Bubbles

De Long, Shleifer, Summers and Waldmann: Noise Trader Risk in Financial Markets

• Overlapping generations

• People live two periods; invest when young; consume when old

• Two assets
— Safe asset r (in perfectly elastic supply) : price 1

— Risky Asset u pays r but u is not in elastic supply: price P_t

• Two types of agents
— Rational investors i: fraction $(1 - \mu)$

— Noise Traders n: fraction μ

• The noise traders misperceive the expected price of the risky asset by $\rho_t \sim N\left(\rho^*, \sigma_\rho^2\right)$

• ρ^* is the average misperception and σ_ρ^2 the variance of misperception.

Question:
Do rational investors arbitrage away the misperceptions of noise traders?

• Noise traders thus maximize their expected utility given the next period dividend, the one period variance of p_{t+1} and their false belief that the distribution of the price of u next period has mean ρ_t above its true value.

• Utilities are given by

$$U = -e^{-2\gamma W}$$

as a function of wealth W when old.

• Maximize expected utility

$$U = -e^{-2\gamma(E[W]-\gamma\sigma_w^2)}.$$

• Equivalent to maximizing

$$\lambda_t^j[r + E_t(P_{t+1}) - P_t(1+r)] - \gamma\left(\lambda_t^j\right)^2 E_t\left(\sigma_{Pt+1}^2\right) + I_{j=n}\lambda_t^j(\rho_t).$$

• This implies demands

$$\lambda_t^j = \frac{r + E_t p_{t+1} - (1+r)P_t + I_{j=n}\rho_t}{2\gamma E_t \sigma_{pt+1}^2}$$

and price

$$P_t = \frac{1}{1+r}(r + E_t p_{t+1} - 2\gamma E_t \sigma_{pt+1}^2 + \mu\rho_t)$$

which can be solved recursively so that

$$P_t = 1 + \frac{\mu(\rho_t - \rho^*)}{1+r} + \frac{\mu\rho^*}{r} - \frac{(2\gamma)\mu^2\sigma_\rho^2}{r(1+r)^2}$$

• In equilibrium the rational investors and noise traders both believe that securities are mispriced. Both sides reduce their bets however as there is uncertainty over the next period beliefs. The prices reflect this risk (the last term).

• Relative Expected returns

$$\Delta R_{n-1} = \left(\left(\lambda_t^n - \lambda_t^i \right) [r + P_{t+1} - P_t(1+r)] \right).$$

• The difference in demand is

$$\lambda_t^n - \lambda_t^i = \frac{\rho_t}{2\gamma E_t \sigma_{p_{t+1}}^2} = \frac{\rho_t}{2\gamma \mu^2 \sigma_\rho^2} \, .$$

• Note that as $\mu \rightarrow 0$, this goes to infinity: hence as noise trader risk disappears, traders take increasingly large bets.

• They show that

$$E(\Delta R_{n-i}) = E_\rho - \frac{(1+r)^2(\rho^*)^2 + (1+r)^2\sigma_\rho^2}{2\gamma\mu\sigma_\rho^2} \, .$$

• Thus noise traders can earn more returns in equilibrium if their misperception is positive $E\rho > 0$.

• Hence wealth of “noise traders” can grow over time

• Extension

$$\mu_{t+1} = max[0, \min \mu_t + \xi(R_n - R_i)]$$

• When ξ i small, can solve for

$$E_t(\Delta R_{n-1}) = \rho_t - \frac{(1+r)^2 (\rho_t)^2}{2\gamma\mu_t\sigma_\rho^2}$$

• There exists μ^* such that this is zero - but the equilibrium is unstable: If

$$\mu_t > \mu^*, E\mu_{t+1} > \mu_t.$$

• Think of the "Internet bubble period"

• This kind of thinking is closely related to literature on "Limits of Arbitrage," see e.g., Shleifer and Vishny (1988) paper with the same title.

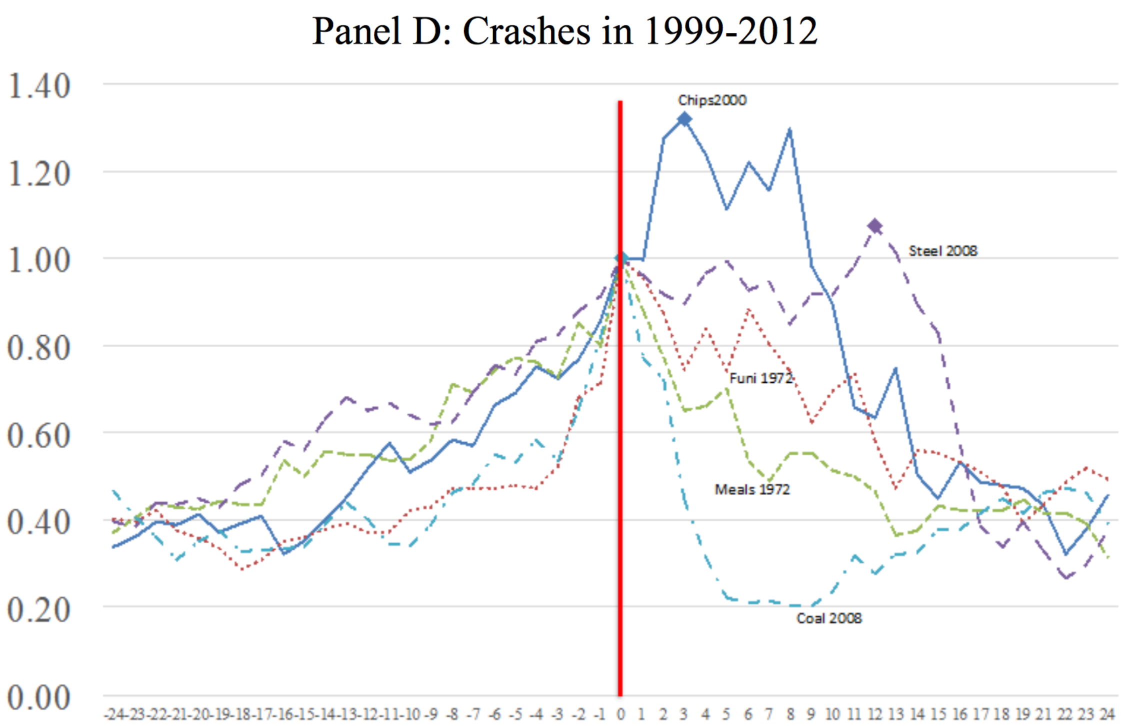
Bubbles for Fama, Greenwood and Shleifer JFE forthcoming

Test what happens after some industry returns > 100% in two years. Is there evidence of a crash?

Yes, if

- Returns accelerate (last year's returns higher than those before)
- If lots of new firms (IPOs)
- If especially the new firms have risen a lot during the market boom
- If volatility is high
- If volatility has increased
- If overall market valuation is high (Shiller's CAPE)

If any one of the latter conditions is also true, then bubble in that industry. Investors are better off keeping their money in cash.



DELEGATED PORTFOLIO MANAGEMENT AND CASCADES

Scharfstein and Stein (1990), ”Herd behaviour and investment”, American Economic Review”, vol. 80, 3, pp. 465-79

Idea:
• In delegated portfolio management, managers may ignore their own signal if uncertain about their own ability. The reason is that if all managers take the same action, then their principals think that most likely they have seen the same signal (=> they have seen a signal and cannot be just guessing).Then if things go bad, most likely it was just bad luck (not bad ability).

• Credit booms in South America, Finland...

• Internet bubble in stock markets?

• Model

• Assume two firms A and B run by managers A and B

• Managers can either be smart or dumb but do not know this themselves.

• The probability that a manager is smart is θ.

Managers select investments sequentially A moves first

• Two possible states ”High profit state” and ”Low profit state” with profits

$x_H > 0$

$x_L < 0$

• Prior probabilities of the two states are α and (1 − α).

• Managers observe signals on profitability of project: S_G or S_B

$$pr(S_G | x_H, smart) = p$$

$$pr(S_G | x_L, smart) = q < p$$

• Also, if manager is dumb, signal is uninformative about x

$$pr(S_G | x_H, dumb) = pr(S_G | x_L, dumb) = z$$

• Assume also that the probability of a good signal is the same irrespective of manager being good or bad (what happens if probability of S_H is higher if smart?). This is to assume that

$$z = \alpha p + (1 - \alpha) q \; .$$

Now, application of Bayes rule gives

$$pr(x_H \mid s_G) = \mu_G = \frac{\Pr ob(x_H \,\&\, s_G)}{s_G} = \frac{\theta p + (1-\theta)z}{z}\alpha$$

$$pr(x_H \mid s_B) = \mu_B = \frac{\theta(1-p) + (1-\theta)(1-z)}{1-z}\alpha$$

Assume that investment is attractive if good signal has been received but not if bad signal has been received

$$\mu_G x_H + (1-\mu_G)x_L > 0$$

$$> \mu_B x_H + (1-\mu_B)x_l$$

• In this case, manager *A* clearly should follow his signal! This means that *B* can learn *A*'s signal from *A*'s action.

• The question is what *B* should do?

• In principal *B* should invest when:

$$E(x \mid s_A, s_B) > 0$$

• This paper however shows that this is not necessarily the case - *B* may ignore his own signal and behave always similarly to *A* for reputational reasons !!

Additional assumptions:

• Let $\alpha = 1/2$, $p = 1 - q$

• If managers are smart, they see the same signal!

• Managerial labor market: after this round of investments they receive a payoff (payoff in retirement job) proportional to markets assessment for their ability: $\hat{\theta}$.

• PAPER SHOWS: B never follows his signal!!

• This occurs as because if B follows his signal, for instance when A does not invest, his expected reputation decreases as:

$$E(\theta_B(s_B, s_B \mid s_B, s_G) > E(\theta_B(s_B, s_G) \mid s_B, s_G)$$

implying that B does not want to follow his signal. This can be verified looking at the posterior probabilities on ability.

• There is an equilibrium in which A invests if and only if he observes s_G and B always mimics A's action.

• Idea: it is better to fail together than separately. If you fail together then this is most likely due to a bad signal - not stupidity (10000 portfolio managers investing in India today cannot all be wrong!!)

• Solution: performance fees (possible problem excessive risk taking (gamble with borrowed money)). Solution: Fund managers must invest their own money.

• Empirical research on career concerns and managerial investment:

-JA Chevalier, G Ellison (1995): Risk Taking by Mutual Funds as a response for incentives

-Patrigi and Massa (2005): Compensation and managerial herding: evidence from the mutual fund industry

Bikchandani, Hirshleifer and Welch (1992) A theory of fads, fashions, custom and cultural changes as informational cascades, in Journal of Political Economy.

• Information cascades investors ignore their signals and behave as others

• When signals are imperfect, high probability that they behave in contrast to the aggregate information

• Small information releases can lead to very large revisions of signals
MODEL

• Two possible payoffs to asset $V = 1$ or $V = 0$

• Cost of investment $C = 1/2$

• Assume individuals observe independent signals $X_i \in \{H, L\}$

• They observe H with probability $p > 1/2$ if $V = 1$.

• They observe L with probability $p > 1/2$ if $V = 0$.

• First knows his signal; the second knows his signal + action of the first (and can infer his signal); third observes his signal + actions of first and second (and can infer their signals).

• High probability that third ignores already his signal: Why?

• Suppose his signal is L and two previous have invested. Then

$$Pr(V = 1 \mid H, H, L) > \frac{1}{2}$$

so he will also invest (hence his information is not revealed and the fourth investors problem is the same as the third ones) hence will also invest and we have a UP cascade! But it is still possible that true state is V=0 and the first two just received uninformative signals!

• The probability of an UP cascade, no cascade and DOWN cascade after n individuals are:

$$\frac{\left[1-(p-p^2)^{n/2}\right]}{2}, (p-p^2)^{n/2}, \left[\frac{1-\left(p-p^2\right)^{n/2}}{2(1-p+p^2)}\right]$$

• When true state is V=1 the probability of an UP cascade, no cascade and DOWN cascade after n individuals are:

$$\frac{p(1-p)\left[1-\left(p-p^2\right)^{n/2}\right]}{2\left(1-p+p^2\right)}, (p-p^2)^{n/2}, \frac{(p-2)(p-1)[1-(p-p^2)^{n/2}]}{2(1-p+p^2)}$$

• Additional results: SMALL announcements of new information can lead to large revisions in value (internet bubble ended when Soros and Buffet made a statement that they do not understand prices.

• EXTENSIONS:

• Avery and Zemsky, AER 2000, argue that with continuous signals cascades in financial markets are not possible if all traders are rational as price adjusts from $1/2$ to $E(V \mid \Omega_t)$, where $\Omega_t = x_1, x_2, \ldots x_{t-1}$, so each new trader finds it optimal to trade on his information as in Glosten and Milgrom (if some noise traders so that trading is possible in general).

Duffie (2010) Slow moving capital

Fraction q of investors are "inattentive" for k periods (they arrive to markets every k period)

Fraction (1-q) are present all the time

Risk free asset with return r >0. Inattentive investors invest dividends at the risk free rate while out of the market.

Current supply of the asset Zt and dividend Xt of the risky asset are jointly Normal and autoregressive

$$\Phi_{t+1} = \Lambda\Phi_t + \Sigma^{1/2}\varepsilon_{t+1}$$

Here Σ is positive semidefinite and symmetric.

Return from purchasing one unit of the risky asset at time t is

$$R_{T+K} = S_{T+K} + \sum_{I=1}^{k} r^{k-i} X_{t+i}$$

Market clearing implies (given demands of inattentive D and attentive K) is

$$D_t + K_t = Z_t - D_{t-1} - D_{t-2} ... D_{t-k+1}$$

Let $H_t = D_{t-1}, D_{t-2} \ldots D_{t-k+1}$ be the vector of quantities held off the market by infrequent investors.

Anticipate an equilibrium stationary autoregressive state vector $Y_t = \left(\Phi_t^T, H_t\right)^T$

and price $S_t = cY_t$.

Where c is k+1 dimentional constant

Inattentive investors demand is in equilibrium

$$K_t = b(c)\ Y_t$$

Attentive investors demand is

$$D_t = a(c)\ Y_t$$

Dynamics of Y is

$$Y_{t+1} = A(c)Y_t + B\varepsilon_{t+1}$$

It follows that

$$E(Y_{t+k} \mid Y_t) = A(c)^k Y_t$$

This implies price effects of shocks to Y_t (build up and) dissipate gradually over time

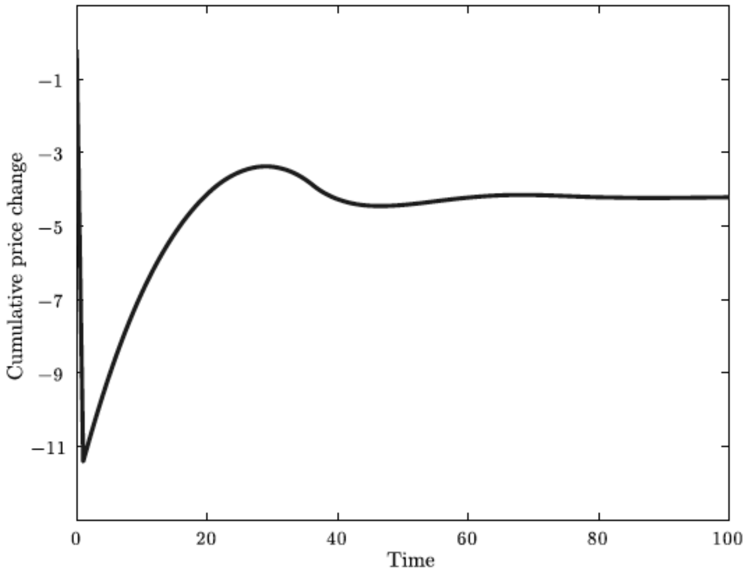


Figure 5. The price path associated with a supply shock on date 1 for the model and parameters described in the text. The parameters are provided on page 1252 of the text.

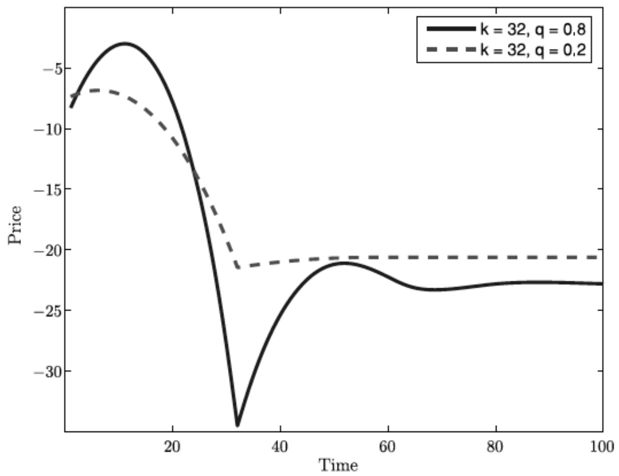


Figure 8. The modeled price path associated with an announcement on date 1 that a block sale occurs on date 32. The model and parameters are described in the text.

Greenwood, Hanson and Liao (2015)

Price dynamics in partially segmented markets

Extension of Duffie (2010) to two markets

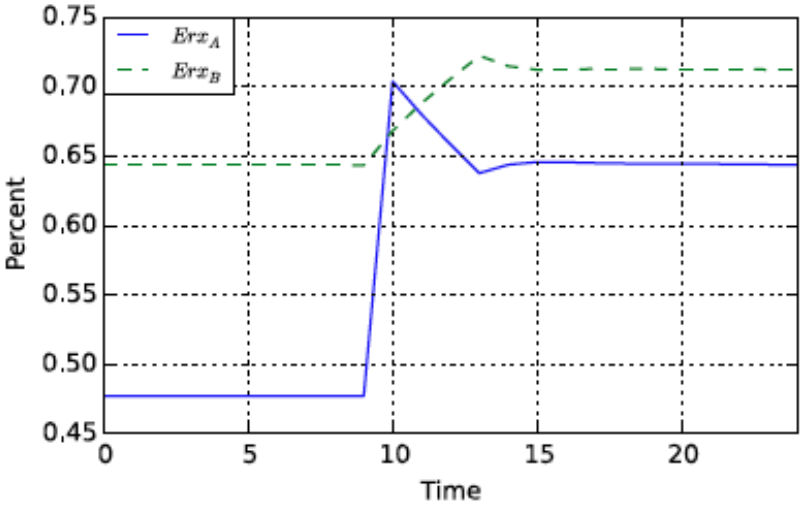
- Two segmented markets
- Two types of investors
- Attentive local investors operating in one market alone
- Inattentive investors (generalists) operating in both markets

Supply shocks in one market get gradually transmitted to the related market through the generalists

Reversal in the market where supply shock hits and continuation in the other market

Figure 1: Price impact of an unanticipated shock to the supply of asset *A*. This figure shows the impact on annual bond risk premia and bond yields of an unanticipated shock that increases the supply of asset A by 50% in period 10. Panel A shows the evolution of annual bond risk premia in market A, $E_t[rx_{A,t+1}]$, and market B, $E_t[rx_{B,t+1}]$, over time. Panel B shows the evolution of bond yields in market A, $y_{A,t}$, and market B, $y_{B,t}$, over time.

Panel A: Annual bond risk premia



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Vayanos 2001: Strategic Trading in a Dynamic Noisy Market

Investors may choose to trade slowly to avoid price impact (hide their order imbalance very much as in Kyle model informed trader hides his information by trading slowly)

Empirical evidence that investors trade slowly in e.g.

Chan and Lakonishok (1995) and Keim and Madhavan (1995)

Other type of slow trading is that mutual fund flows are autocorrelated.

Lou (2010) RFS paper shows that the slowly adjusting flows help explain momentum in stock returns in line with Vayanos and Woolley (2012)

MANIPULATION

• Allen and Gorton (1993): Churning bubbles

-Portfolio managers with zero wealth that invest investors funds and have performance fees $\pi = B + \alpha (y - B)$

-Two types of managers: good and bad

-Short selling restrictions

-Good managers are able to find profitable investment opportunities

-Bad managers buy a bubble stock that has 0 payoff at end time T and costs t at time t

-This is a negative NPV project, but bad managers are happy to invest as they may be able to find another bad manager who buys this stock from them allowing them to make a profit. Clearly the last manager loses everything, but then again this was not his money.

• Other papers:

• Allen and Gale (1991): Stock Price Manipulation, Market Microstructure and Asymmetric Information

• Suominen (2004): Manipulation of Closing Prices

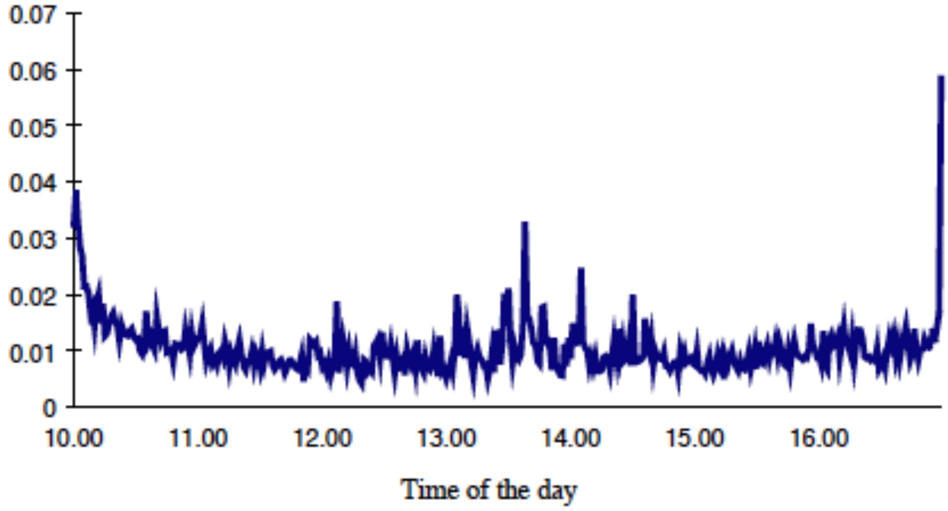


Fig. 1. One-minute variance of the CAC40 stocks (100 × return squared), January 3, 1995–April 26, 1995.

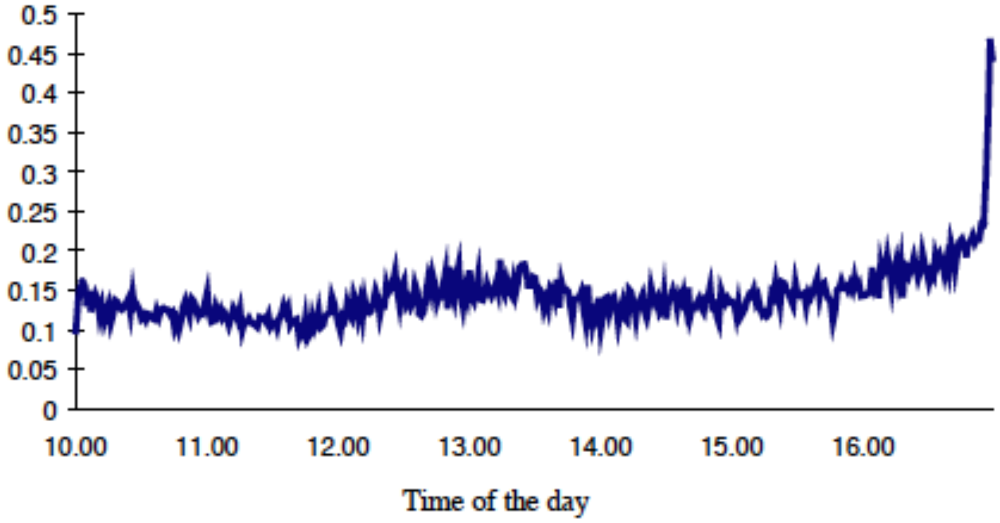


Fig. 3. Proportion of hidden orders for CAC40 stocks, January 3, 1995–April 26, 1995.

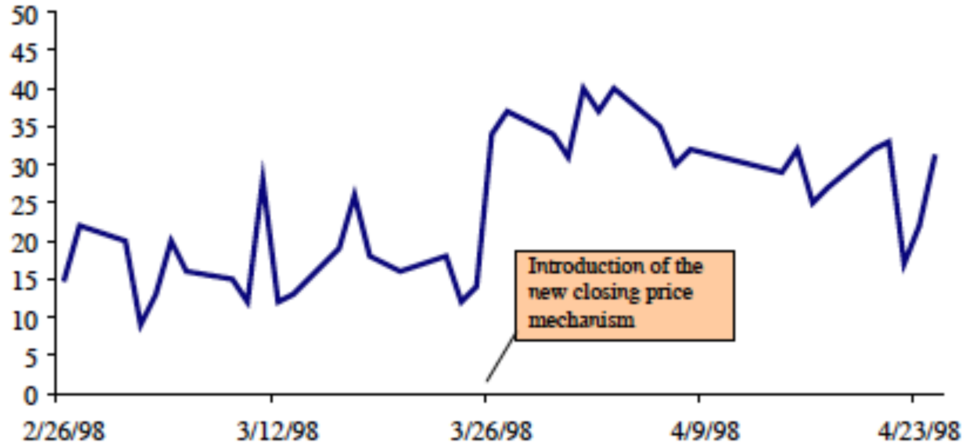


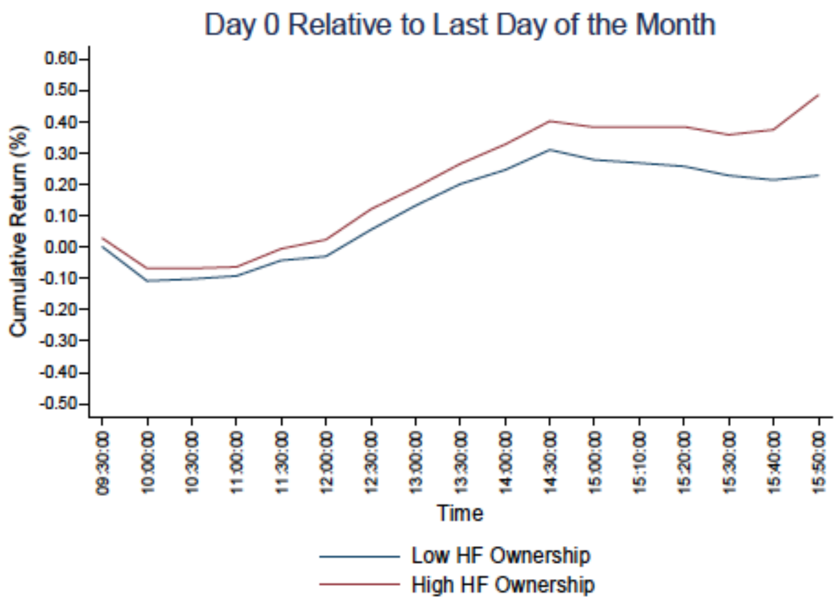
Fig. 4. Number of transactions with exactly 500 shares traded in the last 15 seconds of the day at the Bolsa de Madrid.

- Ben David, Franzoni, Landier, Moussawi (2013): Do Hedge Funds Manipulate Stock Prices?

Figure 1. Intraday Cumulative Returns

The figure reports the cumulative intraday returns (expressed as percentages) for stocks that have above- and below-median hedge fund ownership in the quarter. The two panels focus on the last day of the quarter and the first day of the next quarter, respectively. The sample period is 2000Q1 to 2009Q4.

Figue1a: Last Day of the Month



Figue1b: First Day of the Month

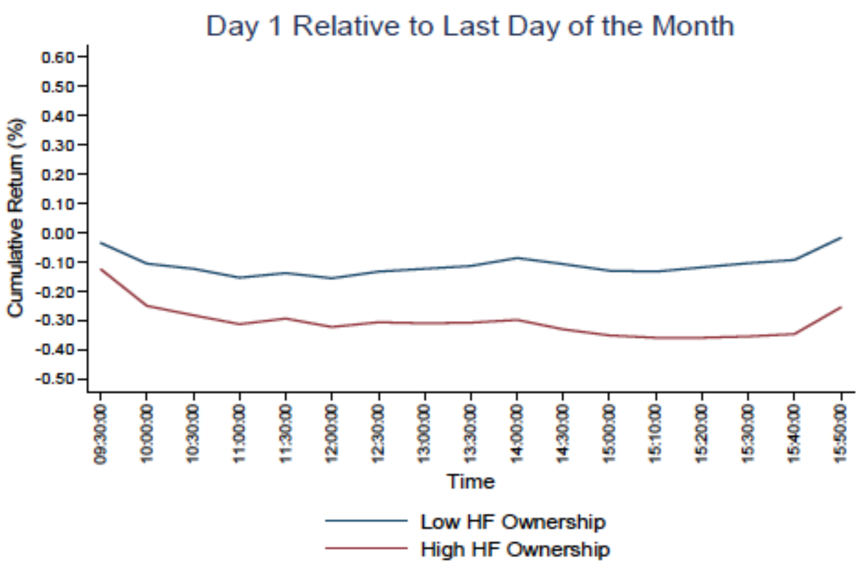


Figure 4. Dollar Volume Needed to Move the Price by 1%

The figure presents results from a regression of second-level regressions of returns (expressed as percentages) on the signed dollar volume. The regressions are run for each group of Amihud (2002) decile stocks, for each second of the last 11 last seconds of trade. Only the last days of the month are included for all months from January 2000 through December 2009. The figure presents the inverse of the coefficient on the signed volume. It represents the dollar amount associated with a move of one percent in the price.