Discussion of

"The Demand for Money, Near-Money, and Treasury Bonds"

by Krishnamurthy and Li

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What this paper does? Asset Pricing Perspective

- For any asset: $P_{i,t} = E_t\left[M_{t+1}(D_{i,t+1} + P_{i,t+1})\right] + X_{i,t}$
- X (I will loosely refer to it as a non-pecuniary payoff) can be
  - +: liquidity, collateral value
  - -: (non-pecuniary) storage costs
- This paper: explore X for “safe” assets *i* where $D_{i,t+1} = 1$ and $P_{i,t+1} = 0$
  - $P_{i,t} = E_t[M_{t+1}] + X_{i,t}$
  - "money, near-money, and treasury bonds" = short-term assets with a known ("safe") payoff
- Goal: parametrize the demand system for non-pecuniary payoffs in excess of some benchmark asset *j*
  - Focus on X by eliminating $E_t[M_{t+1}]$: $P_{i,t} - P_{j,t} = X_{i,t} - X_{j,t}$
  - $X_{i,t}$ can be a function of quantities Q_i, Q_j, … and the state of the economy
  - No explicit micro-foundation for X (e.g. search, info insensitivity, etc.)
- Enables one to impact of quantitative policies e.g. QE, bank capital/reserve/liquidity regulation, changes in money supply

Estimation

- Assets: 3-month treasury B_t, non-time bank deposits D_t, non-deposit fin sector debt D_t^{NB} (repos, CP, GSE short-term debt)
  - Baseline asset: banker's acceptances until 91, 3M GC repo post 91, Fed Funds, Commercial Paper
- CES Demand system
  - Model 1 (Nagel 16): $\left((1-\lambda_t)D_t^{\rho} + \lambda_t B_t^{\rho}\right)^{\frac{1}{\rho}}$
  - Model 2: $\left((1-\lambda_t)D_t^{\rho} + \lambda_t\left((1-\mu_t)(D_t^{NB})^{\eta} + \mu_t B_t^{\eta}\right)^{\rho}\right)^{\frac{1}{\rho}}$
- Model 1 implies $i_t - i_t^b = \frac{\lambda_t}{1-\lambda_t}\left(\frac{B_t}{D_t}\right)^{\rho-1}\left(i_t - i_t^d\right)$
  - Goal: estimate ρ
  - Calculate $i_t - i_t^b$ and $\frac{B_t}{D_t}$ in the data, assume $\frac{\lambda_t}{1-\lambda_t} \sim$ VIX ("flight to safety") and $i_t - i_t^d \sim$ FFR
  - Estimate
    - Nagel's linear estimation: $\rho \approx 1$ (bank debt and govt debt perfect substitutes)
    - **This paper's GMM estimation: $\rho \approx 0.6$ (bank debt and govt debt partial substitutes)**
- Estimation of Model 2 finds $\rho \approx 0.6, \eta \approx 0.8 - 1$

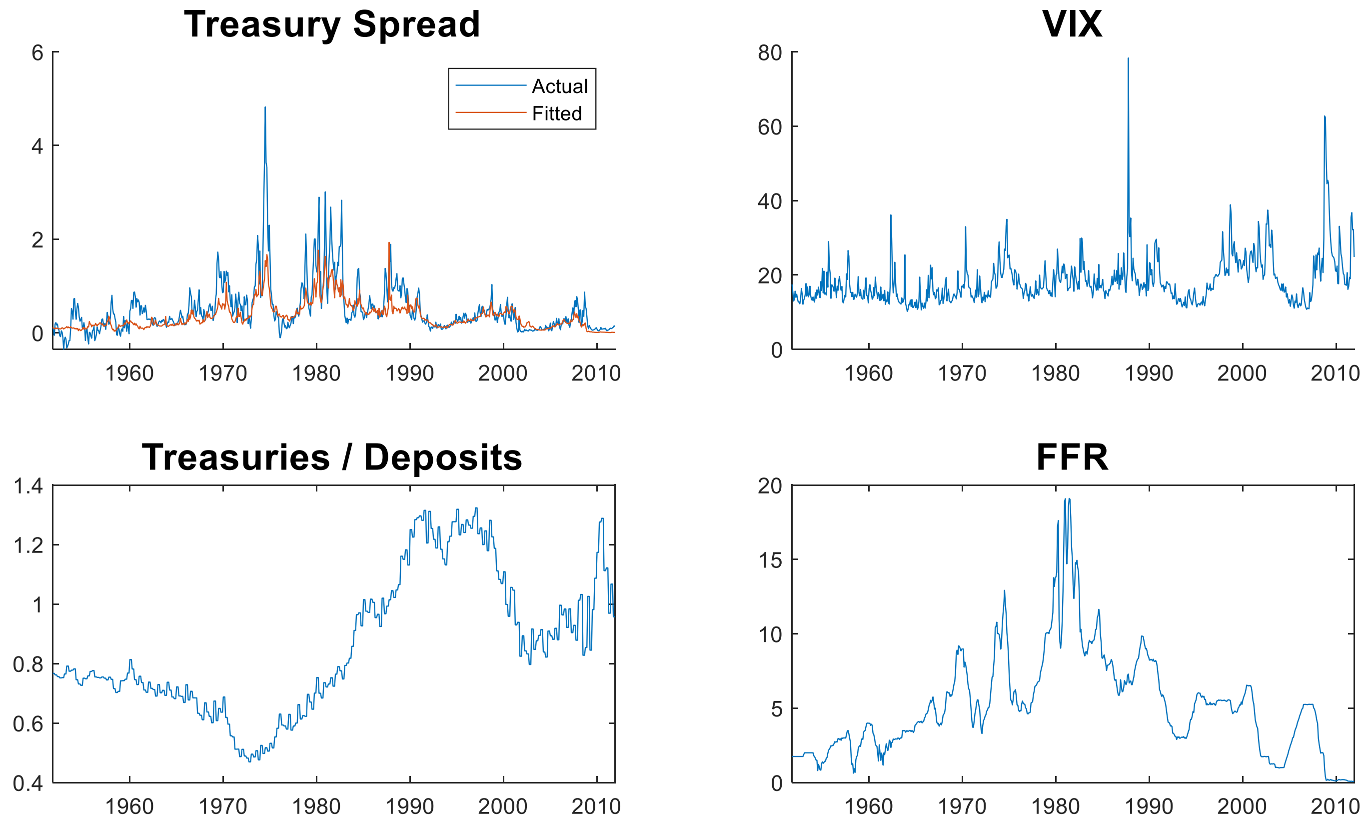
Results

- Deposits and Treasuries are NOT perfect substitutes
  - Differences from prior work due to different specification motivated by theory
  - A different quantity measure (B / D) instead of (B / Y)
  - Non-linear estimation
- Interest rate elasticity of money demand is stable over time if "money" is defined as the CES liquidity aggregate
  - Not true if money is defined as M1 ("missing money puzzle")

Comment Summary

- Very nice paper identifying important parameters
  - Battery of robustness tests that I didn't mention…
  - $0 < \rho < 1$ is a robust result, and even $\rho \approx 0.6$ is surprisingly stable
- Questions I had (and tried to answer)
  - What is driving the fit?
  - What does time-varying λ_t measure?
  - Which treasuries provide liquidity services, and to whom?
  - What is the role of the benchmark assets?

Estimation Inputs

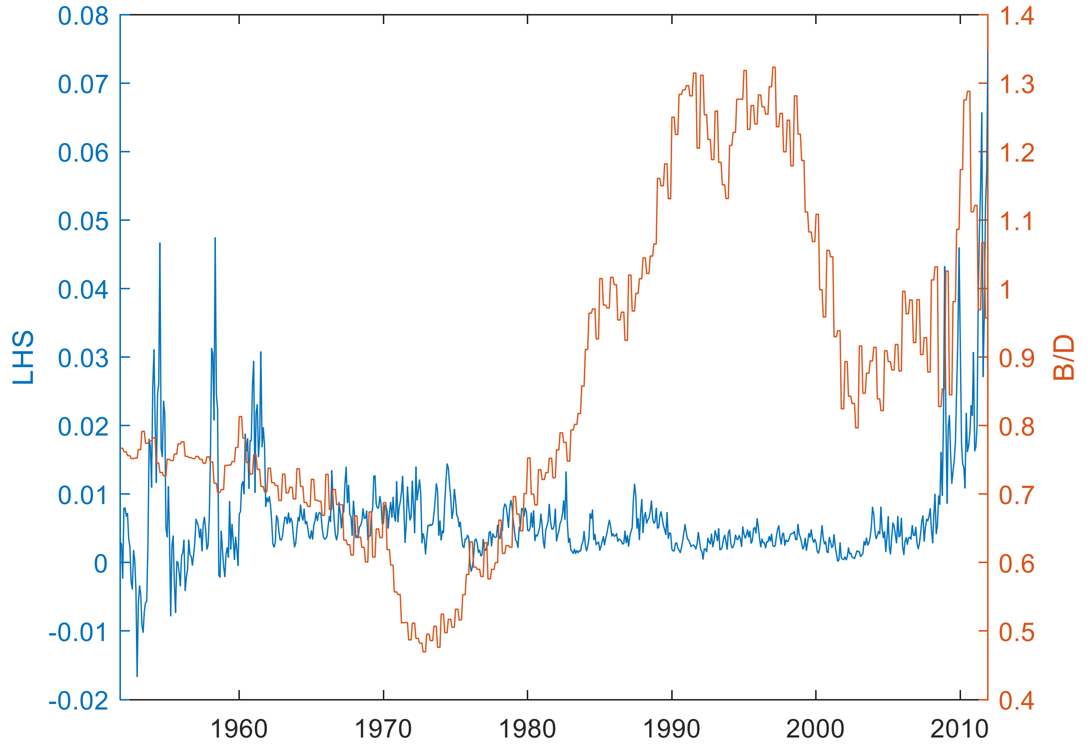


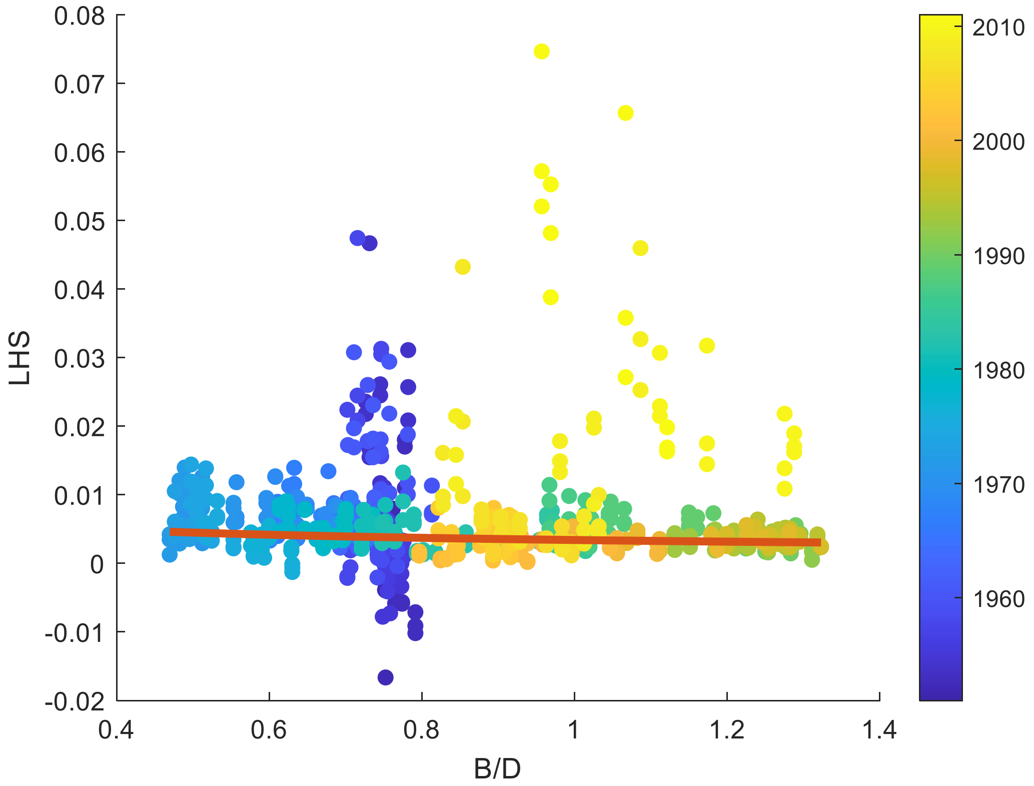
$$i_t - i_t^b = \frac{\lambda_t}{1 - \lambda_t}\left(\frac{B_t}{D_t}\right)^{\rho-1}(i_t - i_t^d)$$

$$lp_t = \beta_s \beta_\lambda VIX_t FFR_t \left(\frac{B_t}{D_t}\right)^{\rho-1} + \epsilon_t$$

Can't visualize 4D, let's visualize 2D

How much of the variation in Treasury liquidity premium do quantities explain ON TOP of the other stuff?





$$\frac{lp_t}{VIX_t FFR_t} = \beta_s \beta_\lambda \left(\frac{B_t}{D_t}\right)^{\rho-1} + u_t$$

Without Low FFR Periods

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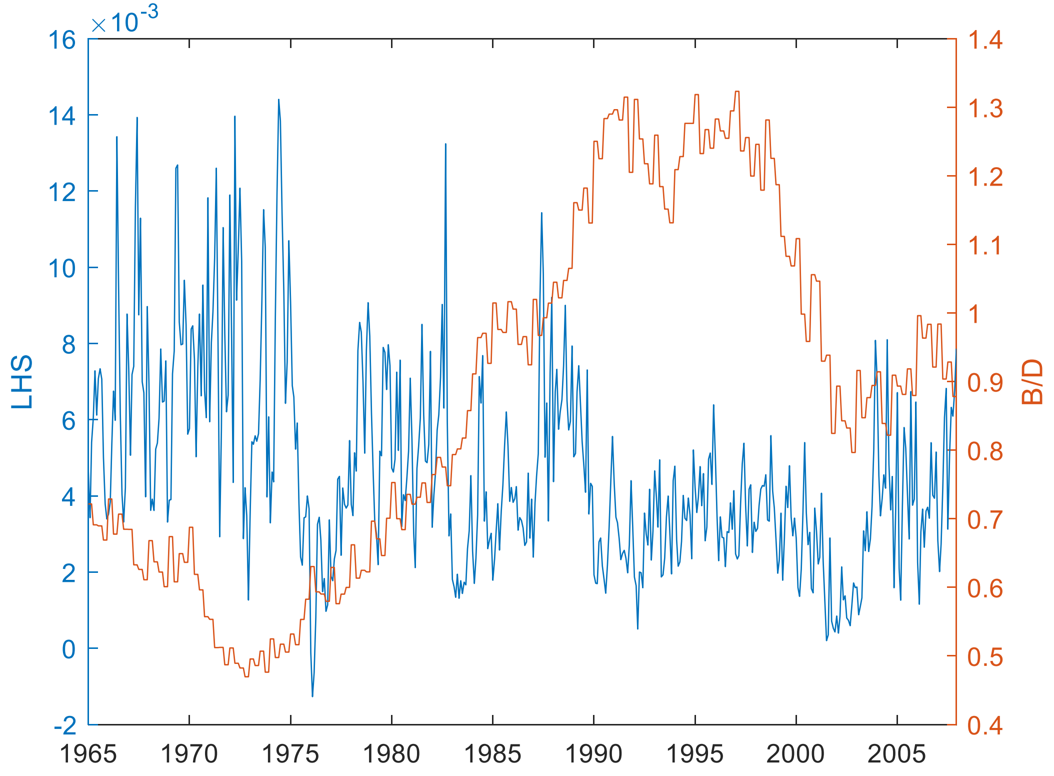

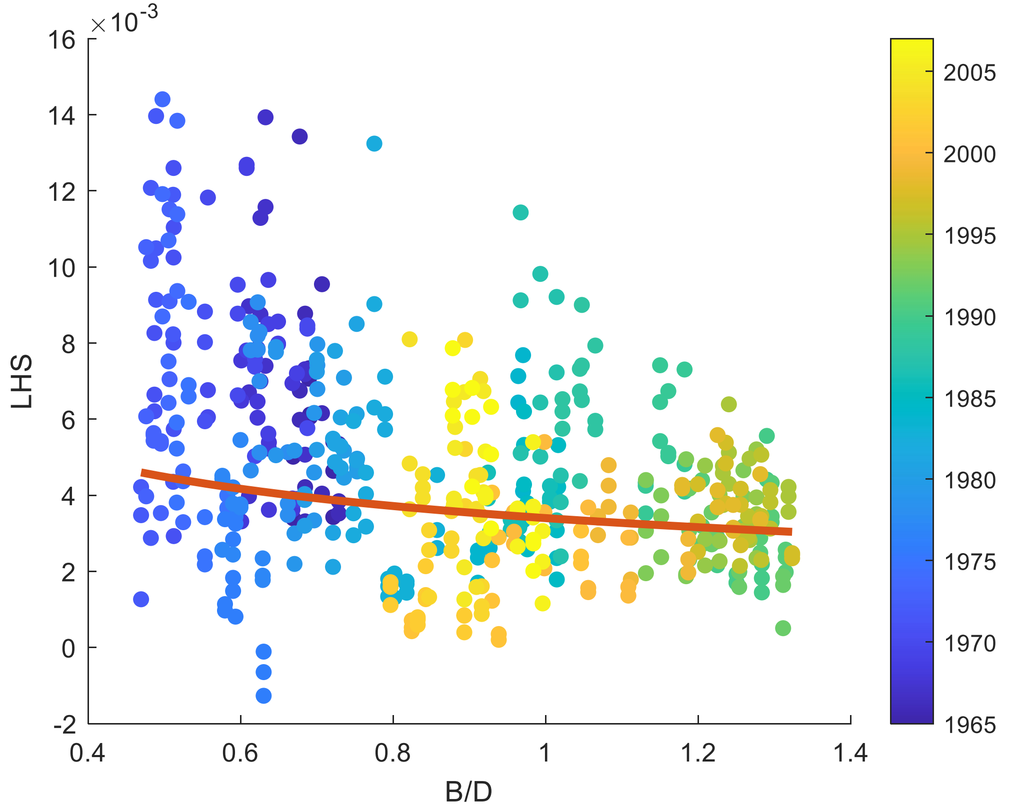

$$\frac{lp_t}{VIX_t FFR_t} = \beta_s \beta_\lambda \left(\frac{B_t}{D_t}\right)^{\rho-1} + u_t$$

What does time-varying λ_t measure?

- Idea: in times of uncertainty, non-pecuniary value of deposits falls relative to Treasuries
- Why?
  - Deposits not at safe as previously thought
    - But, deposits include:
      - Checking
      - Savings (including MMA)
      - Small time deposit (defined in Call Reports as less than the FDIC limit)
    - How much money in these checking and savings accounts is above FDIC insurance limit?
  - Treasuries are always more useful as collateral, and multipliers on constraints increased
- Better ways to measure each story than VIX
  - Bank risk: cross-sectional dispersion of non-insured debt spreads? (~Gorton-Penacchi idea of liquidity)
  - Treasury collateral: measure of binding constraints (e.g. credit line drawdowns) for non-financial sector (since that's the modeled agent)

Which treasuries provide liquidity services, and to whom?

- Liquidity premium measured using 3M T-Bills
- B in B / D measured using all Treasuries
- Implicit assumptions
  - Treasuries perfect substitutes across maturities
  - Convenience yield curve is flat
- Alternative 1: use T-bill quantity for B
  - FoF breaks down Treasury holdings into T-bills and Other for some sectors, can be used to put an upper bound on HH T-Bill quantities
  - Downside: Non-fin sector doesn’t hold many T-Bills, fin sector holds most
- Alternative 2: compute the liquidity premium using a longer-horizon bond assuming term risk is differenced out by the baseline asset
- Deeper question: does the same SDF price T-bills and deposits?
  - Maybe it does, but then B should include holdings by fin sector as well

What is the role of the benchmark assets?

- We can't measure $X_{i,t}$, only $X_{i,t} - X_{j,t}$
  - Liquidity relative to some other benchmark (i.e. lower liquidity) asset
- This paper
  - Treasury liquidity: relative to GC Repo
  - Deposit liquidity: relative to FFR
  - Non-bank debt liquidity: relative to P2-rated CP
- Why 3 different benchmarks?
  - GC Repo is available for longer, but has its own liquidity benefit
  - But FFR?
- Implications for policy
  - Estimate of ρ allows a central banker to predict the change in a liquidity spread $X_{i,t} - X_{j,t}$ e.g. as a result of e.g. quantitative easing
  - But the spread $X_{j,t}$ of the "true" risk-free rate over the baseline asset will likely change as well
  - What is the effect on $X_{i,t}$?