Nonbank Fragility in Credit Markets:
Evidence from a Two-Layer Asset Demand System

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Financial ‘fragility’ often at center of economic crises

- Amplification of fundamental shock through intermediaries
- Typical focus on traditional banking sector
Financial ‘fragility’ often at center of economic crises

- Amplification of fundamental shock through intermediaries
- Typical focus on traditional banking sector
- However, Spring 2020 crisis features nonbank fragility
  - Historical outflows from bond mutual funds
  - Sharp drop in bond prices
  - Dry-up in firm debt issuance
→ Federal Reserve purchased corporate bonds for first time ever
Feedback loop between flows and asset prices

Flow-performance sensitivity – $\beta$

Outflows from intermediaries (bond mutual funds)

Asset prices fall (Credit spreads rise)

Inelastic demand – $\kappa$

Sell assets to other investors (insurers)

Portfolio rebalancing – $S$
Feedback loop between flows and asset prices

**Question:** How can we quantify equilibrium effects and assess policy interventions in crises?

- Two-layer asset demand system, extend Koijen Yogo 2019
- Estimable from micro-data on bond holdings, fund flows, and asset prices
**Literature**

**Risks of non-bank intermediaries**: Chen, Goldstein, and Jiang 2010; Chernenko and Sunderam 2016, 2020, Goldstein, Jiang, and Ng 2017, Falato, Goldstein, and Hortacsu 2021, Ellul, Jotikasthira, and Lundblad, 2011, Haddad, Moreira, and Muir 2021, Ma, Xiao, and Zeng 2022, Kundu 2023

- Measure effect of institutions’ inelastic demand on fragility

**Demand system asset pricing**: Koijen and Yogo 2019, Koijen et al 2021, Bretscher et al 2022, Chaudhary, Fu, and Li 2023, Azarmsa and Davis 2023 Haddad, Huebner, Loualiche 2021

- Endogenize the dynamics of institution size via first layer

**Role of intermediaries in crises, policy responses**: Greenwood, Landier, Thesmar 2015, He and Krishnamurthy 2013, Brunnermeier and Sannikov 2014, Hanson, Kashyap and Stein 2011, Hanson, Scharfstein and Sunderam 2014, Haddad, Moreira, and Muir 2022, Buchak Matvos Piskorski and Seru 2024

- Focus on how unlevered intermediaries amplify shocks
Model overview: Two-layer asset demand system

First layer:
- Households allocate liquid savings across institutions with different characteristics
  - Bond mutual funds, insurance policy, deposit
- Logit portfolio choice simplifies to a flow-to-performance relationship $f_t = B_t(\beta)$
  - $B_t(\beta)$ (weighted) flow sensitivity to returns; $v_t$ is institution-level returns

Second layer:
- Institutions allocate wealth (AUM) across assets with different characteristics
  - i.e., bonds with different expected return, maturity, credit ratings, etc.
- Change in asset demand driven by expected returns and flows:
  \[ q_t = K_t(\kappa) \text{re}t + S_t^\top f_t \]
  - $K_t$ is demand sensitivity to return (determines price elasticity)
  - $S_t$ is asset shares across institutions, $\delta$ is bond yield; $f_t$ is fund flows
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\[ q_t = K_t(\kappa) r^e_t + S_t^\top f_t \]

- \( K \) is demand sensitivity to return (determines price elasticity)
- \( S_t \) is asset shares across institutions, \( \delta \) is bond yield; \( f_t \) is fund flows
Equilibrium asset prices

• Market clearing implies (iterating forward):

\[ p_t = \sum_{\tau = t}^{\infty} (I + \delta (I - (K\delta)^{-1}S^\top B\theta))^{-(\tau-t+1)} \delta d_\tau \]

• \( B \) is flow-to-performance sensitivity across institutions
• \( K \) is sensitivity to expected return across assets
• \( S \) is asset holding shares
• \( \theta \) is portfolio weights
• \( d_\tau \) is cash flow shock
Intuition: amplification

- Consider a one asset, one fund, and a permanent shock $d_\tau = d$, for $\tau \geq t$

\[ p_t = (1 - (K\delta)^{-1}B\theta)^{-1}d \]
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$\ p_t = (1 - (K\delta)^{-1}B\theta)^{-1}d$

• Special case 1: no flow to performance $B = 0$,

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- Special case 1: no flow to performance \( B = 0 \),

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\[ p_t = d \]

- In general: \( B > 0 \) and \( K < \infty \)

\[ p_t = \left(1 - (K\delta)^{-1}B\theta\right)^{-1}d > d \]
Numerical illustration

Feed in 10 days of negative fundamental (permanent) shocks to HY bonds
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- **Bond prices**
  - **Amplification**: cumulative effects are greater

- **Institutions’ AUM**
Feed in 10 days of negative fundamental (permanent) shocks to HY bonds

- **Amplification**: cumulative effects are greater
- **Contagion**: both HY and IG bond prices fall, insurers are also affected
1. **Layer 1:** Estimate flow sensitivities $\beta$ across bond investors group
   - Data: CRSP Mutual Fund/Morningstar and NAIC Insurer data
   - Classic FE regressions on panel of flows and returns (monthly)

2. **Layer 2:** Estimate demand elasticities $\kappa$
   - Data: Thomson Reuters eMAXX + CRSP Mutual Fund Data + Mergent FISD + TRACE
   - IV: price changes instrumented with residualized MF flows

<table>
<thead>
<tr>
<th>Fund type</th>
<th>Beta (negative returns)</th>
<th>Beta (positive returns)</th>
<th>Demand elasticity</th>
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<tr>
<td>Life insurers</td>
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<td>Active mutual funds</td>
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<td>Residual fund</td>
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<td>0.000</td>
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How systemically important are different bonds?

- **Asset-level systemic importance**: Impact of 1% drop in bond value on aggregate market

\[
\text{Asset systemic measure} \equiv \alpha'(I - (K\delta)^{-1}S^\top B\theta)^{-1}/\alpha'
\]

Normalize by \(\alpha\) (asset market share) \(\implies\) measure is 1 if no amplification

<table>
<thead>
<tr>
<th></th>
<th>IG Long</th>
<th>IG Short</th>
<th>HY Long</th>
<th>HY Short</th>
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<td>Asset systemic measure 2019</td>
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<td>1.34</td>
<td>1.40</td>
<td>1.91</td>
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- Short bonds more systemic: held by MF with especially high flow sensitivity
- Even if they are more “liquid” (lower bid-ask spread)
Matching the model to March 2020 turmoil

Model joint flows and bond prices dynamics of March 2020

- Feed in CDS spreads as cash-flow shocks to bonds
- Feed in estimated flow sensitivity and demand elasticities + 2019Q4 portfolio shares
- Additional demand characteristic: preference to sell IG bonds first (Ma Xiao Zeng 2022)

Able to match key moments of crisis:

1. Large mutual fund outflows \( \approx 5\% \) of AUM (Falato, Goldstein, and Hortacsu 2021)
2. Large bond price decline \( \approx -13-17\% \), even for safer IG bonds
3. Large share of IG price decline due to amplification, much lower for HY (Haddad, Moreira, Muir 2021)
Conventional monetary policy: 50bps rate cut

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<tr>
<th>Date</th>
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<th>IG-S</th>
<th>HY-L</th>
<th>HY-S</th>
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Conventional monetary policy: 50bps rate cut

- Implemented $T = 14$
- Broad effects, but stronger for IG (higher duration)
Expected asset purchases: Buy 5% of short-term IG in 20 days

- Price recovers somewhat upon announcement
- Continues to drift upwards until purchases occur

![Asset prices graph](image1)

![AUM graph](image2)
Direct lending to funds

- Suppose funds borrow from Fed at 10% of IG assets
- Insurers also benefit

![Asset prices and AUM graphs]

**Asset prices**

**AUM**
Redemption restrictions

- Mitigates amplification effect: if implemented immediately

Asset prices ($T = 14$ vs $T = 2$)

AUM ($T = 14$ vs $T = 2$)
Develop two-layer asset demand framework to analyze fragility of corporate bond market

- Tractable joint dynamics of flows and asset values, even with heterogeneity
- Crisis dynamics: amplification + contagion across assets and institutions
- Dynamics characterized by simple statistics that can be estimated from micro-data
Conclusion

Develop two-layer asset demand framework to analyze fragility of corporate bond market

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- Crisis dynamics: amplification + contagion across assets and institutions
- Dynamics characterized by simple statistics that can be estimated from micro-data

Integrate asset pricing and intermediation to better understand credit markets

- Quantifiable models of fragility
- Lessons for policy design