A note on the equity market response to monetary shocks: Term premia vs. compensation for dividend risk

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May 30, 2025

In this note, we revisit the effects of monetary policy on equity prices using the framework developed in Caramp and Silva (2025). In particular, we focus on the decomposition proposed by Nagel and Xu (2024), which separates the impact of a monetary shock into two components: one capturing changes in interest rates and term premia, and the other capturing changes in compensation for dividend risk. We find that the model, as originally calibrated, not only reproduces the overall stock market response documented by Bernanke and Kuttner (2005) and the bond yield response from Hanson and Stein (2015), but also matches the decomposition of equity price movements estimated by Nagel and Xu (2024). Thus, the model simultaneously accounts for the behavior of both equity and bond markets in response to monetary policy shocks.

1 The decomposition

Consider the environment described in Caramp and Silva (2025), where the economy is subject to a (non-recurrent) disaster event with Poisson intensity λ_t under a reference probability measure. This probability evolves endogenously and responds to monetary shocks.

Equity prices and dividend futures. Let $Q_{E,t}$ denote the equity price in our economy, that is, a claim to aggregate (nominal) dividends $\tilde{D}_t$, where $\tilde{D}_t = D_t$ if the economy is in the no-disaster state and $\tilde{D}_t = D_t^*$ if the economy is in the disaster state. The equity price satisfies the standard pricing condition:

$$Q_{E,t} = \mathbb{E}_t \left[\int_t^\infty \frac{\tilde{\eta}_s}{\eta_t} \tilde{D}_s ds \right], \tag{1}$$

where $\tilde{\eta}_s$ is the (nominal) stochastic discount factor (SDF).

The price of a *dividend future* delivered h periods ahead is denoted by $Q_{E,t}(h)$, and it satisfies

$$0 = \mathbb{E}_t \left[\tilde{\eta}_{t+h} \left(\tilde{D}_{t+h} - Q_{E,t}(h) \right) \right] \Rightarrow Q_{E,t}(h) = \frac{\mathbb{E}_t \left[\tilde{\eta}_{t+h} \tilde{D}_{t+h} \right]}{\mathbb{E}_t \left[\tilde{\eta}_{t+h} \right]}, \tag{2}$$

so $Q_{E,t}(h)$ equals the price investors agree today to pay at time $t+h$ for receiving the cash flow $\tilde{D}_{t+h}$, given there is no exchange of cash at time t. This implies that the price of the dividend future corresponds to the risk-neutral expectation of the dividend strip.

We can then write the equity price as follows:

$$Q_{E,t} = \int_0^\infty Q_{B,t}(h) Q_{E,t}(h) dh, \tag{3}$$

where $Q_{B,t}(h) \equiv \frac{\mathbb{E}_t[\tilde{\eta}_{t+h}]}{\eta_t}$ denotes the price of a zero-coupon bond paying off h periods ahead.

Equity price decomposition. We are interested in the effects of a monetary shock. Prior to the shock, the economy is in a stationary equilibrium, where asset prices are constant conditional on no disaster and inflation is zero. Log deviations from the stationary equilibrium are denoted by lower case variables, e.g., $q_{E,t} \equiv \log Q_{E,t}/Q_E$, where Q_E is the equity price in the stationary equilibrium. We can then write the response of equity prices to a monetary shock as follows:

$$q_{E,t} = \underbrace{\int_0^\infty \omega(h) q_{B,t}(h) dh}_{\substack{\text{interest rate+} \\ \text{term premium effect}}} + \underbrace{\int_0^\infty \omega(h) q_{F,t}(h) dh}_{\text{dividend-futures effect}}, \tag{4}$$

where $\omega(h) \equiv \frac{Q_E(h) Q_B(h)}{Q_E}$ is the share of h-periods ahead dividends in the total value.

The expression above decomposes the response of equity prices into two components. The first component captures the effect of changes in the path of short-term interest rates as well as changes in term premia. The second component captures changes in the risk-neutral expectation of future dividends, as captured by changes in the price of dividend futures.

It will be instructive to compare the stock market response with the response of a long-term bond. Consider a bond that pays off coupons $e^{-\psi_L h}$ h periods ahead. The price of the bond is given by

$$Q_{L,t} = \mathbb{E}_t \left[\int_0^\infty \frac{\tilde{\eta}_{t+h}}{\eta_t} e^{-\psi_L h} dh \right] = \int_0^\infty e^{-\psi_L h} Q_{B,t}(h) dh. \tag{5}$$

The impact of the monetary shock on the long-term bond is given by

$$q_{L,t} = \int_0^\infty \omega_L(h) q_{B,t}(h) dh, \tag{6}$$

where $\omega_L(h) = \frac{e^{-\psi_L h} Q_B(h)}{Q_L}$.

To compute the interest rate and term premium effect, we need to compute the weight function $\omega(h)$, which depends on the asset prices in the stationary equilibrium, and $q_{B,t}(h)$, the response of bond prices to a monetary shock.

Stationary equilibrium. In the stationary equilibrium, the switching probability is constant and given by λ. The probability the economy will be in the no-disaster state h periods ahead is then $e^{-\lambda h}$. The SDF is given by $\eta_t = e^{-\rho_s t} C_s^{-\sigma}$ in the no-disaster state and $\eta_t^* = e^{-\rho_s t} (C_s^*)^{-\sigma}$ in the disaster state.

The price of the zero-coupon bond is given by

$$Q_B(h) = e^{-\lambda h} e^{-\rho_s h} + (1 - e^{-\lambda h}) e^{-\rho_s h} \left(\frac{C_s}{C_s^*} \right)^{\sigma}. \tag{7}$$

The yield on the bond, $y_B(h) = -\frac{1}{h} \log Q_B(h)$, is given by

$$y_B(h) = \rho_s + \lambda - \frac{1}{h} \log \left[1 + \left(e^{\lambda h} - 1 \right) \left(\frac{C_s}{C_s^*} \right)^{\sigma} \right] \approx r_n + \frac{\lambda^2}{2} \left(\frac{C_s}{C_s^*} \right)^{\sigma} \left[\left(\frac{C_s}{C_s^*} \right)^{\sigma} - 1 \right] h, \tag{8}$$

where the approximation holds for small h, and $r_n = y_B(0) = \rho_s - \lambda \left[\left(\frac{C_s}{C_s^*} \right)^{\sigma} - 1 \right]$ corresponds to the short-term (natural) interest rate in the stationary equilibrium. The expression above shows that the yield curve is upward sloping in the stationary equilibrium. Notice that inflation is zero in the stationary equilibrium, so there is no distinction between real and nominal yields.

The price of the dividend future is given by

$$Q_E(h) = \frac{e^{-\lambda h} e^{-\rho_s h}}{e^{-\lambda h} e^{-\rho_s h} + (1 - e^{-\lambda h}) e^{-\rho_s h} \left(\frac{C_s}{C_s^*} \right)^{\sigma}} D + \frac{(1 - e^{-\lambda h}) e^{-\rho_s h} \left(\frac{C_s}{C_s^*} \right)^{\sigma}}{e^{-\lambda h} e^{-\rho_s h} + (1 - e^{-\lambda h}) e^{-\rho_s h} \left(\frac{C_s}{C_s^*} \right)^{\sigma}} D^*. \tag{9}$$

The price of the equity claim is given by

$$Q_E = \int_0^{\infty} Q_B(h) Q_E(h) dh = \frac{1}{\rho_s + \lambda} D + \frac{\lambda}{\rho_s + \lambda} \left(\frac{C_s}{C_s^*} \right)^{\sigma} \frac{D^*}{\rho_s}. \tag{10}$$

Therefore, the weight of the strip of maturity h is given by

$$\omega(h) = (\rho_s + \lambda) e^{-(\rho_s + \lambda) h} \frac{1 + (e^{\lambda h} - 1) \left(\frac{C_s}{C_s^*} \right)^{\sigma} \frac{D^*}{D}}{1 + \frac{\lambda}{\rho_s} \left(\frac{C_s}{C_s^*} \right)^{\sigma} \frac{D^*}{D}}. \tag{11}$$

Monetary policy and bond prices. Consider next the response of bond prices to a monetary shock. Let $r_{B,t}(h)$ denote the excess holding-period return on a bond maturing h periods ahead conditional on no disaster:

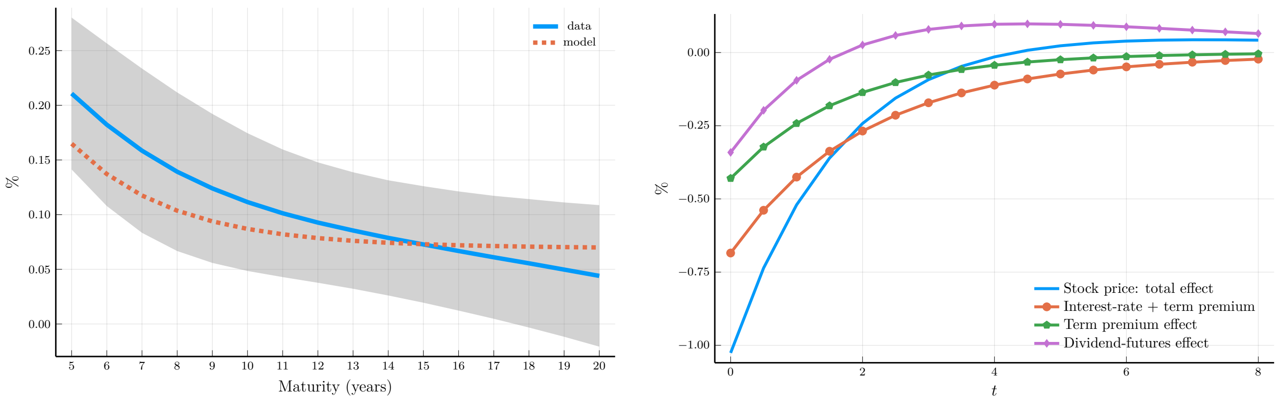
$$r_{B,t}(h) = \frac{1}{Q_{B,t}(h)} \left[-\frac{\partial Q_{B,t}}{\partial h} + \frac{\partial Q_{B,t}}{\partial t} \right] - i_t. \tag{12}$$

The Euler equation for the bond is given by

$$r_{B,t}(h) = \lambda_t \left(\frac{C_{s,t}}{C_{s,t}^*} \right)^{\sigma} \frac{Q_{B,t}(h) - Q_{B,t}^*(h)}{Q_{B,t}(h)}. \tag{13}$$

Let $q_{b,t}(h) \equiv \log Q_{B,t}(h) - \log Q_{B,t}(h)$, then linearizing the equation above we obtain

$$-\frac{\partial q_{B,t}(h)}{\partial h} + \frac{\partial q_{B,t}(h)}{\partial t} = i_t - r_n + r_B(h) \left[\hat{\lambda}_t + \frac{Q_B^*(h)}{Q_B(h) - Q_B^*(h)} q_{b,t}(h) \right], \tag{14}$$



(a) Forward curve

(b) Equity market decomposition

Figure 1: Impact on bond and equity markets of a monetary shock

Note: The left panel shows the response of forward rates to a 25 bps change in the two-year yield, as estimated by Hanson and Stein (2015), and the corresponding forward curve in the model when the monetary shock is scaled such that the two-year yield increases by 25 bps. Grey areas are confidence bands. The right panel shows the decomposition of equity market response to a monetary shock based on Eq.(4). The "term premium effect" isolates the response of changes in term premia. We report the response of levered claim on dividends, using a debt-to-equity ratio of 0.5, as in, e.g., Barro (2006).

where $\hat{\lambda}_t = \log \lambda_t / \lambda$, assuming that $r_B(h)\sigma c_{s,t}$ is second order, as discussed in Caramp and Silva (2025).

In the case that the nominal interest rate is exponentially decaying, $i_t - r_n = e^{-\psi_m t}(i_0 - r_n)$, the solution to the PDE takes the form:

$$q_{B,t}(h) = \chi_{B,i}(h)(i_t - r_n) + \chi_{B,\lambda}(h)\hat{\lambda}_t, \tag{15}$$

where $\chi_{B,i}(h)$ and $\chi_{B,\lambda}(h)$ are the solution to a pair of ODEs.

Bond prices depend on the two relevant state variables: the path of nominal interest rate, $i_t - \rho$, and the market-implied disaster probability, $\hat{\lambda}_t$. The second term captures the impact of changes in term premia.

2 Results

Given the expression for the weights $\omega(h)$, Eq.(11), and for bond prices, Eq.(15), we can compute the decomposition in Eq.(4). We adopt the original calibration from Caramp and Silva (2025). Figure 1 shows the results. The left panel reports the response of the forward curve implied by the model and the estimated response by Hanson and Stein (2015). This shows that the model is able to capture the response of bond prices observed in the data. Panel (b) shows the response of the stock market. Even though this was not a targeted moment, the model matches the overall response of the stock market as estimated by Bernanke and Kuttner (2005). The orange line shows the *interest rate and term premium effect*, while the purple line shows the *dividend-futures effect*. On impact, the interest rate and term premium effect accounts for 67% of the overall response of the stock market. Therefore, movements in bond yields are major driver of the equity response to monetary shocks. This is in line with the estimates from Nagel and Xu (2024). Taking the ratio of the response to a policy surprise in columns (3)

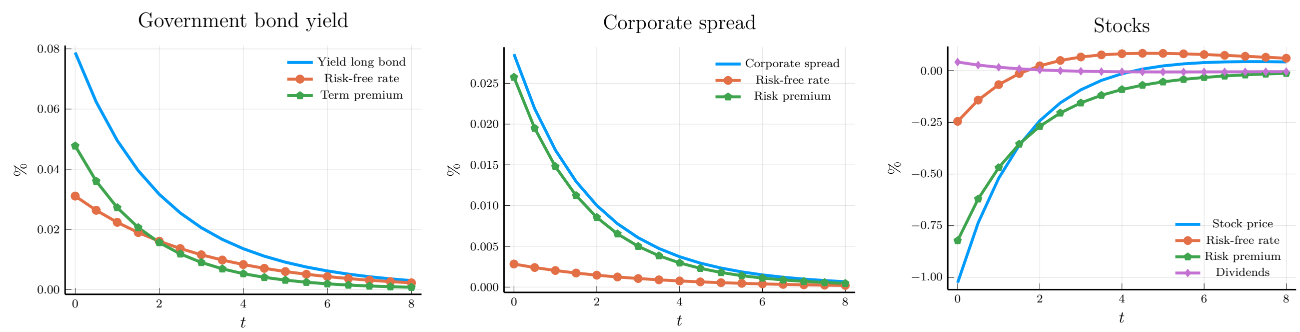


Figure 2: Asset-pricing response to monetary shocks.

and (1) of Table 3 of their work, we obtain a relative importance of the interest rate and term premium effect as $\frac{25.47}{36.84} = 69\%$, consistent with the model predictions.

We can further decompose the response of equity markets into a term reflecting the expected path of short rates and a term reflecting changes in term premia. From Eq.(15), the bond price depends on the nominal interest rate, $i_t - r_n$, and the market-implied disaster probability, $\hat{\lambda}_t$. The second term drives the response of term premia. We can then write the interest rate and term premium effect as follows:

$$\int_0^\infty \omega(h) q_{B,t}(h) dh = \underbrace{\int_0^\infty \omega(h)\chi_{B,i}(h)(i_t - \rho) dh}_{\text{interest rate effect}} + \underbrace{\int_0^\infty \omega(h)\chi_{B,\lambda}(h)\hat{\lambda}_t dh}_{\text{term premium effect}}. \tag{16}$$

The green line in Panel (b) shows the term premium effect. On impact, the term premium effect accounts for 63% of the overall response coming from bond yields. Nagel and Xu (2024) estimate that roughly half of the effect from bond yields is from changes in the term premium, in line with our results.

3 An alternative decomposition

To understand the mechanism behind these results, it is instructive to consider an alternative decomposition of the bond and equity market response to monetary policy shocks. The price of a long-term bond can be written as follows:

$$q_{L,0} = -\underbrace{\int_0^\infty e^{-(\rho+\psi_L)t}(i_t - r_n) dt}_{\text{path of nominal interest rates}} - \underbrace{\int_0^\infty e^{-(\rho+\psi_L)t} r_L p_{d,t} dt}_{\text{term premium}}, \tag{17}$$

where $p_{d,t} = \sigma c_{s,t} + \hat{\lambda}_t$ is the *price of disaster risk*, and $r_L = \lambda \left(\frac{C_s}{C_s^*}\right)^\sigma \frac{Q_L - Q_L^*}{Q_L}$ equals the spread between the long-term bond and the short-term interest rate in the stationary equilibrium.

The first term corresponds to the path of nominal interest rates, while the second component corresponds to the term premium. Equity prices satisfy a related expression:

$$q_{E,0} = \underbrace{\frac{Y}{Q_E}\int_0^\infty e^{-\rho t}\hat{\Pi}_t dt}_{\text{dividends}} - \underbrace{\int_0^\infty e^{-\rho t}\left[i_t - \pi_t - r_n + r_E p_{d,t}\right]dt}_{\text{discount rate}}, \tag{18}$$

where $\hat{\Pi}_t$ denotes real profits and $r_E \equiv \lambda\left(\frac{C_s}{C_s^*}\right)^\sigma \frac{Q_E - Q_E^*}{Q_E}$.

The first term captures a cash-flow effect, while the second term captures the effect of discount rates. Notice that changes in $\hat{\lambda}_t$ simultaneously affect bonds and stocks, with each asset having a specific loading. This is in line with the observation that monetary policy shocks lead to a revaluation of a range of risky assets— government bonds, corporate bonds, stocks—, consistent with monetary policy affecting the market price of risk.

Figure 2 shows the result of this decomposition for long-term (non-defaultable) government bonds, (defaultable) corporate bonds, and stocks.[1] This decomposition implies that the bulk of the stock market response is due to changes in the risk premium, in line with the original interpretation of the results in Bernanke and Kuttner (2005). However, as the comparison of Eq.(17) and Eq.(18) makes clear, a similar risk premium effect would be present even in the absence of dividend risk. The risk premium effect in Figure 2 then conflates changes in the compensation for dividend risk and changes in term premia, given the equity claim is also a long-term asset.[2] The decomposition in Eq.(4) separates the two components, showing the importance of changes in term premia.

4 Conclusion

Understanding how asset prices respond to monetary shocks is crucial for understanding the broader monetary transmission mechanism. Empirical evidence points to a strong and simultaneous reaction of asset prices to monetary policy: government bonds (Hanson and Stein, 2015), corporate bonds (Gertler and Karadi, 2015), and equity markets (Bernanke and Kuttner, 2005) all exhibit responses far larger than what is implied by risk-neutral benchmarks. More recently, Nagel and Xu (2024) provide new evidence showing that changes in bond yields—rather than changes in dividend risk—primarily drive the stock market's reaction to monetary shocks.

These empirical facts pose a significant challenge to conventional monetary policy analysis. The workhorse New Keynesian model cannot generate such movements in equity prices or term premia. The findings of Nagel and Xu (2024) further underscore the importance of capturing shifts in term premia. We show that the tractable model of Caramp and Silva (2025) successfully reproduces asset price responses to monetary shocks consistent with the evidence. Importantly, Caramp and Silva (2025) also demonstrate that accounting for the response of asset prices has significant implications for the transmission of monetary policy to the real economy. Taking asset price responses seriously is not just important—it is a necessary next step in advancing monetary policy analysis.

[1] See the discussion in Caramp and Silva (2025) for the pricing of the corporate bonds in this environment.

[2] Given the weights $\omega(h)$, we can compute the Macaulay duration of the stock market, $Dur = \int_0^\infty \omega(h)h dh$. We obtain a duration of 16 years, still lower than the estimates in Van Binsbergen (2020) (between 20 and 60 years), but substantially higher than government bond duration of roughly 5 years (see, e.g., Hall and Sargent 2023).

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