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Is it Heterogeneous Investor Beliefs or Private Information that Affects Prices and Trading Volume?

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Motivation

- Evidence againts Efficient Market Hypothesis (EMH)
- Large literature on anaomalies
  - Limits to arbitrage
  - Market frictions (e.g. Transaction cost, short selling constraints)
  - Disagreement Model
  - Gradual information flow, limited attention span and heterogeneous priors

Theoretical Literature - I

- Miller (1977)
  - Two classes of investors
    - Optimists
    - Pessimists
  - $P = w_1.P_O + w_2.P_P$
  - Short selling constraint exists
  - Pessimists can not sell short
  - Prices reflect optimists' opinion
  - Beliefs converge in the long term

Theoretical Literature - II

- Harrison and Kreps (1978)
  - $P_t \neq E_t [m \cdot x_t + 1]$
  - Rational investors' willingness to overpay
    - Trading possibility at a future date
      - Heterogeneous investors
      - Others will pay even more
    - Short selling constraint exists

Harrison and Kreps (1978)

- Features
  - Multi period model
  - Future state of the world = f (last period dividend)
  - $\{d_1, d_2, d_T\}$ follows stationary Markov chain in space (0, 1)
  - Two classes of investors
  - Both possess same information
  - Different interpretation

Harrison and Kreps (1978) – Transition Probabilities

	Class 1 - Pessimists	Class 2 - Optimists
Transition to state 1	+	-
Dividend at future date given state 1	-	+

Critiques of Harrison and Kreps (1978)

- Interpretation of public information
  - not always easy
  - can trigger private signal
  - different interpretation or private information?

Our Contribution

- A new measure of heterogeneous priors
  - from primary market order data
  - current measures are:
  - inferred from price ex-post
  - based on third party (e.g. analyst) opinion
- Pr ice and volume analyzed simultaneously
  - mictrostructure effects are eliminated
- Incorporate private information

Preview of Results

- One std dev ↑ in private information → 18% ↓ share turnover
- For firms in the highest quintile of heterogeneous priors
  - 2.5 buy trades for every sell trade
  - 17% higher return

Estimation

Return = f (HE, public information, private information, X)

Trading Volume = f (HE, public information, private information, X)

Heterogeneous Expectations

Oversubscriptionj = f (total number of bidders, public information, private information, X)

where

j = Institutions (QIB), High net worth individuals (HNI) and Retail investors

and $$Oversubscription_j = \frac{Demand_{p,j}}{Supply_{p,j}}$$

where p = clearing price

Heterogeneous Expectations

$$Dev_j = Oversubscription_j - Oversubscription_{j\,(predicted)}$$

$$HE = \sqrt{(Dev_{QIB} - Dev_{Retail})^2 + (Dev_{Retail} - Dev_{HNI})^2 + (Dev_{HNI} - Dev_{QIB})^2}$$

Private Information

- Easley, Keifer, O'Hara (1997) Probability of Informed Trade (PIN)
  - $Pi = E[V_i \mid \text{information}]$
  - $i = 1, \ldots I$ trading days, Time in a day is $t \in [0, T]$
  - Nature draws the information event α.
  - Good with probability δ
  - Value of asset conditional on good (bad) news at the end of the day is V_i^+ (V_i^-).

Private Information

- Uninformed buyers and sellers arrive; independent poisson rate
- Informed traders arrive if there was information
- Information goes to one trader at a time, at rate μ.
- Risk neutral MM tries to infer the type of day
- Expolits order imbalance

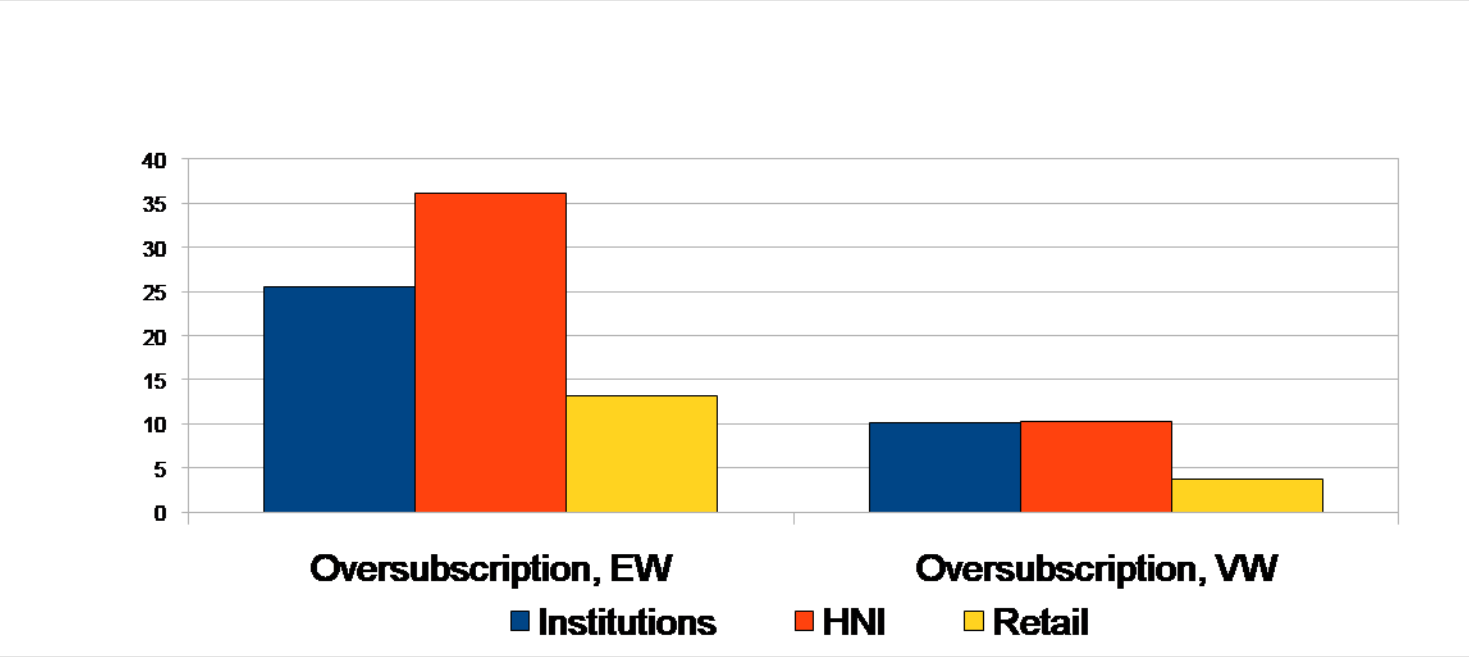
Data & Sample Selection

- Book-building IPOs – October 2000 to September 2007
- Bid and allocation – Prime Database
- Firm specific variables – IPO prospectus
- High frequency trading data – National Stock Exchange of India (NSE)

Descriptive Statistics

Variables	Mean	Median
Proceeds, mil USD	**97**	**23**
Initial Return, %	**28.3**	**18.4**
Share Turnover	**1.6**	**1.2**
Offer Price, USD	**5**	**4**
Filing Range, % of Offer Price	**13.3**	**13.7**
PIN	**0.065**	**0.045**
Elasticity over filing range	**1.0**	**0.2**

Relative Demand for the Three Classes of Investors



Predictive Regression - Oversubscription

	Institutional	Retail	HNI
Number of Bidders (log)	1.038*** (0.000)	0.805*** (0.000)	0.991*** (0.000)
PIN	-0.793 (0.286)	2.452*** (0.000)	-3.634** (0.008)
Institutional Allocation: Auction	0.567*** (0.000)	0.142 (0.122)	0.887*** (0.000)
Market Return t-10	-0.114 (0.907)	1.726* (0.019)	2.668 (0.136)
Issue Size	-0.352*** (0.000)	-0.708*** (0.000)	-0.855*** (0.000)
Adjusted R2	0.838	0.876	0.633
No of Obs	170		

Heterogeneous Expectations – Pairwise Measure

	HE: HNI and Retail	HE: Institution and HNI	HE: Institutions and Retail
Oversubscription : Institutions	0.054 (0.403)	0.289*** (0.000)	0.355*** (0.000)
Oversubscription : HNI	0.539*** (0.000)	-0.744*** (0.000)	-0.232*** (0.000)
Oversubscription : Retail	-0.466*** (0.000)	0.392*** (0.000)	-0.036 (0.607)
Adjusted R2	0.403	0.353	0.211
No of Obs	169	170	169

Simultaneous Estimation of Return and Turnover at the First Day of Trade

	NSE	
	Turnover	Return
Turnover		0.476*** (0.000)
Return	0.526*** (0.000)	
Intercept	0.672 (0.000)	-0.019 (0.072)
Adjusted R2	0.246	
No of Obs	176	

Simultaneous Estimation of Return and Trading Frequency at the First Day of Trade

	NSE	
	Trading Frequency	Return
Turnover		1.020*** (0.000)
Return	0.115*** (0.000)	
Intercept	0.005 (0.715)	0.245 (0.705)
Adjusted R2	0.112	
No of Obs	176	

Residual Turnover and Heterogeneous Expectations (HE)

	Turnover		
HE:Q1	-0.087 (0.278)		-0.099 (0.256)
HE:Q5	0.057 (0.482)		0.020 (0.820)
PIN	- 2.734*** (0.000)	- 2.800*** (0.000)	
Institutional Allocation: Auction			0.286** (0.001)
Total Oversubscription	0.281*** (0.000)	0.277*** (0.000)	0.289*** (0.000)
Adjusted R2	0.457	0.457	0.351
No of Obs		159	

Residual Trading Frequency and Heterogeneous Expectations (HE)

	Trading Frequency		
HE:Q1	-0.044 (0.127)		-0.044 (0.126)
HE:Q5	- 0.071* (0.016)		- 0.078** (0.008)
PIN	-0.329 (0.144)	-0.351 (0.125)	
Institutional Allocation: Auction	-0.348 (0.391)	0.030 (0.400)	0.014 (0.607)
Total Oversubscription	-0.021 (0.118)	-0.022 (0.111)	-0.020 (0.147)
Adjusted R2	0.135	0.102	0.116
No of Obs	146		

Residual Return (Orthogonalized against Share Turnover) and Heterogeneous Expectations (HE)

	Return		
HE:Q1	-0.083 (0.228)		-0.089 (0.194)
HE:Q5	0.165* (0.029)		0.170* (0.024)
PIN	0.052 (0.965)	0.258 (0.829)	
Market Return at t-10	2. 721** (0.001)	2. 905*** (0.000)	2.538*** (0.000)
Total Oversubscription	0.139*** (0.000)	0.131*** (0.000)	0.137*** (0.000)
Adjusted R2	0.428	0.404	0.426
No of Obs	146		

Residual Return (Orthogonalized against Trading Frequency) and Heterogeneous Expectations (HE)

	Return		
HE:Q1	-0.069 (0.331)		-0.075 (0.291)
HE:Q5	0.257** (0.001)		0.249** (0.002)
PIN	-1.507 (0.216)	-1.163 (0.356)	
Market Return at t-10	1. 705** (0.003)	1. 991** (0.001)	1.697** (0.002)
Total Oversubscription	0.265*** (0.000)	0.255*** (0.000)	0.261*** (0.000)
Adjusted R2	0.443	0.394	0.444
No of Obs	146		

Conclusions

- HNIs most frequent flippers
  - Firms with the lowest (highest) quintile of institutions and retail shareholders → about 30% higher (lower) turnover
- One std dev ↑ in private information → 18% ↓ share turnover
  - Awareness of Adverse selection problem

Conclusions (cont..)

- For firms in the highest quintile of heterogeneous priors
  - 2.5 buy trades for every sell trade
  - 17% higher return
- Excluding HE measure reduces the explanatory power of the model by 5% - 13% in most cases
- Policy Implications?