 to 1.42 across columns. These coefficients indicate that the variation in the observed IEP measure is much closer to the variation in the actual equity premium, consistent with this measures being a point estimate rather than a lower bound (as is the case for the SVIX and LBR) of equity premia. That said, the coefficients greater than one still suggest we should multiply FOMC effects in Table 7 for IEP by a factor of up to 1.5. This factor, combined with the larger average FOMC effect of 1.5 basis points per meeting under the IEP measure, implies that the additional equity premium on FOMC days that is similar to our estimate with the SVIX and LBR measures, and is thus also substantially lower

[17] In Appendix Section E we formalize how to interpret the regression coefficient and what it means for the variation in the true expected return.

than realized excess counterparts in previous studies. It is possible that the adjustment coefficients in Table 8 vary across time (Back et al. (2022)) and announcement types, though more data for daily options expirations will be required to further examine these possibilities.

Overall, we conclude the following from our reconciliation efforts. First, the FOMC effect on equity premia is much smaller, at 12 bps, in a long sample from 1928-2024 than in the Savor-Wilson or Lucca-Moench samples, while the NFP effect is around 7 bps even in the long sample. And even the long sample could be affected to some extent by positive good news on FOMC or NFP days (see Elton (1999) and Fama and French (2002) for evidence and arguments that realized and expected returns can deviate substantially even for periods of 50 years or longer). Second, FOMC and NFP effects estimated from options-implied equity premium measures are likely too small since these measures do not appear to vary enough with the true equity premium.

V. Understanding Macroeconomic Release Premia

A strength of the options-implied approach is that one can observe the equity premia for each date. This allows one to study time-variation in the equity premium for particular event types in a way that is statistically difficult when estimating equity premia from realized excess returns. In this section, we propose an asset pricing framework to understand the drivers of abnormal equity premia on macroeconomic release days. We apply this framework to gain intuition on the CPI-release risk premia and, in particular, on the period of elevated CPI risk premia between June 2022 and June 2023.

V.A. Conceptual framework

We start from the basic asset-pricing equation with a representative investor, $E_t\left(R_{t+1}\, M_{t+1}\right) = 1$, where R_{t+1} is the realized stock market return on day $t+1$ and M_{t+1} is the stochastic discount factor (SDF). The expected stock market excess return $\mu_t = E_t\left(R_{t+1}\right) - R^F_{t+1}$

can then be expressed as:

$$\mu_t = -R^F_{t+1} Cov_t \left(R_{t+1} \, M_{t+1} \right), \tag{12}$$

where R^F_{t+1} is the (gross) risk-free rate on day $t+1$.

Consider a macroeconomic data release day m where news η_{t+1} is released. The realized return on the release day can be expressed as follows:

$$R^m_{t+1} - R^F_{t+1} = \mu^m_t + \beta^R_t \eta_{t+1} + \epsilon^R_{t+1}, \tag{13}$$

where μ^m_t is the macroeconomic release day equity premium, β^R_t is the sensitivity of the market return to the news released, and ϵ^R_{t+1} is the residual return; i.e., the portion of the return that is uncorrelated with the macroeconomic news.

From equations (12) and (13), the equity premium for the macroeconomic data release day m is:

$$\begin{aligned}
\mu^m_t &= -R^F_{t+1} Cov_t \left(R^m_{t+1}, M_{t+1} \right) \\
&= -R^F_{t+1} \beta^R_t Cov_t \left(\eta_{t+1}, M_{t+1} \right) - R^F_{t+1} Cov_t \left(\epsilon^R_{t+1}, M_{t+1} \right).
\end{aligned}$$

Assuming the residual return ϵ^R_{t+1} on a release day has the same covariance with the SDF as returns on surrounding non-release days, i.e., $Cov_t \left(\epsilon^R_{t+1}, M_{t+1} \right) = Cov_t \left(R_{t+1}, M_{t+1} \right)$, and noting that $\mu_t = -R^F_{t+1} Cov_t \left(R_{t+1}, M_{t+1} \right)$, then, the abnormal equity premium on a macroeconomic release day is:

$$\mu^m_t - \mu_t = -R^F_{t+1} \beta^R_t Cov_t \left(\eta_{t+1}, M_{t+1} \right). \tag{14}$$

Defining the sensitivity of the SDF to the release news as $\beta^M_t = \frac{Cov_t(\eta_{t+1}, M_{t+1})}{Var_t(\eta_{t+1})}$, we have the following result for abnormal release day risk premia:

Result 1 (Abnormal release day equity premia) *Assuming arbitrage-free markets (equation (12)) and a linear sensitivity of returns to announcement news (equation (13)),* *then the abnormal equity premium on a macroeconomic data release day m is the product of four terms:*

$$\mu_t^m - \mu_t = -R_{t+1}^F \beta_t^R \beta_t^M \sigma_t^2(\eta_{t+1}), \tag{15}$$

where $R_{t+1}^F \approx 1$ is the gross risk-free rate on day $t+1$, β_t^R is the return sensitivity to the macroeconomic news released, β_t^M is the stochastic discount factor sensitivity to the macroeconomic news released, and $\sigma_t^2(\eta_{t+1})$ is the conditional variance of released news.

Result 1 implies that the drivers of abnormal risk premia can be grouped into the following two key determining factors:

1. the quantity of news released on the day: $\sigma_t^2(\eta_{t+1})$
2. the sensitivities to news released on the day: $-\beta_t^R \beta_t^M$.

Variation in macroeconomic release risk premia, whether it is the variation over time for a given macroeconomic release type or variation across different macroeconomic release types within a given period of time, is due to variation in the amount of news released or in the sensitivity of returns or the SDF to a given unit of released news.

V.B. Application to CPI Releases

We apply our conceptual framework to shed light on the time series variation in the CPI release abnormal equity premium during our main option-implied sample period. The top panel of Figure 6 reports the time series of the abnormal equity premia (based on the Martin measure) for all CPI releases, with the shaded area highlighting the period of elevated CPI release premia between June 2022 and June 2023. Abnormal CPI release premia reached a peak of 4.98 bp midway through this period for the January 12, 2023, CPI release.

[Insert Figure 6 here]

To understand this variation in CPI release premia, we first consider the role of the quantity of CPI news released on CPI days. The estimated time series of $\sigma_t^2(\eta_{t+1})$ is plotted on the left-hand-side of Figure 6 Panel B, where we estimate the conditional variance of CPI release day news using a GARCH(1,4) model on the release surprises.[18] The GARCH model specification is selected using the BIC for the optimal number of lags. Interestingly, the conditional variance of CPI release news peaks in the Summer of 2021, before the period of elevated abnormal release premia that begins in the summer of 2022. The rise in CPI-release news variance in the summer of 2021 reflects a period where the largest CPI release surprises occurred. The two largest CPI release shocks occur at the May 12, 2021, and July 13, 2021, releases, with month-on-month CPI being 60 bp and 40 bp above forecaster consensus at these releases, respectively.[19] Given that the elevated CPI risk premia in the June 2022 to June 2023 period do not line up well with the time-series of CPI-release news variance, there is also a role for elevated $-\beta_t^R \beta_t^M$ during the June 2022 to June 2023 period. To show this, on the right-hand-side of Figure 6 Panel B, we rearrange equation (15) and compute the implied product of betas from the observed abnormal risk premia and the estimated news variance.

While the SDF M, and thus β_t^M, is not observable, we do observe the stock market responses to CPI release surprises and, therefore, we can compute β_t^R empirically. Specifically, for a given CPI release, we compute the return of near-month E-mini S&P 500 Futures from 8:20 am (10 minutes before the CPI data release) to 8:50 am (20 minutes after the CPI data release) and divide the high frequency data-release return by the release surprise. This method is conceptually close to estimating rolling regressions (without a constant) of returns on surprises to extract conditional betas. However, our approach yields a measure of the sensitivity of the stock market for each individual re-

[18]Release surprises are defined as the difference between the actual data release and the median Bloomberg forecast for CPI. We use month-on-month CPI releases and compute a surprise for both headline and core releases, taking an equal-weighted average of the two.

[19]To get a sense of the timeline of CPI surprises and monetary policy reactions, headline year-on-year CPI in the U.S. first passed 3 percent at the April 2021 CPI release and reached its peak of 8.9 percent at the June 2022 CPI release. The Federal Reserve began its tightening cycle at the March 2022 meeting.

lease, which should map closely to ex ante risk premia for that specific release day. The cost to this approach is that when the CPI surprise on a particular release day is close to zero, the return sensitivity is not identified. In these cases, we use the lagged return sensitivity as measured at the previous CPI-release date.

The pink line in the left hand side of Figure 6 Panel C plots the measured betas of the stock market response to CPI news at the release day frequency. In the period of elevated abnormal risk premia, there were very large stock market responses to CPI release surprises. The largest CPI release beta was observed at the October 13, 2022, CPI release where, following an 18 bp higher CPI print than forecast, the stock market declined 324 bp over the following 20 minutes. The measured sensitivity was $\beta_t^R = -18$. Figure 6 Panel C also plots the implied β_t^M, which, as expected, is negatively correlated with β_t^R.

Our analysis indicates that CPI release abnormal risk premia reached elevated levels in 2022 and 2023 amid elevated variation in news shocks, but also amid a significant increase in the sensitivity of stock returns and the SDF to the releases of inflation news. The right hand side of Figure 6 Panel C explores one potential driver of this increase in sensitivity, which is an increase in long-term inflation uncertainty. The Federal Reserve's Survey of Primary Dealers collects survey participants' probability density function for long-term inflation and presents the average distribution across participants in the public survey release. From this forecast distribution, we compute the variance of the average forecasts PDF of long-term inflation, and we plot this variance against CPI release-day return sensitivities. As can be seen, announcement risk premia and return sensitivities all peak at the same time as long-term inflation uncertainty, which is consistent with models where resolution of uncertainty can be a key driver of release-day premia (Ai and Bansal (2018)).

VI. Pricing the Calendar

Since end of day option prices can be obtained in real time, the methodology to estimate abnormal premia developed in this paper can be used to estimate risk pricing of upcoming events on the economic and political calendar. Forward equity premia for the upcoming month of daily forward periods are available at www.pricingthecalendar.com.

Pricing the economic calendar. In Table 9, we provide an example of how our empirical framework can be applied to the economic calendar for the upcoming month of forward periods as of June 10, 2024.

[Insert Table 9 here]

The table presents forward raw and abnormal premia using the SVIX, which only requires end of day option prices as opposed to the IEP. We report select economic releases occurring during each forward period. Abnormal forward equity premia falling above the top 80th percentile with respect to a historical distribution starting in August 2022, following the introduction of daily option expirations on the S&P 500, are highlighted. Shading goes from yellow (80th percentile) to red (100th percentile). In this example, the forward period ending on June 12th (CPI and FOMC) and July 5 (the employment report) have elevated abnormal forward premia (0.95 bp and 0.46 bp for June 12 and July 5, respectively, with corresponding raw forward premia of 1.37 bp and 0.98 bp, respectively), while the Jun 28 forward period is associated with modestly elevated risk pricing.

Given the significant variation documented with regard to which releases matter at a given point in time, this empirical framework can help us identify which upcoming events are perceived by markets to be more important on any given day.

Pricing an event order time. Since our approach is based on the forward equity term structure, it can in principle also be used monitor the importance of an upcoming event over time. To illustrate, Figure 7 reports the evolution of the equity premium for the forward period that covers the day of the 2024 U.S. election over the month preceding the election. Conceptually, variation in abnormal equity premia could reflect both (i) the market's changing perception about the uncertainty of who will win and (ii) changing betas of the market or the SDF with respect to election news. In that context, a decline in this equity premium over the month preceding the election suggests either that there was less perceived remaining uncertainty about the outcome of the election, or that the perceived policy differences between the two candidates diminished over time. Evidence from prediction markets suggests a role for (i). We obtain prediction market implied win probabilities for the republication candidate from UBS. UBS collects predicted market implied probabilities from leading prediction markets and averages implied probabilities across markets. As indicated in the figure, the election risk premium declined over the preceding month as market implied probablities of a republication candidate market increased from around 50% (maximum uncertainty) to around 65%, suggesting that resolution of uncertainty drove the decline in the 2024 election equity premium over time.

[Insert Figure 7 here]

VII. Conclusion

We exploit the fine grid of option expirations on the S&P 500 since 2016 along with option-implied measures of the equity risk premium to estimate forward one-or-two day equity premia from October 2016 through December 2023. We develop a new methodology for identifying equity premium events, which we define as days with abnormally high equity premia relative to surrounding dates. We document four main results.

First, equity premium events are prevalent, with the cross-expiration standard deviation on a given calendar date about 1/5 the size of the time series variation in the median equity premium.

Second, using a data-driven approach, we study what happens on event dates. A wide variety of events are important to equity investors. These events include well-studied macroeconomic releases, monetary policy releases, and presidential elections, as well as several less studied economic and political events.

Third, among macroeconomic releases, options-implied equity premia suggest that the most important are FOMC, NFP and CPI. While these releases have significantly higher options-implied equity premia relative to the daily equity term structure, equity premia on these release days account for a smaller fraction of overall equity premia than is the case for equity premium estimates based on historical average excess returns previously documented in the literature. We partially recognize these differing magnitudes by showing that using a longer sample for realized returns from 1928-2024 results in a much smaller FOMC effect of 12 bps than in prior work on shorter samples.

Fourth, developing a simple asset pricing framework we show that event risk premia are driven by both the quantity of news (news variance) and the sensitivity of the stock market return and the stochastic discount factor (SDF) to the news. These vary over time, thus rationalizing variation in the equity premium for a given announcement type over time, including the elevated levels of CPI equity premia between June 2022 and June 2023.

Importantly, since forward premia can be estimated in real time, our approach can be applied to the upcoming economic and political calendar to assess which upcoming events the market perceives to be important at a given point in time. This calendar can be a useful tool for market participants, researchers, and policymakers.

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Figure 1: Forward Equity Premia

This figure shows the full panel data set of forward equity premia $F_{t,e}^{SVIX}$ for trade date t and forward period ending on date e using the SVIX measure of equity premia. The figure reports the distribution of forward premia (blue points) and the median forward premia (orange series) each trade day. Forward equity premia are reported in bp per trade day. For readability of the figure, 47 data points with forward equity premia above 15 bp are reported at 15 bp (actual values range from 15.5 bp to 63.4 bps). These data points pertain to 13 calendar dates in Spring 2020.

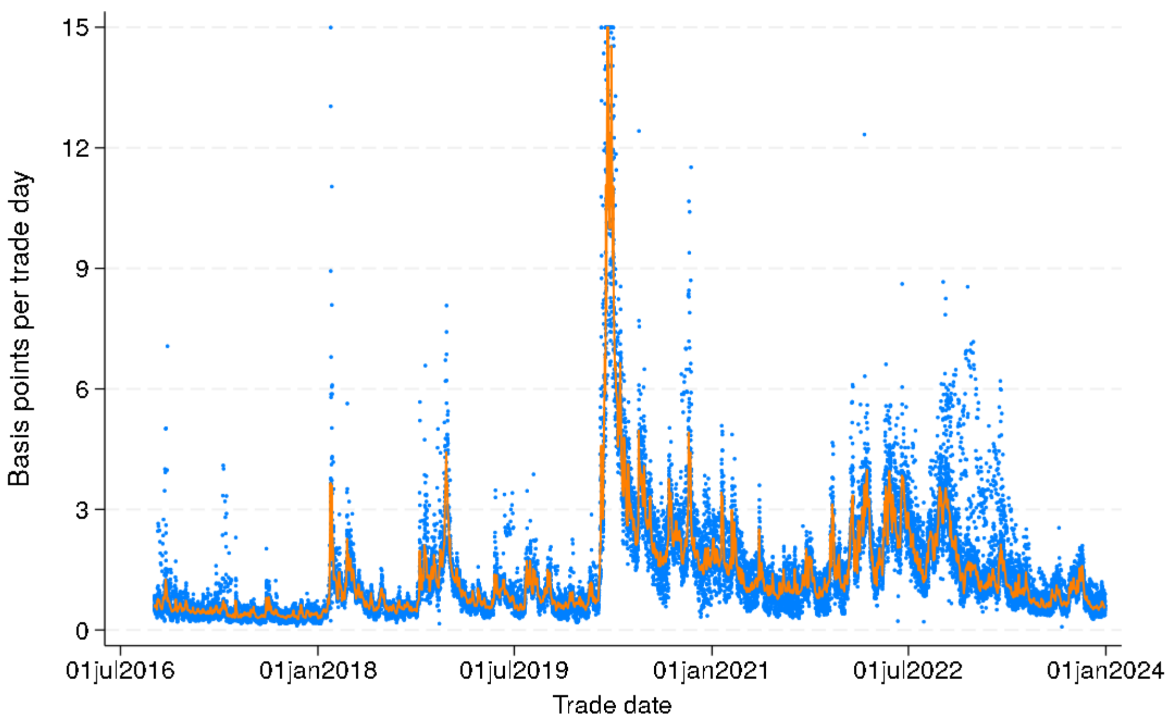


Figure 2: Forward Equity Premia on Example Trade Dates

This figure illustrates the data and our methodology on two example trade dates. Panel A reports SVIX risk premia observed on October 19, 2020, and Panel B reports SVIX risk premia observed on January 18, 2023. In all panels, first expiration dates of the week are differentiated from other days as white dots. The top row figures show the cumulative equity risk premium for each option expiration date, the middle row figures show the forward equity risk premium per trade day over each forward period, and the bottom row figures show the abnormal forward equity premium per trade day. The vertical lines highlight the forward periods with elevated abnormal forward premia. After fitting the daily equity term structure, we re-scale abnormal premia by the length of the forward period in trade days (bottom left panel, red series). The abnormal forward period observed on October 19, 2020, spans the 2020 presidential election. The three highlighted forward periods observed on January 18, 2023, span the February 1 FOMC announcement, the February 3 nonfarm payrolls release, and the February 14 CPI release.

Panel A. October 19, 2020 **Panel B. January 18, 2023**

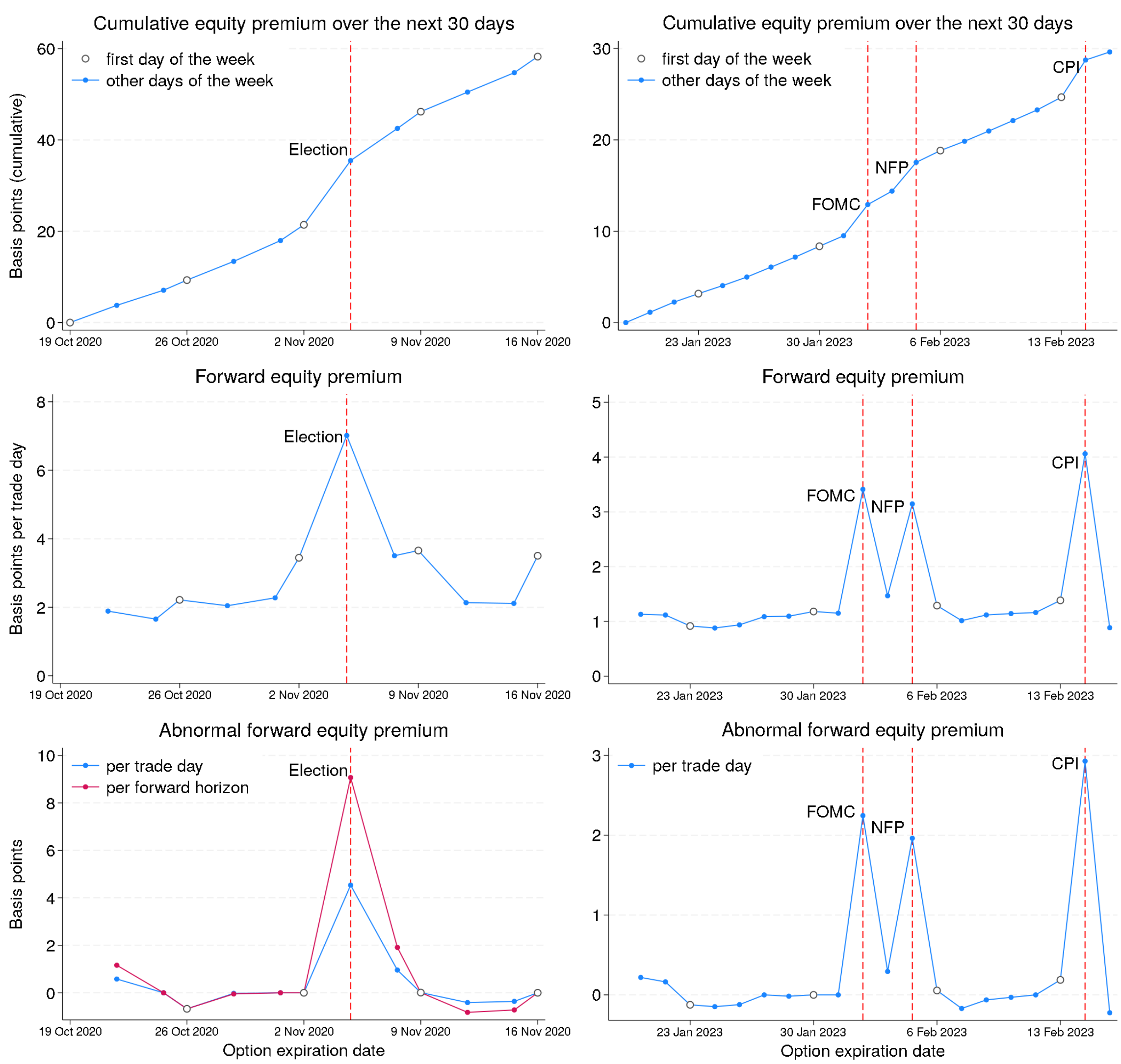
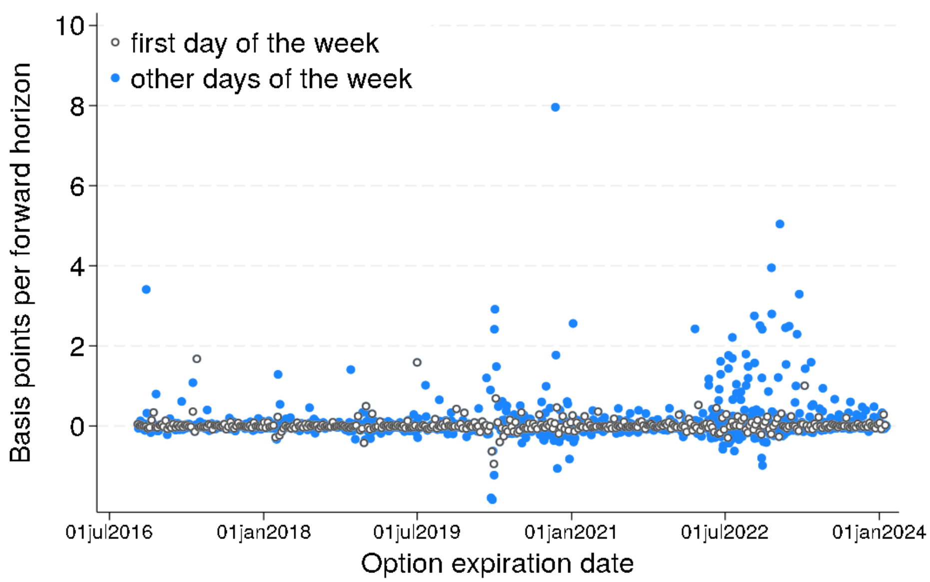


Figure 3: Abnormal Forward Daily Equity Premia by Forward Period

This figure reports the time series of average SVIX abnormal forward equity premia across estimation days for each forward period in our sample. In Panel A, we separate forward premia expiration dates into two sub samples: expiration dates that are the first trade day of the week (white dots) and expiration dates that are not the first trade day of the week (blue dots). In Panel B, forward periods spanning CPI releases (red dots), FOMC releases (green dots), NFP releases (yellow dots), and Elections (purple dots) are marked separately. Forward premia are reported in basis points.

Panel A. Abnormal Forward Equity Premia Per Forward Period



Panel B. Abnormal Forward Equity Premia Per Forward Period, By Release Type

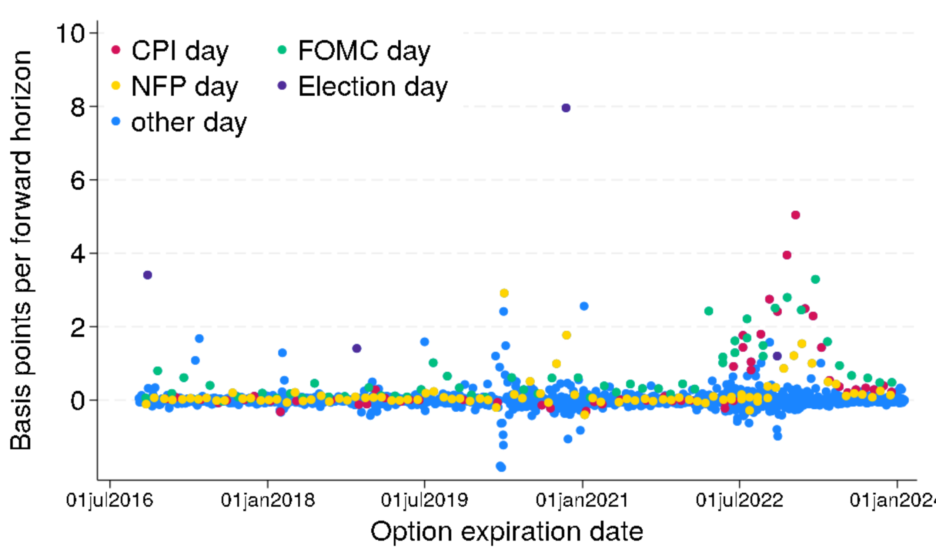


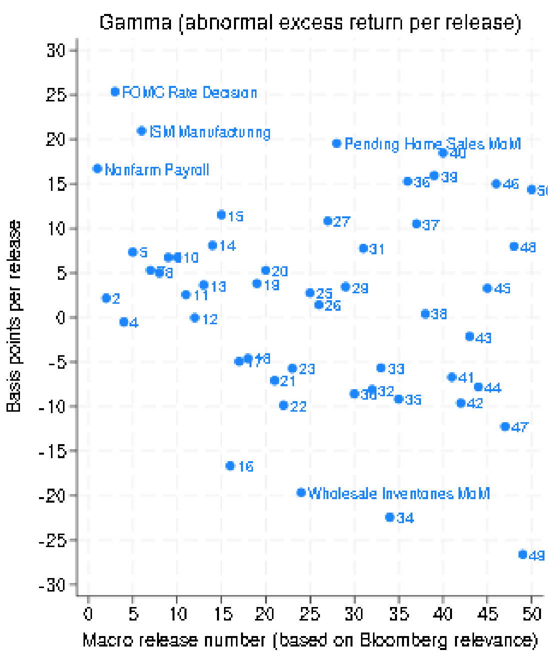
Figure 4: Excess Stock Returns on Macroeconomic Release Dates, October 1996-December 2023

This figure reports results for the following regression of realized excess stock returns on indicator variables for each of the 50 macroeconomic releases and an additional indicator variable for presidential elections:

$$r_t^{stock} - r_t^f = \alpha + \Sigma_{m=1}^{M} (\gamma_m I_{m,t}) + \delta I_t^{election} + \epsilon_t.$$

Daily excess stock returns, $r_t^{stock} - r_t^f$, are S&P500 returns minus the risk-free rate from Ken French's data library. $I_{m,t} = 1$ if macroeconomic release m occurs on day t and zero otherwise. $I_t^{election} = 1$ on the days following presidential election dates. The regression is estimated on daily data from October 31, 1996, to December 31, 2023. Panel A reports the estimated γ coefficients, with statistically significant releases labeled with the release name and statistically insignificant releases labeled with their release number (listed in Appendix Table A3). The estimated values of α and δ are $\widehat{\alpha} = -0.74$ bp (t =-0.27) and $\widehat{\delta} = -2.45$ bp (t =-0.05). Panel B reports the estimated γ coefficient multiplied by the number of releases of release m per year for each macroeconomic release.

Panel A. Additional excess return per release



Panel B. Additional excess return per year

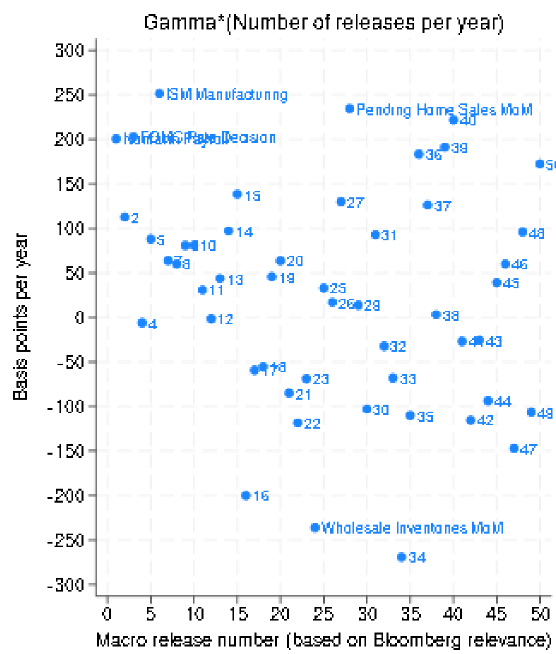


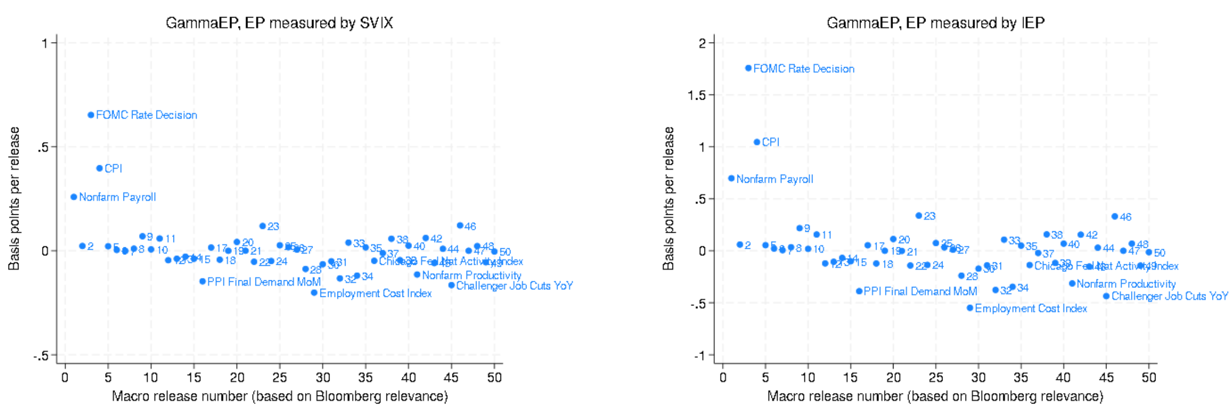
Figure 5: Equity Premia on Macroeconomic Release Dates

This figure reports results for the following regression of abnormal equity premia per forward period on indicator variables for each of the 50 macroeconomic releases and an additional indicator variable for presidential elections:

$$A_e^{EP} \times H_e = \alpha + \Sigma_{m=1}^{M} \left(\gamma_m I_{m,e}\right) + \delta I_e^{election} + \epsilon_e,$$

where A_e^{EP} is the average abnormal SVIX or IEP premium across available trade dates, $I_{m,e} = 1$ if macroeconomic release m occurs over forward period e and zero otherwise. $I_t^{election} = 1$ for forward periods spanning presidential elections. H_e is the length of the forward period in trading days. Panel A reports the estimated γ coefficients (based on separate regressions for the equity premium measured by SVIX or IEP). Releases for which γ values are statistically significant are labeled with the release name and statistically insignificant estimates are instead labeled with their release number (listed in Appendix Table A3). Panel B reports for the estimated γ coefficient multiplied by the number of releases of release type m per year for each macroeconomic release. Tabular results are reported in Appendix Table A6

A. Additional abnormal equity premium per release



B. Additional abnormal equity premium per year

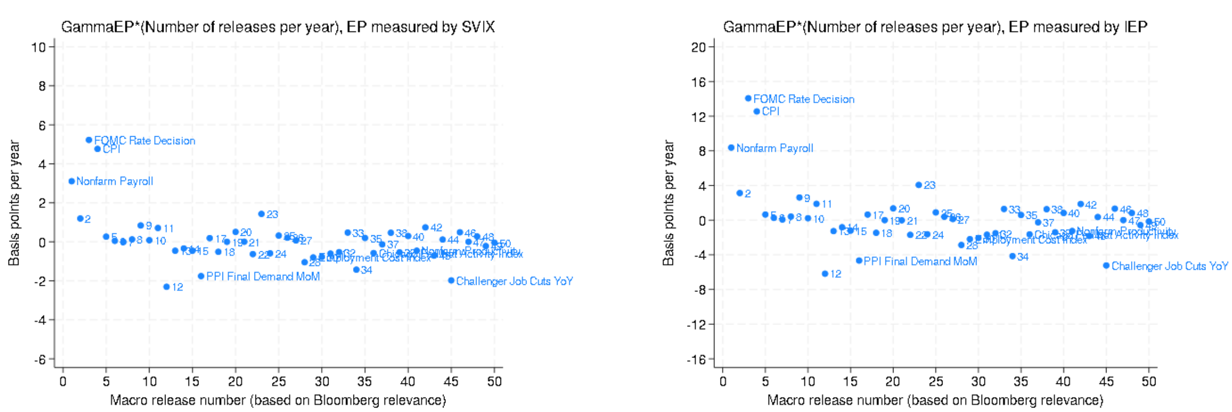


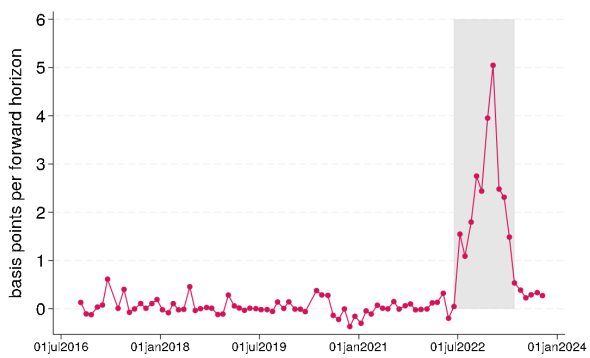
Figure 6: Time-variation in the CPI Announcement Risk Premium

This figure shows the components of the abnormal expected return for CPI announcements, $\mu_t^m - \mu_t$, based on the asset pricing framework introduced in Section V:

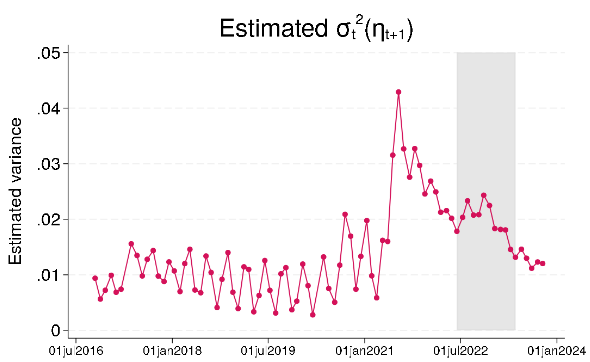
$$\mu_t^m - \mu_t = -R_{t+1}^F \beta_t^R \beta_t^M \sigma_t^2(\eta_{t+1}),$$

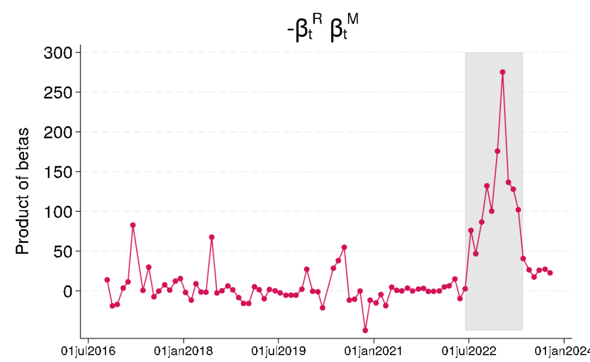
where $R_{t+1}^F \approx 1$ is the risk-free rate on day $t+1$, β_t^R is the return sensitivity to the macroeconomic news released, β_t^M is the stochastic discount factor sensitivity to the macroeconomic news released, and $\sigma_t^2(\eta_{t+1})$ is the conditional variance of released news.

Panel A. Abnormal SVIX equity premium $\mu_t^m - \mu_t$

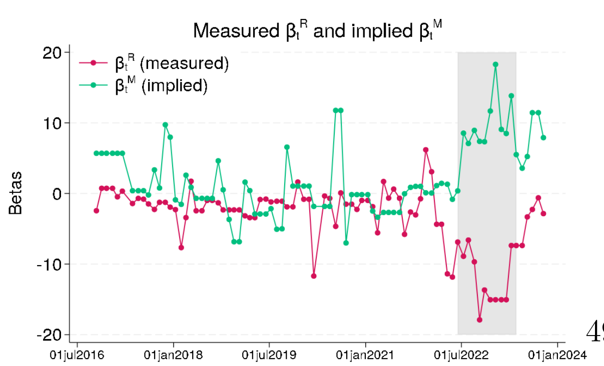


Panel B. Decomposing $\mu_t^m - \mu_t$ into $\sigma_t^2(\eta_{t+1})$ and $-\beta_t^R \beta_t^M$





Panel C. Inflation news betas and inflation news uncertainty



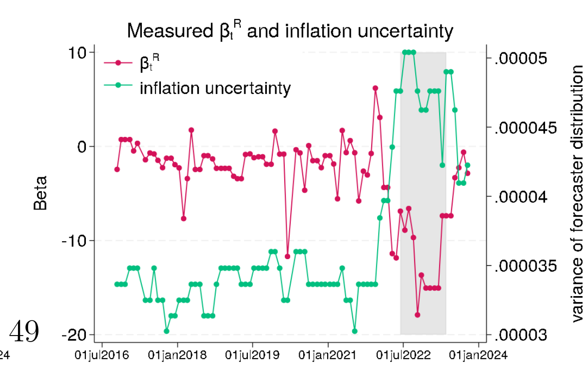


Figure 7: Pricing an Event Over Time

This figure illustrates how event risk premia associated can be tracked over time. The figure reports SVIX equity premium estimates for the 2024 election (orange series) and average market implied probabilities of the republican presidential candidate winning (blue series) over the month preceding the election.

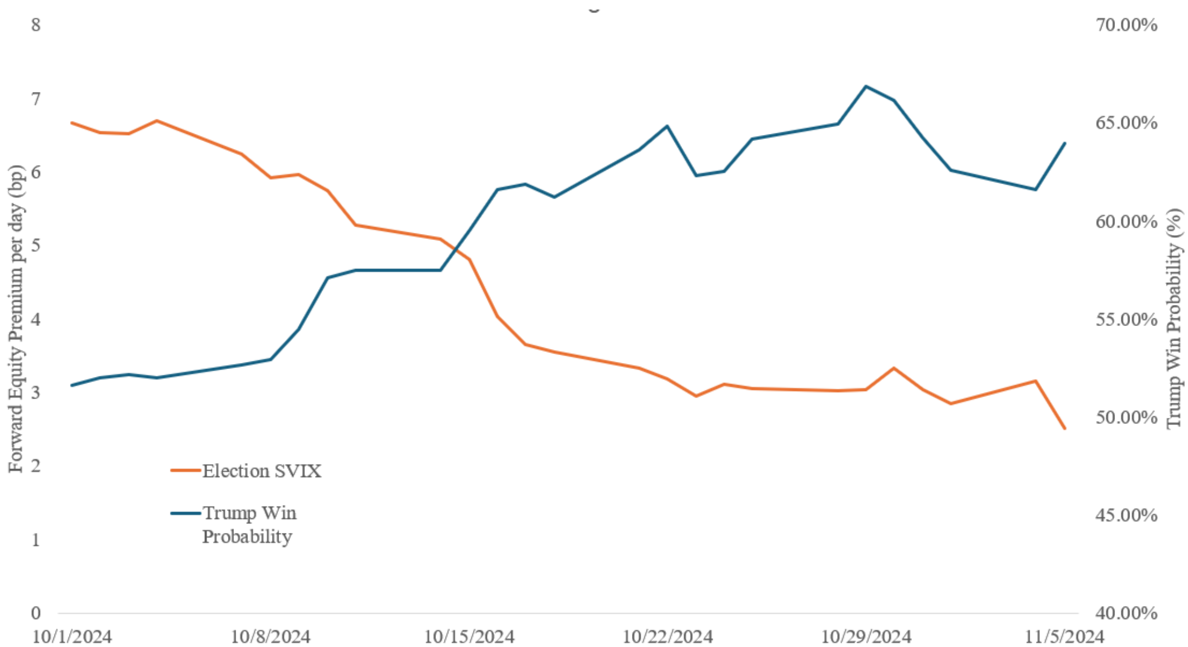


Table 1: Data Availability

This table shows the availability of options data, separated by expiration year and expiration day of the week. Panel A shows the unique option expiration dates, e, and Panel B shows all trade-expiration date observations, (t, e).

Panel A: Number of Unique Option Expiration Dates, e

	Expiration date day of the week					
	Monday	Tuesday	Wednesday	Thursday	Friday	Total
2016	11	1	12	0	9	33
2017	46	9	52	3	47	157
2018	48	7	51	2	51	159
2019	48	7	51	4	51	161
2020	48	6	52	5	49	160
2021	47	7	52	3	50	159
2022	45	38	52	34	51	220
2023	45	51	52	51	51	250
2024	2	4	4	4	4	18
Total	340	130	378	106	363	1,317

Panel B: Number of Trade Date-Expiration Observations, (t, e)

	Expiration date day of the week					
	Monday	Tuesday	Wednesday	Thursday	Friday	Total
2016	139	16	165	0	130	450
2017	706	139	805	47	722	2,419
2018	732	108	785	32	784	2,441
2019	740	108	789	62	788	2,487
2020	740	94	804	78	755	2,471
2021	722	110	805	46	770	2,453
2022	683	398	794	328	779	2,982
2023	687	784	801	785	785	3,842
2024	18	40	37	34	31	160
Total	5,167	1,797	5,785	1,412	5,544	19,705

Table 2: The Distribution of Forward Equity Premia

This table reports the following descriptive statistics of forward risk premia: the total number (count), the average (avg), the 5^{th}, 25^{th}, 50^{th}, 75^{th}, and 95^{th} percentiles (p5, p25, p50, p75, p95, respectively), and the standard deviation (sd). Panel A and B present summary statistics of forward and abnormal risk premium, respectively. Risk premia using the SVIX, LBR, and IEP measures and are reported in basis points per day. Panel C reports summary statistics of the abnormal risk premia under different quantile regressions (QR) specifications. The specifications include estimating at the median quantile ($\mathcal{T} = 0.5$) and the 0.3 quantile ($\mathcal{T} = 0.3$), and conditioning on the first forward period expiration of the week ($I_{e=fow}$), time to expiration ($T_{t,e}$), and time to expiration squared ($T_{t,e}^2$).

Panel A: Forward Equity Premium Summary Statistics

Equity premium measure	count	avg	p5	p25	p50	p75	p95	sd
		Basis points per trade day						
SVIX	19,705	1.48	0.38	0.66	1.07	1.81	3.69	1.47
LBR	19,705	1.76	0.43	0.75	1.23	2.13	4.39	1.89
IEP	19,705	4.05	1.08	1.83	2.92	4.91	9.91	4.02

Panel B: Abnormal Forward Equity Premium Summary Statistics

Equity premium measure	count	avg	p5	p25	p50	p75	p95	sd
		Basis points per trade day						
SVIX	19,705	0.06	-0.23	-0.03	0.00	0.05	0.46	0.49
LBR	19,705	0.06	-0.27	-0.04	0.00	0.06	0.53	0.58
IEP	19,705	0.15	-0.61	-0.09	0.00	0.13	1.23	1.34
		Basis points per forward period						
SVIX	19,705	0.07	-0.31	-0.04	0.00	0.06	0.58	0.63
LBR	19,705	0.08	-0.36	-0.05	0.00	0.08	0.68	0.72
IEP	19,705	0.18	-0.83	-0.13	0.00	0.17	1.58	1.72

Panel C: Effect of Model Choice on Abnormal Forward Equity Premia

$\mathcal{T}$	Regressors	count	avg	p5	p25	p50	p75	p95	sd
			Basis points per forward period (SVIX)						
0.5	constant,	19,705	0.08	-0.41	-0.08	0.00	0.14	0.77	0.59
0.5	constant, I_{fow},	19,705	0.06	-0.36	-0.05	0.00	0.11	0.55	0.57
0.5	constant, I_{fow}, Term,	19,705	0.05	-0.27	-0.04	0.00	0.06	0.48	0.50
0.5	constant, I_{fow}, Term, Term^2	19,705	0.05	-0.23	-0.04	0.00	0.05	0.45	0.49
0.3	constant, I_{fow}, Term, Term^2	19,705	0.13	-0.10	-0.00	0.01	0.11	0.59	0.49

Table 3: Decomposing the Variation in Forward Equity Premia

This table reports results for a decomposition of the variation of the trade date-forward period panel. We report the time series standard deviation (Std. dev.) of the trade date-level median forward premia, $Median_t$, in the left column and the time series average (Avg.) of trade date-level standard deviations, SD_t, in the right column. Results are reported for raw and abnormal forward premia using the SVIX, LBR, and IEP measures of expected returns.

	Equity premium measure	Median EP (across expirations) by trade date: $Median_t$	Std. dev. of EP (across expirations) by trade date: SD_t
(1)	Raw SVIX	Std. dev.= 1.31	Avg.= 0.36
(2)	Abnormal SVIX		Avg.= 0.25
(3)	Raw LBR	Std. dev.=1.72	Avg.= 0.43
(4)	Abnormal LBR		Avg.= 0.29
(5)	Raw IEP	Std. dev.=3.57	Avg.= 0.98
(6)	Abnormal IEP		Avg.= 0.69

Table 4: Forward Periods with Significant Abnormal Premia

This table reports all forward periods with significant abnormal premia. After averaging abnormal premia across available trade dates for each forward period e, we estimate the following regression using the time series of average abnormal forward premia:

$$A_e^{SVIX} \times H_e = \alpha + \beta I_e + \epsilon_e,$$

where A_e^{SVIX} is the average abnormal SVIX forward equity premia (per trade day) for the forward period ending on date e, H_e is the length of the forward period in trade days, and I_e is an indicator variable equal to one for all observations pertaining to one forward period in each regression and zero otherwise. Statistically significant forward periods are sorted in order of economic significance measured by $\hat{\beta}$ in column (4). Column (2) reports the end date of each forward period. Column (3) reports the associated event(s). For forward periods not spanning CPI, FOMC, and NFP releases, we use the online archives of the Wall Street Journal to identify scheduled event(s). The p-values are reported in column (5). Column (6) reports the length of each forward period in trade days. We additionally report the trade date average of raw forward premia, in basis points, over the forward period for the SVIX, LBR, and IEP measures of expected returns in columns (7), (8), and (9) respectively.

(1) No.	(2) Forward Period	(3) Event(s)	(4) $\hat{\beta}$ (bp)	(5) p-value	(6) Period Length	(7) SVIX Equity Prem. (bp)	(8) LBR Equity Prem. (bp)	(9) IEP Equity Prem. (bp)
1	2020-11-04	Presidential Election	7.896	< 0.001	2	13.43	15.52	35.69
2	2023-01-12	CPI	4.978	< 0.001	1	6.61	7.07	17.24
3	2022-12-13	CPI	3.885	< 0.001	1	5.47	5.87	14.35
4	2016-11-09	Presidential Election	3.343	< 0.001	2	4.95	5.39	13.73
5	2023-03-22	FOMC	3.225	< 0.001	1	4.65	5.08	12.15
6	2020-04-03	NFP	2.848	< 0.001	2	20.69	26.52	57.64
7	2022-12-14	FOMC	2.730	< 0.001	1	4.29	4.64	11.25
8	2022-10-13	CPI	2.683	< 0.001	1	5.60	6.11	15.09
9	2021-01-06	Georgia Runoff	2.493	< 0.001	2	6.39	7.72	17.31
10	2022-11-02	FOMC	2.440	< 0.001	1	5.70	6.33	15.17
11	2023-02-14	CPI	2.427	< 0.001	1	3.53	3.87	9.22
12	2023-02-01	FOMC	2.386	< 0.001	1	3.70	3.95	9.64
13	2022-03-16	FOMC	2.358	< 0.001	2	8.01	9.66	21.92
14	2020-04-01	Covid-19	2.349	< 0.001	1	10.99	14.89	30.69
15	2022-11-10	CPI	2.348	< 0.001	1	5.66	6.32	14.95
16	2023-03-14	CPI	2.226	< 0.001	1	3.49	3.82	9.14
17	2022-07-27	FOMC	1.902	< 0.001	2	5.37	5.91	14.61
18	2022-09-13	CPI	1.728	< 0.001	1	4.06	4.43	11.06
19	2020-11-06	FOMC, NFP	1.704	< 0.001	2	7.78	9.39	20.88
20	2017-05-08	French Presidential Election Runoff	1.610	< 0.001	1	2.31	2.67	6.48
21	2023-05-03	FOMC	1.525	< 0.001	1	2.66	2.91	6.98
22	2019-07-01	Trump-Xi G-20 Bilateral	1.521	0.001	1	2.65	2.91	7.55
23	2022-07-13	CPI	1.505	0.001	2	5.52	6.22	15.00
24	2023-02-03	NFP	1.471	0.001	1	2.77	2.98	7.23
25	2020-04-08	Covid-19	1.416	0.002	2	19.98	26.37	55.18
26	2022-06-15	FOMC	1.374	0.003	2	5.08	5.69	13.87
27	2023-04-12	CPI	1.364	0.003	1	2.86	3.27	7.48
28	2018-11-07	Midterm Election	1.340	0.004	2	4.52	5.36	12.85
29	2022-09-21	FOMC	1.283	0.006	2	4.50	5.01	12.22
30	2018-02-21	FOMC Minutes	1.220	0.008	1	2.84	3.81	8.16
31	2023-01-06	NFP	1.143	0.014	1	2.97	3.25	7.78
32	2022-11-09	Midterm Election	1.132	0.014	1	4.53	4.96	11.94
33	2020-03-04	FOMC	1.132	0.015	2	3.59	4.09	10.36
34	2022-05-04	FOMC	1.033	0.026	2	4.00	4.72	10.97
35	2017-04-24	French Presidential Election First Round	1.014	0.029	3	3.20	3.53	8.92
36	2019-07-31	FOMC	0.950	0.040	2	2.26	2.50	6.47
37	2023-04-10	NFP	0.938	0.043	1	2.80	3.29	7.33
38	2023-03-10	NFP	0.933	0.044	1	2.23	2.44	5.84
39	2020-10-02	NFP	0.925	0.046	2	5.72	6.86	15.15

Table 5: Macroeconomic Release Equity Premia Statistics

This table reports equity premium statistics for all forward periods in our sample and for forward periods spanning CPI, FOMC, and NFP releases. Panel A reports results using the forward SVIX, Panel B reports results for the forward LBR, and Panel C reports results for the forward IEP. Row 1 of each panel reports the number of forward periods in our sample, row 2 reports the average forward premium per forward period in the full sample in bp, row 3 reports the yearly average of forward premia per annum in the full sample in percent, row 4 reports the number of forward periods spanning CPI, FOMC, and NFP releases, row 5 reports average forward premia per period for each release type in bp, row 6 reports average release forward premia per annum (avg. forward premia per release forward period times number of releases per year) in percent. We also report the share of total premia account for by CPI, FOMC, and NFP releases in our sample, as well as the share of total forward periods spanning these releases.

Panel A: SVIX				
(1) No. fwd. periods		1317		
(2) Avg. EP (bp per period)		2.04		
(3) Avg EP p.a. (percent)		3.50%		
	CPI	FOMC	NFP	All
(4) No. release fwd. periods	87	58	86	226
(5) Avg. release EP (bp per period)	2.66	2.90	2.53	2.69
(6) Avg. release EP p.a. (percent)	0.32%	0.23%	0.30%	
(4)/(1)	6.61%	4.40%	6.53%	17.16%
%Total EP	8.63%	6.27%	8.11%	22.59%
Panel B: LBR				
(1) No. fwd. periods		1317		
(2) Avg. EP (bp per period)		2.42		
(3) Avg EP p.a. (percent)		4.13%		
	CPI	FOMC	NFP	All
(4) No. release fwd. periods	87	58	86	226
(5) Avg. release EP (bp per period)	3.15	3.37	3.01	3.17
(6) Avg. release EP p.a. (percent)	0.38%	0.27%	0.36%	
(4)/(1)	6.61%	4.40%	6.53%	17.16%
%Total EP	8.63%	6.15%	8.14%	22.51%
Panel C: IEP				
(1) No. fwd. periods		1317		
(2) Avg. EP (bp per period)		5.58		
(3) Avg EP p.a. (percent)		9.59%		
	CPI	FOMC	NFP	All
(4) No. release fwd. periods	87	58	86	226
(5) Avg. release EP (bp per period)	7.29	7.93	6.95	7.35
(6) Avg. release EP p.a. (percent)	0.87%	0.63%	0.83%	
(4)/(1)	6.61%	4.40%	6.53%	17.16%
%Total EP	8.63%	6.26%	8.14%	22.60%

Table 6: Realized Excess Returns on Macroeconomic Release Dates

The table reports results for the following regression of realized daily excess stock returns on indicator variables for three types of macroeconomic releases:

$$r_t^{stock} - r_t^f = \alpha + \Sigma_{m=1}^M (\beta_m I_{m,t}) + \epsilon_t.$$

where daily excess stock returns, $r_t^{stock} - r_t^f$, are S&P 500 returns minus the risk-free rate from Ken French's data library. $I_{m,t} = 1$ if macroeconomic release m occurs on day t and zero otherwise. Over the sample 1928-2024, there are 826 FOMC meetings, 1,129 nonfarm payroll announcements and 999 CPI/PPI announcements (using the earlier of CPI and PPI in each month). t-statistics are in parentheses and are based on standard errors robust to heteroskedasticity. The dependent variable is measured in basis points.

	(1) Savor-Wilson 1958-2009	(2) Lucca-Moench 1994m9-2011m3	(3) Long sample 1928-2024	(4) Pre-SW 1928-1957	(5) 1958-1977	(6) Post-SW 2010-2024
$I_{FOMC,t}$	21.66***	34.34***	11.84***	9.55	7.06	6.85
	(3.62)	(3.12)	(2.98)	(0.84)	(1.61)	(0.66)
$I_{NFP,t}$	7.36*		7.16**	7.47		5.16
	(1.85)		(2.09)	(0.98)		(0.60)
$I_{\mathrm{CPI/PPI},t}$	4.59		0.93	0.325		-10.36
	(1.16)		(0.26)	(0.03)		(-1.21)
Constant	1.30	1.68	2.27***	2.68*	1.28	5.33***
	(1.46)	(0.86)	(3.00)	(1.65)	(1.21)	(2.75)
Observations	13,092	4,176	24,367	7,501	5,016	3,774
R^2	0.001	0.002	0.001	0.000	0.001	0.001

Column 1: FOMC data start in 1978. PPI data start in 1971.

Column 3, 4: FOMC data start in 1936. CPI data start in 1941, PPI data start in 1971.

Table 7: Options-Implied Equity Premia on Macroeconomic Release Dates, October 2016-December 2023

Column (1) reports results of the following regression of abnormal equity premia per forward period on indicator variables for each of three types of macroeconomic releases and an additional indicator variable for presidential elections:

$$A_e^{SVIX} \times H_e = \alpha + \Sigma_{m=1}^{M} (\gamma_m I_{m,e}) + \delta I_e^{election} + \epsilon_e$$

where A_e^{SVIX} is the average across available trade dates of $A_{t,e}^{SVIX}$, $I_{m,e} = 1$ if macroeconomic release m occurs over forward period e and zero otherwise. $I_t^{election} = 1$ for forward periods spanning November presidential elections. H_e is the length of the forward period in trading days (1 or 2). t-statistics are in parentheses and are based on standard errors robust to heteroskedasticity. Column (2) and (3) repeat the same regression using LBR and IEP instead of SVIX.

	Dependent variable (in basis points):		
	$A_e^{SVIX} \times H_e$	$A_e^{LBR} \times H_e$	$A_e^{IEP} \times H_e$
	(1)	(2)	(3)
$I_{FOMC,e}$	0.563***	0.604***	1.518***
	(5.76)	(5.72)	(5.89)
$I_{NFP,e}$	0.151***	0.163***	0.406***
	(3.70)	(3.69)	(3.64)
$I_{CPI,e}$	0.320***	0.335***	0.843***
	(3.12)	(3.10)	(3.13)
$I_t^{election}$	3.335***	3.719***	9.002***
	(2.91)	(2.91)	(2.97)
Constant	0.007	0.011**	0.021
	(0.84)	(1.10)	(0.89)
Observations	1,260	1,260	1,260
R^2	0.274	0.259	0.273

Table 8: Relationship between realized excess returns and expected excess returns

This table reports results from the following regression:

$$\tilde{R}_{t,T} = \alpha + \beta E_t(\tilde{R}_{t,T}) + \epsilon_t$$

where $\tilde{R}_{t,T}$ is the realized excess return from time t to $t+T$, and $E_t(\tilde{R}_{t,T})$ is the horizon-matched time t expectation of the excess return using option-implied measures. Panel A, B and C report results for the SVIX, LBR and IEP measures of option-implied equity premium respectively. The regressions use constant maturity realized and expected excess returns of 1-month (columns 1,2 and 4), 1-week (columns 3 and 5) and 2-day (column 6) with overlapping observations. For each column we winzorize the sample at the 5th and 95th percentiles. Newey West standard errors with lag length set the horizon to adjust for overlapping observations are reported in parathesis.

Panel A: SVIX measure of Equity Premium

	1996-2024	2009-2024		2016-2024		
	1-month	1-month	1-week	1-month	1-week	2-day
	(1)	(2)	(3)	(4)	(5)	(6)
Horizon-matched Equity Premium	1.73**	2.71**	3.11***	3.37**	3.58**	3.38*
	(0.84)	(1.10)	(1.20)	(1.45)	(1.77)	(1.94)
Constant	0.07	0.25	0.05	0.13	0.05	0.03
	(0.28)	(0.34)	(0.08)	(0.44)	(0.10)	(0.04)
R^2	0.009	0.028	0.009	0.032	0.009	0.004
Observations	7,247	4,044	4,045	2,092	2,093	2,093

Panel B: LBR measure of Equity Premium

	1996-2024	2009-2024		2016-2024		
	1-month	1-month	1-week	1-month	1-week	2-day
	(1)	(2)	(3)	(4)	(5)	(6)
Horizon-matched Equity Premium	1.51**	2.15**	2.78**	2.89**	3.39**	3.16*
	(0.71)	(0.90)	(1.09)	(1.19)	(1.62)	(1.84)
Constant	0.06	0.30	0.06	0.12	0.04	0.03
	(0.28)	(0.33)	(0.08)	(0.43)	(0.10)	(0.04)
R^2	0.010	0.026	0.008	0.034	0.010	0.004
Observations	7,247	4,044	4,045	2,092	2,093	2,093

Panel C: IEP measure of Equity Premium

	1997-2024	2009-2024		2016-2024		
	1-month	1-month	1-week	1-month	1-week	2-day
	(1)	(2)	(3)	(4)	(5)	(6)
Horizon-matched Equity Premium	1.12***	1.12**	1.30***	1.34**	1.42**	1.36*
	(0.42)	(0.45)	(0.49)	(0.56)	(0.69)	(0.76)
Constant	-0.13	0.25	0.06	0.11	0.04	0.03
	(0.29)	(0.34)	(0.07)	(0.44)	(0.10)	(0.04)
R^2	0.017	0.028	0.009	0.033	0.010	0.004
Observations	7,018	4,044	4,045	2,092	2,093	2,093

Table 9:
Pricing the Economic Calendar

This Table illustrates an example of how the methodology to estimate forward event premia (Londono and Samadi (2023)) and abnormal premia developed in this paper can be used to estimate risk pricing for the upcoming economic calendar. Forward premia are estimated using option prices on June 10, 2024, for the following four weeks of economic releases. Raw and abnormal forward premia using the SVIX are reported. Release days with abnormal premia falling in above the 80th percentiles of the historical distribution from August 2022 are highlighted. Premia are reported in basis points per trade day. Forward premia for the upcoming month of daily forward periods are available at www.pricingthecalendar.com.

S&P 500 Forward Premia: Jun 10, 2024

DATE	EVENT(S)	SVIX (BP)	ABN. SVIX (BP)
Jun 11, 2024		0.35	−0.05
Jun 12, 2024	Consumer Price Index, Fed Interest Rate Decision	1.37	0.95
Jun 13, 2024	Producer Price Index	0.54	0.09
Jun 14, 2024	Michigan Consumer Sentiment Index	0.41	−0.05
Jun 17, 2024		0.48	0.00
Jun 18, 2024	Retail Sales	0.44	−0.05
Jun 20, 2024		0.56	0.06
Jun 21, 2024	S&P Global Manufacturing PMI, S&P Global Services PMI	0.57	0.06
Jun 24, 2024		0.52	0.00
Jun 25, 2024		0.44	−0.09
Jun 26, 2024		0.45	−0.08
Jun 27, 2024	Gross Domestic Product	0.49	−0.04
Jun 28, 2024	Personal Consumption Expenditures	0.68	0.14
Jul 1, 2024	ISM Manufacturing PMI	0.63	0.09
Jul 2, 2024		0.53	0.00
Jul 3, 2024	ADP Employment Change, FOMC Minutes, ISM Services PMI	0.35	−0.18
Jul 5, 2024	Average Hourly Earnings, Nonfarm Payrolls	0.98	0.46
Jul 8, 2024		0.52	0.00

This table reports daily forward S&P 500 equity premia (Londono and Samadi, 2023) and abnormal equity premia (Knox, Londono, Samadi, and Vissing-Jorgensen, 2024) for each upcoming trade date. Forward periods with abnormal premia above the 80th percentile of the historical distribution since September 2022 are highlighted. Source: LiveVol

Appendix to “Equity Premium Events”

This Appendix provides additional description and empirical evidence to supplement the analyses provided in the main text. Below, we list the content.

1. Table A1 reports expiration-level descriptive statistics for the daily option expirations in our sample.
2. Table A2 reports retail trading activity statistics for our sample.
3. Section A details our approach to group 124 macroeconomic variables tracked in the Bloomberg Economic Calendar into 50 releases.
4. Table A3 reports the grouping of the 124 macroeconomic variables into 50 releases.
5. Table A4 reports goodness of fit statistics and coefficient estimates of our QR approach.
6. Section B details the implementation of the LBR and IEP.
7. Figure A1 reports the estimated IEP GO weights.
8. Figure A2 compares the SVIX, LBR, and IEP models of expected returns at the one year horizon.
9. Table A4 reports the estimation fit of various QR specifications and statistics for coefficient estimates in our baseline specification.
10. Table A5 reports multiple-testing adjusted p-values for the data-driven analysis.
11. Table A6 reports multivariate results examining expected returns in the cross-section of macroeconomic releases.
12. Section C reports additional results on the cross-section of macroeconomic releases.
13. Figure A3 reports univariate results for excess stock returns on macroeconomic release dates.
14. Figure A4 reports univariate results for expected return over forward periods spanning macroeconomic release dates.
15. Section D reports our data collection and validation process for the near century of macroeconomic releases.
16. Section E reports our data collection and validation process for the near century of macroeconomic releases.

Table A1:
Daily Option Expiration Descriptive Statistics

This table provides descriptive statistics for trade date-expiration level daily options data aggregated to the expiration level. For each variable, we report the mean, standard deviation, and select percentiles of expiration-level statistics. #Strikes is the daily average number of unique strike prices for a given expiration. Min. Moneyness is the daily average minimum moneyness (K/P_t) across available strike prices for a given expiration. Max. Moneyness is the daily average maximum moneyness across available strike prices for a given expiration. Min. Call Delta is the daily average of minimum call option delta across available strike prices for a given expiration. Max. Put Delta is the daily average maximum put option delta across available strike prices for a given expiration. Spread is the daily average of the within trade date median of percentage bid-ask spread for at-the-money ($0.4 \leq \Delta \leq 0.6$) options for a given expiration. Volume is the sum of trading volume across all contracts and trade dates for a given expiration. Open Interest is the daily average total open interest across all contracts for a given expiration.

	Statistic							
	Count	Mean	P5	P25	P50	P75	P95	SD
#Strikes	1,319	196	113	148	170	226	363	73
Min. Moneyness	1,319	0.39	0.21	0.27	0.30	0.59	0.63	0.16
Max. Moneyness	1,319	1.30	1.13	1.18	1.27	1.43	1.53	0.15
Min. Call Delta	1,319	0.0013	0.0003	0.0004	0.0008	0.0012	0.0042	0.0022
Max. Put Delta	1,319	-0.0008	-0.0026	-0.0007	-0.0004	-0.0002	-0.0001	0.0013
Spread	1,319	1.7%	0.8%	1.0%	1.3%	2.5%	3.6%	1.0%
Volume	1,319	710,944	247,697	382,350	550,289	948,515	1,648,837	465,053
Open Interest	1,319	148,033	25,507	44,778	66,961	210,671	468,883	170,431

Table A2:
Retail Trading Activity

This table reports average daily shares of retail volume (in contracts) using the proxy of Bryzgalova et al. (2023). Trade date-expiration level daily retail volume shares are grouped by year of the trade date, trading days to expiration, and expirations following CPI, FOMC, NFP releases or other expirations. This analysis uses option trade data obtained from the Cboe. Trades with a price of quantity less than or equal to zero are removed. Trades with prices below the prevailing best bid minus the bid-ask spread or above the best ask plus the bid-ask spread are removed. Trades with a prevailing bid-ask spread that is less than or equal to zero are removed. Cancelled trades are removed. Results are presented for trade dates from 2020 through 2023. The retail trading proxy does not detect any retail trading prior to 2020.

2020				
Days to Expiration	Other	CPI	FOMC	NFP
0	0.42%	1.26%	0.00%	0.34%
1	0.45%	1.00%	0.00%	0.40%
2	0.59%	3.11%	0.00%	0.73%
3	1.48%	0.40%	0.00%	0.28%
4	1.27%	3.76%	0.00%	1.70%
5	1.91%	7.30%	4.24%	0.10%
6	0.85%	7.14%	7.00%	0.00%
7	0.38%	0.17%	0.12%	0.00%
8	1.13%	0.00%	5.58%	0.02%
9	1.69%	0.03%	0.34%	0.11%
10	0.23%	0.01%	0.11%	0.56%
11	0.27%	0.40%	0.55%	0.03%
12	0.44%	0.07%	0.16%	0.08%
13	0.22%	0.36%	0.41%	0.00%
14	0.71%	1.19%	0.79%	0.00%
15	2.50%	0.12%	0.14%	0.07%
16	0.10%	0.12%	0.47%	0.07%
17	0.21%	0.07%	0.11%	0.23%
18	0.21%	0.33%	0.06%	0.54%
19	0.64%	0.11%	0.01%	0.08%
20	0.21%	1.07%	0.00%	0.00%

2021				
Days to Expiration	Other	CPI	FOMC	NFP
0	0.92%	1.16%	0.32%	0.76%
1	0.99%	0.64%	2.13%	1.07%
2	0.52%	0.31%	0.49%	0.45%
3	0.38%	0.28%	0.49%	0.34%
4	0.23%	0.10%	0.21%	0.26%
5	0.13%	0.04%	0.13%	0.10%
6	0.15%	0.11%	0.33%	0.31%
7	0.26%	0.12%	0.11%	0.22%
8	0.22%	0.16%	0.10%	0.12%
9	0.19%	0.45%	0.06%	0.07%
10	0.12%	0.36%	0.17%	0.12%
11	0.15%	0.28%	0.25%	0.19%
12	0.22%	0.44%	0.16%	0.18%
13	0.31%	0.72%	0.22%	0.33%
14	0.23%	0.21%	0.09%	0.13%
15	0.23%	0.36%	0.17%	0.11%
16	0.24%	0.29%	0.00%	0.26%
17	0.13%	0.05%	0.20%	0.14%
18	0.27%	0.00%	0.23%	0.05%
19	0.14%	0.14%	0.00%	0.01%
20	0.17%	0.49%	0.00%	0.04%

2022				
Days to Expiration	Other	CPI	FOMC	NFP
0	3.51%	3.00%	1.83%	3.31%
1	2.33%	3.33%	2.68%	3.48%
2	1.39%	1.28%	0.98%	1.68%
3	1.05%	0.75%	0.89%	1.89%
4	0.81%	1.32%	0.00%	0.79%
5	0.63%	0.11%	0.25%	0.47%
6	0.72%	0.72%	0.82%	0.35%
7	0.78%	0.43%	0.39%	0.72%
8	0.63%	0.73%	1.20%	0.81%
9	0.80%	0.53%	0.82%	0.45%
10	0.72%	0.00%	0.00%	0.36%
11	0.62%	0.40%	0.82%	0.48%
12	0.53%	0.61%	0.46%	0.32%
13	0.79%	0.63%	0.64%	0.44%
14	0.54%	1.07%	0.29%	0.19%
15	0.50%	0.24%	0.88%	0.21%
16	0.71%	0.36%	0.48%	0.00%
17	0.56%	0.17%	0.59%	0.00%
18	0.42%	0.13%	0.45%	0.36%
19	0.44%	0.35%	0.00%	0.33%
20	0.25%	0.00%	0.00%	0.19%

2023				
Days to Expiration	Other	CPI	FOMC	NFP
0	3.81%	4.11%	2.81%	3.12%
1	1.97%	1.84%	2.55%	0.95%
2	1.21%	0.87%	0.91%	1.14%
3	1.06%	0.73%	0.60%	1.08%
4	0.73%	0.00%	0.31%	0.64%
5	0.59%	1.05%	0.33%	0.62%
6	0.74%	0.34%	0.49%	0.81%
7	0.73%	0.36%	0.25%	0.68%
8	0.59%	0.41%	0.29%	0.74%
9	0.58%	0.17%	1.50%	0.88%
10	0.60%	0.36%	0.84%	0.57%
11	0.66%	0.48%	0.31%	0.49%
12	0.55%	0.97%	0.28%	0.47%
13	0.60%	1.38%	0.54%	0.34%
14	0.58%	0.85%	0.29%	0.28%
15	0.48%	0.89%	0.48%	0.31%
16	0.44%	0.30%	0.00%	0.71%
17	0.64%	0.05%	0.21%	1.15%
18	0.78%	0.29%	0.00%	0.17%
19	0.65%	0.62%	0.00%	0.13%
20	0.38%	0.00%	0.10%	0.29%

A. Procedure to Group Macroeconomic Variables into 50 releases

Our procedure for grouping the 124 macroeconomic variables tracked in the Bloomberg Economic Calendar into 50 releases is as follows:

1. For each variable, determine the first announcement date available, T_i^{min}.

2. Sort the variables based on Bloomberg's relevance score, from most to least relevant.

3. Define a set of 124 daily dummy variables $D_{i,t}$, with $i = 1, \ldots, 124$, and $D_{i,t} = 1$ if date t is an announcement date for variable i.

4. For each variable, regress $D_{i,t}$ on $D_{1,t}, \ldots, D_{i-1,t}$ using daily data from T_i^{min} and later.

   - If an $R^2 = 1$ emerges, determine (by looking at the underlying releases) whether the variable i is from the same release as one of the more relevant variables 1 to $i - 1$. This is the case for 62 variables. We then use only one combined release dummy and label it based on the most relevant variable included in the release measured by the Bloomberg relevance variable.
   - For seven variables, R^2 values close to 1 in cases where the less relevant variable is in fact from the same release as a more relevant variable, but one of the two variables involved has one or a few errors in the release date. In each case, we use only one combined release dummy, labelling releases based on the most relevant variable according to the Bloomberg relevance variable.
   - For four variables, we get R^2 values above 0.80 despite the variables not being a part of a release of a more relevant variable. This occurs when two variables tend to be released on the same dates, but as part of different economic releases. We drop these variables to avoid multi-collinearity issues (none of these four variables are significantly correlated with the four variables we find to be associated with abnormal equity premia).
   - One variable has data only for 2023, and we drop it.

Based on this method, we group variables into 50 (=124-62-7-4-1) macroeconomic releases. The groupings of macroeconomic variables are reported in Appendix Table A3.

Table A3: Grouping of Macroeconomic Variables Into 50 Releases

This table lists the grouping of 124 macroeconomic variables tracked in the Bloomberg Economic Calendar into 50 releases. Variables are grouped using the approach detailed in Appendix A.

Release No.	Macro variable
1	Nonfarm Payroll
1	Unemployment Rate
1	Change in Manufact. Payrolls
1	Continuing Claims
1	Average Hourly Earnings MoM
1	Average Hourly Earnings YoY
1	Change in Private Payrolls
1	Average Weekly Hours All Employees
1	Underemployment Rate
1	Labor Force Participation Rate
2	Initial Jobless Claims
3	FOMC Rate Decision (Upper Bound)
3	FOMC Rate Decision (Lower Bound)
3	Interest on Reserve Balances Rate
4	CPI MoM
4	CPI YoY
4	CPI Ex Food and Energy MoM
4	CPI Ex Food and Energy YoY
4	CPI Core Index SA
4	CPI Index NSA
4	Real Avg Weekly Earnings YoY
4	Real Avg Hourly Earning YoY
5	GDP Annualized QoQ
5	GDP Price Index
5	Personal Consumption
5	Core PCE Price Index QoQ
6	ISM Manufacturing
6	ISM Prices Paid
6	ISM New Orders
6	ISM Employment
7	U. of Mich. Sentiment
7	U. of Mich. 1 Yr Inflation
7	U. of Mich. 5-10 Yr Inflation
7	U. of Mich. Expectations
7	U. of Mich. Current Conditions

Release No.	Macro variable
8	Retail Sales Advance MoM
8	Retail Sales Ex Auto MoM
8	Retail Sales Ex Auto and Gas
8	Retail Sales Control Group
9	Conf. Board Consumer Confidence
9	Conf. Board Expectations
9	Conf. Board Present Situation
10	Durable Goods Orders
10	Durables Ex Transportation
10	Cap Goods Orders Nondef Ex Air
10	Cap Goods Ship Nondef Ex Air
10	Factory Orders Ex Trans
11	ADP Employment Change
12	MBA Mortgage Applications
13	New Home Sales
13	New Home Sales MoM
14	Housing Starts
14	Building Permits
15	Industrial Production MoM
15	Capacity Utilization
15	Manufacturing (SIC) Production
16	PPI Final Demand MoM
16	PPI Final Demand YoY
16	PPI Ex Food and Energy MoM
16	PPI Ex Food and Energy YoY
16	PPI Ex Food, Energy, Trade MoM
16	PPI Ex Food, Energy, Trade YoY
17	Existing Home Sales
17	Existing Home Sales MoM
18	Personal Income
18	Personal Spending
18	PCE Core Deflator MoM
18	PCE Core Deflator YoY
18	PCE Deflator YoY
18	Real Personal Spending
18	PCE Deflator MoM
19	Factory Orders
20	Trade Balance
21	Empire Manufacturing
22	Leading Index
23	MNI Chicago PMI
24	Wholesale Inventories MoM
24	Wholesale Trade Sales MoM

Release No.	Macro variable
25	ISM Services Index
25	ISM Services Prices Paid
25	ISM Services New Orders
25	ISM Services Employment
26	Philadelphia Fed Business Outlook
27	Import Price Index MoM
27	Import Price Index YoY
27	Export Price Index MoM
27	Export Price Index YoY
27	Import Price Index ex Petroleum MoM
28	Pending Home Sales MoM
28	Pending Home Sales NSA YoY
29	Employment Cost Index
30	Monthly Budget Statement
31	Richmond Fed Manufact. Index
32	Current Account Balance
33	Net Long-term TIC Flows
33	Total Net TIC Flows
34	FHFA House Price Index MoM
35	Dallas Fed Manf. Activity
36	Chicago Fed Nat Activity Index
37	NFIB Small Business Optimism
38	FOMC Meeting Minutes
39	JOLTS Job Openings
40	NAHB Housing Market Index
41	Nonfarm Productivity
41	Unit Labor Costs
42	Wards Total Vehicle Sales
43	Consumer Credit
44	Business Inventories
45	Challenger Job Cuts YoY
46	House Price Purchase Index QoQ
47	Housing Starts MoM
47	Building Permits MoM
48	Kansas City Fed Manf. Activity
49	Household Change in Net Worth
50	Advance Goods Trade Balance
50	Retail Inventories MoM

Table A4:
QR Model Fit and Coefficient Estimates

Panel A reports model fits for various quantile regression specifications. On each trade date t, we fit the term structure of forward risk premium using a quantile regression model:

$$Q_{F_{t,e}|x_{t,e}}(\mathcal{T}) = x_{t,e}\beta_{t,\mathcal{T}},$$

where $Q_{F_{t,e}|x_{t,e}}(\mathcal{T})$ is the $\mathcal{T}$'th quantile of forward expected returns on date t and $x_{t,e}$ is a vector containing the conditioning variables. The goodness of fit measure, the pseudo$-R^2$, is estimated as 1 minus the ratio between the sum of absolute deviations in the parameterized model and the sum of absolute deviations in the null (non-conditional) quantile model. The table presents summary statistics of the goodness of fit measure across trade dates for the SVIX and a given model specification. Panel B reports statistics for our baseline QR specification using the SVIX.

Panel A: SVIX Goodness of Fit Statistics

	count	mean	p5	p25	p50	p75	p95	sd
$Q_{F_{t,e}\|a_t}(0.5)$	1,820	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00
$Q_{F_{t,e}\|a_t,I_{e=fow}}(0.5)$	1,820	0.15	0.00	0.04	0.11	0.22	0.45	0.14
$Q_{F_{t,e}\|a_t,I_{e=fow},T_{t,e}}(0.5)$	1,820	0.39	0.07	0.22	0.40	0.56	0.72	0.21
$Q_{F_{t,e}\|a_t,I_{e=fow},T_{t,e}}(0.3)$	1,820	0.48	0.12	0.30	0.49	0.66	0.79	0.21
$Q_{F_{t,e}\|a_t,I_{e=fow},T_{t,e},T^2_{t,e}}(0.5)$	1,820	0.50	0.15	0.34	0.52	0.68	0.81	0.21

Panel B: SVIX Coefficient Estimate Statistics

	count	mean	p5	p25	p50	p75	p95	sd
Constant	1,820	1.458	0.170	0.349	0.695	1.458	4.321	3.419
First of Week	1,820	0.321	0.027	0.096	0.177	0.426	0.933	0.522
Slope	1,820	-0.024	-0.229	-0.017	0.021	0.056	0.148	0.382
Curvature	1,820	0.001	-0.006	-0.002	0.000	0.001	0.008	0.013

B. Estimation of Restricted Lower Bound (LBR) and Implied Equity Premium (IEP)

II.A. LBR

To compute the LBR, we follow Chabi-Yo and Loudis (2020) when computing risk neutral moment k of expected excess returns (Carr and Madan (2001)):

$$\frac{k(k-1)R_{f,t,T_n}}{P_t^2}\left[\int_0^{F_{t,T_n}}(\frac{K}{P_t}-R_{f,t,T_n})^{k-2}p_{t,T_n}(K)dK+\int_{F_{t,T_n}}^{\infty}(\frac{K}{P_t}-R_{f,t,T_n})^{k-2}c_{t,T_n}(K)dK\right]. \tag{16}$$

where P_t is the price of the S&P 500 index on trade date t, F_{t,T_n} is the forward price on trade date t for horizon T_n, and $p_{t,T_n}(K)$ ($c_{t,T_n}(K)$) are the midquote prices of out-of-the-money put (call) options with strike price K and expiration date T_n.

II.B. IEP

For comparability to Tetlock (2023)'s IEP estimates, we use a similar approach to estimate Growth Optimal (GO) portfolio weights $w_{k,t}$ using option data from 2009. GO portfolio weights are estimated using recursive (expanding) window of seemingly unrelated regressions (SUR) of variance premium on higher order risk neutral moments of expected excess market returns for horizons of 30, 60, 90, 180, and 360 days:

$$\begin{aligned}
E_t^*(\tilde{R}^2_{T_n=30})-E_t(\tilde{R}^2_{T_n=30}) =& \alpha_{T_n=30}-R^{-1}_{f,t,T_n=30}\sum_{k=1}^{4}w_{k,t}E_t^*(\tilde{R}^{k+2}_{T_n=30})+\epsilon_{t,T_n=30}\\
E_t^*(\tilde{R}^2_{T_n=60})-E_t(\tilde{R}^2_{T_n=60}) =& \alpha_{T_n=60}-R^{-1}_{f,t,T_n=60}\sum_{k=1}^{4}w_{k,t}E_t^*(\tilde{R}^{k+2}_{T_n=60})+\epsilon_{t,T_n=60}\\
E_t^*(\tilde{R}^2_{T_n=90})-E_t(\tilde{R}^2_{T_n=90}) =& \alpha_{T_n=90}-R^{-1}_{f,t,T_n=90}\sum_{k=1}^{4}w_{k,t}E_t^*(\tilde{R}^{k+2}_{T_n=90})+\epsilon_{t,T_n=90}\\
E_t^*(\tilde{R}^2_{T_n=180})-E_t(\tilde{R}^2_{T_n=180}) =& \alpha_{T_n=180}-R^{-1}_{f,t,T_n=180}\sum_{k=1}^{4}w_{k,t}E_t^*(\tilde{R}^{k+2}_{T_n=180})+\epsilon_{t,T_n=180}\\
E_t^*(\tilde{R}^2_{T_n=360})-E_t(\tilde{R}^2_{T_n=360}) =& \alpha_{T_n=360}-R^{-1}_{f,t,T_n=360}\sum_{k=1}^{4}w_{k,t}E_t^*(\tilde{R}^{k+2}_{T_n=360})+\epsilon_{t,T_n=360}
\end{aligned} \tag{17}$$

For identification of GO portfolio weights, we impose a cross-horizon linear restriction, requiring that the GO weights of a given order be equal across all horizons:

$$w_{k,t,T_1} = w_{k,t,T_2}, \forall T_1 = 30, ..., 360, T_2 = 30, ..., 360. \tag{18}$$

Risk neutral moment k of expected excess returns is estimated using the following approach:

$$\frac{k!}{P_t^k}\left[\int_0^{F_{t,T_n}} (K - F_{t,T_n})^{k-2} p_{t,T_n}(K)dK + \int_{F_{t,T_n}}^{\infty} (K - F_{t,T_n})^{k-2} c_{t,T_n}(K)dK\right]. \tag{19}$$

We use options with a.m. settlement, without special settlement, and with time to expiration greater than or equal to 7 days and less than or equal to 549 days. We remove options with missing implied volatility, which occurs when the option midquote is below intrinsic value or when the Optionmetrics implied volatility calculation fails to converge. We use option expirations with at least 10 distinct strike prices and a moneyness range (K/P_t) from 95% to 105%.

Constant maturity risk-neutral moments are obtained using linear interpolation. Variance premia are estimated as the difference between risk-neutral and physical variance, where physical variance is estimated using a T_n-step ahead forecast of realized variance coming from an recursive window estimation of an ARFIMA(0,d,0) model.

Daily realized variance is estimated using trades in the SPY ETF obtained from TAQ from 2005. We require that transaction prices and quantities are positive, trades take place during regular trading hours, trades are not marked as corrected, the trade condition code not be 1, 4, 7, 8, 9, A, B, C, D, G, H, K, L, N, P, R, S, U, V, W, Y, or Z, and that the trade comes from the most active exchange on that day. We use the median transaction price for each timestamp.

We use the approach of Barndorff-Nielsen, Hansen, Lunde, and Shephard (2009) and Patton and Sheppard (2015), where the daily RV estimator is the average of 10 sub-sampled RV estimators based on 10 staggered sets of 78 non-overlapping intervals coming from 79 trade prices equally spaced in trade time. The first RV estimator uses prices 1, 11, 21, ..., 781, the second uses prices 2, 12, 22, ..., 782, and the tenth uses prices 10, 20, 30, ..., 790.

Estimates of GO portfolio weights are presented in Figure A1, and estimates for the LVIX, SVIX, and IEP for the one year horizon are presented in Figure A2. Estimates are quantitatively similar to those of Tetlock (2023), who shows that these weights can be interpreted as futures (k=1), and swaps based on market variance, skewness, and kurtosis (k=2,3,4, respectively) positions by an unconstrained rational log utility investor (Shiller, Fischer, and Friedman (1984) and Campbell and Kyle (1993)).

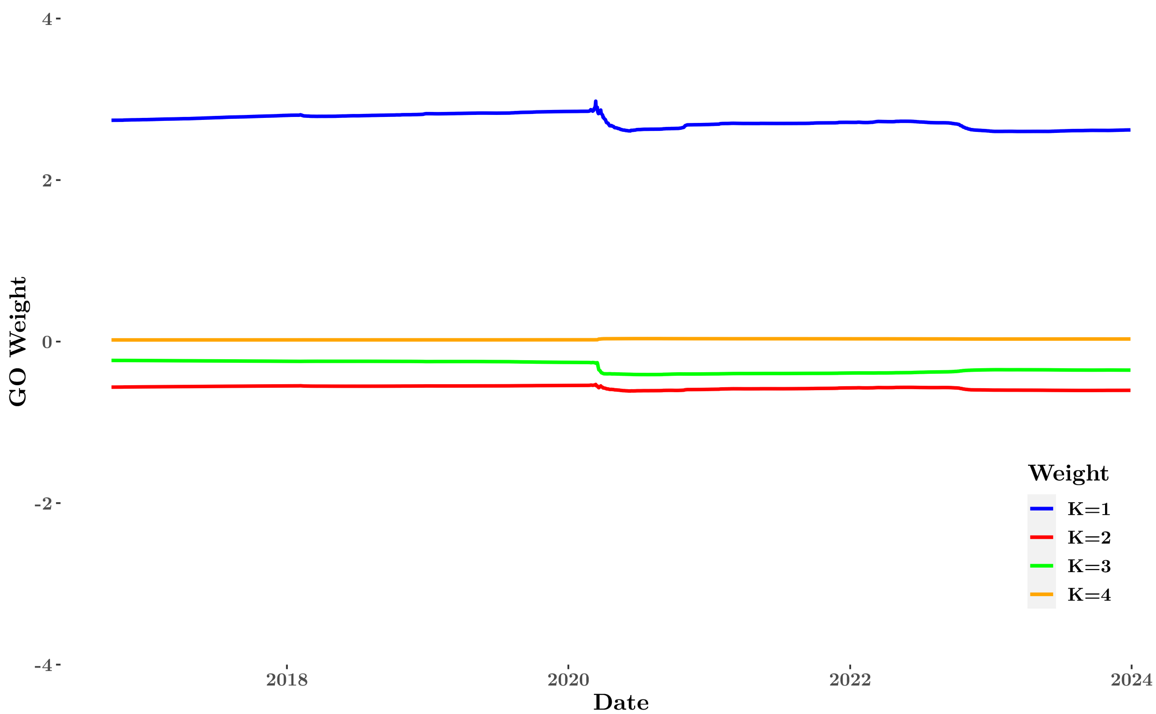


Figure A1: Estimated GO Portfolio Weights. This figure presents estimated Growth Optimal (GO) portfolio weights. GO portfolio weights are estimated using recursive window SUR regressions of variance premium on higher order risk neutral moments of expected excess market returns for horizons of 30, 60, 90, 180, and 360 days.

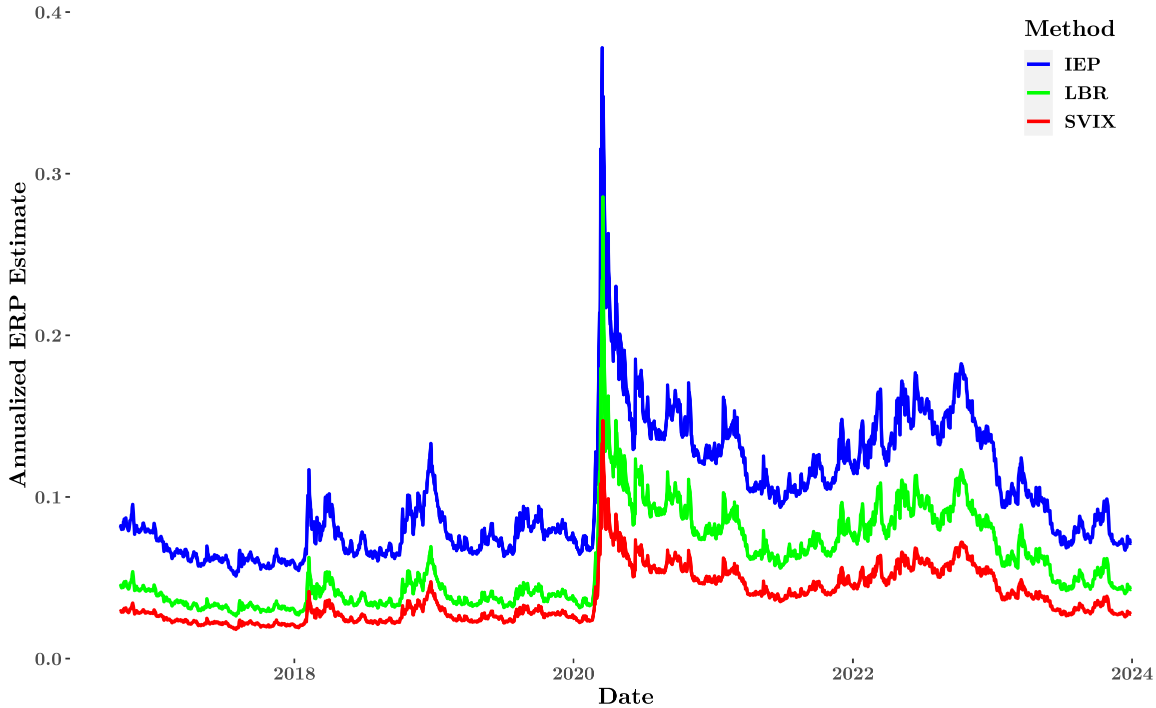


Figure A2: Comparison of SVIX, LBR, and IEP. This figure compares estimates of the Martin (2017) SVIX, Chabi-Yo and Loudis (2020) LBR, and Tetlock et al. (2024) IEP measures of the equity premium at the one year horizon.

Table A5:
Multiple Testing Adjusted p-values for Data-Driven Analysis

This table reports all forward periods with significant abnormal premia. After averaging abnormal premia across available trade dates for each forward period e, we estimate the following regressions:

$$A_e^{SVIX} \times H_e = \alpha + \beta I_e + \epsilon_e,$$

where A_e^{SVIX} is the average SVIX abnormal forward equity premia (per trade day) for the forward period ending on date e, H_e is the length of the forward period in trade days, and I_e is an indicator variable equal to one for all observations pertaining to one forward period in each regression and zero otherwise. Statistically significant forward periods are sorted in order of economic significance measured by $\hat{\beta}$ in column (4). Column (2) reports the end date of each forward period. Column (3) reports the associated event(s). For forward periods not spanning CPI, FOMC, and NFP releases, we use the online archives of the Wall Street Journal to identify scheduled event(s). The p-values are reported in column (5). Column (6) reports the length of each forward period in trade days. We additionally report the trade date average of raw forward premia over the forward period for the SVIX, LBR, and IEP models of expected returns in columns (7), (8), and (9) respectively. We also report multiple testing adjusted p-values using the Holm (1979) and Benjamini and Hochberg (1995) (FDR of 0.05) corrections.

No.	Fwd. Period	Event(s)	$\beta(bp)$	p-value (Holm)	p-value (BH)	Period Length	SVIX Equity Prem. (bp)	LBR Equity Prem. (bp)	IEP Equity Prem. (bp)
1	2020-11-04	Presidential Election	7.896	< 0.001	< 0.001	2	13.43	15.52	35.69
2	2023-01-12	CPI	4.978	< 0.001	< 0.001	1	6.61	7.07	17.24
3	2022-12-13	CPI	3.885	< 0.001	< 0.001	1	5.47	5.87	14.35
4	2016-11-09	Presidential Election	3.343	< 0.001	< 0.001	2	4.95	5.39	13.73
5	2023-03-22	FOMC	3.225	< 0.001	< 0.001	1	4.65	5.08	12.15
6	2020-04-03	NFP	2.848	< 0.001	< 0.001	2	20.69	26.52	57.64
7	2022-12-14	FOMC	2.730	< 0.001	< 0.001	1	4.29	4.64	11.25
8	2022-10-13	CPI	2.683	< 0.001	< 0.001	1	5.60	6.11	15.09
9	2021-01-06	Georgia Runoff	2.493	< 0.001	< 0.001	2	6.39	7.72	17.31
10	2022-11-02	FOMC	2.440	< 0.001	< 0.001	1	5.70	6.33	15.17
11	2023-02-14	CPI	2.427	< 0.001	< 0.001	1	3.53	3.87	9.22
12	2023-02-01	FOMC	2.386	< 0.001	< 0.001	1	3.70	3.95	9.64
13	2022-03-16	FOMC	2.358	< 0.001	< 0.001	2	8.01	9.66	21.92
14	2020-04-01	Covid-19	2.349	< 0.001	< 0.001	1	10.99	14.89	30.69
15	2022-11-10	CPI	2.348	< 0.001	< 0.001	1	5.66	6.32	14.95
16	2023-03-14	CPI	2.226	0.002	< 0.001	1	3.49	3.82	9.14
17	2022-07-27	FOMC	1.902	0.051	0.003	2	5.37	5.91	14.61
18	2022-09-13	CPI	1.728	0.242	0.012	1	4.06	4.43	11.06
19	2020-11-06	FOMC, NFP	1.704	0.299	0.014	2	7.78	9.39	20.88
20	2017-05-08	French Presidential Election Runoff	1.610	0.650	0.030	1	2.31	2.67	6.48
21	2023-05-03	FOMC	1.525	1.000	0.056	1	2.66	2.91	6.98
22	2019-07-01	Trump-Xi G-20 Bilateral	1.521	1.000	0.056	1	2.65	2.91	7.55
23	2022-07-13	CPI	1.505	1.000	0.060	2	5.52	6.22	15.00
24	2023-02-03	NFP	1.471	1.000	0.075	1	2.77	2.98	7.23
25	2020-04-08	Covid-19	1.416	1.000	0.109	2	19.98	26.37	55.18
26	2022-06-15	FOMC	1.374	1.000	0.141	2	5.08	5.69	13.87
27	2023-04-12	CPI	1.364	1.000	0.146	1	2.86	3.27	7.48
28	2018-11-07	Midterm Election	1.340	1.000	0.167	2	4.52	5.36	12.85
29	2022-09-21	FOMC	1.283	1.000	0.230	2	4.50	5.01	12.22
30	2018-02-21	FOMC Minutes	1.220	1.000	0.337	1	2.84	3.81	8.16
31	2023-01-06	NFP	1.143	1.000	0.524	1	2.97	3.25	7.78
32	2022-11-09	Midterm Election	1.132	1.000	0.524	1	4.53	4.96	11.94
33	2020-03-04	FOMC	1.132	1.000	0.524	2	3.59	4.09	10.36
34	2022-05-04	FOMC	1.033	1.000	0.869	2	4.00	4.72	10.97
35	2017-04-24	French Presidential Election First Round	1.014	1.000	0.919	3	3.20	3.53	8.92
36	2019-07-31	FOMC	0.950	1.000	0.999	2	2.26	2.50	6.47
37	2023-04-10	NFP	0.938	1.000	0.999	1	2.80	3.29	7.33
38	2023-03-10	NFP	0.933	1.000	0.999	1	2.23	2.44	5.84
39	2020-10-02	NFP	0.925	1.000	0.999	2	5.72	6.86	15.15

Table A6:
Equity Premia on Macroeconomic Release Dates, Oct 2016-Dec 2023

This table reports results of the following regression of abnormal equity premia per forward period on indicator variables for each of the 50 macroeconomic releases and an additional indicator variable for presidential elections.

$$A_e^{SVIX} \times H_e = \alpha + \Sigma_{m=1}^{M} (\gamma_m I_{m,e}) + \delta I_e^{election} + \epsilon_e$$

where A_e^{SVIX} is the average across available trade dates of $A_{t,e}^{SVIX}$, $I_{m,e} = 1$ $I_{m,t} = 1$ if macroeconomic release m occurs over forward period e and zero otherwise. $I_t^{election} = 1$ for forward periods spanning November presidential elections. H_e is the length of the forward period in trading days. Releases for which γ values are statistically significant are labeled with the release name and statistically insignificant estimates are instead labeled with their release number (listed in Appendix Table A3). Robust standard errors are used. Factory Orders and Housing Starts are excluded due to collinearity with Durable Goods Orders and month-over-month housing starts respectively during this subsample.

Regressor	Coefficient	t-stat	p-value	Regressor	Coefficient	t-stat	p-value
$I_{1,e}$ (NFP)	0.259	4.24	0.0000	$I_{26,e}$	0.017	0.35	0.7257
$I_{2,e}$	0.023	0.42	0.6720	$I_{27,e}$	0.006	0.1	0.9219
$I_{3,e}$ (FOMC)	0.653	5.63	0.0000	$I_{28,e}$	-0.087	-1.82	0.0694
$I_{4,e}$ (CPI)	0.397	3.32	0.0009	$I_{29,e}$	-0.201	-2.08	0.0376
$I_{5,e}$	0.022	0.55	0.5804	$I_{30,e}$	-0.065	-0.81	0.4199
$I_{6,e}$	0.004	0.04	0.9689	$I_{31,e}$	-0.050	-1.12	0.2630
$I_{7,e}$	-0.001	-0.01	0.9890	$I_{32,e}$	-0.133	-1.54	0.1227
$I_{8,e}$	0.010	0.22	0.8269	$I_{33,e}$	0.039	1.04	0.2976
$I_{9,e}$	0.070	0.55	0.5824	$I_{34,e}$	-0.119	-1.72	0.0862
$I_{10,e}$	0.007	0.16	0.8761	$I_{35,e}$	0.016	0.69	0.4887
$I_{11,e}$	0.059	0.78	0.4369	$I_{36,e}$	-0.048	-2.06	0.0400
$I_{12,e}$	-0.045	-0.96	0.3351	$I_{37,e}$	-0.011	-0.12	0.9011
$I_{13,e}$	-0.038	-1.38	0.1665	$I_{38,e}$	0.058	0.97	0.3319
$I_{14,e}$	-0.028	-0.77	0.4403	$I_{39,e}$	-0.045	-0.8	0.4257
$I_{15,e}$	-0.038	-0.83	0.4080	$I_{40,e}$	0.025	0.61	0.5390
$I_{16,e}$	-0.147	-2.54	0.0112	$I_{41,e}$	-0.114	-2.24	0.0253
$I_{17,e}$	0.016	0.32	0.7518	$I_{42,e}$	0.062	0.5	0.6154
$I_{18,e}$	-0.043	-0.75	0.4560	$I_{43,e}$	-0.059	-1.23	0.2182
$I_{19,e}$	n.a			$I_{44,e}$	0.010	0.51	0.6094
$I_{20,e}$	0.042	0.58	0.5615	$I_{45,e}$	-0.165	-2.08	0.0373
$I_{21,e}$	0.000	0.01	0.9917	$I_{46,e}$	0.122	1.83	0.0672
$I_{22,e}$	-0.053	-1.79	0.0737	$I_{47,e}$	n.a		
$I_{23,e}$	0.119	1.39	0.1654	$I_{48,e}$	0.023	0.46	0.6452
$I_{24,e}$	-0.049	-0.98	0.3264	$I_{49,e}$	-0.055	-1.2	0.2294
$I_{25,e}$	0.027	0.49	0.6226	$I_{50,e}$	-0.004	-0.1	0.9222
				$I_e^{election}$	3.296	3.06	0.0023
				Constant	0.032	1.73	0.0844
				N	1,258		
				R^2	0.32		

C. Additional Results on the Cross-section of Macroeconomic Releases

Figure A3 reports a univariate version of Figure 4 in which we include only one macroeconomic release at a time when explaining realized excess stock returns. Similarly, Figure A4 reports a univariate version of Figure 5 in which we include only one macroeconomic release at a time when explaining the equity premium.

Figure A3: Excess Stock Returns on Macroeconomic Release Dates

This figure is based on regressions of realized excess stock returns on one of the 50 macroeconomic releases and an additional indicator variable for elections

$$r_t^{stock} - r_t^f = \alpha + \gamma_m I_{m,t} + \delta I_t^{election} + \epsilon_t.$$

A separate regression is estimated for each macroeconomic release m. Excess stock returns are from Ken French's data library. $I_{m,t} = 1$ if there is a release of macroeconomic release m occurring on day t and $I_t^{election} = 1$ on the day following November presidential election dates. The regression is estimated on daily data from October 31, 1996, to December 31, 2023. The figure reports the estimated γ coefficients, with statistically significant releases labeled with the release name and statistically insignificant releases are labeled with their release number (listed in Appendix Table A3). Robust standard errors are used.

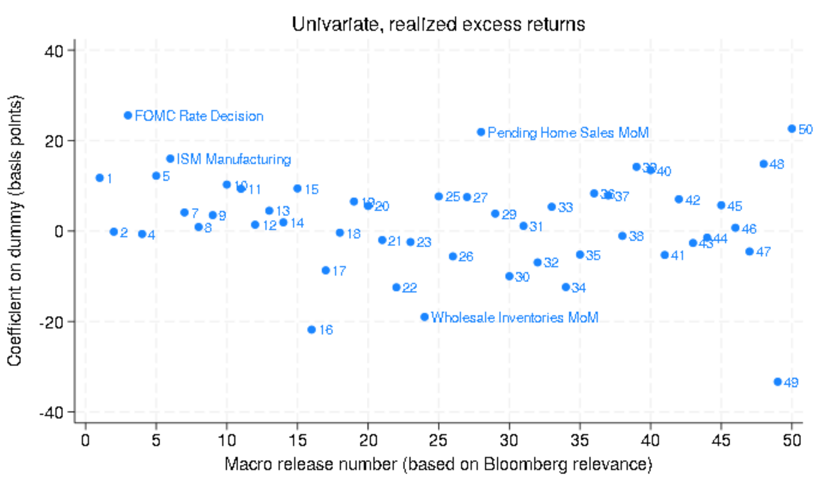


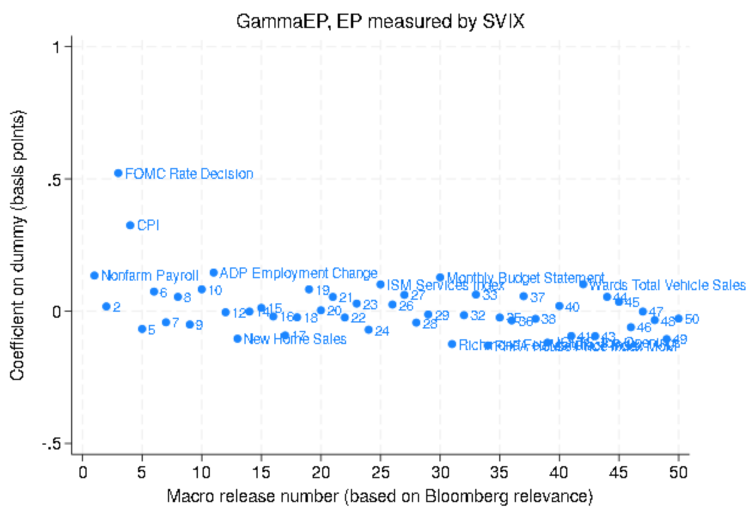
Figure A4: Equity Premia on Macroeconomic Release Dates

The figure is based on a regression of abnormal equity premia per forward period on indicator variables for one of the 50 macroeconomic releases and an additional indicator variable for elections

$$A_e^{SVIX} \times H_e = \alpha + \gamma_m I_{m,e} + \delta I_e^{election} + \epsilon_e.$$

A separate regression is estimated for each macroeconomic release m. A_e^{SVIX} is the average across trade dates of $A_{t,e}^{SVIX}$, $I_{m,t} = 1$ if there is a release of macroeconomic release m over forward period e and $I_t^{election} = 1$ if there is a presidential election over forward period e. Robust standard errors are used. Releases for which γ values are statistically significant are labelled with the release name and statistically insignificant estimates are labelled with their release number (listed in Appendix Table A3).

Additional abnormal equity premium per release, SVIX



D. Data collection for a century of macroeconomic releases

To provide more context for the difference in magnitudes between our ex ante estimates of the macroeconomic release premium and those of previous studies using realized excess returns, we hand-collect historical data for FOMC meetings, NFP releases and CPI releases dating as far back as 1928. These data allow us to provide novel extended sample estimates of equity premiums for these event types from average excess returns.

FOMC meetings from 1936. We hand-collect data on FOMC meetings dating back to 1936 from the Federal Reserve Board's webpage. To restrict attention to scheduled meetings, we remove conference calls. This results in 826 FOMC meetings over an 89-year period from 1936 to 2024, with the number of meetings per year ranging from 3 to 19. We date the FOMC as the second day for 2-day meetings. Prior to 1994, no announcement was made following an FOMC meeting and the public instead learned of any policy change from the open market operation on the following day. We follow Kuttner (2001) and Savor and Wilson (2013) and assume that the FOMC "announcement" in those years was one day after the meeting. We examined newspaper archives using Proquest to assess whether investors were aware of the dates of FOMC meetings in the early decades of the sample, finding many references to upcoming FOMC meetings. For example, a January 22, 1937, Wall Street Journal article covers an upcoming FOMC meeting reporting, "Open Market Group to Meet January 26".

Nonfarm payroll announcements from 1928. For NFP announcements from May 1955, we use Federal Reserve's ALFRED database. Prior to this, we hand-collect announcements dating back to 1928 using Proquest newspaper archives. NFP announcements were widely covered by the press as we find articles in the New York Times, Wall Street Journal, and other leading publications for most announcements, which occur monthly over the full 1928-2024 sample.[20] Overall, we obtain dates for NFP 1,136 announcements. As anecdotal evidence that nonfarm payroll has been an important economic indicator for many decades, we note that the first Federal Reserve Greenbook from June 1964 prominently lists nonfarm payroll among the indicators monitored.[21]

CPI announcements from 1941. For CPI announcements from March 1949, we use Federal Reserve's ALFRED database. CPI release dates back to 1941 are then obtained from historical newspapers via ProQuest as well as documents from the National

[20] Data are sparser from 1943-1951 where we are able to date between 6 and 11 announcements per year.

[21] See https://www.federalreserve.gov/monetarypolicy/files/FOMC19640617greenbook19640610.pdf.

Archives. From a site visit to the National Archives, we accessed hard copies of the CPI releases, which were available from November 1944. These actual releases were useful as a proof of concept that the Proquest new articles search worked correctly, as we verified that by the search approach we found the same dates. We then extended the data as far back as possible with Proquest searches until the period before which inflation announcements (at that time called the "Cost of Living Index") were weekly.

E. Regressing realized returns on measures of expected returns: interpretation of the estimated coefficient

In this analysis, we formalize how to estimate how much the true expected return varies given the variation in the observed estimates of equity premia. This is a related but distinct question to those that have been studied in prior literature, such as asking whether equity premia bounds are tight or violated, or what the predictability of the observed equity premia is as measured by out-of-sample r-squared.

In the true model, the realized return is:

$$r_{t+1} = \mu_{t+1} + \eta_{t+1} \tag{20}$$

where μ_{t+1} the expected return and η_{t+1} is the unexpected return (news) in period $t+1$.

However, in the data we observe a proxy $\tilde{\mu}_{t+1}$ of the true expected return. Assume the relationship is linear:

$$\mu_{t+1} = \alpha + m\tilde{\mu}_{t+1} + \varepsilon^{\mu}_{t+1} \tag{21}$$

where ε^{μ}_{t+1} is uncorrelated with $\tilde{\mu}_{t+1}$ and thus

$$Var(\mu_{t+1}) = m^2 Var(\tilde{\mu}_{t+1}) + Var(\varepsilon^{\mu}_{t+1}). \tag{22}$$

We then estimate the regression specification:

$$r_{t+1} = a + b\tilde{\mu}_{t+1} + \varepsilon^{r}_{t+1} \tag{23}$$

to extract $\hat{b}$. This parameter informs us how much the true expected return changes given the observed change in the proxy for the expected return, i.e. $\hat{b} = m$.

Proof. Given $\tilde{\mu}_{t+1} = \frac{1}{m}\left(\mu_{t+1} - \varepsilon^{\mu}_{t+1}\right)$, then

$$\begin{aligned}
\hat{b} = \frac{Cov(r_{t+1}, \tilde{\mu}_{t+1})}{Var(\tilde{\mu}_{t+1})} &= \frac{1}{m}\left[\frac{Cov(r_{t+1}, \mu_{t+1})}{Var(\tilde{\mu}_{t+1}))} - \frac{Cov(r_{t+1}, \varepsilon^{\mu}_{t+1})}{Var(\tilde{\mu}_{t+1}))}\right] \\
&= \frac{1}{m}\left[\frac{Var(\mu_{t+1})}{Var(\tilde{\mu}_{t+1}))}\frac{Cov(r_{t+1}, \mu_{t+1})}{Var(\mu_{t+1})} - \frac{Var(\varepsilon^{\mu}_{t+1})}{Var(\tilde{\mu}_{t+1}))}\frac{Cov(r_{t+1}, \varepsilon^{\mu}_{t+1})}{Var(\varepsilon^{\mu}_{t+1})}\right].
\end{aligned}$$

and since the below holds by definition from equation (20),

$$\frac{Cov(r_{t+1}, \mu_{t+1})}{Var(\mu_{t+1})} = \frac{Cov(r_{t+1}, \varepsilon^{\mu}_{t+1})}{Var(\varepsilon^{\mu}_{t+1})} = 1,$$

then

$$\hat{b} = \frac{1}{m} \frac{Var(\mu_{t+1}) - Var(\varepsilon^{\mu}_{t+1})}{Var(\tilde{\mu}_{t+1})}.$$

Finally, rearrange equation (22) and substitute in $Var(\tilde{\mu}_{t+1})$ to show $\hat{b} = m$ as required.