ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

UNIVERSITY OF PIRAEUS

Network Dynamics, pt. II

Herding

Session Outline

- **Following the Crowd**
  - Herding and informational cascades
  - Informational Effects versus Direct-Benefit Effects

- **A Herding Experiment**
  - Experimental Setup
  - Individual Decisions
  - Emergence of an informational cascade

- **Herding in Financial and Political Markets**
  - Markets
  - Stocks
  - Commodities

Following the Crowd

Herding and Informational Cascades
Informational Effects
Direct-Benefit Effects

Following the Crowd

- People are connected; they **influence** each other's behavior and decisions.
- There are social processes in which the network functions as **aggregator**.
- Individual behavior can have a **collective** outcome. Why do we influence each other?
- **Imitation** may be **rational** or not.
- **Example**: suppose that, having consulted various eating-out websites, you want to dine at **restaurant A**. Once you get there, A is empty. **B**, a restaurant across the street, is almost full - Where do you go?
- Assuming that everyone there has a similar taste with you, and that they have some information about where to eat: **may be rational to follow the crowd** and choose B rather than stick to your information.

Following the Crowd

How does this work?

- Suppose that each individual has some '**independent**' (also **imperfect**) information about which restaurant is better.
- If diners at B are many, the information from their choice may be more powerful than your own (private) information.
- Then, it is natural to disregard your own information and join diners at B.
- In this case, **herding** (i.e. an **information cascade**) has occurred.
- More formally, an information cascade can occur when people make decisions **sequentially**, with later people watching the actions (or decision-making) of earlier people, and from these actions (or decisions) **inferring** what the earlier people know.
- A cascade develops when people **abandon their own information in favor of inferences** based on earlier people's actions.

Following the Crowd

Alternative reasons for imitation

- Individuals in a cascade imitate others' behavior, but it's not blind imitation.
- They draw **rational inferences** from **limited information**.
- Obviously, imitation can also occur due to **peer influence**, **social pressure** to align with others etc., and may be difficult to distinguish it from its rational version.
- As the group conforming (or exerting pressure) gets larger, so does the social pressure itself.

Following the Crowd: Informational effects vs. Direct-Benefit effects

Imitation due/thanks to a benefit by aligning behaviors:

- Having a telephone is useless if no one else has one
- Considering to buy a computer, which OS?

It's important to know what others do/own:

- Not only because their decisions convey information
- Their decisions affect the value of our own actions - there's a **direct benefit** to choose the option with a larger user population.

Direct-benefit effect ≠ informational effects

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A Herding Experiment

Experimental setup
Individual decisions
Emergence of an informational cascade

A Herding Experiment (1/7)

(a) There is a decision to be made (e.g., adopt a new technology): people decide **sequentially**, each observes the decisions of those who acted earlier. Everyone has some **private information** guiding their decision-making.

(b) A person can only make **inferences** about others' private information from their decision-making and actions.

The experiment:

In a classroom, the teacher puts a vase with 3 **marbles** in it and informs users that there is:

- 50% chance there are **2 red marbles and 1 blue marble** ("**majority-red**")
- 50% chance there are **2 blue marbles and 1 red marble** ("**majority-blue**")

Anderson, L. R., and Holt, C. A., (1996). Classroom games: Information cascades, *Journal of Economic Perspectives*, 10(4), pp. 187–193.
Anderson, L. R., and Holt, C. A., (1997). Information cascades in the laboratory, *American Economic Review*, 87(5), pp. 847–862.

A Herding Experiment (2/7)

- One by one, each student comes at the vase, **draws a marble**, looks at the color, and puts it back inside without showing it to the others; then **guesses** whether the vase is a majority-red or majority-blue and **announces** it to the class.

- The classroom doesn't know what the student drew; but knows what the student thinks about the vase (the guess on majority).

- **Similarity to the restaurant**: we don't know what other diners actually think or know about restaurant B; we only know that they eventually chose to dine there.

- How does the experiment roll out? We take for granted that our students are **rational**.

A Herding Experiment (3/7)

First student

We assume there's a simple decision-making

- **if (s)he draws a red marble**, (s)he guesses there's a **majority-red**
- **if (s)he draws a blue**, (s)he guesses there's a **majority-blue**

[for now, this is based on intuition; we'll see it holds mathematically, too]

Second student

- **If (s)he draws the color the first student announced**, choice is simple → guess the same
- **If (s)he draws the opposite color**, how should reasoning unfold?
  - Suppose the first guessed blue (suppose truthful) and the second draws red
  - Reasons as if (s)he drew twice, i.e., first blue, then red
- **Indifferent** and **guesses the color seen**, i.e., majority-red

A Herding Experiment (4/7)

Third student

- **If the first two students have guessed opposite colors**, the third student should just guess the color (s)he sees, so as to break the tie.

- **Suppose the first two guesses are the same** (e.g., blue) and the third student draws red:
  - Reasons (based on perfect information) as if (s)he drew three times: two blue, one red.
  - The guess is majority-blue (**ignores private information** which would suggest a guess of majority-red).

- Generally, when the first two guesses are the same, the third should guess the same, regardless of the information (s)he has – i.e. an **information cascade begins**.

A Herding Experiment (5/7)

Fourth student and onward

- first student: majority-blue
- second student: majority-blue
- third student: regardless of private information, majority-blue

The fourth knows that:

- first two conveyed **perfect information** (guesses based on draws)
- the third conveyed **no information** (guess based on previous two guesses)

The fourth, in decision-making terms, **is in the position of the third student**:

- whatever color (s)he draws, the guess is outweighed by the first two blues, so the fourth guesses a majority-blue - regardless of what (s)he sees.

A Herding Experiment (6/7)

This goes one with all subsequent students:

- Suppose the first two guesses (remember we have three marbles) are **blue**, under the assumptions that students make **rational decisions.**

- An **information cascade** takes place.
  - Nobody believes that everybody draws a blue marble but future announcements worth nothing
  - The best strategy is to rely on the genuine (though limited) information from the first two students.

A Herding Experiment (7/7)

1. **Information cascades occur easily**, under the right conditions, but even if everyone is 'rational' decision-making may look weird.

2. **Information cascades can lead to non-optimal outcomes**: suppose majority-red
   - **1/3** chance first student draws blue, **1/3** chance second student draws blue.
   - Chances are independent → **1/3 *1/3 = 1/9** chance both students draw blue → two first guesses majority-blue → all subsequent guesses will be majority-blue
   - All guesses will be **wrong** (we have a majority-red vase).

Cascades can be fragile, too:

- Suppose we have this scenario (1st - blue, 2nd - blue then it plays out as described → all guesses, irrespective of draws, blue).
- Suppose students 50, 51 both draw red and choose to **cheat** (show the marble to the class); **cascade broken**, because student 52 has **4 genuine pieces of input**: 1, 2 50, 51, so guess should be made based on draw.

Examples: Herding in Financial & Political Markets

Markets
Stocks
Commodities

The Dotcom Herd

Herd behaviour was observed in the late 1990s as venture capitalists and private investors were frantically investing huge amounts of money into internet-related companies, even though most of these dotcoms did not (at the time) have financially sound business models.

- A recurring theme?

The driving force that seemed to compel these investors to sink their money into such an uncertain venture was the reassurance they got from seeing so many others do the same thing.

http://www.investopedia.com/university/behavioral_finance/behavioral8.asp

Public & Private Information

In an experiment with 7 traders, Cipriani and Guarino conducted a trading experiment where the participants actually traded with 'real' money. There was evidence of herd behavior in their experiment:

Decision	Percentage
Following Private Information	**45.7%**
Partially Following Private information	**19.6%**
Cascade Trading	**19.0%**
Cascade No-Trading	**12.3%**
Errors	**3.4%**
Total	**100%**

Marco Cipriani and Antonio Guarino (2008). Herd Behavior in Financial Markets: An Experiment with Financial Market Professionals. *IMF Working Paper WP/08/141.* (http://www.imf.org/external/pubs/ft/wp/2008/wp08141.pdf)

Incentives and Reputational Herding

In a study of the performance of 2,345 hedge funds, and their managers, between 1994-2004, Nicole Boyson found that:

Fund Type	**Tendency to herd in Managers**	
	More Experienced	**Less Experienced**
Hedge Funds	Yes	No
Mutual Funds	No	Yes

Boyson, Nicole. M (2010). Implicit incentives and reputational herding by hedge fund managers. *Journal of Empirical Finance.* Vol. 17, pp 283-299

Crossing continents

“Foreign investors” bring investment, as well as volatility:

- International investors tend to mimic each other's behaviour, sometimes ignoring useful information — one contributor to market volatility in developing countries.

- A positive association between a country's lack of transparency and international investors' tendency to herd when investing in its assets.

- If herding by international investors raises volatility or causes more frequent financial crises in emerging markets, it is related to these countries' transparency features.

Shang-Jin Wei and Heather Milkiewicz (2003). A Global Crossing for Enronitis?: How Opaque Self-Dealing Damages Financial Markets around the World. *Brookings Papers on Economic Activity*. 2003.

Noise, noisy traders and herding?

Assume that there are two kinds of traders only in a market: **informed traders** and **noise traders.** The noise trader fails to ascertain the true value of an asset and relies on guesswork, heuristics, imitation of the informed trader, or prayer. The noise trader *misprices* and the informed trader should see this as an opportunity to create a margin through arbitrage. This arbitrage is not always possible and worse still the informed tries to follow the noise trader.

Traders		Noise	
		Pessimistic	Optimistic
Informed	Pessimistic	Herding	Short-sell
	Optimistic	Buy	Herding

Herding in Financial Services

Herding behavior is fragile :

- **It may break easily** with the arrival of some trigger (for example, new information)
- **It is idiosyncratic,** in that "random events combined with the choices of the first few players determine the type of behavior on which individuals herd"
- **It is dynamic** in that a small change in one parameter can quickly change the systems' behavior
- **Comes in waves** in that delay is followed by a sudden simultaneous action and path dependent, as the outcome depends on the order of activities

There are two polar views of herding:

1. **Rational Herding**
2. **Behavioral Herding**

Haiss, Peter (2010). 'Bank Herding and Incentive Systems as Catalysts for the Financial Crisis'. *The IUP Journal of Behavioral Finance.* Vol 7 (Nos. 1 &2), pp 30-58

Rational Herding

There are several potential reasons for rational herd behavior in banking and financial Markets:

- **(imperfect) information cascades:** Can arise when there is uncertainty about the accuracy (or the lack of) of the information possessed by market participants. When there are costs to collect and analyze information, creditors may be more inclined to follow others' behavior. Random events combined with the choices of the first few market participants thus may determine the type of behavior on which the followers herd.
- **principal/ agent concern for reputation:** Can arise when there is uncertainty on the employers' or other principals' side about the investment managers' or credit officers ability to pick the right stock or debtor. Managers may mimic the actions of other managers, completely ignoring private information, as Keynes' (1936) observed by arguing that "it is better for reputation to fail conventionally than to succeed unconventionally"

Haiss, Peter (2010). 'Bank Herding and Incentive Systems as Catalysts for the Financial Crisis'. *The IUP Journal of Behavioral Finance.* Vol 7 (Nos. 1 &2), pp 30-58

Rational Herding

There are several potential reasons for rational herd behavior in banking and financial Markets:

- **compensation structures:** Investment managers are usually compensated relative to the return performance of other competing managers who follow broadly similar investment strategies rather than on absolute performance. This may distort the investors' performance and lead to herd behavior, as the investor (i.e., agent) has an incentive to imitate the benchmark investor in that the optimal investment portfolio moves closer to the benchmark.
- **other payoff externalities:** At the core of this type of herding are bank runs and the refusal of creditors to renegotiate loans that take place when the idea of withdrawals spills over. Depositors running on banks when they observe other depositors doing so is a common textbook anecdote.

Haiss, Peter (2010). 'Bank Herding and Incentive Systems as Catalysts for the Financial Crisis'. *The IUP Journal of Behavioral Finance.* Vol 7 (Nos. 1 &2), pp 30-58

Behavioral herding

There are several 'investor psychology' and 'investor sociology' phenomena which cannot be explained by purely 'rational' (utility maximizing) behavior that involve some type of herding. Such phenomena are:

- Dependence of behavior upon the **observed behavior of others**, or the **results of their behavior**
- Convergence by actors such as firms or individuals **upon mistaken actions based upon little investigation** and little justifying information
- The tendency for actors to **delay decisions and then suddenly rush** to act simultaneously
- **Imitation as sub-rational mechanism** that induces an individual to be influenced by another to behave the same way
- **Contagion in the emotions** of individuals interacting as groups

Haiss, Peter (2010). 'Bank Herding and Incentive Systems as Catalysts for the Financial Crisis'. *The IUP Journal of Behavioral Finance*. Vol 7 (Nos. 1 &2), pp 30-58

Herding in Equity Markets

Guo and Shih (2008) have examined the **co-movement of stock prices** and its association with **herd behavior** during period of high-tech mania using the implications for return data and found 5 key points:

1. Return dispersion and volatility dispersion are **higher in high-tech industries.**

2. Directional co-movement of stock prices as a modified herding measure to investigate herd behavior for high-tech stocks.

3. Return and volatility dispersion were **not found to exhibit a consistent relation** with extreme market conditions in the Taiwan market.

4. Herding, measured by directional co-movement, is **more prevalent in high-tech industries**, as compared to traditional economic industries

5. An asymmetric result that herding has great significance during extreme up markets.

Wen-Chung Guo and Hsiu-Ting Shih (2008). The co-movement of stock prices, herd behavior and high-tech mania. *Applied Financial Economics*, Vol 18, pp 1343–1350

Herding in Politics: Donald Trump

- **Pandering leadership –** *the practice of telling followers what they want to hear, even if it is not what they should hear* – is an affliction that has permeated politics since the dawn of the Republic.
- **Donald Trump** has elevated pandering politics to near pandemic levels in his battle for the Republican presidential nomination.
- The risk that arises from a pandering style leadership is that it ignores the complexity of some issues, raises false expectations and causes disillusionment when the promised fixes are unfulfilled.
- **Donald Trump** is pandering to the fears and ignorance of the base of the Republican Party.

Herding in Politics: Donald Trump

"As ludicrous as the campaign for the Republican presidential nomination has become, what is really frightening is that a dominant majority of the Republican Party and close to a majority of the general electorate would accept Trump as president."

- There is a great lesson to learn here for anyone who desires to be an effective leader in business or politics. The simple lesson is that **pandering to those we want to lead is not leadership**, it **is herding.**

- Any similarities to the European/Greek political systems?

Herding in media: The ANT1 case

- In 2013 one of the most popular TV channels in Greece (ANT1) fell for a hoax due to herding.
- koulouri.com is a “onion” like site in Greek, spreading false and fictional articles as real news.
- In one of their articles (tokoulouri.com) they present a major investment from Saudi Arabia to build a state of the art snow resort in Central Greece and how this investment will boost the region’s economy (Fokida is the 2nd from last prefecture in poverty in Greece).
- The specific link was shared by thousands of users in social media and inevitably ANT1 fell for it, presenting it as real news…
- **Enjoy it here:** https://www.youtube.com/watch?v=-GQdHJlHqBA