Discussion of "Granular Treasury Demand with Arbitrageurs" by Jansen, Li, Schmid

William Diamond, UW Madison

SF Fed Fixed Income Conference, May, 2025

Overview

- Structural model of treasury demand, estimated on a new rich dataset of sector-level treasury holdings.
- Broker-dealers and hedge funds modeled as rational arbitrageurs. Other sectors have reduced-form demand curves.
- Unlike standard demand-based asset pricing models, find highly elastic demand by non-arbitrageurs,
- Unlike standard preferred habitat models, high elasticity of substitution changes behaviour of arbitrageurs.

1. Rich new dataset of treasury holdings

Table 1. **Data sources**

This table provides a summary of the different data sources that we use in this paper.

Investor Type	**Data Source**	**Frequency**	**Period**	**Detail**
Banks	CALL Reports	Quarterly	1976Q1-2022Q4	Maturity bucket
Fed	Federal Reserve	Weekly	2003W1-2022W52	Security
Primary Dealers	Federal Reserve	Weekly	1998W5-2022W52	Maturity bucket
Hedge Funds	Form PF SEC	Quarterly	2011Q4-2022Q4	Aggregate
Insurers and Pension Funds	eMAXX	Quarterly	2010Q1-2022Q4	Security
Money Market Funds	IMoneyNet	Monthly	2011M8-2022M12	Security
	Flow of Funds	Quarterly	1993Q1-2022Q4	Aggregate
Mutual Funds	Morningstar	Monthly/Quarterly	2000M1-2022M12	Security
ETFs	ETF Global	Daily/Monthly	2012M1-2022M12	Security
Foreign Official and Private	Public TIC	Quarterly	2011Q4-2022Q4	T-bill/non T-bill

- Aggregate to quarter-level holdings of 3 buckets of treasuries (short ¡1Y /1Y¡ medium ¡ 5Y

2. Reduced-form model of non-arbitrageur treasury demand

$$Z_t^l(m) = \theta_0^l + b_1^l y_t(m) + b_2^l y_t(-m) + (b_3^l)'\mathbf{x}_t(m) + (b_4^l)'\mathbf{Macro}_t + u_t^l(m), \quad (8)$$

where $y_t(m)$ is the yield for maturity bucket m, $y_t(-m)$ equals the weighted-average yield of the other maturity buckets, $\mathbf{x}_t(m)$ is a vector of value-weighted bond characteristics for maturity bucket m: coupon, maturity bucket fixed effects, bid-ask spread, and $\mathbf{Macro}_t$ equals a set of macro variables, including GDP gap, debt/GDP, core inflation, and credit spread.

- New advance: include average yield of treasuries of different maturities. Low yields on other buckets cause rebalacing to this bucket.
- IO demand systems have no notion of a portfolio- this steps in the right direction.

3. IV estimation of demand system

- 1. Run regression of holdings on non-yield predictors.
- 2. Use predictions to infer “pseudo-yields” that would clear market, nonlinear function of charecteristics.
- 3. Plug fitted values in for yield, relying on linear functional form for identification.
- Comment: No statement of formal exclusion restriction. Best to use an IV that holds without assuming model form...

Demand curve estimates

- Mutual funds, money market funds, banks have most elastic demand. Substitution across maturities is crucial.

3.3. Demand Functions of Granular-Demand Investors

Table 3. **Demand System Results - IV**

	Banks	ICPF	MF ROW	MF U.S.	MMF	Other U.S.	Foreign O	Foreign P
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$y_t(m)$	63.850**	3.833	6.934*	137.258***	436.596*	172.272	-33.849	32.697
	[26.277]	[11.461]	[3.716]	[47.699]	[236.128]	[199.313]	[115.257]	[94.669]
$y_t(-m)$	-72.167**	-1.247	-3.663	-152.400***	-611.375*	-17.813	-94.278	-42.745
	[28.676]	[13.518]	[4.025]	[53.939]	[367.663]	[257.566]	[154.463]	[125.330]
Coupon Rate	-148.638***	3.053	-4.817	-137.838**	55.752	182.530	-480.953**	-315.103*
	[35.111]	[18.189]	[4.853]	[61.177]	[545.299]	[319.718]	[191.041]	[180.040]
Bid-Ask Spread	7.730	18.664***	3.059**	12.692	136.693	109.723	-102.377**	-65.497
	[7.921]	[4.472]	[1.206]	[16.243]	[140.086]	[76.916]	[46.128]	[56.216]
$1\{1Y \leq \tau < 5\}$	56.159***	148.746***	12.952***	189.591***		-427.082***	2923.108***	-346.709***
	[15.057]	[4.427]	[2.132]	[26.569]		[122.524]	[91.434]	[83.651]
$1\{\tau \geq 5\}$	-68.055	182.999***	9.623	36.298		451.302	148.771	44.390
	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

4. Rational mean-variance arbitrageurs

- Risk-averse arbitrageurs substitute across all treasury maturities. GMM estimates of their risk aversion parameter.

The objective of arbitrageurs is to maximize a mean-variance utility,

$$\max_{\{X_t^\tau\}_\tau, \tilde{X}_t} E_t[W_{t+1}] - \frac{\gamma}{2} Var_t(W_{t+1}),$$

subject to the wealth dynamics specified in (22).

Finally, for each maturity τ, there is a market-clearing condition,

$$Z_t(\tau) + X_t(\tau) = S_t(\tau).$$

Arbitrageurs significantly dampen supply shock responses

Table 7. **Impact of Latent Demand Shocks on Treasury Prices with and without Arbitrageurs.**

Panel (a): With Arbitrageur

	price change (%) of		
	short maturity	medium maturity	long maturity
shock on short maturity	0.001	0.006	0.013
shock on medium maturity	0.008	0.057	0.139
shock on long maturity	0.015	0.111	0.323

Panel (b): Without Arbitrageur

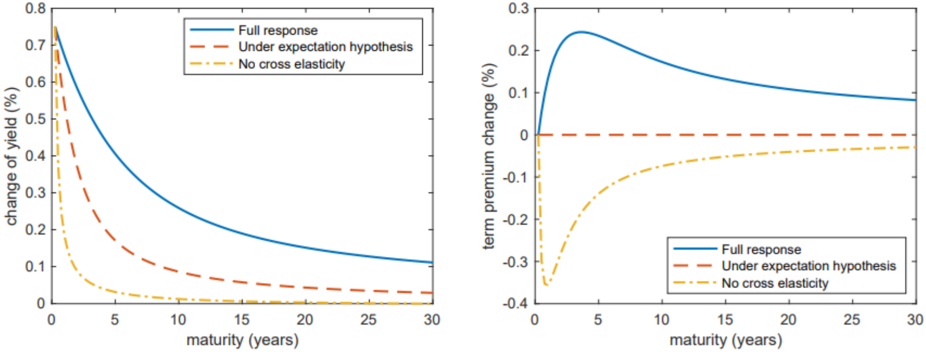
	short maturity	medium maturity	long maturity
shock on short maturity	0.344	1.292	7.108
shock on medium maturity	2.287	7.508	44.102
shock on long maturity	0.707	2.478	12.878

- Key question: due to modelling arbs differently or inherent differences in behaviour?

More realistic impact of monetary policy on term structure

Figure 7. **Contemporaneous Yield Curve Response to a Monetary Policy Shock.**

This figure illustrates the impact of a one standard deviation monetary policy shock ($\varepsilon_t^r = 1$) under three different models: the full model, the model with risk-neutral arbitrageurs (the expectation hypothesis), and the model without cross elasticities. The left panel illustrates yield curve responses. The right panel illustrates the response of the term premium, which is the risk premium component of yields.

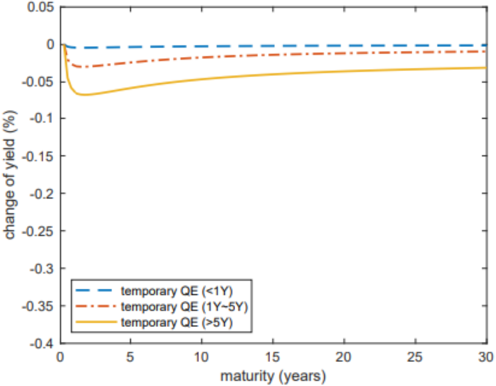


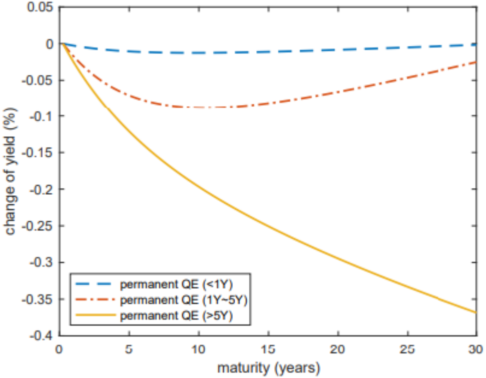
(a) Yield curve response (b) Term premium response

Long-lived QE necessary to move yields significantly

Figure 8. **Impact of QE Shocks on Treasury Yields.**

This figure illustrates how a $100 billion QE shock on different maturity buckets, either temporary (left panel, increasing latent demand u_t) or permanent (right panel, increasing permanent demand θ_0), affects Treasury yields. For dollar values, we use the stationary model unit as described in Section 4.





Steps forward

- Paper is state-of-the-art as is (... and already 98 pages). My comments are mostly for demand-based asset pricing going forward.
- 1. Dynamic modelling of arbs and static modelling of non-arbs is a bit inconsistent. Ideally we want a model that integrates the logic of portfolio choice and the idea that assets are imperfect substitutes.
- IO demand systems (e.g. BLP) built for buying a single car.
- In finance, we almost always have panel data on individual portfolios. Let's not copy-paste from other literatures, but follow the process that led to their success! (This paper does better than others by at least combining models...)

Steps forward: instruments

- 2. Instruments in demand-based asset pricing often rely heavily on structure of model.
- Ideal: find good model-free natural experiments; match directly estimated causal effects with model.
- Challenge for this literature: many good micro-level shocks. Tricky aggregation problem to get macro-elasticities...
- Similar micro-to-macro aggregation issues for cross-sectional estimates of e.g. fiscal multipliers.

Steps forward: elasticity at what horizon?

- 3. Cross-sectional estimation makes it difficult to think of firms slowing adjusting to a "target" portfolio.
- Because yields respond to shocks and impact future demand, the model here does have dynamic implications, but somewhat by accident.
- Reduced-form literature will often examine panel-data responses to identified shocks.
- Can we write dynamic asset demand systems that directly confronts such evidence?

Conclusion

- Structural estimation of treasury demand on rich new dataset of sector-maturitity specific holdings.
- Interaction between rational arbitrageurs and relatively elastic demand curves from non-arbitrageurs crucial for results.
- Realistic effects of monetary shocks and of QE on long-term yields.
- Going forward: demand-based asset pricing methodologically very much a work in progress.