

Third Annual Arrow Lecture

Speculation, trading and bubbles

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Bubbles

- History of financial markets dotted with episodes described as *bubbles* - periods in which asset prices seem to vastly exceed fundamentals.
- However not much agreement among economists on which economic mechanisms generate such episodes.
- *"I don't even know what a bubble means. These words have become popular. I don't think they have any meaning."*
Eugene Fama, The New Yorker

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Bubbles

- Discussions of bubbles often concentrate solely on the behavior of prices.
 - The most common definition of a bubble is as a period in which prices exceed fundamental valuation.
 - Any valuation however depends on a model of fundamentals
 - Valuations are always ex-post wrong.
- Additional empirical regularities help determine “reasonable” mechanisms that generate bubbles.

Plan

- 1 Present some stylized facts concerning bubbles.
- 2 Discuss a particular model for bubbles and argue that it fits these facts.
 - Present some additional evidence
- 3 Discuss the role of advice bias in bubbles.
- 4 Use the model to discuss compensation practices in the US financial industry.
- 5 Summary

Three stylized facts

- ① Asset price bubbles coincide with increases in trading volume.
 - ② Asset price bubble implosions seem to coincide with increases in asset supply.
 - ③ Asset price bubbles often coincide with financial or technological innovations.
- Price volatility ...

Bubbles and trading volume: South Sea Bubble

- Extraordinary rise and fall of price of South Sea Company shares and other similar joint-stock companies in 1720.
- \sim 2,000 transactions per year in Bank of England stock 1717-1719, 6,846 transactions (100% of stocks outstanding) in 1720.
- East India Company and Royal African Company turned over 150% of stock outstanding in 1720.
- Carlos, Neal and Wandschneider (2006)

Bubbles and trading volume: Roaring Twenties

- Accounts of stock-market boom of late 1920s emphasize overtrading in 28-29.
- Annual turnover at NYSE climbs from 100% per annum in 1925-27 to over 140% in 1928 and 1929. (Davis, Neal and White, 2005)
- All-time daily records of share trading volume were reached 10 times in 1928 and 3 times in 1929. New record not set until April 1, 1968, when LBJ announced he would not seek re-election (Hong and Stein, 2006)

Bubbles and trading volume: Internet...

- During the DotCom bubble internet stocks had 3 times the turnover of other similar stocks.
- Lamont and Thaler's 6 cases of spinoffs average 38% daily turnover.
 - Typical NYSE stock turnover of 100% per year.
- Cochrane (2002) documents cross sectional correlation between the ratio of market value to book value of a stock and that stock's turnover.

Asset price bubbles implosion and increases in asset supply

- In 1720, new issues by the South Sea Company doubled the amount of shares outstanding.
- Royal African Company more than tripled.
- Numerous other joint-stock companies started (Bubbles).
- Bubble Act of 1720: Parliament banned joint-stock companies not authorized by Royal Charter or the extension of corporate charters into new ventures.
 - Used by South Sea Company to sue old chartered companies that had changed activities and were attracting speculators.
- Neal, 1993.

Asset price bubbles implosion and increase in asset's supply

- Extraordinary number of lock up expirations for DotCom companies in H1 2000. (Ofek and Richardson, 2003)
- Venture capital firms that had distributed 3.9 billion to limited partners in third quarter of 1999, distributed 21 billion in 2000 Q1. (Janeway, to appear)
- Credit Bubble.
 - ABX index, synthetic Collateralized Debt Obligation (CDO) and the implosion of the credit bubble.

Asset price bubbles and the arrival of “new technologies”

- Railroad, electricity, automobiles, radio, micro-electronics, personal computers, bio-technology, and internet.
- US credit bubble: New financial instruments and hedging techniques allowed for better risk management and lower risk premia.
 - real estate bubble.
- Bubbles may actually generate benefits.
 - Cheaper credit for risky innovative activities.
- Credit bubbles destroy the financial system and have typically very costly aftermaths.

Bubbles: definition(s)

- 1 Asset prices exceed an asset's fundamental value
- 2 Asset prices exceed fundamentals because owners believe they can resell the asset for a higher price in the future.
(Brunnermeier, *The New Palgrave*)

Bubbles: Theories

- Rational Bubbles (Santos and Woodford, 1997)
 - Prices exceed fundamental value because they are expected to exceed fundamental value by even more tomorrow.
 - Difficulty dealing with finite-lived assets.
 - Does not generate correlation with trading volume.
- A positive shock is amplified by extrapolation of past returns (Shiller, 2000)
- **Limited arbitrage**
 - Asymmetry between costs of going short vs. long.
 - Heterogeneous beliefs (Miller, 1977; Harrison and Kreps, 1978.)
 - Absence of common knowledge that bubble exists (Allen, Morris and Postlewaite, 1993; Abreu and Brunnermeier, 2003.)

Principal assumptions

- Costly shorting
- Heterogeneous beliefs from overconfidence, the tendency of people to overestimate the precision of their knowledge.
- Far from being standard in economics
 - Economic models typically assume symmetric costs between going long and going short
 - Results showing that rational investors with common priors cannot agree to disagree.
 - No trade theorems: Unless some traders trade for “irrational” reasons, there is no trade. (K. Arrow, *The New Palgrave*)
 - Trading induced by liquidity shocks (Campbell, Grossman and Wang, 1993).

Evidence for costly short-sale

- Some obvious cases
 - Housing
 - CDO's before the introduction of ABX and synthetic CDO's.
- Shorting mechanisms for stocks (D'Avolio, 2002)
- Stocks with higher dispersion of earnings forecasts have lower future returns (Diether, Malloy and Scherbina, 2002)
 - It is easier for optimists to express their beliefs in markets.

Evidence of overconfidence

- Alpert and Raiffa, 1959, Lichtenstein, Fischhoff, and Phillips, 1982.
- Documented among: Engineers (Kidd, 1970), Entrepreneurs (Cooper, Woo, and Dukelberg, 1988)...
- Expert political judgment (Tetlock, 2005).
- Ben David, Graham and Harvey, 2010 on CFO predictions of S&P returns.
 - Realized returns are within executives [10%,90%] intervals 33% of the time.

A sketch of a model

- With Bolton, Hong, Xiong
- Investors in model estimate the “state” of the system using signals they believe are related to that state.
 - Filtering.
- Investors have heterogeneous beliefs
 - Some investors attribute excessive informativeness to certain signals. Others may be rational
 - Group A is “rational” but group B thinks that opinion of a business commentator correlates well with future dividends.
 - Overconfidence (miscalibration): Some investors overestimate how much they know .
 - No learning about overconfidence (horizon).
 - Investors know relative opinions fluctuate.

A sketch of a model

- Buyers know that in the future optimists may be willing to pay more than their own reservation value.
- Short sales are costly
 - Optimists have an easier time expressing their opinions.
- Buyer acquires a right to future dividends *plus* an option to resell.
- Even “rational” investors are willing to pay more than they think the asset is worth.
- Investors (also) face risk of fluctuations of others opinions
 - Sentiment Risk (Dumas, Kurshev and Uppal, 2009)
 - Excess volatility (Grossman and Schiller, 1981)
- Bubble = value of resale option. (*cf.* definition)

Consequences

- A higher degree of overconfidence leads to higher prices and a higher value for the resale option.
- Also leads to more volatile *relative* opinions and thus **higher trading volume**.
- Lower borrowing costs make resale option more valuable.
- Shorter horizon implies fewer opportunities to resell, thus smaller bubble.
- When investors have limited capacity to bear risk, an increase in the supply of the asset is absorbed by less optimistic buyers.

Consequences

- Valuation that marginal buyer has of the future payoffs declines as supply increases.
 - Lower discounted fundamental value of the asset.
- Buyer also knows that because the larger supply needs to be absorbed, future marginal buyers are likely to be less optimistic and thus the value of the resale option declines.
- **Increase in asset supply diminishes the bubble.**
 - Shorting
- Insiders that have more precise knowledge of future prospects will increase supply in response to bubble.
 - Other investors may learn from insider sales and put less weight on signals they previously overweighted.
- Leverage.

Some equations

- Risky asset with cumulative dividends:

$$dD_t = f_t dt + \sigma_D dZ_t^D$$

- Fundamentals f are not observable:

$$df_t = -\lambda(f_t - \bar{f})dt + \sigma_f dZ_t^f,$$

- Signal s ,

$$ds_t = f_t dt + \sigma_s dZ_t^s,$$

- Brownians Z^D , Z^f and Z^s all independent of each other.

Some equations

- Two sets of agents. Group A is “rational.” Group B believes that innovations to s and f are correlated:

$$ds_t = f_t dt + \sigma_s \phi dZ_t^f + \sigma_s \sqrt{1 - \phi^2} dZ_t^s,$$

$0 \leq \phi \leq 1$ measures disagreement.

- Assume ϕ fixed
- Difficult to learn true correlation because f is not observed.

Some equations

- Linear filtering problem. With Gaussian initial data, posteriors on the fundamentals f are Gaussian.
 - Group B agents overweight innovations to s .
 - Larger ϕ makes B agents more confident of their own views (less variance on their posterior distribution of f .)
- Opinions “cross.” In stationary solution, volatility of difference of beliefs increases with ϕ .
- If short sales are impossible, each group pays for the asset *and* for the option to sell the asset to agents in the other group when the difference in beliefs is large enough.
- Larger ϕ implies larger value for option and more trade.

Further tests of model

- China's A and B stocks (Mei, Scheinkman and Xiong, 2009)
- China's put warrants (Xiong and Yu, 2010).
 - Panel of prices, trading volume etc... of 18 put warrants trading in 2005-2007.
 - Price much higher than value justified by fundamentals.
 - Black-Scholes price
 - Looser upper bounds
 - Bubble declines as expiration approaches.
 - Bubble positively related to trading volume in panel.
 - Larger float of a warrant associated with smaller bubble.

Bubbles an optimists

- Bubble model requires presence of some optimists
- Where do optimists opinions come from?
 - Overconfidence more pronounced when problems are more difficult.
 - Change in degree of overconfidence
 - Bubbles and innovations
 - Extrapolation
 - Observing success of others...

Advisors and ignorance

- Use the credit bubble to illustrate the role of biased advice.
- Many banks kept large positions on mortgage and credit derivatives.
- Bad incentives (Greed) vs. ignorance
- Present a mechanism of how ignorance combines with biased advice
- Later, discuss evidence on the role of compensation (incentives).

Advisors and ignorance

- Advisors that have direct incentives to issue biased advice.
 - Sell side analysts, mortgage brokers, housing brokers
 - Malmendier and Shankitumar (2004) on investor reaction to recommendations by analysts
 - Michaely and Womak (1999) for evidence of price impact.
- During DotCom bubble, firms with no investment banking business, such as Sanford and Bernstein, issued recommendations every bit as optimistic as investment banks (Cowen, Groysberg, and Healy, 2003).
- No clear incentive to issue these optimistic recommendations.

Advisors and ignorance

- Two types of advisors: old fogies and quant-savvy that understand new quant pricing and hedging models.
- Quant-savvies want to signal their type (separate from old fogies)
 - Career concerns
 - Well intentioned but want to keep their influence
- Separation requires over-signalling; quant-savvies say models are even better than they truly think they are.
 - Economics of information.
- Sophisticated CEOs understand bias in advice, naive CEOs do not.
 - Naive CEOs become optimists (ignorance).

Tom Wolfe, *The Painted Word*

“To be against what is new is not to be modern. Not to be modern is to write yourself out of the scene. Not to be in the scene is to be nowhere.”

Compensation

- Principal-agent framework of optimal incentive contract
- Emphasizes contracts to solve misalignment between managers' and shareholders interests.
 - Managers' compensation should have equity component.
- Episodes of management's high rewards despite subsequent dismal performance of companies brought some disrepute to the theory.
- Call for governance reforms to reduce compensation and risk-taking.

Compensation

- In efficient markets no conflict between short-horizon and long-horizon shareholders or between current and future shareholders.
- During bubbles, short-horizon shareholders want to encourage management's actions that fuel speculation and short-term stock price even at the expense of long-run firm fundamental value.

Compensation

- If short horizon shareholders dominate board, they will design compensation contracts that emphasize stock based compensation with early vesting.
 - Increased compensation (efficiency wages).
- Some observations about the 90's
 - Increase in board independence from management, decrease in average CEO tenure and higher forced CEO turnover.
 - Growth of estimated earnings manipulation.
 - Enron, HealthSouth, Global Crossing, WorldCom, Adelphia...

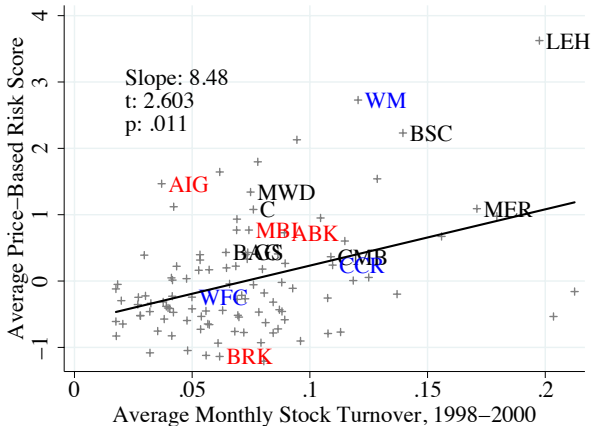
Compensation and risk-taking in US financial industry

- Cheng, Hong, and Scheinkman (2010)
- Panel data on US financial industry in 1992-2007 indicate that compensation of top executives and risk-taking are positively correlated in the cross-section.
 - *Residual compensation* corrected for size of firm.
 - Specially bonuses and equity/option compensation.
- Correlation may result from
 - ① Governance: Mis-alignment between manager's and shareholders interests.
 - ② Investor's Demand: Risk-taking a result of shareholders with short horizons incentivizing managers to take short-term risk.
 - ③ Supply, or "Firm Culture": Risk-taking as part of firm's culture, and short-term investors invest in these firms.
 - Bear Stearns' "cowboy culture" of risk-taking.

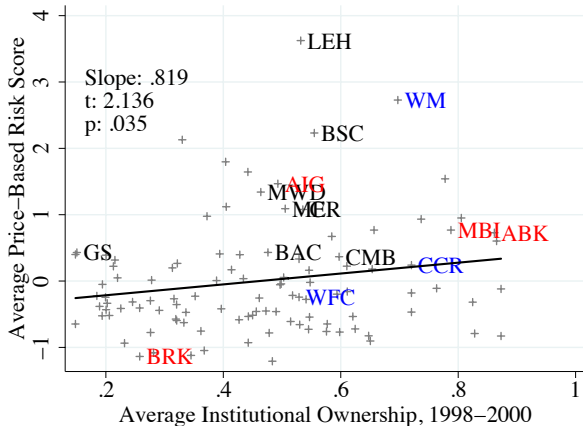
Governance vs. shareholders' choices

- Governance measures (entrenchment measures, outside directors,,,) do not correlate with residual compensation, risk taking or returns.
- High residual compensation, high risk-taking stocks, also have high institutional ownership and high turnover
 - Consistent with theory where speculative investors (especially institutions) incentivize managers to take risks
 - Also consistent with short-term investors selecting into firms with a culture of taking risks
- Indicates government reforms likely to be ineffective, unless reforms shift power to long-term stockholders.

Turnover 98-00 vs. Risk 01-07



Institutional ownership 98-00 vs. Risk 01-07



Michael Lewis, “The Irresponsible Investor”, *NYT*, June 6, 2004.

“The investor cares about short-term gains in stock prices a lot more than he does about the long-term viability of a company. Indeed, he does not seem even to notice that the two goals often conflict. The investor, of course, likes to think of himself as a force for honesty and transparency, but he has proved, in recent years, that he prefers a lucrative lie to an expensive truth. And he’s very good at letting corporate management know it.”

Summary

- Three observations concerning asset-price bubbles.
 - Volume of trade.
 - Coincidence of bubbles and innovations.
 - Coincidence of bubble implosion and increase in supply
- Argued that a model combining heterogenous beliefs resulting from overconfidence and costly short-sales can explain these observations.
- False positives
 - Not much work on non-bubble episodes.
- Shorting restrictions, low costs of borrowing help bubbles.
- Emphasis on governance may be misplaced.