The Effects of Experience on Investor Behavior: Evidence from India's IPO Lotteries

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Motivation

- Standard economic models predict little role for personal experience in future decision making
  - Especially in high public information environment (stock market)
- Newer models explore implications of personal experience
  - Reinforcement learning - Roth and Erev (1995)
- Empirical literature suggests personal experience important
  - Macro: experiences of Great Depression lowers risk-taking - Malmendier and Nagel (2007)
  - Micro: correlated portfolio experiences and future decisions- - Kaustia and Knupfer (2008), Choi et. al. (2009), others
- Empirical challenge: personal experiences are endogenous
  - Comparison of those experiencing high vs. low returns may conflate unobserved risk-taking, investment strategy, w/ experience

This paper

- New research design to estimate experience effects
  - Exploit randomized variation in portfolio experiences induced by Initial Public Offering (IPO) lottery outcomes
- New facts on how experiences cause changes in investment behavior
- Experimental variation allows credible testing of *portfolio-wide* impacts:
  - Theories typically assume fully aggregate or fully narrow framing
  - Test for spillover effects to rest of portfolio ("within portfolio contagion")

The Indian IPO Lottery Process: Example

- Suppose 10,000 shares supplied for retail investors
- Investors can bid for 100, 200 or 300 shares ("share category")
- Minimum allocation is 100 shares
- Suppose demand at final price is 40,000 shares (r=4)

Share Category (1)	Total # Applications (2)	Total Demand (3)	Proportional Allocation (4)	Win Probability (5)	Winner Allotment (6)	Total Allocated
100	200	20,000	25	.25	100	5,000
200	88	17,600	50	.50	100	4,400
300	8	2,400	75	.75	100	600
Total		40,000				10,000

- Win probability $\rightarrow$proportional allocation received in expectation
  - Winners get minimum lot size, losers receive no shares
- Think of each IPO*share category as a randomized control trial
  - In this example we would have 3 experiments
  - Our sample has 383 such experiments (323 with positive returns)

Data

- IPO Applications
  - 1.5 million retail applications to 54 IPOs from 2007 - 2012
  - Data provider handled 8% of value of all IPOs in this period
  - Observe:
    - # shares applied for, # shares allocated, zip code, cutoff bid

- Monthly Portfolio Data
  - 12 million accounts over period 2002 - 2012
  - Full data covers 40% of Indian retail investor accounts
  - Match to IPO applications using anonymized account #
  - Observe:
    - Full portfolio at end of month
    - Total value and number of shares of buys and sells

- Randomization check: treatment/control accounts look very similar on average prior to IPO allocation

Characterizing the Treatment Experience

Treatment Characteristics		Percentile Across Experiments				
	Mean	10	20	50	75	90
	(1)	(2)	(3)	(4)	(5)	(6)
Application Amount ($)	1803	163	392	846	1524	2174
Probability of Treatment	0.35	0.09	0.18	0.35	0.63	0.82
Allotment Value ($)	150	123.8	134	145	157	165
First Day Gain (%)	42	6.0	11.5	21.7	40.0	87.8
First Day Gain ($)	67	8.6	14.3	29.6	65.3	141.6
Median Portfolio Value ($t-1$, $)	1866	805	1126	1632	2466	3208

Notes: Includes 40 positive return IPOs (323 share categories) in sample. Treatment and control sample sizes are 433,042 and 1,040,031 accounts respectively.

- Small treatments on average
  - Median portfolio gain is $\approx$ 1.7 percent
  - On average, treat/control put down $1800 for 1st day gain of $67

Regression Framework

Main Results

- Compare treat/control accounts
- One regression for each of 6 months after treatment
- Estimate cross-sectional regression model:

$$y_{ij} = \beta_0 + \beta_1 T_{ij} + \eta_j + \epsilon_{ij}$$

- y_{ij} is outcome for investor i in share category j
- T_{ij} = treatment dummy, η_j is IPO share category fixed effect
- Specification *only* uses randomized variation w/in category
  - β_1 = weighted average of experiment treatment effects (Angrist 1998)
- All outcomes exclude IPO treatment stock

Effect on Probability of Applying for IPOs

	Month Relative to Treatment IPO					
	1	2	3	4	5	6
Treatment Effect	0.0094***	0.0071**	0.0029**	0.0019**	0.0032**	0.0013
	(0.0015)	(0.0030)	(0.0015)	(0.0009)	(0.0012)	(0.0011)
Control Mean	[0.4636]	[0.2242]	[0.1283]	[0.0959]	[0.1341]	[0.0605]

Notes: Dependent variable = 1 if account applied for IPO in our data or was allotted IPO not in our data in month. Observations= 1,473,073; # Share Categories = 323; # IPOs = 40. Sample includes only positive return IPOs.

- Small but significant impact on future IPO participation (Kaustia and Knupfer, 2008; Chiang et. al., 2011)

Treatment Effects at the Share Category Level

BGR Share	Share Category of Outcome IPO: Future Capital Holdings Limited															
Category	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128
14	.191	.034	.000	.009	-.001	-.001	.000	.004	-.003	-.003	-.001	-.002	-.001	.000	-.001	-.025
28	.032	.112	.028	.013	-.003	-.002	-.005	-.006	-.005	-.005	.001	-.001	.001	-.001	-.002	-.021
42	.006	.028	.063	.011	.011	.004	-.003	-.001	.002	.001	-.003	-.004	-.003	-.002	.001	-.017
56	-.006	.017	.031	.059	.013	.001	.020	.004	.003	-.004	.001	.002	-.003	.002	.000	-.025
70	.005	.012	.002	.022	.041	.018	.010	.016	.004	.000	-.002	.003	-.003	-.002	-.001	-.019
84	.002	.013	.009	.013	.013	.010	.018	.020	-.006	.001	.004	.007	-.003	-.003	-.003	-.003
98	.002	.003	.004	.014	.005	.007	.006	.061	.001	-.002	.002	.001	.000	.002	-.002	-.025
112	-.005	-.002	.005	.009	.007	.002	.006	.009	.043	.010	.005	-.002	.003	-.002	.002	-.023
126	-.009	.006	-.006	.015	.003	.015	.010	.011	.029	.019	.012	.009	.009	-.003	-.005	-.030
140	.002	.002	.006	.005	.007	.002	.004	.009	.006	.050	.020	.004	.001	-.002	-.005	-.038
154	-.008	.002	-.010	.002	.001	.006	.003	-.001	.001	.023	.012	.036	.015	.007	.013	-.030
168	-.002	-.002	.004	-.004	-.011	.005	.010	.019	.006	.013	.010	.018	.019	.008	-.011	-.009
182	-.001	-.002	.003	.001	-.005	-.004	-.002	-.002	-.007	-.005	.013	.013	.022	-.002	.037	.005
196	-.001	-.001	-.001	.000	.000	.000	-.001	.000	.000	.001	.000	.000	.000	.000	.000	.031

Notes: Treatment IPO is BGR Energy Systems. Numbers in table give the treatment effect of getting allotted in the BGR lottery on the probability the investor applies to a specific share category in the Future Capital Holdings IPO. Green: positive and significant at 10% level. Red: negative and significant at 10% level.

- Green (diagonal): Experience effects largely concentrated on diagonal
- Red (upper-right): Control group more likely to apply for large amounts of shares - strategic learning about probabilities (lose-switch)
- Red (lower-left): Losers who applied for a lot of shares switch to fewer (lose-switch)

Effect on Gross Trading Value in non-IPO Stocks

	Months After IPO Treatment					
	1	2	3	4	5	6
Treatment Effect	0.0746***	0.0742***	0.0447***	0.0333***	0.0345***	0.0345***
	(0.0121)	(0.0082)	(0.0118)	(0.0083)	(0.0089)	(0.0066)
Control Mean	[1.5832]	[0.9868]	[0.3052]	[0.2147]	[0.4525]	[0.2522]

Notes: Dependent variable = IHS(buy value + sell value in month) and excludes the treatment IPO stock. Observations = 1,473,073; # Share Categories = 323; # IPOs = 40. Sample includes only positive return IPOs.

- Treatment group trades more in *non-IPO* stocks
  - 7.5 percent more in two months after treatment
  - 3.5 percent more trades six months out
  - Effects largest in lower portfolio value / younger accounts, but significant even for larger and older accounts
- Portfolio re-balancing?
  - Small treatment size causes 6 months of re-balancing?
  - Find negative effect on trading for IPOs w/ negative returns
- Implication: within portfolio spillovers potentially important

Effect on Portfolio Value

	Months After IPO Treatment					
	1	2	3	4	5	6
Panel A: Dummy(Portfolio Value $>$ 0)						
Treatment Effect	-0.0003	-0.0001	0.0005	0.0003	0.0003	0.0006
	(0.0007)	(0.0005)	(0.0003)	(0.0005)	(0.0004)	(0.0004)
Control Mean	[0.8762]	[0.8891]	[0.8902]	[0.8764]	[0.8786]	[0.8765]
Panel B: IHS(Portfolio Value)						
Treatment Effect	-0.0002	0.0025	0.0071	0.0057	0.0065	0.0089
	(0.0076)	(0.0067)	(0.0063)	(0.0076)	(0.0073)	(0.0075)
Control Mean	[8.0207]	[8.7253]	[9.0154]	[8.0666]	[7.6502]	[7.5205]

Notes: Dependent variable = IHS(buy value + sell value in month) and excludes treatment IPO stock. Observations = 1,473,073; # Share Categories = 323; # IPOs = 40. Sample includes only positive return IPOs.

- No spillover effect of IPO gains on portfolio value
- Policy: IPO gains do not foster greater stock market participation

Treatment Effect Heterogeneity By Listing Day Return

Main Results

IPO Sample:	Positive Returns (1)	Negative Returns (2)
1. Future IPO Participation	0.0117***	-0.0142**
Time: (t+1) to (t+6)	(0.0013)	(0.0039)
2. Gross Transaction Value	0.0717***	-0.0210
Time: (t+1) to (t+6)	(0.0071)	(0.0192)
3. Disposition	0.0082***	-0.0013
Time: (t+1)	(0.0020)	(0.0029)
4. Propensity to hold IPO sector stocks	0.0022	-0.0064**
Time: (t+1) to (t+6)	(0.0015)	(0.0029)
5. Weight in IPO sector	0.0006***	-0.0011**
Time: (t+6)	(0.0002)	(0.0064)
6. Portfolio value $>$ 0	0.0013***	0.0012
Time: (t+1) to (t+6)	(0.0004)	(0.0014)
7. Portfolio value	0.0089	-0.0154
Time: (t+6)	(0.0075)	(0.0209)
Observations	1,473,073	89,637

Notes: 14 IPOs (40 share categories) with negative returns. 40 IPOs (323 share categories) with positive returns.

Wealth Effects

Are Results Generated by the Change in Wealth?

- Two ways to think about wealth effects:

  1. IPO gain relieves liquidity constraint
     - Seems less plausible
     - Accounts put down $1,800 in escrow to participate, so unlikely that $67 gain is relieving liquidity constraint
     - Significant effect sizes for large portfolio value accounts

  2. Marginal propensity to invest out of wealth
     - Given wealth gains are small, suggest (perhaps implausibly) large changes in behavior due to small changes in wealth
     - e.g. 1.5 % gain in wealth $\rightarrow$ 7 % increase in trading value

- Overall, evidence not consistent with pure wealth effects story

Conclusion

- Present new research design to identify experience effects
- Experience of portfolio gain in randomly assigned IPO stock causes:
  - Win-stay, lose-switch learning
  - Increase in trading activity in non-IPO stocks
  - No change in portfolio value outside of IPOs
- Theory (in progress): refining our understanding of experience effects/reinforcement learning in financial markets:
  - Narrow vs. portfolio reinforcement learning $\rightarrow$ within portfolio contagion
  - Win-stay, lose-switch models of investor behavior