Financial Intermediaries and Demand for Duration

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Outline

- Intro
- Motivation
- Data & Methodology
- Empirical Results
- Conclusion
This paper in a nutshell

Research Question

- Who seeks long-term cash flows in the stock market?
  e.g., we often assume “pension funds are long-term investors”
  Are they always so in the equity market?

- Moreover:
  Does demand for long-term cash flows change over time?
  If yes, what drives its time variation?

What we do

- Study demand for long-term cash flows of financial intermediaries

What we find

- Significant time variation in demand for long-term cash flows
- Financial constraints affect demand
  more binding constraints $\implies$ long-duration demand
Motivation
Positioning

- Increasing interest on institutional investors’ portfolio choice:
  · demand system asset pricing
  e.g., Koijen-Yogo (2019), Koijen-Richmond-Yogo (2023), Huebner-Haddad-Loualiche (2022)

- Financial Intermediaries do matter for asset prices:
  · their balance sheet affect market prices
  e.g., Adrian-Etula-Muir (2014), He-Kelly-Manela (2017), Haddad-Muir (2022)
  · typically regarded as long-term investors (unconditionally)

This paper:

→ Do financial intermediaries demand long-term cash flows in equity?
→ How balance sheet constraints impact investors’ demand?
Positioning

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Data & Methodology
Data

1980:Q1 - 2022:Q2 sample

- CRSP/Compustat

- 13F (Thomson Reuters)
  NY Fed Primary Dealers
  Banks
  Insurances
  Pension Funds
## Summary Stats

### Summary Holdings: Full Sample

<table>
<thead>
<tr>
<th>Category</th>
<th>N. investors</th>
<th>% market</th>
<th>AUM ($MM) median</th>
<th>AUM ($MM) p90</th>
<th>N. stocks median</th>
<th>N. stocks p90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Dealers</td>
<td>63</td>
<td>10.13</td>
<td>14,169</td>
<td>133,220</td>
<td>1,503</td>
<td>2,722</td>
</tr>
<tr>
<td>Banks</td>
<td>594</td>
<td>15.50</td>
<td>412</td>
<td>9,176</td>
<td>198</td>
<td>1,051</td>
</tr>
<tr>
<td>Insurances</td>
<td>158</td>
<td>5.13</td>
<td>816</td>
<td>16,511</td>
<td>157</td>
<td>1,175</td>
</tr>
<tr>
<td>Pension Funds</td>
<td>114</td>
<td>5.51</td>
<td>3,023</td>
<td>24,281</td>
<td>438</td>
<td>1,468</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>929</strong></td>
<td><strong>36.26</strong></td>
<td><strong>711</strong></td>
<td><strong>21,990</strong></td>
<td><strong>227</strong></td>
<td><strong>1,541</strong></td>
</tr>
</tbody>
</table>
Methodology (I)

Goal: study demand for long-term cash flows in equity

→ need a proxy for stock-specific “cash flow maturity”

- Equity Duration following Goncalves (2021)

\[
Dur_{j,t} = \sum_{h=1}^{\infty} h \cdot e^{-dr_{j,t} \cdot h} \frac{E_t[PO_{j,t+h}]}{ME_{j,t}}
\]

- where:
  - \(E[CF_{t+h}]\) as VAR(1) on accounting variables
  - Finds \(dr_{j,t}\) who matches market prices
  - Get \(Dur_{j,t}\)
Methodology (I)

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Methodology (II)

- Intertemporal-CAPM (e.g., Merton, 1973; Goncalves, 2021)
  
  Portfolio choice of an agent with $H$-period horizon (and $H \to \infty$):

  \[
  \rightarrow w_{i,t}(n) = A_{i,t} \cdot \mathbb{E}[r_{mkt,t+1}] + B_{i,t} \cdot \mathbb{E}[r_{t+1 \rightarrow t+H}] \quad \text{(hedging)}
  \]

  Long-term investors demand:

  1. “market portfolio”
  2. hedge reinvestment risk\(^1\)

---

\(^1\)i.e., unfavorable shifts in future investment opportunities.
Methodology (III)

- Demand System (Koijen-Yogo, 2019):

\[
\frac{w_{i,t}(n)}{w_{i,t}(0)} = \exp \left\{ \alpha_{i,t} + \theta_{0,i,t} \text{met}(n) + \theta_{mkt,i,t} \beta_{mkt}^t(n) + \theta_{dur,i,t} \text{dur}_t(n) \right\} \epsilon_{i,t}(n)
\]

where: \( \text{me}_t \) (\( \text{dur}_t \)) is log market equity (duration)

- Validation check:

**Gormsen-Lazarus (2022):** *a single duration factor subsumes traditional characteristics*

- Estimation follows Koijen-Richmond-Yogo (2022):
  - IV for \( \text{me}_t \) excluding Household sector
  - GMM across four quarters
    (Shrinkage estimation if \( \leq 2,000 \) holdings within four quarters)
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Empirical Results
Empirical Results - Validation Exercise

Demand for equity duration by **Target-Date Funds** w/ different “time-to-maturity”

-0.06  -0.05  -0.04  -0.03  -0.02  -0.01  0  0.01

![Chart showing demand for equity duration by Target-Date Funds with different time-to-maturity](chart.png)

- **Low TTM ( < 10 years)**
- **High TTM ( ≥ 20 years)**
Fact 1: Time-Series Variation
Time Series Variation: Primary Dealers

\[ \rho = 0.464^{***} \]

(AUM-weighted: \( \rho = 0.219^{***} \))
Time Series Variation and Intermediaries’ Capital

\[ \theta_{dur,t} = \alpha + \delta \eta_{t-1} + \gamma \sigma(dur)_{t-1} + u_t , \]  

for each intermediary type

<table>
<thead>
<tr>
<th>Avg. Duration Demand and Intermediary Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Dealers</td>
</tr>
<tr>
<td>( \eta_{t-1} )</td>
</tr>
<tr>
<td>(0.024)</td>
</tr>
<tr>
<td>( \sigma(dur)_{t-1} )</td>
</tr>
<tr>
<td>(0.304)</td>
</tr>
<tr>
<td>( N )</td>
</tr>
<tr>
<td>( R^2 )</td>
</tr>
</tbody>
</table>
\[ \theta_{dur,i,t} = \alpha_i + \delta \eta_{t-1} + \gamma \sigma(dur)_{t-1} + u_{i,t}, \] for each intermediary type

<table>
<thead>
<tr>
<th>Duration Demand: Panel Regression</th>
<th>Primary Dealers</th>
<th>Banks</th>
<th>Insurances</th>
<th>Pension Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\theta_{dur,t})</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\eta_{t-1})</td>
<td>0.052</td>
<td>0.058*</td>
<td>0.169***</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.031)</td>
<td>(0.048)</td>
<td>(0.035)</td>
</tr>
<tr>
<td>(\sigma(dur)_{t-1})</td>
<td>0.542</td>
<td>1.071***</td>
<td>-0.060</td>
<td>0.317</td>
</tr>
<tr>
<td></td>
<td>(0.389)</td>
<td>(0.331)</td>
<td>(0.404)</td>
<td>(0.292)</td>
</tr>
<tr>
<td>Manager FE</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(N)</td>
<td>2,605</td>
<td>16,457</td>
<td>5,625</td>
<td>4,901</td>
</tr>
<tr>
<td>(Adj R^2)</td>
<td>0.297</td>
<td>0.425</td>
<td>0.275</td>
<td>0.142</td>
</tr>
</tbody>
</table>
Fact 2: Cross-Sectional Variation

[Graph showing cross-sectional variation with data points for Primary Dealers and Banks from 1985 to 2020.]
Cross-Sectional Variation

For 1992Q1-2020Q4 manually match: Thomson Reuters (mgrno) to Compustat (cusip)

\[
\theta_{dur,i,t} = \alpha_i + \delta \mathbb{1}_{\text{High } \eta_{t-1}} i,t + \gamma \sigma(dur)_{t-1} + u_{i,t}
\]

<table>
<thead>
<tr>
<th>Demand for Duration</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High ( \eta_{t-1} )</td>
<td>0.157**</td>
<td>0.130**</td>
</tr>
<tr>
<td></td>
<td>(0.063)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>( \sigma(dur)_{t-1} )</td>
<td></td>
<td>0.907***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.239)</td>
</tr>
<tr>
<td>Manager FE</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>N</td>
<td>29,658</td>
<td>29,658</td>
</tr>
<tr>
<td>Adj ( R^2 )</td>
<td>0.389</td>
<td>0.393</td>
</tr>
</tbody>
</table>
Conclusion

- We study a demand-system with equity duration (I-CAPM)
  \[ \theta_{dur} : \text{demand for long-term cash flows in the stock market} \]

- Time variation in \( \theta_{dur} \)

- Explore the link between:
  demand for long-term cash flows and intermediaries’ constraints

  \[
  \text{when constraints are binding} \implies \theta_{dur} \downarrow
  \]
  \begin{align*}
  & \text{(pro-cyclical demand for long-term cash flows)}
  \end{align*}

- Channel: gambling for resurrection? More to do on this...
Heterogeneity in Demand

Model investors preference as function of equity capital ratio:

\[
\ln \frac{w_{i,t}(n)}{w_{i,t}(0)} = \alpha_{i,t} + \theta_{\text{me, } t}(n) + (\theta_{\text{mkt},g}^{(0)} + \theta_{\text{mkt},g}^{(1)} \eta_{t-1,g}) \beta_{\text{mkt},t}(n) + (\theta_{\text{dur},g}^{(0)} + \theta_{\text{dur},g}^{(1)} \eta_{t-1,g}) \text{dur}_{t}(n) + u_{i,t}(n)
\]

<table>
<thead>
<tr>
<th>Heterogeneity in Demand Coefficients</th>
<th>Primary Dealers</th>
<th>Banks</th>
<th>Insurances</th>
<th>Pension Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\theta_{\text{dur}} \times \eta_{t-1})</td>
<td>0.091**</td>
<td>0.177***</td>
<td>0.036</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.041)</td>
<td>(0.024)</td>
<td>(0.038)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>(\theta_{\text{mkt}} \times \eta_{t-1})</td>
<td>-0.082***</td>
<td>-0.055***</td>
<td>-0.072***</td>
<td>-0.055***</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.012)</td>
<td>(0.016)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Manager-Time FE</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>(N)</td>
<td>2,785,546</td>
<td>6,198,498</td>
<td>1,997,622</td>
<td>2,864,040</td>
</tr>
<tr>
<td>(\text{Adj } R^2)</td>
<td>0.441</td>
<td>0.234</td>
<td>0.225</td>
<td>0.462</td>
</tr>
</tbody>
</table>
- 12 CPI-deflated accounting variables + 1 constant
  - clean surplus profitability,
  - book equity growth,
  - book to market,
  - payout yield,
  - sales yield,
  - asset growth,
  - sales growth,
  - ROE,
  - gross profitability,
  - market leverage,
  - book leverage,
  - cash holdings.

- Variable construction follows standard choice in the literature
Distribution of $dr_{j,t}$
Equity Duration Time Series

- Average (VW)
- Median (EW)

Duration (years)

- 1985
- 1990
- 1995
- 2000
- 2005
- 2010
- 2015

Years (x-axis): 1985 to 2015
- Stocks’ $j$ payouts in $t$: $PO_{j,t} = \text{dividends} + \text{repurchases} - \text{issuances}$

- $ME_{j,t} = \sum_{h=1}^{\infty} \mathbb{E}_t[PO_{j,t+h}] \cdot e^{-h \cdot dr_{j,t}}$

- Where $\mathbb{E}_t[PO_{j,t+h}]$ depends on state-vector $s_{j,t+h}$ (assumed to follow a VAR(1))

\[
s_{j,t} = \Gamma s_{j,t-1} + u_{j,t}, \quad \text{where: } u_{j,t} \sim \mathcal{N}(0, \Sigma)
\]

- Estimating VAR(1) parameters $\rightarrow \mathbb{E}_t[PO_{j,t+h}] \; \forall \; h = 1, \ldots$

- Finds $dr_{j,t}$ who makes hold: $ME_{j,t} = \sum \mathbb{E}_t[PO_{j,t+h}] \cdot e^{-h \cdot dr_{j,t}}$

$\rightarrow Dur_{j,t} = \sum_{h=1}^{\infty} h \cdot \frac{e^{-dr_{j,t} \cdot h} \mathbb{E}_t[PO_{j,t+h}]}{ME_{j,t}}$
$\sigma$ (latent demand) - Primary Dealers
σ (latent demand) - Banks

- mkt + dur
- 5 characteristics
$\sigma$ (latent demand) - Insurance Companies

- Back

Graph showing the trend of $\sigma$ (latent demand) over time from 1985 to 2020.
$\sigma$ (latent demand) - Pension Funds

Graph showing volatility ($\sigma$) over time for pension funds, with two lines representing different characteristics: mkt + dur and 5 characteristics. The x-axis represents years from 1985 to 2020, and the y-axis represents volatility from 0.2 to 1.2.