

Mislearning and (Poor) Performance of Individual Investors¹

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¹Our opinions do not necessarily represent the Regulator's views.

Motivation

- ▶ Pension savings currently amounts to 19% of total financial assets for the average individual in an OECD country.
- ▶ In Chile, this figure is 43%; AUM close to 70% of GDP.
- ▶ Individuals are faced with complex investment decisions which have a direct effect on their expected pension.
- ▶ Recent years have seen increased interest and attention regarding the way in which pension funds are invested.
- ▶ We study the incentives to engage in active investment decisions when ability is unknown (i.e. learning-by-doing).

Performance literature

- ▶ Overall, there is less availability of evidence for pension plan members.
- ▶ Average individual investor has **poor performance** and trades too much (Odean, 1999, Barber and Odean, 2000, 2001, Calvet et al, 2007).
- ▶ Nevertheless, there is considerable **heterogeneity in results** (Grinblatt et al, 2001).
- ▶ Average individual member of pension plan displays **inertia** (Agnew et al, 2003, Mitchell et al, 2006)
- ▶ For Chile, younger, men, low income, low financial knowledge make less investment decisions (Kristjanpoller and Olson, 2014).

Learning literature

- ▶ **Past performance affects future frequency** of investment decisions (Glaser and Weber, 2007, Barber et al, 2014).
- ▶ In some cases, **performance improves with experience** (Nicolosi et al, 2009 and Meyer et al, 2012).
- ▶ While in others, individuals **stop trading** after discovering their **lack of ability** (Seru et al, 2009).
- ▶ This can be rationalized by the existence of **learning-by-trading** (Mahani and Bernhardt, 2007, Linnainmaa, 2011).

Our Approach

- ▶ We study **incentives for making investment decisions** (trading) within a large DC pension scheme.
- ▶ Investment ability is unknown so it must be estimated: **“learning-by-trading”**.
- ▶ Our dataset allows us to determine patterns of **fund changing** and estimate **performance**.
- ▶ We explore the existence of a **feedback between past performance and subsequent fund changes**.

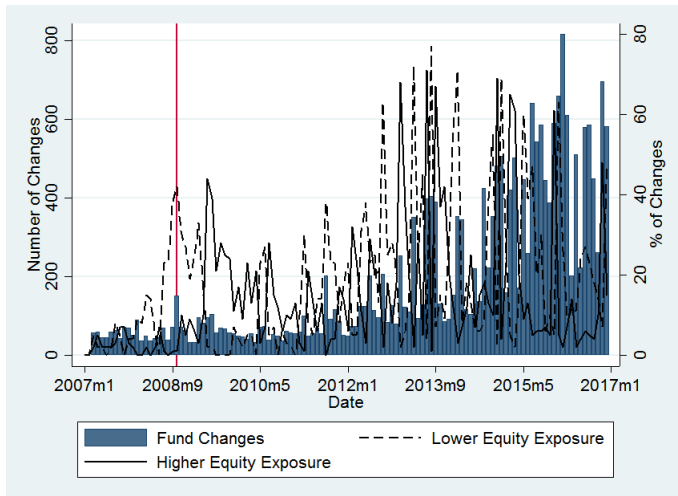
Main Results

- ▶ On average, individuals that make fund changes have **poor performance**.
- ▶ Performance tends to **decrease with higher frequency of changes**, which are usually accompanied by **extreme adjustments in equity exposure**.
- ▶ Robust evidence of learning and **feedback effect for naive ability-updating rule**.
- ▶ Policy implications: individual freedom of choice vs. ex-post results; impact on financial markets stability (Da et al, 2018).

Background Information

- ▶ The Chilean DC system was introduced in 1981.
- ▶ Participation is mandatory (75% coverage).
- ▶ Contributions are invested by six Pension Fund Managers.
- ▶ Members do not choose individual assets.
- ▶ Since August 2002, there are five types of fund (A, B, C, D and E).
- ▶ Maximum investment limits in equity: 80%, 60%, 40%, 20% and 5%, respectively.
- ▶ Default allocation features a decreasing equity exposure as members age.

Monthly Fund Changes



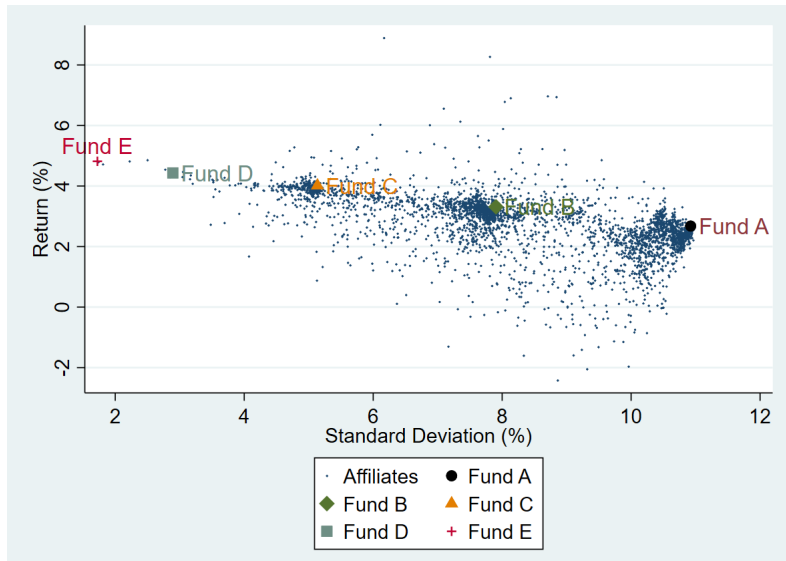
Type of Fund Change

Type	Group 1 (0)	Group 2 (1 to 3)	Group 3 (4-6)	Group 4 (7+)
-4	0%	18.75%	15.03%	28.54%
-3	0%	16.29%	7.64%	5.41%
-2	0%	21.66%	16.56%	13.05%
-1	0%	21.83%	27.27%	5.07%
0	100%	98.52%	96.08%	87.88%
1	0%	10.25%	8.23%	4.74%
2	0%	5.61%	11.43%	15.14%
3	0%	1.81%	3.20%	4.20%
4	0%	3.80%	10.65%	23.86%

Descriptive Statistics (Mean)

Variable	Full Sample	Group 1	Group 2	Group 3	Group 4
Age	41.147	41.212	39.392***	42.108***	40.688***
log(Balance)	14.76	14.675	15.729***	16.164***	16.369***
log(Income)	12.252	12.174	13.069***	13.289***	13.604***
VPS	0.043	0.034	0.106***	0.173***	0.283***
Unemp.	0.192	0.197	0.129***	0.114***	0.089***
Male	0.55	0.55	0.592***	0.597***	0.671***
Change	0.003	0	0.015***	0.039***	0.121***
Cumm Chg.	0.09	0	0.415***	1.586***	3.986***
More Risk	0.001	0	0.003***	0.013***	0.058***
Less Risk	0.002	0	0.012***	0.026***	0.063***
Equity	49.81	49.365	58.56***	53.124***	52.371***
Change PFM	0.005	0.004	0.008***	0.012***	0.013***
Password	0.083	0.066	0.216***	0.347***	0.535***
N	62,760	58,602	2,353	797	1,008

Investors and Pension Fund Performance (%)



Investors and Pension Fund Performance (%)

(a) Pension Funds		(b) Group 2	
Fund	Return		Return
A	2.678	P5	2.018
B	3.314	P25	2.536
C	4.013	Mean	3.012
D	4.433	P75	3.399
E	4.817	P95	4.019
(d) Group 3		(c) Group 4	
	Return		Return
P5	0.833	P5	0.506
P25	2.318	P25	1.794
Mean	2.848	Mean	2.429
P75	3.471	P75	3.132
P95	4.045	P95	4.086

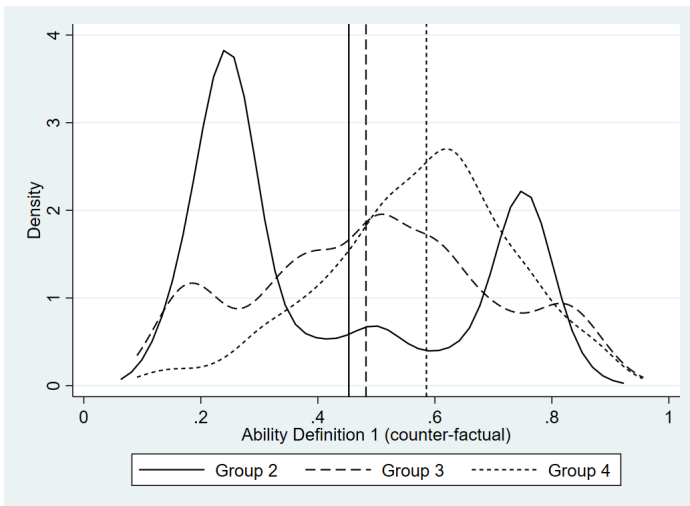
Relation between number of fund changes and performance

	Group 2		Group 3		Group 4	
Return	N	Changes	N	Changes	N	Changes
$r > 3.37$	608	1.86	253	4.55	177	13.6
$2.95 < r < 3.37$	734	1.63***	164	4.56	141	12.46**
$2.37 < r < 2.95$	658	1.64	157	4.70	225	13.90
$r < 2.37$	353	2.09	223	4.84	465	15.53

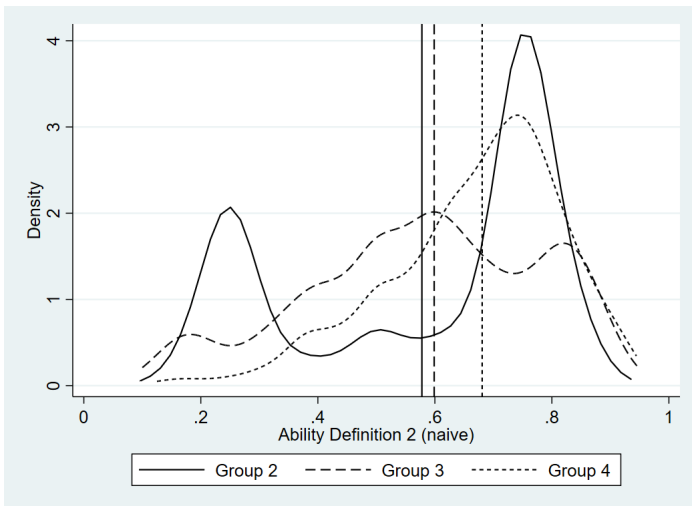
Why change funds? Learning from past experience

- ▶ **Trading motives:** Not for liquidity or tax reasons → Life cycle (unidirectional?) and perceived ability to time the market remain.
- ▶ **Learning:** Success and evaluation horizon (monthly).
- ▶ Success is defined as:
 - ▶ Def 1 (*counter-factual*): r with change $\geq r$ w/o change.
 - ▶ Def 2 (*naive*): r of selected fund > 0 .
 - ▶ Def 3 (*market timing*): r of selected fund is the highest.
- ▶ **Ability** is the proportion of successful over total accumulated changes.

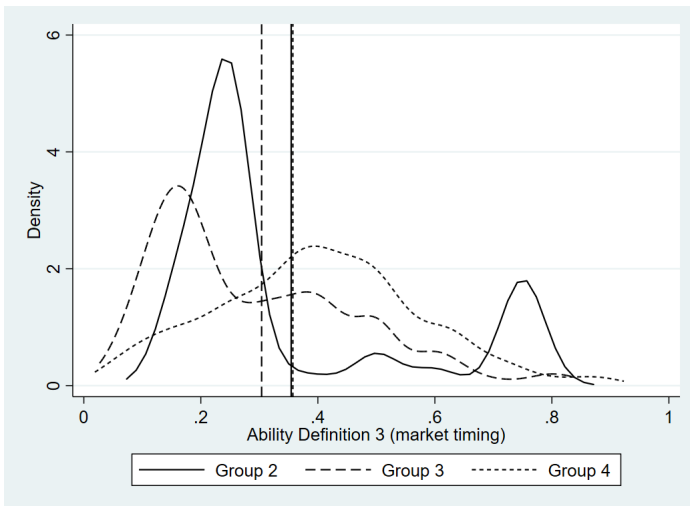
Density of Ability - Definition 1 (*counter-factual*)



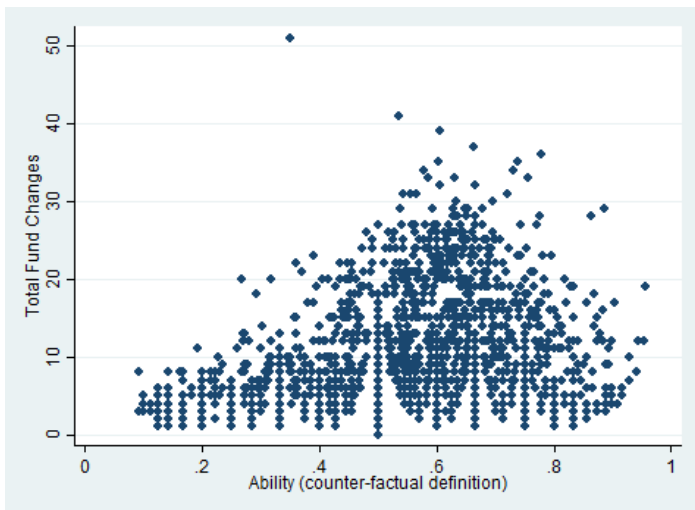
Density of Ability - Definition 2 (*naive*)



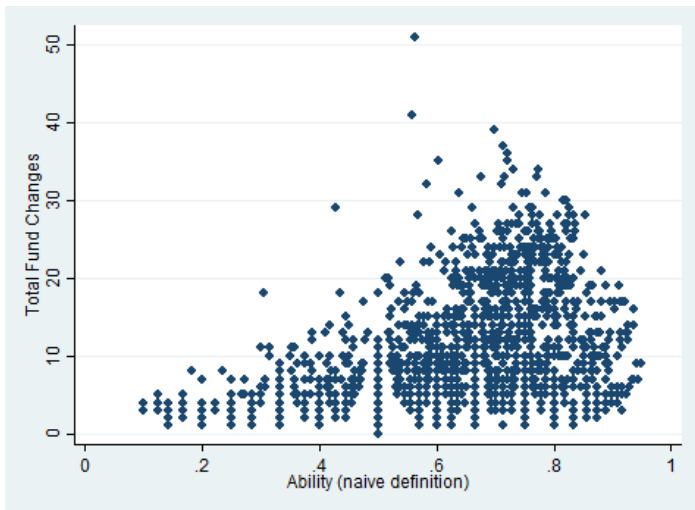
Density of Ability - Definition 3 (*market timing*)



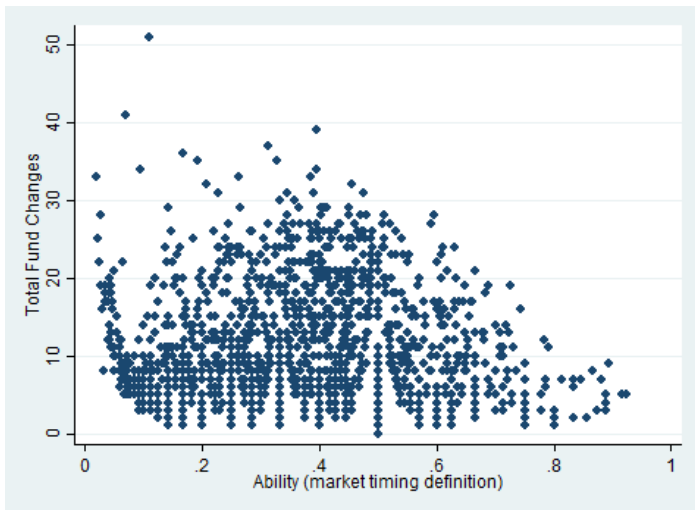
Total Changes vs Ability - Counter-factual ($\rho = 0.17$)



Total Changes vs Ability - Naive ($\rho = 0.45$)



Total Changes vs Ability - Market timing ($\rho = -0.38$)



Detecting Learning: Regression Analysis

- ▶ Lineal panel with individual fixed effects and probit models:

$$Y_{i,t} = \beta \times Ability_{i,t} + \delta \times (Ability_{i,t} \times Male_i) + \Gamma X_{i,t} + \gamma_i + \epsilon_{i,t}$$

- ▶ $Y_{i,t}$: Change; More Risk; Less Risk
- ▶ $Ability_{i,t}$: three definitions
- ▶ $X_{i,t}$: Controls (age, balance, income, voluntary savings, lagged returns, lagged A-E return gap, gender, gender interactions, A volatility, PFM change, password, year FE, quadratic trend, financial advisor recommendations dummies and trend)

Panel Regression Results: Change

	(1)	(2)	(3)
Ability	0.139***	0.312***	-0.222***
Male×Ability	0.0447**	0.0424**	0.00239
Age	-0.000637***	-0.000502***	-0.000570***
log(Balance)	0.000547***	0.000518***	0.000715***
log(Income)	0.000398***	0.000315***	0.000331***
VPS	0.0120***	0.00908***	0.00916***
Change PFM	0.0355***	0.0348***	0.0348***
Web Password	0.0227***	0.0178***	0.0209***
Unemployed	0.00546***	0.00436***	0.00473***
$\Delta_{r,t-1}$	-0.000231***	-0.000238***	-0.000251***
$\Delta_{r,36}$	0.000272***	0.000282***	0.000311***
Volatility	0.000102***	0.000109***	0.000117***
Indiv. & Year FE	Yes	Yes	Yes
Trend	Yes	Yes	Yes
R^2 (%)	1.9	4.1	2.4
N	7,403,126	7,403,126	7,403,126

Panel Regression Results: More Risk

	(1)	(2)	(3)
Ability	0.0933***	0.141***	-0.0708***
Male×Ability	0.0232**	0.0256**	-0.00277
Age	-0.000370***	-0.000302***	-0.000340***
log(Balance)	0.000202***	0.000202***	0.000279***
log(Income)	0.000154***	0.000116***	0.000133***
VPS	0.00538***	0.00414***	0.00465***
Change PFM	0.0213***	0.0210***	0.0211***
Web Password	0.00882***	0.00669***	0.00850***
Unemployed	0.00219***	0.00169***	0.00198***
$\Delta r_{r,t-1}$	2.94e-05***	2.42e-05***	1.93e-05***
$\Delta r_{r,36}$	-5.32e-05	-3.93e-05	-2.43e-05
Volatility	3.49e-05***	3.94e-05***	4.30e-05***
Indiv. & Year FE	Yes	Yes	Yes
Trend	Yes	Yes	Yes
R^2 (%)	1.2	2.0	0.9
N	7,403,126	7,403,126	7,403,126

Panel Regression Results: Less Risk

	(1)	(2)	(3)
Ability	0.0452***	0.170***	-0.151***
Male×Ability	0.0215*	0.0168	0.00516
Age	-0.000268***	-0.000200***	-0.000230***
log(Balance)	0.000345***	0.000316***	0.000436***
log(Income)	0.000244***	0.000199***	0.000198***
VPS	0.00660***	0.00494***	0.00451***
Change PFM	0.0142***	0.0138***	0.0137***
Web Password	0.0139***	0.0111***	0.0124***
Unemployed	0.00327***	0.00267***	0.00275***
$\Delta_{r,t-1}$	-0.000260***	-0.000262***	-0.000270***
$\Delta_{r,36}$	0.000325***	0.000322***	0.000336***
Volatility	6.70e-05***	6.93e-05***	7.36e-05***
Indiv. & Year FE	Yes	Yes	Yes
Trend	Yes	Yes	Yes
$R^2(\%)$	0.8	2.0	1.5
N	7,403,126	7,403,126	7,403,126

Takeaways

- ▶ Results are fairly consistent with theoretical models of learning-by-trading, although an important part of variation remains unexplained.
- ▶ Self-perceived ability fosters more trading for simple evaluation rules (effect stronger for males).
- ▶ Propensity of making changes declines with age.
- ▶ Wealth and income have positive effects (consistent with low RA).
- ▶ Making VPS has a strong (and robust) effect on propensity of making changes.
- ▶ Potential gains from MT lead to more changes (r chasing and shelter seeking).

Robustness: Different Cohort and time periods

- ▶ We repeat our analysis for a cohort of individuals who joined the system during 2007, allowing us to follow all their investment decisions.
 - ▶ Most of our previous results continue to hold.
- ▶ We also examine our original sample for different time periods (excluding the Subprime Crisis).
 - ▶ Even though average performance improves, helped by funds' performance, it is still negatively related to the number of changes.
 - ▶ We also obtain identical results in terms of the presence of learning effects.

Robustness: Simulated Performance

- ▶ Using multinomial regression models we estimate the “investment rules” followed by different groups: full sample, best/worst performers, individuals with high/low number of fund changes.
- ▶ Caveat: limited set of independent variables.
- ▶ Nevertheless, rules replicate in-sample behaviour (i.e. more extreme changes for market timers).
- ▶ Difference in performance obtained in simulations is negligible between groups, questioning the existence of ability.

Conclusions

- ▶ Performance seems to be poor for individuals who make fund changes.
- ▶ Moreover, we find robust evidence showing that performance decreases with the number of fund changes.
- ▶ We document the existence of feedback effect between self-assessed ability and the frequency of fund changes.
- ▶ However, this effect has the expected sign & highest predictive power for naive performance measures.

Conclusions

- ▶ Maintaining the possibility of making fund adjustments is desirable in the presence of heterogeneity among individuals.
- ▶ Nevertheless, negative and unintended consequences may be present.
- ▶ The results suggest that increased efforts should be made in order to understand how individuals learn from past decisions and also in improving the way in which the consequences of past fund changes are informed.

Thank You!

Comments & suggestions are most welcomed!
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Villatoro et al.

Comments by Alberto Humala

January 20th, 2020

Main Ideas

- Pension funds members who move between types of funds obtain lesser returns (on average) than those who remain in one type of fund.
 - ▶ Passive beats active strategy.
- Former "successful" decisions on changing funds lead to further movements.
 - ▶ Learning bias.
- However, average returns diminish with number of changes.
 - ▶ No market timing skills.

Methodology

- Data from administrative records.
- Focus on reallocation explicitly requested by fund members (flexibility to move).
- CAPM-type of regression for each individual to get returns and alpha.

Main Results

- Mislearning ("naive learning rules") contributes to poor performance.
- Poor performance would depend partially on sample period.
- More reallocation decisions lead to lesser returns.
- Therefore, good results come from luck (rather than from skill).

General Comments

Efficient use of data

- Assessment of granular (detailed) data pays-off in revealing financial decisions.
- Proper use of (previous) empirical evidence for assumptions and methodology choice.

General Comments

Financial markets uncertainty

- Financial markets are highly non-linear.
 - ▶ Could non-trained individuals' learning process cope with that?
 - ▶ Professional investors?
- Behavioral finance biases
 - ▶ Non-rational investors?

Specific Comments

Trading or reallocation

- Poorer performance from individual investors (in other contexts) due to excessive trade fees or behavioral finance biases (overconfidence).
- In a pension fund, members decision is limited to switching among type of funds (not individual-asset allocation).
 - ▶ Confidence in PFM's trading decisions?
- Active fund reallocation: protects expected returns or tries beating the market (?).

Specific Comments

Assessing volatility

- Intriguing result: higher equity-weight funds with the worst performance
- Should the PFM take decisions more actively inside each fund?
 - ▶ Profesional market-timing skills
- Non linear estimation of individual regressions.

Specific Comments

Performance

- Would the default investment strategy be a more appropriate baseline for comparison?
- Mislearning or incomplete learning?

Conclusions

- Pension funds members cannot measure risk properly in times where finance relationships have been changing considerably
 - ▶ Not even professionals can (?).
- Too much or too little flexibility