How Competitive is the Stock Market?

Theory, Evidence from Portfolios, and Implications for the Rise of Passive Investing

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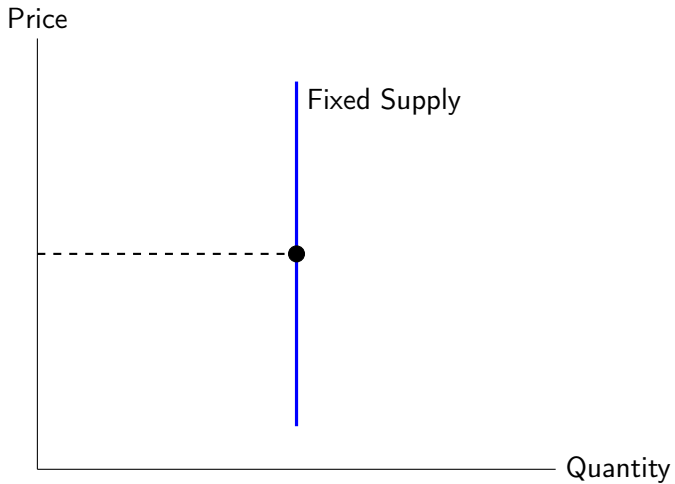
The Inelastic Market Hypothesis



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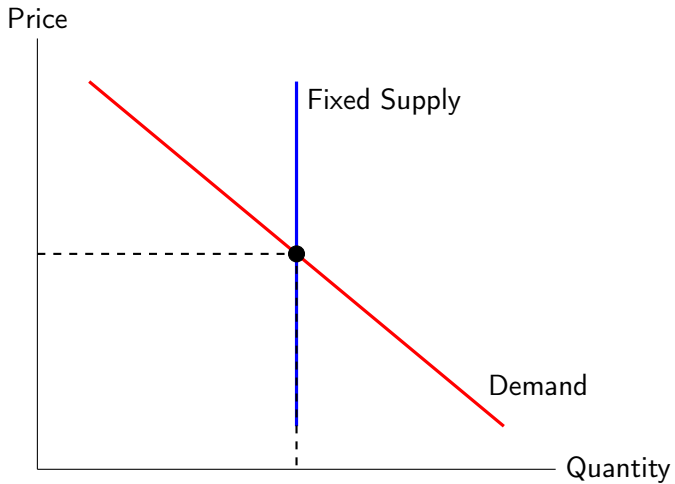

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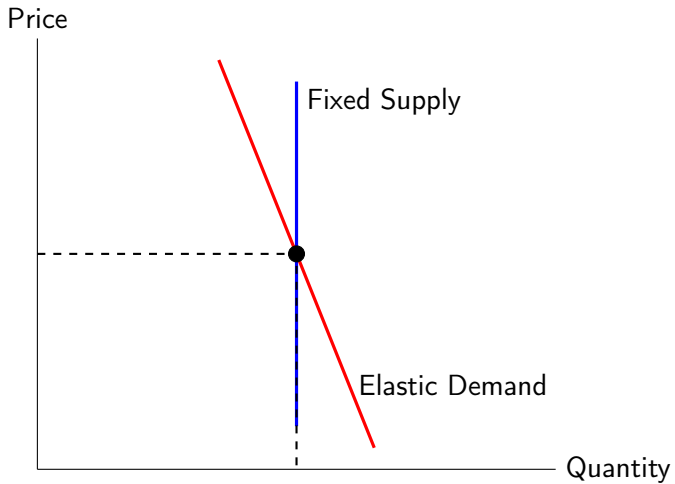

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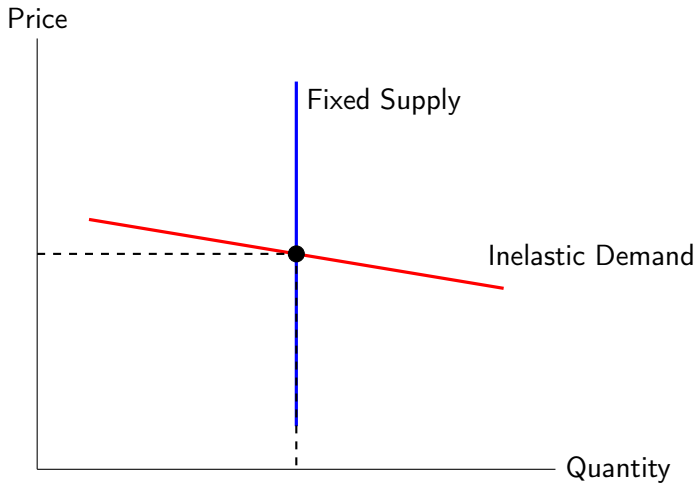
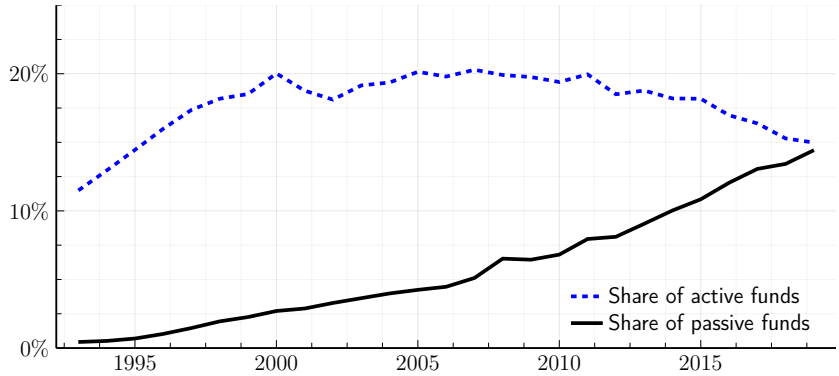


What is the effect of changes in the trading strategy of some institutions on the equilibrium behavior of asset prices?

The Rise of Passive Investing

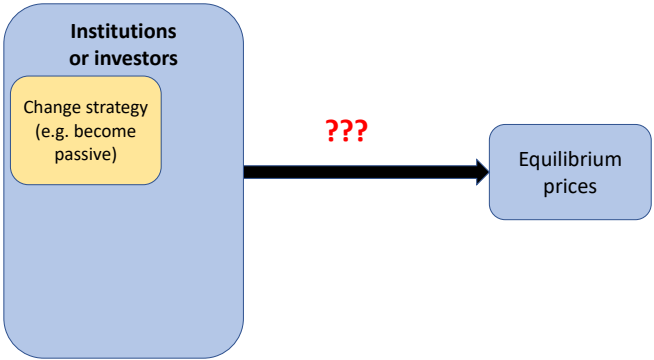
Active and passive (+ ETF) mutual funds as fraction of US total market cap. (source: ICI)



→ *How does this change prices and investment opportunities?*

What is the effect of changes in the strategy of some institutions on the equilibrium behavior of prices?

- The rise of passive investing



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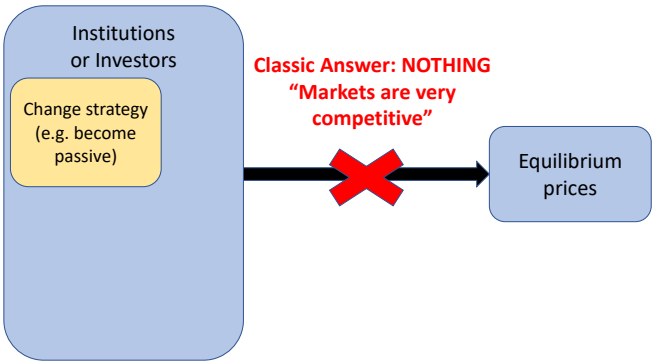

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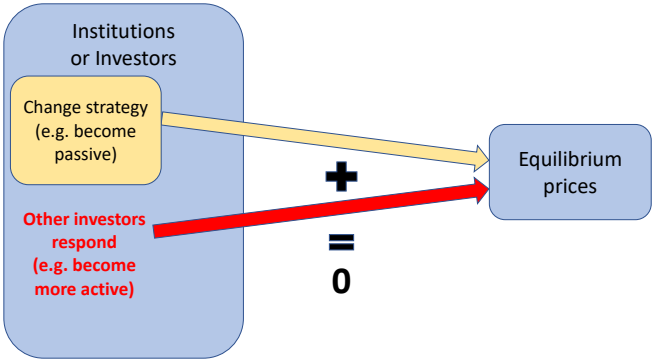

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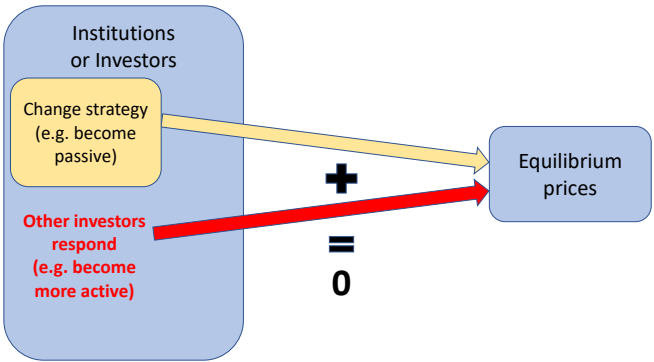
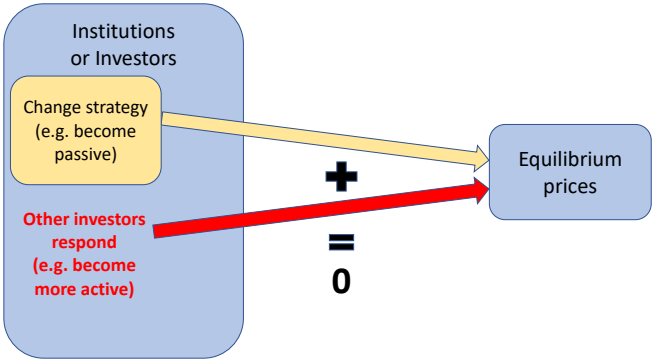


→ How large is the strategic response?

What is the effect of changes in the strategy of some institutions on the equilibrium behavior of prices?

- **The rise of passive investing**
- Regulated financial intermediaries trading more conservatively
- An "arbitrageur" (e.g. Melvin Capital) going bust



→ How large is the strategic response?

Framework: how to estimate the strategic response of investors?

- Simple statistic, degree of strategic response χ:

how much does my demand elasticity respond to the aggregate demand elasticity?

- **If someone stops looking for $20 bills on the floor, how much harder do you look?**

Measurement: quantify the degree of strategic respo

- Demand system of investors' portfolio
  - Understand and account for large heterogeneity across stocks and investors
- Two-step equilibrium
  - Competition for the asset: *Prices so that investor demands clear market*
  - Competition in strategies: *Investor interactions in choosing their demand elasticities*

Results: strategic responses in the US stock market

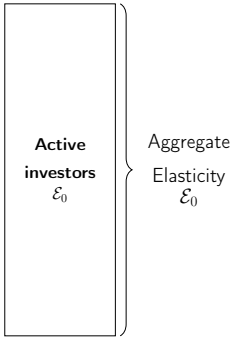
On the strategic response ...

- Strategic response much weaker than standard finance
- Direct effect of changes in individual behavior reduced by 60%

On the rise of passive investing ...

- Rise of passive investing leads to 15% more inelastic aggregate demand curves for individual stocks
  - If buying \$1 of a stock used to raise its price by \$2.5, now the response is \$3
  - More volatility, less liquidity

Impact of the Rise in Passive Investing



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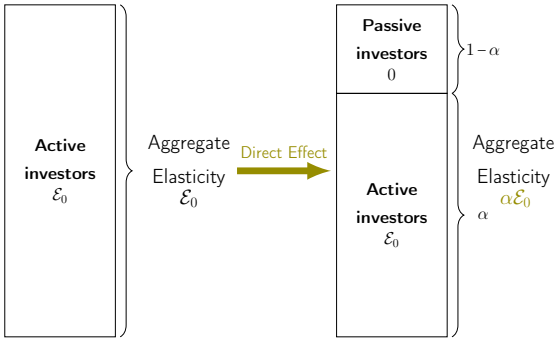

- Empirical increase in fraction of passive investors: $\alpha = 70\%$
  - No strategic response ($\chi = 0$): proportional reduction, $\mathcal{E}_{NEW} = \alpha\mathcal{E}_0 = 70\% \times \mathcal{E}_0$

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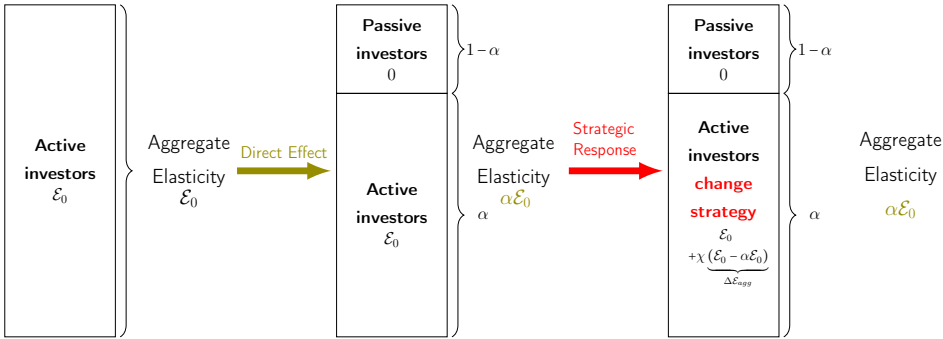

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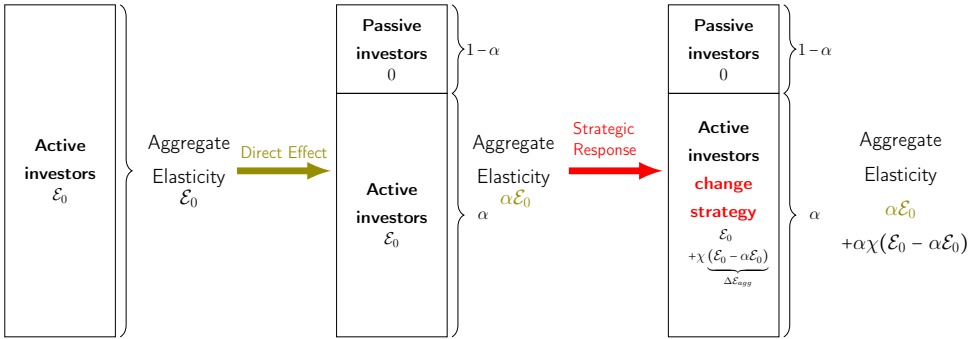

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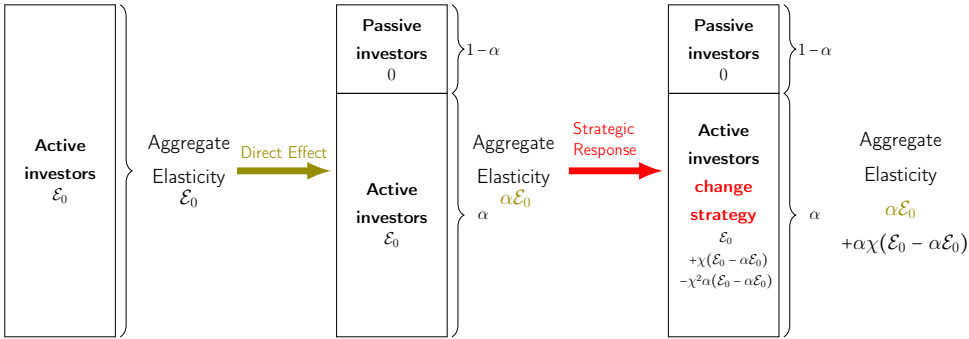

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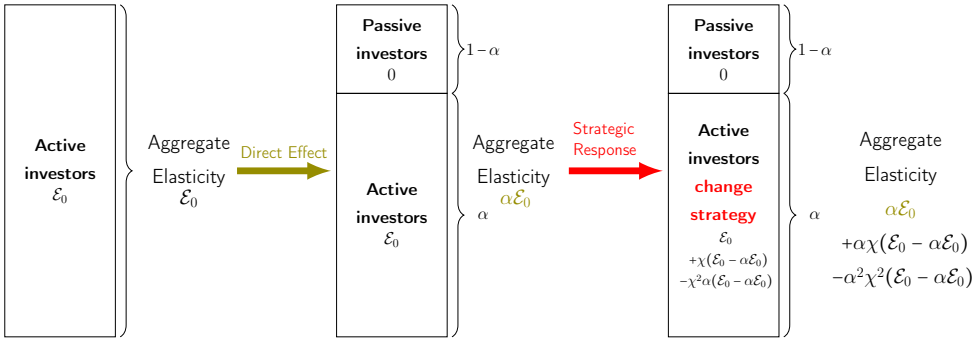

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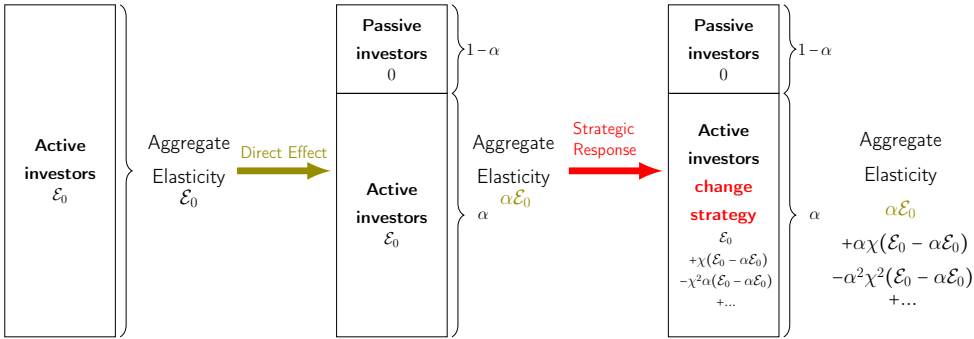

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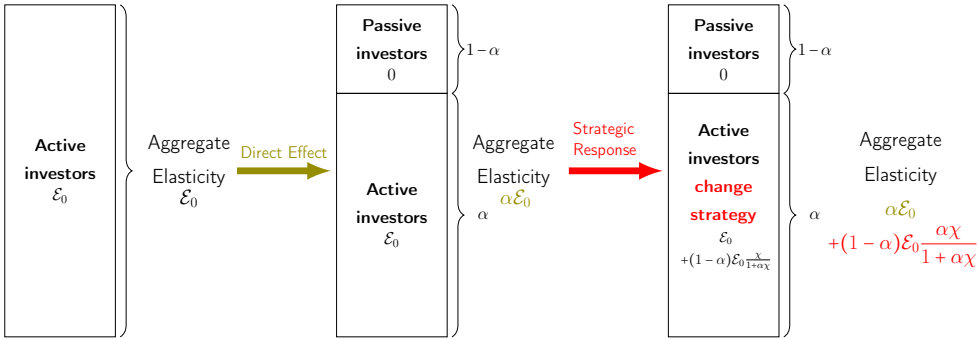

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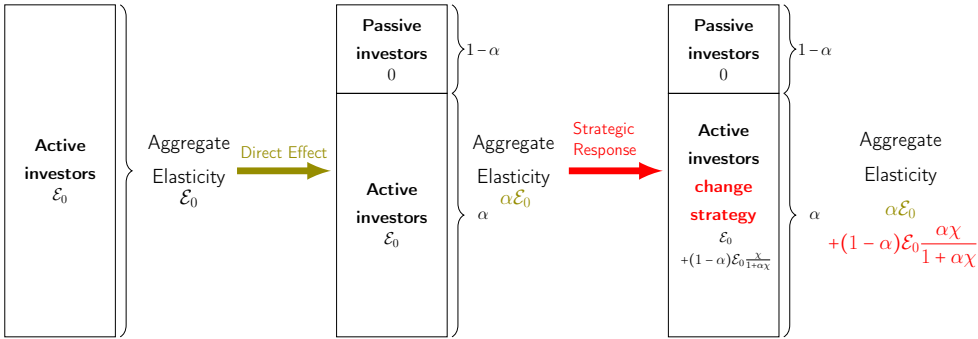

- Empirical increase in fraction of passive investors: $\alpha = 70\%$
  - No strategic response ($\chi = 0$): proportional reduction, $\mathcal{E}_{NEW} = \alpha\mathcal{E}_0 = 70\% \times \mathcal{E}_0$
  - "Perfectly competitive financial markets" ($\chi \to \infty$): nothing happens, $\mathcal{E}_{NEW} = \alpha\mathcal{E}_0 + (1-\alpha)\mathcal{E}_0 = \mathcal{E}_0$

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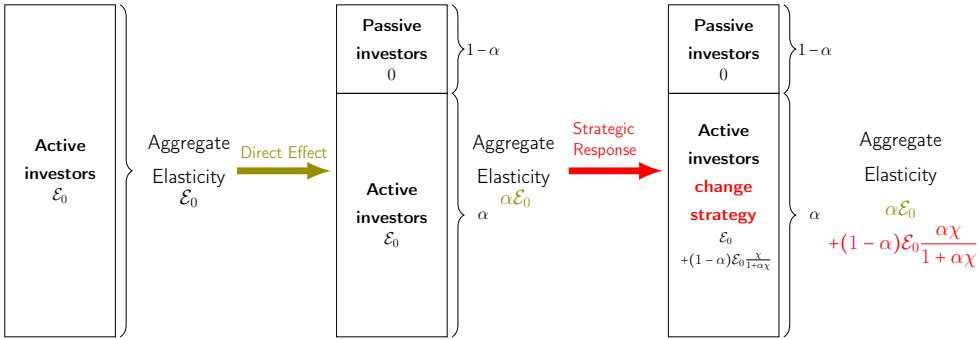

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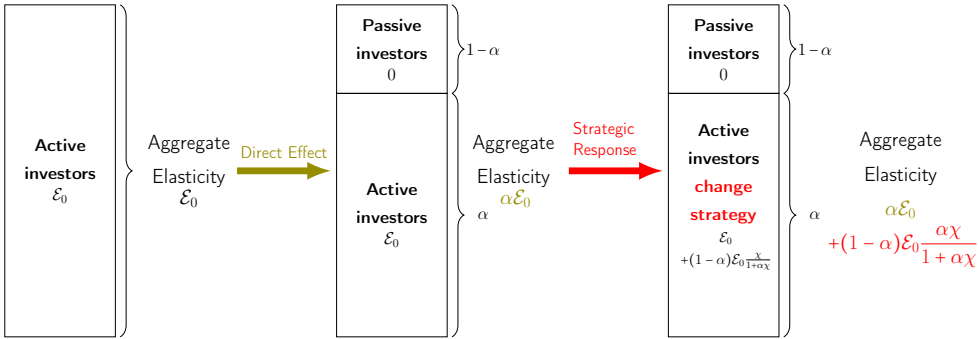

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$\Rightarrow \mathcal{E}_{NEW} = 87.5\% \times \mathcal{E}_0$ (vs 100% with full response and 70% without strategic response)

Outline

Data

- Stock level data
  - CRSP and COMPUSTAT
  - Price and characteristics: book equity, dividends, profitability, investment
- Portfolio data
  - 13F filings from SEC, 2000–2020 (Backus, Conlon and Sinkinson, 2020)
  - Every institution with AUM over $100m reports stock positions quarterly
  - Includes 80% of total ownership in U.S. stock market (2008)
  - Residual for market clearing collected as "households"
  - **Each quarter: keep track of 1300 investors and 2800 stocks**

Quantitative Model

- Portfolio choice represented by a logit in portfolio shares w_{ik} (Koijen Yogo 2019)

$$\underbrace{\log \frac{w_{ik}}{w_{i0}} - p_k}_{\text{relative demand}} = \underbrace{- \mathcal{E}_{ik}\ p_k}_{\text{price elasticity}} + \underbrace{\underline{d}_{0i} + \underline{d}'_{1i} X_k + \epsilon_{ik}}_{\text{baseline demand}}$$

$$\mathcal{E}_{ik} = \underbrace{\underline{\mathcal{E}}_{0i} + \underline{\mathcal{E}}'_{1i} X_k}_{\text{baseline elasticity}} - \underbrace{\chi\, \mathcal{E}_{agg,k}}_{\text{strategic response}}$$

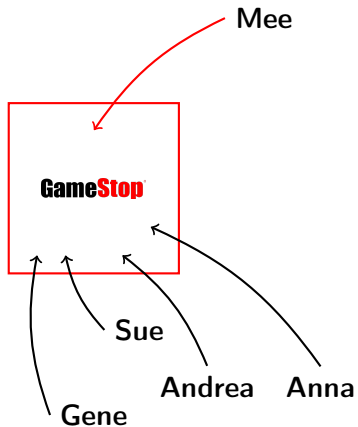
- Baseline demand $\underline{d}_i$
- Baseline elasticity $\underline{\mathcal{E}}_i$
  - Embeds Koijen Yogo 2019, who assume no competition: $\chi = 0$
- **Passive investors**: $\mathcal{E}_i = 0$ (includes index investing, identified using KY elasticity)

Three Challenges for Estimation

- *Reflection problem* (Manski 1993)
- *Endogeneity in demand estimation*
  - Koijen-Yogo (2019) price instrument + model-based instruments for aggregate elasticity
- *Implementation*
  - An efficient algorithm to run large dimensional regressions and solve all the equilibria simultaneously: **process each quarter of data in about 2 minutes**

The Reflection Problem

- Does Mee trade GameStop agressively because
  - she is an agressive trader: high $\underline{\mathcal{E}}_i$
  - of the influence of other traders



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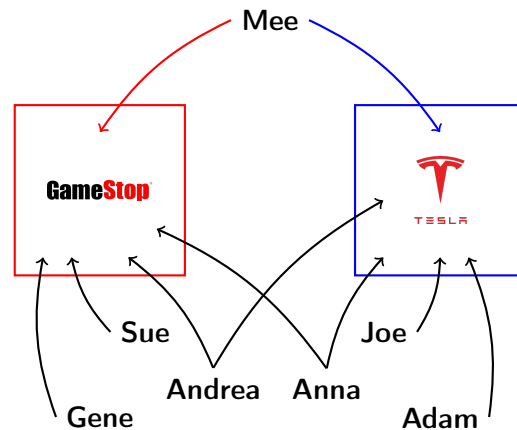
→ **Mee faces a *different* mix of other investors for different stocks**



Estimates of Strategic Response χ

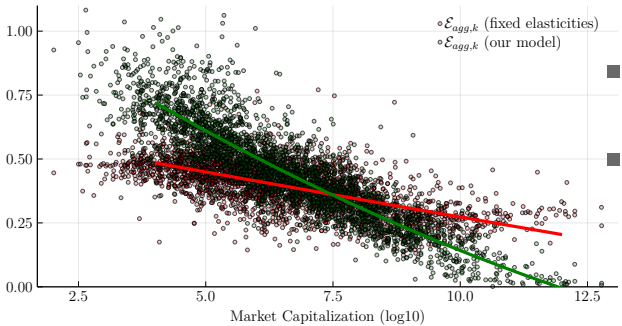
- **Degree of strategic response**

  estimate stable over time, $\chi = 2.15$

- **Substantial individual response**: The same investor responds less to price movements for assets with more aggressive investors than assets with less aggressive investors
  - If all other investors are more elastic by 1, lower my elasticity by 2.15

- **Far from "competitive financial markets"**, $\chi \ll \infty$
  - In simple calculation, needed $\chi > 18$ to compensate 90% of direct effect

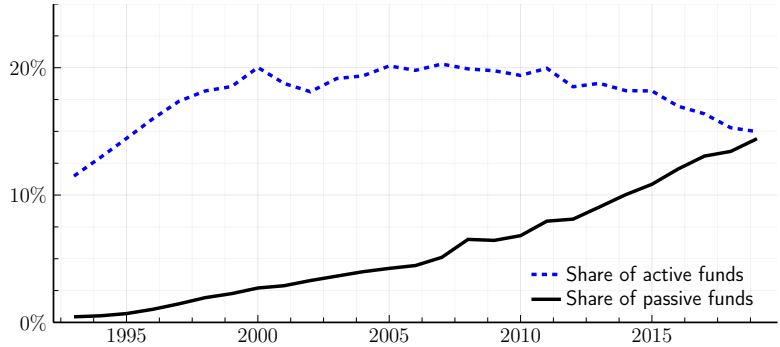
Estimates of Aggregate Elasticity by Stock



- **Elasticities are low** ≈ 0.4: consistent with previous studies
- **Size effect**: less willing to adjust positions with large weights
- **Less cross-sectional variation**: important to account for the elasticity equilibrium
  - If an active investor shows up in one stock, others become more passive

The Rise of Passive Investing

Active and passive (+ ETF) mutual funds as fraction of US total market cap. (source: ICI)



- In our estimation, fraction of active investors down from 81% to 59% from 2001 to 2020

The Rise of Passive Investing

What does the model predict about the effect of this trend?

- Aggregate elasticity equilibrium:

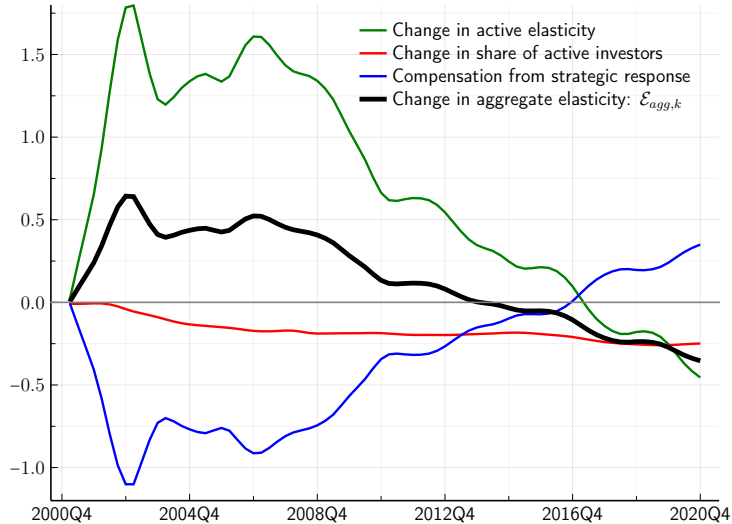
$$\mathcal{E}_{agg,k} = \underbrace{|A_k|}_{\text{fraction active}} \times \underbrace{\mathbf{E}\left(\underline{\mathcal{E}}_{ik} | i \in A_k\right)}_{\text{avg. active elasticity}} \times \underbrace{\frac{1}{1+\chi|A_k|}}_{\text{general equilibrium}}$$

- Effect of change in active share:
  - Assuming random investors switch:

$$\frac{d\log \mathcal{E}_{agg}}{d\log|A|} = \frac{1}{1+\underbrace{\chi}_{2.15}\underbrace{|A|}_{68\%}} = 40.6\%$$

Elasticities drop by $40.6\% \times 32\% = 13\%$

Decomposing Actual Changes in Elasticity



Implications for Price Dynamics

The rise of passive investing decreased elasticities by 13%

elasticity $\downarrow \Rightarrow$ volatility $\uparrow$, price informativeness $\uparrow$, liquidity$\downarrow$

Beyond Passive Investing

Lack of strategic response implies that:

- There are profitable trading opportunities where others haven't stepped in yet
- There are crowded trades that many take even if unprofitable
- **Key source of information**: follow where different investors are going, analyze holdings data

Conclusion

- **Degree of strategic response** χ: useful statistic to understand the equilibrium effect of changes in specific investors' behavior
  - A tractable approach: 2-layer equilibrium
- **Stock market far from the "perfectly competitive ideal"**, $\chi = 2 \ll \infty$
  - Dampen direct effects by 60%
- **Rise of passive investing leads to 15% more inelastic markets**
  - Effect on cross-section of stocks in the paper
- More applications:
  - Financial health and regulation of intermediaries
  - Role of big data
  - International finance: what if China stops buying treasuries?