Monetary Policy, the Yield Curve, and the Repo Market

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EFA, August 2024

Motivation: QE Effects in Bond and Money Markets

- Frictionless models of bond markets are insufficient for understanding balance sheet policies over the last 15 years

- Macro-finance literature on unconventional policy transmission:
  - Constrained intermediation [Gertler & Karadi (2012, 2015), Sims and Wu (2021), ...]
  - Departures from rational expectations [Farhi & Werning (2017), Iovino & Sergeyev (2023), ...]
  - Market segmentation and preferred habitat [Vayanos & Vila (2021), Greenwood & Vayanos (2014), ...]

- The preferred habitat tradition has gained in popularity, but mostly focused on simple bond markets

This paper:

- Extends the preferred habitat framework to model both bond and repo markets
- Takeaway: QE impact on repo rates is important (missing in standard habitat models)

- QE has large effects on spot yields and repo rates [D'Amico, Fan, & Kitsul (2018)]

Fed Purchases
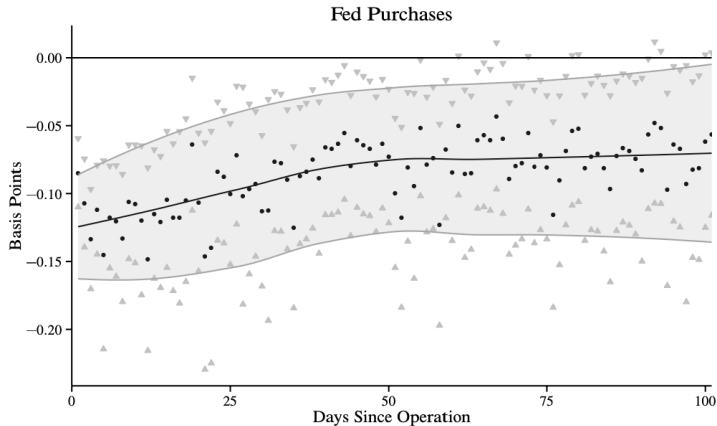
- Continuum of zero-coupon bonds with maturity τ, with risk-free rate r_t (following exogenous stochastic process)

- Bonds are either "general" or "special" (as a function of investor demand and segmentation frictions). Bonds on special have overnight repo rate $r_t^{(\tau)}$

- Risk-averse arbitrageurs allocate wealth across all assets. Bond carry trades:
  - General bonds with funding cost r_t
  - Special bonds with repo rates $r_t^{(\tau)}$

- Specialized preferred habitat investors trade special bonds only of specific maturities

- Bond yields and repo rates determined in equilibrium:
  - Arbitrageurs satisfy their optimality conditions
  - Habitat investors are on their demand curve
  - Markets clear $\implies$ market price of risk reacts to demand (QE) shocks

Standard Preferred Habitat: Setup

- Suppose there are two types of bonds: "silver" and "gray": $P_t^{(\tau,s)}$ and $P_t^{(\tau,g)}$
- Habitat investors like silver bonds, dislike gray bonds

$$Z_t^{(\tau,s)} = -\alpha(\tau) \log P_t^{(\tau,s)} - \beta_t^{(\tau,s)}, \ \ Z_t^{(\tau,g)} = 0$$

- Arbitrageurs with mean-variance preferences solve

$$\max E_t(dW_t) - \frac{a}{2} Var_t(dW_t)$$

$$\text{s.t. } dW_t = W_t r_t \, dt + \int_0^T X_t^{(\tau,s)} \left(\frac{dP_t^{(\tau,s)}}{P_t^{(\tau,s)}} - r_t \, dt \right) d\tau + \int_0^T X_t^{(\tau,g)} \left(\frac{dP_t^{(\tau,g)}}{P_t^{(\tau,g)}} - r_t \, dt \right) d\tau$$

- Market clearing:

$$Z_t^{(\tau,s)} = -X_t^{(\tau,s)}, \ \ Z_t^{(\tau,g)} = -X_t^{(\tau,g)} = 0$$

- Risk factors: short rate r_t and demand shocks $\beta_t^{(\tau,s)}$

Standard Preferred Habitat: Equilibrium

- How do bond prices evolve in equilibrium? Collect risk terms dB_t

$$\frac{dP_t^{(\tau,i)}}{P_t^{(\tau,i)}} = \mu_t^{(\tau,i)} \, dt + \sigma_t^{(\tau,i)} \, dB_t \, , \quad i = s, g$$

- Endogenous drift $\mu_t^{(i,\tau)}$ and diffusion $\sigma_t^{(i,\tau)}$ for $i = s, g$ determined by:

$$\mu_t^{(i,\tau)} - r_t = \sigma_t^{(i,\tau)} \Lambda_t^\top$$

$$\Lambda_t = a \int_0^T \left[X_t^{(\tau,s)} \sigma_t^{(\tau,s)} + X_t^{(\tau,g)} \sigma_t^{(\tau,g)} \right] d\tau$$

$$= a \int_0^T \left(\alpha(\tau) \log P_t^{(\tau,s)} + \beta_t^{(\tau,s)} \right) \sigma_t^{(\tau,s)} \, d\tau$$

- Demand shocks $\beta_t^{(\tau,s)}$ affect *both* bonds
- Why? The (global) market price of risk Λ_t is equivalent across both types of bonds

$$\implies P_t^{(\tau,s)} = P_t^{(\tau,g)}$$

Preferred Habitat and Segmentation

- Because arbitrage is global, demand shocks in one market have spillover effects through the re-pricing of risk in other markets
  - With "silver" and "gray" bonds, the pass-through is one-to-one
  - In more realistic situations, the spillovers depend on the equilibrium loadings on joint sources of risk
- But preferred habitat models still feature some kinds of segmentation in equilibrium
  - Localization across maturities [Vayanos & Vila (2021), Ray, Droste, & Gorodnichenko (2024)]
  - Imperfect spillovers to risky assets [Ray, Droste, & Gorodnichenko (2024)]
  - Spillovers across currencies [Gourinchas, Ray, & Vayanos (2024)]
- However, other types of more extreme segmentation cannot be captured
  - On/off the run
  - Covered interest parity
- Even with extreme segmentation due to habitat forces, strict no-arbitrage conditions imposed by arbitrageurs imply silver and gray bonds have the same price

Comments and Suggestions

- Extending the preferred habitat framework to capture additional sources of segmentation is crucial! Great contribution

- Spell out very precisely what additional frictions your model imposes
    - Segmentation via habitat demand alone is not necessarily enough

- Discuss and contrast with the local/global spillovers in the model which are inherited from the preferred habitat setup