The Consequences of Pension Fund Herding for Asset Prices and Financial stability

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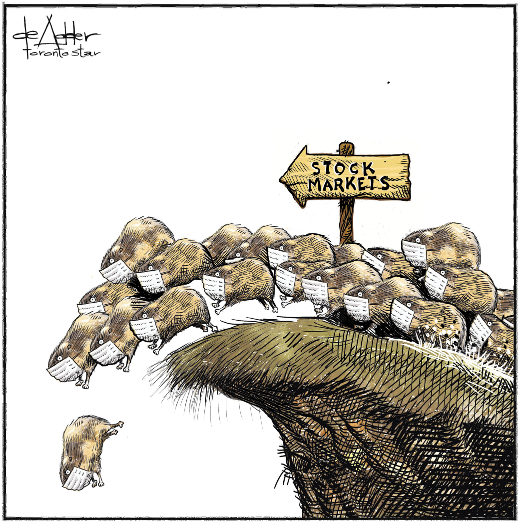
Definition - Herding

The tendency of investors to follow the actions of other investors rather than relying on their own information or analysis.



Cartoon from the Toronto Star commenting on investor behavior during the COVID-19 pandemic

Motivation

- Pension funds have long-term investment horizons
- Should in theory be less prone to herding behavior
- Empirical evidence suggests otherwise
- Indicates that relationship between herding, pension funds and asset prices more complex than previously thought

Motivation

- We pair detailed data on individual transactions and a novel herding measure in order to disentangle these complexities
- The advantage of our method over previous literature is that it utilizes high-frequency observations of herding behavior
- Previous methods rely on extrapolation from aggregate data

Herding in asset markets - theory

- **Reputation concerns**
  Scharfstein and Stein (1990a), Dasgupta et al. (2011)
- **Compensation structures**
  Maug and Naik (1996), Gumbel (1998)
- **Informational asymmetries**
  Bikhchandani et al. (1992), Welch (1992), Banerjee (1992), Avery and Zemsky (1998), Cipriani and Guarino (2008)

Pension funds and herding

- **Pension funds herd to a moderate amount, and at least to the same extent as other institutional investors**
  e.g. Grinblatt et al. (1995), Puckett and Yan (2008), Jame (2011)
- **Large variation in herding behavior across countries and asset types**
  e.g. Voronkova and Bohl (2005), Stein et al. (2011), Raddatz and Schmukler (2013), Cai et al. (2019), Koetsier and Bikker (2022)
- **Pension fund herding has significant impact on asset prices**
  Grinblatt et al. (1995), Nofsinger and Sias (1999), Puckett and Yan (2008), Jame (2011), Koetsier and Bikker (2022)

Generating transaction level herding measure

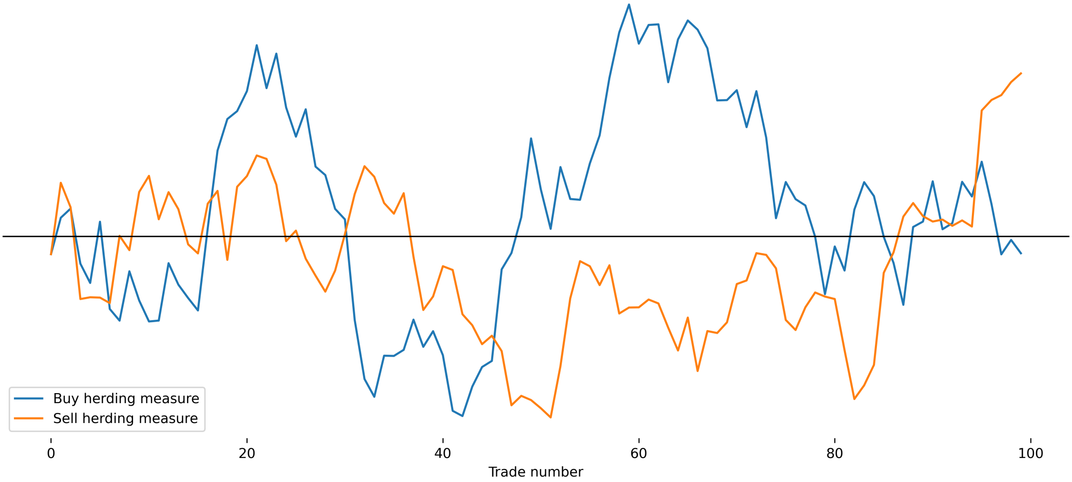
- We combine the estimates from a structural trading model due to Cipriani and Guarino (2014) with transaction level data on financial assets
- Structural model allows us to identify a herding measure at each transaction
- Transaction data allow us to link each transaction back to end buyers and sellers
- We follow the following steps to produce our transaction level herding measure:
  1. Use trade data from the stock exchange to estimate model
  2. Use model to produce estimates of herding intensity at each trade
  3. Link trade data with transaction data

Cipriani and Guarino (2014) model

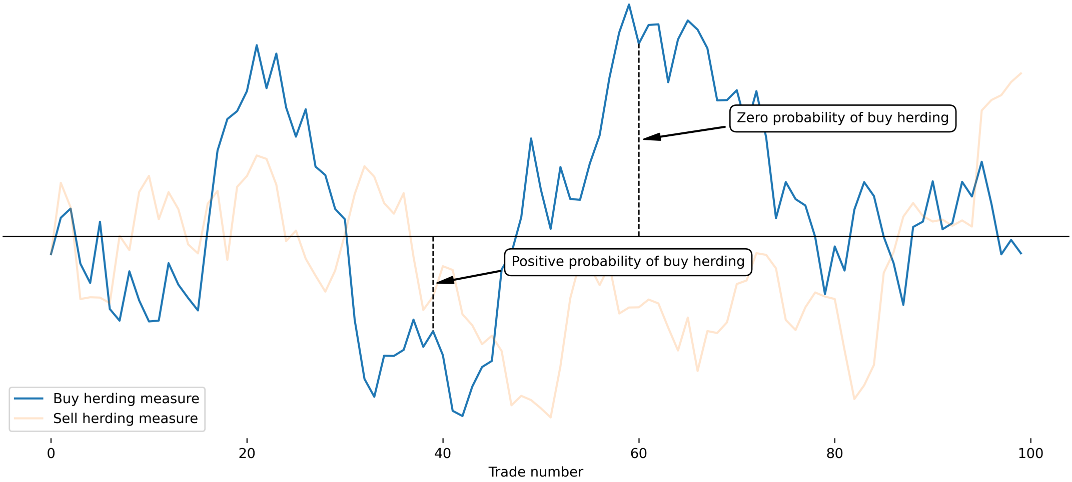
- Traders trade sequentially throughout the day in asset market
- Some traders have private information about asset values
- Make their trading decisions based on own signal and belief about other traders' possible signal
- Belief about other traders' signals is based on history of trades throughout the day

Cipriani and Guarino (2014) model

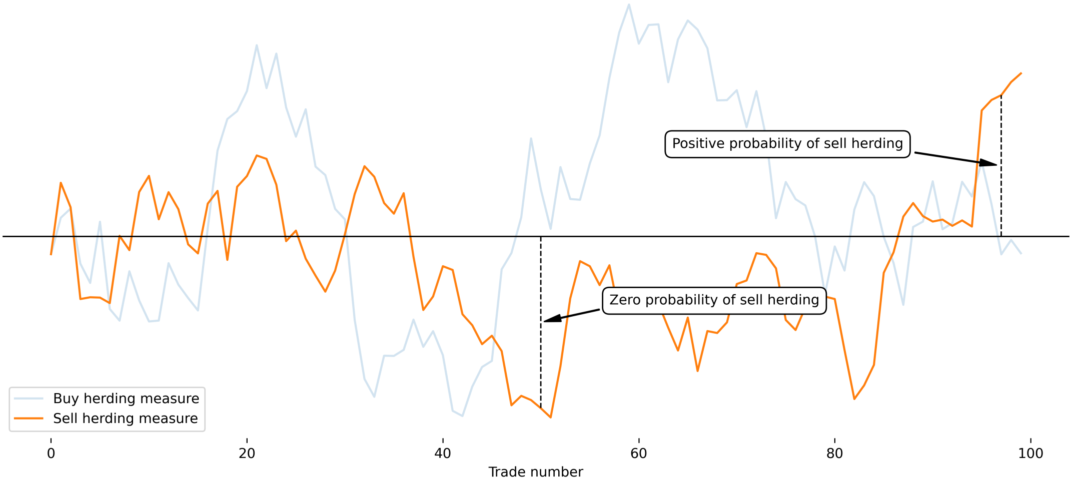
- Herding occurs when traders make trades that go against their own valuation
- Herding decision can be reduced to two evolving threshold values, one for buy herding and one for sell herding
- Also serve as a measure of the intensity of herding conditions at the time of each trade



Cipriani and Guarino herding measures



Buy herding in the Cipriani and Guarino model



Sell herding in the Cipriani and Guarino model

Data

- In order to estimate herding model, make use of trade level data from Icelandic stock exchange
  - All trades in all assets from 2020 to september 2024
  - 512,810 unique trades split between 47 assets
  - Includes information on prices, volumes and exact timestamps
- Combine this with confidential TRS data collected from financial institutions by the Central Bank of Iceland in accordance with European regulation (MiFID/MiFIR):
  - Match with trade data using timestamps
  - Total number of matched transactions is 258,498, divided between 17 assets
  - 97,806 from institutional investors other than pension funds
  - 56,850 from individual investors
  - 1240 from pension funds

Results

1. There is a significant amount of herding in the Icelandic stock market
2. Investors herd more during periods where there is less information available in the market
3. Pension funds herd less than other institutional investors
4. Pension funds tend to trade counter-cyclically during periods of market herding

Policy implications

- Pension funds are less prone to herding, so they are less likely to contribute to asset price bubbles
- Pension funds trade counter-cyclically during periods of market herding, so they will help break up information cascades before they lead to bubbles
- Pension funds trade less frequently than other traders, but when they do they trade in larger volumes
- Encouraging more active participation by pension funds may be beneficial, both for market efficiency and financial stability

Conclusion

- We link Icelandic transaction level data with a herding measures from a structural trading model
- Using this dataset we find that pension funds are less prone to herding than other institutional investors
- We also find that pension funds are more likely to trade counter-cyclically during periods of market herding
- These results may have important implications for asset market efficiency and financial stability
- Next steps to look at the possible impact this behavior has on asset prices

Appendix

Estimating herding measure

- Each model has 5 parameters to estimate
  - α - probability an event during day
  - δ - probability of good event
  - ε - probability of noise trader buying
  - μ - proportion of uninformed traders
  - τ - signal informativeness
- Use maximum likelihood to estimate model for each asset
- Successfully estimated models that meet the following criteria used for estimating herding measures for each trade:
  1. τ estimate significantly different from zero
  2. τ estimate less than 1
  3. Log likelihood ratio test rejects reduced no herding model (trading model from Easley et al. (1997))
- Models that do not meet these are not able to establish herding behavior

Table: **Proportions of buys and sells - TRS II data (Part 1)**

Trader Type	Metric	All Days	Good Days	Bad Days
All				
	$\Pr(buy)$	0.497	0.490	0.622
	$\Pr(buy \mid \beta_t^d < 0{,}5)$	0.514	0.506	0.638
	$\Pr(buy \mid \sigma_t^d > 0{,}5)$	0.468	0.471	0.630
	$\Pr(sell)$	0.492	0.497	0.376
	$\Pr(sell \mid \beta_t^d < 0{,}5)$	0.479	0.487	0.359
	$\Pr(sell \mid \sigma_t^d > 0{,}5)$	0.525	0.521	0.370
Individual				
	$\Pr(buy)$	0.548	0.538	0.810
	$\Pr(buy \mid \beta_t^d < 0{,}5)$	0.562	0.549	0.750
	$\Pr(buy \mid \sigma_t^d > 0{,}5)$	0.475	0.488	0.823
	$\Pr(sell)$	0.452	0.462	0.190
	$\Pr(sell \mid \beta_t^d < 0{,}5)$	0.438	0.451	0.250
	$\Pr(sell \mid \sigma_t^d > 0{,}5)$	0.525	0.512	0.177

Table: **Proportions of buys and sells - TRS II data (Part 2)**

Trader Type	Metric	All Days	Good Days	Bad Days
Non-pension institutional				
	$\Pr(buy)$	0.490	0.485	0.557
	$\Pr(buy \mid \beta_t^d < 0{,}5)$	0.507	0.500	0.605
	$\Pr(buy \mid \sigma_t^d > 0{,}5)$	0.469	0.470	0.554
	$\Pr(sell)$	0.510	0.515	0.443
	$\Pr(sell \mid \beta_t^d < 0{,}5)$	0.493	0.500	0.395
	$\Pr(sell \mid \sigma_t^d > 0{,}5)$	0.531	0.530	0.446
Pension funds				
	$\Pr(buy)$	0.536	0.538	0.414
	$\Pr(buy \mid \beta_t^d < 0{,}5)$	0.429	0.426	0.440
	$\Pr(buy \mid \sigma_t^d > 0{,}5)$	0.707	0.701	0.667
	$\Pr(sell)$	0.464	0.462	0.586
	$\Pr(sell \mid \beta_t^d < 0{,}5)$	0.571	0.574	0.560
	$\Pr(sell \mid \sigma_t^d > 0{,}5)$	0.293	0.299	0.333

Regression specification

- We define two indicator variables using our herding measure:
  1. $bh_i = 1$ if $\beta_i < 0{,}5$, 0 otherwise
  2. $sh_i = 1$ if $\sigma_i > 0{,}5$, 0 otherwise
- We then estimate a logit model using these indicator variables as dependent variables with the following independent variables:
  1. $institutional_i$ - 1 if trader is institutional, 0 otherwise
  2. $pension_i$ - 1 if trader is pension fund, 0 otherwise
  3. $good\_day_i$ - 1 if day is good, 0 otherwise
  4. bad_day_i - 1 if day is bad, 0 otherwise
  5. buy_trade_i - 1 if trade is buy, 0 otherwise
  6. $sell\_trade_i$ - 1 if trade is sell, 0 otherwise

Table: **Logit Model Estimation Results - Buy herding**

	Baseline	Event Days	Event Days Interactions	Trade Type	Trade Type Interactions	All
Intercept	-0.5435*** (0.0215)	-0.3816*** (0.0221)	-0.3750*** (0.0222)	-0.5037*** (0.0218)	-0.5261*** (0.0226)	-0.3618*** (0.0235)
institutional	0.0254** (0.0100)	0.0080 (0.0101)	-0.0001 (0.0106)	0.0310*** (0.0100)	0.0693*** (0.0135)	0.0510*** (0.0143)
institutional:pension	0.0531 (0.0543)	0.0399 (0.0547)	0.0267 (0.0562)	0.0489 (0.0543)	-0.3534*** (0.0780)	-0.3761*** (0.0792)
good_day		-0.3916*** (0.0161)	-0.4659*** (0.0315)			-0.4715*** (0.0318)
bad_day		-2.2900*** (0.0440)	-2.2798*** (0.0791)			-2.2729*** (0.0793)
good_day:institutional			0.0985*** (0.0361)			0.0949*** (0.0364)
bad_day:institutional			-0.0193 (0.0946)			-0.0221 (0.0948)
good_day:institutional:pension			0.2050 (0.2589)			0.1259 (0.2614)
bad_day:institutional:pension			0.5056 (0.5308)			0.5625 (0.5334)
sell_trade				-0.0965*** (0.0081)	-0.0348* (0.0177)	-0.0192 (0.0182)
sell_trade:institutional					-0.0841*** (0.0200)	-0.0995*** (0.0204)
sell_trade:institutional:pension					0.8410*** (0.1101)	0.8392*** (0.1108)
Observations	255896	255896	255896	255896	255896	255896
Fixed Effects	Assets and time	Assets and time	Assets and time	Assets and time	Assets and time	Assets and time

Table: **Logit Model Estimation Results - Sell herding**

	Baseline	Event Days	Event Days Interactions	Trade Type	Trade Type Interactions	All
Intercept	-1.5556*** (0.0236)	-1.1459*** (0.0243)	-1.1564*** (0.0244)	-1.4706*** (0.0241)	-1.3839*** (0.0257)	-1.0360*** (0.0266)
institutional	0.0667*** (0.0102)	0.0455*** (0.0104)	0.0577*** (0.0108)	0.0604*** (0.0102)	-0.0359** (0.0146)	-0.0112 (0.0151)
institutional:pension	-0.0125 (0.0564)	-0.0355 (0.0569)	-0.0399 (0.0581)	-0.0042 (0.0563)	-0.6274*** (0.0953)	-0.6396*** (0.0965)
good_day		-2.5360*** (0.0350)	-2.3978*** (0.0658)			-2.3445*** (0.0659)
bad_day		-0.3309*** (0.0229)	-0.2020*** (0.0402)			-0.2626*** (0.0406)
good_day:institutional			-0.1882** (0.0775)			-0.2372*** (0.0777)
bad_day:institutional			-0.1844*** (0.0475)			-0.1213** (0.0479)
good_day:institutional:pension			0.0943 (0.5952)			0.1240 (0.5989)
bad_day:institutional:pension			0.1086 (0.3314)			-0.0291 (0.3408)
buy_trade				-0.1518*** (0.0082)	-0.3052*** (0.0180)	-0.2175*** (0.0185)
buy_trade:institutional					0.1873*** (0.0203)	0.1247*** (0.0208)
buy_trade:institutional:pension					1.0642*** (0.1200)	1.0365*** (0.1213)
Observations	255896	255896	255896	255896	255896	255896
Fixed Effects	Assets and time	Assets and time	Assets and time	Assets and time	Assets and time	Assets and time