Macroeconomic Announcements and the Repricing of Earnings Risk

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Abstract: Macroeconomic announcements lead to the repricing of previous firm-specific earnings news, generating cross-sectional heterogeneity in risk compensation. When firms announce earnings, investors form joint beliefs about firm-specific and aggregate conditions. Subsequent macroeconomic announcements reveal information about the aggregate state of the economy, prompting investors to reassess the firm-specific component of prior earnings news. We develop a dynamic general equilibrium model in which investors rationally learn from both earnings and macroeconomic announcements to quantify this repricing channel. Empirical evidence supports the model's predictions: on macroeconomic announcement days, firms with recent earnings news earn a lower risk premium relative to those without, and this effect is stronger for firms whose earnings announcements were more informative about aggregate conditions.

Keywords: Learning, Information, Earnings Announcements, Macroeconomic Announcements, Cross Section

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1 Introduction

It is well documented that macroeconomic announcements convey news about the aggregate economy and are associated with large realizations of the equity market risk premium. The existing literature has emphasized *positive* fundamental comovement on these days: favorable macroeconomic news raises expected cash flows for all firms, while unfavorable news lowers them (Savor and Wilson (2014, 2016)). In this paper, we provide both theoretical and empirical evidence for a distinct *negative* comovement mechanism: the repricing channel of macroeconomic announcements. This channel arises from the interaction between macroeconomic announcements and previously released firm-specific earnings news. We show that this mechanism is quantitatively important and generates substantial cross-sectional heterogeneity in announcement-day returns.

Firm earnings announcements convey information about both future expected macroeconomic conditions and firm-specific fundamentals. When subsequent macroeconomic announcements reveal the aggregate state of the economy, rational investors update not only their beliefs about the macroeconomy but also their beliefs about firm-specific fundamentals. Consequently, a rational capital market must reprice prior firm-specific earnings news on macroeconomic announcement days. If macro data reveal that aggregate conditions were stronger than previously believed, investors infer that a positive earlier earnings surprise reflected favorable macro conditions rather than idiosyncratic outperformance and therefore revise their expectations about firm-specific cash flows downward. Conversely, worse-than-expected macroeconomic news leads to upward revisions of the firm-specific component. This repricing channel implies a negative covariance between aggregate and firm-specific belief updates, which dampens the firm's return comovement with the market and thereby lowers its beta and risk premium on macroeconomic announcement days.

We demonstrate this repricing mechanism in a dynamic general equilibrium model of learning from both earnings and macroeconomic announcements. Both expected firm-specific cash flow growth (g) and aggregate cash flow growth (θ) are unobservable, requiring investors to form Bayesian beliefs based on public information. We assume a cross section of firms announces earnings simultaneously at pre-scheduled dates. Each firm's earnings announcement is a noisy signal about the sum of firm-specific and aggregate cash flow growth, $g + \theta$. Investors therefore use earnings announcements to jointly update their beliefs about firm fundamentals and aggregate economic conditions.

Immediately after the earnings announcement, a scheduled macroeconomic announcement fully reveals aggregate cash flow θ, allowing investors to disentangle these components and reprice the information content of prior earnings announcements. Because the earlier earnings announcement conveyed information about the lump sum $g + \theta$, a positive surprise in θ mechanically triggers a negative revision in firm-specific g, and vice versa. Consequently, the firm's return (driven by beliefs about both θ and g) comoves negatively with the market return (driven solely by θ) on macroeconomic announcement days. This negative comovement lowers the firm's beta and required risk compensation. We refer to this negative contribution to expected returns as the *repricing premium*. By offsetting standard macroeconomic risk exposure, firms that announce earnings shortly before macroeconomic news effectively act as partial hedges against aggregate shocks.

Our model further predicts cross-sectional heterogeneity in this repricing effect. Firms with more informative earnings announcements about macroeconomic conditions exhibit higher earnings-announcement-day betas and experience stronger repricing on macroeconomic announcement days. In the model, earnings signal precision is heterogeneous across firms. More informative earnings news leads to higher earnings-day betas because precise signals induce joint revisions in firm-specific and aggregate expectations in the same direction. However, this same precision amplifies repricing when macroeconomic news arrives. Because informative earnings signals tightly identify the sum $\theta + g$, a surprise in θ forces a near one-for-one opposite revision in g, generating a more negative covariance and a larger repricing premium. In contrast, when earnings are noisy, the link between aggregate and firm-specific components is weak and repricing is muted. As a result, cross-sectional variation in earnings-announcement betas generates predictable cross-sectional variation in macro-announcement returns.

We empirically test the economic mechanism of the repricing channel by examining four predictions of the model using high-frequency U.S. equity data from 1998 to 2023.[1] Our first prediction is that firms with recent earnings announcements earn lower expected returns on macroeconomic announcement days than firms without recent news. This return spread isolates the repricing premium, as the repricing mechanism dampens the returns of recent announcers but is absent for non-announcers. Empirically, we classify firms into "announcers" (those that reported earnings within the past month) and "non-announcers" (those without recent earnings news), and compare their average returns on macro-announcement days. Consistent with the theory, announcers systematically underperform non-announcers when macro news is released. A long-short portfolio that is long non-announcers and short announcers, matched on industry and size, earns approximately 12 to 14 basis points (bps)

[1]Following Ai and Bansal (2018), we focus on five major macroeconomic releases: FOMC, GDP, Nonfarm Payroll Employment, CPI, and the ISM Manufacturing Index.

per macro-announcement day. With roughly 46 macroeconomic events per year, this implies an annualized return spread of about 5.5% to 6.4%. These patterns are not explained by standard risk adjustments: although the CAPM explains the cross section of returns particularly well on macro-announcement days, CAPM-beta-neutral returns continue to show pronounced underperformance of announcers relative to non-announcers.

The second prediction of our model concerns cross-sectional heterogeneity among announcers. Firms whose earnings announcements are more informative about macroeconomic conditions should exhibit higher earnings-announcement betas but lower macro-announcement betas and returns. To test this implication, we extend the approach of Patton and Verardo (2012) and estimate market betas using high-frequency intraday returns. We measure earnings-announcement informativeness using an earnings-day excess beta, defined as a stock's intraday beta on its earnings-announcement day in excess of its unconditional CAPM beta. This excess beta captures the incremental information embedded in the announcement. The macro-day excess beta is defined analogously. On the day prior to each macroeconomic announcement, we sort announcers into portfolios based on their earnings-announcement informativeness. Consistent with the model, we find a steep monotonic pattern: firms in the highest earnings-day excess beta quintile (most informative) earn substantially lower average returns on the subsequent macro-announcement day than firms in the lowest quintile, and their macro-day betas are correspondingly lower. A long-short strategy that is long low-informativeness announcers and short high-informativeness announcers earns economically large and statistically significant risk-adjusted returns of 26 to 27 bps per macro-announcement day.

Third, we show that the repricing effect depends critically on the timing of earnings announcements. Firms that announce earnings immediately before a macroeconomic event ("recent announcers") earn substantially lower returns on macro-announcement days than firms that announce immediately after ("distant announcers", as they are farthest from the next macroeconomic announcement). In the model, firms announcing earnings after a macro announcement face no repricing because the aggregate state is already known at the time of the earnings release. In contrast, firms announcing earnings just before a macro announcement are subject to repricing and therefore earn significantly lower macro-announcement-day returns. Consistent with this prediction, portfolios that are long distant announcers and short recent announcers generate economically and statistically significant returns of 12 to 21 bps per event.

Finally, we provide direct evidence for the belief revision channel underlying the repricing mechanism using analyst earnings per share (EPS) forecast revisions. The model predicts that for recent announcers, macroeconomic news induces systematic revisions of firm-specific beliefs: positive macroeconomic surprises lead to downward revisions of expected firm cash flows, while negative surprises lead to upward revisions. To isolate this repricing component from general "fundamental comovement" (where good macro news boosts all firms), we employ a two-stage decomposition. We use non-announcers as a control group to estimate the baseline sensitivity of forecasts to macro news. We then compute excess revisions for recent announcers relative to this benchmark. Consistent with the model, excess forecast revisions are negatively related to macroeconomic surprises: analysts revise firm-specific growth expectations in the opposite direction of the macroeconomic shock. A placebo test confirms that this pattern is absent for the non-announcing control group. We further show that analyst forecasting activity intensifies on macroeconomic announcement days, and that this increase cannot be explained by the timing of firm-specific earnings announcements or post-earnings-announcement information dynamics, reinforcing the interpretation that forecast revisions reflect belief updating in response to macroeconomic news.

Our model quantitatively accounts for the repricing channel. Calibrated to match standard macroeconomic and asset-pricing moments, it reproduces average earnings- and macro-announcement premia comparable to those observed in the data. Crucially, it replicates the key cross-sectional patterns we document: the systematic underperformance of recent announcers relative to non-announcers and the monotonic relation between earnings informativeness and the subsequent repricing premium.

Related Literature Our paper contributes to the literature on how macroeconomic news affects stock returns. A large body of work documents significant excess returns around macroeconomic—especially FOMC—announcement days. Key empirical contributions include Lucca and Moench (2015), Savor and Wilson (2013), Mueller, Tahbaz-Salehi, and Vedolin (2017), Cieslak, Morse, and Vissing-Jorgensen (2019), Hu, Pan, Wang, and Zhu (2022), and Boguth, Fisher, Grégoire, and Martineau (2023), while Ai and Bansal (2018) and Wachter and Zhu (2022) provide theoretical foundations. While most studies focus on aggregate equity returns, some examine cross-sectional effects. Most related, Savor and Wilson (2014) show that the CAPM holds especially well on macro-announcement days: unconditional market beta strongly predicts the cross section of returns, implying that individual stocks comove positively with the market. Hasler and Martineau (2024) similarly find a stronger beta-return relation in high expected return periods. In contrast, we use high-frequency intraday returns to measure excess beta—the component beyond the unconditional CAPM beta—which isolates the incremental information revealed at announcements. This excess beta uncovers a repricing channel in which individual stock and market returns comove negatively on announcement days, opposite to the positive comovement in Savor and Wilson (2014). Our paper highlights the importance of high-frequency micro data for understanding the impact of macroeconomic policy announcements. Other work explores stock-level exposure to monetary policy surprises and documents cross-sectional FOMC announcement premium: Ai, Han, Pan, and Xu (2022) use option-implied variance, Ozdagli (2018) and Chava and Hsu (2020) examine financial constraints, and Ozdagli and Velikov (2020) construct an exposure index. Distinct from these studies, we analyze a broader set of macroeconomic announcements—not limited to FOMC—and highlight their interaction with earnings announcements through a repricing mechanism.

Second, our paper relates to the literature on the earnings announcement premium. A long line of work documents that stocks earn high average returns around earnings announcements (e.g., Chari, Jagannathan, and Ofer (1988), Ball and Kothari (1991), Frazzini and Lamont (2007), Cohen, Dey, Lys, and Sunder (2007), Barber, De George, Lehavy, and Trueman (2013), Gao, Hu, and Zhang (2025), among others), but these studies do not provide a risk-based explanation. Savor and Wilson (2016) offer such a mechanism by showing that scheduled earnings announcements contain both firm-specific and aggregate cash flow information, creating a signal-extraction problem: investors observe total earnings but must infer the aggregate component. This spillover generates high conditional covariance between firm and market returns, producing a higher risk premium for announcing firms. Consistent with this mechanism, they show that a portfolio of announcing firms predicts future aggregate earnings growth. Patton and Verardo (2012) provide further evidence, showing that high-frequency betas rise around earnings announcements, especially when the news is informative about other firms. Building on the insight of Savor and Wilson (2016) and employing the high-frequency beta approach of Patton and Verardo (2012), we show that the signal-extraction problem is resolved on macro-announcement days, when macro news reveals purely aggregate cash flow information. This induces investors to reprice earlier firm-specific earnings news. Unlike the earnings-focused literature, we emphasize that earnings and macro announcements contain distinct information, prompting investors to learn across announcements and generating cross-sectional variations in returns on macro-announcement days.

Third, our paper broadly fits within the literature on learning and information spillovers.

Ben-Rephael, Carlin, Da, and Israelsen (2021) empirically confirm the Savor and Wilson (2016) mechanism by showing that investors cross-learn from peer firms' scheduled earnings announcements, as announcing firms convey cash flow news about related firms and the aggregate economy.[2] Ferracuti and Lind (2025) demonstrate that investors extract more macroeconomic information from earnings announcements during periods of clustered releases. Bonsall, Bozanic, and Fischer (2013) further show that management earnings forecasts convey macroeconomic information and influence peer firms' returns, especially when the forecast is bundled with an earnings announcement. Our paper theoretically frames the cross-learning mechanism in clustered earnings announcements, showing that investors pool signals to extract aggregate cash-flow information, and we focus on the implications of this learning for risk premia on macro-announcement days.

The rest of the paper is organized as follows. Section 2 develops a dynamic general equilibrium model featuring both earnings and macroeconomic announcements and establishes the theoretical link between earnings informativeness and the repricing premium. Section 3 tests these cross-sectional implications in the data and presents quantitative results demonstrating that the model can reproduce the observed empirical patterns. Section 4 concludes.

2 A Dynamic Model

In this section, we present a dynamic general equilibrium model of learning across earnings and macroeconomic announcements to formalize the macroeconomic announcement repricing channel. The model provides a quantitative benchmark for our empirical analysis and allows us to assess the importance of this mechanism in shaping the cross-section of stock returns. Details of the model solution and derivations are provided in Appendix A.

2.1 Model Setup

Preferences and Endowment We consider an endowment economy in which the representative agent has Duffie and Epstein (1992) recursive preferences with time discount rate ρ, constant risk aversion γ, and constant intertemporal elasticity of substitution (IES) ψ. We assume $\gamma > 1 > 1/\psi$, such that preferences satisfy the strong generalized risk sensitivity condition (strong GRS) of Ai, Han, and Xu (2022). This condition implies a high-frequency

[2]Related literature documents attention spikes on announcement days, consistent with our theory that investors extract signals from announcements (e.g.,Drake, Roulstone, and Thornock (2012), Hirshleifer and Sheng (2021), Fisher, Martineau, and Sheng (2022)).

announcement-day risk premium and ties its magnitude to the informativeness of the announcement.

We assume that aggregate consumption, C_t, evolves according to the diffusion process:

$$\frac{dC_t}{C_t} = \theta_t dt + \sigma_C dB_{C,t}, \tag{1}$$

where θ_t represents the *unobservable* aggregate cash flow (expected long-run consumption growth) and σ_C is the volatility of aggregate consumption. The state variable θ_t follows an Ornstein-Uhlenbeck (OU) process:

$$d\theta_t = a\left(\bar{\theta} - \theta_t\right) dt + \sigma_\theta dB_{\theta,t}, \tag{2}$$

where a governs persistence, $\bar{\theta}$ is the long-run mean, and σ_θ is its volatility.

There is a cross-section of N firms. Suppose the dividend of firm i is proportional to aggregate consumption,

$$D_{i,t} = \delta_{i,t} C_t, \tag{3}$$

where the firm's dividend-to-consumption ratio follows a geometric Brownian motion:

$$\frac{d\delta_{i,t}}{\delta_{i,t}} = g_{i,t} dt + \sigma_D dB_{D_i,t}, \tag{4}$$

with $g_{i,t}$ the *unobservable* firm-specific cash flow growth rate and σ_D the volatility of the dividend-consumption ratio. The firm's growth rate $g_{i,t}$ evolves as an OU process:

$$dg_{i,t} = b\left(\bar{g} - g_{i,t}\right) dt + \sigma_g dB_{g_i,t}, \tag{5}$$

where b is the mean reversion rate, $\bar{g}$ is the long-run average growth rate, and σ_g is the volatility of firm-specific cash flow growth. All Brownian shocks $(B_C, B_\theta, B_{D_i}, B_{g_i})$ for all i are assumed independent.

Earnings and Macroeconomic Announcements Both the aggregate and the firm-specific cash flow components, θ_t and $g_{i,t}$, are unobservable. Investors continuously learn about these latent states from two sources. First, the observed aggregate consumption C_t and the firm's dividend-consumption ratio $\delta_{i,t}$ contain information. Second, investors observe discrete signals at prescheduled dates: earnings announcements (EA) and macroeconomic announcements (MA).

Earnings announcements occur at times $\tau, 2\tau, ..., n\tau$ and provide a noisy signal about both aggregate and firm-specific cash flow components. For firm i at time τ, the earnings signal is:

$$s_{E,i}(\tau) = \theta_\tau + g_{i,\tau} + \epsilon_{i,\tau},\ \epsilon_i \sim \mathcal{N}\left(0, \sigma^2_{E,i}(\tau)\right), \tag{6}$$

where ϵ_i is normally distributed with mean zero and variance $\sigma^2_{E,i}(\tau)$.

Consequently, earnings announcements confound aggregate and firm-specific news. This structure creates a signal extraction problem: investors cannot perfectly distinguish between market-wide news (θ) and firm-specific news (g_i) at the time of the announcement.

The noise variance $\sigma^2_{E,i}(\tau)$ quantifies the information quality of the earnings announcement, with lower variance indicating a more informative signal. To capture cross-sectional heterogeneity in earnings-announcement informativeness, we assume that N firms announce simultaneously and that $\sigma^2_{E,i}(\tau)$ is drawn from a common distribution F_E, which is uniformly distributed on the interval $[\underline{\sigma}^2_E, \overline{\sigma}^2_E]$, with realizations assigned to firms by random permutation in each cycle.[3]

Macroeconomic announcements occur at prescheduled times $0, T, 2T, \ldots$. For tractability, we model the MA as a signal that fully reveals the true aggregate state θ_t:[4]

$$s_M(T) = \theta_T. \tag{7}$$

For notational convenience, we focus on a representative announcement cycle $[0, T]$. Let T (or T^-) denote the instant just before the macro announcement and T^+ (or 0) the instant immediately afterward. Likewise, let τ (or τ^-) be the moment just before the earnings announcement and τ^+ the moment just after it. We consider the representative case in which the earnings announcement occurs immediately prior to the macroeconomic announcement, so that $\tau \to T$ and $\tau^+ = T^-$. In other words, the instant after the earnings announcement coincides with the instant before the macro announcement.[5] This timeline allows us to isolate the repricing mechanism: investors first form joint beliefs at the earnings announcement,

[3]On each earnings date, N values are drawn from $F_E = \{\sigma^2_{E,1}, \ldots, \sigma^2_{E,N}\}$ and assigned to firms by random permutation (sampling without replacement across firms within that cycle). This permutation is redrawn across earnings dates, ensuring that for any firm i, the sequence of signal precisions $\{\sigma^2_{E,i}(n\tau)\}$ is independent over time. This assumption ensures that the value function depends only on the aggregate state rather than on firm-specific histories; we formalize this result in Appendix C.3.

[4]Allowing the MA to be noisy or heterogeneous across announcements would not affect the repricing mechanism but would substantially increase the state space by introducing additional cross-sectional covariances. We therefore abstract from this without loss of generality.

[5]This timing assumption is again for tractability: if the two announcements were separated in time, the associated covariances would evolve between announcements and become additional state variables.

which are subsequently disentangled at the macroeconomic announcement. The timeline is summarized as follows:

$$0 \xrightarrow{\text{interior}} \tau^- \xrightarrow{\text{EA}} \underbrace{\tau^+ = T^-}_{\text{pre-MA}} \xrightarrow{\text{MA}} \underbrace{T^+ = 0}_{\text{post-MA}}.$$

Dynamics of Beliefs and Repricing Since θ_t and $g_{i,t}$ are unobservable, equilibrium prices and quantities depend on investors' posterior beliefs. The standard Kalman filter implies that the posterior distribution is summarized by the first two moments. Let $\hat{\theta}_t \equiv \mathbb{E}_t[\theta_t]$ and $\hat{g}_{i,t} \equiv \mathbb{E}_t[g_{i,t}]$ denote the posterior means of the aggregate and firm-specific cash flows, respectively. The uncertainty is summarized by the posterior variances: $q_{\theta\theta}(t) \equiv \mathbb{E}[(\hat{\theta}_t - \theta_t)^2]$ for the common cash flow and $q_{ii}(t) \equiv \mathbb{E}[(\hat{g}_{i,t} - g_{i,t})^2]$ for firm i's idiosyncratic cash flow. We further define the covariance between aggregate and firm-specific cash flows as $q_{\theta g_i}(t) \equiv Cov(\theta_t, g_{i,t})$, and the cross-firm covariance as $q_{ij}(t) \equiv Cov(g_{i,t}, g_{j,t})$ for $i \neq j$.

Between announcements, $t \in (0, \tau)$, investors update their beliefs using a Kalman-Bucy filter. We characterize the resulting belief dynamics in Lemma 1 of Appendix A.1. Note that the covariances satisfy $q_{\theta g_i}(t) = 0$ and $q_{ij}(t) = 0$. This independence arises because the preceding macroeconomic announcement fully revealed the aggregate state θ, resetting cross-component uncertainty to zero. Consequently, in the interior of the cycle, investors learn about the aggregate and firm-specific components separately.

Before characterizing belief updates at announcement times, it is useful to define the *informativeness index* for firm i's earnings announcement,

$$\alpha_i := \frac{q_{ii}^-(\tau)}{q_{ii}^-(\tau) + \sigma_{E,i}^2(\tau)} \in [0, 1]. \tag{8}$$

This index measures the weight investors place on the earnings signal relative to prior uncertainty. A more precise earnings announcement (lower $\sigma_{E,i}^2$) increases α_i: as the signal becomes perfectly informative, $\alpha_i \to 1$, whereas $\alpha_i \to 0$ when the signal is highly noisy.

We now summarize how beliefs update at the earnings and macro announcements. The posterior moments and their full derivations are provided in Lemma 2 in Appendix A.1.

Updates at the Earnings Announcement τ: After the earnings announcement at time τ, the posterior mean updates for θ and g_i are:

$$\hat{\theta}^{+}(\tau) \;=\; \hat{\theta}^{-}(\tau) + q^{+}_{\theta\theta}(\tau) \times (\text{Pooled Surprise}), \tag{9}$$

$$\hat{g}^{+}_{i}(\tau) \;=\; \hat{g}^{-}_{i}(\tau) + \alpha_i z_i - \alpha_i \left(\hat{\theta}^{+}(\tau) - \hat{\theta}^{-}(\tau)\right), \tag{10}$$

where $q^{+}_{\theta\theta}(\tau) = \frac{q^{-}_{\theta\theta}(\tau)}{1+q^{-}_{\theta\theta}(\tau)s_{\Sigma}}$ is the updated aggregate variance, $s_{\Sigma} \equiv \sum_{i=1}^{N} v_i$, and $v_i \equiv [\, q^{-}_{ii}(\tau) + \sigma^2_{E,i}(\tau)\,]^{-1}$.[6] The pooled surprise is defined as $\sum_{i=1}^{N} v_i z_i$, and firm-specific earnings surprise $z_i \equiv s_{E,i,\tau} - (\hat{\theta}^{-}_{\tau} + \hat{g}^{-}_{i,\tau})$.

The first equation shows that investors learn about the aggregate component by pooling earnings surprises across firms, placing greater weight on more informative announcements. The second equation decomposes the firm-level belief revision into a purely idiosyncratic component, $\alpha_i z_i$, and an offsetting adjustment that removes the portion attributed to the market-wide news. As a result, firm-specific beliefs reflect only the residual component of the earnings surprise after accounting for common information.

This joint updating generates two effects. First, pooling information reduces uncertainty about the aggregate component, so $q^{+}_{\theta\theta}(\tau) < q^{-}_{\theta\theta}(\tau)$. Second, because the earnings signal mixes aggregate and firm-specific news, belief updating induces a negative conditional covariance,

$$q^{+}_{\theta g_i}(\tau) = -\alpha_i q^{+}_{\theta\theta}(\tau) < 0. \tag{11}$$

Intuitively, the earnings signal pins down the sum $\theta + g_i$, so an upward revision in θ requires a downward revision in g_i. Consequently, after the earnings announcement, each firm's idiosyncratic component becomes negatively correlated with the common component.

Updates at the Macroeconomic Announcement T: At time T, the macroeconomic announcement fully reveals the true aggregate state θ_T, resolving all common uncertainty so that $q^{+}_{\theta\theta}(T) = 0$. This revelation forces a revision of the beliefs formed at the earnings announcement and drives the repricing of firm-specific fundamentals. The repricing mechanism is summarized in the following proposition.

Proposition 1. *(Repricing Channel and Cross-Sectional Risk). After the earnings announcement at τ, the conditional common-idiosyncratic covariance becomes negative, i.e.,*

[6] In general, s_{Σ} is history dependent because it depends on all past firm-level variances $\{q^{-}_{ii}(\tau)\}_{i=1}^{N}$. Our random permutation assumption allows this dependence to be summarized by a stationary, permutation-invariant aggregator $\bar{s}_{\Sigma}$ (see Appendix C.3 for a proof).

$q^+_{\theta g_i}(\tau) = -\alpha_i q^+_{\theta\theta}(\tau) < 0.$

At the subsequent macroeconomic announcement T, the aggregate state is fully revealed, i.e., $\hat{\theta}^+(T) = \theta_T$. The firm-specific belief updates according to:

$$\hat{g}_i^+(T) - \hat{g}_i^+(\tau) = -\alpha_i \left(\theta_T - \hat{\theta}^+(\tau)\right). \tag{12}$$

and the covariance of conditional expectations satisfies:

$$Cov\left(\hat{\theta}^+_T, \hat{g}^+_{i,T}\right) = -\alpha_i q^+_{\theta\theta}(\tau) < 0. \tag{13}$$

Holding other objects fixed, the comparative statics with respect to firm i's earnings announcement noise satisfy

$$\frac{dCov\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}\right)}{d\sigma^2_{E,i}} < 0, \qquad \frac{dCov\left(\hat{\theta}^+_T, \hat{g}^+_{i,T}\right)}{d\sigma^2_{E,i}} > 0. \tag{14}$$

Proof. See Appendix A.1. □

The proposition formalizes the *repricing channel*. Because the sum $\theta + g_i$ was pinned down by the earnings signal at τ, any surprise in the aggregate component θ at time T forces an opposite revision in the firm-specific component g_i. Equation (12) shows that when macroeconomic condition is stronger than expected ($\theta_T > \hat{\theta}^+_\tau$), investors realize that part of the earlier earnings strength was over-attributed to firm-specific fundamentals, leading to a downward revision in $\hat{g}_i$; conversely, weaker-than-expected macroeconomic condition induces an upward revision.

The magnitude of this repricing is governed by the informativeness index α_i. Firms with more informative earnings announcements (lower $\sigma^2_{E,i}$, higher α_i) experience stronger repricing because the earnings signal tightly identifies the sum of aggregate and firm-specific growth, $\theta + g_i$; thus, revisions to θ translate almost one-for-one into opposite revisions to g_i. When earnings announcements are less informative, the attribution between aggregate and firm-specific components is weaker and the induced covariance is closer to zero.

The macroeconomic announcement concludes this signal-extraction process by fully revealing the aggregate state. As aggregate uncertainty vanishes ($q^+_{\theta\theta}(T) = 0$), the covariance between aggregate and firm-specific beliefs collapses to zero ($q^+_{\theta g_i} = 0$), leaving only idiosyncratic uncertainty to drive returns until the next cycle.

Implications for Announcement Betas: Since announcement betas are proportional to the covariances of conditional expectations, Proposition 1 maps directly into announcement betas and premia. To formally compute the CAPM beta, we define the market return as the equal-weighted average of returns from all firms. We then define earnings- and macro-announcement betas as follows. Details of the beta computations are provided in Appendix A.5.

Definition 1. *(Earnings- and Macro-Announcement Betas) Conditioning on $\sigma_{E,i}$, the earnings-announcement beta is:*

$$\beta_{E,i}|\sigma_{E,i} = \frac{Cov\left(R_{E,i}, R_{E,M}|\,\sigma_{E,i}\right)}{Var\left(R_{E,M}|\,\sigma_{E,i}\right)}, \tag{15}$$

where the earnings-announcement return for firm i is $R_{E,i} \equiv \frac{p(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_{ii,\tau}, \tau^+)}{p(\hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_{ii,\tau}, \tau^-)}$, and the market return is $R_{E,M} \equiv \frac{1}{N}\sum_{j=1}^N R_{E,j}$. Similarly, the macro-announcement beta is

$$\beta_{M,i}|\sigma_{E,i} = \frac{Cov\big(\,R_{M,i}, R_{M,M}|\,\sigma_{E,i}\big)}{Var\big(\,R_{M,M}|\,\sigma_{E,i}\big)}, \tag{16}$$

where $R_{M,i} \equiv \frac{p(\hat{\theta}^+_T, \hat{g}^+_{i,T}, q^+_{ii,T}, T^+)}{p(\hat{\theta}^-_T, \hat{g}^-_{i,T}, q^-_{ii,T}, T^-)}$, and $R_{M,M} \equiv \frac{1}{N}\sum_{j=1}^N R_{M,j}$.

Firm returns depend on both aggregate and firm-specific beliefs $(\hat{\theta}, \hat{g}_i)$, whereas market returns depend only on the aggregate component $(\hat{\theta})$. With the (log) price-dividend ratio approximately linear and monotone in beliefs, the announcement beta is proportional to $Cov(\hat{\theta}, \hat{\theta} + \hat{g}_i) = Var(\hat{\theta}) + Cov(\hat{\theta}, \hat{g}_i)$. Since the variance of the market return on a given announcement day, $Var(\hat{\theta})$, is common across stocks, all cross-sectional variation in announcement betas is driven by the common-idiosyncratic covariance $Cov(\hat{\theta}, \hat{g}_i)$. Thus, the beta inherits the properties of the covariance dynamics derived in Proposition 1.

At the macroeconomic announcement, the negative covariance $Cov(\hat{\theta}^+_T, \hat{g}^+_{i,T}) < 0$ implies a lower announcement-day beta and a lower macro-announcement premium relative to firms where this repricing channel is absent. Moreover, Equation (14) shows that because $Cov(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau})$ decreases in $\sigma^2_{E,i}$ while $Cov(\hat{\theta}^+_T, \hat{g}^+_{i,T})$ increases in $\sigma^2_{E,i}$, firms with more informative earnings announcements exhibit larger earnings-announcement betas but significantly lower macro-announcement betas.

2.2 Asset Prices

We consider a cross section of equity claims indexed by i. Equity i is a claim on the dividend:

$$\frac{dD_{i,t}}{D_{i,t}} = \left(\hat{g}_{i,t} + \hat{\theta}_t\right) dt + \sigma_C d\hat{B}_{C,t} + \sigma_D d\hat{B}_{D_i,t}, \tag{17}$$

which follows immediately from Equation (3).

Under recursive preferences, the representative agent's lifetime utility can be written as: $V\left(\hat{\theta}_t, t, C_t\right) = \frac{1}{1-\gamma} H\left(\hat{\theta}_t, t\right) C_t^{1-\gamma}$. As a result, changes in beliefs about θ_t are reflected through the continuation utility $H\left(\hat{\theta}_t, t\right)$. Note that only beliefs about the aggregate cash flow affect the continuation utility and the stochastic discount factor (SDF); the value function does not depend on firm-specific growth $g_{i,t}$ because idiosyncratic shocks do not affect aggregate consumption. Solutions for the value function are provided in Lemma 3 in Appendix A.2.

Given the value function, we construct the pricing kernel. In the interior of $(0, \tau)$, i.e., in the absence of announcements, the state price density M_t evolves as

$$\frac{dM\left(\hat{\theta}_t, t\right)}{M\left(\hat{\theta}_t, t\right)} = -r\left(\hat{\theta}_t, t\right) dt - \sigma_M\left(\hat{\theta}_t, t\right) d\hat{B}_{C,t}, \tag{18}$$

where the risk-free rate $r(\hat{\theta}_t, t)$ and the market price of risk $\sigma_M\left(\hat{\theta}_t, t\right)$ are given in Equations (A.43) and (A.44) in Appendix A.3.

We now characterize the dynamics of the individual firm's price-to-dividend ratio. Since dividends depend on $\hat{\theta}_t$ and $\hat{g}_{i,t}$, the price-to-dividend ratio depends on the posterior means, time, and the entire variance-covariances matrix of beliefs (i.e., $\{q_{\theta\theta}, q_{ii}, q_{\theta g_i}, q_{ij}\}_{i=1,\dots N}$ for $i \neq j$). However, our assumption that the macroeconomic announcement fully reveals the aggregate state substantially simplifies this problem. We show that in the interior of the cycle, the price-to-dividend ratio for firm i depends on only four state variables—$\hat{\theta}_t$, $\hat{g}_{i,t}$, $q_{ii}(t)$, and t—with one additional state variable, $\sigma^2_{E,i}(\tau)$, entering only through boundary conditions at announcement dates.[7] We denote the price-to-dividend ratio by $p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right)$, so that the stock price is given by $p(\cdot)D_{i,t}$. By definition, the stock price equals the discounted

[7] Specifically, the posterior variance of aggregate cash flow, $q_{\theta\theta}$, is deterministic over time (see Equation (A.3)) and can therefore be absorbed into time t. Furthermore, the covariances $q_{\theta g_i}$ and q_{ij} are zero in the interior and jump only at earnings and macroeconomic announcements. For firm i, these jumps can be summarized by $\{\sigma^2_{E,i}(\tau), q^-_{ii}(\tau)\}$ (see Lemma 2 in Appendix A.1).

expected future dividends:

$$p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right) D_{i,t} = \mathbb{E}\left[\int_0^\infty \frac{M_{t+s}}{M_t} D_{i,t+s} ds \mid \hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right]. \tag{19}$$

The partial differential equation (PDE) and boundary conditions that pin down $p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right)$ are given in Lemma 4 of Appendix A.3. Given the pricing kernel and the price-to-dividend ratio, we can characterize the market risk premium, which consists of two components: (i) a continuous instantaneous premium accruing in the interior of $(0, \tau)$, and (ii) a discrete announcement premium realized at the boundary.

In the interior $(0, \tau)$, the instantaneous risk premium is

$$\mathbb{E}_t\left[\frac{d\left[p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right) D_{i,t}\right] + D_t dt}{p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right) D_{i,t}}\right] - r\left(\hat{\theta}_t, t\right) dt = \left(\gamma\sigma_C - \frac{\frac{1}{\psi} - \gamma}{\sigma_C(1-\gamma)} \frac{H_\theta}{H} q_{ii,t}\right)\left(\sigma_C + \frac{p_\theta}{p}\frac{q_{ii,t}}{\sigma_C}\right), \tag{20}$$

where subscripts for H and p denote partial derivatives.

We are specifically interested in the discrete announcement premia realized on earnings and macroeconomic announcement days. The following proposition summarizes these results.

Proposition 2. *(Announcement Premium) Let $B \equiv \frac{\frac{1}{\psi}-\gamma}{1-\gamma}$. At the earnings announcement τ, earnings announcement premium conditioning on $\sigma_{E,i}$ is*

$$R_{E,i}(\sigma_{E,i}; \tau) = \frac{\mathbb{E}_{\tau^-}\left[p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_{ii,\tau}, \tau^+\right) \Big| \sigma_{E,i}\right]}{\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_{ii,\tau}, \tau^-\right)}, \tag{21}$$

where the conditional price-to-dividend ratio is

$$\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_{ii,\tau}, \tau^-\right) = \frac{\mathbb{E}_{\tau^-}\left[H\left(\hat{\theta}^+_\tau, \tau^+\right)^B p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_{ii,\tau}, \tau^+\right) \Big| \sigma_{E,i}\right]}{\left(\mathbb{E}_{\tau^-}\left[H\left(\hat{\theta}^+_\tau, \tau^+\right)\right]\right)^B}.$$

At the macro announcement T, the macro announcement premium conditioning on $\sigma_{E,i}$ is

$$R_{M,i}(\sigma_{E,i}; T) = \frac{\mathbb{E}_{T^-}\left[p\left(\hat{\theta}^+_T, \hat{g}^+_{i,T}, q^+_{ii,T}, T^+\right) \Big| \sigma_{E,i}\right]}{\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^-_T, \hat{g}^-_{i,T}, q^-_{ii,T}, T^-\right)}, \tag{22}$$

where the conditional price-to-dividend ratio:

$$\tilde{p}\left(\sigma_{E,i};\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_{ii,T}^-,T^-\right)=\frac{\mathbb{E}_{T^-}\left[H\left(\hat{\theta}_T^+,T^+\right)^B p\left(\hat{\theta}_T^+,\hat{g}_{i,T}^+,q_{ii,T}^+,T^+\right)\middle|\,\sigma_{E,i}\right]}{\left(\mathbb{E}_{T^-}\left[H\left(\hat{\theta}_T^+,T^+\right)\right]\right)^B}.$$

Proof. See Appendix A.5. □

In Appendix A.3, we show that the announcement SDF at $t_A\in\{\tau,T\}$ is given by $H(\hat{\theta}_{t_A}^+,t_A^+)^B/\left\{\mathbb{E}_{t_A^-}\left[H(\hat{\theta}_{t_A}^+,t_A^+)\right]\right\}^B$, where $B\equiv\frac{\frac{1}{\psi}-\gamma}{1-\gamma}$. Under the strong GRS condition $\gamma>1>1/\psi$, we have $B>0$. Since the continuation value H decreases in $\hat{\theta}_t$ while the price-to-dividend ratio increases in $\hat{\theta}_t$, it follows that: $Cov\left(H(\hat{\theta}_{t_A}^+,t_A^+)^B,\ p(\hat{\theta}_{t_A}^+,\hat{g}_{i,t_A}^+,q_{ii,t_A}^+,t_A^+)\right)<0$. At announcement times, investors' beliefs jump from $\hat{\theta}_{t_A}^-$ to $\hat{\theta}_{t_A}^+$ as new aggregate information is revealed, inducing contemporaneous movements in the SDF and asset prices. As a result, announcements require positive risk compensation. This mechanism generates positive *average* earnings- and macro-announcement premia, consistent with the empirical evidence in Savor and Wilson (2013, 2016).

Our primary focus, however, is the cross-sectional repricing risk on macroeconomic announcement days, rather than the average announcement premium. To isolate the repricing channel, we measure risk premia relative to a benchmark "non-announcer," defined as the limiting case in which earnings announcements are completely uninformative.

Definition 2. *(Repricing Premium) Conditioning on earnings signal noise $\sigma_{E,i}$, the repricing premium for firm i at macroeconomic announcement T is defined as:*

$$\pi_i^{Rep}\mid\sigma_{E,i}\equiv\mathbb{E}_{T^-}\left[R_{M,i}\mid\sigma_{E,i}\right]-\mathbb{E}_{T^-}\left[R_{M,non}\right],\tag{23}$$

where $R_{M,i}$ is the macro-announcement return for announcing firm i, and $R_{M,non}$ is the return for a non-announcer (a firm with uninformative earnings $\sigma_{E,i}\to\infty$).

On macro days, the aggregate cash flow θ_T is fully revealed and constitutes a common source of risk for all firms. For non-announcers, firm-specific beliefs $\hat{g}_{i,T}$ are uncorrelated with $\hat{\theta}_T$. In this benchmark case, firms carry pure aggregate risk, yielding a zero repricing premium ($\pi_i^{Rep}=0$).

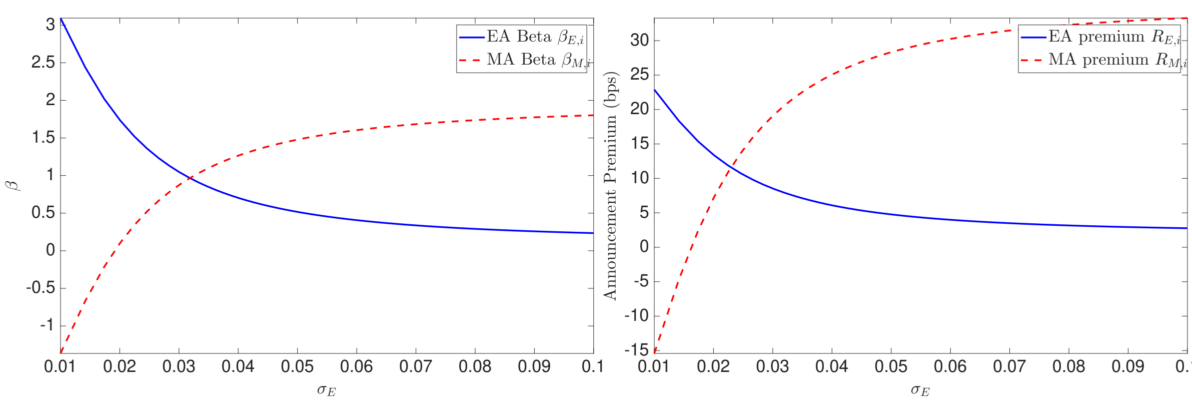
However, as established in Proposition 1, the preceding earnings announcement induces a negative covariance, $Cov(\hat{\theta}_T^+,\hat{g}_{i,T}^+)<0$, which acts as a partial *hedge* against aggregate risk. When positive macro news arrives (a state of low marginal utility), the aggregate component of the stock price rises, but the firm-specific component is revised downward. This dampens the firm's upside in good states relative to the non-announcer. Conversely, in bad states, the firm receives an upward revision, cushioning the crash. Because the firm is less sensitive to aggregate shocks than the benchmark, it requires less risk compensation, resulting in a negative repricing premium ($\pi_i^{Rep} < 0$).

Crucially, the repricing premium is heterogeneous across firms. More informative earnings announcements (smaller $\sigma_{E,i}$) generate a stronger positive covariance $Cov(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+)$ at the earnings announcement, leading to a higher earnings-day beta $\beta_{E,i}$. Yet, this same informativeness leads to a more negative covariance $Cov(\hat{\theta}_T^+, \hat{g}_{i,T}^+)$ at the macroeconomic announcement. Consequently, firms with more informative earnings exhibit a lower macro-day beta $\beta_{M,i}$ and earn a lower risk premium on macro days compared to firms with noisier earnings signals. Thus, cross-sectional heterogeneity in earnings informativeness maps directly into the magnitude of the repricing premium.

2.3 Policy Functions

In this section, we use the policy functions implied by the model to illustrate the central economic mechanism—the repricing channel—and its implications for cross-sectional returns.

Figure 1: Earnings and Macro Announcement Betas and Risk Premia



The left panel plots the model-implied earnings announcement (EA) beta (blue solid line) and macro announcement (MA) beta (red dashed line) defined in Definition 1, as functions of the earnings-signal noise $\sigma_{E,i}$. The right panel plots the corresponding EA-day expected return (blue solid line) and MA-day expected return (red dashed line) characterized in Proposition 2.

Proposition 1 establishes that the covariance between aggregate and firm-specific cash flows is monotonic in earnings-announcement noise $\sigma_{E,i}^2$. The left panel of Figure 1 illustrates the resulting beta dynamics. The earnings announcement beta $\beta_{E,i}$ (blue solid line) decreases monotonically with $\sigma_{E,i}$. Firms with more informative earnings announcements (low $\sigma_{E,i}$) exhibit high $\beta_{E,i}$ because precise earnings news contains significant information about the aggregate condition; consequently, the firm's price becomes highly sensitive to aggregate news. In contrast, the macro announcement beta $\beta_{M,i}$ (red dashed line) increases monotonically as $\sigma_{E,i}$ rises. This pattern reflects the repricing channel. For firms with highly informative earnings announcements, the sum $\theta + g_i$ is tightly pinned down prior to the macro announcement. When the macro announcement subsequently reveals the true aggregate state θ, investors revise their beliefs about firm-specific fundamentals g_i in the opposite direction. This "reverse learning" generates a strong negative beta for informative firms. As noise increases, this link weakens, and the beta increases.

The right panel of Figure 1 plots the corresponding expected returns. The pattern in risk premia mirrors the pattern in betas, confirming that the belief dynamics map directly into asset prices. The earnings-day risk premium (blue solid line) decreases with $\sigma_{E,i}$ because more informative earnings announcements resolve greater uncertainty about aggregate conditions, requiring higher risk compensation. Conversely, the macro-day risk premium (red dashed line) is lower for stocks with informative recent earnings announcements. This illustrates the repricing premium. Because the repricing channel effectively turns more informative firms into a hedge against aggregate shocks—suffering valuation cuts in good times and enjoying upgrades in bad times—they command a lower required risk premium.

2.4 Timing and Recency: Distant vs. Recent Announcer

In this section, we examine how the timing of earnings announcements relative to macroeconomic news determines the strength of the repricing channel. We contrast a "Recent Announcer" (firm i) against a counterfactual "Distant Announcer" (firm j) to isolate the mechanism.

As before, we consider a representative announcement cycle over the interval $t \in (0, T]$, where $t = 0$ denotes the start of the cycle and $t = T$ denotes the arrival of the current macroeconomic announcement. The sequence of events is structured such that firm i announces immediately before the macro news, while firm j announces immediately after:

$$0 \xrightarrow{\text{interior}} \tau_i^- \xrightarrow{\text{EA}_i} \underbrace{\tau_i^+ = T^-}_{\text{Pre-MA}} \xrightarrow{\text{MA}} \underbrace{T^+ = \tau_j^-}_{\text{Post-MA}} \xrightarrow{\text{EA}_j} \tau_j^+.$$

Firm i is a recent announcer, with an earnings announcement at τ_i immediately preceding the macroeconomic announcement ($\tau_i^+ = T^-$). As shown in earlier sections, this timing maximizes the repricing effect. Because the earnings signal arrives before θ_T is revealed, investors cannot perfectly disentangle aggregate from firm-specific news. This confounding induces a negative covariance $q^+_{\theta g_i}(\tau_i) < 0$ precisely at the moment of the macro announcement, making the firm a partial hedge against the aggregate shock.

In contrast, consider firm j to be a distant announcer, defined as a firm scheduled to announce earnings at τ_j, immediately following the macro announcement, i.e., $\tau_j^- = T^+$. Within the recursive structure of the announcement cycle, the time T^+ effectively marks the restart of a new cycle (equivalent to $t = 0$). This timing schedule therefore implies that firm j's previous announcement occurred at the beginning of the current cycle ($t = 0$). Consequently, firm j is the "distant" announcer, as its earnings signal is the furthest away from the current macro announcement at time T.

This difference in timing leads to distinct asset pricing dynamics. Because the earnings signal arrives after the aggregate state θ_T is fully revealed, investors face no signal extraction problem. They can simply subtract the known aggregate component from the total earnings signal to isolate the firm-specific component. This perfect disentangling implies that the firm starts the subsequent cycle with uncorrelated beliefs: $q^+_{\theta g_j}(\tau_j) = 0$.

Consequently, when the next macroeconomic announcement arrives, firm j has no pre-existing covariance to correct. The repricing channel is therefore absent, and firm j's return is driven solely by aggregate news. In this sense, firm j behaves identically to the "non-announcer" benchmark discussed earlier. The following proposition formalizes the belief dynamics for the distant announcer.

Proposition 3. *(Distant Announcer) Consider a distant announcer j whose earnings announcement occurs immediately after the macro announcement, i.e., $\tau_j^- = T^+$. Assume the macro announcement is fully revealing. Let the earnings signal be $s_{j,E}(\tau_j) = \theta_{\tau_j} + g_{j,\tau_j} + \varepsilon_{E,j}$. Then, the conditional common-idiosyncratic covariance is zero:*

$$Cov\left(\hat{\theta}^+_T, \hat{g}^+_{j,T}\right) = 0. \tag{24}$$

Furthermore, the posterior update for the firm-specific fundamental g_j reduces to a univariate Gaussian update:

$$\hat{g}^+_j(\tau_j) = \hat{g}^-_j(\tau_j) + \alpha_j \tilde{z}_j, \tag{25}$$

where $\alpha_j \equiv \frac{q^-_{jj}(\tau_j)}{q^-_{jj}(\tau_j) + \sigma^2_{E,j}}$, and the innovation is $\tilde{z}_j \equiv \left(s_{j,E}(\tau_j) - \theta_T\right) - \hat{g}^-_{j,\tau_j}$.

Proof. See Appendix A.4. □

3 Empirical Evidence and Quantitative Analysis

In this section, we calibrate the model to match key moments of aggregate consumption growth, asset returns, and announcement-day returns. We then test the model's central repricing mechanism in the data and replicate the same empirical exercises using simulated model data. Our analysis proceeds in four steps: (i) quantifying the repricing premium by comparing earnings announcers to non-announcers; (ii) analyzing the cross-sectional variation in the repricing premium driven by earnings informativeness; (iii) testing the implications of announcement timing; and (iv) providing direct evidence on belief revisions using analyst forecasts.

3.1 Data and Calibration

Data Our sample consists of publicly traded U.S. firms from January 1998 to December 2023. We focus on five major scheduled macroeconomic announcements: FOMC meetings, GDP releases, Nonfarm Payroll Employment, CPI, and the ISM Manufacturing Index. Daily stock returns, market capitalization, and industry classifications (SIC codes) are obtained from CRSP. Earnings announcement dates and timestamps are drawn from the intersection of Compustat and the Thomson Reuters I/B/E/S database. High-frequency intraday data from TAQ are used to construct measures of stock-market comovement, including daily betas. We restrict the sample to non-financial firms and exclude firms with SIC codes between 6000 and 6999. We use individual analyst earnings forecasts from I/B/E/S to measure belief revisions, focusing on changes in expected annual earnings per share (EPS). Consensus macroeconomic forecasts used to construct macroeconomic surprises are obtained from the Survey of Professional Forecasters. Appendix B.1 provides detailed descriptions of data construction, including the processing of high-frequency returns, the identification of earnings and macroeconomic announcement dates, the construction of macroeconomic surprises, and analyst forecast revisions.

Calibration We calibrate the model to match standard annualized macroeconomic and asset pricing moments. The simulation features 100 firms with quarterly earnings announcements ($T = 1/4$). Table 1 reports the annualized parameter values.

Preference parameters follow the long-run risk literature (e.g., Bansal and Yaron (2004); Ai (2010); Ai and Bansal (2018)): the subjective discount rate is $\rho = 1.5\%$, risk aversion $\gamma = 10$, and the IES $\psi = 2$. Aggregate consumption parameters ($\bar{\theta} = 1.5\%$, $\sigma_C = 3\%$, $a =$

0.085) are chosen to match the mean, volatility, and persistence of U.S. consumption growth over 1929–2023. In the data (model), these moments are 1.74% (1.51%), 2.72% (3.47%), and 0.38 (0.31). Dividend growth parameters ($\bar{g} = 1\%$, $\sigma_g = 0.008$, $b = 0.03$) are calibrated to match the first two moments and autocorrelation of dividend growth. The model produces an annual mean growth rate of 2.04%, volatility of 13.59%, and autocorrelation of 0.20, compared to 1.6%, 10.8%, and 0.19 in the data. We set $\sigma_\theta = 0.75\%$ and $\sigma_D = 15\%$ to jointly match the equity premium and return volatility, yielding an annual equity premium of 6.61% and volatility of 19.03%, close to their data counterparts of 5.69% and 18.29%. All nominal quantities are deflated using the CPI.

Earnings-announcement precision is disciplined using the cross-sectional dispersion of earnings announcement-day returns. We set the lower and upper bounds of signal noise to $\underline{\sigma}_E = 0.01$ and $\bar{\sigma}_E = 0.1$ to match the decile distribution of announcement-day returns. In the data (model), the mean return at the 10th percentile is 12 bps (15 bps), and at the 90th percentile is 28 bps (25 bps).

The model also matches untargeted moments. It generates a real risk-free rate of 0.42% with an annual standard deviation of 0.92%, compared to 0.26% and 1.08% in the data. In addition, it produces sizable announcement premia: the average earnings announcement-day return is 20 bps, the average macroeconomic announcement-day return is 25 bps, and the average non-announcement-day return is 3 bps, closely matching the empirical values of 20 bps, 20 bps, and 4 bps.

Table 1: Calibrated Parameters

Para.	Value	Description	Para.	Value	Description
σ_C	0.03	vol of consumption growth	b	0.03	persistence of cash flow
a	0.085	long-run consumption growth persistence	$\bar{g}$	0.01	mean of latent cash flow
$\bar{\theta}$	0.015	mean of long-run consumption growth	σ_g	0.008	vol of latent cash flow
σ_θ	0.0075	vol of long-run consumption growth	$\underline{\sigma}_E$	0.01	lower bound of EA signal noise
σ_D	0.15	vol of dividend growth rate	$\bar{\sigma}_E$	0.1	upper bound of EA signal noise

3.2 The Repricing Premium: Announcers vs. Non-Announcers

The first prediction of our model is that the repricing premium on macroeconomic announcement days is negative: firms with recent earnings announcements earn lower expected returns than firms without recent earnings news. In other words, recent earnings announcers systematically underperform non-announcers on macroeconomic announcement days. In the model, non-announcers correspond to the limiting case of completely uninformative earnings announcements ($\sigma_{E,i} \to \infty$). As shown in Figure 1, these firms carry pure aggregate risk and earn higher premia. In contrast, recent announcers ($\sigma_{E,i} < \infty$) partially hedge aggregate risk because the revelation of aggregate news triggers an offsetting revision in firm-specific beliefs, lowering both their macro-day beta and required return relative to the non-announcing benchmark.

Empirically, we test this prediction by forming two portfolios on the day preceding each macroeconomic announcement. Announcers are firms that released earnings within the previous month, while non-announcers are firms without recent earnings news. We compute equal-weighted (EW) and value-weighted (VW) excess returns on the macro-announcement day. To ensure a clean comparison, we impose the following restrictions. First, we exclude firms that announce earnings on the macro-announcement day itself and retain only scheduled earnings announcements. Second, we construct the non-announcer portfolio to match the industry and size composition of the announcer portfolio. Finally, we require at least 100 announcing firms per event and at least 50 firms scheduled to announce within the three days following the macro event (to ensure comparability with subsequent timing tests). We then form a long-short portfolio that is long non-announcers and short announcers.

We replicate the same exercise in simulated model data by constructing a portfolio of announcers (drawn from the calibrated signal distribution F_E) against a portfolio of non-announcers (consisting of firms with $\sigma_{E,i} \to \infty$).

Table 2: Performance of Earnings Announcers and Non-Announcers on Macro Days

	Data (EW)	Data (VW)	Model
Non-Announcers (Long)	33.0	33.0	30.0
	(2.85)	(2.96)	
Announcers (Short)	21.0	19.0	17.5
	(1.76)	(1.94)	
Long-short	**12.0**	**14.0**	12.5
	(2.68)	**(2.29)**	

This table reports daily excess returns (in basis points) for portfolios formed on macroeconomic announcement days. The short portfolio (Announcers) consists of firms that issued a scheduled earnings announcement within the prior 30 days. The long portfolio (Non-Announcers) consists of firms without recent earnings announcements, matched to announcers by industry and size. Equal-weighted (EW) and value-weighted (VW) returns are computed for each announcement day. The table reports time-series means with t-statistics in parentheses. The sample includes 181 macroeconomic announcement days from the intersection of CRSP, I/B/E/S, TAQ, and Compustat over 1998–2023.

Table 2 reports the results. On macroeconomic announcement days, firms with recent earnings announcements earn significantly lower returns than non-announcers, consistent with a negative repricing premium. The equal-weighted long-short spread (non-announcers minus announcers) is 12.0 bps ($t = 2.68$), and the value-weighted spread is 14.0 bps ($t = 2.29$), both statistically significant. With an average of 46 macroeconomic announcements per year, these spreads correspond to annualized returns of about 5.5% to 6.4%. The calibrated model closely matches these magnitudes, generating a spread of 12.5 bps, driven by lower expected returns for announcers (17.5 bps) relative to non-announcers (30.0 bps).

3.3 Cross-Sectional Repricing Premium

The second implication of the model concerns cross-sectional heterogeneity among recent earnings announcers. Firms whose earnings announcements are more informative about aggregate conditions exhibit higher earnings-announcement betas but lower macro-announcement betas and returns. In the model, the earnings-announcement beta is strictly decreasing in signal noise $\sigma^2_{E,i}$ (or increasing in the informativeness index α_i), making it a natural empirical proxy for earnings informativeness. Firms with high earnings-day betas therefore experience stronger repricing when macroeconomic news arrives, resulting in more negative macro-day betas and lower macro-announcement returns.

Measuring Informativeness on Announcement Days To empirically test this prediction, we require a measure of earnings-announcement informativeness. While the high-frequency beta on the announcement day is a natural candidate, observed betas in the data are contaminated by time-invariant risk exposures. For example, a firm may have a high beta on all days, unrelated to the information content of its earnings announcement. Since our model abstracts from heterogeneity in unconditional CAPM betas, we must strip out this persistent component to isolate the repricing channel.

We construct this measure by decomposing a firm's return on the earnings announcement day into two components: a baseline time-invariant CAPM exposure and an announcement-induced incremental component reflecting excess co-movement with the market. When an announcement conveys additional information about aggregate conditions, the firm's return co-moves more strongly with the market than implied by its unconditional beta. We interpret this excess co-movement as earnings-day excess beta, denoted by β^{EA}.

For each stock i, we use high-frequency intraday returns (25-minute intervals) from the 14 calendar days preceding the announcement and the announcement day itself to estimate the following regression:

$$r_{i,t,k} = \beta_i^{CAPM} r_{m,t,k} + \beta_i^{EA} (r_{m,t,k} \cdot \mathbf{1}_{EA}) + \phi_i \cdot \mathbf{1}_{EA} + \varepsilon_{i,t,k}, \tag{26}$$

where $r_{i,t,k}$ is the intraday log return of firm i in interval k of day t, $r_{m,t,k}$ is the corresponding market return, and $\mathbf{1}_{EA}$ is an indicator equal to one on the earnings announcement day and zero otherwise. In this specification, β_i^{CAPM} captures the firm's unconditional CAPM exposure, while β_i^{EA} captures the excess market exposure induced specifically by the earnings announcement.

To track the subsequent belief revision, we construct an analogous measure of macro-day excess beta, β_i^{MA}, by applying the same regression framework on each macroeconomic announcement day. According to our theory, a high β^{EA} (more informative earnings) is associated with a lower β^{MA} and lower expected returns on macro days (stronger repricing).[8]

Empirical Test We sort firms that announced earnings within the prior 30 days into five portfolios based on their estimated β_i^{EA}. We then form a long-short strategy that is long the least informative firms (low β^{EA}) and short the most informative firms (high β^{EA}). Under the repricing channel, this strategy should earn positive returns on macroeconomic announcement days.

Because the CAPM explains the cross-section of returns particularly well on macroeconomic announcement days (Savor and Wilson (2014)), firms with higher unconditional CAPM betas naturally earn higher returns on these days. To control for this exposure and isolate the specific impact of the repricing channel, we focus on CAPM-beta-neutral returns. For each stock, we remove the unconditional CAPM component by subtracting the product of the realized market return and the firm's estimated unconditional beta, β_i^{CAPM}. We then aggregate these beta-neutral returns within each portfolio using both equal and value weights. Portfolios are formed at the close of the trading day prior to the macroeconomic announcement and held for one day. On average, the strategy includes approximately 200 stocks per event.

Table 3 reports the results. Panel A documents a strong negative relationship between earnings informativeness and subsequent macro-announcement-day returns. Portfolio mean

[8] While early work (beginning with Ball and Brown (1968)) documents slow incorporation of earnings information into prices, more recent evidence Martineau (2022) shows that earnings news is incorporated rapidly in modern markets. Our mechanism is distinct: earnings news is quickly priced given available information, but its interpretation remains incomplete until subsequent macroeconomic announcements reveal the aggregate state. It is this delayed reinterpretation that generates repricing.

Table 3: Portfolio Performance Based on Earnings Informativeness

	P1	P2	P3	P4	P5	P1-P5
Panel A: CAPM β-neutral returns						
Data (EW)	15.95	3.32	2.31	-7.17	-10.94	**26.9**
	(2.30)	(0.63)	(0.48)	(-1.34)	(-1.53)	**(2.97)**
Data (VW)	16.51	7.66	-0.87	-0.54	-9.49	**25.9**
	(2.57)	(1.75)	(-0.18)	(-0.12)	(-1.41)	**(2.84)**
Model	10.00	6.50	0.00	-2.50	-11.00	21.0
Panel B: Excess Beta on EA and MA days						
$\mathbb{E}[\beta_i^E]$	-4.60	-1.27	0.06	1.40	4.74	
	(-30.1)	(-24.3)	(2.61)	(24.2)	(32.2)	
Model	-2.50	-1.10	0.00	1.20	2.40	
$\mathbb{E}[\beta_i^M]$	0.32	0.07	0.00	-0.17	-0.45	
	(8.16)	(2.26)	(-0.14)	(-4.88)	(5.19)	
Model	0.60	0.40	0.00	-0.39	-0.58	

This table reports the performance of trading strategies based on earnings announcement informativeness, evaluated on macroeconomic announcement (MA) days. Firms are sorted into five portfolios (P1-P5) at each earnings announcement (EA) date based on their β^{EA}, defined as the component of the firm's announcement-day beta in excess of its unconditional CAPM beta (estimated via Equation (26)). Daily β-neutral excess returns are obtained by subtracting the firm's unconditional CAPM component (the market return scaled by the estimated CAPM β) from its daily excess return. Panel A reports equal- and value-weighted β-neutral excess returns (in basis points) on macroeconomic announcement days for portfolios P1-P5 and the long-short (P1 minus P5) strategy in the data (with time-series t-statistics in parentheses), alongside the equal-weighted portfolio returns from the model simulation. Panel B reports the average β^{EA} and β^{MA} for each portfolio in both the data and the model. The sample covers the intersection of CRSP, I/B/E/S, TAQ, and Compustat from 1998–2023.

returns decline monotonically from P1 (least informative) to P5 (most informative) in both equal- and value-weighted specifications, indicating that firms with more informative earnings announcements exhibit a more negative repricing premium when macroeconomic news arrives. The long-short portfolio that buys low-β^{EA} firms and sells high-β^{EA} firms delivers economically and statistically significant positive returns of 27 bps (EW) and 26 bps (VW). Furthermore, Panel B confirms the underlying mechanism: β^{EA} is negatively related to β^{MA}. Firms whose earnings announcements are most informative about aggregate conditions experience the strongest revision in idiosyncratic beliefs, leading to significantly lower (more negative) betas and lower risk compensation on macroeconomic announcement days.

We replicate the same exercise in the simulated model. Consistent with the empirical procedure, firms are sorted into quintiles based on their earnings-announcement beta, and we compute beta-neutral macro-announcement-day returns. In the model, unconditional CAPM betas equal one, so beta-neutral returns are obtained by subtracting the market return. The model reproduces the steep monotone pattern observed in the data. In the data, the P1–P5 spread is 25.9 bps (P1: 16.51 bps; P5: −9.49 bps). The model generates a comparable spread of 21.0 bps (P1: 10.00 bps; P5: −11.00 bps). Moreover, the associated betas display the predicted reversal: on earnings announcement days, betas increase with earnings informativeness, whereas on macroeconomic announcement days they decrease monotonically. This confirms that the repricing channel drives the observed cross-sectional return spread.

3.4 Timing: Recent vs. Distant Announcers

The third implication of our model concerns the timing of the repricing effect. As shown in Proposition 3, earnings announcements released before macroeconomic news ("Recent Announcers," RA) should exhibit a repricing premium, whereas earnings announcements released after macroeconomic news ("Distant Announcers," DA) should not. When earnings precede the macro announcement, investors confound aggregate and firm-specific information, generating the negative covariance that drives the repricing channel. In contrast, when earnings are announced after the macro event, the aggregate state is already known; consequently, the signal extraction problem disappears, and the repricing premium is absent.

To test this prediction, we compare recent announcers with distant announcers on macro-announcement days, using the same sample construction as in Table 2. The recent-announcer portfolio consists of firms announcing earnings within three days before the macro event, while the distant-announcer portfolio consists of firms announcing within three days after the macro event. Because stock returns often exhibit systematic patterns around earnings announcements—such as pre- or post-announcement drift—independent of macroeconomic news, we adjust for these earnings lifecycle effects. Specifically, for each portfolio we subtract the average return earned by firms at the same relative earnings-announcement timing in periods without macroeconomic announcements. These benchmark returns are estimated using earnings announcements that do not coincide with macro events. The resulting excess returns therefore isolate the effect of the macroeconomic announcement itself and cleanly identify the repricing premium.

Table 4 displays the results. Recent announcers earn significantly lower returns than distant announcers on macro-announcement days. Recent announcers earn 22.6 bps (EW) and 16.9 bps (VW), while distant announcers earn higher returns of 35.0 bps (EW) and 37.9 bps (VW). The long-short portfolio that buys distant announcers and sells recent announcers (DA minus RA) gives a statistically significant spread of 12.4 bps (EW) and 21.0 bps (VW).

Table 4: Earnings Announcements Before and After Macroeconomic News

	EW (bps)	VW (bps)
Recent Announcers (RA)	22.61	16.86
	(2.03)	(1.60)
Distant Announcers (DA)	35.00	37.90
	(2.87)	(3.14)
DA – RA	**12.39**	**21.04**
	(2.25)	**(2.54)**

This table reports daily excess returns (in basis points) for portfolios formed on macroeconomic announcement days. Recent Announcers (RA) are firms with a scheduled earnings announcement within three days before the macroeconomic announcement. Distant Announcers (DA) are firms with a scheduled earnings announcement within three days after the macroeconomic announcement (and no announcement in the prior 30 days). Returns are adjusted for lifecycle effects by subtracting the average return earned by firms at the same relative earnings timing on non-macro days. Equal-weighted (EW) and value-weighted (VW) returns are computed daily, and the table reports time-series means with t-statistics in parentheses. The sample includes 181 macroeconomic announcement days with at least 50 firms in both portfolios, drawn from the intersection of CRSP, I/B/E/S, TAQ, and Compustat over 1998–2023.

Note that the returns earned by distant announcers are very similar to those of the non-announcer portfolio reported in Table 2, consistent with the model's predictions. In both cases, firms earn the standard macro-announcement risk premium, while recent announcers underperform due to the repricing effect.

In Appendix B.2.2, we present robustness tests showing that the repricing effect decays as earnings news becomes increasingly stale. We find that the negative relationship between earnings-day informativeness and subsequent macro-announcement-day betas is strongest for firms that announced earnings within the past week and attenuates significantly for more distant announcements (one week to one month prior).

3.5 The Belief Revision Channel

Finally, the model provides a precise structural prediction for how investors revise beliefs about firm-specific fundamentals on macroeconomic announcement days. Equation (12) establishes that for firms with recent earnings announcements, the update to idiosyncratic beliefs at the macroeconomic announcement satisfies:

$$\hat{g}_{i,T} - \hat{g}_{i,T^-} = -\alpha_i(\theta_T - \hat{\theta}_{T^-}), \tag{27}$$

where $\alpha_i > 0$ for recent announcers due to the repricing mechanism, and $\alpha_i = 0$ for non-announcers.

The key implication is a negative relationship between revisions in firm-specific beliefs and aggregate shocks: a positive macroeconomic surprise ($\theta_T > \hat{\theta}^+(\tau)$) triggers a downward revision in firm-specific cash flow expectations, while a negative macroeconomic surprise triggers an upward revision. Intuitively, when macroeconomic data are stronger than expected, investors learn that part of the firm's earlier earnings strength was driven by favorable aggregate conditions rather than idiosyncratic fundamentals. As a result, firm-specific cash flow expectations are revised downward. This belief-revision mechanism is the core driver of the repricing channel.

We test this prediction using analyst EPS forecast revisions around macroeconomic announcement days. A direct test of Equation (12) is challenging because forecast revisions typically reflect both aggregate and firm-specific updates. In particular, a positive macroeconomic surprise generally raises expected cash flows for all firms (a positive "fundamental comovement" effect). To isolate the repricing channel, we implement a two-stage decomposition that uses non-announcers as a control group. Because the repricing channel is absent for these firms ($\alpha_i = 0$), their forecast revisions reflect only the baseline sensitivity of firm fundamentals to macroeconomic news.

In the first stage, we estimate the baseline response of analyst beliefs to macroeconomic surprises using the sample of non-announcers:

$$\text{Rev}_{i,t} = \alpha_k + \phi_k \beta_i^{\text{CAPM}} + \psi_k(\text{Surprise}_t \cdot \beta_i^{\text{CAPM}}) + \theta_k \text{Surprise}_t + \varepsilon_{i,t} \tag{28}$$

where $\text{Rev}_{i,t}$ denotes the analyst forecast revision for firm i, Surprise_t is the standardized macroeconomic surprise, and β_i^{CAPM} captures the firm's systematic risk exposure. We allow the coefficients to vary by announcement type k to account for heterogeneity in macro signal transmission. In the second stage, we compute *excess belief revisions* for recent announcers as the difference between the actual forecast revision and the benchmark predicted by the first-stage regression. This procedure removes the positive fundamental comovement component and isolates the belief revision induced by the repricing channel.

Table 5 reports regressions of excess belief revisions on macroeconomic surprises. Consistent with the model's prediction, we find a negative and statistically significant relationship for recent announcers: positive macroeconomic surprises lead to downward revisions in firm-specific growth expectations, and vice versa. Economically, a one-standard-deviation positive macroeconomic surprise induces a decline in expected firm-specific growth of 0.24 percentage points.

As a validation exercise, we conduct a placebo test using the non-announcer sample. Since

Table 5: Analysts' Forecast Revisions

	EA firms	Non-EA firms (placebo)
Macro surprise	-0.235	-0.029
	(-1.92)	(-0.63)
N	2,136	49,422
R^2	0.455	0.277
Constant	✓	✓
Firm fixed effects	✓	✓

This table reports estimates of the belief-revision channel. The dependent variable is the excess analyst forecast revision for individual firm EPS. We construct this measure using a two-stage approach. First, we estimate a benchmark relation between macroeconomic surprises and firm-level revisions using firms without recent earnings announcements (non-announcers): $\text{Rev}_{i,t} = \alpha_k + \phi_k \beta_i^{\text{CAPM}} + \psi_k(\text{Surprise}_t \cdot \beta_i^{\text{CAPM}}) + \theta_k \text{Surprise}_t + \varepsilon_{i,t}$, where Surprise_t denotes the standardized macroeconomic surprise and β_i^{CAPM} is the firm's unconditional CAPM beta. Coefficients are estimated separately by macroeconomic announcement type k. Second, excess belief revisions are defined as deviations from this benchmark. Macroeconomic surprises are standardized consensus forecast errors for CPI, GDP, and unemployment, and monetary policy shocks for FOMC announcements (Bauer and Swanson (2023)). We exclude extreme outliers for GDP and unemployment in June and September 2020. Regressions include firm fixed effects with standard errors two-way clustered by firm and macroeconomic announcement date. t-statistics are reported in parentheses.

these firms define the benchmark, their excess revisions should be orthogonal to macroeconomic surprises. Consistent with this implication, the estimated coefficient is small and statistically insignificant. This confirms that the negative relation documented for recent announcers is not mechanical, but instead reflects the belief-revision mechanism highlighted by the model.

In Appendix B.2.3, we provide additional evidence on analyst forecast revisions around macroeconomic announcement days. Analyst revision activity spikes on macro days, with the probability of a forecast update rising by about 1.5 percentage points even after controlling for earnings timing. Consistent with the repricing mechanism, this effect is strongest for firms with very recent earnings announcements and attenuates as earnings information becomes more distant.

4 Conclusion

In this paper, we identify and quantify a repricing channel of macroeconomic announcements. We demonstrate that aggregate news significantly reprices previously released firm-level earnings, generating substantial cross-sectional heterogeneity in risk premia. We formalize this mechanism in a dynamic general equilibrium model in which investors learn from both earnings and macroeconomic announcements. Our empirical analysis strongly supports the model's predictions: firms with recent earnings announcements earn significantly lower returns on macroeconomic announcement days than firms whose earnings information is stale. Accordingly, a strategy that goes long non-announcers and short announcers generates significantly positive returns on macroeconomic announcement days. Furthermore, using high-frequency earnings-day betas to proxy for earnings informativeness, we find that firms with the most informative earnings experience the strongest repricing. A long-short portfolio formed on these earnings-day betas earns about 27 basis points per macroeconomic announcement day, confirming the quantitative significance of the repricing channel.

References

Ai, Hengjie, 2010, Information Quality and Long-Run Risk: Asset Pricing Implications, *Journal of Finance* 65, 1333–1367.

Ai, Hengjie, and Ravi Bansal, 2018, Risk Preferences and the Macroeconomic Announcement Premium, *Econometrica* 86, 1383–1430.

Ai, Hengjie, Leyla Jianyu Han, Xuhui Nick Pan, and Lai Xu, 2022, The cross section of the monetary policy announcement premium, *Journal of Financial Economics* 143, 247–276.

Ai, Hengjie, Leyla Jianyu Han, and Lai Xu, 2022, Information-driven volatility, *Available at SSRN 3961096*.

Ball, Ray, and Philip Brown, 1968, An Empirical Evaluation of Accounting Income Numbers, *Journal of Accounting Research* 6, 159–178.

Ball, Ray, and S P Kothari, 1991, Security returns around earnings announcements, *The Accounting Review* 66, 718–738.

Bansal, Ravi, and Amir Yaron, 2004, Risks for the long run: A potential resolution of asset pricing puzzles, *The journal of Finance* 59, 1481–1509.

Barber, Brad M., Emmanuel T. De George, Reuven Lehavy, and Brett Trueman, 2013, The Earnings Announcement Premium Around the Globe, *Journal of Financial Economics* 108, 118–138.

Bauer, Michael D, and Eric T Swanson, 2023, A reassessment of monetary policy surprises and high-frequency identification, *NBER Macroeconomics Annual* 37, 87–155.

Ben-Rephael, Azi, Bruce I Carlin, Zhi Da, and Ryan D Israelsen, 2021, Information consumption and asset pricing, *The Journal of Finance* 76, 357–394.

Boguth, Oliver, Adlai J Fisher, Vincent Grégoire, and Charles Martineau, 2023, Noisy FOMC Returns? Information, Price Pressure, and Post-Announcement Reversals, *SSRN Working Paper* Available at SSRN 4131740.

Bollerslev, Tim, Tzuo Hann Law, and George Tauchen, 2008, Risk, jumps, and diversification, *Journal of Econometrics* 144, 234–256.

Bonsall, Samuel B, Zahn Bozanic, and Paul E Fischer, 2013, What Do Management Earnings Forecasts Convey About the Macroeconomy?, *Journal of Accounting Research* 51, 225–266.

Chari, V V, Ravi Jagannathan, and Aharon R Ofer, 1988, Seasonalities in security returns: The case of earnings announcements, *Journal of Financial Economics* 21, 101–121.

Chava, Sudheer, and Alex Hsu, 2020, Financial constraints, monetary policy shocks, and the cross-section of equity returns, *The Review of Financial Studies* 33, 4367–4402.

Cieslak, Anna, Adair Morse, and Annette Vissing-Jorgensen, 2019, Stock returns over the FOMC cycle, *The Journal of Finance* 74, 2201–2248.

Cohen, Daniel A, Aiyesha Dey, Thomas Lys, and Shyam Sunder, 2007, Earnings Announcement Premia and the Limits to Arbitrage, *Journal of Accounting and Economics* 43, 153–180.

DellaVigna, Stefano, and Joshua M Pollet, 2009, Investor inattention and Friday earnings announcements, *The Journal of Finance* 64, 709–749.

Drake, Michael S., Darren T. Roulstone, and Jacob R. Thornock, 2012, Investor Information Demand: Evidence from Google Searches Around Earnings Announcements, *Journal of Accounting Research* 50, 1001–1040.

Duffie, Darrell, and Larry G. Epstein, 1992, Asset Pricing with Stochastic Differential Utility, *Review of Financial Studies* 5, 411–436.

Ferracuti, Elia, and Gary Lind, 2025, Macroeconomic Information Acquisition Around Earnings Clusters, *Journal of Accounting Research* 63, Forthcoming.

Fisher, Adlai, Charles Martineau, and Jinfei Sheng, 2022, Macroeconomic Attention and Announcement Risk Premia, *Review of Financial Studies* 35, 5057–5093.

Frazzini, Andrea, and Owen A Lamont, 2007, The earnings announcement premium and trading volume, *NBER working paper*.

Gao, Chao, Grace Xing Hu, and Xiaoyan Zhang, 2025, Uncertainty Risk Resolution Before Earnings Announcements, *Management Science* Forthcoming.

Hasler, Michael, and Charles Martineau, 2024, Equity return predictability with the ICAPM, *The Review of Asset Pricing Studies* 14, 481–512.

Hirshleifer, David, and Jinfei Sheng, 2021, Macro news and micro news: Complements or substitutes?, *Journal of Financial Economics* 142, 1160–1187.

Holden, Craig W, and Stacey Jacobsen, 2014, Liquidity measurement problems in fast, competitive markets: Expensive and cheap solutions, *The Journal of Finance* 69, 1747–1785.

Hu, Grace Xing, Jun Pan, Jiang Wang, and Haoxiang Zhu, 2022, Premium for heightened uncertainty: Explaining pre-announcement market returns, *Journal of Financial Economics* 145, 909–936.

Liptser, Robert S, and Albert N Shiryaev, 2001, *Statistics of Random Processes I: General Theory* vol. 6. (Springer Berlin) 2nd edn.

Lucca, David O, and Emanuel Moench, 2015, The pre-FOMC announcement drift, *The Journal of Finance* 70, 329–371.

Martineau, Charles, 2022, Rest in Peace Post-Earnings Announcement Drift, *Critical Finance Review* 11, 613–646.

Mueller, Philippe, Alireza Tahbaz-Salehi, and Andrea Vedolin, 2017, Exchange rates and monetary policy uncertainty, *The Journal of Finance* 72, 1213–1252.

Ozdagli, Ali, and Mihail Velikov, 2020, Show me the money: The monetary policy risk premium, *Journal of Financial Economics* 135, 320–339.

Ozdagli, Ali K, 2018, Financial frictions and the stock price reaction to monetary policy, *The Review of Financial Studies* 31, 3895–3936.

Patton, Andrew J, and Michela Verardo, 2012, Does beta move with news? Firm-specific information flows and learning about profitability, *The Review of Financial Studies* 25, 2789–2839.

Savor, Pavel, and Mungo Wilson, 2013, How much do investors care about macroeconomic risk? Evidence from scheduled economic announcements, *Journal of Financial and Quantitative Analysis* 48, 343–375.

Savor, Pavel, and Mungo Wilson, 2014, Asset pricing: A tale of two days, *Journal of Financial Economics* 113, 171–201.

Savor, Pavel, and Mungo Wilson, 2016, Earnings announcements and systematic risk, *The Journal of Finance* 71, 83–138.

Todorov, Viktor, and Tim Bollerslev, 2010, Jumps and betas: A new framework for disentangling and estimating systematic risks, *Journal of Econometrics* 157, 220–235.

Wachter, Jessica A, and Yicheng Zhu, 2022, A model of two days: Discrete news and asset prices, *The Review of Financial Studies* 35, 2246–2307.

Appendix A: Model Solutions

A.1 Investors' Learning Problems

Learning between announcements This section summarizes how investors update their beliefs about the common (aggregate) cash flow component θ_t and the firm-specific components $\{g_{i,t}\}_{i=1}^{N}$. The learning problem is solved using a standard Kalman-Bucy filter. Applying Theorem 10.3 in Liptser and Shiryaev (2001), we characterize the resulting belief dynamics in the following lemma.

Lemma 1. *In the interior between announcements, $t \in (0, \tau)$, investors update their beliefs based on observed consumption and dividend processes using a standard Kalman-Bucy filter. The posterior means evolve according to*

$$d\hat{\theta}_t = a\left(\bar{\theta} - \hat{\theta}_t\right)dt + \frac{q_{\theta\theta}(t)}{\sigma_C} d\hat{B}_{C,t}, \tag{A.1}$$

$$d\hat{g}_{i,t} = b\left(\bar{g} - \hat{g}_{i,t}\right)dt + \frac{q_{ii}(t)}{\sigma_D} d\hat{B}_{D_i,t}, \tag{A.2}$$

where $d\hat{B}_{C,t} = \frac{1}{\sigma_C}\left(\frac{dC_t}{C_t} - \hat{\theta}_t dt\right)$ and $d\hat{B}_{D_i,t} = \frac{1}{\sigma_D}\left(\frac{d\delta_t^i}{\delta_t^i} - \hat{g}_{i,t} dt\right)$ are innovations in the consumption growth rate and the dividend-consumption ratio. The posterior variances satisfy the Riccati equations:

$$dq_{\theta\theta}(t) = \left[\sigma_\theta^2 - 2a q_{\theta\theta}(t) - \frac{q_{\theta\theta}^2(t)}{\sigma_C^2}\right]dt, \tag{A.3}$$

$$dq_{ii}(t) = \left[\sigma_g^2 - 2b q_{ii}(t) - \frac{q_{ii}^2(t)}{\sigma_D^2}\right]dt. \tag{A.4}$$

Note that in general, absent fully revealing MA, belief dynamics involve time-varying covariances. For exposition, consider first the one-firm case. The posterior means and variances satisfy

$$d\hat{\theta}_t = a\left(\bar{\theta} - \hat{\theta}_t\right)dt + \frac{q_{\theta\theta}(t)}{\sigma_C} d\hat{B}_{C,t} + \frac{q_{\theta g}(t)}{\sigma_D} d\hat{B}_{D,t},$$

$$d\hat{g}_t = b\left(\bar{g} - \hat{g}_t\right)dt + \frac{q_{\theta g}(t)}{\sigma_C} d\hat{B}_{C,t} + \frac{q_{gg}(t)}{\sigma_D} d\hat{B}_{D,t},$$

$$dq_{\theta\theta}(t) = \left[\sigma_\theta^2 - 2aq_{\theta\theta}(t) - \left(\frac{q_{\theta\theta}^2(t)}{\sigma_C^2} + \frac{q_{\theta g}^2(t)}{\sigma_D^2}\right)\right] dt, \quad (A.5)$$

$$dq_{\theta g}(t) = -\left[(a+b)\, q_{\theta g}(t) + q_{\theta g}(t)\left(\frac{q_{\theta\theta}(t)}{\sigma_C^2} + \frac{q_{gg}(t)}{\sigma_D^2}\right)\right] dt, \quad (A.6)$$

$$dq_{gg}(t) = \left[\sigma_g^2 - 2bq_{gg}(t) - \left(\frac{q_{\theta g}^2(t)}{\sigma_C^2} + \frac{q_{gg}^2(t)}{\sigma_D^2}\right)\right] dt. \quad (A.7)$$

Under the assumption that the macroeconomic announcement is fully revealing, immediately after the announcement we have $q_{\theta\theta}(T) = 0$ and $q_{\theta g}(T) = 0$. Since the cross-covariance starts from zero right after the macro, its law of motion keeps it at zero between that macro and the next earnings announcement; i.e. for $t \in [0, \tau)$, we have $q_{\theta g}(t) = 0$ (from Equation (A.6)). Plugging $q_{\theta g}(t) = 0$ into the system above collapses it to the simpler dynamics reported in Equations (A.1) to (A.4): investors learn separately about the aggregate component and about each firm's idiosyncratic component. Thus the only time we get "mixing" between θ and g_i is at the earnings announcement, because the signals load on both.

Earnings and macroeconomic announcement as discrete Gaussian updates The following lemma characterizes the updates to posterior moments induced by the earnings announcement.

Lemma 2. *After the earnings announcement at time τ, the posterior mean updates for θ and g_i are*

$$\hat{\theta}^+(\tau) = \hat{\theta}^-(\tau) + \frac{q_{\theta\theta}^-(\tau)}{1 + q_{\theta\theta}^-(\tau)s_\Sigma} \sum_{i=1}^{N} v_i z_i, \quad (A.8)$$

$$\hat{g}_i^+(\tau) = \hat{g}_i^-(\tau) + \alpha_i z_i - \alpha_i \left(\hat{\theta}^+(\tau) - \hat{\theta}^-(\tau)\right), \quad (A.9)$$

where $s_\Sigma \equiv \sum_{i=1}^N v_i$, $v_i \equiv [\, q_{ii}^-(\tau) + \sigma_{E,i}^2(\tau)\,]^{-1}$, and $z_i \equiv s_{E,i,\tau} - (\hat{\theta}_\tau^- + \hat{g}_{i,\tau}^-)$.

The posterior variance for the common factor θ, the posterior variance for idiosyncratic g_i, the cross-firm covariances, and the common-idiosyncratic covariances of g_i with θ are

$$q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)}{1 + q_{\theta\theta}^-(\tau)s_\Sigma}, \quad (A.10)$$

$$q_{ii}^+(\tau) = q_{ii}^-(\tau)(1-\alpha_i) + \alpha_i^2 q_{\theta\theta}^+(\tau), \quad (A.11)$$

$$q_{ij}^+(\tau) = \alpha_i \alpha_j q_{\theta\theta}^+(\tau), \quad (A.12)$$

$$q_{\theta g_i}^+(\tau) = -\alpha_i q_{\theta\theta}^+(\tau). \quad (A.13)$$

At the macroeconomic announcement T (immediately after earnings, so $T^- = \tau^+$), $\hat{\theta}^+(T) = \theta_T$, the firm's belief revision follows

$$\hat{g}_i^+(T) - \hat{g}_i^+(\tau) = \alpha_i \left(\theta_T - \hat{\theta}^+(\tau) \right), \tag{A.14}$$

and the posterior variances satisfy

$$q_{\theta\theta}^+(T) = 0, \quad q_{ii}^+(T) = q_{ii}^-(\tau)(1 - \alpha_i) = \frac{q_{ii}^-(\tau)\sigma_{E,i}^2(\tau)}{q_{ii}^-(\tau) + \sigma_{E,i}^2(\tau)}, \tag{A.15}$$

and the covariances are $q_{\theta g_i}^+(T) = 0$, $q_{ij}^+(T) = 0$ for $i \neq j$.

Proof. At the earnings announcement time τ, investors observe for each firm i a noisy signal about θ_τ and $g_{i,\tau}$. Stack the latent state before the EA as

$$x = \begin{bmatrix} \theta_\tau \\ g_{1,\tau} \\ \vdots \\ g_{N,\tau} \end{bmatrix}, \qquad \mu_x^- = \begin{bmatrix} \hat{\theta}_\tau^- \\ \hat{g}_{1,\tau}^- \\ \vdots \\ \hat{g}_{N,\tau}^- \end{bmatrix}, \qquad \Sigma_{xx}^- = \begin{bmatrix} q_{\theta\theta}^-(\tau) & 0 & \cdots & 0 \\ 0 & q_{11}^-(\tau) & & 0 \\ \vdots & & \ddots & \vdots \\ 0 & 0 & \cdots & q_{NN}^-(\tau) \end{bmatrix}.$$

Stack the N EA signals as

$$y = \begin{bmatrix} s_{E,1} \\ \vdots \\ s_{E,N} \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & 1 & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & 0 & 0 & \cdots & 1 \end{bmatrix}}_{=:W} x + \epsilon, \quad \epsilon \sim \mathcal{N}\big(0, \Sigma_E\big),$$

with $\Sigma_E = \mathrm{diag}(\sigma_{E,1}^2, \ldots, \sigma_{E,N}^2)$. Equivalently, W says: "the i-th signal loads on θ and on g_i, but not on any other firm's g_j." Because (x, y) is jointly Gaussian, the posterior distribution of x conditional on y is again Gaussian. To apply the Gaussian conditioning formula, first form the two covariance blocks

$$\Sigma_{xy}^- = \Sigma_{xx}^- W^\top, \quad \Sigma_{yy}^- = W \Sigma_{xx}^- W^\top + \Sigma_E.$$

Given our diagonal Σ_{xx}^-, these take the explicit form

$$\Sigma_{xy}^- = \begin{bmatrix} q_{\theta\theta}^- & \cdots & q_{\theta\theta}^- \\ q_{11}^- & & 0 \\ \vdots & \ddots & \vdots \\ 0 & & q_{NN}^- \end{bmatrix}, \quad \Sigma_{yy}^- = q_{\theta\theta}^- \mathbf{1}\mathbf{1}^\top + \operatorname{diag}(d_1, \ldots, d_N),$$

where $d_i := q_{ii}^- + \sigma_{E,i}^2$. The matrix Σ_{xy}^- captures how the latent state co-moves with the EA signals, and Σ_{yy}^- is the covariance matrix of the EA signals themselves (the part coming from the latent state plus the EA noise).

Then the posterior mean and covariance are

$$\mu_x^+ = \mu_x^- + K(y - W\mu_x^-), \qquad \Sigma_{xx}^+ = \Sigma_{xx}^- - KW\Sigma_{xx}^-,$$

where the Kalman gain is

$$K := \Sigma_{xy}^- (\Sigma_{yy}^-)^{-1}. \tag{A.16}$$

The term $z := y - W\mu_x^-$ is the vector of EA surprises, i.e.,

$$z_i = s_{E,i} - (\hat{\theta}_\tau^- + \hat{g}_{i,\tau}^-). \tag{A.17}$$

That is, the actual signals minus their model-implied means. The Kalman gain tells us how strongly each surprise should move each component of the state. Now we only need to invert Σ_{yy}^-. This matrix has the special form of "diagonal part + rank-one part":

$$\Sigma_{yy}^- = \underbrace{\operatorname{diag}(d_1, \ldots, d_N)}_{=:A} + \underbrace{q_{\theta\theta}^- \mathbf{1}\mathbf{1}^\top}_{\text{rank one}},$$

so we can apply the Sherman-Morrison formula to compute the inverse therefore the Kalman gain.

Theorem. *(The Sherman-Morrison formula) If A is an invertible $n \times n$ matrix and u, v are $n \times 1$ column vectors, then*

$$(A + uv^\top)^{-1} = A^{-1} - \frac{A^{-1}uv^\top A^{-1}}{1 + v^\top A^{-1}u}, \tag{A.18}$$

provided that $1 + v^\top A^{-1}u \neq 0$.

Let

$$v_i := \frac{1}{d_i}, \qquad s_\Sigma := \sum_{i=1}^{N} v_i, \qquad V := \mathrm{diag}(v_1, \ldots, v_N).$$

Apply the Theorem, $A = \mathrm{diag}(d_1, \ldots, d_N)$, $u = \sqrt{q_{\theta\theta}^-}\mathbf{1}$, $v^\top = \sqrt{q_{\theta\theta}^-}\mathbf{1}^\top$. Therefore, $A^{-1} = V = \mathrm{diag}(v_1, \ldots, v_N)$.

$$v^\top A^{-1} u = \left(\sqrt{q_{\theta\theta}^-}\mathbf{1}^\top\right) V \left(\sqrt{q_{\theta\theta}^-}\mathbf{1}\right) = q_{\theta\theta}^- \mathbf{1}^\top V \mathbf{1} = q_{\theta\theta}^- \Sigma_{i=1}^{N} v_i = q_{\theta\theta}^- s_\Sigma,$$

and

$$A^{-1} u v^\top A^{-1} = V \left(\sqrt{q_{\theta\theta}^-}\mathbf{1}\right) \left(\sqrt{q_{\theta\theta}^-}\mathbf{1}^\top\right) V = q_{\theta\theta}^- V \mathbf{1}\mathbf{1}^\top V.$$

Finally,

$$\left(\Sigma_{yy}^-\right)^{-1} = V - \frac{q_{\theta\theta}^- V \mathbf{1}\mathbf{1}^\top V}{1 + q_{\theta\theta}^- s_\Sigma}.$$

Substituting this back into (A.16), and multiplying out (row by row) gives the following elementwise Kalman gain, which is what we actually use:

$$\left(\Sigma_{yy}^-\right)^{-1}_{ij} = \underbrace{v_i \, \mathbf{1}\{i = j\}}_{\mathrm{diag}(v)} - \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} \, v_i v_j.$$

where the diagonal: $\left(\Sigma_{yy}^-\right)^{-1}_{ii} = v_i - \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} v_i^2$, and the off-diagonal: $\left(\Sigma_{yy}^-\right)^{-1}_{ij} = -\frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} \, v_i v_j$ for $i \neq j$.

Therefore, the Kalman gain is

$$K = \Sigma_{xy}^- \left(V - \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} V \mathbf{1}\mathbf{1}^\top V\right)$$

Final the Kalman gain can be summarized as

$$K_{1i} = \frac{q_{\theta\theta}^- v_i}{1 + q_{\theta\theta}^- s_\Sigma}, \qquad K_{i+1,j} = \begin{cases} q_{ii}^- v_i - \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} q_{ii}^- v_i v_j, & j = i \\ -\frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} q_{ii}^- v_i v_j, & j \neq i \end{cases}, \tag{A.19}$$

where K_{1i} is the common component (1-st row), and $K_{i+1,j}$ is firm i's idiosyncratic component ($(i+1)$-th row).

EA posterior means

For the common component, the update is

$$\Delta\hat{\theta}(\tau) = \hat{\theta}_\tau^+ - \hat{\theta}_\tau^- = \sum_{i=1}^{N} K_{1i} z_i = \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} \sum_{i=1}^{N} v_i z_i. \tag{A.20}$$

This says: pool all EA surprises across firms, weight them by their signal precisions v_i, and scale by the prior uncertainty about θ.

For each idiosyncratic component g_i, start from the general expression

$$\Delta\hat{g}_i(\tau) = \hat{g}_{i,\tau}^+ - \hat{g}_{i,\tau}^- \quad = \quad \sum_{j=1}^{N} K_{i+1,j} z_j = q_{ii}^- v_i z_i - \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} q_{ii}^- v_i \sum_{j=1}^{N} v_j z_j.$$

Factor out $q_{ii}^- v_i$ and define the EA precision loadings

$$\alpha_i := q_{ii}^- v_i = \frac{q_{ii}^-}{q_{ii}^- + \sigma_{E,i}^2} \in [0, 1], \tag{A.21}$$

we get the compact form

$$\Delta\hat{g}_i(\tau) = \alpha_i z_i - \alpha_i \frac{q_{\theta\theta}^-}{1 + q_{\theta\theta}^- s_\Sigma} \sum_{j=1}^{N} v_j z_j = \alpha_i z_i - \alpha_i \Delta\hat{\theta}(\tau). \tag{A.22}$$

The first term $\alpha_i z_i$ is exactly the usual "precision-weighted own surprise" if firm i's EA only convey information about g_i. The second term subtracts the part of that surprise that the joint set of EAs says is actually a surprise about the common component θ. The economic intuition is: The more precise firm i's signal is (the bigger α_i), the more heavily its signal was used to pin down θ, and therefore the more we have to remove from the idiosyncratic part. That is why the same common update $\Delta\hat{\theta}(\tau)$ is scaled by α_i when we clean up firm i's estimate. Equivalently, each $\Delta\hat{g}_i$ = (own precision-weighted surprise) − (the piece reattributed to the common θ), where the reattribution weight is $\frac{q_{\theta\theta}^-}{1+q_{\theta\theta}^- s_\Sigma}$.

EA posterior covariance

The posterior covariance is updated by

$$\Sigma_{xx}^+ = \Sigma_{xx}^- - \Sigma_{xy}^- (\Sigma_{yy}^-)^{-1} (\Sigma_{xy}^-)^\top,$$

and, using the inverse derived above, each block takes a simple form.

Common-factor posterior variance:

$$q_{\theta\theta}^{+}(\tau) = q_{\theta\theta}^{-} - \frac{(q_{\theta\theta}^{-})^{2} s_{\Sigma}}{1 + q_{\theta\theta}^{-} s_{\Sigma}} = \frac{q_{\theta\theta}^{-}}{1 + q_{\theta\theta}^{-} s_{\Sigma}}. \tag{A.23}$$

Cross-firm covariances (for $i \neq j$):

$$q_{ij}^{+}(\tau) = \frac{q_{\theta\theta}^{-}}{1 + q_{\theta\theta}^{-} s_{\Sigma}} q_{ii}^{-} q_{jj}^{-} v_i v_j = \alpha_i \alpha_j q_{\theta\theta}^{+} > 0. \tag{A.24}$$

After the earnings announcement, firms' idiosyncratic components become positively correlated because residual uncertainty about the aggregate component θ induces comovement across firms. This remaining aggregate uncertainty, of magnitude $q_{\theta\theta}^{+}$, loads onto firm-level beliefs in proportion to $\alpha_i \alpha_j$, implying positive cross-firm covariance $q_{ij}^{+} > 0$.

Idiosyncratic variances:

$$q_{ii}^{+}(\tau) = q_{ii}^{-} - (q_{ii}^{-})^{2} \left(v_i - \frac{q_{\theta\theta}^{-}}{1 + q_{\theta\theta}^{-} s_{\Sigma}} v_i^{2} \right) = q_{ii}^{-}(1 - \alpha_i) + \alpha_i^{2} q_{\theta\theta}^{+}. \tag{A.25}$$

This equation shows that each firm's idiosyncratic variance falls by $(1 - \alpha_i)$ because part of g_i is learned from its own EA, with a small add-back $\alpha_i^2 q_{\theta\theta}^{+}$ since the EA mixes common and firm-specific news, letting residual uncertainty about θ "leak" into g_i. In limiting cases, if all EAs are very precise or numerous firms announce earnings, $q_{\theta\theta}^{+} \to 0$; if a firm's EA is uninformative ($\alpha_i \to 0$), then $q_{ii}^{+} \approx q_{ii}^{-}$ and the EA barely changes beliefs about that firm.

Common-idiosyncratic covariances:

$$q_{\theta g_i}^{+}(\tau) = -\frac{q_{\theta\theta}^{-}}{1 + q_{\theta\theta}^{-} s_{\Sigma}} q_{ii}^{-} v_i = -\alpha_i q_{\theta\theta}^{+} < 0, \tag{A.26}$$

Thus, after the EA, each firm's idiosyncratic component is negatively correlated with the common component.

Collecting these entries, the posterior covariance matrix takes the compact form:

$$\Sigma_{xx}^{+} = \begin{bmatrix} q_{\theta\theta}^{+} & -\alpha_1 q_{\theta\theta}^{+} & \cdots & -\alpha_N q_{\theta\theta}^{+} \\ -\alpha_1 q_{\theta\theta}^{+} & q_{11}^{-}(1 - \alpha_1) + \alpha_1^{2} q_{\theta\theta}^{+} & \cdots & \alpha_1 \alpha_N q_{\theta\theta}^{+} \\ \vdots & \vdots & \ddots & \vdots \\ -\alpha_N q_{\theta\theta}^{+} & \alpha_N \alpha_1 q_{\theta\theta}^{+} & \cdots & q_{NN}^{-}(1 - \alpha_N) + \alpha_N^{2} q_{\theta\theta}^{+} \end{bmatrix}.$$

Immediate macro (fully revealing) right after the EAs

Let $T^- = \tau^+$, and suppose the macro announcement at T reveals θ_T through

$$s_M = \theta_T + \varepsilon_M, \qquad \varepsilon_M \sim \mathcal{N}(0, \sigma_M^2),$$

and we take the fully revealing case $\sigma_M^2 \to 0$. The following lemma summarizes the posterior beliefs.

For a finite σ_M^2, the usual Gaussian update gives

$$\hat{\theta}_T^+ = \hat{\theta}_\tau^+ + \frac{q_{\theta\theta}^+(\tau)}{q_{\theta\theta}^+(\tau) + \sigma_M^2}\big(s_M - \hat{\theta}_\tau^+\big), \qquad \hat{g}_i^+(T) = \hat{g}_i^+(\tau) + \frac{q_{\theta g_i}^+(\tau)}{q_{\theta\theta}^+(\tau) + \sigma_M^2}\big(s_M - \hat{\theta}_\tau^+\big). \quad \text{(A.27)}$$

Letting $\sigma_M^2 \to 0$ and using $q_{\theta g_i}^+(\tau) = -\alpha_i q_{\theta\theta}^+(\tau)$, we obtain

$$\hat{\theta}_T^+ = \theta_T, \qquad \hat{g}_i^+(T) = \hat{g}_i^+(\tau) - \alpha_i\big(\theta_T - \hat{\theta}_\tau^+\big). \quad \text{(A.28)}$$

So any remaining surprise about θ after the EAs, $\theta_T - \hat{\theta}_\tau^+$, is stripped out of firm i's idiosyncratic component in proportion to its EA loading α_i.

A fully revealing macro sets the common uncertainty to zero and removes all comovement generated by θ:

$$q_{\theta\theta}^+(T) = 0, \quad q_{\theta g_i}^+(T) = 0, \quad q_{ij}^+(T) = 0 \ (i \neq j).$$

For the idiosyncratic variances, apply the standard Gaussian projection step to the g-block:

$$\Sigma_{gg}(T) = \Sigma_{gg}(\tau) - \Sigma_{g\theta}(\tau)\big(q_{\theta\theta}^+(\tau)\big)^{-1}\Sigma_{\theta g}(\tau).$$

Elementwise, this gives, for $i \neq j$,

$$q_{ij}^+(T) = q_{ij}^+(\tau) - \frac{q_{\theta g_i}^+(\tau)\, q_{\theta g_j}^+(\tau)}{q_{\theta\theta}^+(\tau)} = \alpha_i\alpha_j q_{\theta\theta}^+(\tau) - \frac{\big(-\alpha_i q_{\theta\theta}^+\big)\big(-\alpha_j q_{\theta\theta}^+\big)}{q_{\theta\theta}^+} = 0,$$

and, for the diagonals,

$$q_{ii}^+(T) = q_{ii}^+(\tau) - \frac{\big(q_{\theta g_i}^+(\tau)\big)^2}{q_{\theta\theta}^+(\tau)} = q_{ii}^-(\tau)(1-\alpha_i) = \frac{q_{ii}^-(\tau)\sigma_{E,i}^2}{q_{ii}^-(\tau) + \sigma_{E,i}^2}.$$

Thus, immediately after the macro, all EA-induced comovement vanishes, and each firm is left only with its own EA residual variance. $\square$

Proof of Proposition 1 We have just shown that, after the earnings announcement τ, the conditional common–idiosyncratic covariance is negative,

$$Cov\left(\theta_\tau, g_{i,\tau} \middle| s_{i,E}(\tau)\right) \equiv q^{+}_{\theta g_i}(\tau) = -\alpha_i q^{+}_{\theta\theta}(\tau) \leq 0. \tag{A.29}$$

By the law of total covariance, the conditional covariance and the covariance of conditional expectations must sum to the unconditional covariance $q^{-}_{\theta g_i}(\tau)$, which is zero. Hence, after the EA,

$$Cov\left(\hat{\theta}^{+}_{\tau}, \hat{g}^{+}_{i,\tau}\right) = -\mathbb{E}\left[q^{+}_{\theta g_i}(\tau)\right] = \alpha_i q^{+}_{\theta\theta}(\tau) \geq 0. \tag{A.30}$$

At the macro announcement, with $T^{-} = \tau^{+}$, Equation (A.27) gives

$$Cov\left(\hat{\theta}^{+}_{T}, \hat{g}^{+}_{i,T}\right) = \frac{q^{+}_{\theta\theta}(\tau)}{q^{+}_{\theta\theta}(\tau) + \sigma^2_M} \frac{q^{+}_{\theta g_i}(\tau)}{q^{+}_{\theta\theta}(\tau) + \sigma^2_M} Var\left(s_M - \hat{\theta}^{+}_{\tau}\right) = \frac{q^{+}_{\theta\theta}(\tau)\, q^{+}_{\theta g_i}(\tau)}{q^{+}_{\theta\theta}(\tau) + \sigma^2_M} \leq 0. \tag{A.31}$$

since $q^{+}_{\theta g_i}(\tau) \leq 0$. In the fully revealing case $\sigma_M = 0$,

$$Cov\left(\hat{\theta}^{+}_{T}, \hat{g}^{+}_{i,T}\right) = q^{+}_{\theta g_i}(\tau) = -\alpha_i q^{+}_{\theta\theta}(\tau) \leq 0. \tag{A.32}$$

Finally, since $\alpha_i = \dfrac{q^{-}_{ii}}{q^{-}_{ii} + \sigma^2_{E,i}}$, holding other objects fixed the comparative statics with respect to firm i's EA noise satisfy

$$\frac{dCov\left(\hat{\theta}^{+}_{\tau}, \hat{g}^{+}_{i,\tau}\right)}{d\sigma^2_{E,i}} \leq 0, \qquad \frac{dCov\left(\hat{\theta}^{+}_{T}, \hat{g}^{+}_{i,T}\right)}{d\sigma^2_{E,i}} \geq 0. \tag{A.33}$$

A.2 The Value Function of the Representative Agent

In this subsection, we derive the solution to the value function and the associated boundary conditions at the earnings and macroeconomic announcements.

Using the results from Duffie and Epstein (1992), the representative agent's preference is specified by a pair of aggregators $(f, \mathcal{A})$ such that the utility of the representative agent, V_t, is the solution to the following SDE:

$$dV_t = [-f(C_t, V_t) - \frac{1}{2}\mathcal{A}(V_t)||\sigma_V(t)||^2]dt + \sigma_V(t)dB_t \tag{A.34}$$

for a square-integrable process $\sigma_V(t)$. We adopt the convenient normalization $\mathcal{A}(V_t) = 0$ as Duffie and Epstein (1992), and denote $\bar{f}$ as the normalized aggregator. Under this normalization, for $\psi \neq 1$, $\bar{f}(C_t, V_t)$ is defined as:

$$\bar{f}(C_t, V_t) = \frac{\rho}{1 - 1/\psi} \frac{C_t^{1-1/\psi} - ((1-\gamma) V_t)^{\frac{1-1/\psi}{1-\gamma}}}{((1-\gamma) V_t)^{\frac{1-1/\psi}{1-\gamma}-1}}. \tag{A.35}$$

The Hamilton-Jacobi-Bellman (HJB) equation for the recursive utility satisfies

$$\bar{f}\left(C_t, V\left(\hat{\theta}, t, C_t\right)\right) + \mathcal{L}\left[V\left(\hat{\theta}, t, C_t\right)\right] = 0, \tag{A.36}$$

where $\mathcal{L}$ is the infinitesimal generator defined as $\mathcal{L}(V_t) = \lim_{\Delta \to 0} \frac{1}{\Delta} \mathbb{E}_t [V_{t+\Delta} - V_t]$. Consider the following homogeneous form of

$$V\left(\hat{\theta}_t, t, C_t\right) = \frac{1}{1-\gamma} H\left(\hat{\theta}_t, t\right) C_t^{1-\gamma}, \tag{A.37}$$

where

$$\frac{dC_t}{C_t} = \hat{\theta}_t dt + \sigma_C d\hat{B}_{C,t} \tag{A.38}$$

$$d\hat{\theta}_t = a\left(\bar{\theta} - \hat{\theta}_t\right) dt + \frac{q_{\theta\theta}(t)}{\sigma_C} d\hat{B}_{C,t} \tag{A.39}$$

The following lemma summarizes the solution to the value function, with details for numerical solutions available in Appendix B.2.3.

Lemma 3. *In the interior* $(0, \tau)$, $H\left(\hat{\theta}_t, t\right)$ *satisfies the following HJB equation*

$$\begin{aligned} 0 = & \frac{1}{H(1-\gamma)} \left\{ H_t + H_\theta \left[a\left(\bar{\theta} - \hat{\theta}_t\right) + (1-\gamma) q_{\theta\theta}\right] + \frac{1}{2} H_{\theta\theta} \frac{q_{\theta\theta}^2}{\sigma_C^2} \right\} \\ & + \frac{\rho}{1 - \frac{1}{\psi}} \left(H^{-\frac{1-\frac{1}{\psi}}{1-\gamma}} - 1\right) + \left(\hat{\theta}_t - \frac{1}{2}\gamma\sigma_C^2\right) \end{aligned} \tag{A.40}$$

where we use the following notations: $H_t = \frac{\partial H(\hat{\theta}_t, t)}{\partial t}$, $H_\theta = \frac{\partial H(\hat{\theta}_t, t)}{\partial \hat{\theta}_t}$, *and* $H_{\theta\theta} = \frac{\partial^2 H(\hat{\theta}_t, t)}{\partial \hat{\theta}_t^2}$.

After the earnings announcement τ, *the boundary condition is*

$$H\left(\hat{\theta}_\tau^-, \tau^-\right) = \mathbb{E}\left[H\left(\hat{\theta}_\tau^+, \tau^+\right) \mid \hat{\theta}_\tau^-, \tau^-\right] = \int_{-\infty}^{+\infty} H\left(\hat{\theta}_\tau^+, \tau^+\right) \phi_1\left(\hat{\theta}_\tau^+\right) d\hat{\theta}_\tau^+, \tag{A.41}$$

where $\phi_1(\hat{\theta}_\tau^+)$ *is the density of normal distribution and* $\hat{\theta}_\tau^+ \sim \mathcal{N}\left(\hat{\theta}_\tau^-, \frac{q_{\theta\theta}^-(\tau)^2 s_\Sigma}{1+q_{\theta\theta}^-(\tau) s_\Sigma}\right)$.

After the macroeconomic announcement T, where $T^- = \tau^+$, the boundary condition is

$$H\left(\hat{\theta}_T^-, T^-\right) = \mathbb{E}\left[H\left(\hat{\theta}_T^+, T^+\right) \mid \hat{\theta}_T^-, T^-\right] = \int_{-\infty}^{+\infty} H\left(\hat{\theta}_T^+, T^+\right)\phi_1\left(\hat{\theta}_T^+\right) d\hat{\theta}_T^+, \tag{A.42}$$

where $\hat{\theta}_T^+ \sim \mathcal{N}\left(\hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\right)$.

Proof. The form of value function implies: $\bar{f}(C,V) = \frac{\rho}{1-\frac{1}{\psi}} C^{1-\gamma}\left(H^{1-\frac{1-\frac{1}{\psi}}{1-\gamma}} - H\right)$. Using Ito's lemma, we have

$$\begin{aligned}
\frac{\mathcal{L}\left[V\left(\hat{\theta}_t, t, C_t\right)\right]}{C_t^{1-\gamma}} &= \frac{\mathcal{L}\left[H\left(\hat{\theta}_t, t\right) C_t^{1-\gamma}\right]}{(1-\gamma)\, C_t^{1-\gamma}} \\
&= H\left(\hat{\theta}_t - \frac{1}{2}\gamma\sigma_C^2\right) + \frac{1}{1-\gamma}\left[H_t + H_\theta a\left(\bar{\theta} - \hat{\theta}_t\right) + \frac{1}{2} H_{\theta\theta}\frac{q_{\theta\theta}^2}{\sigma_C^2}\right] + H_\theta q_{\theta\theta}
\end{aligned}$$

Therefore, the HJB equation is written as Equation (A.40).

We have two boundary conditions at both the earnings and the macro announcement. First, after earnings announcement, the boundary condition satisfies Equation (A.41), where $\hat{\theta}_\tau^+ \sim \mathcal{N}\left(\hat{\theta}_\tau^-, q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau)\right)$, in which $q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau)$ reflects the posterior variance drop upon earnings announcement. With N firms announcing at τ, the posterior $q_{\theta\theta}^+(\tau)$ is $q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)}{1+q_{\theta\theta}^-(\tau)s_\Sigma}$ from Equation (A.10). Hence the posterior variance drop is: $q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)^2 s_\Sigma}{1+q_{\theta\theta}^-(\tau)s_\Sigma}$.

Second, after the macro announcement at T, the boundary condition satisfies Equation (A.42), where $\hat{\theta}_T^+ \sim \mathcal{N}\left(\hat{\theta}_T^-, q_{\theta\theta}^-(T)\right)$, which is equivalent to $\hat{\theta}_T^+ \sim \mathcal{N}\left(\hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\right)$ since $q_{\theta\theta}^+(T) = 0$ and $T^- = \tau^+$. □

A.3 Asset Prices

In this section, we begin by deriving the pricing kernel for the representative investor. Following that, we derive the risk-free rate and the partial differential equation (PDE) for the price-to-dividend ratio, along with boundary conditions at both earnings and macro announcement. Finally, we calculate the cumulative return and the risk premium.

Pricing kernel and the risk-free rate We first provide a proof for the law of motion of the pricing kernel, which satisfies the stochastic differential equation (SDE) of Equation

(18), where the risk free rate r_t and price of risk $\sigma_M(\hat{\theta}_t, t)$ are

$$r\left(\hat{\theta}_t, t\right) = \rho + \frac{1}{\psi}\hat{\theta}_t - \frac{\gamma\sigma_C^2}{2}\left(\frac{1}{\psi}+1\right) + \frac{\frac{1}{\psi}-\gamma}{1-\gamma}\frac{H_\theta}{H}q_{\theta\theta} + \frac{\left(\frac{1}{\psi}-\gamma\right)\left(1-\frac{1}{\psi}\right)}{2\left(1-\gamma\right)^2}\left(\frac{H_\theta}{H}\frac{q_{\theta\theta}}{\sigma_C}\right)^2 \quad (A.43)$$

$$\sigma_M\left(\hat{\theta}_t, t\right) = \gamma\sigma_C - \frac{\frac{1}{\psi}-\gamma}{1-\gamma}\frac{H_\theta}{H}\frac{q_{\theta\theta}}{\sigma_C}, \quad (A.44)$$

where we use notations $\frac{H_\theta}{H} = \frac{\partial H(\hat{\theta}_t,t)/\partial\hat{\theta}_t}{H(\hat{\theta}_t,t)}$ and $\frac{H_{\theta\theta}}{H} = \frac{\partial^2 H(\hat{\theta}_t,t)/\partial\hat{\theta}_t^2}{H(\hat{\theta}_t,t)}$.

Proof. The pricing kernel is defined as

$$\frac{dM_t}{M_t} = \frac{d\bar{f}_C\left(C,V\right)}{\bar{f}_C\left(C,V\right)} + \bar{f}_V\left(C,V\right)dt, \quad (A.45)$$

where $\bar{f}_C\left(C,V\right) = \rho H^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}C^{-\gamma}$, and $\bar{f}_V\left(C,V\right) = \rho\frac{\frac{1}{\psi}-\gamma}{1-\frac{1}{\psi}}H^{-\frac{1-\frac{1}{\psi}}{1-\gamma}} - \rho\frac{1-\gamma}{1-\frac{1}{\psi}}$. Applying Ito's lemma, we have:

$$\begin{aligned}\frac{d\bar{f}_C\left(C,V\right)}{\bar{f}_C\left(C,V\right)} &= \frac{d[H^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}C_t^{-\gamma}]}{H^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}C_t^{-\gamma}} = \Bigg\{-\gamma\hat{\theta}_t + \frac{1}{2}\gamma\left(\gamma+1\right)\sigma_C^2 - \gamma\frac{\frac{1}{\psi}-\gamma}{1-\gamma}\frac{H_\theta}{H}q_{\theta\theta} \\ &+\frac{\frac{1}{\psi}-\gamma}{1-\gamma}\left[\frac{H_t}{H}+\frac{H_\theta}{H}a\left(\bar{\theta}-\hat{\theta}_t\right)\right] + \frac{1}{2}\frac{\frac{1}{\psi}-\gamma}{1-\gamma}\left(\frac{\frac{1}{\psi}-1}{1-\gamma}\frac{H_\theta^2}{H^2}+\frac{H_{\theta\theta}}{H}\right)\frac{q_{\theta\theta}^2}{\sigma_C^2}\Bigg\}dt \\ &+\left(-\gamma\sigma_C + \frac{\frac{1}{\psi}-\gamma}{1-\gamma}\frac{H_\theta}{H}\frac{q_{\theta\theta}}{\sigma_C}\right)d\hat{B}_{C,t}. \end{aligned} \quad (A.46)$$

Matching the drift and diffusion of Equation (18), we can get (A.44) and the risk-free rate

$$\begin{aligned} r_t &= -\frac{\frac{1}{\psi}-\gamma}{\left(1-\gamma\right)H}\left[H_t + H_\theta a\left(\bar{\theta}-\hat{\theta}_t\right) + \frac{1}{2}\left(\frac{\frac{1}{\psi}-1}{1-\gamma}\frac{H_\theta^2}{H}+H_{\theta\theta}\right)\frac{q_{\theta\theta}^2}{\sigma_C^2} - \gamma H_\theta q_{\theta\theta}\right] \\ &+\gamma\hat{\theta}_t - \frac{1}{2}\gamma\left(\gamma+1\right)\sigma_C^2 - \rho\frac{\frac{1}{\psi}-\gamma}{1-\frac{1}{\psi}}H^{-\frac{1-\frac{1}{\psi}}{1-\gamma}} + \rho\frac{1-\gamma}{1-\frac{1}{\psi}}. \end{aligned} \quad (A.47)$$

Using the HJB equation to simplify r_t by multiplying $\frac{1}{\psi}-\gamma$ on both sides of (A.40),

$$\begin{aligned} 0 &= \frac{\frac{1}{\psi}-\gamma}{H(1-\gamma)}\left\{H_t + H_\theta\left[a\left(\bar{\theta}-\hat{\theta}_t\right)+(1-\gamma)\,q_{\theta\theta}\right]+\frac{1}{2}H_{\theta\theta}\left(\frac{q_{\theta\theta}^2}{\sigma_C^2}\right)\right\} \\ &\quad +\frac{\rho\left(\frac{1}{\psi}-\gamma\right)}{1-\frac{1}{\psi}}\left(H^{-\frac{1-\frac{1}{\psi}}{1-\gamma}}-1\right)+\left(\frac{1}{\psi}-\gamma\right)\left(\hat{\theta}_t-\frac{1}{2}\gamma\sigma_C^2\right)\end{aligned}$$

and adding up with (A.47), we obtain the instantaneous risk-free rate in Equation (A.43). □

Price-to-dividend ratio The solution for the price-to-dividend ratio $p\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)$ is presented in the following lemma. Further details on numerical solutions can be found in Appendix B.2.3.

Lemma 4. *In the interior $(0,\tau)$, the price-to-dividend ratio $p(\hat{\theta}_t,t)$ satisfies the PDE of*

$$\varpi\left(\hat{\theta}_t,\hat{g}_{i,t},t\right)p = 1 + p_t + p_\theta\varrho\left(\hat{\theta}_t,t\right)+p_g\vartheta\left(\hat{\theta}_t,q_{ii},t\right)+\frac{1}{2}p_{\theta\theta}\frac{q_{\theta\theta}^2}{\sigma_C^2}+\frac{1}{2}p_{gg}\frac{q_{ii}^2}{\sigma_D^2}+p_q\zeta\left(q_{ii}\right) \quad \text{(A.48)}$$

where we use notations $p_t = \frac{\partial p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial t}$, $p_\theta = \frac{\partial p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial \hat{\theta}_t}$, $p_{\theta\theta} = \frac{\partial^2 p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial \hat{\theta}_t^2}$, $p_g = \frac{\partial p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial \hat{g}_{i,t}}$, $p_{gg} = \frac{\partial^2 p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial \hat{g}_{i,t}^2}$, $p_q = \frac{\partial p(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t)}{\partial q_{ii,t}}$, *and*

$$\begin{aligned}\varpi\left(\hat{\theta}_t,\hat{g}_{i,t},t\right) &= -\hat{g}_{i,t}-\left(1-\frac{1}{\psi}\right)\hat{\theta}_t+\rho+\frac{1}{2}\gamma\left(1-\frac{1}{\psi}\right)\sigma_C^2+\frac{\left(\frac{1}{\psi}-\gamma\right)\left(1-\frac{1}{\psi}\right)}{2\left(1-\gamma\right)^2}\left(\frac{H_\theta}{H}\frac{q_{\theta\theta}}{\sigma_C}\right)^2, \\ \varrho\left(\hat{\theta}_t,t\right) &= a\left(\bar{\theta}-\hat{\theta}_t\right)+(1-\gamma)\,q_{\theta\theta}+\frac{\frac{1}{\psi}-\gamma}{1-\gamma}\frac{H_\theta}{H}\frac{q_{\theta\theta}^2}{\sigma_C^2}, \\ \vartheta\left(\hat{g}_t,q_{gg},t\right) &= b\left(\bar{g}-\hat{g}_t\right)+q_{gg}, \\ \zeta\left(q_{gg}\right) &= \sigma_g^2-2bq_{gg}-\frac{q_{gg}^2}{\sigma_D^2}.\end{aligned}$$

The boundary condition at the earnings announcement τ satisfies

$$\tilde{p}\left(\sigma_{E,i};\hat{\theta}_\tau^-,\hat{g}_{i,\tau}^-,q_{ii,\tau}^-,\tau^-\right)=\frac{\int\int e^{B\ln H\left(\hat{\theta}_\tau^+,\tau^+\right)+\ln p\left(\hat{\theta}_\tau^+,\hat{g}_{i,\tau}^+,q_\tau^+,\tau^+\right)}\phi\left(\hat{\theta}_\tau^+,\hat{g}_{i,\tau}^+\middle|\hat{\theta}_\tau^-,\hat{g}_{i,\tau}^-,\Delta\Sigma_{E,i}\right)d\hat{\theta}_\tau^+d\hat{g}_{i,\tau}^+}{\left[\int e^{\ln H\left(\hat{\theta}_\tau^+,\tau^+\right)}\phi_1\left(\hat{\theta}_\tau^+\middle|\hat{\theta}_\tau^-,q_{\theta\theta}^-(\tau)-q_{\theta\theta}^+(\tau)\right)d\hat{\theta}_\tau^+\right]^B}, \quad \text{(A.49)}$$

$$p\left(\hat{\theta}_\tau^-,\hat{g}_{i,\tau}^-,q_{ii,\tau}^-,\tau^-\right)=\sum_{n=1}^N\frac{1}{N}\tilde{p}\left(\sigma_{E,n};\hat{\theta}_\tau^+,\hat{g}_{i,\tau}^+,q_{ii,\tau}^+,\tau^+\right), \quad \text{(A.50)}$$

where $B = \frac{\frac{1}{\psi}-\gamma}{1-\gamma}$, $\Delta\Sigma_{E,i} = \begin{bmatrix} q_{\theta\theta}^{-}(\tau) - q_{\theta\theta}^{+}(\tau) & \alpha_i q_{\theta\theta}^{+}(\tau) \\ \alpha_i q_{\theta\theta}^{+}(\tau) & \alpha_i q_{ii}^{-}(\tau) - \alpha_i^2 q_{\theta\theta}^{+}(\tau) \end{bmatrix}$, *and* ϕ *is the joint normal density of* $\hat{\theta}$ *and* $\hat{g}_i$.

The boundary condition at the macroeconomic announcement T *satisfies*

$$\begin{aligned}\tilde{p}\left(\sigma_{E,i}; \hat{\theta}_T^-, \hat{g}_{i,T}^-, q_{ii,T}^-, T^-\right) &= \frac{\int e^{B \ln H\left(\hat{\theta}_T^+, T^+\right) + \ln p\left(\hat{\theta}_T^+, \hat{g}_{i,T}^+(\hat{\theta}_T^+), q_{ii,T}^+, T^+\right)} \phi_1\left(\hat{\theta}_T^+ \middle| \hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\right) d\hat{\theta}_T^+}{\left[\int e^{\ln H\left(\hat{\theta}_T^+, T^+\right)} \phi_1\left(\hat{\theta}_T^+ \middle| \hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\right) d\hat{\theta}_T^+\right]^B} \\ p\left(\hat{\theta}_T^-, \hat{g}_{i,T}^-, q_{ii,T}^-, T^-\right) &= \sum_{n=1}^{N} \frac{1}{N} \tilde{p}\left(\sigma_{E,n}; \hat{\theta}_T^-, \hat{g}_{i,T}^-, q_{ii,T}^-, T^-\right).\end{aligned}$$

where $\hat{g}_i^+(T) = \hat{g}_i^-(T) - \alpha_i\left(\hat{\theta}_T^+ - \hat{\theta}_T^-\right)$.

Proof. The present value relationship (19) implies

$$M_t D_{i,t} dt + \mathcal{L}\left[M_t p\left(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t\right) D_{i,t}\right] = 0. \tag{A.51}$$

This gives $\frac{\mathcal{L}\left[M_t p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t) D_{i,t}\right]}{M_t p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t) D_{i,t}} + \frac{1}{p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t)} = 0$. Applying Ito's lemma and using Equations (3) and (18),

$$\begin{aligned}\frac{\mathcal{L}\left[M_t p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t) D_t\right]}{M_t p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t) D_t} &= -r_t + \frac{1}{p}\left[p_t + p_\theta a\left(\bar{\theta} - \hat{\theta}_t\right) + \frac{1}{2} p_{\theta\theta} \frac{q_{\theta\theta}^2}{\sigma_C^2} + p_g b\left(\bar{g} - \hat{g}_{i,t}\right)\right. \\ &\quad \left. + \frac{1}{2} p_{gg} \frac{q_{ii}^2}{\sigma_D^2} + p_q\left(\sigma_g^2 - 2b q_{ii} - \frac{q_{ii}^2}{\sigma_D^2}\right)\right] + \left(\hat{g}_{i,t} + \hat{\theta}_t\right) \qquad \text{(A.52)} \\ &\quad - \sigma_M\left(\sigma_C + \frac{p_\theta}{p} \frac{q_{\theta\theta}}{\sigma_C}\right) + \frac{p_\theta}{p} q_{\theta\theta} + \frac{p_g}{p} q_{ii}. \qquad \text{(A.53)}\end{aligned}$$

Plugging in r_t from (A.43) would give the PDE for $p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t)$.

We next solve the boundary conditions at the announcements, both at the earnings and macro announcement. In order to price the asset at the announcement, we need the announcement SDF. Another way to write Equation (A.45) is: $M_t = f_C\left(C_t, V_t\right) e^{\int_0^t f_V(C_s, V_s) ds}$. From this formula, we can derive the announcement SDF as $\frac{H(\hat{\theta}_T^+, 0)^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}}{\mathbb{E}\left[H(\hat{\theta}_T^+, 0)\middle|\hat{\theta}_T^-, T\right]^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}}$. The intuition is as follows. Upon the announcement, C_t is continuous while the continuation utility $H(\hat{\theta}_t, t)$ jumps when new information about $\hat{\theta}_t$ arrives because of generalized risk sensitivity in preferences (Ai and Bansal, 2018).

For an event at time $t_{\text{evt}} \in \{\tau, T\}$. For a focal firm i, the pre-event state is $(\hat{\theta}^-, \hat{g}_i^-)$. For notational convenience, define the (event-time) variance drop

$$\Delta\Sigma_{t_{\text{evt}}} = \begin{bmatrix} \Delta q_{\theta\theta}\left(t_{\text{evt}}\right) & \Delta q_{\theta g_i}\left(t_{\text{evt}}\right) \\ \Delta q_{\theta g_i}\left(t_{\text{evt}}\right) & \Delta q_{ii}\left(t_{\text{evt}}\right) \end{bmatrix} = \begin{bmatrix} q_{\theta\theta}^-\left(t_{\text{evt}}\right) - q_{\theta\theta}^+\left(t_{\text{evt}}\right) & q_{\theta g_i}^-\left(t_{\text{evt}}\right) - q_{\theta g_i}^+\left(t_{\text{evt}}\right) \\ q_{\theta g_i}^-\left(t_{\text{evt}}\right) - q_{\theta g_i}^+\left(t_{\text{evt}}\right) & q_{ii}^-\left(t_{\text{evt}}\right) - q_{ii}^+\left(t_{\text{evt}}\right) \end{bmatrix}$$

is positive semidefinite. Also define $B = \frac{\frac{1}{\psi} - \gamma}{1-\gamma}$. As before, denote ϕ_1 the marginal density for $\hat{\theta}$, and further define ϕ the joint normal density of $\hat{\theta}$ and $\hat{g}_i$.

First, we derive the boundary condition at the earrings announcement. Note that there are N firms simultaneously announce earnings at τ. Define the earnings announcement posterior variance drop at τ for (θ, g_i): $\begin{pmatrix} \hat{\theta}^+(\tau) \\ \hat{g}_i^+(\tau) \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} \hat{\theta}^-(\tau) \\ \hat{g}_i^-(\tau) \end{pmatrix}, \Delta\Sigma_{E,i} \right)$. Using the boundary conditions in Equations (A.10) to (A.12), we have

$$\Delta\Sigma_{E,i} \equiv \begin{bmatrix} \Delta q_{\theta\theta}(\tau) & \Delta q_{\theta g_i}(\tau) \\ \Delta q_{\theta g_i}(\tau) & \Delta q_{ii}(\tau) \end{bmatrix} = \begin{bmatrix} q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau) & \alpha_i q_{\theta\theta}^+(\tau) \\ \alpha_i q_{\theta\theta}^+(\tau) & \alpha_i q_{ii}^-(\tau) - \alpha_i^2 q_{\theta\theta}^+(\tau) \end{bmatrix}. \tag{A.54}$$

Or equivalently,

$$\begin{aligned} \Delta q_{\theta\theta}(\tau) &= q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau) = \frac{\left(q_{\theta\theta}^-(\tau)\right)^2 s_\Sigma}{1 + q_{\theta\theta}^-(\tau) s_\Sigma}, \\ \Delta q_{\theta g_i}(\tau) &= q_{\theta g_i}^-(\tau) - q_{\theta g_i}^+(\tau) = 0 - \left(- \alpha_i q_{\theta\theta}^+(\tau)\right) = \alpha_i q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau) q_{ii}^-(\tau)}{\left(1 + q_{\theta\theta}^-(\tau) s_\Sigma\right)} v_i, \\ \Delta q_{ii}(\tau) &= q_{ii}^-(\tau) - q_{ii}^+(\tau) = q_{ii}^-(\tau) - \left(q_{ii}^-(\tau)(1-\alpha_i) + \alpha_i^2 q_{\theta\theta}^+(\tau)\right) = \alpha_i q_{ii}^-(\tau) - \alpha_i^2 q_{\theta\theta}^+(\tau) \\ &= \left(q_{ii}^-(\tau)\right)^2 \left(v_i - v_i^2 q_{\theta\theta}^+(\tau)\right) = \left(q_{ii}^-(\tau)\right)^2 v_i \left[1 - \frac{v_i q_{\theta\theta}^-(\tau)}{1 + q_{\theta\theta}^-(\tau) s_\Sigma} \right]. \end{aligned}$$

We compute the boundary condition in two steps. Using the announcement SDF, the boundary condition at the earnings announcement τ is

$$p\left(\hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right) = \mathbb{E}\left[\frac{H\left(\hat{\theta}_\tau^+, \tau^+\right)^B p\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+\right)}{\left(\mathbb{E}\left[H\left(\hat{\theta}_\tau^+, \tau^+\right) \mid \hat{\theta}_\tau^-, \tau^- \right]\right)^B} \middle| \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^- \right].$$

We understand the above boundary condition in two steps.

Step 1. Condition on a realization of $\sigma_{E,i}^2$.

On each earnings announcement day τ, We draw a random permutation $\sigma^2_{E,i}(\tau)$ from $F_E = \{\sigma^2_{E,1}, \ldots, \sigma^2_{E,N}\}$. Because investors know the distributions F_E, so they can update their beliefs about the associated distribution of $\hat{g}_i^+(\tau)$ according to Equation (A.54), conditioning on a given $\sigma^2_{E,i} \in F_E$. It is useful to denote this intermediate step as:

$$\begin{aligned}\tilde{p}\left(\sigma_{E,i}; \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right) &= \mathbb{E}\left[\left.\frac{H\left(\hat{\theta}_\tau^+, \tau^+\right)^B p\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+\right)}{\left(\mathbb{E}\left[H\left(\hat{\theta}_\tau^+, \tau^+\right) \mid \hat{\theta}_\tau^-, \tau^-\right]\right)^B}\right| \sigma_{E,i}, \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right] \\ &= \frac{\iint H\left(\hat{\theta}_\tau^+, \tau^+\right)^B p\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+\right) \phi\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+ \middle| \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, \Delta\Sigma_{E,i}\right) d\hat{\theta}_\tau^+ d\hat{g}_{i,\tau}^+}{\left[\int_{-\infty}^{+\infty} H\left(\hat{\theta}_\tau^+, \tau^+\right) \phi_1\left(\hat{\theta}_\tau^+ \middle| \hat{\theta}_\tau^-, \Delta q_{\theta\theta}(\tau)\right) d\hat{\theta}_\tau^+\right]^B} \\ &= \frac{\iint e^{B \ln H\left(\hat{\theta}_\tau^+, \tau^+\right) + \ln p\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+\right)} \phi\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+ \middle| \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, \Delta\Sigma_{E,i}\right) d\hat{\theta}_\tau^+ d\hat{g}_{i,\tau}^+}{\left[\int e^{\ln H\left(\hat{\theta}_\tau^+, \tau^+\right)} \phi_1\left(\hat{\theta}_\tau^+ \middle| \hat{\theta}_\tau^-, \Delta q_{\theta\theta}(\tau)\right) d\hat{\theta}_\tau^+\right]^B}\end{aligned}$$

Step 2. Average over the heterogeneity in $\sigma^2_{E,i}$.

We compute the unconditional expectation by averaging over all possible realizations of $\sigma^2_{E,i}$. This step allows us to derive the expected value function based on the information set $\left\{\hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right\}$ right before the announcement. Since the probability for each $\sigma^2_{E,i}$ is $1/N$, this gives

$$\begin{aligned}p\left(\hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right) &= \mathbb{E}\left[\tilde{p}\left(\sigma_{E,i}; \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right) \middle| \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right] \\ &= \sum_{n=1}^{N} \frac{1}{N} \tilde{p}\left(\sigma_{E,n}; \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-\right).\end{aligned}$$

Second, we derive the boundary condition at the macro announcement T. Since macroeconomic announcement is fully revealing and happens immediately after the earnings announcement ($T^- = \tau^+$), we have $q^+_{\theta\theta}(T) = 0$ and $q^+_{\theta g_i}(T) = 0$. Using the boundary conditions for beliefs, we have $q^+_{\theta\theta}(\tau) = \dfrac{q^-_{\theta\theta}(\tau)}{1 + q^-_{\theta\theta}(\tau) s_\Sigma}$, $\alpha_i = \frac{q^-_{ii}(\tau)}{q^-_{ii}(\tau) + \sigma^2_{E,i}}$, $s_\Sigma = \sum_{j=1}^N \frac{1}{q^-_{jj}(\tau) + \sigma^2_{E,j}}$. The macro day posterior variance drop is $\begin{pmatrix} \hat{\theta}^+(T) \\ \hat{g}_i^+(T) \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} \hat{\theta}^-(T) \\ \hat{g}_i^-(T) \end{pmatrix}, \Delta\Sigma_{M,i}\right)$, and

$$\Delta\Sigma_{M,i} = \begin{pmatrix} \Delta q_{\theta\theta}(T) & \Delta q_{\theta g_i}(T) \\ \Delta q_{\theta g_i}(T) & \Delta q_{ii}(T) \end{pmatrix} = \begin{pmatrix} q^+_{\theta\theta}(\tau) & -\alpha_i q^+_{\theta\theta}(\tau) \\ -\alpha_i q^+_{\theta\theta}(\tau) & \alpha_i^2 q^+_{\theta\theta}(\tau) \end{pmatrix}, \tag{A.55}$$

i.e., $\Delta q_{\theta\theta}(T) = q^{+}_{\theta\theta}(\tau)$, $\Delta q_{\theta g_i}(T) = -\alpha_i q^{+}_{\theta\theta}(\tau)$, $\Delta q_{ii}(T) = q^{-}_{ii}(T) - q^{+}_{ii}(T) = q^{+}_{ii}(\tau) - q^{+}_{ii}(T) = \alpha_i^2 q^{+}_{\theta\theta}(\tau)$.

This can be further simplified into a one dimension problem (degeneracy). Conditional on $\hat{\theta}^{+}(T)$, the conditional variance of $\hat{g}^{+}_i(T)$ is zero:

$$\hat{g}^{+}_i(T) = \hat{g}^{-}_i(T) - \alpha_i\big(\hat{\theta}^{+}_T - \hat{\theta}^{-}_T\big). \tag{A.56}$$

Hence the joint Gaussian integral over $(\hat{\theta}^{+}, \hat{g}^{+}_i)$, i.e., $\iint(.)\phi(.)$ collapses to a one-dimensional integral over $\hat{\theta}^{+} \sim \mathcal{N}\big(\hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\big)$.

We again compute the boundary condition in two steps. First, condition on a realization of $\sigma^2_{E,i}$, the distribution of $\hat{\theta}^{+} \sim \mathcal{N}\big(\hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\big)$. This intermediate step $\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right)$ can be computed as

$$\begin{aligned}
\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right) &= \mathbb{E}\left[\left.\frac{H\left(\hat{\theta}^{+}_T, T^{+}\right)^B p\left(\hat{\theta}^{+}_T, \hat{g}^{+}_{i,T}, q^{+}_{ii,T}, T^{+}\right)}{\left(\mathbb{E}\left[H\left(\hat{\theta}^{+}_T, T^{+}\right) \mid \hat{\theta}^{-}_T, T^{-}\right]\right)^B}\right| \sigma_{E,i}; \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right] \\
&= \frac{\int_{-\infty}^{+\infty} H\left(\hat{\theta}^{+}_T, T^{+}\right)^B p\left(\hat{\theta}^{+}_T, \hat{g}^{+}_{i,T}(\hat{\theta}^{+}_T), q^{+}_{ii,T}, T^{+}\right) \phi_1\left(\hat{\theta}^{+}_T \middle| \hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\right) d\hat{\theta}^{+}_T}{\left[\int_{-\infty}^{+\infty} H\left(\hat{\theta}^{+}_T, T^{+}\right) \phi_1\left(\hat{\theta}^{+}_T \middle| \hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\right) d\hat{\theta}^{+}_T\right]^B} \\
&= \frac{\int e^{B \ln H\left(\hat{\theta}^{+}_T, T^{+}\right) + \ln p\left(\hat{\theta}^{+}_T, \hat{g}^{+}_{i,T}(\hat{\theta}^{+}_T), q^{+}_{ii,T}, T^{+}\right)} \phi_1\left(\hat{\theta}^{+}_T \middle| \hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\right) d\hat{\theta}^{+}_T}{\left[\int e^{\ln H\left(\hat{\theta}^{+}_T, T^{+}\right)} \phi_1\left(\hat{\theta}^{+}_T \middle| \hat{\theta}^{-}_T, q^{+}_{\theta\theta}(\tau)\right) d\hat{\theta}^{+}_T\right]^B}
\end{aligned}$$

Next, we compute the unconditional expectation by averaging over all possible realizations of $\sigma^2_{E,i}$:

$$\begin{aligned}
p\left(\hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right) &= \mathbb{E}\left[\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right) \middle| \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right] \\
&= \sum_{n=1}^{N} \frac{1}{N} \tilde{p}\left(\sigma_{E,n}; \hat{\theta}^{-}_T, \hat{g}^{-}_{i,T}, q^{-}_{ii,T}, T^{-}\right).
\end{aligned}$$

□

Risk premium Conjecture the compensated cumulated return of the following form

$$\frac{dR\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)}{R\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)}=\mu_R\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)dt+\sigma_{RC}\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)d\hat{B}_{C,t}+\sigma_{RD}\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)d\hat{B}_{D,t} \tag{A.57}$$

The cumulative return can be computed as

$$\frac{dR_t}{R_t}=\frac{1}{p\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)D_t}\left[D_tdt+d\left(p\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)D_t\right)\right]=\frac{1}{p}dt+\frac{d\left(pD\right)}{pD}$$

$$\begin{aligned}\frac{d\left(p\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)D_t\right)}{p\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right)D_t} &= \Bigg\{\left(\hat{g}_{i,t}+\hat{\theta}_t\right)+\frac{1}{p}\Bigg[p_t+p_\theta a\left(\bar{\theta}-\hat{\theta}_t\right)+\frac{1}{2}p_{\theta\theta}\frac{q_{\theta\theta}^2}{\sigma_C^2}+p_g b\left(\bar{g}-\hat{g}_{i,t}\right)\\ &\quad +\frac{1}{2}p_{gg}\frac{q_{ii}^2}{\sigma_D^2}+p_q\left(\sigma_g^2-2bq_{ii}-\frac{q_{ii}^2}{\sigma_D^2}\right)\Bigg]+\frac{p_\theta}{p}q_{\theta\theta}+\frac{p_g}{p}q_{ii}\Bigg\}dt\\ &\quad +\left(\sigma_C+\frac{p_\theta}{p}\frac{q_{\theta\theta}}{\sigma_C}\right)d\hat{B}_{C,t}+\left(\sigma_D+\frac{p_g}{p}\frac{q_{ii}}{\sigma_D}\right)d\hat{B}_{D_i,t}\end{aligned}$$

Therefore,

$$\begin{aligned}\mu_R\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right) &= \hat{g}_{i,t}+\hat{\theta}_t+\frac{1}{p}\Bigg[1+p_t+p_\theta\left[a\left(\bar{\theta}-\hat{\theta}_t\right)+q_{\theta\theta}\right]+\frac{1}{2}p_{\theta\theta}\frac{q_{\theta\theta}^2}{\sigma_C^2}\\ &\quad +p_g\left[b\left(\bar{g}-\hat{g}_{i,t}\right)+q_{ii}\right]+\frac{1}{2}p_{gg}\frac{q_{ii}^2}{\sigma_D^2}+p_q\left(\sigma_g^2-2bq_{ii}-\frac{q_{ii}^2}{\sigma_D^2}\right)\Bigg] && \text{(A.58)}\\ \sigma_{RC}\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right) &= \sigma_C+\frac{p_\theta}{p}\frac{q_{\theta\theta}}{\sigma_C} && \text{(A.59)}\\ \sigma_{RD}\left(\hat{\theta}_t,\hat{g}_{i,t},q_{ii,t},t\right) &= \sigma_D+\frac{p_g}{p}\frac{q_{ii}}{\sigma_D} && \text{(A.60)}\end{aligned}$$

Together with the pricing kernel, the risk premium is therefore

$$\begin{aligned}\mathbb{E}_t\left[\frac{dR_{i,t}}{R_{i,t}}\right]-r_t &= -\mathrm{Cov}_t\left[\frac{dM_t}{M_t},\frac{dR_{i,t}}{R_{i,t}}\right]\\ \mu_{R_i,t}-r_t &= \sigma_M\sigma_{RC}=\left(\gamma\sigma_C-\frac{\frac{1}{\psi}-\gamma}{\sigma_C\left(1-\gamma\right)}\frac{H_\theta}{H}q_{ii}\right)\left(\sigma_C+\frac{p_\theta}{p}\frac{q_{ii}}{\sigma_C}\right).\end{aligned}$$

A.4 Timing and Recency

Proof of Proposition 3 We prove the result using standard properties of conditional normal distributions. At time τ_j^- (which corresponds to T^+), the macro announcement fully reveals the aggregate state. Therefore, θ is effectively a known constant given information at τ_j^-:

$$\hat{\theta}_{\tau_j}^- = \theta_T \quad \text{and} \quad q_{\theta\theta}^-(\tau_j) = 0.$$

The conditional covariance between a constant (θ_{τ_j}) and a random variable (g_{j,τ_j}) is immediately zero: $\text{Cov}_{\tau_j^-}(\theta_{\tau_j}, g_{j,\tau_j}) = \mathbb{E}\big[(\theta_{\tau_j} - \mathbb{E}[\theta_{\tau_j} \mid \tau_j^-])(\cdot) \mid \tau_j^-\big] = 0$. Since the earnings signal $s_{j,E}(\tau_j)$ is observed after θ_T is already known, observing it cannot create new uncertainty about θ or generate correlation between θ and g_{j,τ_j}. Therefore, the posterior common-idiosyncratic covariance remains zero:

$$q_{\theta g_j}^+(\tau_j) = 0.$$

Moreover, since $\hat{\theta}_{\tau_j}^+ = \theta_T$ is constant in the conditioning set, it has zero variance, implying

$$Cov(\hat{\theta}_{\tau_j}^+, \hat{g}_{j,\tau_j}^+) = 0. \tag{A.61}$$

Next, the earnings signal is given by: $s_{j,E}(\tau_j) = \theta_{\tau_j} + g_{j,\tau_j} + \varepsilon_{E,j}$. Because $\theta_{\tau_j} = \theta_T$ is known at the time of the earnings announcement, investors can perfectly subtract it from the signal to isolate the firm-specific component. Define the residual (post-MA) signal:

$$\tilde{s}_{j,E} \equiv s_{j,E}(\tau_j) - \theta_T = g_{j,\tau_j} + \varepsilon_{E,j}.$$

This reduces the inference problem to a standard one-dimensional signal-extraction problem: estimating g_{j,τ_j} given a noisy observation $\tilde{s}_{j,E}$. The standard Gaussian update yields

$$\hat{g}_j^+(\tau_j) = \hat{g}_j^-(\tau_j) + \frac{q_{jj}^-(\tau_j)}{q_{jj}^-(\tau_j) + \sigma_{E,j}^2}\left(\tilde{s}_{j,E} - \hat{g}_j^-(\tau_j)\right) = \hat{g}_j^-(\tau_j) + \alpha_j \tilde{z}_j,$$

where $\alpha_j \equiv \frac{q_{jj}^-(\tau_j)}{q_{jj}^-(\tau_j)+\sigma_{E,j}^2}$, and $\tilde{z}_j \equiv \tilde{s}_{j,E} - \hat{g}_j^-(\tau_j) = s_{j,E}(\tau_j) - \theta_T - \hat{g}_j^-(\tau_j)$.

Finally, the posterior variance follows from the standard conditional-normal formula:

$$q_{jj}^+(\tau_j) = \left(\frac{1}{q_{jj}^-(\tau_j)} + \frac{1}{\sigma_{E,j}^2}\right)^{-1} = \frac{q_{jj}^-(\tau_j)\,\sigma_{E,j}^2}{q_{jj}^-(\tau_j) + \sigma_{E,j}^2} = (1-\alpha_j)\,q_{jj}^-(\tau_j). \tag{A.62}$$

A.5 Model Implications

Here we provide details for computing earnings- and macro-announcement betas. We define the market return as the equal-weighted average of returns from all firms. For an announcement event $x \in \{E, M\}$ (EA or MA), define each firm's gross event return $R_{x,i} \equiv \frac{p_i(t_x^+)}{p_i(t_x^-)}$, where $t_E = \tau$ and $t_M = T$. The market event return is the equal-weighted average: $R_{x,M} \equiv \frac{1}{N}\sum_{j=1}^{N} R_{x,j}$. Conditioning on firm i's earnings precision $\sigma_{E,i}$, the announcement beta is

$$\beta_{x,i} \mid \sigma_{E,i} \equiv \frac{Cov\big(R_{x,i}, R_{x,M} \mid \sigma_{E,i}\big)}{Var\big(R_{x,M} \mid \sigma_{E,i}\big)}.$$

Earnings Announcement (EA) Beta Let τ denote the earnings announcement time. The EA returns for equity i and for the market portfolio are:

$$R_{E,i} \equiv \frac{p_i(\tau^+)}{\tilde{p}_i(\tau^-)}, \quad R_{E,M} \equiv \frac{1}{N}\sum_{j=1}^{N} R_{E,j},$$

where $p_i(t) \equiv p(\hat{\theta}_t, \hat{g}_{i,t}, q_{ii,t}, t)$ and $\tilde{p}_i(\tau^-) \equiv p(\sigma_{E,i}; \hat{\theta}_\tau^-, \hat{g}_{i,\tau}^-, q_{ii,\tau}^-, \tau^-)$.

Let $\phi_\tau(d\hat{\theta}_\tau^+, d\hat{g}_{i,\tau}^+ \mid \sigma_{E,i})$ denotes the joint law of post-EA posterior means implied by the Kalman update (given $\sigma_{E,i}$), then the first moment

$$\mathbb{E}\left[R_{E,i} \mid \sigma_{E,i}\right] = \frac{1}{\tilde{p}_i(\tau^-)} \iint p\left(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+\right) \phi_\tau(d\hat{\theta}_\tau^+, d\hat{g}_{i,\tau}^+ \mid \sigma_{E,i}).$$

The market mean is

$$\mathbb{E}\left[R_{E,M} \mid \sigma_{E,i}\right] = \frac{1}{N}\sum_{j=1}^{N} \mathbb{E}\left[R_{E,j} \mid \sigma_{E,i}\right].$$

The cross moment

$$\begin{aligned} \mathbb{E}\left[R_{E,i}R_{E,M} \mid \sigma_{E,i}\right] &= \mathbb{E}\left[R_{E,i}\frac{1}{N}\sum_{j=1}^{N} R_{E,j} \mid \sigma_{E,i}\right] = \frac{1}{N}\sum_{j=1}^{N} \mathbb{E}\left[R_{E,i}R_{E,j} \mid \sigma_{E,i}\right] \\ &= \frac{1}{N}\mathbb{E}\left[R_{E,i}^2 \mid \sigma_{E,i}\right] + \frac{1}{N}\sum_{j \neq i} \mathbb{E}\left[R_{E,i}R_{E,j} \mid \sigma_{E,i}\right], \end{aligned}$$

where

$$\mathbb{E}[R_{E,i}^2 \mid \sigma_{E,i}] = \frac{1}{\tilde{p}_i(\tau^-)^2} \iint \left(p(\hat{\theta}_\tau^+, \hat{g}_{i,\tau}^+, q_{ii,\tau}^+, \tau^+)\right)^2 \phi_\tau(d\hat{\theta}_\tau^+, d\hat{g}_{i,\tau}^+ \mid \sigma_{E,i}).$$

The second moment

$$\mathbb{E}\left[(R_{E,M})^2 \mid \sigma_{E,i}\right] = \mathbb{E}\left[\left(\frac{1}{N}\sum_{j=1}^{N} R_{E,j}\right)^2 \middle| \sigma_{E,i}\right]$$
$$= \frac{1}{N^2}\sum_{j=1}^{N}\mathbb{E}[R_{E,j}^2 \mid \sigma_{E,i}] + \frac{2}{N^2}\sum_{1\le j<k\le N}\mathbb{E}[R_{E,j}R_{E,k} \mid \sigma_{E,i}].$$

As a result,

$$\beta_{E,i}|\sigma_{E,i} = \frac{\mathbb{E}\left[R_{E,i}R_{E,M} \mid \sigma_{E,i}\right] - \mathbb{E}\left[R_{E,i} \mid \sigma_{E,i}\right]\mathbb{E}\left[R_{E,M} \mid \sigma_{E,i}\right]}{\mathbb{E}\left[(R_{E,M})^2 \mid \sigma_{E,i}\right] - \left(\mathbb{E}\left[R_{E,M} \mid \sigma_{E,i}\right]\right)^2}. \tag{A.63}$$

Because $R_{E,M}$ is increasing in $\hat{\theta}^+_\tau$ and the EA induces $Cov(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}) = \alpha_i q^+_{\theta\theta}(\tau) > 0$, we obtain $\beta_{E,i} > 0$. Moreover, α_i rises as $\sigma^2_{E,i}$ falls, so $\beta_{E,i}$ increases with EA precision. The expected EA return (conditional on $\sigma_{E,i}$) is

$$\mathbb{E}[R_{E,i} \mid \sigma_{E,i}] = \frac{\mathbb{E}\left[p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_{ii,\tau}, \tau^+\right) \middle| \sigma_{E,i}\right]}{p\left(\sigma_{E,i}; \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_{ii,\tau}, \tau^-\right)}. \tag{A.64}$$

Macroeconomic Announcement (MA) beta Let T denote the macro announcement time. The MA gross return for equity i is

$$R_{M,i} \equiv \frac{p_i(T^+)}{p_i(T^-)}, \qquad R_{M,M} \equiv \frac{1}{N}\sum_{j=1}^{N} R_{M,j}.$$

Conditioning on $\sigma_{E,i}$, the MA beta is

$$\beta_{M,i}|\sigma_{E,i} = \frac{Cov\left(R_{M,i}, R_{M,M} | \sigma_{E,i}\right)}{Var\left(R_{M,M} | \sigma_{E,i}\right)}.$$

Let $\phi_T(d\hat{\theta}^+_T, d\hat{g}^+_{i,T} \mid \sigma_{E,i})$ denote the joint post-MA law of $(\hat{\theta}^+_T, \hat{g}^+_{i,T})$ (with $T^- = \tau^+$). Then the first moment is

$$\mathbb{E}[R_{M,i} \mid \sigma_{E,i}] = \frac{1}{p_i(T^-)}\iint p(\hat{\theta}^+_T, \hat{g}^+_{i,T}, q^+_{ii,T}, T^+)\,\phi_T(d\hat{\theta}^+_T, d\hat{g}^+_{i,T} \mid \sigma_{E,i}).$$

The market mean is

$$\mathbb{E}[R_{M,M} \mid \sigma_{E,i}] = \frac{1}{N}\sum_{j=1}^{N}\mathbb{E}[R_{M,j} \mid \sigma_{E,i}].$$

The cross moment is computed using $R_{M,M} = \frac{1}{N}\sum_{j=1}^{N} R_{M,j}$:

$$\begin{aligned}
\mathbb{E}[R_{M,i}R_{M,M} \mid \sigma_{E,i}] &= \mathbb{E}\left[R_{M,i}\frac{1}{N}\sum_{j=1}^{N} R_{M,j}|\sigma_{E,i}\right] = \frac{1}{N}\sum_{j=1}^{N}\mathbb{E}[R_{M,i}R_{M,j} \mid \sigma_{E,i}] \\
&= \frac{1}{N}\mathbb{E}[R_{M,i}^2 \mid \sigma_{E,i}] + \frac{1}{N}\sum_{j\neq i}\mathbb{E}[R_{M,i}R_{M,j} \mid \sigma_{E,i}],
\end{aligned}$$

where

$$\mathbb{E}[R_{M,i}^2 \mid \sigma_{E,i}] = \frac{1}{p_i(T^-)^2}\iint \left(p(\hat{\theta}_T^+, \hat{g}_{i,T}^+, q_{ii,T}^+, T^+)\right)^2 \phi_T(d\hat{\theta}_T^+, d\hat{g}_{i,T}^+ \mid \sigma_{E,i}).$$

The second moment of the market MA return is

$$\mathbb{E}[(R_{M,M})^2 \mid \sigma_{E,i}] = \mathbb{E}\left[\left(\frac{1}{N}\sum_{j=1}^{N} R_{M,j}\right)^2 \middle| \sigma_{E,i}\right] = \frac{1}{N^2}\sum_{j=1}^{N}\mathbb{E}[R_{M,j}^2 \mid \sigma_{E,i}] + \frac{2}{N^2}\sum_{1\le j<k\le N}\mathbb{E}[R_{M,j}R_{M,k} \mid \sigma_{E,i}].$$

As a result,

$$\beta_{M,i} \mid \sigma_{E,i} = \frac{\mathbb{E}[R_{M,i}R_{M,M} \mid \sigma_{E,i}] - \mathbb{E}[R_{M,i} \mid \sigma_{E,i}]\mathbb{E}[R_{M,M} \mid \sigma_{E,i}]}{\mathbb{E}[(R_{M,M})^2 \mid \sigma_{E,i}] - \left(\mathbb{E}[R_{M,M} \mid \sigma_{E,i}]\right)^2}. \tag{A.65}$$

At the MA, $\hat{\theta}_T^+ = \theta_T$ and $Cov(\hat{\theta}_T^+, \hat{g}_{i,T}^+) = -\alpha_i q_{\theta\theta}^+(\tau) < 0$. Because the macro announcement fully reveals θ_T, all firms' post-MA prices depend on the common realization of $\hat{\theta}_T^+$, generating comovement in returns through the shared aggregate revelation. Together with the induced negative revision in $\hat{g}_{i,T}^+$ proportional to α_i, this implies $\beta_{M,i}$ is negative, and it becomes more negative as EA precision increases (larger α_i, smaller $\sigma_{E,i}^2$). The expected MA return (conditional on $\sigma_{E,i}$) is

$$\mathbb{E}[R_{M,i} \mid \sigma_{E,i}] = \frac{\mathbb{E}\left[p\left(\hat{\theta}_T^+, \hat{g}_{i,T}^+, q_{ii,T}^+, T^+\right)\middle| \sigma_{E,i}\right]}{p\left(\hat{\theta}_T^-, \hat{g}_{i,T}^-, q_{ii,T}^-, T^-\right)}. \tag{A.66}$$

Appendix B: Data and Additional Empirical Tests

B.1 Data Construction

High-Frequency Returns We construct national best bid and offer (NBBO) quotes by consolidating quotes from all exchanges posting prices for a given stock. We use MTAQ data through 2004 and DTAQ data from 2004 onward, which Holden and Jacobsen (2014) show to be the first-best source for intraday quotes when available. Following Holden and Jacobsen (2014), NBBO quotes are generated at 5-minute intervals, and from these we sample prices every twenty-five minutes between 9:45 a.m. and 4:00 p.m., retaining only observations recorded exactly at each 25-minute mark. We combine the resulting high-frequency returns with the overnight return, computed between 4:00 p.m. on the previous day and 9:45 a.m. on the current day, yielding sixteen intradaily returns per day. The choice of a twenty-five-minute interval follows Patton and Verardo (2012), who show that it optimally captures return comovement around earnings announcements, and is supported by prior work aimed at mitigating microstructure noise (see Bollerslev, Law, and Tauchen (2008) and Todorov and Bollerslev (2010)). The market return is measured using the S&P 500 index, proxied by the SPY exchange-traded fund, also available on TAQ.

Earnings Announcement Days We identify quarterly earnings announcements using the announcement dates and times recorded in I/B/E/S. We only use announcement dates with a valid timestamp (we delete observations with an announcement time of 00:00, which limits our sample period to start in 1998). Announcements recorded at or after 4:00 p.m. are assigned to the following trading day, since price reactions occur only when the market opens. Our analysis focuses exclusively on expected earnings announcements—consistent with our theoretical framework, which applies only to scheduled announcements. Expected announcements are defined by requiring that the actual I/B/E/S timestamped announcement falls within a 10-day window around the expected announcement date, following the approach in Savor and Wilson (2016), which relies on Compustat announcement dates. This procedure ensures that we retain only firms that issue an announcement and do so within their anticipated disclosure window. Our final sample contains 144,955 earnings announcements. Table B.1 panel A presents summary statistics. The earnings day portfolio returns are computed as daily cross-sectional averages and then averaged over 1998–2023. On earnings announcement days, the equal-weighted average return is approximately 20 bps, whereas on non-announcement days, the average return is close to the market average at roughly 4.4

Table B.1: Returns on macroeconomic and Earnings Announcement Days

	N	Mean	t-stat	Median
Panel A - Returns on EA vs. non-EA days				
EA	144,955	19.9	(3.50)	13.5
non-EA	14,885,495	4.44	(2.35)	9.24
Panel B - Returns on MA vs. non-MA days				
MA	3,180,415	20.1	(4.66)	27.9
non-MA	15,104,915	4.43	(2.34)	9.42

This table reports summary statistics for daily equal-weighted excess returns (in basis points), computed as cross-sectional averages of firm-level excess returns. Panel A presents returns for firm-days on earnings announcement (EA) dates, identified using timestamped IBES announcements and aligned to the next trading day for after-hours releases, and compares them with firm-days not associated with an announcement. Panel B reports analogous statistics for macroeconomic announcement (MA) dates, defined as release days for major U.S. indicators-NFP, GDP, CPI, ISM, and FOMC-and compares them with non-macroeconomic announcement days. The sample covers the intersection of CRSP, IBES, TAQ, and Compustat from 1998–2023.

bps, this announcement premium is consistent with that documented in Savor and Wilson (2016).

Macroeconomic Announcement Days We consider the releases of major U.S. macroeconomic indicators: total Nonfarm Payroll employment (NFP), Gross Domestic Product (GDP), the Consumer Price Index (CPI), and the Institute for Supply Management's manufacturing index (ISM). All of these macroeconomic indicators are released monthly. Data on these announcements is from the websites of the entities that released them. Except for ISM, all other economic indicators are public indices released by government agencies at 8:30 a.m. Eastern Time. ISM is an economic indicator released by private institutions, typically at 10:00 a.m. We also include the FOMC announcement, which occurs eight times a year, typically around 2:00 p.m. We exclude macro announcements immediately preceded by another announcement. Table B.1 panel B summarizes average excess returns on macroeconomic announcement versus non-macroeconomic announcement days. Across all macroeconomic announcement days in our sample, we observe 3,180,415 firm-day observations. The equal-weighted daily excess return on macroeconomic announcement days is approximately 20 bps, consistent with Savor and Wilson (2013) and Ai and Bansal (2018) documenting sizable risk premia around macroeconomic news releases. By contrast, on days without earnings or macroeconomic announcements, the average excess return is roughly 4.4 bps, consistent with the baseline premium reported in Panel A.

Consensus Macroeconomic Forecasts We measure macroeconomic surprises using consensus forecasts from the Survey of Professional Forecasters (SPF) as compiled in the Federal Reserve Bank of Philadelphia's Error Statistics releases. For each announcement, we use the latest available quarterly nowcast prior to the release and define the forecast error as the realized value minus the consensus forecast. We use unemployment (UNEMP) rather than Nonfarm Payrolls (NFP) because SPF forecasts for NFP begin only in 2003, while UNEMP is released on the same day and provides a longer forecast history. The SPF does not provide consensus forecasts for the ISM; ISM announcements are therefore excluded from the construction of macroeconomic surprises. Forecast errors are signed so that positive values correspond to outcomes that are more expansionary than expected; FOMC surprises are measured using high-frequency monetary policy shocks following Bauer and Swanson (2023). All macroeconomic forecast errors are standardized to have mean zero and unit standard deviation.

Individual Firm Earnings Forecasts We measure firm-level belief revisions using I/B/E/S Detail (individual analyst forecasts) for annual earnings per share, focusing on the one-year-ahead forecast horizon, which provides the largest and most frequently updated set of forecasts in the data. For a given broker-analyst-firm triple, a belief revision is defined as the change in the analyst's forecast relative to that analyst's most recent prior forecast; the first observed forecast for a given broker-analyst-firm is therefore not treated as a revision. Revisions are scaled by the firm's stock price two trading days prior to the forecast revision to ensure comparability across firms. To mitigate extreme values driven by very low-priced stocks, we require the price per share to exceed \$0.20. These filters yield over 4 million individual analyst forecasts and approximately 3 million analyst-level belief revisions.

B.2 Additional Empirical Tests

B.2.1 Excess Beta and Returns

On both earnings-announcement days and macroeconomic announcement days, returns are driven in large part by standard CAPM beta. To isolate the belief-revision channel proposed in our model, we decompose intraday returns into a standard CAPM component and an excess beta component—β^{EA} on earnings-announcement days and β^{MA} on macroeconomic announcement days—as described in Section 3.3.

We show that a higher excess beta is associated with higher contemporaneous returns on both types of announcement days. Column (1) of Table B.2 shows that on earnings-

Table B.2: Excess Returns and Announcement-Specific Risk

	(1) EA-day Exret	(2) MA-day Exret
β (standardized)	0.300	0.306
	(2.47)	(11.10)
N	115,464	2,772,835
R^2	0.137	0.190
Constant	✓	✓
Firm and Time FE	✓	✓

This table reports regressions of firm-level daily excess returns (exret) on the standardized β^{EA} and β^{MA}. Column (1) uses excess returns on earnings-announcement (EA) days and relates returns to β^{EA}, while Column (2) uses excess returns on macro-announcement (MA) days and relates returns to β^{MA}. The beta measure is defined as the component of a firm's announcement-day beta in excess of its unconditional CAPM beta, computed as in Equation (26). All specifications include firm and date fixed effects. The excess return is in units of bps. Parentheses report t-statistics. The sample covers the intersection of CRSP, IBES, TAQ, and Compustat from 1998–2023.

announcement days, a one-standard-deviation increase in β^{EA} is associated with approximately 0.30 basis points higher daily excess returns, corresponding to an annualized magnitude of 76 basis points. Column (2) shows that on macroeconomic announcement days, a one-standard-deviation increase in β^{MA} is associated with approximately 0.31 basis points higher daily excess returns, corresponding to 77 basis points per year.

Because β^{EA} and β^{MA} are standardized to have mean zero and unit variance, the coefficients are directly comparable. The magnitude of risk pricing on macroeconomic announcement days is quantitatively similar to that on earnings-announcement days, suggesting that the market prices this information risk consistently across events.

B.2.2 Earnings Informativeness through Time

We further test whether the strength of the repricing channel on macroeconomic announcement days varies with the recency of the prior earnings announcement. As time passes, the information about aggregate conditions embedded in an earnings signal $(g + \theta)$ becomes increasingly noisy as it is superseded by other news. Consequently, when a macroeconomic announcement eventually reveals the aggregate state, less repricing occurs for more distant announcers than for recent ones. This implies a weaker reversal and a less negative β^{MA} for firms with stale earnings news.

To test this prediction, we regress β^{MA} on β^{EA} on macroeconomic announcement days. All variables are standardized to have mean zero and unit variance, so the coefficients measure the change in standard deviations of β^{MA} associated with a one-standard-deviation increase in earnings informativeness. A negative coefficient indicates that firms with more informative earnings announcements experience stronger repricing on macroeconomic announcement days. To examine how this relation decays over time, we split the sample into recent announcers (earnings announced within the past week) and "stale announcers" (earnings announced between one week and one month earlier).

Table B.3: Reversion of β^{MA} on Macroeconomic Announcement Days

	(1) All EAs	(2) EA $<$ 1 week	(3) EA $<$ 1 month
β^{EA} (standardized)	-0.338	-0.342	-0.317
	(-28.17)	(-26.31)	(-13.21)
N	102,822	86,703	15,024
R^2	0.139	0.145	0.308
Constant	✓	✓	✓
Firm and Time FE	✓	✓	✓

This table reports regressions of β^{MA} on the standardized β^{EA}. The beta measures are defined as the component of a firm's announcement-day beta in excess of its unconditional CAPM beta, computed as in Equation (26). Column (1) uses all earnings announcements, Column (2) restricts to cases in which the prior earnings announcement occurred within the past week, and Column (3) restricts to cases in which the prior earnings announcement occurred between one week and one month prior. All specifications include firm and date fixed effects, and parentheses report t-statistics. The sample covers the intersection of CRSP, IBES, TAQ, and Compustat from 1998–2023.

Panel A reports the regression results. The coefficients are negative and highly statistically significant across all specifications, confirming the repricing mechanism. In the full sample, a one-standard-deviation increase in β^{EA} predicts a decline of approximately 0.34 standard deviations in β^{MA}. Conditioning on announcement recency reveals a clear gradient: the relation is strongest (–0.41) when earnings were announced within the past week and attenuates substantially (–0.12) when the earnings news is more than one week old.

To assess the economic magnitude, we relate daily excess returns on macroeconomic announcement days to β^{MA} using the regression $exret_t = \alpha + \gamma\, \beta^{MA} + \varepsilon_t$. The estimated slope coefficient γ is 11.8 basis points and is highly significant. Since β^{MA} has a mean of –0.033 and a standard deviation of 1.86, a one-standard-deviation increase in β^{MA} is associated with an increase of approximately 22 basis points in daily excess returns (11.8×1.86). Combining this estimate with the coefficients in Panel A implies that a one-standard-deviation increase in prior earnings informativeness (β^{EA}) corresponds to an implied decline of approximately 4 basis points in daily excess returns on macroeconomic announcement days.

B.2.3 Analyst Forecast Revisions around Macroeconomic Announcements

If macroeconomic announcements prompt investors to reassess firm-specific information revealed in recent earnings releases, belief revision activity should intensify on macroeconomic announcement days. We show that analysts' forecast revisions cluster on these days, that this activity is strongest for firms with very recent earnings announcements, and that it attenuates as earnings information becomes more distant.

In a first test, we perform a time-series analysis of forecast revisions around macroeconomic announcement days. Results are displayed in Table B.2.3. For each calendar day in our sample, we construct three measures of analyst belief revision activity: (i) the average number of forecast revisions per firm, (ii) the total number of revisions across all firms, and (iii) the number of distinct firms experiencing at least one revision. We then regress each outcome on indicators for macro-announcement days, as well as the day before (MA-1) and the day after (MA+1), controlling for day-of-week effects following DellaVigna and Pollet (2009). Robust standard errors are used throughout.

Table B.2.3 shows that analyst activity responds sharply to macroeconomic announcements. Column (1) indicates an increase of approximately 0.05 additional revisions per firm on macroeconomic announcement days, with no significant change on adjacent days. Column (2) confirms this pattern in the aggregate: macroeconomic announcement days are associated with roughly 51 additional forecast revisions across the cross section, while MA-1 and MA+1 show no effect. Finally, Column (3) shows that the number of distinct firms experiencing revisions rises by about 19 on macroeconomic announcement days, again with no significant change on neighboring days. Together, these results indicate that analysts actively update firm-level expectations in response to macroeconomic news.

We next estimate an analyst-forecast-level probit model in which the dependent variable equals one if an analyst revises a firm's earnings forecast on a given day. For each firm, the time series begins on the first date the firm appears in I/B/E/S and ends on its last recorded forecast date. The dependent variable is set to one whenever at least one revision occurs on a firm-day, regardless of the number of updates. This approach prevents the results from being disproportionately driven by firms that mechanically receive many revisions on a single day.

The key regressors include indicators for macroeconomic announcement days and earnings announcement days, as well as controls for the timing of the most recent earnings announcement. The estimation sample contains approximately 25 million analyst-forecast observations. As reported in Table B.2.3, analysts are significantly more likely to revise

Table B.4: Belief updates on macroeconomic announcement days

	(1) Avg Revisions/Firm	(2) Total Revisions	(3) # Revised Firms
MA day	0.047	51.10	18.84
	(3.740)	(4.500)	(4.120)
MA+1 day	0.022	17.34	5.94
	(1.370)	(1.180)	(1.020)
MA−1 day	0.011	21.65	8.26
	(0.870)	(1.810)	(1.610)
Constant	1.304	322.3	236.3
	(241.1)	(49.56)	(60.96)
Observations	6,765	6,765	6,765
R^2	0.121	0.024	0.006
DOW controls	✓	✓	✓

This table reports regressions of analyst forecast revision activity on indicators for macroeconomic announcement (MA) days. The dependent variables are: (1) the average number of forecast revisions per firm, (2) the total number of revisions across firms, and (3) the number of distinct firms with at least one revision. The regressors include indicators for the macroeconomic announcement day, the day before (MA−1), and the day after (MA+1). All specifications include day-of-week fixed effects, and robust t-statistics are reported in parentheses. The sample covers the intersection of CRSP, IBES, TAQ, and Compustat from 1998–2023.

forecasts on macroeconomic announcement days even after conditioning on firm-level earnings events, confirming that the increase in belief updating is not mechanically driven by contemporaneous or recent earnings announcements.

The estimated marginal effects indicate that macroeconomic announcement days raise the probability of at least one analyst revision by approximately 1.5 percentage points, even after conditioning on the timing of earnings announcements. This increase is economically meaningful, given that the information released is not firm-specific. By comparison, earnings announcement days—when firm-level information is directly revealed—generate a much larger increase in revision activity of roughly 35 percentage points. Thus, macroeconomic announcements independently prompt belief updating beyond what is explained by contemporaneous or recent earnings announcements.

Finally, the earnings-announcement recency indicators exhibit a clear gradient: analyst revisions are most likely when the most recent earnings announcement occurred within the prior few days and decline steadily as the announcement becomes more distant. This pattern reflects that newer firm-specific information elicits stronger belief revision, whereas its influence attenuates over time. Taken together, these results show that the surge in analyst revisions on macroeconomic announcement days cannot be attributed solely to nearby earnings news. Instead, macroeconomic announcements themselves induce additional belief

Table B.5: Probit model of forecast revisions and marginal effects

Variable	Probit Coefficients Estimate	(z-stat)	Average Marginal Effects dy/dx	(z-stat)
MA day indicator	0.16	(153.8)	0.01	(144.6)
EA within 0-1 days	1.52	(930.1)	0.35	(589.1)
EA within 2-5 days	0.46	(242.8)	0.06	(184.8)
EA within 6-10 days	0.00	(-0.240)	0.00	(-0.240)
EA within 11-50 days	-0.19	(-182.2)	-0.02	(-186.8)
Constant	-1.78	(-2462)	—	—
Observations	25,651,008		25,651,008	
Pseudo R^2	0.1104			

This table reports probit regressions in which the dependent variable equals one if at least one analyst revises its earnings forecast for firm i on day t. For each firm, the time series begins on the first day the firm appears in the I/B/E/S database and ends on the last day for which I/B/E/S data are available. The regressors include an indicator for scheduled macroeconomic announcement (MA) days and indicators for the recency of the firm's most recent earnings announcement (EA): within 0–1 days, 2–5 days, 6–10 days, and 11–50 days. Columns labeled "Probit Coefficients" report coefficient estimates from the probit model, with t-statistics in parentheses. Columns labeled "Average Marginal Effects" report the average change in the probability of a forecast revision associated with a one-unit change in each regressor, with corresponding z-statistics in parentheses. The sample covers the intersection of CRSP, I/B/E/S, TAQ, and Compustat from 1998–2023.

updating consistent with the repricing channel emphasized in the model.

Appendix C: Numerical Solutions

C.1 Solve for H function

We use finite difference method to solve for the value function. The HJB equation can be rewritten as:

$$(1-\gamma)\left(\frac{\rho}{1-\frac{1}{\psi}}-\hat{\theta}_t+\frac{1}{2}\gamma\sigma_C^2\right)H = H_t + H_\theta\left[a\left(\bar{\theta}-\hat{\theta}_t\right)+(1-\gamma)\,q_{\theta\theta}\right]+\frac{1}{2}H_{\theta\theta}\frac{q_{\theta\theta}^2}{\sigma_C^2}+\frac{\rho\,(1-\gamma)}{1-\frac{1}{\psi}}H^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}.$$

Use finite difference method and approximate the functions $H\left(\hat{\theta}_t,t\right)$ at I discrete points in the space dimensions, $\hat{\theta}_i,\ i=1,2,...,I$. Denote $H_i^n = H\left(\hat{\theta}_i,t^n\right)$, where time dimension

$n = 0, 1, 2, ..., N$. Assume $H_0 = H_1$, and $H_{I+1} = H_I$. Denote

$$\beta_i = (1-\gamma)\left(\frac{\rho}{1-\frac{1}{\psi}} - \hat{\theta}_i + \frac{1}{2}\gamma\sigma_C^2\right), \tag{C.1}$$

$$u_i^{n+1} = \frac{\rho(1-\gamma)}{1-\frac{1}{\psi}}\left(H_i^{n+1}\right)^{\frac{\frac{1}{\psi}-\gamma}{1-\gamma}}. \tag{C.2}$$

Use implicit method to update the value function,

$$\begin{aligned}\beta_i H_i^n &= \frac{H_i^{n+1} - H_i^n}{\Delta t} + u_i^{n+1} + \frac{1}{2}\partial_{\theta\theta} H_i^n \left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 \\ &+ \partial_{\theta,F} H_i^n \left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^+ + \partial_{\theta,B} H_i^n \left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^- .\end{aligned}$$

Use upwind scheme to approximate the derivatives $\partial_\theta H_i^n$ and $\partial_{\theta\theta} H_i^n$,

$$\begin{aligned}\beta_i H_i^n &= \frac{H_i^{n+1} - H_i^n}{\Delta t} + u_i^{n+1} + \frac{1}{2}\frac{H_{i+1}^n - 2H_i^n + H_{i-1}^n}{\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 \\ &+ \frac{H_{i+1}^n - H_i^n}{\Delta\hat{\theta}}\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^+ + \frac{H_i^n - H_{i-1}^n}{\Delta\hat{\theta}}\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^- .\end{aligned}$$

Collecting terms and rewrite HJB equation,

$$\beta_i H_i^n = \frac{H_i^{n+1} - H_i^n}{\Delta t} + u_i^{n+1} + H_{i-1}^n x_i + H_i^n y_i + H_{i+1}^n z_i \tag{C.3}$$

where

$$x_i = -\frac{\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^-}{\Delta\hat{\theta}} + \frac{1}{2\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 \tag{C.4}$$

$$y_i = -\frac{\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^+}{\Delta\hat{\theta}} + \frac{\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^-}{\Delta\hat{\theta}} - \frac{1}{\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 \tag{C.5}$$

$$z_i = \frac{\left[a\left(\bar{\theta} - \hat{\theta}_i\right) + (1-\gamma)\, q_{\theta\theta}^{n+1}\right]^+}{\Delta\hat{\theta}} + \frac{1}{2\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 \tag{C.6}$$

Rewrite in the matrix notation,

$$\beta H^n = u^{n+1} + \mathbf{A}^{n+1} H^n + \frac{H^{n+1} - H^n}{\Delta t}, \tag{C.7}$$

where

$$\mathbf{A}^{n+1} = \begin{bmatrix} y_1 & z_1 & 0 & \cdots & 0 \\ x_2 & y_2 & z_2 & 0 & \vdots \\ 0 & x_3 & y_3 & z_3 & \vdots \\ \vdots & \ddots & \ddots & \ddots & \ddots \\ 0 & \cdots & 0 & x_I & y_I \end{bmatrix}, H^n = \begin{bmatrix} H_1 \\ H_2 \\ H_3 \\ \vdots \\ H_I \end{bmatrix}, \beta = \begin{bmatrix} \beta_1 & 0 & & & \cdots \\ 0 & \beta_2 & & & \\ & & \beta_3 & & \\ & & & \ddots & 0 \\ \vdots & & & & \beta_I \end{bmatrix}, u^{n+1} = \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ \vdots \\ u_I \end{bmatrix}.$$

At the boundaries, we assume $H_0 = H_1$ and $H_{I+1} = H_I$. The system can be written as

$$\mathbf{B}^{n+1} H^n = b^{n+1},\ \mathbf{B}^{n+1} = \left(\frac{1}{\Delta t} + \beta\right) - \mathbf{A}^{n+1},\ b^{n+1} = u^{n+1} + \frac{1}{\Delta t} H^{n+1}. \tag{C.8}$$

Boundary conditions for H We have two boundary conditions.
First, after earnings announcement,

$$H\left(\hat{\theta}_\tau^-, \tau^-\right) = \mathbb{E}\left[H\left(\hat{\theta}_\tau^+, \tau^+\right) \mid \hat{\theta}_\tau^-, \tau^-\right] = \int_{-\infty}^{+\infty} H\left(\hat{\theta}_\tau^+, \tau^+\right) \phi_1\left(\hat{\theta}_\tau^+\right) d\hat{\theta}_\tau^+,$$

where $\phi_1\left(\hat{\theta}_\tau^+\right)$ is the density of normal distribution and $\hat{\theta}_\tau^+ \sim \mathcal{N}\left(\hat{\theta}_\tau^-, \underbrace{q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau)}_{\text{EA variance drop}}\right)$.
With N firms announcing at τ, the posterior $q_{\theta\theta}^+(\tau)$ is $q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)}{1+q_{\theta\theta}^-(\tau)\, s_\Sigma}$, $s_\Sigma := \sum_{i=1}^N v_i$, $v_i := \frac{1}{q_{ii}^-(\tau)+\sigma_{E,i}^2}$. (If only a subset announces at τ, the sum runs over that subset.) Hence the one-dimensional variance inside the EA integral is: $q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)^2 s_\Sigma}{1+q_{\theta\theta}^-(\tau) s_\Sigma}$.
Second, after the macro announcement at T, the boundary condition is

$$H\left(\hat{\theta}_T^-, T^-\right) = \mathbb{E}\left[H\left(\hat{\theta}_T^+, T^+\right) \mid \hat{\theta}_T^-, T^-\right] = \int_{-\infty}^{+\infty} H\left(\hat{\theta}_T^+, T^+\right) \phi_1\left(\hat{\theta}_T^+\right) d\hat{\theta}_T^+,$$

where $\phi_1\left(\hat{\theta}_T^+\right)$ is the density of normal distribution and $\hat{\theta}_T^+ \sim \mathcal{N}\left(\hat{\theta}_T^-, q_{\theta\theta}^-(T)\right)$, which is equivalent to $\hat{\theta}_T^+ \sim \mathcal{N}\left(\hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\right)$ since $q_{\theta\theta}^+(T) = 0$. We use Gaussian quadrature to approximate the normal density. Note, H does not depend on the realization of $\sigma_{E,i}$, therefore it is the same across all firms.

C.2 Solve for price-to-dividend ratio

The PDE for $p\left(\hat{\theta}_t, \hat{g}_t, q_{gg}, t\right)$ is

$$\varpi\left(\hat{\theta}_t, \hat{g}_t, t\right) p = 1 + p_t + p_\theta \varrho\left(\hat{\theta}_t, t\right) + p_g \vartheta\left(\hat{\theta}_t, q_{gg}, t\right) + \frac{1}{2} p_{\theta\theta} \frac{q_{\theta\theta}^2}{\sigma_C^2} + \frac{1}{2} p_{gg} \frac{q_{gg}^2}{\sigma_D^2} + p_q \zeta\left(q_{gg}\right)$$

where

$$\varpi\left(\hat{\theta}_t, \hat{g}_t, t\right) = -\hat{g}_t - \left(1 - \frac{1}{\psi}\right)\hat{\theta}_t + \rho + \frac{1}{2}\gamma\left(1 - \frac{1}{\psi}\right)\sigma_C^2 + \frac{\left(\frac{1}{\psi} - \gamma\right)\left(1 - \frac{1}{\psi}\right)}{2\left(1-\gamma\right)^2}\left(\frac{H_\theta}{H}\right)^2 \frac{q_{\theta\theta}^2}{\sigma_C^2} \tag{C.9}$$

$$\varrho\left(\hat{\theta}_t, t\right) = a\left(\bar{\theta} - \hat{\theta}_t\right) + \left(1-\gamma\right) q_{\theta\theta} + \frac{\frac{1}{\psi} - \gamma}{1-\gamma}\frac{H_\theta}{H}\frac{q_{\theta\theta}^2}{\sigma_C^2} \tag{C.10}$$

$$\vartheta\left(\hat{g}_t, q_{gg}, t\right) = b\left(\bar{g} - \hat{g}_t\right) + q_{gg} \tag{C.11}$$

$$\zeta\left(q_{gg}\right) = \sigma_g^2 - 2b q_{gg} - \frac{q_{gg}^2}{\sigma_D^2} \tag{C.12}$$

Use finite difference method and approximate the functions $p\left(\hat{\theta}_t, \hat{g}_t, q_{gg}, t\right)$ at I discrete points in the space dimensions, $\hat{\theta}_i$, $i = 1, 2, ..., I$ and J discrete points in the space dimensions $\hat{g}_j$, $j = 1, 2, ..., J$, and K discrete points in q_{gg}, $k = 1, 2, ..., K$. Denote $p_{i,j,k}^n = p\left(\hat{\theta}_i, \hat{g}_j, q_k, t^n\right)$, where time dimension $n = 0, 1, 2, ..., N$. Denote

$$\varpi_{i,j}^{n+1} = -\hat{g}_j - \left(1 - \frac{1}{\psi}\right)\hat{\theta}_i + \rho + \frac{1}{2}\gamma\left(1 - \frac{1}{\psi}\right)\sigma_C^2 + \frac{\left(\frac{1}{\psi} - \gamma\right)\left(1 - \frac{1}{\psi}\right)}{2\left(1-\gamma\right)^2}\left(\frac{H_{\theta,i}^{n+1}}{H_i^{n+1}}\right)^2 \left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2$$

$$\varrho_i^{n+1} = a\left(\bar{\theta} - \hat{\theta}_i\right) + \left(1-\gamma\right) q_{\theta\theta}^{n+1} + \frac{\frac{1}{\psi} - \gamma}{1-\gamma}\frac{H_{\theta,i}^{n+1}}{H_i^{n+1}}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2$$

$$\vartheta_{j,k}^{n+1} = b\left(\bar{g} - \hat{g}_j\right) + q_k^{n+1}$$

$$\zeta_k^{n+1} = \sigma_g^2 - 2b q_k^{n+1} - \left(\frac{q_k^{n+1}}{\sigma_D}\right)^2$$

Use implicit method to update the price-to-dividend ratio,

$$\begin{aligned}\varpi_{i,j}^{n+1} p_{i,j,k}^n = {} & \frac{p_{i,j,k}^{n+1} - p_{i,j,k}^n}{\Delta t} + 1 + \frac{1}{2}\partial_{\theta\theta} p_{i,j,k}^n \left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2 + \frac{1}{2}\partial_{gg} p_{i,j,k}^n \left(\frac{q_k^{n+1}}{\sigma_D}\right)^2 \\ & + \partial_{\theta,F} p_{i,j,k}^n \left(\varrho_i^{n+1}\right)^+ + \partial_{\theta,B} p_{i,j,k}^n \left(\varrho_i^{n+1}\right)^- + \partial_{g,F} p_{i,j,k}^n \left(\vartheta_{j,k}^{n+1}\right)^+ \\ & + \partial_{g,B} p_{i,j,k}^n \left(\vartheta_{j,k}^{n+1}\right)^- + \partial_{q,F} p_{i,j,k}^n \left(\zeta_k^{n+1}\right)^+ + \partial_{q,B} p_{i,j,k}^n \left(\zeta_k^{n+1}\right)^-\end{aligned} \tag{C.13}$$

Use upwind scheme to approximate the derivatives, where we use multivariate finite differences,

$$\begin{aligned}
\varpi_{i,j}^{n+1} p_{i,j,k}^{n} &= \frac{p_{i,j,k}^{n+1}-p_{i,j,k}^{n}}{\Delta t}+1+\frac{p_{i+1,j,k}^{n}-2p_{i,j,k}^{n}+p_{i-1,j,k}^{n}}{2\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2+\frac{p_{i,j+1,k}^{n}-2p_{i,j,k}^{n}+p_{i,j-1,k}^{n}}{2\left(\Delta\hat{g}\right)^2}\left(\frac{q_{k}^{n+1}}{\sigma_D}\right)^2 \\
&+\frac{p_{i+1,j,k}^{n}-p_{i,j,k}^{n}}{\Delta\hat{\theta}}\left(\varrho_i^{n+1}\right)^{+}+\frac{p_{i,j,k}^{n}-p_{i-1,j,k}^{n}}{\Delta\hat{\theta}}\left(\varrho_i^{n+1}\right)^{-}+\frac{p_{i,j+1,k}^{n}-p_{i,j,k}^{n}}{\Delta\hat{g}}\left(\vartheta_{j,k}^{n+1}\right)^{+} \\
&+\frac{p_{i,j,k}^{n}-p_{i,j-1,k}^{n}}{\Delta\hat{g}}\left(\vartheta_{j,k}^{n+1}\right)^{-}+\frac{p_{i,j,k+1}^{n}-p_{i,j,k}^{n}}{\Delta q}\left(\zeta_k^{n+1}\right)^{+}+\frac{p_{i,j,k}^{n}-p_{i,j,k-1}^{n}}{\Delta q}\left(\zeta_k^{n+1}\right)^{-}
\end{aligned}$$

Collecting terms and rewrite the above PDE,

$$\begin{aligned}
\varpi_{i,j}^{n+1} p_{i,j,k}^{n} &= \frac{p_{i,j,k}^{n+1}-p_{i,j,k}^{n}}{\Delta t}+1+p_{i-1,j,k}^{n}x_{i,j}^{n+1}+p_{i,j,k}^{n}y_{i,j,k}^{n+1}+p_{i+1,j,k}^{n}z_{i,j}^{n+1}+p_{i,j-1,k}^{n}\chi_{i,j,k}^{n+1} \\
&+p_{i,j+1,k}^{n}\lambda_{i,j,k}^{n+1}+p_{i,j,k+1}^{n}\iota_{i,j,k}^{n+1}+p_{i,j,k-1}^{n}\kappa_{i,j,k}^{n+1}. \qquad \text{(C.14)}
\end{aligned}$$

Let $\alpha_\theta^{n+1} \equiv \frac{1}{2\left(\Delta\hat{\theta}\right)^2}\left(\frac{q_{\theta\theta}^{n+1}}{\sigma_C}\right)^2$, and $\alpha_{g,k}^{n+1} \equiv \frac{1}{2\left(\Delta\hat{g}\right)^2}\left(\frac{q_{k}^{n+1}}{\sigma_D}\right)^2$, we have

$$\begin{aligned}
x_{i,j}^{n+1} &= -\frac{\left(\varrho_i^{n+1}\right)^{-}}{\Delta\hat{\theta}}+\alpha_\theta^{n+1} \\
y_{i,j,k}^{n+1} &= -\frac{\left(\varrho_i^{n+1}\right)^{+}}{\Delta\hat{\theta}}+\frac{\left(\varrho_i^{n+1}\right)^{-}}{\Delta\hat{\theta}}-\frac{\left(\vartheta_{j,k}^{n+1}\right)^{+}}{\Delta\hat{g}}+\frac{\left(\vartheta_{j,k}^{n+1}\right)^{-}}{\Delta\hat{g}} \\
&\quad -2\alpha_\theta^{n+1}-2\alpha_{g,k}^{n+1}-\frac{\left(\zeta_k^{n+1}\right)^{+}}{\Delta q}+\frac{\left(\zeta_k^{n+1}\right)^{-}}{\Delta q} \\
z_{i,j}^{n+1} &= \frac{\left(\varrho_i^{n+1}\right)^{+}}{\Delta\hat{\theta}}+\alpha_\theta^{n+1} \\
\chi_{i,j,k}^{n+1} &= -\frac{\left(\vartheta_{j,k}^{n+1}\right)^{-}}{\Delta\hat{g}}+\alpha_{g,k}^{n+1} \\
\lambda_{i,j,k}^{n+1} &= \frac{\left(\vartheta_{j,k}^{n+1}\right)^{+}}{\Delta\hat{g}}+\alpha_{g,k}^{n+1} \\
\iota_k^{n+1} &= \frac{\left(\zeta_k^{n+1}\right)^{+}}{\Delta q} \\
\kappa_k^{n+1} &= -\frac{\left(\zeta_k^{n+1}\right)^{-}}{\Delta q}
\end{aligned}$$

Rewrite in the matrix notation,

$$\varpi^{n+1} p^n = 1 + \mathbf{A}^{n+1} p^n + \frac{p^{n+1} - p^n}{\Delta t},$$

The system can be written as

$$\mathbf{B}^{n+1} p^n = b^{n+1}, \ \mathbf{B}^{n+1} = \left(\frac{1}{\Delta t} + \varpi^{n+1}\right)\mathbf{I} - \mathbf{A}^{n+1}, \ b^{n+1} = 1 + \frac{1}{\Delta t} p^{n+1}.$$

Boundaries We impose reflecting (Neumann) boundary conditions on both state variables $\hat{\theta}$ and $\hat{g}$. At the grid boundaries, the value function is reflected back into the interior so that the normal derivative is zero. This applies $p_{0,j,k} = p_{2,j,k}, \ p_{I+1,j,k} = p_{I-1,j,k}, \ p_{i,0,k} = p_{i,2,k}, \ p_{i,J+1,k} = p_{i,J-1,k}$. Rather than introducing ghost points, we enforce these reflection conditions directly in the finite-difference operator by modifying the coefficients at the grid edges. Specifically, at the lower and upper boundaries of the $\hat{\theta}$ grid, we set the inward-pointing coefficients to zero and add the corresponding mass to the outward coefficient: $x_{1,j} = 0, \ z_{1,j} \leftarrow z_{1,j} + \alpha_\theta^{n+1}$; $z_{I,j} = 0, \ x_{I,j} \leftarrow x_{I,j} + \alpha_\theta^{n+1}$. An analogous adjustment is applied along the $\hat{g}$ dimension: $\chi_{i,1,k} = 0, \ \lambda_{i,1,k} \leftarrow \lambda_{i,1,k} + \alpha_{g,k}^{n+1}$; $\lambda_{i,J,k} = 0, \ \chi_{i,J,k} \leftarrow \chi_{i,J,k} + \alpha_{g,k}^{n+1}$. Along the q dimension, where no second-order derivative appears, we impose upwind (outflow) boundary conditions. At the lower boundary $k = 1$, we set $\kappa_{i,j,1} = 0$ and at the upper boundary $k = K$ we set $\iota_{i,j,K} = 0$. Then p^n is a vector of size $(IJK) \times 1$: $p^n = \left[p^n_{1,1,1}, \ldots, p^n_{I,1,1}; \ p^n_{1,2,1}, \ldots, p^n_{I,2,1}; \ \ldots; \ p^n_{1,J,1}, \ldots, p^n_{I,J,1}; \ \ldots; \ p^n_{1,J,K}, \ldots, p^n_{I,J,K}\right]^\top$. The transition matrix $\mathbf{A}^{n+1} \in \mathbb{R}^{(IJK)\times(IJK)}$, and the weighting matrix $\boldsymbol{\varpi}^{n+1} \in \mathbb{R}^{(IJK)\times(IJK)}$ are both of dimension $(IJK) \times (IJK)$. The transition matrix has the following structure:

$$\mathbf{A}^{n+1} = \mathbf{A}^0 + \mathbf{C}_\theta + \mathbf{C}_g.$$

(i) Base interior operator

$$\mathbf{A}^0 = \begin{bmatrix} \mathbf{G}_1 & \mathbf{S}_1^+ & 0 & \cdots & 0 \\ \mathbf{S}_2^- & \mathbf{G}_2 & \mathbf{S}_2^+ & \ddots & \vdots \\ 0 & \ddots & \ddots & \ddots & 0 \\ \vdots & \ddots & \mathbf{S}_{K-1}^- & \mathbf{G}_{K-1} & \mathbf{S}_{K-1}^+ \\ 0 & \cdots & 0 & \mathbf{S}_K^- & \mathbf{G}_K \end{bmatrix},$$

Each k-block $\mathbf{G}_k \in \mathbb{R}^{IJ\times IJ}$ is block-tridiagonal in j:

$$\mathbf{G}_k = \begin{bmatrix} \mathbf{T}_{1,k} & \mathbf{U}_{1,k} & 0 & \cdots & 0 \\ \mathbf{L}_{2,k} & \mathbf{T}_{2,k} & \mathbf{U}_{2,k} & \ddots & \vdots \\ 0 & \ddots & \ddots & \ddots & 0 \\ \vdots & \ddots & \mathbf{L}_{J-1,k} & \mathbf{T}_{J-1,k} & \mathbf{U}_{J-1,k} \\ 0 & \cdots & 0 & \mathbf{L}_{J,k} & \mathbf{T}_{J,k} \end{bmatrix},$$

θ-block (tridiagonal in i) for each (j,k):

$$(\mathbf{T}_{j,k})_{i,i-1} = x_{i,j} \ (i>1), \quad (\mathbf{T}_{j,k})_{i,i} = y_{i,j,k}, \quad (\mathbf{T}_{j,k})_{i,i+1} = z_{i,j} \ (i<I)$$

with the outward entries omitted automatically when $i=1$ or $i=I$.

g-off-diagonal blocks (diagonal in i):

$$\mathbf{U}_{j,k} = \operatorname{diag}\left(\lambda_{i,j,k}, ..., \lambda_{I,j,k}\right), \ \mathbf{L}_{j,k} = \operatorname{diag}\left(\chi_{i,j,k}, ..., \chi_{I,j,k}\right),$$

again omitting the outward entries when $j=1$ or $j=J$.

q-off-diagonal blocks (diagonal in i, block-diagonal across j):

$$\begin{aligned} \mathbf{S}_k^+ &= \operatorname{blkdiag}\left(\operatorname{diag}(\iota_{1,1,k}, \ldots, \iota_{I,1,k}), \ \ldots, \ \operatorname{diag}(\iota_{1,J,k}, \ldots, \iota_{I,J,k})\right), \\ \mathbf{S}_k^- &= \operatorname{blkdiag}\left(\operatorname{diag}(\kappa_{1,1,k}, \ldots, \kappa_{I,1,k}), \ \ldots, \ \operatorname{diag}(\kappa_{1,J,k}, \ldots, \kappa_{I,J,k})\right). \end{aligned}$$

By construction (omit outward), $\mathbf{S}_1^- = \mathbf{0}$ and $\mathbf{S}_K^+ = \mathbf{0}$.

(ii) Neumann fixes in $\hat{\theta}$: $\mathbf{C}_\theta$. Add the missing diffusion half at the $\hat{\theta}$ walls: $(\mathbf{C}_\theta)_{(1,j,k),(2,j,k)} = \alpha_\theta^{n+1}, \qquad (\mathbf{C}_\theta)_{(I,j,k),(I-1,j,k)} = \alpha_\theta^{n+1}$ for all $j,k,$ zeros elsewhere.

(iii) Neumann fixes in $\hat{g}$: $\mathbf{C}_g$. Add the missing diffusion half at the $\hat{g}$ walls: $(\mathbf{C}_g)_{(i,1,k),(i,2,k)} = \alpha_{g,k}^{n+1}, \qquad (\mathbf{C}_g)_{(i,J,k),(i,J-1,k)} = \alpha_{g,k}^{n+1}$ for all $i,k,$ zeros elsewhere.

Boundary conditions for P/D For an event at time $t_{\text{evt}} \in \{\tau, T\}$. For a focal firm i, the pre-event state is $(\hat{\theta}^-, \hat{g}_i^-)$. Define the (event-time) variance drop

$$\Delta\Sigma_{t_{\text{evt}}} = \begin{bmatrix} \Delta q_{\theta\theta}\left(t_{\text{evt}}\right) & \Delta q_{\theta g_i}\left(t_{\text{evt}}\right) \\ \Delta q_{\theta g_i}\left(t_{\text{evt}}\right) & \Delta q_{ii}\left(t_{\text{evt}}\right) \end{bmatrix} = \begin{bmatrix} q_{\theta\theta}^-\left(t_{\text{evt}}\right) - q_{\theta\theta}^+\left(t_{\text{evt}}\right) & q_{\theta g_i}^-\left(t_{\text{evt}}\right) - q_{\theta g_i}^+\left(t_{\text{evt}}\right) \\ q_{\theta g_i}^-\left(t_{\text{evt}}\right) - q_{\theta g_i}^+\left(t_{\text{evt}}\right) & q_{ii}^-\left(t_{\text{evt}}\right) - q_{ii}^+\left(t_{\text{evt}}\right) \end{bmatrix}$$

is positive semidefinite. Also define $B = \frac{\frac{1}{\psi}-\gamma}{1-\gamma}$. As before, denote by ϕ the joint normal density, ϕ_1 the marginal for $\hat{\theta}^+$, and ϕ_2 the conditional for $\hat{g}_i^+ \mid \hat{\theta}^+$.

After the macroeconomic announcement at T (fully revealing) Fully revealing simplification. With $T^- = \tau^+$, we have $q_{\theta\theta}^+(T) = 0$ and $q_{\theta g_i}^+(T) = 0$. Using the N-firm EA identities at τ, $q_{\theta\theta}^+(\tau) = \dfrac{q_{\theta\theta}^-(\tau)}{1 + q_{\theta\theta}^-(\tau) s_\Sigma}$, $\alpha_i = \frac{q_{ii}^-(\tau)}{q_{ii}^-(\tau)+\sigma_{E,i}^2}$, $s_\Sigma = \sum_{j=1}^N \frac{1}{q_{jj}^-(\tau)+\sigma_{E,j}^2}$. The macro variance drop is $\begin{pmatrix} \hat{\theta}^+(T) \\ \hat{g}_i^+(T) \end{pmatrix} \sim \mathcal{N}\left(\begin{pmatrix} \hat{\theta}^-(T) \\ \hat{g}_i^-(T) \end{pmatrix}, \Delta\Sigma_{M,i} \right)$, and

$$\Delta\Sigma_{M,i} = \begin{pmatrix} \Delta q_{\theta\theta}(T) & \Delta q_{\theta g_i}(T) \\ \Delta q_{\theta g_i}(T) & \Delta q_{ii}(T) \end{pmatrix} = \begin{pmatrix} q_{\theta\theta}^+(\tau) & -\alpha_i q_{\theta\theta}^+(\tau) \\ -\alpha_i q_{\theta\theta}^+(\tau) & \alpha_i^2 q_{\theta\theta}^+(\tau) \end{pmatrix}, \tag{C.15}$$

i.e., $\Delta q_{\theta\theta}(T) = q_{\theta\theta}^+(\tau)$, $\Delta q_{\theta g_i}(T) = q_{\theta g_i}^+(\tau) = -\alpha_i q_{\theta\theta}^+(\tau)$, $\Delta q_{ii}(T) = q_{ii}^-(T) - q_{ii}^+(T) = q_{ii}^+(\tau) - q_{ii}^+(T) = \alpha_i^2 q_{\theta\theta}^+(\tau)$.

Degeneracy (1D reduction). Conditional on $\hat{\theta}^+(T)$, the conditional variance of $\hat{g}_i^+(T)$ is zero:

$$\hat{g}_i^+(T) = \hat{g}_i^-(T) - \alpha_i\big(\hat{\theta}_T^+ - \hat{\theta}_T^-\big). \tag{C.16}$$

Hence the joint Gaussian integral over $(\hat{\theta}^+, \hat{g}_i^+)$, i.e., $\int\int(.)\phi(.)$ collapses to a one-dimensional integral over $\hat{\theta}^+ \sim \mathcal{N}\big(\hat{\theta}_T^-, q_{\theta\theta}^+(\tau)\big)$.

We assume σ_E is i.i.d. across announcing firms with a discrete support $\{\sigma_{E,n}\}_{n=1}^N$ and probabilities $\{prob_n\}_{n=1}^N$ (e.g., follows a uniform distribution with each $\sigma_{E,i}$ has the probability of $1/N$ (given N firms)).

We compute the boundary condition in two steps.

- Step 1. Condition on a realization of σ_E.

  We draw the i.i.d. random variable σ_E. Because investors know the distributions of σ_E, so they can update their beliefs about the associated distribution of $\hat{g}_i^+(T)$ according to Equation (C.15), conditioning on a given $\sigma_{E,i} \in \sigma_E$. It is useful to denote this intermediate step as:

$$\begin{aligned}
\tilde{p}\left(\sigma_{E,i};\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_T^-,T^-\right) &= \mathbb{E}\left[\left.\frac{H\left(\hat{\theta}_T^+,T^+\right)^B p\left(\hat{\theta}_T^+,\hat{g}_{i,T}^+,q_T^+,T^+\right)}{\left(\mathbb{E}\left[H\left(\hat{\theta}_T^+,T^+\right)\mid\hat{\theta}_T^-,T^-\right]\right)^B}\right|\sigma_{E,i};\hat{\theta}_T^-,\hat{g}_T^-,q_T^-,T^-\right] \\
&= \frac{\int_{-\infty}^{+\infty} H\left(\hat{\theta}_T^+,T^+\right)^B p\left(\hat{\theta}_T^+,\hat{g}_{i,T}^+(\hat{\theta}_T^+),q_T^+,T^+\right)\phi_1\left(\hat{\theta}_T^+\middle|\hat{\theta}_T^-,q_{\theta\theta}^+(\tau)\right)d\hat{\theta}_T^+}{\left[\int_{-\infty}^{+\infty} H\left(\hat{\theta}_T^+,T^+\right)\phi_1\left(\hat{\theta}_T^+\middle|\hat{\theta}_T^-,q_{\theta\theta}^+(\tau)\right)d\hat{\theta}_T^+\right]^B} \\
&= \frac{\int e^{B\ln H\left(\hat{\theta}_T^+,T^+\right)+\ln p\left(\hat{\theta}_T^+,\hat{g}_{i,T}^+(\hat{\theta}_T^+),q_T^+,T^+\right)}\phi_1\left(\hat{\theta}_T^+\middle|\hat{\theta}_T^-,q_{\theta\theta}^+(\tau)\right)d\hat{\theta}_T^+}{\left[\int e^{\ln H\left(\hat{\theta}_T^+,T^+\right)}\phi_1\left(\hat{\theta}_T^+\middle|\hat{\theta}_T^-,q_{\theta\theta}^+(\tau)\right)d\hat{\theta}_T^+\right]^B}
\end{aligned}$$

- Step 2. Average over the heterogeneity in σ_E.

  We compute the unconditional expectation by averaging over all possible realizations of σ_E. This step allows us to derive the expected value function based on the information set $\left\{\hat{\theta}_\tau^-,\hat{g}_\tau^-,q_\tau^-,\tau^-\right\}$ right before the announcement. This gives

$$\begin{aligned}
p\left(\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_T^-,T^-\right) &= \mathbb{E}\left[\tilde{p}\left(\sigma_{E,i};\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_T^-,T^-\right)\middle|\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_T^-,T^-\right] \\
&= \sum_{n=1}^{N}\text{prob}_n\tilde{p}\left(\sigma_{E,n};\hat{\theta}_T^-,\hat{g}_{i,T}^-,q_T^-,T^-\right).
\end{aligned}$$

Similarly, after earnings announcement(s) at τ With N firms announcing at τ, let

$$d_i := q_{ii}^-(\tau)+\sigma_{E,i}^2,\qquad v_i := \frac{1}{d_i},\qquad s_\Sigma := \sum_{i=1}^{N} v_i,\qquad \alpha_i := \frac{q_{ii}^-(\tau)}{d_i}.$$

The common-factor posterior is $q_{\theta\theta}^+(\tau)=\frac{q_{\theta\theta}^-(\tau)}{1+q_{\theta\theta}^-(\tau)\,s_\Sigma}$. Define the event-time variance drop at τ for (θ,g_i): $\begin{pmatrix}\hat{\theta}^+(\tau)\\ \hat{g}_i^+(\tau)\end{pmatrix}\sim\mathcal{N}\left(\begin{pmatrix}\hat{\theta}^-(\tau)\\ \hat{g}_i^-(\tau)\end{pmatrix},\Delta\Sigma_{E,i}\right)$. Using the N-firm EA identities (with $q_{\theta g_i}^-(\tau)=0$ on the interior),

$$\Delta\Sigma_{E,i}\equiv\begin{bmatrix}\Delta q_{\theta\theta}(\tau) & \Delta q_{\theta g_i}(\tau)\\ \Delta q_{\theta g_i}(\tau) & \Delta q_{ii}(\tau)\end{bmatrix}=\begin{bmatrix}q_{\theta\theta}^-(\tau)-q_{\theta\theta}^+(\tau) & \alpha_i q_{\theta\theta}^+(\tau)\\ \alpha_i q_{\theta\theta}^+(\tau) & \alpha_i q_{ii}^-(\tau)-\alpha_i^2 q_{\theta\theta}^+(\tau)\end{bmatrix}.$$

Or equivalently,

$$\Delta q_{\theta\theta}(\tau) = q^-_{\theta\theta}(\tau) - q^+_{\theta\theta}(\tau) = \frac{\left(q^-_{\theta\theta}(\tau)\right)^2 s_\Sigma}{1 + q^-_{\theta\theta}(\tau) s_\Sigma},$$

$$\Delta q_{\theta g_i}(\tau) = q^-_{\theta g_i}(\tau) - q^+_{\theta g_i}(\tau) = 0 - \left(- \alpha_i q^+_{\theta\theta}(\tau)\right) = \alpha_i q^+_{\theta\theta}(\tau) = \frac{q^-_{\theta\theta}(\tau) q^-_{ii}(\tau)}{\left(1 + q^-_{\theta\theta}(\tau) s_\Sigma\right)} v_i,$$

$$\begin{aligned}\Delta q_{ii}(\tau) &= q^-_{ii}(\tau) - q^+_{ii}(\tau) = q^-_{ii}(\tau) - \left(q^-_{ii}(\tau)(1-\alpha_i) + \alpha_i^2 q^+_{\theta\theta}(\tau)\right) = \alpha_i q^-_{ii}(\tau) - \alpha_i^2 q^+_{\theta\theta}(\tau) \\ &= \left(q^-_{ii}(\tau)\right)^2 \left(v_i - v_i^2 q^+_{\theta\theta}(\tau)\right) = \left(q^-_{ii}(\tau)\right)^2 v_i \left[1 - \frac{v_i q^-_{\theta\theta}(\tau)}{1 + q^-_{\theta\theta}(\tau) s_\Sigma}\right].\end{aligned}$$

Rank / singularity issue:

- If only firm i announces (the one-firm case), then $s_\Sigma = v_i$ and $\Delta\Sigma_{E,i}$ is rank-1 (singular).
- If two or more firms announce ($N \geq 2$), then $s_\Sigma > v_i$ and $\Delta\Sigma_{E,i}$ is full rank (positive definite). So the EA kernel is a proper 2D Gaussian for the focal pair.

We compute the boundary condition in two steps.

$$\begin{aligned}\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_\tau, \tau^-\right) &= \mathbb{E}\left[\frac{H\left(\hat{\theta}^+_\tau, \tau^+\right)^B p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_\tau, \tau^+\right)}{\left(\mathbb{E}\left[H\left(\hat{\theta}^+_\tau, \tau^+\right) \mid \hat{\theta}^-_\tau, \tau^-\right]\right)^B} \middle| \sigma_{E,i}, \hat{\theta}^-_\tau, \hat{g}^-_\tau, q^-_\tau, \tau^- \right] \\ &= \frac{\iint H\left(\hat{\theta}^+_\tau, \tau^+\right)^B p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_\tau, \tau^+\right) \phi\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau} \middle| \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, \Delta\Sigma_{E,i}\right) d\hat{\theta}^+_\tau d\hat{g}^+_{i,\tau}}{\left[\int_{-\infty}^{+\infty} H\left(\hat{\theta}^+_\tau, \tau^+\right) \phi_1\left(\hat{\theta}^+_\tau \middle| \hat{\theta}^-_\tau, \Delta q_{\theta\theta}(\tau)\right) d\hat{\theta}^+_\tau\right]^B} \\ &= \frac{\iint e^{B \ln H\left(\hat{\theta}^+_\tau, \tau^+\right) + \ln p\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_\tau, \tau^+\right)} \phi\left(\hat{\theta}^+_\tau, \hat{g}^+_{i,\tau} \middle| \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, \Delta\Sigma_{E,i}\right) d\hat{\theta}^+_\tau d\hat{g}^+_{i,\tau}}{\left[\int e^{\ln H\left(\hat{\theta}^+_\tau, \tau^+\right)} \phi_1\left(\hat{\theta}^+_\tau \middle| \hat{\theta}^-_\tau, \Delta q_{\theta\theta}(\tau)\right) d\hat{\theta}^+_\tau\right]^B}\end{aligned}$$

$$\begin{aligned}p\left(\hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_\tau, \tau^-\right) &= \mathbb{E}\left[\tilde{p}\left(\sigma_{E,i}; \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_\tau, \tau^-\right) \middle| \hat{\theta}^-_\tau, \hat{g}^-_{i,\tau}, q^-_\tau, \tau^-\right] \\ &= \sum_{n=1}^{N} \text{prob}_n \tilde{p}\left(\sigma_{E,n}; \hat{\theta}^+_\tau, \hat{g}^+_{i,\tau}, q^+_\tau, \tau^+\right).\end{aligned}$$

C.3 History Dependence of s_Σ

At an earnings announcement time τ with N announcing firms, the aggregate EA precision entering the updating of aggregate beliefs is

$$s_\Sigma(\tau) = \sum_{i=1}^{N} v_i(\tau), \qquad v_i(\tau) = \frac{1}{q_{ii}^-(\tau) + \sigma_{E,i}^2}.$$

Because each firm's pre-EA idiosyncratic variance $q_{ii}^-(\tau)$ depends on its own history of past EA precision realizations, the realized value of $s_\Sigma(\tau)$ is cohort- and history-specific. Substituting this realized s_Σ directly into the EA boundary condition for the value function H would therefore make H depend on the entire cross-sectional vector$\{q_{ii}^-(\tau)\}_{i=1}^N$. This would substantially enlarge the state space and break the simplification that H depends only on the aggregate belief $\hat{\theta}$.

To preserve tractability, we introduce a stationary, permutation-invariant cohort aggregator. We retain full cross-sectional heterogeneity in the firm-level problem (for the price-dividend ratio p), but restrict the boundary condition for H to depend only on a deterministic aggregator $\bar{s}_\Sigma$ that does not carry firm-level histories.

Here is the setup. Time is organized into announcement cycles. In each cycle: (i) all N announce earnings; (ii) the cohort uses the same multiset of EA noise variances $F_E = \{\sigma_{E,1}, \ldots, \sigma_{E,N}\}$, with one draw of each precision assigned to firms by a random permutation, independently across cycles; (iii) a macro announcement immediately follows and is fully revealing; (iv) the interior span from T^+ to the next τ has fixed length Δ. i.e., $\Delta = \tau - T^+$. Between T^+ and the next τ^-, each firm's idiosyncratic variance q_{ii} evolves deterministically according to the Riccati equation. Let $\Phi_\Delta(x)$ denote the deterministic mapping that takes the post-macro idiosyncratic variance at T^+ ($q_{ii}^+(T)$) to the pre-EA variance at the next τ^- ($q_{ii}^-(\tau)$) over the fixed interior length Δ, so that:

$$q_{ii}^+(T) = x \quad \Longrightarrow \quad q_{ii,\text{next}}^-(\tau) = \Phi_\Delta(x). \tag{C.17}$$

In the same cycle, for a given pre-EA variance $q_{ii}^-(\tau)$ and an EA noise variance σ_E^2, the post-EA idiosyncratic variance at T^+ is given by (from Equation (A.15)):

$$q_{ii}^+(T; \sigma_{E,n}) = \frac{q_{ii}^-(\tau; \sigma_{E,n})\sigma_{E,n}^2}{q_{ii}^-(\tau; \sigma_{E,n}) + \sigma_{E,n}^2}.$$

We now define the type-conditional *means*. At the start of any cycle (just before EAs at τ), firms are grouped according to the EA precision they received in the previous cycle. We refer to this classification as the firm's "previous type." There are N such types, each comprising a fraction $1/N$ of the cross section. Let μ_m denote the (type-conditional) mean pre-EA idiosyncratic variance q_{ii}^- in the current cycle for firms whose "previous type" was m (i.e., firms that received $\sigma_{E,m}$ in the previous cycle). Importantly, we are not saying each firm repeats its own q. We are only tracking type-conditional group means $(\mu_1, ..., \mu_N)$ across cycles.

Under independent permutations, EA precision assignments are independent across cycles; the set of firms classified as "previous type m" in the next cycle contains an equal fraction $1/N$ from each current previous-type group. As a result, at stationarity the vector of type-conditional means $\mu = (\mu_1, \dots, \mu_N)$ satisfy the vector fixed point system

$$\mu_m^{k+1} = \frac{1}{N}\sum_{l=1}^{N} \Phi_\Delta\left(\frac{\mu_l^k \sigma_{E,m}^2}{\mu_l^k + \sigma_{E,m}^2}\right), \qquad m = 1, \dots, N. \tag{C.18}$$

For a given calibration, this system can be solved once by fixed-point iteration, starting from any admissible initial condition (e.g., the steady-state solution of the Riccati equation).

Finally, we construct the permutation-invariant cohort aggregator. Given the stationary solution $\{\mu_n\}_{n=1}^N$, we define the permutation-invariant cohort aggregator

$$\bar{s}_\Sigma = \sum_{n=1}^{N} \frac{1}{N} \sum_{m=1}^{N} \frac{1}{\mu_n + \sigma_{E,m}^2}. \tag{C.19}$$

This $\bar{s}_\Sigma$ is deterministic (given parameters) and does not reflect firm-level histories. We therefore use $\bar{s}_\Sigma$ in the EA boundary condition for the aggregate posterior variance,

$$q_{\theta\theta}^+(\tau) = \frac{q_{\theta\theta}^-(\tau)}{1 + q_{\theta\theta}^-(\tau)\,\bar{s}_\Sigma}, \qquad q_{\theta\theta}^-(\tau) - q_{\theta\theta}^+(\tau) = \frac{\left(q_{\theta\theta}^-(\tau)\right)^2 \bar{s}_\Sigma}{1 + q_{\theta\theta}^-(\tau)\,\bar{s}_\Sigma}$$

With this construction, the value function H remains common across firms and depends only on the aggregate belief $\hat{\theta}$.

To illustrate the mechanism and intuition, consider an example with $N = 2$. Suppose there are two EA noise variances $\{\sigma_{E,1}^2, \sigma_{E,2}^2\}$ in each cycle. Denote $g(q, \sigma) = \frac{q\sigma^2}{q+\sigma^2}$, which is essentially the post-EA idiosyncratic variance $q_{ii}^+(T)$.

Let μ_1^{k-1} and μ_2^{k-1} denote the previous-type pre-EA means in cycle $k-1$. Firms that receive $\sigma_{E,1}$ in that cycle finish the earnings announcement with $g(\mu_1^{k-1}, \sigma_{E,1})$; which then evolves deterministically $\Phi_\Delta(g(\mu_1^{k-1}, \sigma_{E,1}))$ by the next pre-EA date. The same logic applies to type 2 (firms that receive $\sigma_{E,2}$): $\Phi_\Delta\big(g(\mu_2^{k-1}, \sigma_{E,2})\big)$.

At the start of cycle k, we regroup firms by the EA noise they used in cycle $k-1$. So the pre-EA mean of "previous type 1" in cycle k should be

$$\mu_1^k = \Phi_\Delta\big(g(\mu_1^{k-1}, \sigma_{E,1})\big), \qquad \mu_2^k = \Phi_\Delta\big(g(\mu_2^{k-1}, \sigma_{E,2})\big).$$

That would be true if the same firms stayed in those labels. But they don't: in cycle k the assignment of current EA noises is a fresh permutation, independent of cycle $k-1$.

Because assignments are independent across cycles, the set of firms that end up as "previous type 1" in cycle $k+1$ is a mix of all groups from cycle k. Each of the two groups from cycle k contributes half the mass (under random permutation). Hence, for cycle $k+1$,

$$\mu_1^{k+1} = \tfrac{1}{2}\left[\Phi_\Delta\big(g(\mu_1^k, \sigma_{E,1})\big) + \Phi_\Delta\big(g(\mu_2^k, \sigma_{E,1})\big)\right],$$

and similarly

$$\mu_2^{k+1} = \tfrac{1}{2}\left[\Phi_\Delta\big(g(\mu_1^k, \sigma_{E,2})\big) + \Phi_\Delta\big(g(\mu_2^k, \sigma_{E,2})\big)\right].$$

At stationarity, where $\mu^k = \mu^{k+1} = \mu$, the type-conditional means satisfy the vector fixed-point condition

$$\mu_m = \frac{1}{N}\sum_{l=1}^{N} \Phi_\Delta\big(g(\mu_l, \sigma_{E,m})\big), \qquad m = 1, \ldots, N.$$

which in this example reduces to an average across the two types. Although individual firms continue to follow heterogeneous and history-dependent variance paths, the mapping from the previous-type label to the current pre-EA variance *mean* is time-invariant. This fixed point therefore delivers a well-defined, permutation-invariant cohort aggregator $\bar{s}_\Sigma$.