The paradoxes of fundamentalists' profits

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Introduction

- Models with bounded rational HIAs often assume decisions are based on different information sets
- Information is often obtained by
  - past observations
  - properties (at least partially) exogenous to the process of interest
- Actual outcomes depend on interactions among agents
  - May not be consistent with actual information

The case of fundamentalists

- Many models use fundamentalist strategies
- Agents have information about the value of a variable
- In a setup related to the price of an asset
  - if everyone is fundamentalist, the price is indeed the fundamental value
- What about if not everyone is fundamentalist?
  - Is the price level on average different from the fundamental value?
  - What about profits?

Asset pricing model with two types

Baseline version of Brock and Hommes (1998)

- Agents are mean variance maximisers
- Two types of strategies: fundamentalist and trend following
- Two types of assets:
  - Risk free, perfectly elastically supplied, paying interest R
  - Risky pays stochastic (IID) dividend y_t and is sold at price p_t
- Assuming zero supply of outside shares, define as the *fundamental* value of the asset:

$$p^* = y/(R-1) \tag{1}$$

Expected profits

- Let $x_t = p_t - p^*$ denote the deviation from the fundamental value
- Agents who pay C have access to the fundamental value and expect $x_t = 0$
- Trend followers expect that x_t follows a trend g compared to its value in the previous period.
- Expected profits of fundamentalist and trend following strategies are

$$\pi_{f,t} = \frac{1}{a\sigma^2} R x_{t-1}(R x_{t-1} - x_t) - C, \tag{2}$$

where a is assumed risk aversion and σ^2 is the excess return variance, and

$$\pi_{c,t} = \frac{1}{a\sigma^2}(x_t - R x_{t-1})(g x_{t-2} - R x_{t-1}) \tag{3}$$

Dynamics

Assuming a logit framework with scale parameter β, regarding choices the fractions of fundamentalists and trend followers in each period are given by

$$n_{f,t} = \frac{e^{\beta \pi_{f,t}}}{e^{\beta \pi_{f,t}} + e^{\beta \pi_{f,t}}} \tag{4}$$

and

$$n_{c,t} = \frac{e^{\beta \pi_{c,t}}}{e^{\beta \pi_{f,t}} + e^{\beta \pi_{f,t}}} \tag{5}$$

with

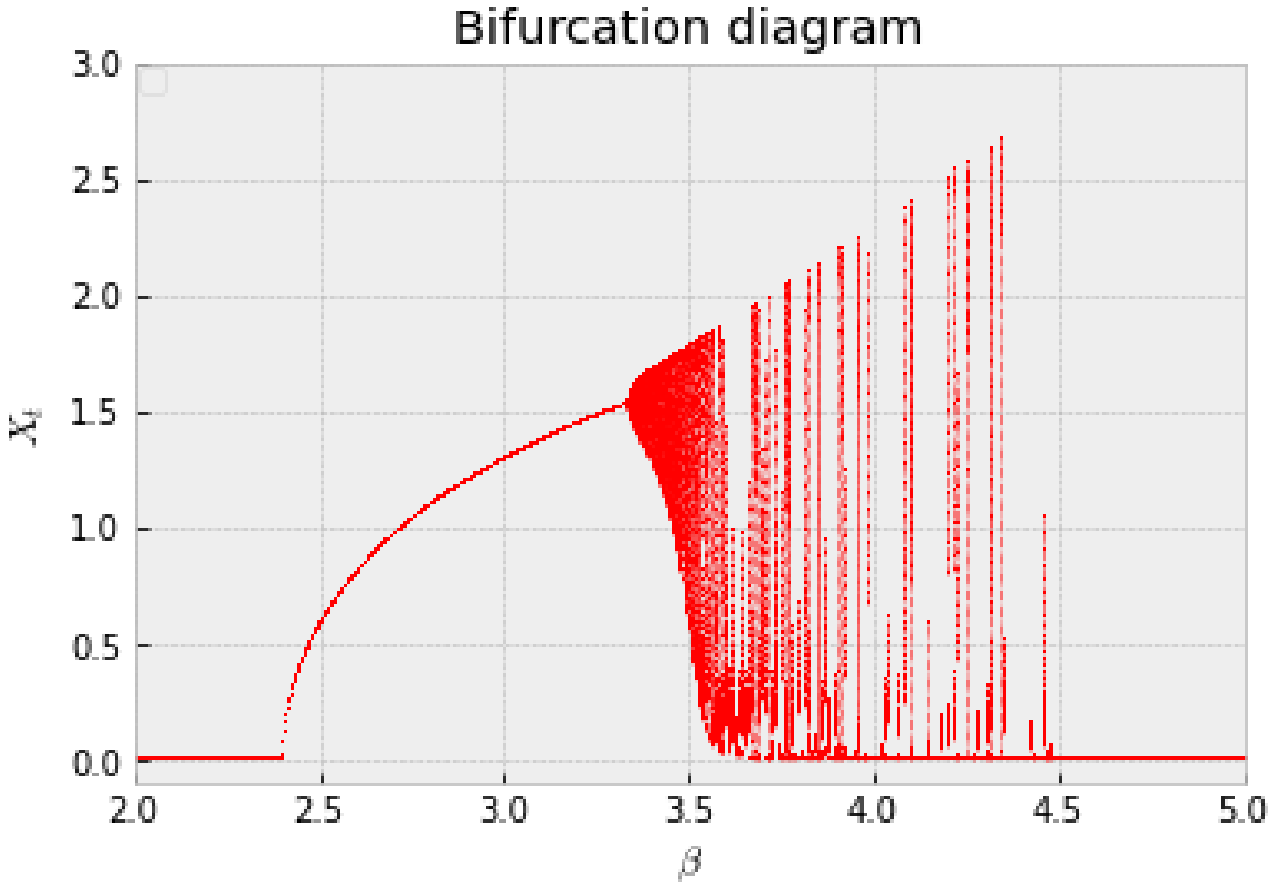
$$m_t = n_{f,t} - n_{c,t} = tanh\left[\frac{\beta}{2}\left(\frac{g x_{t-2}(R x_{t-1} - x_t)}{a\sigma^2} - C\right)\right], \tag{6}$$

and

$$R x_t = n_{c,t-1} g x_{t-1} \tag{7}$$

Summary

Prices can deviate from fundamentals



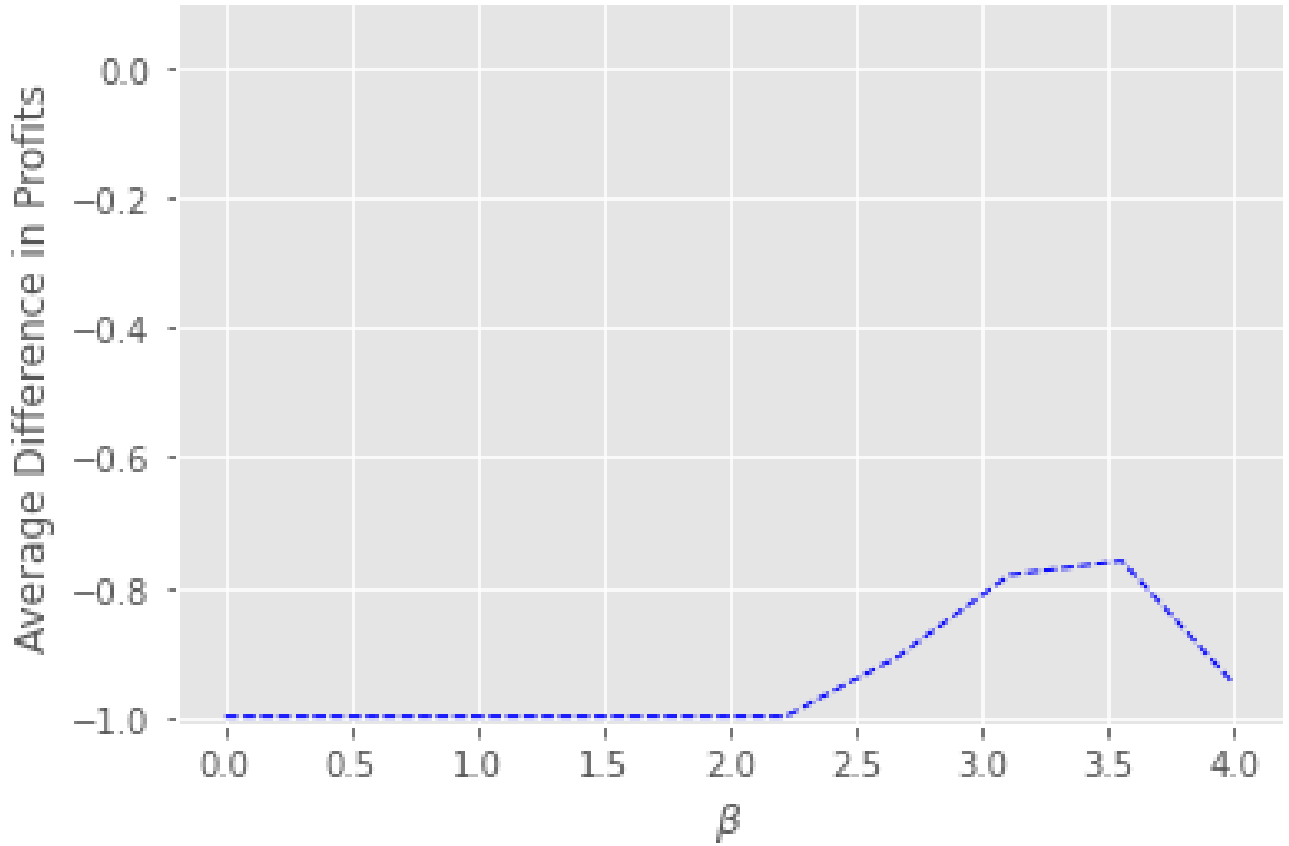
Relative average profits

- We run the model for N (10000) periods
- Calculate the average profits for each of the strategies for the whole period:

$$\hat{\pi}_h = \frac{1}{N} \sum_{t=1}^{N} [\pi_{h,t}] \qquad h = f, c$$

- Calculate $\hat{\pi}_f - \hat{\pi}_c$ for different values of
  - costs C
  - intensity of choice β

Fundamentalists gain less



- When price $x_t = 0$, $\hat{\pi}_f - \hat{\pi}_c = C$
- $\hat{\pi}_f - \hat{\pi}_c$ increases as $x_t > 0$, decreases in part of the chaotic region

Insights

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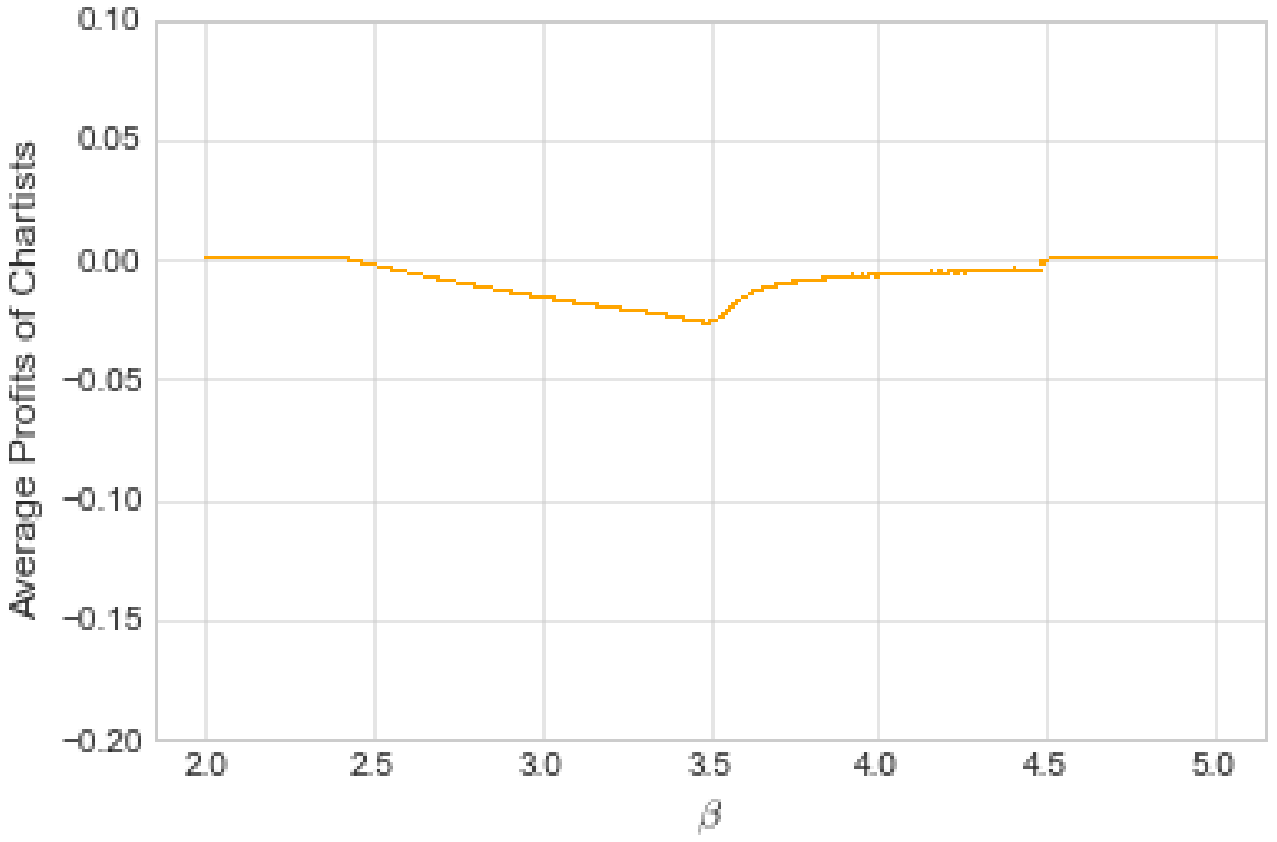
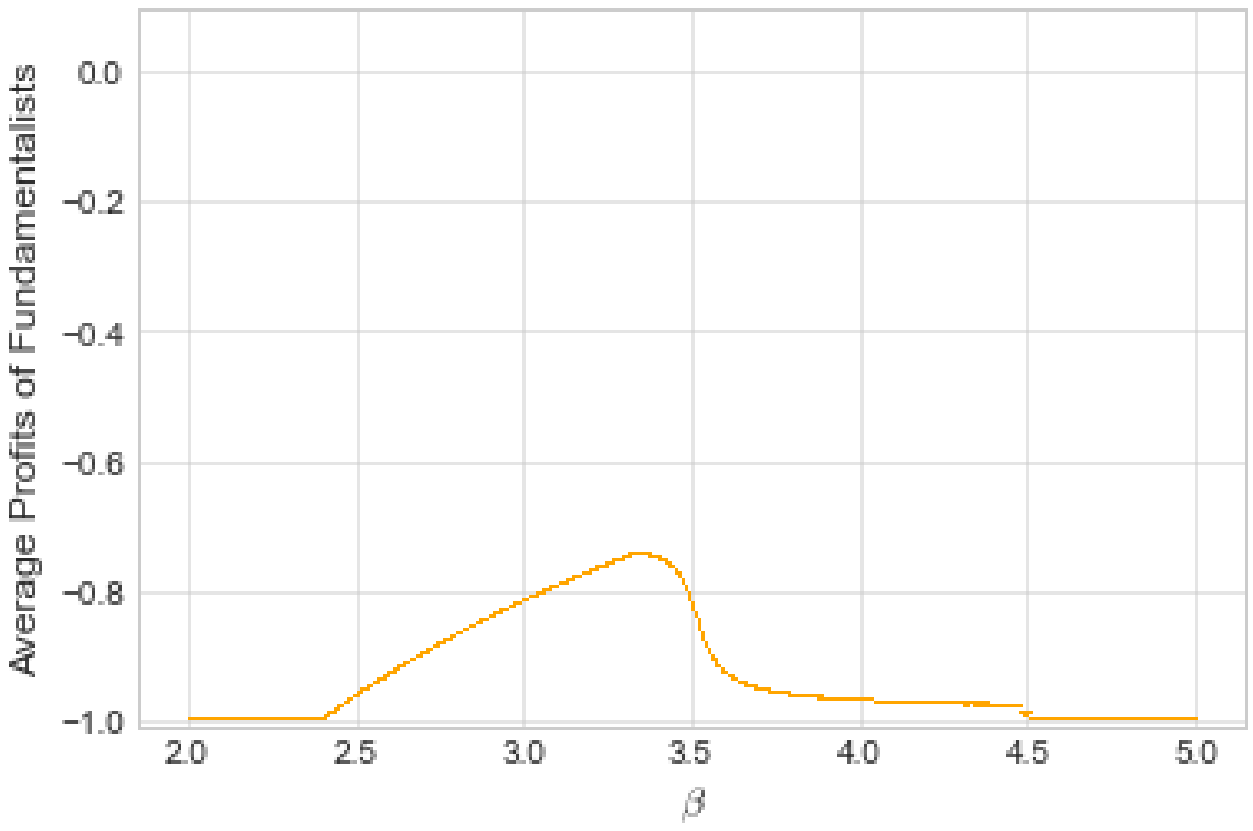
- What drives average relative profits between strategies?
- In order to get a better insight
  - Turn to $\hat{\pi}_f$ and $\hat{\pi}_c$

Trend followers' average profits



Only partially explains the difference in average profitability

Fundamentalists' profits



The difference is driven by the profits of fundamentalists

Taking stock

- Relative profits depend both on costs and intensity of choice
- For the parameter values of Brock and Hommes (1998) and low β
  - Fundamentalists gain less because it's costly
  - Difference in profits equals costs
- Higher β when bifurcation occurs
  - Difference in profits less than costs
  - Non linear effect depending on price dynamics

Profitability paradoxes?

Paradox 1

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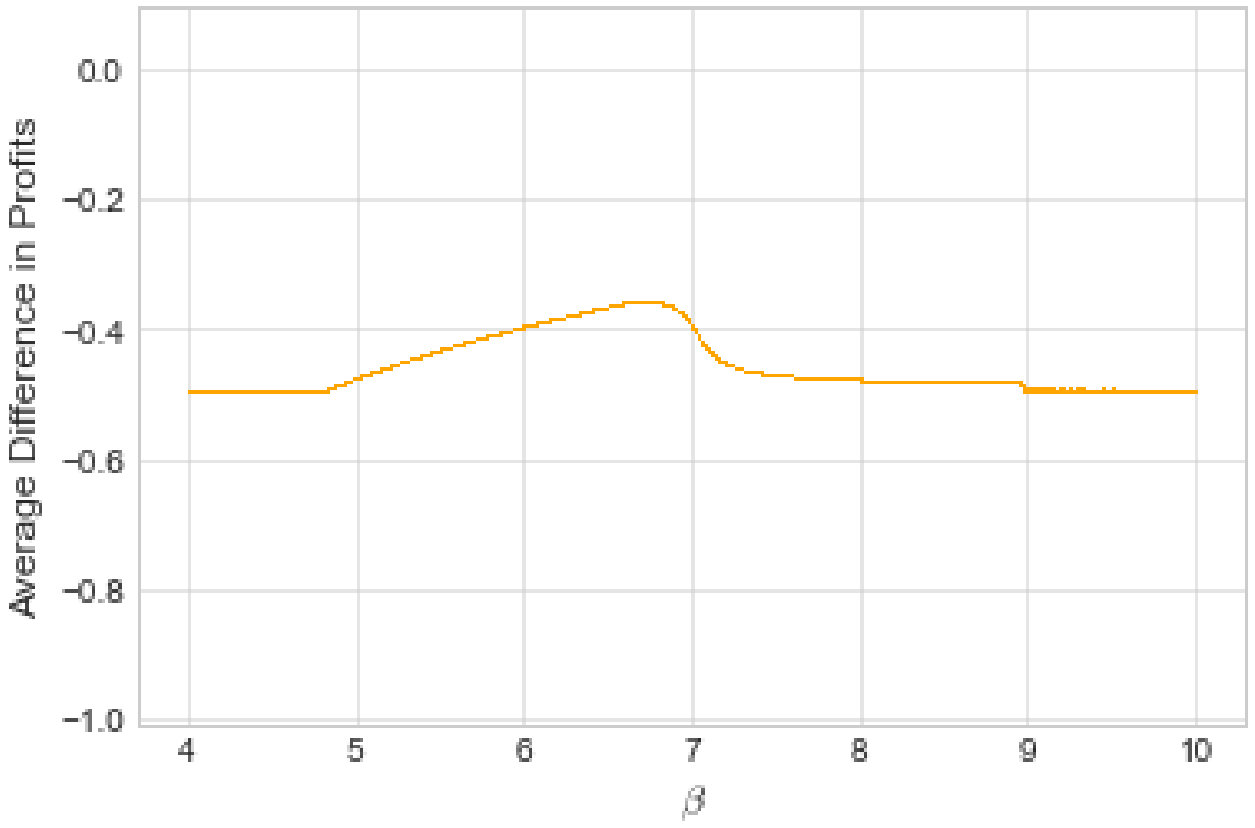
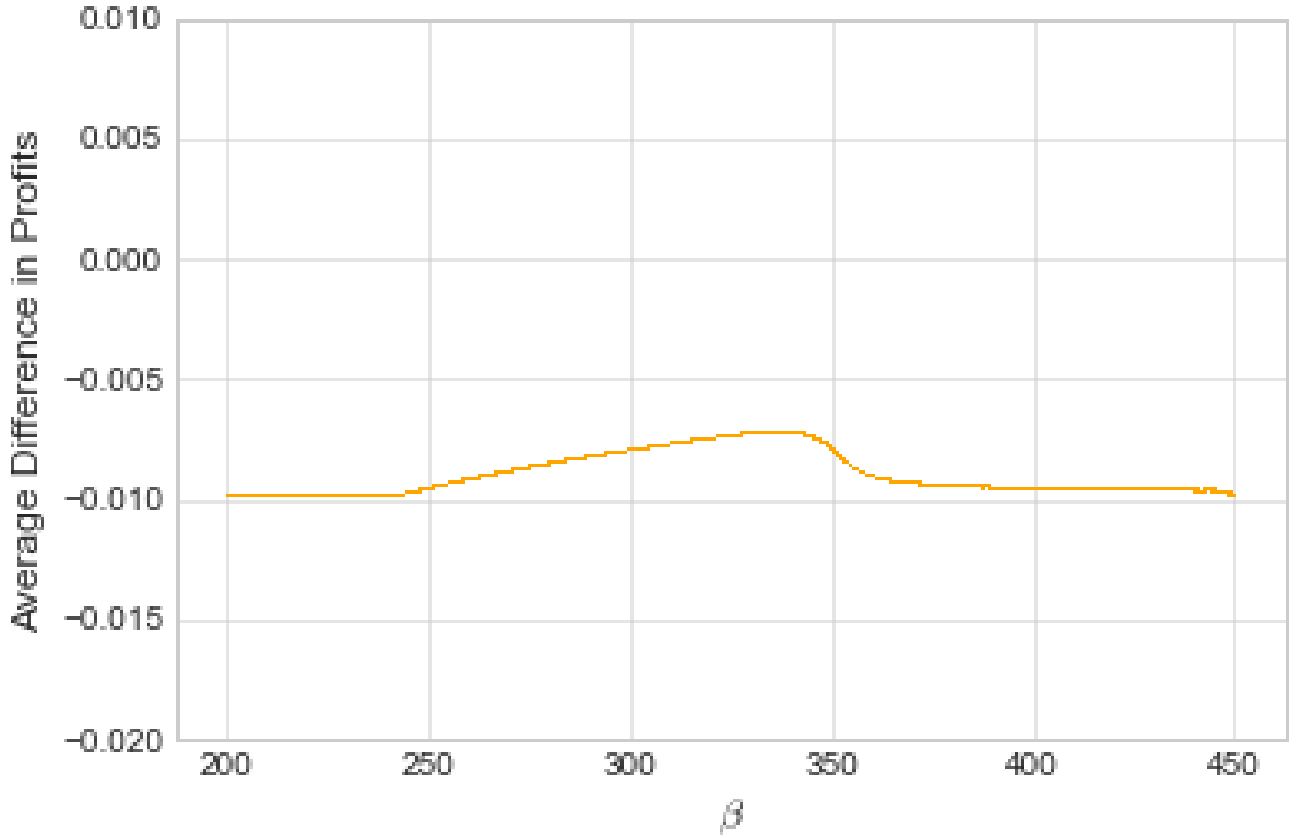
Question 1: Do we still observe these with lower costs?
Question 2: Can fundamentalists gain more?

Average profits for $C = 0.5$



Average profits for $C = 0.01$



Conclusion

- Fundamentalist strategy is on average less profitable than trend following one
  - Costly to bring information to the market
  - Once it's there others can benefit
- High intensity of choice for given costs
  - Makes price deviate from fundamental value but increases relative profits
  - The effect is lower when costs are lower

Next steps

- Explain the paradoxes
  - Initial thoughts related to how fluctuations increase trend followers' profits
- Compare results with when having fixed fractions of two populations
- Answer more questions:
  - How does noise influence the outcomes?
  - How does non-switching affects relative profitability and also prices?
  - What happens if we assume different levels of reasoning?