where $z = \frac{G_L - \lambda}{G_H}$ if $0 < \iota \leq \hat{\iota}(\lambda)$ (and $z = 0$ if $\hat{\iota}(\lambda) < \iota < \bar{\iota}(\lambda)$). In this case, for instance, if $\hat{\iota}(\lambda) < \iota < \bar{\iota}(\lambda)$, then $\mathcal{E}_{\varphi|\iota} \to 0$ if $\theta G_L = 0$, and $\mathcal{E}_{\varphi|\iota} \to -1$ if $(1-\theta) G_L = 1$.

To conclude, notice that in the economy with capital accumulation with production technology given by (91), the elasticity of investment with respect to ι is

$$\mathcal{E}_{\mathcal{X}|\iota} = \frac{\sigma}{1-\sigma} \mathcal{E}_{\varphi|\iota}.$$

8 Quantitative analysis

We regard a unit of time as corresponding to one year. The number of outstanding shares is normalized to 1, i.e., $A^s = 1$. The dividend growth rate is independently lognormally distributed over time, with mean .04 and standard deviation .12 per annum (e.g., as documented in Lettau and Ludvigson (2005), Table 1). That is, $y_{t+1} = e^{x_{t+1}} y_t$, with $x_{t+1} \sim \mathcal{N}(g, \Sigma^2)$, where $g = \mathbb{E}(\log y_{t+1} - \log y_t) = .04$ and $\Sigma = SD(\log y_{t+1} - \log y_t) = .12$. Over the sample period 1994-2007, the average nominal policy rate was 4.47% per annum, and the average inflation rate was 2.69% per annum.[31] Thus, we set $\rho^p = .0447$ and $\bar{\pi} \equiv \pi - g = .0269$, implying a real rate of $r = \rho^p - \bar{\pi} = .0178$ per annum.[32] The parameter δ can be taken as a proxy of the riskiness of stocks; we choose $\delta = .075$, i.e., a productive unit has a 92.5 percent probability of remaining productive each year. We set $\lambda = .75$, which implies a margin requirement of 25 percent.[33]

We adopt the formulation $\alpha_{10} \equiv \alpha_s \alpha$ and $\alpha_{11} \equiv \alpha_s (1-\alpha)$, and set $\alpha_s = 1$. The distribution of idiosyncratic valuations, G, is assumed to be lognormal, and we normalize $\bar{\varepsilon} = 1$, i.e., $ln(\varepsilon) \sim \mathcal{N}(-\frac{1}{2}\Sigma_\varepsilon^2, \Sigma_\varepsilon^2)$. The parameters α, θ, and Σ_ε are calibrated so that, given the rest of the parametrization, the model is consistent with the following three facts: (a) the real asset price falls by about 11 basis points in response to a 1 basis point increase in the nominal policy rate, as in the high-frequency empirical estimates in Lagos and Zhang (2019); (b) transaction velocity of money is 25 per day, which is the average daily number of times a dollar turns over

[31] For the policy rate we use the 3-month Eurodollar futures rate (series IEDCS00 produced by the CME Group available via Datastream). The annual average inflation rate is imputed as $[CPI(January\_2008)/CPI(January\_1994)]^{1/14} - 1$, where $CPI(Month\_Year)$ is monthly CPI index available from FRED at https://fred.stlouisfed.org/series/CPIAUCSL.

[32] To streamline the presentation, here we assume r is constant and therefore associate changes in the policy rate ρ^p with changes in π. In Lagos and Zhang (2019), which corresponds to a special case of this model with no credit, i.e., if either $\lambda = 0$ or $\alpha = 1$, we allow for the possibility that when the policy rate changes by $\Delta\rho^p$, the real rate changes by $\Delta r = w \Delta \rho^p$ and the inflation rate changes by $\Delta \pi = (1-w)\Delta\rho^p$, where $w \in [0,1]$ indexes the degree of passthrough from nominal rates to real rates.

[33] As mentioned in Section 2.2, FINRA Rule 4210 requires that a customer maintains a minimum margin of 25% at all times.

in CHIPS (Clearing House Interbank Payments System); and (c) the median spread on margin loans is about 2.3%, i.e., $\rho^l\left(G_h^{-1}(.5)\right) - \rho^m = .023$ with $G_h(\varepsilon) \equiv \frac{G(\varepsilon)-G(\varepsilon_{11}^*)}{1-G(\varepsilon_{11}^*)}$, which is the current spread (over the fed funds rate) that a typical prime broker charges a large investor.[34] This procedure delivers $\alpha = .0406$, $\theta = .1612$, and $\Sigma_\varepsilon = 2.0784$. In Appendix B we assess the robustness of the quantitative results to alternative calibration strategies.

Our quantitative exercises consist of reporting asset price responses to changes in ρ^p for all $(\alpha, \lambda, \theta) \in [0,1]^3$. Specifically, we focus on the semi-elasticity of the asset price, ϕ^s, with respect to the policy rate, ρ^p. Since the value is always negative, we report $\mathcal{S} = \left|\frac{d\phi^s/\phi^s}{d\rho^p}\right|$.

Figure 6 reports $\mathcal{S}$ for economies indexed by $(\alpha, \lambda) \in [0,1] \times \{.50, .75, .90, .99\}$. Our baseline calibration ensures that $\mathcal{S} \approx 11$ for $\lambda = .75$ and $\alpha = .0406$. The main finding is that the response of the asset price to nominal rate shocks remains significant for a wide range of values of λ, and even in the pure-credit limiting economy that obtains as $\alpha \to 0$. For example, the semi-elasticity is even larger than 11 as $\alpha \to 0$ if investors are able to leverage up to 100 times their wealth. Figure 7 reports $\mathcal{S}$ for economies indexed by $(\alpha, \theta) \in [0,1] \times \{.16, .25, .70, .99\}$. Again, the response of the asset price to nominal rate shocks remains significant in the limiting economy as $\alpha \to 0$. For example, as $\alpha \to 0$, the semi-elasticity remains above 4 even if investors are able to capture 70% of the gains in trades intermediated by bond brokers. Figure 8 reports $\mathcal{S}$ for economies indexed by $(\alpha, \rho^p) \in [0,1] \times \{.03, .04, .0447, .05\}$. This exercise shows that for every level of α, the asset price response tends to be larger in environments with a lower background nominal policy rate.

Figures 9, 10, and 11 offer a comprehensive summary of the magnitude of the effects of monetary policy in limiting economies with $\alpha \to 0$. For a wide range of economies indexed by a pair ρ^p and λ, Figure 9 reports the value of $\mathcal{S}$ in the pure-credit limit that obtains as $\alpha \to 0$. The level sets in the right panel show it is not easy to find reasonable parametrizations that imply a value of $\mathcal{S}$ below 5. Figures 10 and 11 tell a similar story. Figure 10, for example, shows that, as predicted by the theory, $\mathcal{S} = 0$ in the pure-credit cashless limit of economies with no credit-market frictions or markups, i.e., economies with $\lambda = \theta = 1$. In contrast, $\mathcal{S}$ is positive and sizable for economies in which is $\theta < 1$, even if $1 - \theta$ is relatively small.

[34] For example, in June 2017, when the effective fed funds rate was about 1.04% per annum, Morgan Stanley's *Margin Interest Rate Schedule* specified an (annualized) interest rate on margin loans of 3.375% for debit balances of $50,000,000 or more. See https://www.morganstanley.com/wealth-disclosures/pdf/Margin_Interest_Rate.pdf.