Granular Treasury demand with arbitrageurs

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Disclaimer: The views expressed in this presentation are those of the speaker and do not necessarily represent the views of the Board of Governors of the Federal Reserve System.

Q: How elastically does the Treasury market respond to shocks?

Not difficult to motivate this question for policy makers!

This paper: Constructs and estimates a model of Treasury demand with arbitrageurs.

- Brings together data assembled from a wide array of sources.

Findings:

1. **Quantity shocks:** Treasury market is elastic, and more elastic at shorter-term maturities.
   - Permanent shocks have larger effects, implications for QE.
2. **Monetary policy shocks:** Lead to “overreaction” at long maturities as term premia increase.

A very basic version of the model

Two maturities, long and short, supply of long-maturity bonds fixed at $\bar{S}$.

- Short-maturity yield pinned down by Fed rule: $r_{t+1} = r_t + \sigma\varepsilon_t$.
- Long bond yield y_t determined in equilibrium.

Two types of investors:

- **Preferred-habitat investors:**

$$D_t = a + by_t - cr_t + hx_t + e_t$$

  where $a = \sum_i a_i$, $b = \sum_i b_i$...

- **Arbitrageurs:** maximize profit from investing in bonds, risk-aversion γ.
  - *This is where all the action is!*

Equilibrium

$$\text{Term premium} = \frac{1}{2}\frac{\gamma\sigma^2}{1 + b\gamma\sigma^2}\left(\bar{S} - a - br_t + cr_t - hx_t - e_t\right)$$

$$\text{Arbitrageur holdings} = \frac{1}{1 + \frac{b}{2}\gamma\sigma^2}\left(\bar{S} - a - br_t + cr_t - hx_t - e_t\right)$$

(Note: pesky Jensen's term excluded)

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Depends on a and e_t the same.

$$\text{Term premium}_t = \frac{\gamma}{\tau}\Sigma_t \times \text{Arbitrageur holdings}_t$$

Depends on a but not e_t

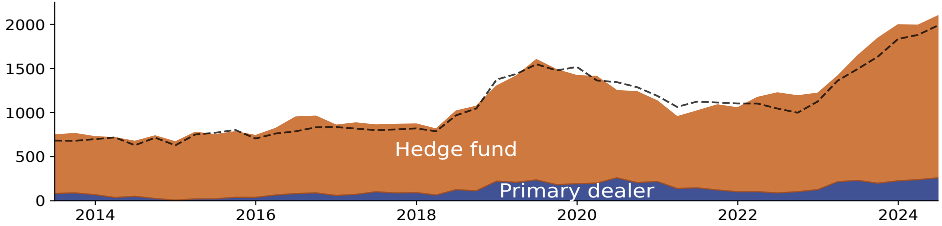
Pinning down γ is crucial for quantitative results

Identification is going to be based off of matching both yields and arbitrageur holdings.

$$\text{Term premium} = \frac{1}{2}\gamma\sigma^2 \times \text{Arbitrageur holdings}$$

- The more arbitrageurs hold, for a given term premia, the lower risk aversion must be.
- This relies on arbitrageurs taking on a certain amount of risk per dollar holding.

What do arbitrageur holdings look like?

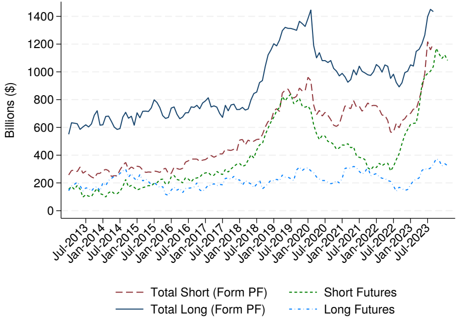


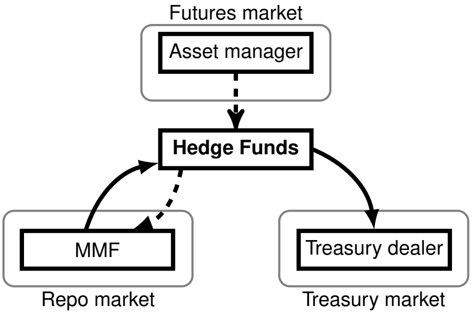
Form PF provides little detail on positions, authors assume similar maturity profile to dealers.

Are hedge fund holdings yield curve arbitrage?

Barth and Kahn (2021) suggest a large share are **cash-futures basis trades.**

- Long cash positions hedged with short futures (funded in repo).
- Risk exposure is much lower than assumed as duration borne by asset managers.
  - Also true of similar trades like Treasury-swap arbitrage.



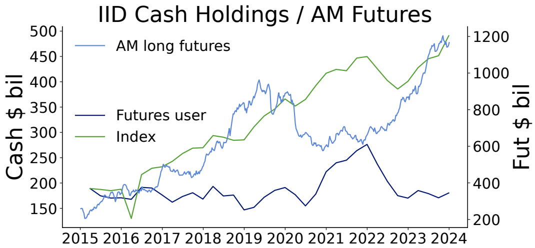


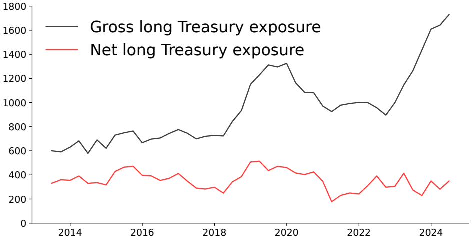
Would seriously attenuate estimate of risk aversion.

Solution:

Use net hedge fund positions for arbitrageur holdings, add gross short to mutual funds.

- Assumes hedge fund matched positions passthrough to mutual funds, Barth et. al (2024).
- ***Upper bound on risk aversion.***





Identification of preferred habitat demand

$$D_{i,t} = a_i + b_i y_t - c_i r_t + h_i x_t + e_{i,t}$$

We can't estimate through OLS because of reverse causality and omitted variables bias.

- *For instance, unlikely MMFs care about debt to GDP (in x_t), but care about outflows (not in x_t).*

Need instrument that affects yields but is otherwise uncorrelated with Treasury demand.

- Tall order!

Current approach: come up with pseudo-yield $\tilde{y} = f(x_t, S_t)$.

- If f is linear, then this won't work because it will be co-linear with x_t in the equation for $D_{i,t}$.
- Meanwhile, e_t must be uncorrelated with the non-linear portion of f.
  - **No way to truly test this, and not easy to evaluate as an economic assumption.**

Is there a way to exploit truly *granular* variation?

Conclusion

This paper takes an ambitious approach to a major policy-relevant question.

- Brings together data from a wide array of sources.
- Presents a parsimonious yet flexible model of Treasury demand.
- Uses innovative methods to deliver quantitative insights on Treasury market elasticity.

Incorporating further detail on investors into structure may help sharpen identification.

Opens up rich opportunities for future research!