The Display of Information and Household Investment Behavior

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Research Question

- Previous research suggests that individuals' decisions are influenced by the way in which information is presented to them

  (*Kahneman, 1973; Benartzi and Thaler, 1999; Hirshleifer and Teoh, 2003; Bordalo, Gennaioli and Shleifer, 2012*)

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  (*Kahneman, 1973; Benartzi and Thaler, 1999; Hirshleifer and Teoh, 2003; Bordalo, Gennaioli and Shleifer, 2012*)

- But we face many open questions:

  - How do households react to information display outside of controlled settings?
  - Does this matter for important decisions like retirement savings allocations?
  - What are possible implications for public policy? Disclosure requirements?

Why Would HH React to the Way Info is Displayed?

- Individuals have limits on the amount of information they can attend to and process (Kahneman, 1973)
    - How individuals react in given situation will partially be determined by where their attention is directed
    - Information that is prominently displayed or exciting is salient

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  - Information that is prominently displayed or exciting is salient

$\Rightarrow$ **Info salience $\rightarrow$ Where attention is directed $\rightarrow$ HH decisions**

Testing the Effect of Information Display on HH Behavior

1. Hard to find real-life investment environment where the manner in which information is displayed changed while the attainable information set remained constant

   $\rightarrow$ Difficult to disentangle the effect of the display of information from the effect of changes to the attainable information set

Testing the Effect of Information Display on HH Behavior

1. Hard to find real-life investment environment where the manner in which information is displayed changed while the attainable information set remained constant

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2. Even if such a setting is found, unobserved time trends could drive any observable effect

What I Do

1. I exploit an Israeli regulatory reform: where retirement funds were subject to changes in the manner in which they could display their past performance:

   - Before: prominently displayed 1-month returns
   - After: can only display 12-month+ returns
   - $\rightarrow$ Attainable information set remains the same: $r_{t-1} = \frac{r_{[t-13,t-1]}+1}{r_{[t-13,t-2]}+1} - 1$
     - ▸ calculation

2. I estimate a differences-in-differences specification: using funds not subject to the regulation to control for possible unobserved factors

BEFORE Regulation: past 1-month return

AFTER Regulation: past 12-month return

Preview of Results

1. Fund flows are less sensitive to past returns

2. Reduced trade volume

3. Allocation to riskier retirement funds

Background

- Retirement funds
    - Allowances and Compensation Provident Funds
    - Similar to 401K mutual funds in the US
    - Tax efficient
        - Tax exemption up to certain level if redeemed at retirement
        - Generally, 35% tax penalty incurred if redeemed early
    - Regulated by the Israeli Minister of Finance (MOF)

- Mutual Funds
    - Open-ended mutual funds
    - Similar investment-vehicle to mutual funds in the US
    - Tax treatment:
        - Most funds are not taxed at the fund level
        - Capital gains tax when units are redeemed
    - Cleared by the Tel-Aviv Stock Exchange Clearing House
    - Regulated by the Israeli Securities Authority (ISA)

Background

- Regulation:
  - January 2010 ▸ quote
  - Only applies to retirement funds
  - Regulation applied to the official government website, retirement funds' websites, and any marketing material
  - Household could still extract the 1-month return from the attainable information set ▸ calculation

- Dataset:
  - Fund level data for universe of retirement and mutual funds
  - Sample period: 48 months

Fund AUM - Treated and Control Groups
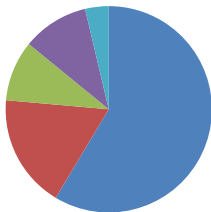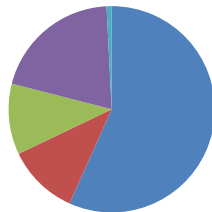
1-month Return Treated and Control Groups
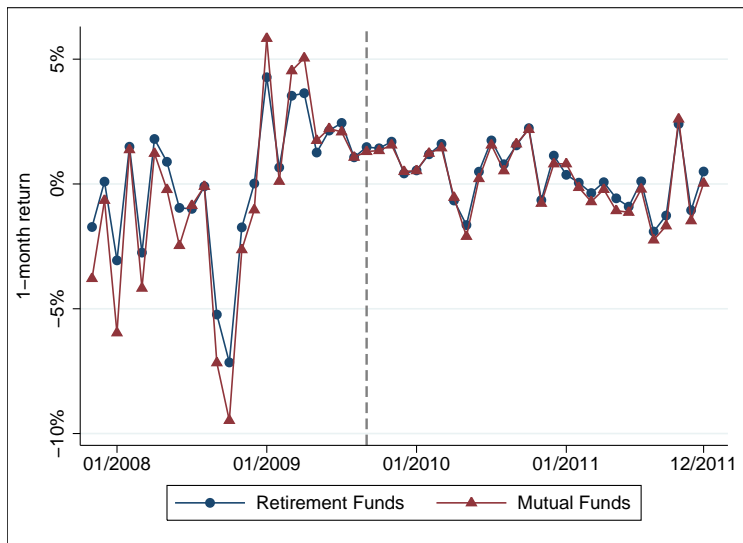
12-month Return Treated and Control Groups
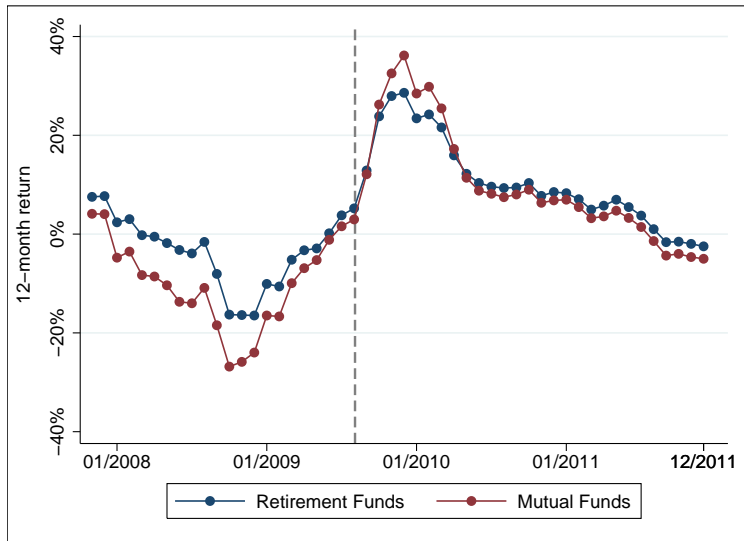
Fund Flow Sensitivity to Past 1-Month Return

- Well-documented performance-flow relation proxy for HH behavior [*Sirri and Tufano, 1998; Frazzini and Lamont, 2008*]

- IF information display is not relevant $\rightarrow$ I do not expect to find changes in HH behavior following the regulation

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- Well-documented performance-flow relation proxy for HH behavior [*Sirri and Tufano, 1998; Frazzini and Lamont, 2008*]

- IF information display is not relevant $\rightarrow$ I do not expect to find changes in HH behavior following the regulation

- To test this hypothesis I estimate the following specification:

$$
\begin{aligned}
FF_{i,t} = & \ \beta_1(r_{i,t-1}) + \beta_2(r_{i,t-1} \times Post_t) + \beta_3(r_{i,t-1} \times RF_i) \\
& + \boxed{\beta_4}(r_{i,t-1} \times Post_t \times RF_i) + \beta_5(Post_t \times RF_i) \\
& + \ Controls + \gamma_t + \alpha_i + \varepsilon_{i,t}
\end{aligned}
$$

- The main coefficient of interest is β_4
  - Identifies any impact of the regulation on HH behavior

Fund Flow Sensitivity to Past 1-Month Return

	$FF_{i,t}$	$FF_{i,t}$
	(1)	(2)
$Post_t \times RF_i$	-0.774	-0.774
	[-0.76]	[-0.60]
$r_{i,t-1}$	0.239***	0.239***
	[2.93]	[2.94]
$r_{i,t-1} \times RF_i$	0.316**	0.316**
	[2.35]	[2.13]
$r_{i,t-1} \times Post_t$	0.135	0.135
	[1.48]	[1.16]
$r_{i,t-1} \times Post_t \times RF_i$	-0.608***	-0.608***
	[-4.45]	[-3.40]
$Yr\text{-}Mth\ FE$	X	X
$Fund\ FE$	X	X
$Cluster$	Fund	Fund, Yr-Mth
N	73074	73074

Fund Flow Sensitivity to Past 1-Month Return

- Fund flows were sensitive to past performance prior to the regulation

- $\beta_4 < 0$: Fund flow sensitivity to past 1-month return decreases significantly following the regulation

- Robust to using different definitions for net fund flow ▸

$\Rightarrow$ These results suggest that HH are influenced by information salience

▸ trends

Trade Volume

- The change in the display of returns may impact trading volume
    - → Once 1-month returns are not as salient, HH possibly trade less in these funds

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- To test this hypothesis I estimate the following specification:

$$\log(\text{TradeS}_{i,t}) = \alpha_i + \gamma_t + \boxed{\beta_1}(Post_t \times RF_i) + R_{i,t-1} + \varepsilon_{it}$$

- $TradeS_{i,t}$ = absolute sum of funds actively initiated by HH scaled by fund's size

- The coefficient of interest is β_1
  - Captures the effect of the change in information display on retirement funds' trade volume

Trade Volume

	(1)	(2)
	$TradeS_{i,t}$	$\log TradeS_{i,t}$
$Post_t \times RF_i$	-2.884***	-0.383***
	(-4.69)	(-6.51)
$r_{i,t-1}$	0.306***	0.0165***
	(9.42)	(11.18)
$r_{i,[t-12,t-1]}$	0.196***	0.0125***
	(15.53)	(20.24)
$Controls$	X	X
N	65674	63880

- I find that $\beta_1 < 0$
- Effect is economically significant
  - $\rightarrow$ Retirement funds' trade volume decreased by $\approx 35\%$ compared to the control group ▶

Risk Allocation

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  - $\rightarrow$ Ultimately the way HH perceive retirement funds' risk profile

- Consistent with HH exhibiting myopic loss aversion [*Benartzi and Thaler, 1995*] ▸ MLA ▸ RobMLA

Myopic Loss Aversion

- Myopic loss aversion (*Benartzi and Thaler, 1995*)
- Individuals often reject a gamble of (200, 0.5; -100, 0.5), but will accept 100 repetitions of this if they are not forced to view outcomes sequentially

Single Lottery

Compound Lottery

▸ RobMLA
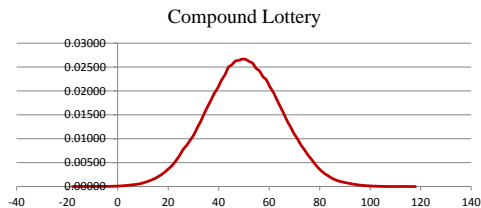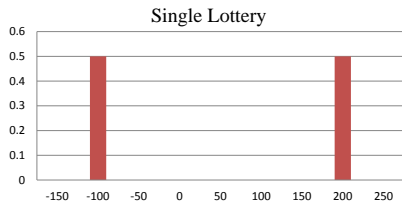
Risk Allocation

- To test whether HH changed their risk allocation I estimate:

$$
\begin{aligned}
Log(In/Outflow_{i,t}) &= \beta_1(RiskMeasure_i \times Post_t) \\
&+ \beta_2(RiskMeasure_i \times RF_i) \\
&+ \boxed{\beta_3}(RiskMeasure_i \times Post_t \times RF_i) \\
&+ \beta_4(Post_t \times RF_i) + \gamma_t + \alpha_i + R_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
$$

- The main coefficient of interest in this specification is β_3
  - Represents the impact of the regulation on HH's flow allocation to riskier retirement funds

- 2 alternative risk measures:
  - $Equity_i$: fund average equity exposure prior to the new regulation
  - $Volatility_i$: fund average volatility prior to the new regulation

Risk Allocation - Inflows/Ouflows

	LogIN$_{i,t}$	LogOUT$_{i,t}$
	(1)	(2)
$Post_t \times RF_i$	-0.786***	-0.0194
	[-4.79]	[-0.18]
$Post_t \times Volatility_i$	-0.0517***	0.0468***
	[-3.78]	[4.57]
$Post_t \times Volatility \times RF_i$	0.152***	-0.0748*
	[2.65]	[-1.86]
R_{it-1}	X	X
$Yr - Mth\,FE$	X	X
$Fund\,FE$	X	X
N	48483	48483

- Similar results for inflows/outflows into equity funds

Risk Allocation

- I find that inflows into riskier funds significantly increased following the regulation
  - I also find that net fund flow significantly increased following the regulation

- This effect is economically significant
  - 1 std increase in the risk measure is associated with a 20% monthly increase in inflows on average
  - Could have important implication for total accumulated wealth at retirement
    - $\rightarrow$ Back of the envelope calculation: $\approx 15\%$ increase of wealth at retirement ▸ Example

- These results are consistent with HH exhibiting myopic loss aversion

Fund Flow Sensitivity to Past 12-Month Return

- The results presented so far suggest that HH are influenced by information display
- ⇒ But how do HH react to past 12-month returns following the regulation?

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⇒ But how do HH react to past 12-month returns following the regulation? is NOT OBVIOUS

- Prominence Hypo: Post regulation 12-month returns are the default performance measure, hence these are more prominent and would attract more attention. (Relative Salience)

  → HH would rely more on 12-month returns post regulation (H_1)

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- Prominence Hypo: Post regulation 12-month returns are the default performance measure, hence these are more prominent and would attract more attention. (Relative Salience)

   $\rightarrow$ HH would rely more on 12-month returns post regulation (H_1)

- Global Hypo: 12-month returns are smoother and less exciting than 1-month returns. Therefore 12-month returns would attract less attention than the "glittery" 1-month returns. (Absolute Salience)

   $\rightarrow$ HH would rely less on past 12-month returns post regulation (H_2)

Fund Flow Sensitivity to Past 12-Month Return

- To test these alternative hypotheses I estimate the following specification:

$$
\begin{aligned}
FF_{i,t} = \quad & \beta_1(r_{i,t-1}) + \beta_2(r_{i,t-1} \times Post_t) + \beta_3(r_{i,t-1} \times RF_i) \\
+ \quad & \boxed{\beta_4}(r_{i,t-1} \times Post_t \times RF_i) + \beta_5(r_{i,[t-12,t-1]}) \\
+ \quad & \beta_6(r_{i,[t-12,t-1]} \times Post_t) + \beta_7(r_{i,[t-12,t-1]} \times RF_i) \\
+ \quad & \boxed{\beta_8}(r_{i,[t-12,t-1]} \times Post_t \times RF_i) \\
+ \quad & \beta_9(Post_t \times RF_i) + Controls + \gamma_t + \alpha_i + \varepsilon_{i,t}
\end{aligned}
$$

- The main coefficients of interest are β_4 and β_8
  - In line with H_1: $\beta_4 < 0$ and $\beta_8 > 0$
  - In line with H_2: $\beta_4 < 0$ and $\beta_8 < 0$

Fund Flow Sensitivity to Past 12-Month Return

	$FF_{i,t}$	$FF_{i,t}$
$Post_t \times RF_i$	-0.417	-0.417
	[-0.36]	[-0.29]
$r_{i,t-1}$	0.119**	0.119*
	[2.01]	[1.72]
$r_{i,t-1} \times RF_i$	0.115	0.115
	[1.00]	[0.86]
$r_{i,t-1} \times Post_t$	0.193***	0.193*
	[2.63]	[1.79]
$r_{i,t-1} \times Post_t \times RF_i$	-0.335***	-0.335*
	[-2.80]	[-1.89]
$r_{i,[t-12,t-1]}$	0.0365*	0.0365
	[1.86]	[1.32]
$r_{i,[t-12,t-1]} \times RF_i$	0.164***	0.164***
	[4.11]	[2.60]
$r_{i,[t-12,t-1]} \times Post_t$	-0.00311	-0.00311
	[-0.14]	[-0.08]
$r_{i,[t-12,t-1]} \times Post_t \times RF_i$	-0.197***	-0.197***
	[-4.48]	[-2.93]
Controls	X	X
N	65720	65720

Fund Flow Sensitivity to Past 12-Month Return

- I find that $\beta_4 < 0$ and $\beta_8 < 0$:

  - Fund flow sensitivity to past 1-month and 12-month returns significantly decreases following the regulation
  - Consistent with Global Hypothesis/Absolute Salience
  - Suggests HH could be paying less attention to their retirement funds following the regulation

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- Alternative explanation − **Info Acquisition Transaction Cost**

    - Potentially consistent with $\beta_4 < 0$
    - BUT inconsistent with $\beta_8 < 0$
        - $\rightarrow$ 12-month return are less costly to obtain following the regulation
        - $\rightarrow$ Result inconsistent with a pure information cost acquisition explanation

Public Policy Implications

These results could have important public policy implications:

1. Relatively low-cost regulation with a potential strong impact on HH

   - Accumulated wealth at retirement
   - *IF* one accepts that investors trade excessively, or under/over invest in equities $\rightarrow$ could have significant welfare implication

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2. No change to the attainable information set thus could be regarded as less paternalistic and encounter less resistant

3. By disregarding the effect information display has on investors, regulators may be granting power to disclosing entities unintentionally

   - Especially relevant in markets where sophisticated players are displaying information to unsophisticated investors

Conclusion

- I use a regulatory change to examine *whether* and *how* the manner in which information is displayed influences HH's investment behavior

- I find that following the regulation:

  - Fund flows are less sensitive to past returns
    - $\rightarrow$ Consistent with information salience been an important driver of HH investment behavior

  - Trade volume significantly decreases
    - $\rightarrow$ Effect is economically significant: decrease of $\approx 35\%$

  - HH allocate more of their retirement savings into riskier funds
    - $\rightarrow$ Could influence HH's accumulated wealth at retirement
    - $\rightarrow$ Consistent with HH exhibiting myopic loss aversion

- Potential important public policy implications

THANK YOU!

QUESTIONS?

APPENDIX

Example How to Compute the 1-Month Return

- r_t the monthly return in month t
- $r_{t-13,t-1}$ the 13-month return from period $t-13$ to $t-1$
- $r_{t-13,t-2}$ the 12-month return from period $t-13$ to $t-2$
- Then an investor can extract $r_{t-1} = \frac{r_{[t-13,t-1]}+1}{r_{[t-13,t-2]}+1} - 1$

▸ Screenshot Website

▸ Regulation

▸ What I Do
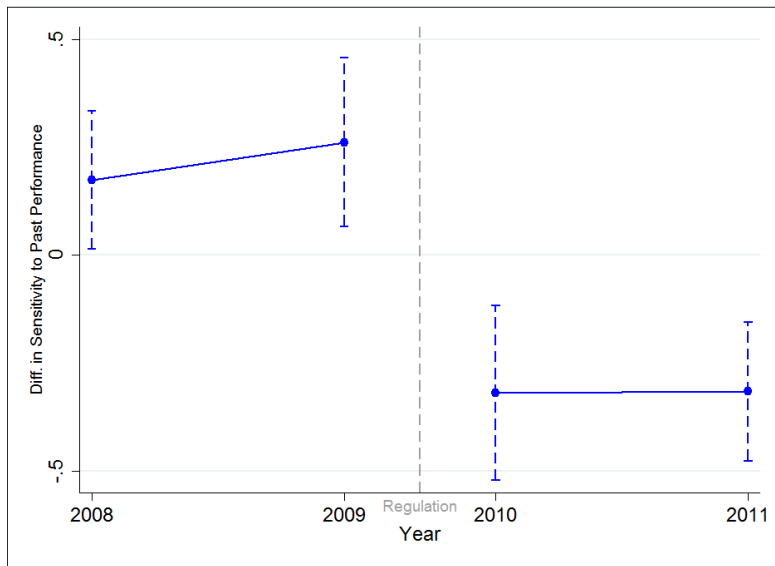
Regulation

The MOF in 2009:

"Pension savings products are longterm savings products whose performance should be examined over long periods. The rules for publication of the funds yields are intended to enable the saver to make a comparison between the various pension savings products and to assist that saver in reaching an informed decision regarding their investment...... Since, as stated, these are long term savings, we will prohibit the institutional bodies from displaying short−term performance....."
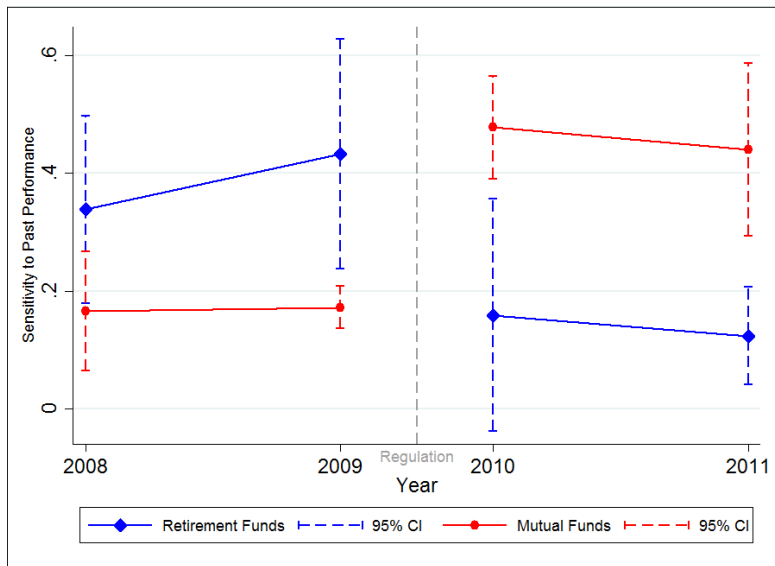
▸ regulation

Fund Flow Sensitivity to Past 1-Month Return ▶

	(1)	(2)	(3)	(4)	(5)
	$FF_{i,t}$	FFV_{it}	$MktS_{i,t}$	$FFS_{i,t}$	$FFVS_{i,t}$
$Post_t \times RF_i$	-0.774	-0.446	-0.0657	-0.817***	-0.811***
	[-0.76]	[-0.42]	[-0.55]	[-2.78]	[-2.72]
$r_{i,t-1}$	0.239***	0.233***	0.0349***	0.161***	0.160***
	[2.93]	[2.85]	[3.89]	[5.41]	[5.38]
$r_{i,t-1} \times RF_i$	0.316**	0.479***	0.0492***	-0.125***	-0.102***
	[2.35]	[3.02]	[3.22]	[-3.80]	[-3.01]
$r_{i,t-1} \times Post_t$	0.135	0.138	-0.00356	0.474***	0.475***
	[1.48]	[1.51]	[-0.40]	[7.47]	[7.48]
$r_{i,t-1} \times Post_t \times RF_i$	-0.608***	-0.713***	-0.0574***	-0.406***	-0.407***
	[-4.45]	[-4.70]	[-3.54]	[-5.09]	[-5.07]
Controls	X	X	X	X	X
N	73074	73074	73074	73074	73074

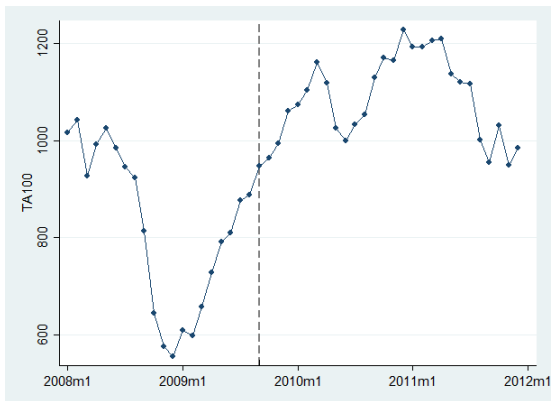# Fund Flow Sensitivity to Past 1-Month Return

Fund Flow Sensitivity to Past 1-Month Return

Time Varying Sensitivity

- Markets rose dramatically around the passage of the regulation
- TA 100:

Why Did FF sensitivity to Past 1-month Returns Increase for the Control Group?

- Ostrich Effect (Karlsson, Loewenstein and Seppi, 2009): Investors monitor and respond more to information regarding their investments when markets are rising
  - Sicherman et al.(2012): Logins into retirement accounts fall by 9.5% after market declines
  - Glode et al.(2012): Performance predictability in mutual funds increases after periods of high markets returns but not after periods of low markets returns [cross sectional]
  - Xie (2011): Mutual funds' investors' sensitivity to fund performance increases when stock markets returns are high [time series]
  - Ben-Rephael, Kandel and Wohl (2011): Israeli mutual funds behave similarly to their US counterparts (similar evidence from Ferreira et al., 2012)
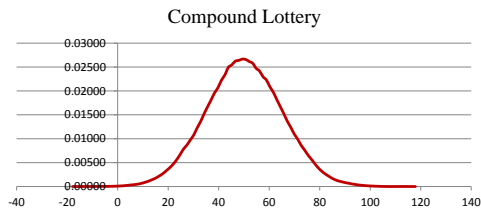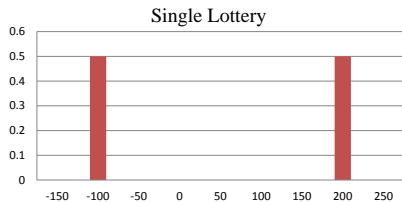
  ▸ result1

Parallel Trends Trade Volume
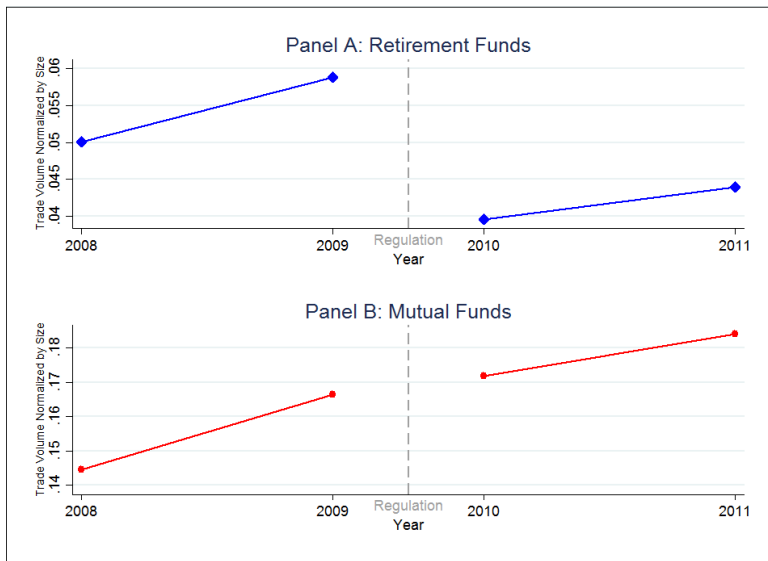
Myopic Loss Aversion

- Myopic loss aversion (*Benartzi and Thaler, 1995*)
- Individuals often reject a gamble of (200, 0.5; -100, 0.5), but will accept 100 repetitions of this if they are not forced to view outcomes sequentially

Single Lottery

Compound Lottery

▸ result3intro

Myopic Loss Aversion - Robustness Test

Sensitivity to Losses vs. Gains

	$FF_{i,t}$	$FF_{i,t}$
	Sensitivity to Gains	Sensitivity to Losses
	(1)	(2)
$r_{i,t-1}$	0.225**	0.510***
	[2.15]	[2.86]
Yr-Mth FE	X	X
Fund FE	X	X
N	4946	2797

▸ MLA

Risk Allocation

- How does information display affect risk allocation?

- Generally 12-month returns are smoother than 1-month return

  - $\rightarrow$ Possibly could impact HH **perception of losses**
  - $\rightarrow$ Ultimately the way HH perceive retirement funds' risk profile
  - $\rightarrow$ Consistent with HH exhibiting myopic loss aversion [*Benartzi and Thaler, 1995*] ▸ MLA ▸ RobMLA

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- To test whether HH changed their risk allocation I estimate:

$$
\begin{aligned}
Inflow_{i,t} &= \beta_1(RiskMeasure_i \times Post_t) + \beta_2(RiskMeasure_i \times RF_i) \\
&+ \beta_3(RiskMeasure_i \times Post_t \times RF_i) \\
&+ \beta_4(Post_t \times RF_i) + \gamma_t + \alpha_i + R_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
$$

- The main coefficient of interest is β_3
- $RiskMeasure_i$: equity exposure or volatility ▸ def

Back of the Envelope Calculation

- If an HH saves $1000 dollars a month for its retirement. In 30 years:

  - Pre regulation: At retirement its balance will be $1.5 million

  - Post regulation: At retirement its balance will be $1.7 million

  $\rightarrow$ Increased its savings by $200K