Information Percolation in Centralized Markets

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Model Implications

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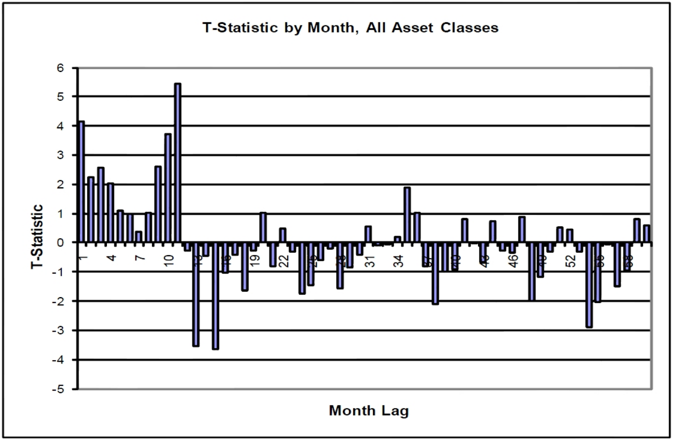
ii) Rumors , circulated through word-of-mouth communications, may induce reversal.

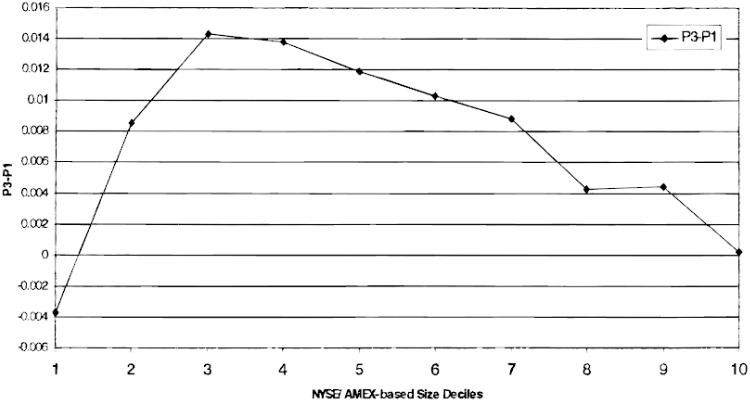
Motivation I

Panel A: $r_t^s / \sigma_{t-1}^s = \alpha + \beta_h r_{t-h}^s / \sigma_{t-h-1}^s + \varepsilon_t^s$



Momentum and reversal in 58 liquid instruments.
Source: *Moskowitz, Ooi, and Pedersen (2010)*

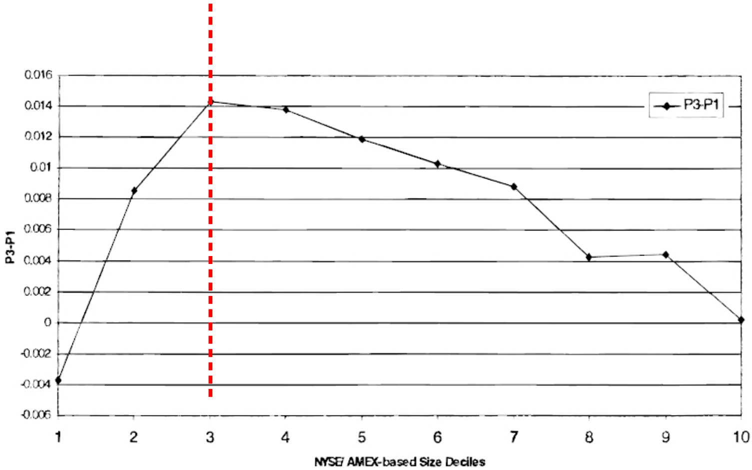
Motivation II



Relationship between size and the magnitude of the momentum

Source: Hong, Lim, and Stein (2000)

Motivation II



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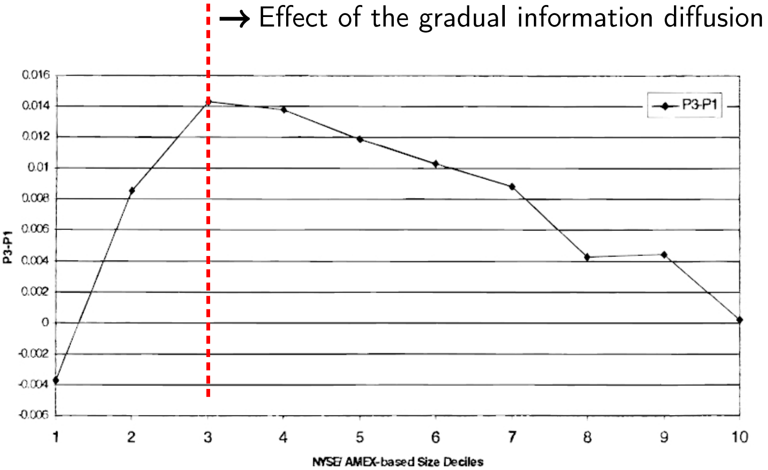
Motivation II

→ Effect of the gradual information diffusion



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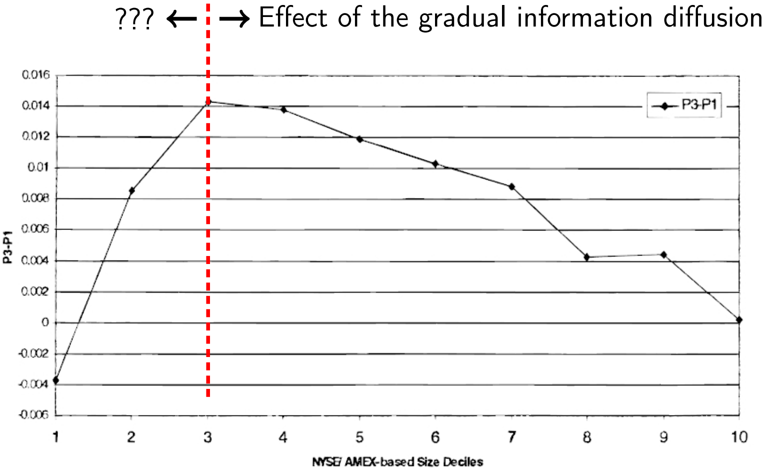

Relationship between size and the magnitude of the momentum

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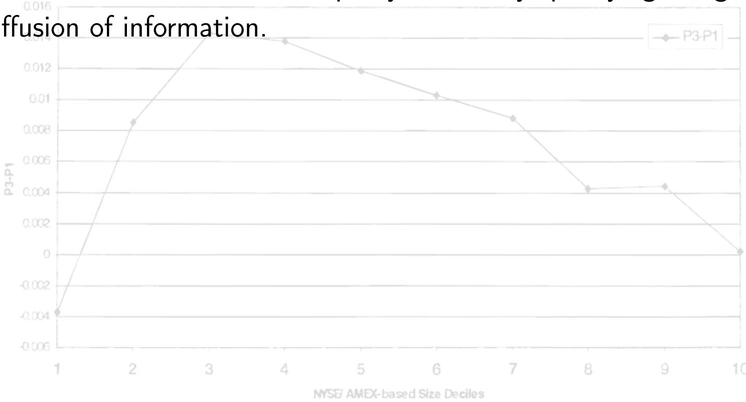
What We Do

P3-P1
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-0.002
-0.004
-0.006
1
2
3
4
5
6
7
8
9
10
NYSE/ AMEX-based Size Deciles

What We Do

We obtain the inverted U-shape by differently specifying the gradual diffusion of information.



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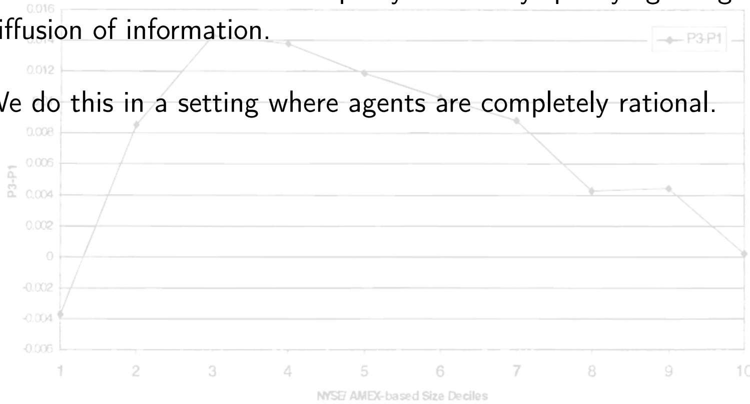

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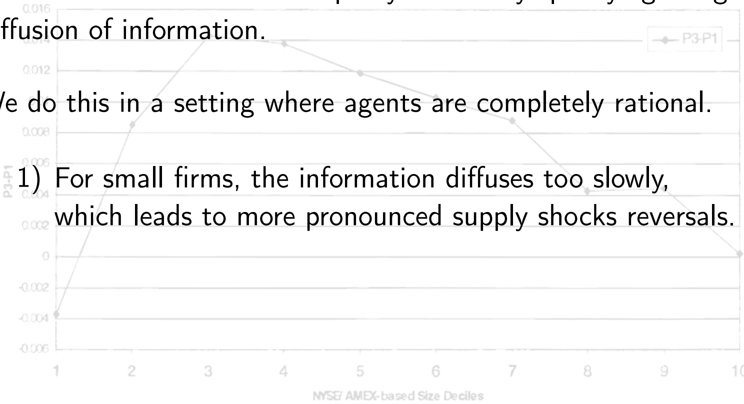
1) For small firms, the information diffuses too slowly, which leads to more pronounced supply shocks reversals.



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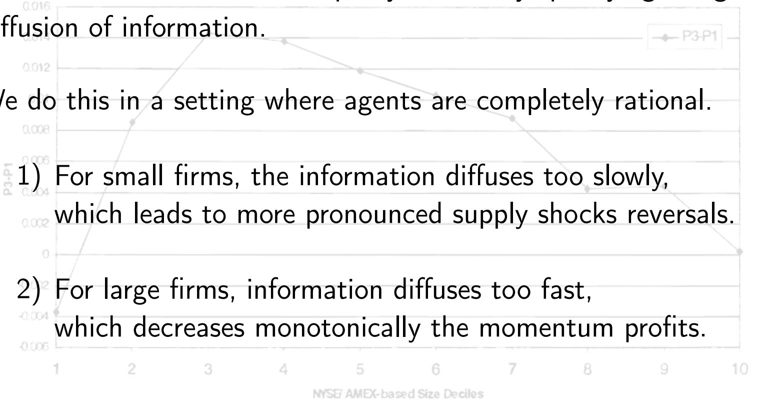

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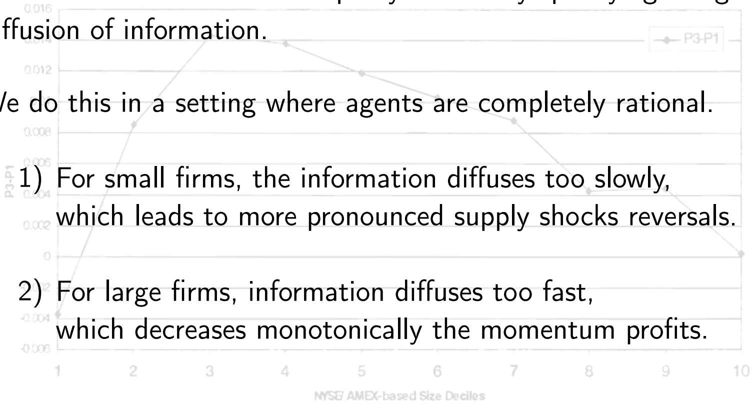

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2) For large firms, information diffuses too fast, which decreases monotonically the momentum profits.

We obtain this nonmonotonic effect with a single parameter, λ.

How We Do That

- We start from a Rational Expectations framework: *He and Wang (1995)*
- We let agents meet and share information, as in *Duffie, Malamud, and Manso (2009)*

Related Literature

Evidence on momentum and reversal

Cutler, Poterba, and Summers (1990), Jegadeesh and Titman (1993), Rouwenhorst (1998), Moskowitz, Ooi, and Pedersen (2010), Bernard (1992), Chan, Jegadeesh, and Lakonishok (1996), De Bondt and Thaler (1985), Lakonishok, Shleifer, and Vishny (1994), Poterba and Summers (1988), Hong, Lim, and Stein (2000).

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Outline

I. A Benchmark Model

- Setup
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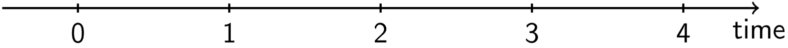

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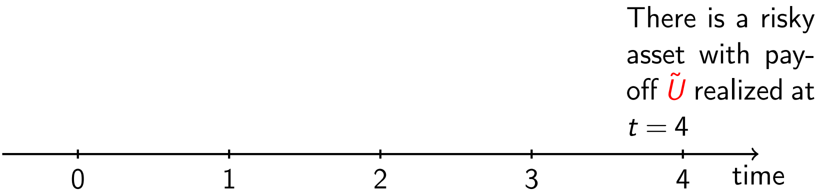
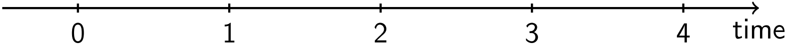


There is a continuum of investors $i \in [0,1]$ with exponential utility function with $CARA = 1/r$.

$\tilde{U} \sim \mathcal{N}(0, 1/H)$

There is a risky asset with payoff $\tilde{U}$ realized at $t = 4$



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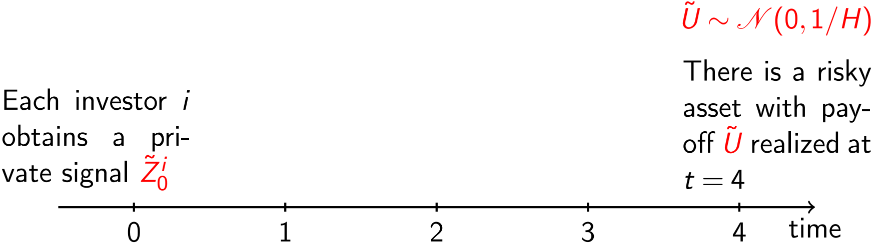

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$\tilde{Z}_0^i = \tilde{U} + \tilde{\varepsilon}_0^i$
$\tilde{\varepsilon}_0^i \sim \mathcal{N}(0, 1/S)$

Each investor i obtains a private signal $\tilde{Z}_0^i$

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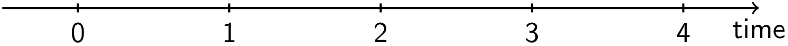

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0	1	2	3	4
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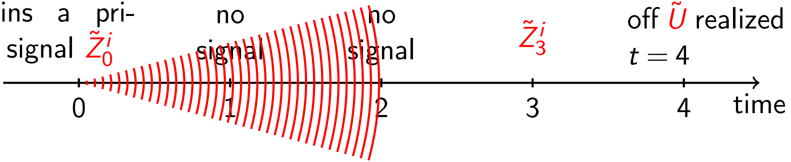

Agents meet with each other and share their private signals. The meeting intensity is λ.

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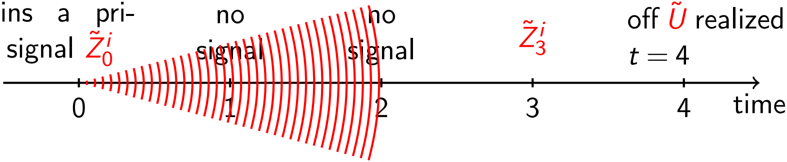

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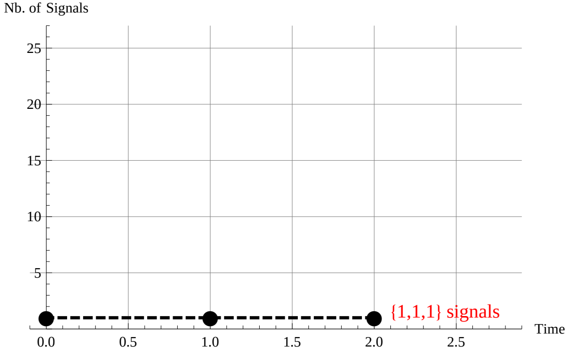
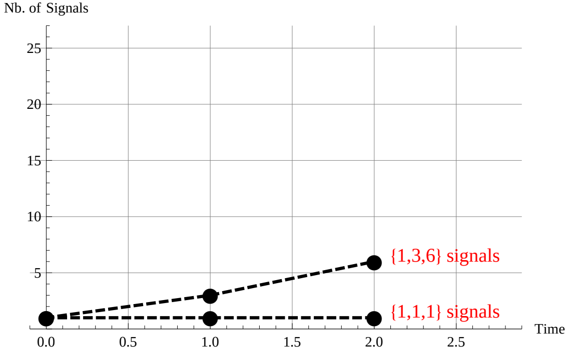
Noisy supply $\tilde{X}_t \sim \mathcal{N}(0, 1/\Phi)$ prevents prices to fully reveal the fundamental.

Simulation



Simulation Example: Different investor types

Simulation



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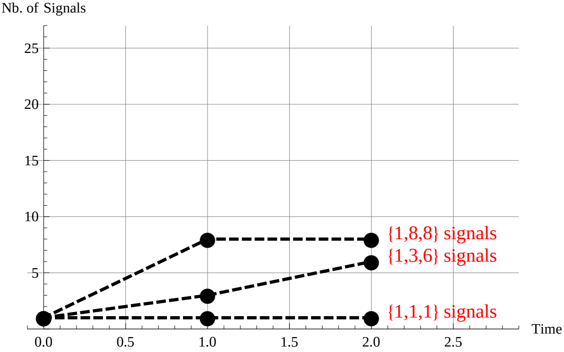

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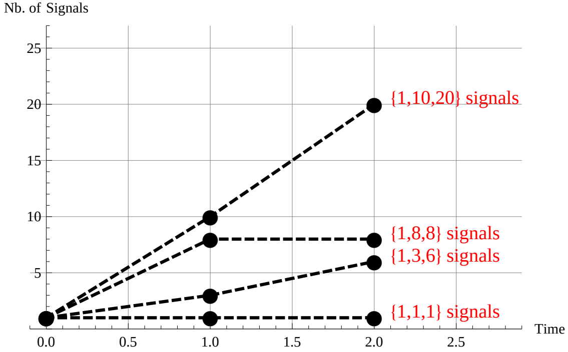

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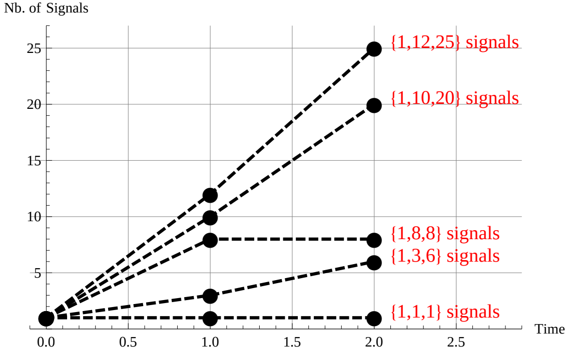

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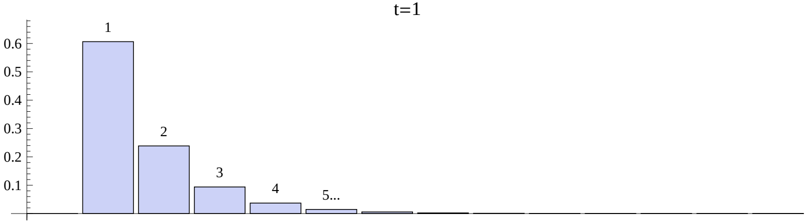
Probability Density Function of the Number of Signals



Distribution of signals: $\lambda = 0.5,\ t = 1$

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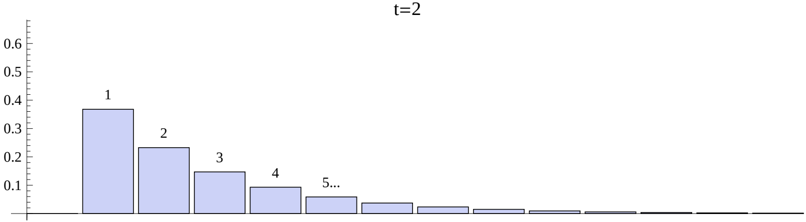

Distribution of signals: $\lambda = 0.5,\ t = 2$

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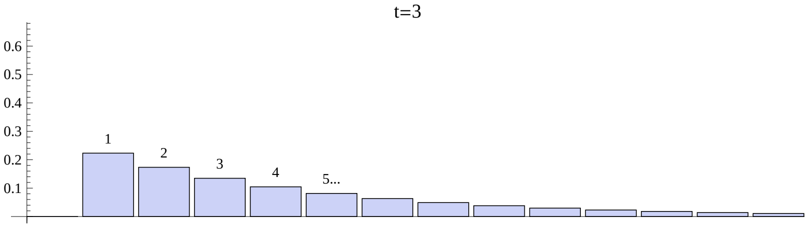

Distribution of signals: $\lambda = 0.5,\ t = 3$

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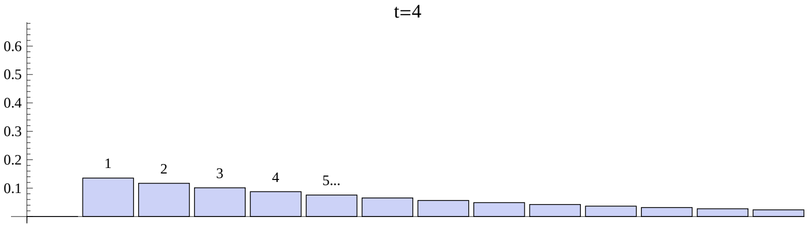

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- The optimal trading strategy of the individual investor i at time $t = 1, 2, 3$ is given by

$$\Delta \tilde{D}^i_{t,k} = \gamma \left[k_t S \left(\bar{Z}^i_{t,k_t} - \tilde{P}_t \right) - S\Omega_t \left(\tilde{U} - \tilde{P}_t \right) + \frac{\tilde{X}_t}{\gamma} - \Delta K^i_{t-1,k} \Delta \widetilde{P}_t \right]$$

- We focus on the correlations between consecutive price differences:

$$\text{corr}\left(\widetilde{P}_1 - \widetilde{P}_0, \widetilde{P}_2 - \widetilde{P}_1 \right)$$
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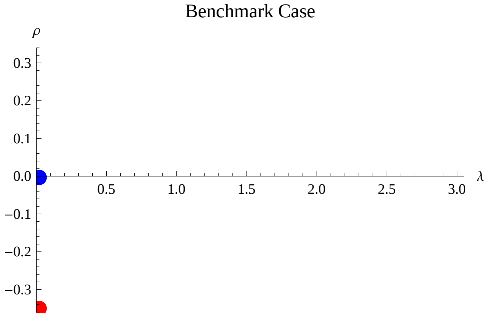
Price Drift in the Benchmark Case



Autocorrelation of stock returns: No information percolation

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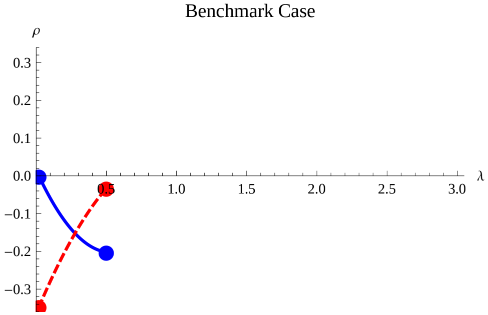

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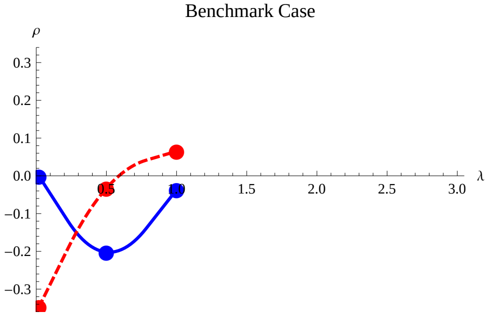

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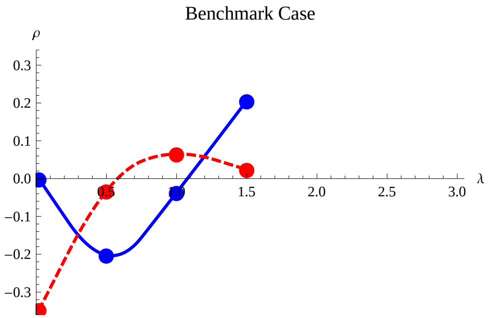

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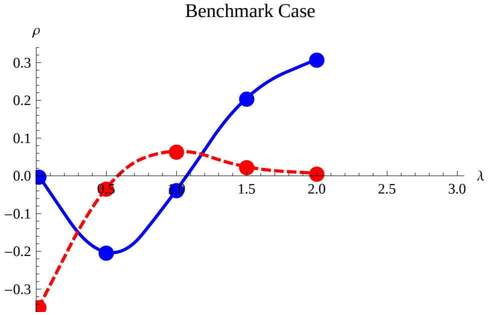

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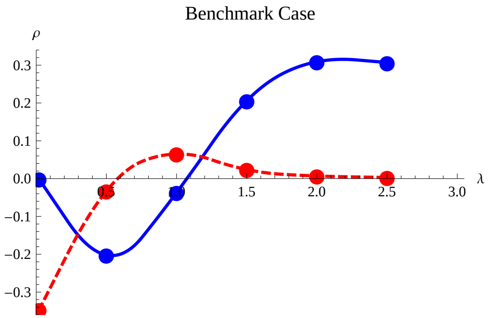

Autocorrelation of stock returns: $\lambda \in [0, 2.5]$

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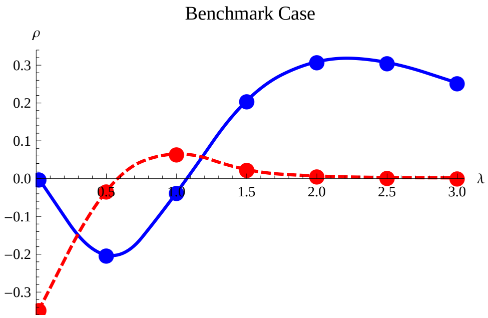

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- Everything is exactly as in the benchmark model, except that

$$\tilde{Z}_0^i = \tilde{U} + \tilde{V} + \tilde{\varepsilon}_0^i$$
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- The private signals at time 0 are not centered on the fundamental $\tilde{U}$. There is a additional (common) noise $\tilde{V} \sim \mathcal{N}(0, 1/\nu)$, *unobserved* by the individual investors.
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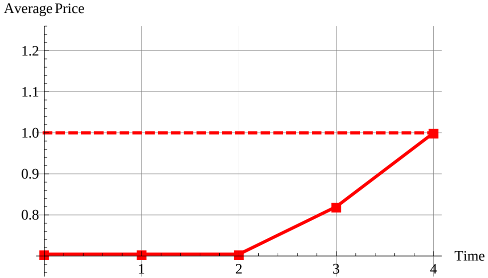
Hump-Shaped Patterns in Stock Prices



Stock Prices: $\tilde{U} = 1, \tilde{V} = 0.5, \lambda = 0$

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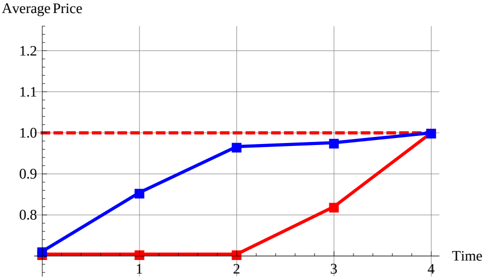

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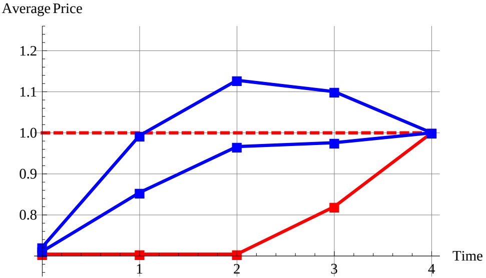

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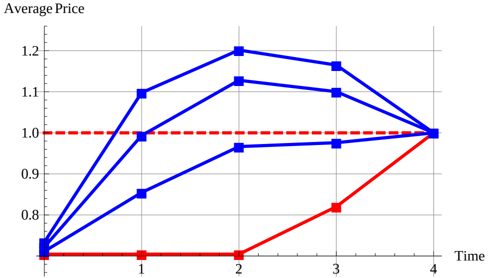

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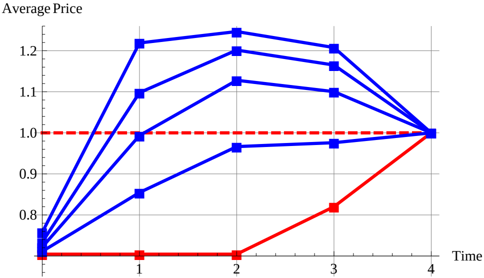

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Conclusion

- The diffusion of information through financial markets has a significant impact on the dynamics of asset prices.
- Word-of-mouth communications produce price drift.
- Rumors may propagate and produce reversals.
- Many interesting extensions are work in progress.

Related Literature

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