Expectations and Inelastic Markets

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Abstract

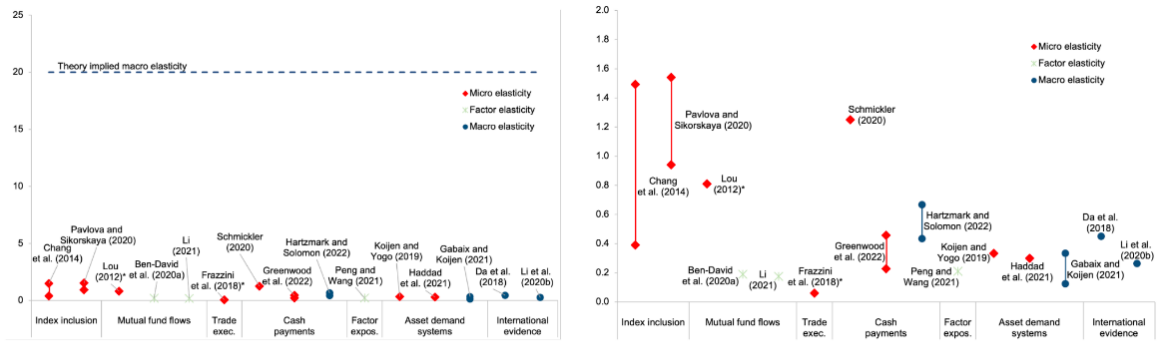
This paper studies how different forms of belief formation contribute to inelastic markets. I start with the observation that, even with a representative agent, price impact need not be the inverse of demand elasticities. Instead, price impact confounds the effect from not only the slope of the demand curve, but also shifts in its intercept. I then study how mislearning from equilibrium prices and mislearning from exogenous fundamentals have different implications for this decomposition. Unlike mislearning from prices, mislearning from fundamentals only affects the intercept of the demand curve, while leaving the slope unchanged. This leads to different predictions regarding the term structures of demand multipliers. Moreover, while mislearning from fundamentals generates trading behavior that is either momentum or contrarian with respect to all lagged returns, mislearning from prices can induce trading behavior that is contrarian with respect to short-run returns and momentum with respect to long-run returns.

1 Introduction

Why are stock prices excessively volatile, while investors' holdings are fairly stable? Recent work on demand-based asset pricing suggests that this may be due to markets being inelastic (Gabaix and Koijen 2022): investors' demand elasticities appear to be too low relative to theory-implied estimates, as shown in Figure 1. Since investors' demands don't respond strongly to shocks, prices must adjust substantially in order to restore market clearing.

Two broad mechanisms can contribute to inelastic demands. The first is a limited pass-through from beliefs to holdings: investors may adjust their portfolios only sluggishly because of fixed-share mandates, adjustment costs, or inertia. The second

Figure 1: Theory-implied macro elasticities and empirical estimates



Source: Gabaix and Koijen (2022)

is limited price-responsiveness of subjective expected returns: if investors' beliefs about future returns move little with prices, there is little reason to rebalance. Recent evidence provides support to both channels. Giglio et al. (2021) show that portfolio adjustments to beliefs are muted relative to frictionless benchmarks, while De La O and Myers (2021) and Nagel and Xu (2023) show that subjective expected returns are fairly stable over time. The economic mechanism behind these findings, however, remains unclear.

This paper clarifies the empirical and theoretical objects being compared, and studies the role of beliefs in shaping both of these channels.

We show that part of the gap between theory and evidence reflects a mismatch between the theoretical and empirical objects being compared. In particular, demand elasticity is not, in general, the inverse of the price multiplier: the latter reflects not only movements along the demand curve, but also shifts in the intercept. Once we account for this distinction, the theory-implied elasticity moves closer to its empirical counterpart, but that is not enough to close the gap entirely.

We then study the role of beliefs in generating inelastic demand by weakening the pass-through from beliefs to actions, or by making expected returns less responsive to prices. Starting with the first channel, we show that under standard CARA demand, inattention or inertia alone do not generate low demand elasticities unless investors hold implausibly high expected returns. To generate meaningful inelasticity through this channel, one needs a demand specification that breaks the proportionality between holdings and expected returns.

Turning to the second channel, we first show that the demand elasticity emphasized in much of the existing literature can be interpreted as arising in a competitive equilibrium

in which investors have rational expectations about exogenous fundamentals but do not learn from prices. In contrast, the elasticity changes in a rational-expectations equilibrium with learning from prices. By connecting the demand-based asset pricing literature to concepts in the information economics literature, this distinction allows us to compare two broad classes of biased beliefs: mislearning from exogenous fundamentals and mislearning from prices.

We show that these two forms of mislearning have different implications for inelastic markets. Mislearning from exogenous fundamentals shifts the intercept of investors' demand curves, but leaves their slope—and therefore the demand elasticity—unchanged. By contrast, mislearning from prices changes both the intercept and the slope of demand, and can therefore generate both excess volatility and inelastic markets.

Moreover, these two forms of mislearning yield different dynamic predictions. Under mislearning from exogenous fundamentals, price multipliers at different horizons decay at the same rate as fundamentals. Instead, under mislearning from prices, multipliers are more persistent and can even be hump-shaped. Therefore, while the static price impact is not enough to distinguish between the two mechanisms (as both forms of mislearning can lead to excess volatility), studying its dynamics can be informative.

Finally, these two classes of biases yield distinct predictions for trading behavior. Under fundamental extrapolation, trading has the same sign across horizons: if investors are contrarian with respect to short-run returns, they are also contrarian with respect to long-run returns. Under price extrapolation, by contrast, investors can be contrarian with respect to short-run returns but momentum with respect to long-run returns. Testing these patterns would help identify both the source of inelasticity and the way investors form beliefs.

This paper combines and contributes to three literatures. First, it contributes to the debate on the drivers of inelastic markets, and draws a distinction between components of the price multiplier arising from either the slope or the intercept of demand curves (Bastianello and Fontanier 2025, Haddad et al. 2025, He et al. 2026, van Binsbergen et al. 2026). Second, it connects this literature to a long-standing body of work in information economics (Grossman 1976, Diamond and Verrecchia 1981), by emphasizing that the slope of the demand curve has different components under a competitive equilibrium (with no learning from prices) and under a rational expectations equilibrium (with learning from prices). Third, it studies how biased beliefs may contribute to inelastic

markets (Bastianello and Fontanier 2025, Bastianello and Fontanier 2026, Chaudhry 2025). While extrapolating fundamentals and extrapolating prices can both impact the price multiplier, and contribute to excess volatility, they have very different implications for demand elasticities, the term structure of price multipliers, and investors' trading behavior.

The paper proceeds as follows. Section 2 starts by decomposing demand elasticities in the pass-through of beliefs to holdings, and the semi-elasticity of expected returns with respect to prices. Section 3 revisits the rational benchmark and draws a distinction between demand elasticities and price multipliers. Section 4 studies how biased expectations can contribute to inelastic markets, and contrasts mislearning from exogenous fundamentals with mislearning from prices. Section 5 derives the dynamic implications of these two mechanisms. Section 6 studies their predictions for trading behavior across horizons. Section 7 concludes.

2 Theory Implied Macro Elasticity

To provide intuition and structure for the mechanisms we explore, we start from a simple setting that highlights the key components of the model and motivates the role of expectations in understanding inelastic markets.

Assume that investors have CARA utility over next period wealth, and that they solve a portfolio choice problem between a risky and a risk-free asset. The risk-free asset is in perfectly elastic supply, and we normalize its price and rate of return to 1. The risky asset is also in zero-net supply, and it pays off a dividend D_t per share in each period t. We let P_t be the price of the risky asset, and Q_{it} be the number of shares held by agent i. Standard optimization then leads to the following demand function for agent i:

$$Q_{it} = \frac{\pi_{it}}{A\mathbb{V}P_t} \implies q_{it} = -p_t + \log(\pi_{it}) - \log(A\mathbb{V}) \tag{1}$$

where $\pi_{it} \equiv \frac{\mathbb{E}_t^i[D_{t+1}+P_{t+1}]-P_t}{P_t}$ is investor i's expected return at time t, $\mathbb{V}$ is the variance of returns (which we assume to be constant over time and across individuals), and A is the coefficient of absolute risk aversion. Lower case letters represent logs of the corresponding upper case variable.

Taking the derivative of the expression in (1), and assuming that $A\mathbb{V}$ is constant over

time, we can write the demand elasticity as:

$$-\frac{\partial q_{it}}{\partial p_t} = 1 - \left(\frac{\partial q_{it}}{\partial \pi_{it}}\right) \times \left(\frac{\partial \pi_{it}}{\partial p_t}\right) \tag{2}$$

This decomposition highlights two reasons why demand elasticities may be low. The first term captures the semi-elasticity of holdings with respect to expected returns, while the second term captures the semi-elasticity of expected returns with respect to prices (Gabaix and Koijen 2022, Davis et al. 2025). In other words, demand elasticities in this simple framework are low either because the pass-through from beliefs to actions is low, or because expected returns are not very responsive to changes in prices. In what follows we discuss each component in turn.

2.1 Low Pass-through from Beliefs to Holdings

In this section we focus on the first term in (2): the pass-through of beliefs to holdings.

CARA Utiliy. Under CARA utility, the demand for the risky asset is proportional to expected returns. Taking the derivative of (1), the semi-elasticity of demand with respect to changes in expected returns is given by:

$$\frac{\partial q_{it}}{\partial \pi_{it}} = \frac{1}{\pi_{it}} \tag{3}$$

Therefore, the only way for this channel to contribute to low demand elasticity is for investors to have implausibly high expected returns. Empirically, this doesn't seem to be the case, as investors' expected returns are in the right ballpark, on average.

Contrary to what argues in prior work, under CARA utility, a low pass-through from beliefs to holdings in *levels* does not generate a low *elasticity* of demand without implying implausibly high expected returns. For example, Giglio et al. (2021) show that the sensitivity of portfolios to expectations in levels appears muted relative to a frictionless portfolio choice model. They document this by estimating the following pass-through in levels:

$$\frac{Q_{it}P_t}{W_t} = \frac{\pi_{it}}{\gamma \mathbb{V}} \implies \frac{\partial\left(\frac{Q_{it}P_t}{W_t}\right)}{\partial \pi_{it}} = \frac{1}{\gamma \mathbb{V}} \tag{4}$$

where W_{it} is agent i's wealth at time t, and $\gamma \equiv W_{it}A$ is the coefficient of relative risk aversion. However, comparing (3) to (4) makes clear that these are two very distinct objects. In fact, the variance component is totally absent in the semi-elasticity of demand with respect to changes in expected returns, as this term becomes additive in (1) once we take logs.[1] Therefore, under CARA utility, a low pass-through in levels does *not* contribute to a low elasticity of demand.

Remark 1. *Under the traditional CARA utility framework, a low pass-through from beliefs to holdings in levels does not contribute to a low elasticity of demand.*

For a limited pass-through to generate meaningful inelasticity without requiring implausibly high expected returns, we need to consider alternative utility specifications that break the proportionality between holdings and expected returns.[2]

Additive Demand. One way to achieve a limited pass-through both in levels and in the semi-elasticity under consideration is to model investors' asset demands as follows:

$$Q_{it} = (1-\alpha)\theta + \alpha\left(\frac{\pi_{it}}{P_t A \mathbb{V}}\right) \tag{6}$$

where $0 < \alpha < 1$ implies a low pass-through in levels, and the additive nature of the demand function now allows this to also affect the demand elasticity. This specification nests fixed mandates with $\alpha = 0$, and captures inattention to expected returns or fixed adjustment costs when $0 < \alpha < 1$ (the lower α is, the more inattentive investors are).

A more general representation of this specification is given by:

$$Q_{it} = \theta + \kappa\pi_{it} \tag{7}$$

The pass-through in levels, and the semi elasticity of demand with respect to expected

[1] By taking logs, the expression in (1) clearly shows how the pass-through of expected returns to the equity share enters additively, and therefore does not influence the semi-elasticity of demand with respect to expected returns.

[2] For example, even modeling inertia by multiplying expected returns by a factor $0 < \theta < 1$ (as in some models of inattention) will limit the pass-through from beliefs to actions in levels, but cannot impact demand elasticities without also predicting implausibly high expected returns in equilibrium:

$$Q_{it} = \frac{\theta\pi_{it}}{P_t A \mathbb{V}} \implies q_{it} = \log(\theta) + \log(\pi_{it}) - p_t - \log(A\mathbb{V}) \implies \frac{\partial q_{it}}{\partial \pi_{it}} = \frac{1}{\pi_{it}} \tag{5}$$

returns are then given by:

$$\frac{\partial Q_{it}}{\partial \pi_{it}} = \kappa \qquad \text{and} \qquad \frac{\partial q_{it}}{\partial \mathbb{E}[R_{it}]} = \frac{1}{\frac{\theta}{\kappa} + \mathbb{E}[R_{it}]} \tag{8}$$

so that a higher θ and a lower κ both contribute to more inelastic markets. A higher θ increases the fraction of demand that comes from the fixed mandate, which is the inelastic part of the demand function. A lower κ reduces the responsiveness of holdings to expected returns, which now also contributes to more inelastic demand.

A downside of this approach is that this demand function is less tractable when working in logs.

Gabaix and Koijen (2024). An alternative asset demand function, which is tractable in logs is the one used in Gabaix and Koijen (2022):

$$Q_{it} = \theta \exp(\kappa \pi_{it}) \tag{9}$$

where $\kappa = 0$ nests fixed mandates, and $0 < \kappa < 1$ may capture inertia or adjustment costs. One of the advantages of this type of utility function is that log holdings are then linear in expected returns.

Given this demand function, the pass-through in levels, and the semi-elasticity of demand with respect to expected returns are then given by:

$$\frac{\partial Q_{it}}{\partial \pi_{it}} = \kappa Q_{it} \qquad \text{and} \qquad \frac{\partial q_{it}}{\partial \pi_{it}} = \kappa \tag{10}$$

The lower κ is, the less responsive are holdings to expected returns, and the lower the semi-elasticity of holdings, therefore also contributing to more inelastic markets.

Remark 2. *The limited pass-through of beliefs to actions depends on the functional form of the chosen demand function. CARA utility is unable to deliver a limited semi-elasticity of holdings to expected returns without also predicting implausibly high levels of expected returns. Alternative demand functions are necessary to accommodate this channel.*

2.2 Limited Variation in Expected Returns

The expression in (2) shows that there is a second channel that may contribute to more inelastic markets, and that is via a low elasticity of expected returns with respect to prices. In the limit where investors' expected returns are constant, holdings are also constant. Empirically, De La O and Myers (2021) and Nagel and Xu (2023) show that investors' expected returns are fairly stable over time, meaning that this second channel may be meaningful.

To make progress, Appendix A.1 shows that we can linearize expected returns around the steady state (with zero growth) to obtain the following expression:

$$1 + \pi_{it} \approx (1 + \delta) - (1 + \delta)p_t + (\mathbb{E}_t[\delta d_{t+1} + p_{t+1}]) \tag{11}$$

where δ is the average (steady-state) dividend-price ratio. The first term on the right hand side of (11) captures the average expected return, the second term captures how expected returns decrease as the asset becomes more expensive, and the third term captures how expected returns are increasing in investors' expectations of future payoffs.

We can then write the semi-elasticity of expected returns to changes in prices as:

$$\frac{\partial \pi_{it}}{\partial p_t} = -(1 + \delta) + \frac{\partial \mathbb{E}_t[\delta d_{t+1} + p_{t+1}]}{\partial p_t} \tag{12}$$

This expression has two components. The first component captures how higher prices make the asset more expensive, which decreases expected returns. The second component captures the possibility than when the price increases, it may be informative of changes in future payoffs as well. While the influence of the first component in (12) is somewhat limited (as investors' average expected returns are in the right ball-park), the second component can have significant impact, as further illustrated by the following calibration.

To illustrate the relevance for demand elasticities of the second component in (12), we consider two calibrations that make starkly different assumptions. The theory implied estimate of the macro elasticity in Figure 1 is obtained by assuming that changes in prices leave expected future payoffs unchanged. Alternatively, one might think of this as capturing how responsive holdings are to completely transitory shocks. Setting

$\frac{\partial \mathbb{E}_t[\delta d_{t+1}+p_{t+1}]}{\partial p_t} = 0$, and using $\delta = 3.7\%$ and $\pi = 4.4\%$, yields:

$$-\frac{\partial q_{it}}{\partial p_t}\Big|_{\text{“}Theory\text{”}} = 1 + \frac{1 + 0.037}{0.044} \approx 25 \tag{13}$$

On the other hand, empirical estimates often consider changes in holdings with respect to completely permanent shocks (e.g., index inclusion), where $\frac{\partial \mathbb{E}_t[\delta d_{t+1}+\Delta p_{t+1}]}{\partial p_t} = 0$. The equivalent theoretical counterpart then translates into a much lower demand elasticity:

$$-\frac{\partial q_{it}}{\partial p_t}\Big|_{\text{“}GK\text{”}} = 1 + \frac{0.037}{0.044} \approx 1.8 \tag{14}$$

When this is the case, the theoretical demand elasticity is lower than what we would observe for a fully transient shock. Intuitively, investors respond more strongly when faced with a purely transitory change in prices than when faced with a completely permanent change in prices.

This discussion highlights two point. First, it is important to define what we are targeting with theory implied estimates of demand elasticities. Allowing for current prices to affect expectations of future payoffs can significantly lower theory-implied demand elasticities. Second, neither notion of demand elasticity is able to fully close the gap between theory and empirical estimates. While (14) is an order of magnitude closer to its empirical counterpart, the obtained value is still higher than the empirically estimated 0.2. The rest of this paper addresses both these points.

3 Rational Benchmark: GK Revisited

To study the determinants of demand elasticities, we revisit the more general demand function in Gabaix and Koijen (2022), we draw a distinction between demand elasticities and demand multipliers, and we highlight the assumptions embedded in the rational benchmark.

Assume that investors trade according to the following linearized asset demand function:

$$q_{it} = -(1-\theta)p_t + \kappa\hat{\pi}_{it} + f_{it} \tag{15}$$

where $\hat{\pi}_{it}$ captures linearized changes in expected returns:

$$\hat{\pi}_{it} = -(1+\delta)p_t + \mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] \tag{16}$$

As well as being tractable, this demand function nests alternative frameworks.

Example 1 (CARA Demand Function.)**.** *Appendix A.2 shows how* (15) *nests a linearized CARA demand function with* $\kappa = \frac{1}{\delta}$ *and* $\theta = 0$*.*

Example 2 (Gabaix and Koijen Demand Function.)**.** *The expression in* (15) *is the same the demand function used in Gabaix and Koijen (2022), where* $\frac{P_t Q_{it}}{W_{it}} = \theta \exp(\kappa \hat{\pi}_{it})$*.*

Combining the two expression in (15) and (16), we have that:

$$q_{it} = -\left(1 - \theta + \kappa(1+\delta)\right) p_t + \kappa \mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] + f_{it} \tag{17}$$

Given this demand curve, we define a theoretical demand elasticity as the *slope* of this demand curve:

$$\zeta_i \equiv -\frac{\partial q_{it}}{\partial p_t} = (1 - \theta + \kappa(1+\delta)) - \kappa \left(\frac{\partial \mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}]}{\partial p_t} \right) \tag{18}$$

If expectations of future payoffs *do not causally depend on the current price*, then the slope of this demand curve is given by: $\zeta = 1 - \theta + \kappa(1+\delta)$. This illustrates that demands are more elastic when the fixed-share mandate θ is lower, and when the pass-through from beliefs to actions κ is higher. This is the quantity that has traditionally been used to derive the theory-implied elasticity in Figure 1. However, if expectations of future payoffs are *causally influenced by current prices* (e.g. due to learning from prices), then the second term in (18) is non-zero, and the demand elasticity will have an additional term. In what follows, we explore how this distinction influences both elasticities and multipliers, on impact and dynamically.

Studying the second term in (18) requires us to take a stance on how people form expectations. We start from the rational benchmark, and show how it is useful to distinguish between two concepts from the literature in information economics: the competitive equilibrium (CE), where investors do not learn information from prices, and the rational expectations equilibrium (REE), where investors learn from prices. We then consider departures from rationality across both benchmarks. In doing so, we highlight

the key assumptions embedded in the rational benchamrk.

3.1 Competitive Equilibrium

We start by deriving expected future payoffs under the "Competitive Equilibrium (CE)," where investors have rational expectations but do not learn fundamental information from prices.

Assume that all agents $i \in \mathcal{I}$ have rational expectations, and that agents form expectations about expected returns using accounting identities. Using (17), imposing market clearing ($\int_{\mathcal{I}} q_{it} d_i = 0$), solving for the equilibrium price, and iterating forward, we obtain that:

$$p_t = \sum_{\tau=0}^{\infty} \left(\frac{\kappa}{1 - \theta + \kappa(1+\delta)} \right)^{\tau+1} \left(\delta \mathbb{E}_t[d_{t+\tau+1}] + \frac{\mathbb{E}_t[f_{t+\tau}]}{\kappa} \right) \tag{19}$$

where $f_{t+\tau} \equiv \int_{\mathcal{I}} f_{i,t+\tau} di$.

Assumption 1. *Investors understand market clearing, form expectations using accounting identities, and have rational expectations.*

If the above assumption holds, then:

$$\mathbb{E}_t[p_{t+1} + \delta d_{t+1}] = \frac{1}{\kappa} \sum_{\tau=0}^{\infty} \left(\frac{\kappa}{1 - \theta + \kappa(1+\delta)} \right)^{\tau+1} (\kappa\delta \mathbb{E}_t[d_{t+\tau+2}] + \mathbb{E}_t[f_{t+1+\tau}]) + \frac{\kappa\delta}{\kappa} \mathbb{E}_t[d_{t+1}] \tag{20}$$

To make further progress, we need to make assumptions about the underlying process of fundamentals, as well as investors' perception of how fundamentals evolve over time. Assume that both d_t and f_t evolve according to the following AR(1) processes, and that investors know these data generating processes:

$$f_t = (1 - \phi_f) f_{t-1} + \epsilon_t \quad \text{and} \quad d_t = (1 - \phi_d) d_{t-1} + \nu_t \tag{21}$$

Assumption 2. *Investors know the process for the evolution of exogenous fundamentals and flows. In this case, they also know flows are uninformative about fundamentals.*

If the above assumption also holds, then:

$$\mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] = \frac{\delta(1-\phi_d)d_t}{1-\left(\frac{\kappa(1-\phi_d)}{1-\theta+\kappa(1+\delta)}\right)} + \frac{\frac{(1-\phi_f)}{1-\theta+\kappa(1+\delta)}f_t}{1-\left(\frac{\kappa(1-\phi_f)}{1-\theta+\kappa(1+\delta)}\right)} \tag{22}$$

This expression highlights how expectations of future payoffs depend on investors' beliefs about exogenous fundamentals. Substituting this into (17), we then obtain that traders have the following demand function:

$$q_{it} = -\underbrace{(1-\theta+\kappa(1+\delta))}_{\text{slope}}p_t + \underbrace{\frac{\kappa\delta(1-\phi_d)d_t}{1-\left(\frac{\kappa(1-\phi_d)}{1-\theta+\kappa(1+\delta)}\right)} + \frac{\frac{\kappa(1-\phi_f)}{1-\theta+\kappa(1+\delta)}f_t}{1-\left(\frac{\kappa(1-\phi_f)}{1-\theta+\kappa(1+\delta)}\right)} + f_{it}}_{\text{intercept}} \tag{23}$$

Imposing market clearing, $\int_{\mathcal{I}} q_{it}di = 0$, and using $\int_{\mathcal{I}} f_{it}di = f_t$, we obtain the following expression for equilibrium prices:

$$p_t = \left(\frac{\kappa(1-\phi_d)}{(1-\theta+\kappa(1+\delta)) - \kappa(1-\phi_d)}\right)\delta d_t + \left(\frac{1}{(1-\theta+\kappa(1+\delta)) - \kappa(1-\phi_f)}\right)f_t \tag{24}$$

3.1.1 Demand Elasticity vs. Demand Multiplier: Slope vs. Intercept

Under the competitive equilibrium with rational expectations, we can write the demand elasticity and the price multiplier as:

$$\text{Demand Elasticity}: \quad -\frac{\partial q_{it}}{\partial p_t} = 1-\theta+\kappa(1+\delta) = \zeta^{GK} + \kappa \equiv \zeta \tag{25}$$

$$\text{Price Impact/Multiplier}: \quad \frac{\partial p_t}{\partial f_t} = \frac{1}{\zeta - \kappa(1-\phi_f)} \equiv M(\phi_f) \tag{26}$$

where $\zeta^{GK} \equiv 1-\theta+\kappa\delta$ is the definition of demand elasticity used in Gabaix and Koijen (2022). There are two points worth emphasizing at this stage.

First, the demand elasticity does *not* capture the equilibrium response of quantities to changes in prices induced by changes in aggregate flows.[3] Rather, the demand elasticity is a partial equilibrium object which captures how much quantities would adjust due to an off-equilibrium change in prices, while keeping fundamentals constant.[4] This is in

[3] This would instead be given by: $\frac{\partial q_{it}}{\partial f_t} = -1$.

[4] In equilibrium, investor i's demand curve is simply given by: $q_{it} = f_{it} - f_t$. So in equilibrium, investors' absorb exogenous flow shocks, while they are unresponsive to changes in fundamentals, which

contrast to the price impact, which is instead an equilibrium object.

Remark 3. *The demand elasticity captures how much quantities would adjust due to an off-equilibrium change in prices. Instead, the price multiplier is an equilibrium quantity.*

Second, there are two special cases of the expressions in (25) and (26) that are interesting to explore. We can start by considering the case with completely transitory flows: $\phi_f = 1$. When this is the case $M(\phi_f = 1) = \frac{1}{\zeta}$, which reflects that our definition of demand elasticity captures the response of holdings to changes in pricing, while holding expected future payoffs constant. Second, we can consider a completely permanent flow: $\phi_f = 0$. When this is the case, $M(\phi_f = 0) = \frac{1}{\zeta^{GK}}$, which illustrates that GK's definition of "demand elasticity" corresponds to the inverse of the price impact for a fully permanent change in flows. As already discussed in Section 2, these two quantities can differ substantially.

Remark 4. *The slope of the demand curve is equal to the inverse of the price impact when flows are completely transitory, such that expected future payoffs are held constant. Instead, the definition of demand elasticity considered in Gabaix and Koijen (2024) is equal to the inverse of the price impact when flows are completely permanent. The latter need not correspond to the slope of agents' demand curves.*

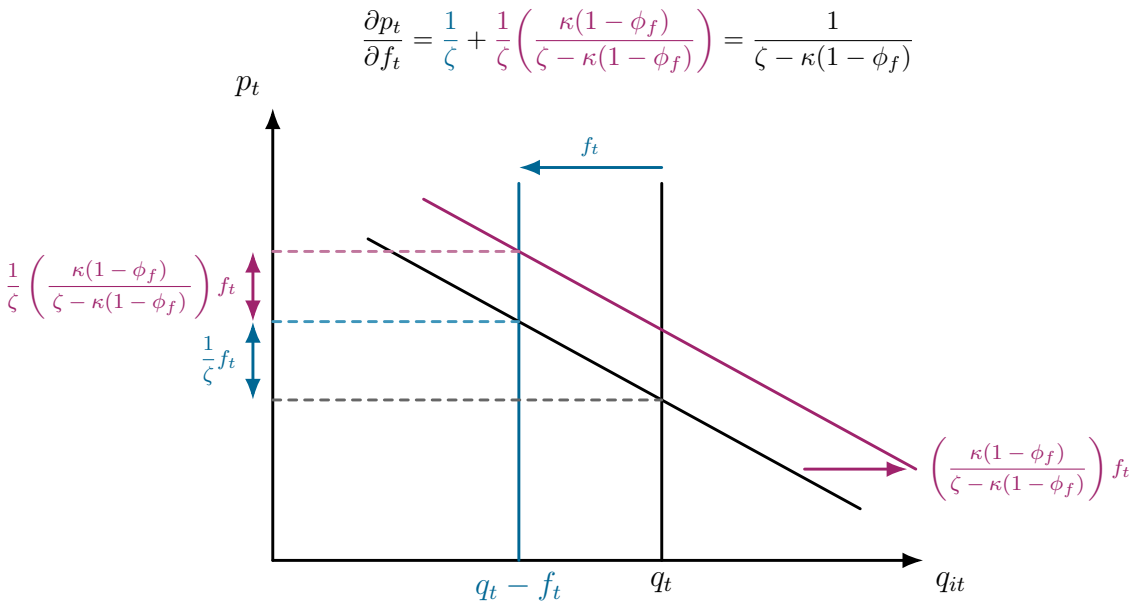
Moving away from these two corner cases, the expressions in (25) and (26) clearly illustrate that the demand elasticity is generally not equal to the inverse of the price impact. Importantly, this discrepancy is driven by the fact that the price impact confounds two effects: movements along the slope of the demand curve, and shifts in its intercept, as illustrated graphically in Figure 2.

Remark 5. *Unless flows are completely transitory, the price impact is* not *equivalent to the inverse of the demand elasticity ζ. The reason for this discrepancy is due to the fact that the price impact confounds the effect of movements along the slope and changes in the intercept of the demand curve.*

When we distinguish between the slope and the intercept of the demand curve, the demand elasticity is fixed, even when the short-run and long-run multipliers vary.

are correctly incorporated into prices, leaving expected returns unchanged.

Figure 2: Demand Multiplier – slope vs. intercept.



Given the above expressions, we can write the short-run demand multiplier as:

$$\frac{\partial p_t}{\partial f_t} = \frac{1}{\zeta - \kappa(1-\phi_f)} \tag{27}$$

while the long-run demand multiplier is given by:

$$\frac{\partial p_{t+s}}{\partial f_t} = \frac{(1-\phi_f)^s}{\zeta - \kappa(1-\phi_f)} \propto \frac{\partial f_{t+s}}{\partial f_t} \tag{28}$$

If the shock is transitory, the long-run multiplier is smaller than the short-run multiplier, and it decays at exactly the same rate as exogenous changes in flows. Importantly, the slope of the demand curve (and therefore the demand elasticity) remains constant throughout, and the declining multiplier simply reflects gradually smaller shifts in the intercepts induced by the fading flow shocks.

Remark 6. *Under rational expectations, the short-run multiplier is larger than the long-run multiplier. Specifically, the price multiplier decays over time at the same rate as exogenous changes in flows. This reflects gradual shifts in the intercept of the demand curve, while the slope of the demand curve remains constant throughout.*

3.2 Rational Expectations Equilibrium

So far we have assumed that investors' expectations of future payoffs are not directly or causally influenced by contemporaneous changes in prices. In what follows we consider how demand elasticities and multipliers change once we consider the "Rational Expectations Equilibrium (REE)," where investors have rational expectations and also learn fundamental information from prices.

To solve for the rational expectations equilibrium, we proceed in two steps. First, we specify what mapping traders use to learn information from prices. Second, we study the properties of traders' demand functions when they do so.

Under rational expectations, traders learn from prices using the true market clearing price function (in other words, they use the right mapping to learn information from prices). In equilibrium, prices are given by:

$$p_t = \frac{\kappa}{\zeta}\mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] + \frac{1}{\zeta}f_t \tag{29}$$

Inverting this price function to determine market participants' expectations of future payoffs yields:

$$\mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] = \frac{\zeta}{\kappa}p_t - \frac{1}{\kappa}f_t \tag{30}$$

If traders live in a rational world, and there is common knowledge of rationality, then traders effectively believe that prices always aggregate information correctly, and efficiently. Substituting these expectations in their demand function, we obtain:

$$q_{it} = -\zeta p_t + \kappa\mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] + f_{it} = f_{it} - f_t \tag{31}$$

This expression makes clear that traders' demand functions in these instances are insen-

sitive to price changes.[5] Formally:

$$\frac{\partial q_{it}}{\partial p_t} = -\zeta + \kappa \frac{\partial \mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}]}{\partial p_t} = -\zeta + \kappa \left(\frac{\zeta}{\kappa}\right) = 0 \tag{32}$$

Remark 7. *When prices are fully revealing and there is common knowledge of rational expectations, investors' demand functions are perfectly inelastic.*

Since traders think prices are always right, they are willing to absorb any changes in aggregate flows, and are completely unresponsive to changes in prices. Formally, there are two competing forces at play. First, prices have their standard role as a measure of scarcity: when the asset becomes more expensive, traders wish to hold less of it. Second, when investors learn from prices, prices have an additional informational role: when the asset price increases, investors attribute this to positive fundamental news, which induces them to want to hold more of the asset. Under the rational expectations equilibrium, these forces perfectly cancel out, leading to perfectly inelastic demand curves.

4 Biased Expectations

So far, we have worked under the assumptions that investors hold rational expectations. Section 3 showed how this required that agents have rational expectations about exogenous fundamentals, that they fully understand market clearing, and that they form expectations respecting accounting identities. In what follows, we relax these assumptions, and study the different implications of mislearning from exogenous fundamentals versus mislearning from equilibrium prices.

4.1 Mislearning from Exogenous Fundamentals

To study mislearning from exogenous fundamentals, we relax Assumption 1 (while maintaining no learning from prices), and instead assume that traders believe that investors

[5]Notice that in this case, the price impact is the same under both the competitive equilibrium and the rational expectations equilibrium. The reason for this is twofold. First, the information structure is such that investors have the same beliefs about expected future payoffs, either because they knew fundamental information (CE), or because they learned it from prices (REE). This would no longer be true if we kept the information structure consistent across the two scenarios (e.g., assuming that investors receive a noisy signal about fundamentals, and they either do or don't learn information from prices). Second, the linearized demand function we are considering leaves any changes in confidence levels (e.g., changes in the variance of expected returns) implicitly unchanged. This can also be relaxed.

misperceive the persistence of the process that drives flows and dividends, as follows:

$$f_t = (1-\tilde{\phi}_f)f_{t-1} + e_t \quad \text{and} \quad d_t = (1-\tilde{\phi}_d)d_{t-1} + u_t \tag{33}$$

where $(1-\tilde{\phi}_d)$ and $(1-\tilde{\phi}_f)$ are investors' perceptions of the persistence of flows and fundamentals, respectively. We can then re-write the demand function in (23) as:

$$q_{it} = -\underbrace{(1-\theta+\kappa(1+\delta))}_{\text{slope}}p_t + \underbrace{\frac{\kappa\delta(1-\tilde{\phi}_d)d_t}{1-\left(\frac{\kappa(1-\tilde{\phi}_d)}{1-\theta+\kappa(1+\delta)}\right)} + \frac{\frac{\kappa(1-\tilde{\phi}_f)}{1-\theta+\kappa(1+\delta)}f_t}{1-\left(\frac{\kappa(1-\tilde{\phi}_f)}{1-\theta+\kappa(1+\delta)}\right)} + f_{it}}_{\text{intercept}} \tag{34}$$

The demand elasticity and the demand multiplier can then be written as:

$$\text{Demand Elasticity}: \quad -\frac{\partial q_{it}}{\partial p_t} = 1-\theta+\kappa(1+\delta) = \zeta^{GK}+\kappa \equiv \zeta \tag{35}$$

$$\text{Price Impact/Multiplier}: \quad \frac{\partial p_t}{\partial f_t} = \frac{1}{\zeta-\kappa(1-\tilde{\phi}_f)} \equiv M(\tilde{\phi}_f) \tag{36}$$

These expressions make clear how mislearning from exogenous fundamentals changes the intercept of the demand curve, but not its slope. Therefore, mislearning from fundamentals affects the price multiplier, even though the demand elasticity is unaffected by this bias. Specifically, over-extrapolating flows ($\tilde{\phi}_f < \phi_f$) induces a greater shift in the demand curve, and to a greater price impact than under the rational benchmark. Therefore, over-extrapolating fundamentals can contribute to excess volatility, but leaves the evidence on inelastic markets unexplained.

Remark 8. *Mislearning from exogenous fundamentals influences price impact (and the multiplier) but does not affect agents' demand elasticities. This is because it shifts the intercept but not the slope of investors' demand curves.*

4.2 Mislearning from Prices

Next, we introduce mislearning from prices, and show how it differs from mislearning from exogenous fundamentals (Bastianello and Fontanier 2023). Specifically, we assume that instead of learning information from prices using the mapping in (30), traders use

the following mapping to learn information from prices:

$$\mathbb{E}_{it}[p_{t+1} + \delta d_{t+1}] = \alpha p_t - \beta f_t \tag{37}$$

where $\alpha = \frac{\zeta}{\kappa}$ and $\beta = \frac{1}{\kappa}$ nests the rational expectations benchmark in (30).[6] We can then rewrite traders' demand curves as:

$$q_{it} = -\zeta p_t + \kappa\left(\alpha p_t - \beta f_t\right) + f_{it} \tag{38}$$

$$= -\underbrace{\left(\zeta - \kappa\alpha\right)}_{\text{slope}} p_t + \underbrace{\left(f_{it} - \kappa\beta f_t\right)}_{\text{intercept}} \tag{39}$$

The demand elasticity and the demand multiplier can then be written as:

$$\text{Demand Elasticity}: \quad -\frac{\partial q_{it}}{\partial p_t} = 1 - \theta + \kappa(1 + \delta - \alpha) = \zeta - \kappa\alpha \tag{40}$$

$$\text{Price Impact/Multiplier}: \quad \frac{\partial p_t}{\partial f_t} = \frac{1 - \kappa\beta}{\zeta - \kappa\alpha} \tag{41}$$

Unlike mislearning from fundamentals, mislearning from prices influences not only the intercept but also the slope of investors' demand curves: the more strongly traders condition on prices, the more inelastic will markets be. Under rational expectations, $\alpha = \frac{\zeta}{\kappa}$, $\beta = \frac{1}{\kappa}$, demand curves are perfectly inelastic.[7] If $\alpha < \frac{\zeta}{\kappa}$, traders think that prices are more responsive to changes in fundamentals than they are in reality. This leads them to underreact to fundamental information, contributing to downward sloping demand curves. If instead $\alpha > \frac{\zeta}{\kappa}$, then traders think that prices are less responsive to information than they are in reality. This leads them to overreact to fundamental information, which translates into upwards sloping demand curves.

Remark 9. *Mislearning from prices affects both the multiplier and demand elasticity, as it alters both the intercept and the slope of investors' demand curves.*

[6] We take this as our starting point as it is the simplest possible functional form that nests the rational expectations equilibrium benchmark.

[7] Under rational expectations, the equilibrium price is obtained by iterating (37) forward, as beliefs are consistent with market outcomes.

5 Dynamics and Term Structure

In this section we show how more dynamic forms of learning may allow us to further distinguish the two classes of biases we have considered to far. Specifically, we consider two forms of extrapolative beliefs: extrapolation from past fundamentals, and extrapolation from past prices. To simplify notation, we assume that $\mathbb{E}_t[d_{t+1}] = 0$, such that expected future payoffs are pinned down by traders' expectations of future prices: $\mathbb{E}_t[p_{t+1} + \delta d_{t+1}] = \mathbb{E}_t[p_{t+1}]$.

5.1 Extrapolating Fundamentals

Suppose that traders believe that *flows* evolve according to:[8]

$$f_{t+1} = \theta_0 f_t + \theta_1 f_{t-1} + e_{t+1} \tag{42}$$

where $e_{t+1} \sim^{iid} N(0, \sigma_e^2)$, and θ_0, θ_1 parameterize extrapolative beliefs. This nests the rational benchmark when $\theta_0 = 1 - \phi_f$ and $\theta_1 = 0$. We continue to assume that $E_t[d_{t+1}] = 0$, so that expected future payoffs are pinned down by expectations of future prices.

We can then form expectations of future payoffs by iterating forward the market clearing condition and using (42):

$$E_t[p_{t+1}] = \left(\frac{\theta_0 + \frac{\kappa\theta_1}{\zeta}}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_t + \left(\frac{\theta_1}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_{t-1}. \tag{44}$$

We can then rewrite traders' demand curves as:

$$q_{it} = -\zeta p_t + \kappa \left[\left(\frac{\theta_0 + \frac{\kappa\theta_1}{\zeta}}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_t + \left(\frac{\theta_1}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_{t-1} \right] + f_{it}. \tag{45}$$

Market clearing then yields:

$$p_t = \left(\frac{1}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_t + \left(\frac{\kappa\theta_1/\zeta}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \right) f_{t-1}. \tag{46}$$

[8] We chose this expression to study extrapolation in the simplest possible setting that nested the rational expectations benchmark. This easily be generalized, for example by including further lags.

The demand elasticity and the demand multiplier can then be written as:

$$\text{Demand Elasticity}: \quad -\frac{\partial q_{it}}{\partial p_t} = \zeta \tag{47}$$

$$\text{Price Impact/Multiplier}: \quad \frac{\partial p_t}{\partial f_t} = \frac{1}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}} \tag{48}$$

$$\text{Dynamic Multiplier}: \quad \frac{\partial p_{t+h}}{\partial f_t} = (1-\phi_f)^{h-1}\left(\frac{1-\phi_f+\frac{\kappa\theta_1}{\zeta}}{\zeta - \kappa\theta_0 - \frac{\kappa^2\theta_1}{\zeta}}\right). \tag{49}$$

These expressions allow us to highlight three points. First, as in the static case, extrapolating fundamentals affects the intercept but not the slope of agents' demand curves. This means that fundamental shocks may be amplified or dampened relative to the rational benchmark, but demand elasticities remain unchanged. Second, when $h \geq 1$, the multiplier remains decreasing in the horizon, and its dynamics continue to reflect the persistence of fundamentals. Third, the multiplier is increasing on impact if and only if $1-\phi_f+\frac{\kappa\theta_1}{\zeta} > 1 \implies \frac{\kappa\theta_1}{\zeta} > \phi_f$, i.e., when extrapolative beliefs are sufficiently strong to generate amplification through expectations.

Remark 10. *Extrapolating fundamentals shifts the* intercept *but not the slope of investors' demand curves. It affects the price multiplier but leaves demand elasticity unchanged. Moreover, the long-run multiplier decreases with the horizon, and its dynamics mirror those of fundamentals.*

Therefore, when considering more dynamic forms of learning from fundamentals, we obtain similar lessons to those we encountered in the more static setup. The same is no longer true once we turn to more dynamic forms of mislearning from prices.

5.2 Extrapolating Past Prices

Suppose expectations are formed according to:[9]

$$\mathbb{E}_t[p_{t+1}] = \theta_{p,0}p_t + \theta_{p,1}p_{t-1} - \theta_{f,0}f_t, \qquad \theta_{p,1} < \theta_{p,0}. \tag{42}$$

[9]We chose this expression to study extrapolation in the simplest possible setting that nested the rational expectations benchmark. This easily be generalized, for example by including further lags.

We can then rewrite traders' demand curves as:

$$q_{it} = -(\zeta - \kappa\theta_{p,0})p_t + \kappa\theta_{p,1}p_{t-1} - \kappa\theta_{f,0}f_t + f_{it}. \tag{43}$$

Market clearing then yields:

$$p_t = \left(\frac{\kappa\theta_{p,1}}{\zeta - \kappa\theta_{p,0}}\right) p_{t-1} + \left(\frac{1 - \kappa\theta_{f,0}}{\zeta - \kappa\theta_{p,0}}\right) f_t. \tag{44}$$

where as long as $\left(\frac{\kappa\theta_{p,1}}{\zeta - \kappa\theta_{p,0}}\right) < 1$, the process is stationary. The demand elasticity and the demand multiplier can then be written as:

$$\text{Demand Elasticity :} \quad -\frac{\partial q_{it}}{\partial p_t} = \zeta - \kappa\theta_{p,0} \tag{45}$$

$$\text{Price Impact/Multiplier :} \quad \frac{\partial p_t}{\partial f_t} = \frac{1 - \kappa\theta_{f,0}}{\zeta - \kappa\theta_{p,0}}. \tag{46}$$

We can then also solve for the dynamic multiplier as follows:

$$\frac{\partial p_{t+h}}{\partial f_t} = \left(\frac{1 - \kappa\theta_{f,0}}{\zeta - \kappa\theta_{p,0}}\right) \left(\frac{(1-\phi_f)^{h+1} - \left(\frac{\kappa\theta_{p,1}}{\zeta - \kappa\theta_{p,0}}\right)^{h+1}}{(1-\phi_f) - \left(\frac{\kappa\theta_{p,1}}{\zeta - \kappa\theta_{p,0}}\right)}\right). \tag{47}$$

This expression illustrates how there are now two persistence parameters that govern dynamics: the persistence of fundamentals $(1-\phi_f)$, and the endogenous price persistence induced by extrapolation $\left(\frac{\kappa\theta_{p,1}}{\zeta - \kappa\theta_{p,0}}\right)$. When the sum of these terms is greater than one, the impulse response is hump-shaped. Even when fundamentals are weakly persistent, prices can display excess persistence purely due to the feedback effect between prices and beliefs that comes from learning from past prices.

Remark 11. *Extrapolating past prices modifies the* slope *of the demand curve. As a result, price extrapolation affects both demand elasticities and multipliers, and introduces endogenous persistence beyond that of fundamentals. Dynamic multipliers can therefore exhibit hump-shaped dynamics that differ from the (in our case monotonic) dynamics of the underlying fundamentals.*

Moreover, the amount of amplification from learning from prices can be arbitrarily large, and far exceed that obtained from learning from fundamentals. While the static price impact alone cannot distinguish between these two mechanisms (as both can gen-

erate large multipliers), dynamics can instead be informative. If the persistence of the price impact matches the persistence of fundamentals, then amplification likely reflects shifts in the intercept of the demand curve. If instead the persistence of the price impact is greater than that of fundamentals, or if it exhibits a hump-shaped response, then price extrapolation may be contributing to these dynamics.

6 Trading Behavior

The framework above also delivers predictions regarding investors' trading behavior. In particular, extrapolative beliefs do not necessarily imply momentum trading at all horizons. Instead, the interaction between the informational role of prices and their scarcity role generates a distinct pattern: investors may appear contrarian with respect to short-run returns while still behaving as momentum traders with respect to long-run returns. This is instead not true with mislearning from fundamentals, where investors are either momentum with respect to both short-run and long-run returns, or contrarian with respect to both.

To understand the properties of investors' trading behavior, we can look at how changes in holdings correlate with past returns at different horizons. We start by looking at the covariance of changes in holdings with respect to short-run returns, and then look at how this covariance differs once we consider how changes in holdings correlate with long-run returns instead.[10]

6.1 Mislearning from Fundamentals

In this section we study the properties of investors' trading behavior when they extrapolate fundamentals.

6.1.1 Covariance with respect to short-run returns

When investors mislearn from fundamentals as in (42), we can write reduced-form changes in individual demands in the following form:

$$\Delta q_{it} = -a\,\Delta p_t + c\,\Delta f_t + d\,\Delta f_{t-1} + \Delta f_{it}. \tag{48}$$

[10]Consider adding a small section explaining why looking at impulse response functions can be misleading.

This nests the competitive equilibrium when $a = \zeta$, $d = 0$ and $c = \frac{\kappa(1-\phi_f)}{\zeta-\kappa(1-\phi_f)}$. Under the belief structure in (42), the coefficients are given by $c = \frac{\kappa\theta_0+\frac{\kappa^2\theta_1}{\zeta}}{\zeta-\kappa\theta_0-\frac{\kappa^2\theta_1}{\zeta}}$ and $d = \frac{\kappa\theta_1}{\zeta-\kappa\theta_0-\frac{\kappa^2\theta_1}{\zeta}}$.

Imposing market clearing yields equilibrium price changes:

$$\Delta p_t = \frac{c+1}{a}\Delta f_t + \frac{d}{a}\Delta f_{t-1}. \tag{49}$$

Substituting this expression back into individuals' demand functions lead to the following changes in equilibrium asset demands:

$$\Delta q_{it} = \Delta f_{it} - \Delta f_t. \tag{50}$$

Thus, as in the price-extrapolation case, equilibrium demand corresponds to investor i's own demand shock relative to the aggregate one.[11] The covariance between changes in investor i's holdings and short-run returns is therefore:

$$Cov(\Delta q_{it}, \Delta p_t) = Cov(\Delta f_{it}, \Delta p_t) - \frac{\sigma_e^2}{a}\left(\frac{2(c+1) - d\phi_f}{2-\phi_f}\right). \tag{51}$$

To simplify this further, assume that individual flows load on aggregate flows according to:

$$\Delta f_{it} = \beta_i \Delta f_t + \varepsilon_{it}, \qquad Cov(\varepsilon_{it}, \Delta p_t) = 0. \tag{52}$$

Then (51) simplifies to:

$$Cov(\Delta q_{it}, \Delta p_t) = (\beta_i - 1)\frac{\sigma_e^2}{a}\left(\frac{2(c+1) - d\phi_f}{2-\phi_f}\right). \tag{53}$$

Thus, whenever $\beta_i < 1$, meaning that investor i's flows move less than one-to-one with aggregate flows, the covariance is negative and investors appear contrarian with respect to short-run returns.

[11] Notice that the equilibrium asset demand is different than the investors' demand function. Equilibrium asset demand is the quantity at the equilibrium price. An asset demand instead considers the hypothetical demand an agent would hold for any given price, including all off-equilibrium prices. While the equilibrium asset demand is the same under price and fundamental extrapolation, asset demands are very different in the two cases, leading to substantial differences in the resulting multipliers, and equilibrium price and trading dynamics.

6.1.2 Covariance with respect to cumulative long-run returns

Define the s-period cumulative return as:

$$p_t - p_{t-s} = \sum_{k=0}^{s-1} \Delta p_{t-k}. \tag{54}$$

Using the equilibrium price dynamics and the AR(1) structure of fundamentals yields:

$$Cov(\Delta q_{it}, p_t - p_{t-s}) = (\beta_i - 1)\frac{\sigma_e^2}{a(2-\phi_f)}\Big[(c+1)\Big(1+(1-\phi_f)^{s-1}\Big) - d\Big(1-(1-\phi_f)^s\Big)\Big]. \tag{55}$$

If $0 < d < c$, the bracketed term is positive for all s, so the sign of trading behavior is determined entirely by β_i. In particular, investors are contrarian with respect to both short-run and long-run returns when $\beta_i < 1$, while they are momentum traders at all horizons when $\beta_i > 1$.

Remark 12. *When individual flows correlate less than one-for-one with aggregate flows, fundamental extrapolation delivers trading behavior that is contrarian with respect to both short-run and long-run returns.*

6.2 Mislearning from Prices

In this section we study the properties of investors' trading behavior when they extrapolate prices.

6.2.1 Covariance with respect to short-run returns

When investors learn from prices as in (42), changes in holdings and in equilibrium prices are given by:

$$\Delta p_t = \frac{b}{a}\Delta p_{t-1} + \frac{1+c}{a}\Delta f_t = \frac{1+c}{a}\sum_{j=0}^{\infty}\left(\frac{b}{a}\right)^j \Delta f_{t-j}, \qquad \left|\frac{b}{a}\right| < 1. \tag{56}$$

$$\Delta q_{it} = -a\,\Delta p_t + b\,\Delta p_{t-1} + c\Delta f_t + \Delta f_{it} = \Delta f_{it} - \Delta f_t \tag{57}$$

When traders learn information from prices as in the more general case considered in (42), the reduced-form coefficients are given by: $a = \zeta - \kappa\theta_{p,0}$, $b = \kappa\theta_{p,1}$, and $c = -\kappa\theta_{f,0}$. The REE is obtained in the limiting case $\theta_{p,0} = \frac{\zeta}{\kappa}$, $\theta_{p,1} = 0$, and $\theta_{f,0} = \frac{1}{\kappa}$, which implies

$a = 0$, $b = 0$, and $c = -1$.[12]

The covariance between changes in investor i's holdings and price changes is therefore:

$$Cov(q_{it}, \Delta p_t) = Cov(\Delta f_{it}, \Delta p_t) - \frac{(1+c)\sigma_e^2}{a}\left(\frac{2 - \frac{b}{a}(2-\phi_f)}{(2-\phi_f)\left[1 - \frac{b}{a}(1-\phi_f)\right]}\right). \tag{58}$$

To simplify this further, we need to make assumptions as to how individual flows correlate with aggregate flows. Assume that:

$$\Delta f_{it} = \beta_i \Delta f_t + \varepsilon_{it}, \qquad Cov(\varepsilon_{it}, \Delta p_t) = 0. \tag{59}$$

Then (58) simplifies to:

$$Cov(q_{it}, \Delta p_t) = (\beta_i - 1)\frac{\sigma_e^2}{a}\left(\frac{2 - \frac{b}{a}(2-\phi_f)}{(2-\phi_f)\left[1 - \frac{b}{a}(1-\phi_f)\right]}\right). \tag{60}$$

As long as $\beta_i < 1$, meaning that individual flows move less than one-to-one with aggregate flows, then investors are contrarian with respect to short-run returns.

6.2.2 Covariance with respect to cumulative long-run returns

Define the s-period cumulative return as:

$$p_t - p_{t-s} = \sum_{k=0}^{s-1} \Delta p_{t-k}. \tag{61}$$

The covariance of changes in holdings with respect to long-run returns is then given by:

$$Cov(\Delta q_{it}, p_t - p_{t-s}) = (\beta_i - 1)\frac{\sigma_e^2}{a}\left(\frac{1 + (1-\phi_f)^{s-1} - \frac{b}{a}(2-\phi_f)}{(2-\phi_f)\left(1 - \frac{b}{a}(1-\phi_f)\right)}\right). \tag{62}$$

As long as $\frac{b}{a} > \frac{1}{1+(1-\phi_f)}$, there exists s, such that investors are momentum with respect to long-run returns. Equations (60) and (62) make clear that trading behavior across horizons is governed by the ratio $\frac{b}{a}$, which captures extrapolation from past prices, while the intercept term c only rescales price responses and therefore does not affect equilibrium trading behavior or whether investors appear contrarian or momentum

[12] In this case, demand is perfectly inelastic and the recursion in (56) no longer applies.

traders.

Therefore, a key difference between price extrapolation and fundamental extrapolation lies in the pattern of trading behavior with respect to returns at different horizons. When investors extrapolate *prices*, price changes inherit an endogenous feedback component through lagged prices. This generates two competing forces: a scarcity effect (higher prices induce selling) and an informational extrapolation effect (recent price increases raise expected future prices). The dependence on fundamentals through $\theta_{f,0}$ shifts the intercept of demand but does not affect this feedback mechanism. When extrapolative beliefs are strong enough, investors can appear contrarian with respect to short-run returns but momentum with respect to longer-run cumulative returns.These patterns consistent with empirical evidence, and can jointly explain trading behavior consistent with the disposition effect, and extrapolative demand (Jin and Peng 2023).

Under *fundamental extrapolation*, by contrast, prices are simply a linear filter of current and lagged fundamentals. There is no additional persistence created by price feedback. Consequently, the sign of the covariance between trading and returns is the same at all horizons: if investors are contrarian with respect to short-run returns, they are contrarian with respect to long-run returns as well, and similarly for momentum trading. Thus, horizon-dependent trading patterns can arise naturally under price extrapolation but not under fundamental extrapolation.

Remark 13. *When individual flows correlate less than one-for-one with aggregate flows, fundamental extrapolation delivers trading behavior that is contrarian with respect to both short-run and long-run returns. Instead, price extrapolation delivers trading behavior which is contrarian with respect to short-run returns, but momentum with respect to long-run returns.*

Only extrapolation from prices, through the ratio $\frac{b}{a}$, shapes trading behavior across horizons, whereas extrapolation from fundamentals shifts the intercept of demand and rescales price responses without altering whether investors appear contrarian or momentum traders.

7 Conclusions

This paper studies how different forms of belief formation contribute to inelastic markets. We begin by clarifying the theoretical and empirical objects being compared. While prior

work often thinks of the demand elasticity as the inverse of the price multiplier, we show that the latter reflects not only movements along the slope of the demand curve, but also shifts in its intercept. Once this distinction is made explicit, the gap between theory-implied and empirically measured elasticities is smaller, but still far too large. To make progress in understanding this gap, we study how biased beliefs may contribute to this discrepancy via the pass-through from beliefs to actions, and the sensitivity of expected returns to prices.

Starting from the pass-through from beliefs to actions, we show that, under standard CARA preferences, inertia or limited adjustment in levels cannot by themselves generate low demand elasticities (which instead capture the slope in logs). This highlights that a low pass-through from beliefs to actions requires either alternative demand specifications or limited variation in expected returns.

Next, we turn to the semi-elasticity of expected returns to changes in prices. To understand how this channel can be meaningful in contributing to inelastic markets, we study expectations formation through the lens of two foundational concepts from the literature on information economics: the competitive equilibrium and the rational expectations equilibrium. In a competitive equilibrium, investors have rational expectations about exogenous fundamentals but do not learn from prices, leading to downward sloping demand curves. In a rational expectations equilibrium, instead, investors learn from prices, which can lead to perfectly inelastic demand. This distinction provides a useful organizing framework to study how different forms of learning affect market outcomes, and highlights how tools from information economics can be brought to bear on questions of market inelasticity.

Within this framework, we then contrast mislearning from exogenous fundamentals with mislearning from prices. These two mechanisms have sharply different implications. Mislearning from fundamentals shifts the intercept of investors' demand curves without affecting their slope. Therefore, mislearning from fundamentals changes the magnitude of price responses without altering demand elasticities or the dynamics of price adjustment. By contrast, mislearning from prices modifies the slope of investors' demand curves, and introduces endogenous feedback between prices and beliefs, generating excess persistence and potentially hump-shaped dynamics.

These differences are particularly stark in their implications for trading behavior. Under fundamental extrapolation, trading has the same sign across horizons: investors

are either contrarian or momentum traders at all horizons. Under price extrapolation, instead, investors may appear contrarian with respect to short-run returns while behaving as momentum traders over longer horizons. We show that this pattern is governed by the feedback effect from past prices, while extrapolation from fundamentals only rescales price responses without affecting trading behavior.

Taken together, these results highlight that the dynamics of price and quantity responses—and not just their magnitude—contain valuable information about the underlying mechanism driving inelastic markets. Studying the term structure of multipliers and trading behavior across horizons can therefore help distinguish between alternative models of belief formation and identify the sources of market inelasticity.

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A Proofs and Derivations

A.1 Linearizing Expected Returns

We derive the linearized expression for expected returns used in the main text.

Start from the definition of gross expected returns:

$$1 + \pi_{it} \equiv \frac{E_t^i[P_{t+1} + D_{t+1}]}{P_t}. \tag{63}$$

We log-linearize around a steady state with constant prices and dividends. Let

$$P_t = \bar{P}(1 + p_t), \qquad D_{t+1} = \bar{D}(1 + d_{t+1}), \tag{64}$$

where p_t and d_{t+1} denote small deviations from steady state. Define the steady-state dividend-price ratio as

$$\delta \equiv \frac{\bar{D}}{\bar{P}}. \tag{65}$$

Under a zero-growth steady state, $\bar{P}_{t+1} = \bar{P}_t = \bar{P}$, so we can write

$$1 + \pi_{it} = \frac{E_t^i[\bar{P}(1 + p_{t+1}) + \bar{D}(1 + d_{t+1})]}{\bar{P}(1 + p_t)}. \tag{66}$$

Dividing numerator and denominator by $\bar{P}$ gives

$$1 + \pi_{it} = \frac{1 + \delta + E_t^i[p_{t+1}] + \delta E_t^i[d_{t+1}]}{1 + p_t}. \tag{67}$$

Using the first-order approximation $(1 + p_t)^{-1} \approx 1 - p_t$, we obtain

$$1 + \pi_{it} \approx \left(1 + \delta + E_t^i[p_{t+1}] + \delta E_t^i[d_{t+1}]\right)(1 - p_t). \tag{68}$$

Dropping second-order terms yields

$$1 + \pi_{it} \approx (1 + \delta) + E_t^i[p_{t+1}] + \delta E_t^i[d_{t+1}] - (1 + \delta)p_t. \tag{69}$$

Rearranging, we obtain the linearized expression used in the main text:

$$1 + \pi_{it} \approx (1 + \delta) - (1 + \delta)p_t + E_t^i[p_{t+1} + \delta d_{t+1}]\,. \tag{70}$$

Taking derivatives with respect to p_t then gives

$$\frac{\partial \pi_{it}}{\partial p_t} = -(1 + \delta) + \frac{\partial E_t^i[p_{t+1} + \delta d_{t+1}]}{\partial p_t}. \tag{71}$$

The linearization highlights two forces through which prices affect expected returns. Holding expectations fixed, a higher current price lowers expected returns mechanically, generating the term $-(1 + \delta)p_t$. In addition, if prices affect beliefs about future payoffs, then $E_t^i[p_{t+1} + \delta d_{t+1}]$ will also vary with p_t. This second channel is absent in a standard competitive equilibrium without learning from prices, but becomes central when investors extract information from prices.

A.2 Linearizing CARA Utility

Taking a first order Taylor series approximation of CARA utility, with $\mathbb{V} = \mathbb{V}[\pi_t]$ we have:[13]

$$\begin{aligned}
Q_t &= \frac{1}{A\mathbb{V}P_t}\left(\frac{\mathbb{E}_t[P_{t+1}+D_{t+1}]-P_t}{P_t}\right) \\
&= \frac{\mathbb{E}_t\left[\bar{P}_{t+1}(1+p_{t+1})+\bar{D}_{t+1}(1+d_{t+1})-\bar{P}_t(1+p_t)\right]}{A\mathbb{V}\bar{P}_t^2(1+p_t)^2} \\
&\approx \frac{1}{A\mathbb{V}\bar{P}_t}\left(\frac{\mathbb{E}_t[\bar{P}_{t+1}+\bar{D}_{t+1}]-\bar{P}_t}{\bar{P}_t} - \frac{2(\mathbb{E}_t[\bar{P}_{t+1}+\bar{D}_{t+1}]-\bar{P}_t)}{\bar{P}_t}p_t + \frac{\mathbb{E}_t[\bar{P}_{t+1}p_{t+1}]+\mathbb{E}_t[\bar{D}_{t+1}d_{t+1}]-\bar{P}_t p_t}{\bar{P}_t}\right) \\
&= \bar{Q}_t - \frac{1}{A\mathbb{V}\bar{P}_t}\left(2\delta p_t - \mathbb{E}[p_{t+1}+\delta d_{t+1}]+p_t\right) = \bar{Q}_t - \frac{1}{A\mathbb{V}\bar{P}_t}\left(\delta p_t + (1+\delta)p_t - \mathbb{E}[p_{t+1}+\delta d_{t+1}]\right)
\end{aligned}$$

Let $q_t \equiv \frac{Q_t-\bar{Q}_t}{\bar{Q}_t}$ and $\bar{Q}_t = \frac{1}{A\mathbb{V}P_t}\left(\frac{\mathbb{E}[\bar{D}]}{\bar{P}}\right) = \frac{\delta}{A\mathbb{V}P_t}$, where δ is the average dividend yield. Then:

$$q_t = -p_t - \left(\frac{1+\delta}{\delta}\right)p_t + \left(\frac{1}{\delta}\right)\mathbb{E}[p_{t+1}+\delta d_{t+1}] = -p_t + \frac{1}{\delta}\hat{\pi}_t \tag{72}$$

This is nested in the linearized demand function in Gabaix and Koijen (2022), with $\zeta = 1$ and $\kappa = \frac{1}{\delta}$ (and no flows).

[13] We let $\mathbb{V} = \mathbb{V}[\pi_t]$, rather than $\mathbb{V} = \mathbb{V}[D_{t+1}+P_{t+1}]$ because empirically it is more realistic to think of as the variance of expected returns rather than the variance of expected future payoffs as being constant over time.