# Ratings and Asset Allocation: An Experimental Analysis[1]

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# Background

- Many financial decisions require difficult computations
  - Long-horizon financial decisions
  - The baseline portfolio selection model (e.g. Merton (1971)) has enormous informational and computational requirements
    - Thousands of stocks, bonds, options, mutual funds
    - Mutual fund theorems simplify the problem, but remain complicated with lifetime effects and individual-specific risks
  - Evaluation and comparisons of bonds
    - Credit risk
    - Term structure
    - Contractual characteristics
- What summaries, defaults, and presentation of information are helpful to investors?

# Literature: Behavioral Aspects of Investment Behavior

- Presentation effects
  - Chen, Lookman, Schürhoff, and Seppi (2014) (split-rated bonds); Del Guercio and Tkac (2008) (chasing Morningstar stars); Massa, Simonov, and Stenkrona (2015) (style representation)
- Effects of financial knowledge
  - Bernheim, Garrett, and Maki (2001); Bernheim and Garrett (2003) and Lusardi and Mitchell (2007); Grinblatt, Keloharju, and Linnainmaa (2011)
- Cognitive limitations; difficulty forming portfolios (numerous)
- Investment choice defaults
  - Madrian and Shea (2001): default enrollment increases participation; participants adopt the default investments
  - Benartzi and Thaler (2001) and Huberman and Jiang (2006) on $1/n$ selections

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- Credit ratings: AAA CDOs were (supposedly) different than AAA corporate bonds.
  - The ratings are analogous to our stars
  - Corporates vs CDOs analogous to our categories
- Morningstar ratings:
  - Ratings are within categories (e.g.: “Conservative Allocation”, “Moderate Allocation”, “Mid-Cap Blend”, “Mid-Cap Growth”, “Small Value”, “Small Blend”, “ Small Growth”, “Specialty Communications”, “Specialty Financial”, “Specialty Health”, “Specialty Natural Resources”, . . . , etc.)
  - How are investors affected by comparing stars across categories?

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- This makes sense, but do star comparisons across categories confuse investors?

# Morningstar Categories

Large Value
Large Blend
Large Growth
Mid-Cap Value
Mid-Cap Blend
Mid-Cap Growth
Small Value
Small Blend
Small Growth
Specialty Communications
Specialty Financial
Specialty Health
Specialty Natural Resources
Specialty Real Estate
Specialty Technology
Specialty Utilities
Conservative Allocation
Moderate Allocation
Convertibles
Long-Short Muni
Specialty Precious Metals
Muni Single State Short
Muni California Long
Muni California Int/Sh
Muni Massachusetts
Muni Minnesota
Muni New Jersey
Muni New York Long
Muni New York Int/Sh
Muni Ohio
Muni Pennsylvania
Moderate Allocation
Target-Date 2000-2014
Target-Date 2015-2029
Target-Date 2030 +
World Allocation
Foreign Large Value
Foreign Large Blend
Foreign Large Growth
Foreign Small/Mid Value
Foreign Small/Mid Growth
World Stock
Diversified Emerging Markets
Latin America Stock
Europe Stock
Japan Stock
Pacific/Asia (ex Japan) Stock
Diversified Pacific/Asia
Global Real Estate
Bear Market
Currency
Long Government
Intermediate Government
Short Government
Inflation-Protected Bond
Long-Term Bond
Intermediate-Term Bond
Short-Term Bond
Ultrashort Bond
Bank Loan
High Yield Bond
Multisector Bond
World Bond
Emerging Markets Bond
Muni National Long
Muni National Intermediate
Muni National Short
High Yield Muni
Muni Single State Long
Single State Interm
Enhanced Risk Measure

# Morningstar Fund Rankings

- All funds are put into a peer group based on investment style
- Funds in a peer group are rated on a curve: 10% 1 and 5 star; 22.5% 2 and 4 star; 35% 3 star.
  - No ratings in categories where funds are not directly comparable
- Rankings are determined by comparing certainty equivalent returns, computed using CRRA preferences with $\gamma = 2$ (Morningstar, 2009).
- Three problems:
  - The stars are eye-catching
  - Most investors probably do not understand them
  - Stars are not comparable across categories, but fund listings (e.g. in pension plans) simply report stars

# This Paper

- Do ratings and categorized ratings (ratings within groups) affect decisions when they add no additional information?
- We find that categorized ratings affect decisions
- We also examine cross-sectional determinants of behavior
  - Much behavioral research is focused on average effects.
  - We are concerned with heterogeneity
  - More knowledgable subjects perform better, but they seem affected by categorization
- The ultimate goal is to understand what interventions might help improve real-world decision making.

# Investment Alternatives

- In each of 4 trials, subjects allocate $12 across six investments:

| Alternative: | | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| High Return: | | 130% | 185% | 125% | 200% | 225% | 190% |
| Low Return: | | 30% | 15% | -25% | -20% | -75% | -90% |
| Average Return: | | 80% | 100% | 50% | 90% | 75% | 50% |
| Range of Returns: | | 100% | 170% | 150% | 220% | 300% | 280% |
| Return/Risk Ratio: | | 0.8000 | 0.5882 | 0.3333 | 0.4091 | 0.2500 | 0.1786 |

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Table 1: Investment alternatives in the experiment. This is an "uncategorized" display.

- No investment ("cash") is an unstated seventh investment.
- Investment returns are perfectly correlated in a stage
- The *return/risk ratio* is the expected return divided by the range (twice the standard deviation). For example, for A:

$$\frac{0.5 \times (130 + 30)}{130 - 30} = 0.80$$

# Display with Categories

| | | Category I | | | | Category II | | |
|---|---|---|---|---|---|---|---|---|
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Table 2: Investment alternatives in the experiment. This is a "categorized" display.

- Note that in both presentations, subjects are given the mean and standard deviation, and the ratio of the two.
- Categories are low risk (Category 1) and high risk (Category 2)

# Investment Characteristics

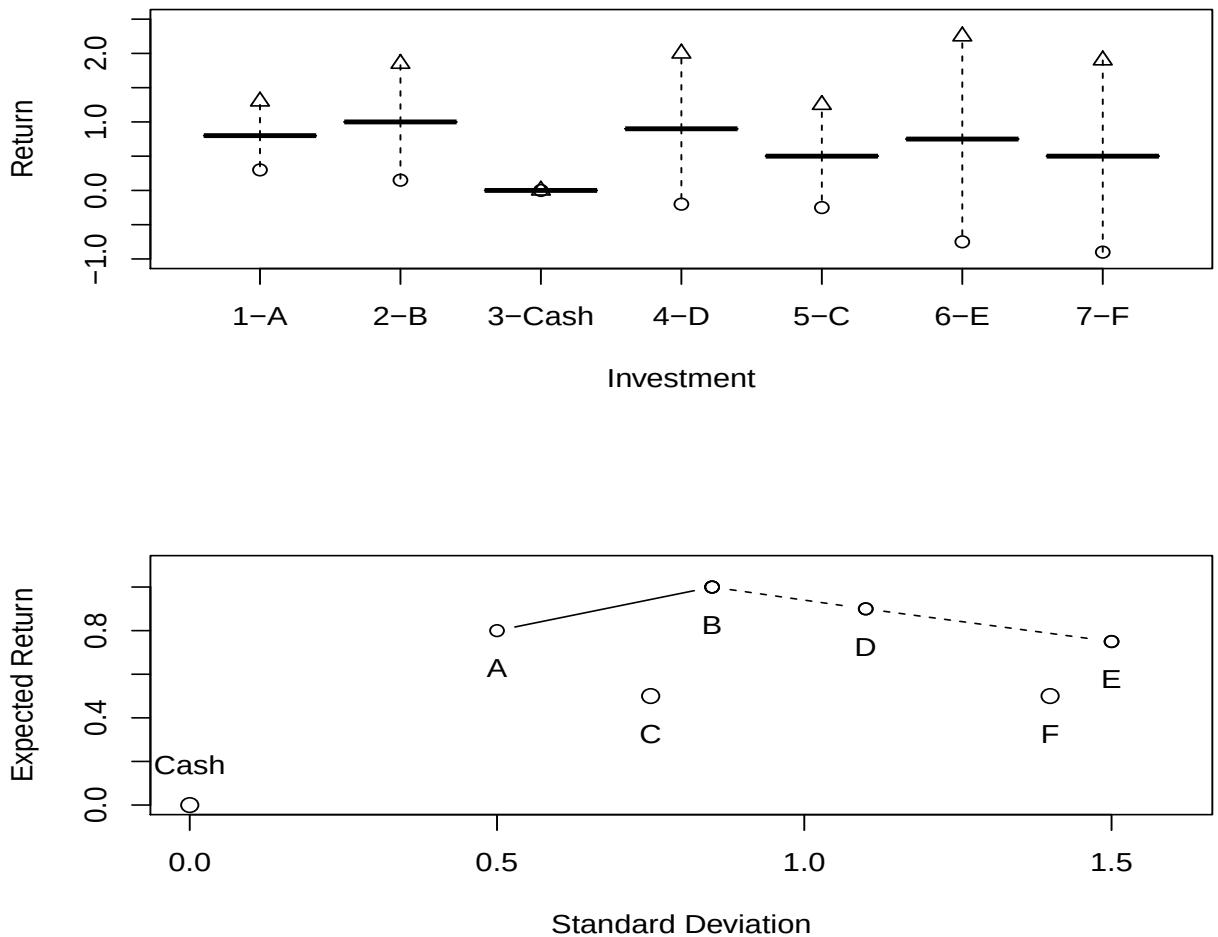


Figure 1: Top: Expected returns and standard deviations of investments. Bottom: Investments ordered by minimum return. **Subjects do not see these figures.**

# Optimal Investment Decisions

- C, F, and cash are dominated
- Risk-averse subjects should select some combination of A and B
  - A risk-averse subject prefers B to D and E.
- Subjects behaving risk-neutrally should invest in B
  - Rabin (2000) notes that subjects in most experiments should rationally be risk-neutral
- Diversification is worthless: In a given stage, all investments earn the high or low return

# The Primary Treatment

- We assign stars using the return-risk ratio *within categories*:

| Alternative: | | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| Uncategorized Ranking: | | *** | *** | ** | ** | * | * |
| Categorized Ranking: | | *** | ** | * | *** | ** | * |

Table 3: Rankings of Investment Alternatives

- Half of subjects consistently see uncategorized displays, half see categorized displays
- **Important**: categorization induces rating shifts:
  - B and C are demoted
  - D and E are promoted
- The goal is to see how rankings affect selections

# Four Trials for Each Participant

- In all stages, subjects were shown investment characteristics and asked to allocate investments across the six gambles.
- Alternatives are reordered and relabeled across stages

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**Trial III:** Subjects ranked the alternatives themselves.

  - Half were asked to rank alternatives according to the return/risk ratio
  - The other half were not told how to rank the alternatives.

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- The other half were not told how to rank the alternatives.

**Trial IV:** Repeat of Trial I: Basic information, no stars

# Treatments

There are 8 treatments ($2 \times 2 \times 2$) with 33 or 34 subjects in each treatment

- Categorization (main effect): Whether the investment alternatives are categorized or not.
- Explicit Ranking Rule: Whether the ranking method used in Trials 2 and 3 is explicitly stated.
- Order: Whether subjects participated in Trial II then Trial III or in Trial III then Trial II.

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Treatments are not mixed: displays are always categorized, or not; subjects are always told the ranking rule, or not.

# Experiment Description

- 266 subjects (U Iowa undergrad and MBA), between August and November 2010 and April and June 2012.
- On-line, any location
- Overall:
  1. General instructions
  2. Subjects choose whether to allocate $1 to a fair bet ($2 or 0)
     - This is to assess risk aversion of the subjects
  3. The 4 trials
  4. Knowledge quiz
  5. Demographic survey
  6. Payoffs determined
     - One round and the initial bet payoff are selected randomly; subject gets $5 participation fee plus the payoff.
- All who got to the stage 0 bet completed the experiment
- Average time to complete each stage (not counting instructions) less than 2.5 minutes

# Example of Subject Payment

- $5 participation fee
- Initial bet: $1 if forego, 0 or $2 otherwise
- Payoff on the randomly-selected stage.
- Example:
  - Subject does not make initial bet
  - Trial III is randomly selected at the end of the experiment; subject has invested $6 in B and $6 unallocated and the return is high
  - For the staged portion, subject then receives $5 + 1 + 6 \times (1 + 1.85) = \$23.10$

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  - For the staged portion, subject then receives $5 + 1 + 6 \times (1 + 1.85) = \$23.10$
- Maximum payoff occurs if subject takes the initial bet and wins, and plunges in asset E and wins:

$$\$5 + \$2 + \$12 \times (1 + 2.25) = \$46$$

# Design

- Note that
  - there is no interaction of participants and no market
  - there is no history of outcomes,
  - there is no learning,
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  - there is no history of outcomes,
  - there is no learning,
  - there is little or no computation,
  - there is no need to understand correlation
- Subjects at all times have complete information about investments.

$\Longrightarrow$ **Treatments should not affect investment decisions.**

# Two main questions

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1. Do participants behave “reasonably”
   - Yes
2. Are choices affected by treatments and by how much?
   - Yes, choices are affected by treatments.
3. Do knowledge and experience matter?
   - We do not find evidence that knowledge and experience counteract the treatment effect.

# Summary of Results

- Knowledge is associated with making better *untreated* decisions
- Categorization harms performance
  - Investment in B and C, and to a lesser extent, D and E, are sensitive to star rankings
- Behavior is heterogeneous
  - Those taking the initial bet are risk-seeking in the experiment
  - Experienced investors perform better

# Results for Trial 1

- Subjects performed reasonably well in complicated setting, investing most in A and B
- Smallest investments in C, F, and Cash
- Median investor invests $10 in two or fewer assets
- 11 (of 266) subjects at some point invest in 7 assets

# Investment in Trial 1

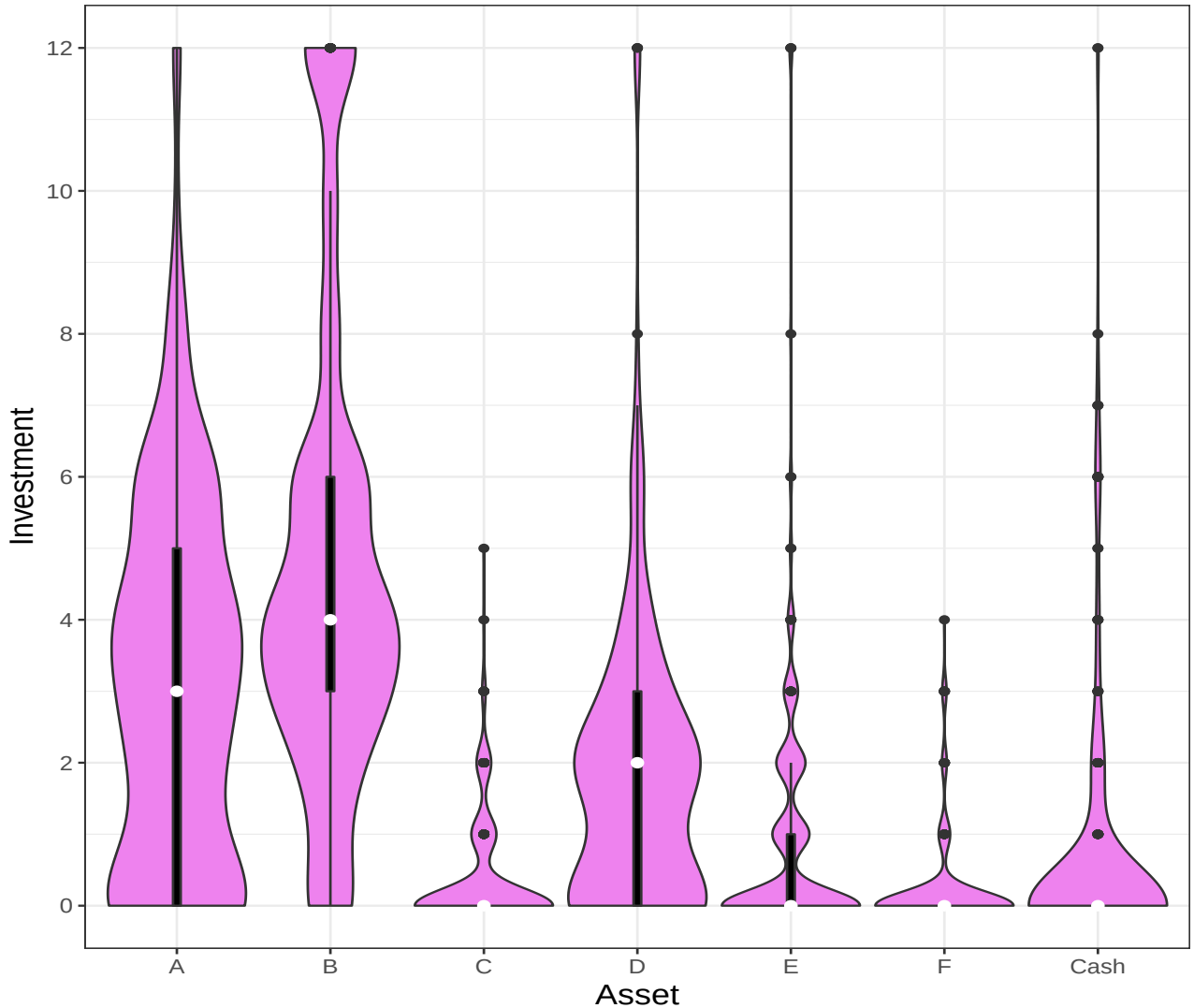


Figure 2: Investment levels in Trial 1.

# Diversification?

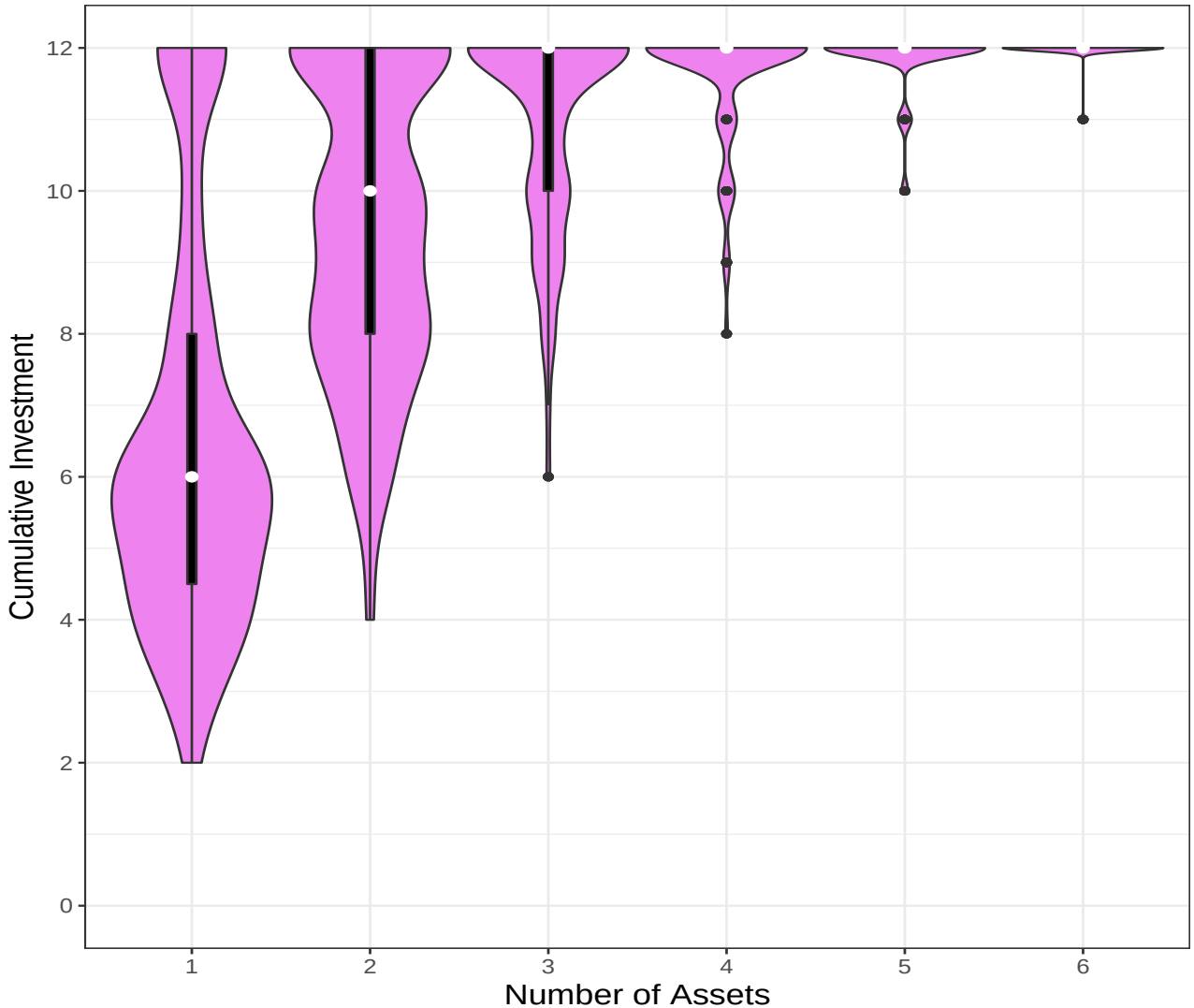


Figure 3: Cumulative Investment levels in Trial 1

# What Should We Find?

- A and F should be unaffected by treatment
- Those in categorized treatment should invest less in B and C, and more in D and E, in Trial 2 and possibly 3.
- All of this is evident in examining the difference between investments in the categorized and non-categorized treatments
- Trial 4 tests whether there are holdover effects from the earlier trials

# Univariate Analysis: Categories Within Stages

| | A | B | C | D | E | F | Cash |
|---|---|---|---|---|---|---|---|
| Panel A: Average Investment in Trial 1 | | | | | | | |
| Mean ($) | 3.125 | 4.798 | 0.388 | 1.817 | 0.951 | 0.228 | 0.692 |
| Std. Dev. ($) | 2.648 | 3.336 | 0.797 | 2.078 | 1.759 | 0.666 | 1.818 |
| Panel B: Changes from Trial 1 in Non-categorized Treatment | | | | | | | |
| Trial 2 | 0.225 | 0.310 | 0.093 | −0.256 | −0.450*** | −0.016 | 0.093 |
| Trial 3 | 0.426 | −0.248 | 0.062 | −0.302 | −0.450*** | −0.078 | 0.589 |
| Trial 4 | 0.310 | 0.341 | −0.031 | −0.256 | −0.372** | 0.000 | 0.008 |
| Panel C: Changes from Trial 1 in Categorized Treatment | | | | | | | |
| Trial 2 | 0.418 | −0.694*** | −0.075 | 0.425** | −0.090 | 0.142 | −0.127 |
| Trial 3 | 0.448 | −0.985*** | −0.045 | 0.157 | −0.321** | 0.104 | 0.642 |
| Trial 4 | 0.373 | −0.425 | −0.164** | 0.119 | 0.037 | 0.104 | −0.045 |
| Panel D: Difference Between Changes in Categorized and Non-Categorized Treatments | | | | | | | |
| Trial 2 | 0.193 | −1.004*** | −0.168** | 0.681*** | 0.360*** | 0.157 | −0.220 |
| Trial 3 | 0.021 | −0.737** | −0.107* | 0.459** | 0.129 | 0.182 | 0.053 |
| Trial 4 | 0.063 | −0.766** | −0.133* | 0.375 | 0.409** | 0.104 | −0.053 |

The main results are in Panel D

# Cash holdings

- Cash holdings are small *except* in Trial 3, when the rating rule is not given
- Subjects may be uncertain how to proceed
- Is this a drawback of disclosure and seeking active subject participation?

# Cash Holdings Across Trials

Table 4: Cash holdings in each trial, split by whether subjects are told the rating rule in the self-rated trial.

| | Trial | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rating Rule Not Given | | | | Rating Rule Given | | | |
| Cash holding | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 0 | 108 | 104 | 96 | 100 | 106 | 108 | 102 | 110 |
| 1 | 2 | 9 | 6 | 13 | 8 | 10 | 11 | 6 |
| 2 | 10 | 5 | 7 | 11 | 8 | 4 | 8 | 3 |
| 3 | 4 | 0 | 4 | 4 | 1 | 3 | 3 | 7 |
| 4 | 2 | 10 | 2 | 0 | 2 | 1 | 2 | 0 |
| 5 | 2 | 1 | 0 | 3 | 0 | 2 | 0 | 0 |
| 6 | 4 | 2 | 4 | 1 | 3 | 1 | 1 | 1 |
| 7 | 0 | 1 | 0 | 0 | 3 | 1 | 0 | 2 |
| 8 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 1 |
| 10 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 1 | 0 | 14 | 1 | 1 | 2 | 4 | 3 |

Note Trial 3, no rating rule.

# Multivariate Regression

- Censored regressions explaining investment levels in each asset,
- Regressions explaining the subject's average Sharpe ratio
- Explanatory variables include
  - knowledge score
  - gender dummy
  - stage dummy
  - stage interacted with a dummy for categorization
  - stage interacted with a dummy for the ranking rule being supplied
  - stage interacted with a dummy for the ordering ($=1$ if self-ranking is first)
- The constant measures behavior in Stage I, uncategorized, male, with mean knowledge score
- Interactions of treatment with knowledge score were generally insignificant

# Trial 1

- Experienced and knowledgeable subjects invest more in B and less in C, E, and F
- Those accepting the initial risky bet invest less in B and more in E and F
- Females invest more in C

# Allocations in Trial 1

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Intercept | 2.42*** | 5.41*** | −1.98*** | 1.17*** | −1.00** | −3.99*** |
| | (0.38) | (0.43) | (0.38) | (0.33) | (0.46) | (0.72) |
| T1*Cat | 0.21 | 0.14 | −0.20 | −0.30 | −0.80* | −1.18* |
| | (0.45) | (0.49) | (0.39) | (0.40) | (0.46) | (0.63) |
| Female | 0.38 | −0.13 | 0.72** | −0.20 | −0.07 | 0.58 |
| | (0.38) | (0.43) | (0.34) | (0.32) | (0.41) | (0.54) |
| Experience | −0.25 | 2.41* | −0.22 | −0.83 | −2.89** | −2.22* |
| | (1.19) | (1.34) | (0.90) | (0.95) | (1.32) | (1.29) |
| Knowledge | −0.01 | 0.53*** | −0.22** | −0.13 | −0.22* | −0.29* |
| | (0.12) | (0.14) | (0.10) | (0.10) | (0.12) | (0.15) |
| RiskBet | −0.19 | −1.29*** | 0.23 | 0.43 | 1.22*** | 1.11** |
| | (0.40) | (0.44) | (0.35) | (0.33) | (0.46) | (0.52) |
| Num. obs. | 1052 | 1052 | 1052 | 1052 | 1052 | 1052 |
| Trial 1: | | | | | | |
| Left-censored | 67 | 21 | 199 | 91 | 157 | 228 |
| Uncensored | 192 | 213 | 64 | 168 | 103 | 35 |
| Right-censored | 4 | 29 | 0 | 4 | 3 | 0 |
| All trials: | | | | | | |
| Left-censored | 247 | 135 | 820 | 394 | 697 | 906 |
| Uncensored | 771 | 800 | 232 | 648 | 349 | 145 |
| Right-censored | 34 | 117 | 0 | 10 | 6 | 1 |

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

# Trial 2: Stars are displayed

- Categorized investors reduce investment in B and C.
- Small effects from knowledge and experience

# Allocations in Trial 2

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Intercept | 2.42*** | 5.41*** | −1.98*** | 1.17*** | −1.00** | −3.99*** |
| | (0.38) | (0.43) | (0.38) | (0.33) | (0.46) | (0.72) |
| T2 | 0.22 | 0.36 | 0.52* | −0.49 | −1.47*** | 0.06 |
| | (0.35) | (0.38) | (0.31) | (0.34) | (0.49) | (0.45) |
| T2*Knowledge | −0.22 | −0.03 | 0.09 | −0.08 | −0.37 | 0.21 |
| | (0.18) | (0.24) | (0.16) | (0.17) | (0.28) | (0.21) |
| T2*Cat | 0.61 | −1.08** | −1.20*** | 0.62 | 0.32 | −0.47 |
| | (0.46) | (0.55) | (0.44) | (0.39) | (0.48) | (0.63) |
| T2*Rule | 0.05 | −0.05 | −0.65 | 0.08 | 0.44 | −0.44 |
| | (0.46) | (0.54) | (0.45) | (0.39) | (0.50) | (0.64) |
| T2*Cat*Knowledge | 0.45* | −0.09 | −0.33 | −0.32 | 0.40 | −0.29 |
| | (0.27) | (0.31) | (0.25) | (0.22) | (0.30) | (0.34) |
| T2*Rule*Knowledge | 0.04 | −0.08 | −0.43* | 0.13 | 0.54* | −0.44 |
| | (0.27) | (0.31) | (0.26) | (0.22) | (0.31) | (0.35) |
| Num. Obs. (trial) | 263 | 263 | 263 | 263 | 263 | 263 |
| Left-censored | 56 | 30 | 205 | 98 | 176 | 225 |
| Uncensored | 200 | 202 | 58 | 163 | 86 | 38 |
| Right-censored | 7 | 31 | 0 | 2 | 1 | 0 |

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

# Self-Ranking of Assets

Table 5: Fraction of subjects assigning a given rating in the self-ranked trial, by treatment. The ratings shown to subjects in the Ranked trial are in bold.

A: Categorized Treatment

| | Rank rule given | | | Rank rule not given | | |
|---|---|---|---|---|---|---|
| Asset | 1 | 2 | 3 | 1 | 2 | 3 |
| A | 0.12 | 0.10 | **0.78** | 0.12 | 0.48 | **0.40** |
| B | 0.03 | **0.87** | 0.10 | 0.04 | **0.48** | 0.48 |
| C | **0.85** | 0.03 | 0.12 | **0.84** | 0.04 | 0.12 |
| D | 0.13 | 0.03 | **0.84** | 0.07 | 0.03 | **0.90** |
| E | 0.03 | **0.94** | 0.03 | 0.04 | **0.94** | 0.01 |
| F | **0.84** | 0.03 | 0.13 | **0.88** | 0.03 | 0.09 |

B: Non-categorized Treatment

| | Rank rule given | | | Rank rule not given | | |
|---|---|---|---|---|---|---|
| Asset | 1 | 2 | 3 | 1 | 2 | 3 |
| A | 0.05 | 0.03 | **0.92** | 0.06 | 0.14 | **0.80** |
| B | 0.05 | 0.02 | **0.94** | 0.02 | 0.06 | **0.92** |
| C | 0.08 | **0.89** | 0.03 | 0.32 | **0.65** | 0.03 |
| D | 0.03 | **0.95** | 0.02 | 0.05 | **0.82** | 0.14 |
| E | **0.86** | 0.11 | 0.03 | **0.65** | 0.27 | 0.08 |
| F | **0.94** | 0.00 | 0.06 | **0.91** | 0.06 | 0.03 |

# Trial 3: Self-Ranking

- Subjects rank assets in accord with the return to risk ratio, especially when this is explained to them
- Subjects invest more in assets they rank more highly
  - One star deviation from the uncategorized value is worth about $2 in investment
- What happens when subjects are forced to downgrade an asset due to categorization?
  - B is theoretically 3 stars
  - If uncategorized, the subject invests less when assigning a lower rating
  - If categorized and the subject assigns a lower rating, there is no effect on investment (T3*SelfRank*Cat offsets T3*Cat)
    - The forced ranking does not change investment

# Allocations in Trial 3

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Intercept | 2.42*** | 5.41*** | −1.98*** | 1.17*** | −1.00** | −3.99*** |
| | (0.38) | (0.43) | (0.38) | (0.33) | (0.46) | (0.72) |
| T3 | 0.54 | −0.26 | 0.65 | −0.56 | −2.65*** | −0.93 |
| | (0.51) | (0.52) | (0.43) | (0.41) | (0.77) | (0.65) |
| T3*SelfRank | 2.06*** | 4.31** | 1.57** | 2.36* | 2.32*** | 1.25 |
| | (0.75) | (1.76) | (0.79) | (1.24) | (0.78) | (1.33) |
| T3*Cat | 1.60* | −0.65 | 0.01 | −0.35 | 2.34* | −1.48 |
| | (0.86) | (1.11) | (0.63) | (0.79) | (1.21) | (1.18) |
| T3*Rule | 0.59 | 0.06 | −0.43 | −0.06 | 1.63** | 0.88 |
| | (0.70) | (0.73) | (0.54) | (0.53) | (0.82) | (0.86) |
| T3*Cat*Rule | −0.82 | −1.36 | −0.76 | 2.04** | −3.52 | 0.82 |
| | (1.15) | (1.80) | (0.86) | (0.93) | (2.25) | (1.54) |
| T3*SelfRank*Cat | 1.03 | −3.64* | 0.66 | −1.97 | −3.89*** | 2.48* |
| | (1.14) | (2.02) | (0.97) | (1.43) | (1.38) | (1.40) |
| T3*SelfRank*Rule | −0.98 | −3.02 | −1.76 | −0.03 | −2.69** | −1.37 |
| | (0.92) | (2.04) | (1.16) | (2.75) | (1.13) | (1.71) |
| T3*SelfRank*Cat*Rule | −1.06 | 1.36 | −0.01 | −1.60 | 4.85** | −13.42*** |
| | (1.34) | (2.58) | (1.36) | (2.86) | (2.40) | (2.11) |
| Num. Obs. (trial) | 263 | 263 | 263 | 263 | 263 | 263 |
| Left-censored | 60 | 49 | 203 | 101 | 187 | 228 |
| Uncensored | 192 | 191 | 60 | 160 | 75 | 35 |
| Right-censored | 11 | 23 | 0 | 2 | 1 | 0 |

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

# Allocations in Trial 4

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Intercept | $2.42^{***}$ | $5.41^{***}$ | $-1.98^{***}$ | $1.17^{***}$ | $-1.00^{**}$ | $-3.99^{***}$ |
| | (0.38) | (0.43) | (0.38) | (0.33) | (0.46) | (0.72) |
| T4 | 0.36 | 0.36 | −0.11 | −0.46 | $-1.10^{***}$ | −0.07 |
| | (0.33) | (0.38) | (0.28) | (0.29) | (0.40) | (0.36) |
| T4*Cat | 0.34 | −0.86 | $-0.94^{**}$ | 0.23 | 0.27 | −0.54 |
| | (0.51) | (0.55) | (0.42) | (0.40) | (0.48) | (0.64) |
| Num. Obs. (trial) | 263 | 263 | 263 | 263 | 263 | 263 |
| Left-censored | 64 | 35 | 213 | 104 | 177 | 225 |
| Uncensored | 187 | 194 | 50 | 157 | 85 | 37 |
| Right-censored | 12 | 34 | 0 | 2 | 1 | 1 |

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

# University of Iowa Faculty and Staff

- We repeated the experiment for 610 University of Iowa faculty and staff
- Goal is to see if experimental results predict real world behavior
- Time series on investment choices
- Detailed HR data

# Is the Experiment Replicable?

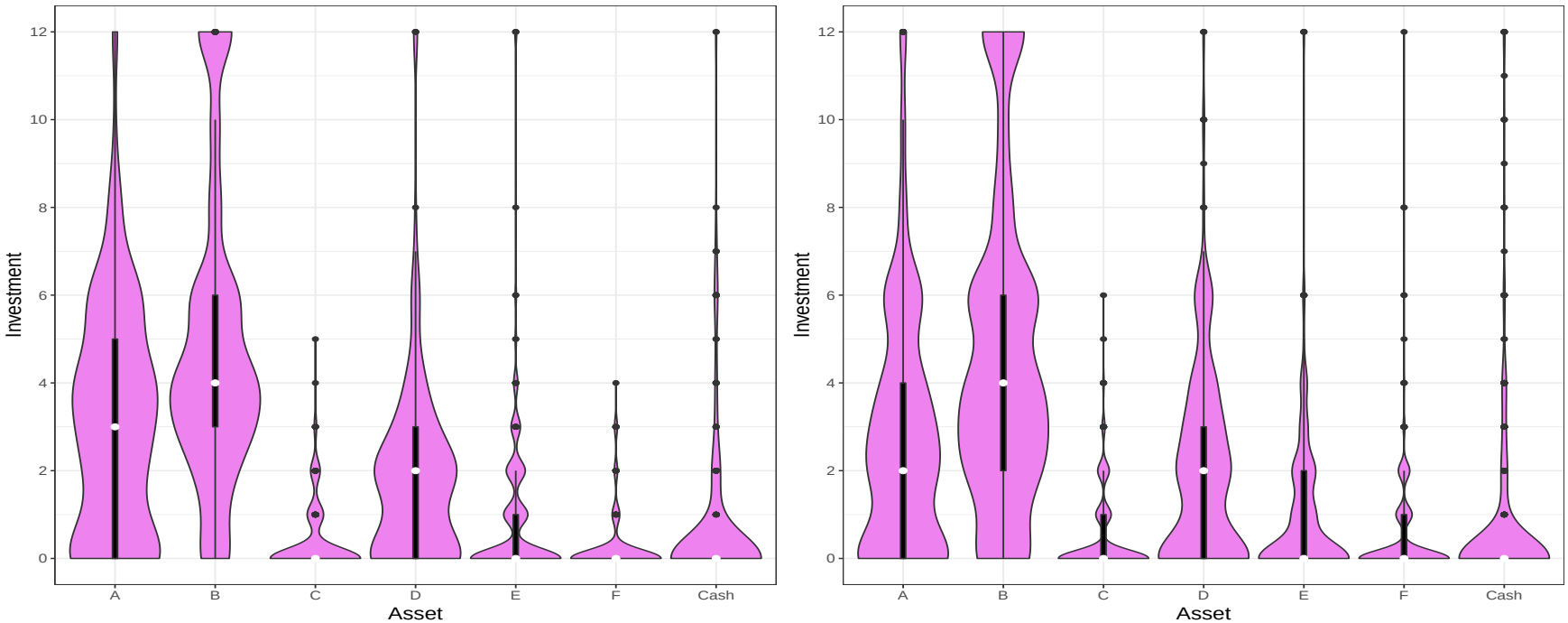


Figure 4: Investment levels in Trial 1: left, student experiment (n=266), right, faculty/staff (n=610)

# Diversification

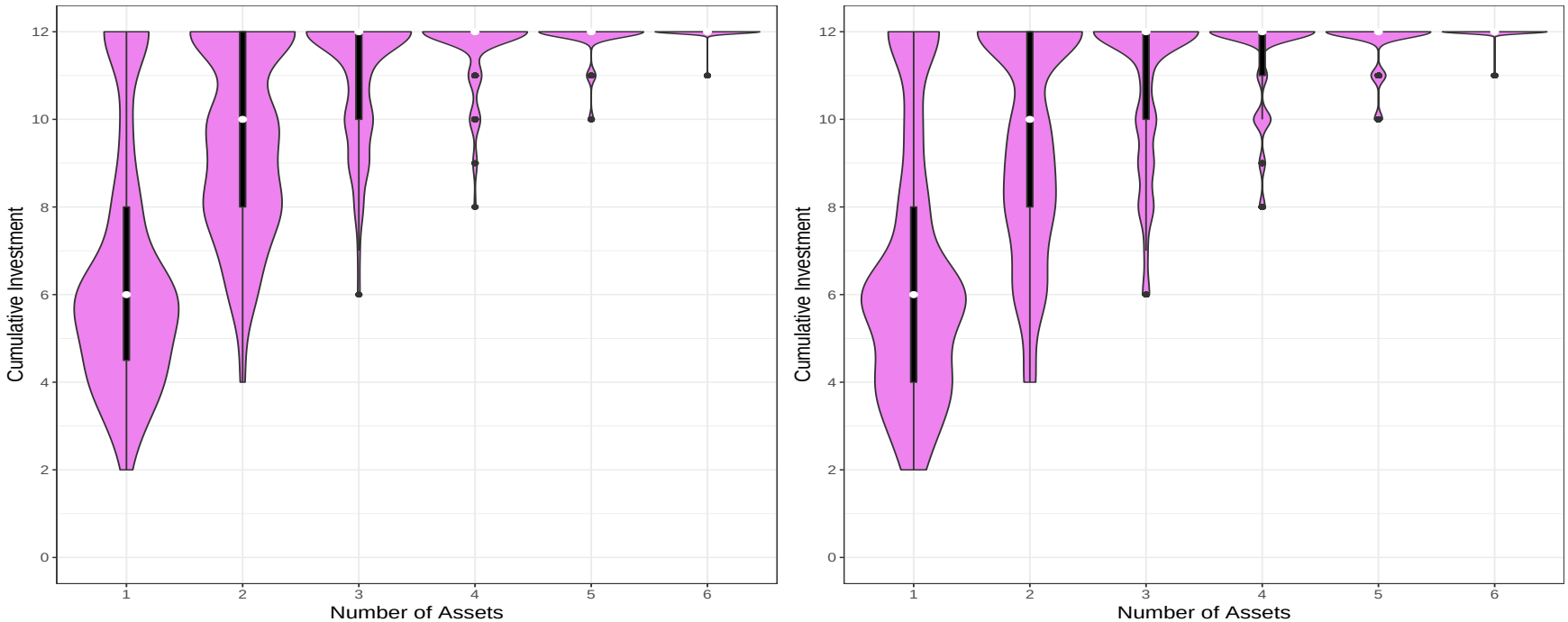


Figure 5: Cumulative Investment levels in Trial 1: left, student experiment (n=266), right, faculty/staff (n=610)

# Conclusion

- Categorization affects investment decisions
- Financial knowledge and gender matter
- Detailed explanations do not undo the effects of categorization
- Treatments affect everyone
- Caution warranted in designing investment aids
  - Should different ranking systems be used for different categories of assets?
- We need to better understand the interaction of knowledge and treatments
  - Knowledgable investors perform better, but there is not strong evidence that they are less affected by treatments

# Final Notes on R

Analysis in this paper was duplicated in Stata and R

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- Both base graphics and ggplot are great

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- Both base graphics and ggplot are great
- Texreg is great

# Final Notes on R

Analysis in this paper was duplicated in Stata and R

- Both base graphics and ggplot are great
- Texreg is great
- Computing clustered, robust standard errors in panel settings is cumbersome and inconsistent
  - I wrote a function to do this with censReg
  - Great opportunity for someone to rethink panel econometrics in R and write a package

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