Low Interest Rates and Investor Behavior: A Behavioral Perspective

Chen Lian       Yueran Ma
MIT              Chicago Booth

Boston Fed Economic Conference
How do low interest rates affect investor behavior?

- Low interest rates $\Rightarrow$ higher appetite for risk taking?
  - “Reaching for yield”; “risk-taking channel” of monetary policy

- Why might investors reach for yield?
Why Reach for Yield? Institutional Frictions

- Agency problems; funding conditions of intermediaries; etc
  - Theories: Diamond-Rajan 12; Morris-Shin 14; Acharya-Naqvi 15; Drechsler-Savov-Schnabl 17
  - Empirics: Maddaloni-Peydro 11; Jimenez et al 14; Chodorow-Reich 14; Hanson-Stein 15
**Why Reach for Yield? Behavioral Perspective**

- Intrinsic individual-level tendencies; preferences & psychology
  - How investors perceive and evaluate return and risk trade-offs
  - **Savers** & the “risk-taking channel” of monetary policy
A Simple Experiment

Fix principal. Randomly assign to:

Case 1:
- Safe asset: 5% interest rate.
- Risky asset: 10% average returns; approx. normal 18% vol.

Case 2:
- Safe asset: 1% interest rate.
- Risky asset: 6% average returns; approx. normal 18% vol.

Fix Sharpe ratio of risky asset, lower the interest rate. Allocations to the risky asset significantly higher in Case 2.
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Fix Sharpe ratio of risky asset, lower the interest rate.

Allocations to the risky asset significantly higher in Case 2.
Mean Allocations in Risky Asset (%) vs. Risk-Free Rate (%)

-1 0 1 3 5 10 15

50 55 60 65 70 75 80
Outline

1. Reaching for Yield in Individual Investment Decisions
   - Randomized experiments (US households, HBS MBAs, Netherlands)
   - Observational data on household investment allocations

2. Mechanisms
   - #1: Reference dependence
   - #2: Salience and proportional thinking
   - Nominal vs. real interest rates

3. Implications
   - Savers in a low interest rate world
   - Financial institutions
   - Asset prices & capital markets
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Benchmark Experiment

- **Two conditions with 200 people in each condition.**
  - **High** interest rate condition: 5%—10%.
  - **Low** interest rate condition: 1%—6%.
Benchmark Experiment

- Two conditions with 200 people in each condition.
  - High interest rate condition: 5%—10%.
  - Low interest rate condition: 1%—6%.

1. MTurk, Hypothetical
   - Consider allocating total savings of $100,000

2. MTurk, Incentivized
   - Invest experimental endowment of 100,000 Francs
   - Receive bonus payment in dollars, proportional to investment payoff
   - On the scale of $12, paid to 10% randomly selected participants

3. HBS MBA, Incentivized
   - Invest experimental endowment of 1,000,000 Francs
   - Receive bonus payment in dollars, proportional to investment payoff
   - On the scale of $200, paid to 10% randomly selected participants
Demographics: MTurk

Gender
- Female: 49%
- Male: 51%

Education
- Grad School: 16%
- High School: 24%
- College: 60%

Financial Asset
- 0-10K: 23%
- 10K-50K: 27%
- 50K-200K: 27%
- In Debt: 14%
- 200K+: 9%

Stock Owner
- No: 40%
- Yes: 60%
Demographics: HBS MBAs

**Gender**
- Female: 39%
- Male: 61%

**Worked in Finance**
- Yes: 57%
- No: 43%

**Background**
- International: 32%
- US: 68%

**Stock Owner**
- Yes: 80%
- No: 20%
**Benchmark Experiment**

### Mean Allocations to Risky Asset (%)

<table>
<thead>
<tr>
<th></th>
<th>High: 5—10</th>
<th>Low: 1—6</th>
<th>Dif</th>
<th>[t]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTurk, Hypo.</td>
<td>48.15</td>
<td>55.32</td>
<td>7.17</td>
<td>[2.52]</td>
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<tr>
<td>MTurk, Incen.</td>
<td>58.58</td>
<td>66.64</td>
<td>8.06</td>
<td>[3.06]</td>
</tr>
<tr>
<td>HBS MBA, Incen.</td>
<td>66.79</td>
<td>75.61</td>
<td>8.83</td>
<td>[3.13]</td>
</tr>
</tbody>
</table>

- Similar results across different settings and populations
  - Do not diminish with education, wealth, investment experience
More Interest Rate Conditions

- Fix excess returns (mean 5%), change $r_f$. 200 people per condition.
Om meer inzicht te krijgen in risicobereidheid van Nederlandse consumenten bij een lage of zelfs negatieve spaarrente, replicaerden we in het AFM Consument Panel onderzoek van Chen Lian en Yueran Ma en Carmen Wang “Low Interest Rates and Risk Taking: Evidence from Individual Investment Decisions.”
More Interest Rate Conditions

- Fix excess returns (mean 5%), change $r_f$. US & Dutch.

![Graph showing mean allocations in risky asset (%) against risk-free rate (%)]

- US (Incentivized, MTurk)
- NL (Hypothetical, AFM Panel)
Observational Data

1. American Association of Individual Investors (AAII)
   - Members report percentage of portfolio allocations to
     - Stocks (directly held & mutual fund)
     - Cash (interest-bearing safe assets)

2. Mutual Fund Flows
   - Flows into equity and high yield corporate bond mutual funds

3. Flow of Funds
   - Household sector flows into stocks and interest-bearing safe assets

4. Structured Financial Products (Celerier-Vallee 17)
   - Low interest rates \(\Rightarrow\) attractiveness of structured financial products
   - Europe, Asia
### AAll: Allocation to Stock

<table>
<thead>
<tr>
<th></th>
<th>Mean Allocations to Stocks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>L.(r_f)</td>
<td>-0.38</td>
<td>-1.47</td>
</tr>
<tr>
<td></td>
<td>[-0.51]</td>
<td>[-4.49]</td>
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<tr>
<td>L.(P/E_{10})</td>
<td>0.84</td>
<td>6.79</td>
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<tr>
<td></td>
<td>[9.16]</td>
<td>[0.40]</td>
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<tr>
<td>L.(Surp)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.(E[r_{x_{stk}}^{12}])</td>
<td></td>
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<tr>
<td>L.AAll Sentiment</td>
<td>0.04</td>
<td>0.17</td>
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<td></td>
<td>[1.66]</td>
<td>[4.01]</td>
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<tr>
<td>L.(VIX^2)</td>
<td>-6.34</td>
<td>-14.45</td>
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<tr>
<td></td>
<td>[-0.78]</td>
<td>[-0.96]</td>
</tr>
<tr>
<td>L.Past 12M GDP Growth</td>
<td>0.34</td>
<td>2.11</td>
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<td></td>
<td>[0.85]</td>
<td>[2.61]</td>
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<tr>
<td>L.Credit Spread</td>
<td>-3.87</td>
<td>-2.64</td>
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<tr>
<td></td>
<td>[-4.02]</td>
<td>[-1.34]</td>
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<tr>
<td>Constant</td>
<td>61.47</td>
<td>52.58</td>
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<td></td>
<td>[19.30]</td>
<td>[14.59]</td>
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<tr>
<td>Observations</td>
<td>326</td>
<td>326</td>
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</tbody>
</table>

Newey-West \(t\)-statistics in brackets
Response to Innovations in Short Rate (sVAR)

Stocks

Cash

95% CI  cumulative irf
Household Investment Flows

-4 -3 -2 0 2 4
-2 -1 0 1 2 3 4
Months

-4 -3 -2 -1 0 1 2 3 4
-2 -1 0 1 2 3 4
Quarters

Equity MF (ICI)

-4 -3 -2 -1 0 1 2 3 4
-2 -1 0 1 2 3 4
Quarters

HY Corp Bond MF (ICI)

-4 -3 -2 -1 0 1 2 3 4
-2 -1 0 1 2 3 4
Quarters

Stocks (FoF)

-4 -3 -2 -1 0 1 2 3 4
-2 -1 0 1 2 3 4
Quarters

Deposits (FoF)

-4 -3 -2 -1 0 1 2 3 4
-2 -1 0 1 2 3 4
Quarters

Who is on the other side? Foreign investors. Corporate issuers.
Structured Products and Other Asset Classes

Marknadsobligationer i Handelsbanken

Du får den korg som stiger mest

Source: Celerier-Vallee 17
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   ▶ Asset prices & capital markets
#1: Reference Dependence

- People form reference points of investment returns
- When interest rates fall below the reference level
  - People experience discomfort ⇒ seek higher returns
  - “1% is too low.”
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  - People experience discomfort ⇒ seek higher returns
  - “1% is too low.”
- Formalization: reference point + loss aversion (e.g. Prospect Theory)

\[
u(w(1+r_p)) = \begin{cases} 
  w(r_p - r_{ref}) & r_p \geq r_{ref} \\
  -\lambda w(r_p - r_{ref}) & r_p < r_{ref}
\end{cases}
\]

Prediction: when \( r_f < r_{ref} \), \( r_f \downarrow \Rightarrow \) allocation to risky asset \( \uparrow \)

Corollary: when \( r_f < r_{ref} \), \( r_{ref} \uparrow \Rightarrow \) allocation to risky asset \( \uparrow \)
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#1: Reference Dependence

Reference Point Formation

- **Important source: previous experiences**
  - Kahneman-Miller 86; Simonsohn-Loewenstein 06; Malmendier-Nagel 11; Bordalo-Gennaioli-Shleifer 17; DellaVigna et al 17

- **Other reference points in literature:**
  - Status quo, risk-free rate, forward-looking rational expectations
  - Hard to explain reaching for yield without experience effect
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- **Further implication: history dependence**
  - Degree of reaching for yield may depend on past economic environment
  - “Low” interest rates are *relative* to investors’ experiences

  “John Bull can stand many things but he cannot stand 2%.”
  —Walter Bagehot (1826-1877)
#2: Salience and Proportional Thinking

- Attractiveness of risky asset affected by proportions:
  - 6% looks attractive relative to 1%
  - 10% does not look as attractive relative to 5%

- Formalization: Salience Theory (Bordalo-Gennaioli-Shleifer 13)

\[
\max_{\phi \in [0,1]} \delta \mathbb{E} r_p - \frac{\gamma}{2} \text{Var}(r_p)
\]

where \( \delta \) is increasing in the ratio of the average returns \( \frac{r_f + \mathbb{E} x}{r_f} \).

- Prediction: Fix excess returns, \( r_f \downarrow \Rightarrow \delta \uparrow \)
  - Allocation to the risky asset (weakly) increases
Additional Tests
### Additional Test: History Dependent Reference Points

- **Experiment 1: Mean Allocations to Risky Asset (%)**

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
</tr>
</thead>
<tbody>
<tr>
<td>φ (%)</td>
<td>High: 5—10</td>
<td>Low: 1—6</td>
</tr>
<tr>
<td></td>
<td>49.23</td>
<td>55.64</td>
</tr>
<tr>
<td></td>
<td>66.12</td>
<td>46.98</td>
</tr>
</tbody>
</table>

*Performed by our discussant Cary Frydman*
Additional Test: History Dependent Reference Points

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</thead>
<tbody>
<tr>
<td>(\phi) (%)</td>
<td>49.23</td>
<td>66.12</td>
</tr>
<tr>
<td>G2</td>
<td>Low: 1—6</td>
<td>High: 5—10</td>
</tr>
<tr>
<td>(\phi) (%)</td>
<td>55.64</td>
<td>46.98</td>
</tr>
</tbody>
</table>

*Performed by our discussant Cary Frydman

- **Experiment 2: Mean Allocations to Risky Asset (%)**

<table>
<thead>
<tr>
<th>G1</th>
<th>Very High: 15—20</th>
<th>High: 13—18</th>
<th>Medium: 3—8</th>
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<tbody>
<tr>
<td>(\phi) (%)</td>
<td>37.74</td>
<td>38.43</td>
<td>60.29</td>
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<tr>
<td>G2</td>
<td>Very Low: 0—5</td>
<td>Low: 1—6</td>
<td>Medium: 3—8</td>
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<tr>
<td>(\phi) (%)</td>
<td>61.57</td>
<td>57.41</td>
<td>49.80</td>
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</tbody>
</table>

*Performed by our discussant Cary Frydman*
## Additional Test: History Dependent Reference Points

### SCF Panel Regressions

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Risk Tolerance</th>
<th>Holds Stocks</th>
<th>% in Stocks</th>
<th>% in Deposits</th>
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<tr>
<td></td>
<td>Ordered Probit</td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
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<tr>
<td>Experienced rates</td>
<td>0.05</td>
<td>0.03</td>
<td>1.58</td>
<td>-1.91</td>
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<tr>
<td></td>
<td>[3.94]</td>
<td>[6.78]</td>
<td>[6.40]</td>
<td>[-5.81]</td>
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<tr>
<td>Experienced ex stock ret</td>
<td>0.03</td>
<td>0.01</td>
<td>0.36</td>
<td>-0.13</td>
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<tr>
<td></td>
<td>[3.10]</td>
<td>[4.44]</td>
<td>[2.36]</td>
<td>[-0.74]</td>
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<tr>
<td>High School</td>
<td>0.12</td>
<td>0.02</td>
<td>0.12</td>
<td>-0.56</td>
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<td>[6.47]</td>
<td>[4.15]</td>
<td>[0.34]</td>
<td>[-1.40]</td>
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<tr>
<td>College</td>
<td>0.36</td>
<td>0.13</td>
<td>4.00</td>
<td>-4.52</td>
</tr>
<tr>
<td></td>
<td>[18.13]</td>
<td>[18.90]</td>
<td>[9.72]</td>
<td>[-9.35]</td>
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<td>Log financial assets</td>
<td>0.10</td>
<td>0.08</td>
<td>4.68</td>
<td>-6.01</td>
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<td>[28.61]</td>
<td>[53.35]</td>
<td>[28.62]</td>
<td>[-28.80]</td>
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<tr>
<td>Age Dummies</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Time Dummies</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Other Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Obs</td>
<td>41,260</td>
<td>43,947</td>
<td>43,941</td>
<td>43,932</td>
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<tr>
<td>$R^2$</td>
<td>0.335</td>
<td>0.252</td>
<td>0.286</td>
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</table>

$t$-statistics in brackets, corrected for multiple imputation

- **2016 SCF**: average equity share of household financial assets
  - age $> 60$ 10pp higher than age $< 40$ (historic high)
Additional Test: Salience and Proportional Thinking

- Benchmark experiments: commonly used net returns
  - Low: 6% vs. 1%; High: 10% vs. 5%.

If instead use gross returns
  - Low: 1.06 vs 1.01; High: 1.10 vs 1.05.

Mean Allocations to Risky Asset (%)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Gross</th>
<th>Baseline - Gross</th>
</tr>
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<tbody>
<tr>
<td>High</td>
<td>56.77</td>
<td>52.70</td>
<td>4.06</td>
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<tr>
<td>Low</td>
<td>64.62</td>
<td>54.59</td>
<td>10.03</td>
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Gross framing: allocation to risky asset ↓, reaching for yield also ↓.
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  - Low: 6% vs. 1%; High: 10% vs. 5%.

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Mean Allocations to Risky Asset (%)

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</tbody>
</table>

Gross framing: allocation to risky asset ↓, reaching for yield also ↓.
Nominal vs. Real Interest Rates
Nominal or Real Interest Rates?

- Reaching for yield triggered by low nominal or low real interest rates?
  - Reference dependence in nominal or real terms?
  - Salience/proportional thinking in nominal or real terms?
Nominal or Real Interest Rates?

- Reaching for yield triggered by low nominal or low real interest rates?
  - Reference dependence in nominal or real terms?
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- Last 10 years in US: nominal & real interest rates:

![Graph showing nominal and real interest rates over time.](image)
Nominal or Real Interest Rates?

- Reaching for yield triggered by low nominal or low real interest rates?
  - Reference dependence in nominal or real terms?
  - Salience/proportional thinking in nominal or real terms?

- Last 10 years in US: nominal & real interest rates

![Graph showing nominal and real 3M Tbill rates and Michigan Inflation Expectations from 2002 to 2014.]

- Nominal vs. real rates: experiments, observational data, anecdotes
  - Nominal rates are important; real rates may have additional impact
  - Combined impact of low nominal & real rates strongest
Nominal or Real Interest Rates?
An Experiment

- **3 conditions:**
  - C1: High nominal rate (5%—10%) & High real rate (5%—10%)
  - C2: High nominal rate (5%—10%) & Low real rate (1%—6%)
  - C3: Low nominal rate (1%—6%) & Low real rate (1%—6%)

- **Results:**

<table>
<thead>
<tr>
<th>Difference in Mean Allocations to Risky Assets</th>
<th>Dif</th>
<th>[t]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2-C1 (fix nominal, change real)</td>
<td>3.64</td>
<td>[1.26]</td>
</tr>
<tr>
<td>C3-C2 (change nominal, fix real)</td>
<td>5.80</td>
<td>[2.01]</td>
</tr>
<tr>
<td>C3-C1 (change nominal &amp; real)</td>
<td>9.44</td>
<td>[3.12]</td>
</tr>
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Yueran Ma (Chicago Booth)
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3. Implications
   ▶ Savers in a low interest rate world
   ▶ Financial institutions
   ▶ Asset prices & capital markets
Savers in a Low Interest Rate World

- Many studies on expansionary monetary policies & borrowers.
- There is also much to be understood about savers’ behavior.
  - Anchors and targets: wealth needs to grow at “decent” rate
  - Salience affects perception
- Consumer protection
- Potential sources of vulnerability in market downturn
Financial Institutions and Capital Markets

Financial Institutions

- Behavioral mechanisms may affect finance professionals
- Institutions can be affected by return and yield chasing flows
  - Institutions’ reaching for yield attract inflows (Choi-Kronlund 17)
  - Flows & agency frictions (Feroli-Kashyap-Schoenholtz-Shin 17)
- Promising fixed returns to end investors
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Asset prices

- High yield bonds. Stocks. Emerging market assets.
  - Berndt-Helwege 18, Bianchi-Lettau-Ludvigson 18,
    Miranda Agrippino-Rey 18
Summary

- Individual-level reaching for yield motives
  - Not just institutional frictions

- Mechanisms: reference dependence, salience
  - Nominal rates appear more important
  - Lack of understanding of risk may aggravate the problems

- Savers & “risk-taking channel” of monetary policy
Thank You