The Distribution of Duration Risk, Fragility, and Central Bank Policy

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Motivation

Standard asset-pricing logic links financial prices to risk-adjusted expected payoffs.

The 2008–09 crisis challenged this view and motivated *intermediary asset pricing* (Gertler and Kiyotaki, 2010; He and Krishnamurthy, 2013): the balance-sheet conditions of financial intermediaries can generate asset-price dislocations.

Why does this matter?

- **Macroeconomics:** financial-sector conditions affect borrowing costs and, ultimately, real activity (Gilchrist and Zakrajšek, 2012).
- **Asset pricing:** intermediary constraints can explain excess volatility, differences in expected returns, and <u>market-specific frictions arising from segmentation</u>.

Gap: Less is known about how segmentation across financial markets—and monetary policy's effect on that segmentation—transmits to the macroeconomy.

Motivation

Research question: *How does Treasury-market fragility affect macroeconomic dynamics? What is the role of central banks?*

I focus on the U.S. Treasury market.

Kashyap et al. (2025) model Treasury-market dysfunction as arising from constraints and outside options faced by **banks**, **hedge funds (HFs)**, and **institutional investors (IIs)**, with an important role for derivatives markets and the basis trade.

Institutional investors are major participants in bond/equity marrkets ($\sim$ \$21T), and the Treasury markets ($\sim$ \$9T).

- **Why use derivatives?** To manage interest-rate risk with borrowing constrained by regulation (Alfaro et al., 2024; Jansen et al., 2026; Matt, 2026).
- Their balance sheets are affected by both **conventional** (Li and Wenning, 2025) and **unconventional** (Kotronis et al., 2025) monetary policy.

Contribution and outline

Contribution: A general equilibrium model of Treasury intermediation and credit provision:

- Endogenize derivatives demand
- Endogenize the basis trade
- Treasury fragility: from partial eq. to macro GE

Today: Focus on the **partial-equilibrium financial-sector block** and its implications for Treasury-market fragility.

Outline

1. Intuition, overview, and arbitrage determination
2. Partial eq. results, does r_t matter?
3. Case study: QT and Reserve Management Purchases

Preliminaries: Swaps and the basis trade

Swap contracts is a financial contract in which two parties agree to exchange future cash flows at a predetermined date:

- *Fix leg*: pays predetermined interest rate. *Floating leg*: pays market rate at maturity.
- The pay off of a *fix leg* receiver of a one period swap with notional amount s_t:

$$s_t(r_t^{fix} - r_{t+1}^{float})$$

A (simplified) positive basis is a mispricing in a swap where $r_t^{float} > r_t^{fix}$. How to leverage it?

- At t: borrow (repo mkt.) today with repayment rate r_{t+1}^{float} and buy a security (bond) that pays r_t^{float}, and enter a swap receiving the *floating leg*.
- At $t+1$, your return is :
  $s_t(r_{t+1}^{float} - r_t^{fix}) + s_t(1 + r_t^{float}) - s_t(1 + r_{t+1}^{float}) = s_t(r_t^{float} - r_t^{fix})$

▸ banks and basis

Institutional investors and the demand for swaps

Risk averse **istitutional investors (IIs) have a hedging motive:** longer-duration liabilities than assets.
Example: two assets with payoffs $a : \{a, \kappa a, \kappa^2 a, ...\}$, $h : \{h, h, h...\}$

IIs	
$a_t q_{a,t}$	$w_{II,t}$
	$h_t q_{h,t}$

$$q_a = \frac{1}{1+r-\kappa}, \qquad q_h = \frac{1}{r}$$

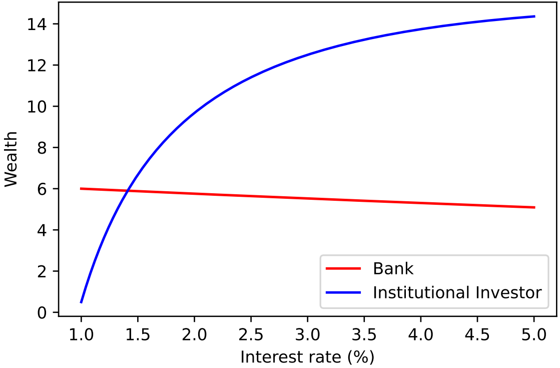
When rates fall:

$$r \downarrow \Rightarrow q_h \uparrow\uparrow > q_a \uparrow > \Rightarrow w_{II} \downarrow \Rightarrow \text{Hedge!}$$

But hedging creates liquidity risk when rates rise: the swap requires cash payments precisely in the high-rate state.

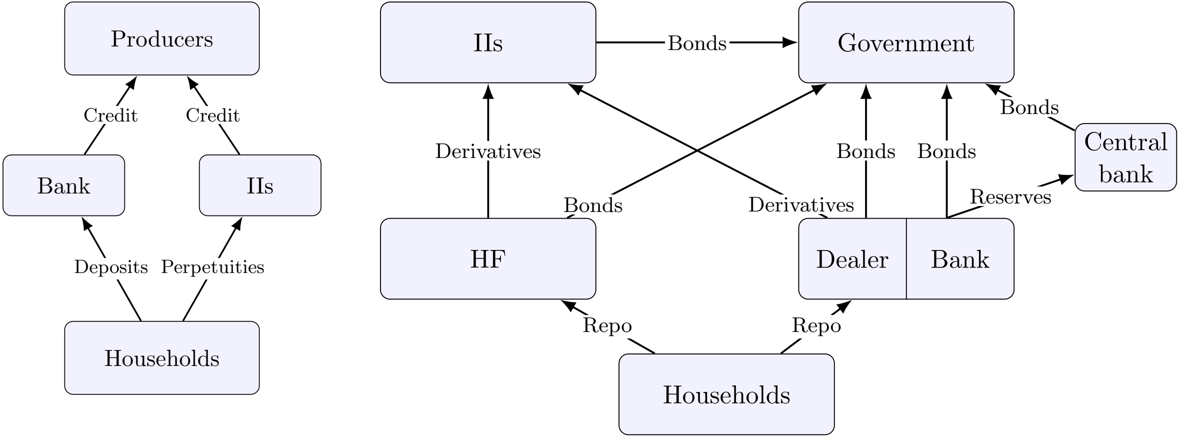
$$m_t = a_{t-1} - h_{t-1} + s(r_{t-1}^{fix} - r_t^{float}) - \Delta a_t q_{a,t} \geq 0$$

Inst. investor problem



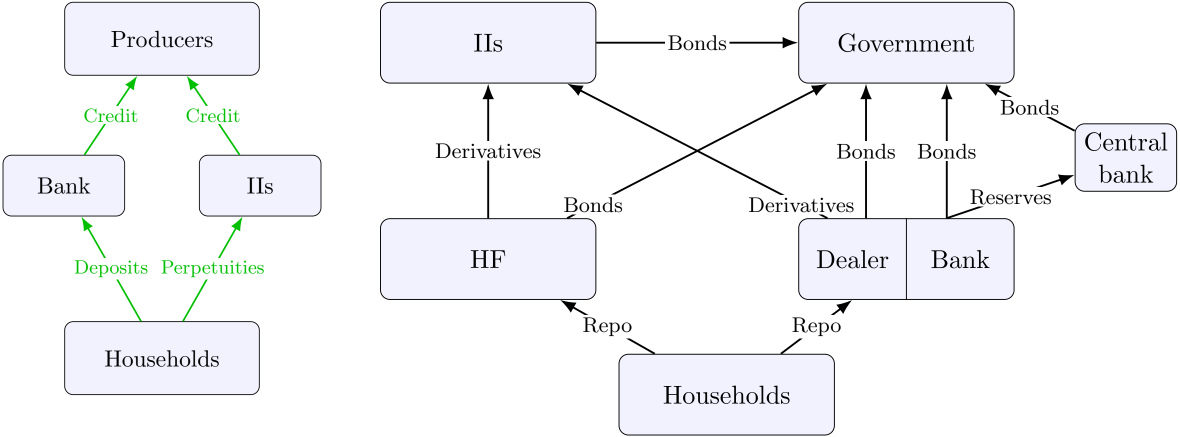
Model overview

A DSGE model linking three financial markets:



Model overview

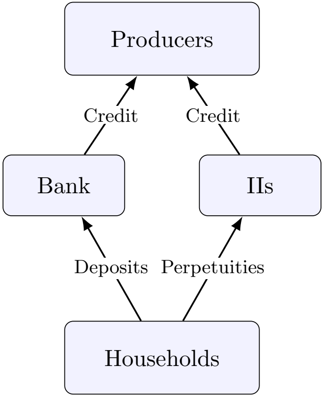
A DSGE model linking three financial markets: Credit supply

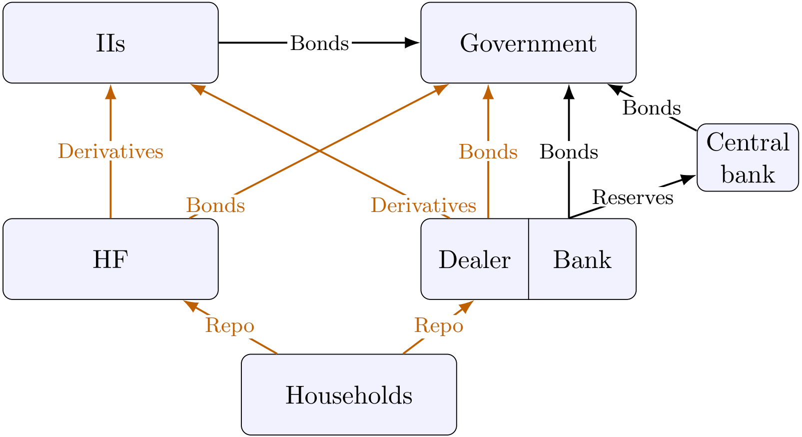


(Gertler and Kiyotaki, 2010)

Model overview

A DSGE model linking three financial markets: Derivatives mkt

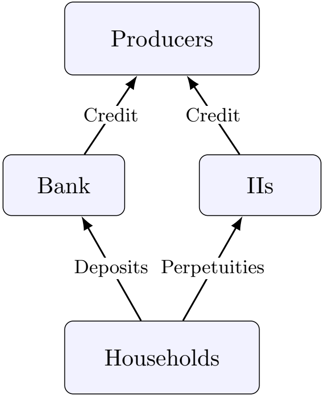


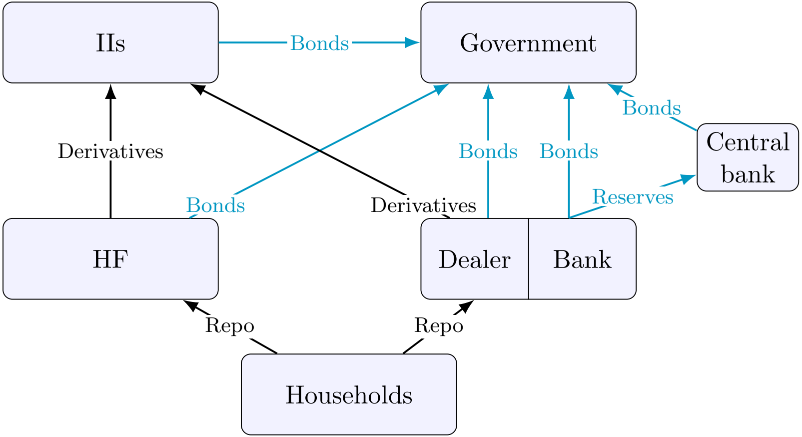


(Kashyap et al., 2025; Alfaro et al., 2024)

Model overview

A DSGE model linking three financial markets: Treasury mkt





Contibution: GE connection: Credit + Treasury

Banks and basis determination

The general problem (dynamic)

$$\max_{\substack{\{a_{r,t}, b_{b,t}, res_t,\\ x_t, d_t\}_{t=0}^{\infty}}} \mathbb{E}_0 \left(m^h_{0,t+1} \left((1-\phi^b) w^b_{t+1} + \phi^b V^b_{t+1}(w^b_{t+1}) \right) \right)$$

$$q_t a_{r,t} + q_{b,t} b_{b,t} + res_t + x_t = w^b_t + q^d_t d_t$$

$$w^b_{t+1} = \Big[R^b_{t+1} q_{b,t} b_{b,t} + R^a_{t+1} q_{t+1} a_{r,t} + \\ + (1 + r^{IORB}_t) res_t + V^{deal}_{t+1}(x_t) - d_t \Big]$$

$$V^b_t(w^b_t) \geq \eta \left(q_t a_{r,t} + q_{b,t} b_{b,t} + x_t \right)$$

Five FOCs, for dealer capacity (x_t):

$$\boxed{\frac{\partial V^{deal}_{t+1}}{\partial x_t} = 1 + r^{IORB}_{t+1} + \eta \mu_t}$$

‣ Preliminaries

The dealer problem (static)

To leverage the basis trade:

1. Borrows repo (p_t) to finance bonds ($b_{deal,t}$): $q_{b,t} b_{deal,t} = q_{p,t} p^{deal}_t$
2. Hedges in derivatives: $b_{deal,t} = \frac{-s^{deal}_t}{\kappa^b}$
3. Must provide repo collateral (haircut) $x_t \geq \gamma q_{p,t} p_{deal,t}$

Using these conditions: ($q^{der}_{b,t+1} > \mathbb{E}_t q_{b,t+1}$):

$$V^{deal}_{t+1}(x_t) = x_t \left[\frac{1}{\gamma} \underbrace{\left(\frac{1 + \kappa^b q^{der}_{b,t+1}}{q_{b,t}} - \frac{1}{q_{p,t}} \right)}_{\text{Basis}} \right]$$

Thus: $$\boxed{\frac{\partial V^{deal}_{t+1}(x_t)}{\partial x_t} = \frac{1}{\gamma} \left(\frac{1 + \kappa^b q^{der}_{b,t+1}}{q_{b,t}} - \frac{1}{q_{p,t}} \right)}$$

Hedge funds: Endogenous absorption capacity

Hedge funds implement the same basis trade as dealers, but can **endogenously raise costly equity** to expand their balance sheet.

$$\max_{\{b_{hf,t}, s_t^{hf}, p_t^{hf}, e_t^{hf}\}_{t=0}^{\infty}} \quad \sum_{t=0}^{\infty} \mathbb{E}_t \left[m_{0,t+1}^h \phi^{hf} w_{t+1}^{hf} \right]$$

$$\text{s.t.} \qquad w_{t+1}^{hf} = (1+\kappa^b q_{b,t+1}) b_{hf,t} + s_t^{hf}(q_{b,t+1} - q_{b,t+1}^{der}) - p_t^{hf} - \frac{\psi^{hf}}{2}(e_t^{hf})^2$$

$$q_{b,t} b_{hf,t} = q_{p,t} p_t^{hf} \qquad\qquad \kappa^b b_{hf,t} = -s_t^{hf}$$

$$\gamma q_{p,t} p_t^{hf} \leq (1-\phi^{hf}) w_t^{hf} + e_t^{hf}$$

At the leverage constraint:

$$w_{t+1}^{hf} = \left[(1-\phi^{hf}) w_t^{hf} + e_t^{hf}\right] \frac{1}{\gamma} \underbrace{\left[\frac{1+\kappa^b q_{b,t+1}^{der}}{q_{b,t}} - \frac{1}{q_{p,t}} \right]}_{\text{Basis}} - \frac{\psi^{hf}}{2}(e_t^{hf})^2$$

Hence, the basis determines the incentive to inject equity:

$$(e_t^{hf})^* = \frac{1}{\gamma \psi^{hf}} \left[\frac{1+\kappa^b q_{b,t+1}^{der}}{q_{b,t}} - \frac{1}{q_{p,t}} \right]$$

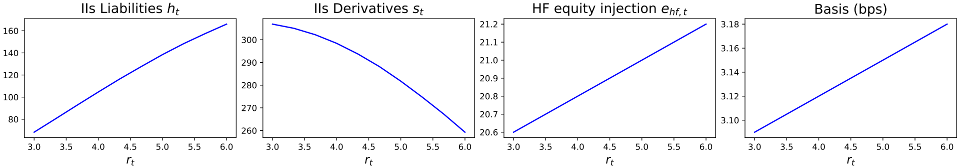
Partial equilibrium dynamics

Setting: at t the CB announces $r_{t+1} \in \{r_t + \epsilon, r_t - \epsilon\}$. All prices are fair.

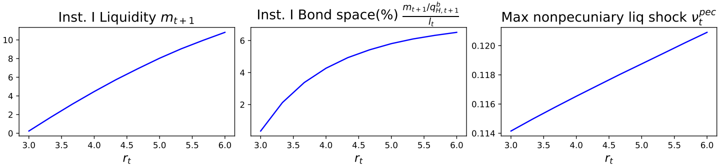
What is the effect of a different starting point r_t?

Does initial r_t matter?

Greatly. Low r_t enhances solvency risk: large price swings and $\log(\cdot)$ utility $\rightarrow$ hedging motive



What if CB hikes? r_t determines absorption capacity of the system. $1 + r^{repo}_{t+1} = \frac{1}{q_{p,t}+\nu_t}$

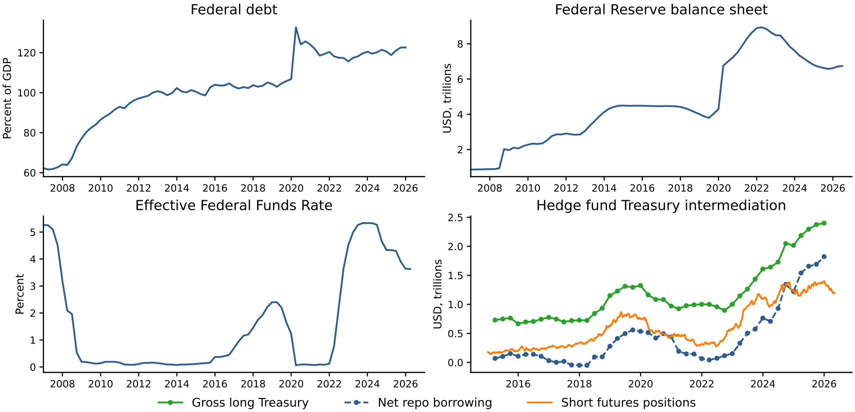


QT space: $m_{t+1} + q^b_{i,t+1}\Delta b_{hf,t}(\nu_t) + \underbrace{q^b_{i,t+1}\Delta b_{b,t}(\nu_t|\mu_t = 0)}_{\text{GE effect}}$

If $\nu_t > v^{pec}_t$ bond prices must drop in equilibrium below fair.

Current policy issue

Reserve management purchases (Dec 2025)



Sources: FRED and OFR.

Smaller QT space, in GE: $m_{t+1} + q^b_{i,t+1}\Delta b_{hf,t}(\nu_t) + q^b_{i,t+1}\Delta b_{b,t}(\nu_t|\mu_t = 0) - \Delta b^{supply}_t$

Potential explanations low m_t? close to $\mu_t > 0$? More sensitivity to ν_t?

Conclusion

- **Treasury absorption capacity depends on who holds what.**
- Monetary policy affects this capacity through the balance sheets of **institutional investors, hedge funds, and dealers**.
- This creates a potential trade-off:

$$\text{Monetary policy} \Rightarrow \text{Treasury fragility} \Rightarrow \text{credit provision.}$$

Next: Embed this mechanism in general equilibrium and quantify the credit spillovers.

Thank you!

Basic model: Inst. investor problem

$$V_t^d = \max_{\{a_{d,t}, b_{d,t}, s_t, e_t^d\}_{t=0}^{\infty}} \mathbb{E}_0 \sum_{t=0}^{\infty} m_{0,t+1}^h \frac{(\phi^d w_{t+1}^d)^{1-\sigma^d}}{1-\sigma^d}$$

$$q_t a_{d,t} + q_{b,t} b_{d,t} = (1-\phi^d) w_t^d + q_{h,t} h_t + e_t^d$$

$$w_{t+1}^d = \frac{1}{\pi_{t+1}} \left[(1+\kappa^a q_{t+1}) \, a_{d,t} + \left(1+\kappa^b q_{b,t+1}\right) b_{d,t} + s_t \left(q_{b,t+1} - q_{b,t+1}^{der}\right) - (1+q_{h,t+1}) \, h_t \right] - \frac{\phi^e}{2} e^{d^2}$$

$$m_t^d = \frac{a_{d,t-1}}{\pi_t} + \frac{b_{d,t-1}}{\pi_t} + \frac{s_{t-1}}{\pi_t} \left(q_{b,t} - q_{b,t}^{der}\right) - \frac{h_{t-1}}{\pi_t} + q_{b,t}(\kappa^b \frac{b_{d,t-1}}{\pi_t} - b_{d,t}) + q_t(\kappa^a \frac{a_{d,t-1}}{\pi_t} - a_{d,t}) \geq 0$$

b_t: bond holdings; l_t: long-term liabilities; s_t: swap position; q_t^b, q_t^l: bond and liability prices; m_{t+1}: liquidity position.

Back

Basic model: Hedge fund problem

$$\max_{b_{hf,t}, f_t, e_t} \quad \mathbb{E}_t(w_{t+1}^{hf})$$

$$q_{b,t} b_{hf,t} = w_t^{hf} + e_t - \frac{\phi^{hf}}{2} e_t^2 + q_{p,t} p_t$$

$$\kappa^b b_{hf,t} = -f_t$$

$$\gamma q_{b,t} b_{hf,t} \leq w_t^{hf} + e_t$$

$$w_{t+1}^{hf} = \left(1 + \kappa^b q_{b,t+1}\right) b_t^{hf} + f_t \left(q_{b,t+1} - q_{b,t+1}^{forward}\right) - p_t$$

Repo pricing has liquidity shock $q_t^p = (1 + r_t + \nu_t)^{-1}$, while the forward price is $q_{b,t+1}^{forward} = E_t q_{b,t+1} + \alpha_t q_{b,t}$, where α_t denotes the basis mispricing.
b_t^{hf}: Treasury holdings; f_t: futures position; q_t^p: repo price; $q_{b,t+1}^{forward}$: forward bond price; γ: leverage requirement; w_t^{hf}: hedge fund wealth; e_t costly equity injection.

Back

Basic model: Bank problem

$$
\begin{aligned}
\max_{a_t, x_t, d_t} \quad & w_{t+1} = (1 + r^a_{t+1}) a_t + V^{deal}_{t+1}(x_t, \mathbb{D}_t) - (1 + r^d_{t+1}) d_t \\
s.t. \quad & a_t + x_t = w_t + d_t \\
& w_t \geq \eta \left(q_{r,t} a_{r,t} + x_t \right)
\end{aligned}
$$

Back

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