

Discussion: Unconventional Monetary Policy and Funding Liquidity Risk

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1 Motivation

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- What is the objective of a Central Bank?
 - Since 1977, the Federal Reserve has operated under a mandate from Congress to "promote effectively the goals of maximum employment, stable prices, and moderate long term interest rates"
 - The primary objective of the ECB, mandated in Article 2 of the Statute of the ECB, is to maintain price stability within the Eurozone.
- How can a Central Bank meet its objectives?
 - Open market operations
 - Standing facilities
 - Minimum reserves
 - Asset purchase programmes
- To what extent is political independence useful in helping a Central Bank meet its objectives?

This paper

- Shadow banks do not have access to CB reserves – limits policy effectiveness
- Can central banks stabilize asset prices by purchasing illiquid securities?
 - Hard question to answer theoretically, because in a frictionless world, a central bank's purchases of securities are like capital structure – its irrelevant [Wallace (1981)]
 - Need a model of agents in the economy who trade financial assets and Central Bank plus some financial frictions.

Model

- 4 types of agent
 - Households: EZW consumer, save by making deposits into banks
 - Regular Banks: EZW consumer, receives transfers from CB, deposits subject to exogenous liquidity shocks
 - Shadow Banks: EZW consumer, receives transfers from CB, deposits subject to exogenous liquidity shocks
 - Central Bank
- 4 assets
 - risky asset
 - loans from Central Bank
 - Central Bank reserves
 - deposits

Assets

- Asset with exogenous stochastic supply of S .

$$\frac{dS_t}{S_t} = \mu dt + \sigma dZ_t \quad (1)$$

- One unit of asset pays out a per unit time: total time- t payout is aS_t per unit time
- Price of one unit of asset at time- t is q_t .
- Total wealth held in asset at time- t is N_t
- Cum-dividend return on N_t over interval $[t, t + dt)$ is $dr_{s,t}$

$$dr_{s,t} = \frac{dN_t + aS_t dt}{N_t} = \frac{dN_t}{N_t} + \frac{adt}{q_t} \quad (2)$$

- Deposits: return over interval $[t, t + dt)$ is $r_t^d dt$
- Central Bank reserves: return over interval $[t, t + dt)$ is $r_t^m dt$
- Central Bank loans: return over interval $[t, t + dt)$ is $r_t^b dt$

Household consumption-savings problem

$$\max_{\{c_\tau^h\}_{\tau \geq t}} E_t \left[e^{-\rho\tau} f(c_\tau^h, V_\tau^h) d\tau \right] \quad (3)$$

s.t.

$$dn_t^h = (r_t^d - c_t^h) dt \quad (4)$$

Regular & Shadow Banks

Regular Banks

$$\max_{\{c_\tau\}_{\tau \geq t}} E_t \left[\int_t^\infty e^{-\rho\tau} f(c_\tau, V_\tau) d\tau \right] \quad (5)$$

s.t.

$$\frac{dn}{n} = w^s dr^s + w^b r^b dt + w^m r^m dt - w^d r^d dt - \frac{c}{n} dt + d\tau + \text{liquidity shocks} \quad (6)$$

and

$$w^s + w^b + w^m - w^d = 1 \quad (7)$$

Shadow Banks

$$\max_{\{\bar{c}_\tau\}_{\tau \geq t}} E_t \left[\int_t^\infty e^{-\rho\tau} f(\bar{c}_\tau, \bar{V}_\tau) d\tau \right] \quad (8)$$

s.t.

$$\frac{d\bar{n}}{\bar{n}} = \bar{w}^s dr^s - \bar{w}^d r^d dt - \frac{\bar{c}}{\bar{n}} dt + d\bar{\tau} + \text{liquidity shocks} \quad (9)$$

and

$$\bar{w}^s - \bar{w}^d = 1 \quad (10)$$

Liquidity Shocks

- Regular Banks

- If risky asset holdings and reserves are sufficiently high relative to deposits, liquidity shocks to deposits do not matter, i.e. when $(\alpha + \underline{\phi})w^s + w^m \geq \sigma^d w^d \geq 0$.
- When this inequality not satisfied regular banks are impacted by liquidity shocks: $\lambda \max(\sigma^d w^d - (\alpha + \underline{\phi})w^s - w^m, 0)nd\tilde{Z}$
- $\alpha \in (0, 1)$: share of risky securities that can be pledge as collateral
- $\underline{\phi}$: funds that can be acquired via discount window, providing extra cushioning against liquidity shocks

- Shadow banks

- do not hold reserves and no access to discount window:
 $\lambda \max(\sigma^d w^d - \alpha + w^s)nd\tilde{Z}$

Central Banks

- Balance sheet

$$q_t \cdot \underbrace{s_t}_{\text{number of shares in risky asset}} + \underbrace{B_t}_{\text{loans made by CB}} = \underbrace{M_t}_{\text{supply of reserves}} \quad (11)$$

- CB's controls

$$\underline{\nu}_t = \frac{q_t \underline{s}_t}{N_t}, \quad \underline{m}_t = \frac{M_t}{N_t} \quad (12)$$

- $\underline{b}_t = \frac{B_t}{N_t} = \underline{m}_t - \underline{\nu}_t$
- net wealth is zero, all gains and losses are transferred to banks

$$dT = \underline{\nu} dr^s - \underbrace{(a - \bar{a}) \underline{\nu}^2 dt}_{\text{costly for CB to hold risky asset}} + \underline{b} r^b dt - \underline{m} r^m dt \quad (13)$$

Market clearing

- risky asset: $w^s n^s + \bar{w}^s \bar{n} + \underline{\nu} N = N$
- loans made by CB to regular banks: $w^b n = \underline{b} N$
- reserves: $w^m n = \underline{m} N$
- consumption good: $cn + \bar{c}\bar{n} + c^h n^h = [a - \underline{\nu}(a - \underline{a})]S$

Welfare

- How does purchasing illiquid assets impact the welfare of the various agent types?
 - Shadow banks benefit, but does anyone else?
- What is the CB's objective? The CB does not possess an objective function, so controls are just chosen exogenously – allows running of policy experiments, but no optimal policy.

Stationarity

- Do all the EZW agents survive in the long-run?
- Regular, Shadow Banks and Households are heterogenous because they have differing investment opportunity sets
- Regular Banks have the best investment opportunity sets, so one would expect them to accumulate wealth at the expense of other agents

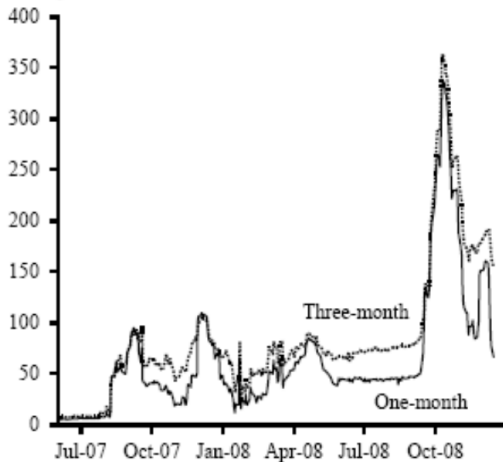
Usefulness of Shadow Banks to Households

- Why would a Household place a deposit in a Shadow Bank as opposed to a Regular Bank?

Spike in LIBOR during credit crunch

Figure 1
Yield spreads of USD Libor over OIS rates

Basis points



Spike in LIBOR during credit crunch

- What happens to interest rates when there is a negative liquidity shock? Does the interbank rate r^b go up?
- Following equation suggests so:

$$r^b - r^m = \gamma \lambda^2 \max(\sigma^d w^d - (\alpha + \underline{\phi}) w^s - w^m, 0) \quad (14)$$

- What about $r^b - r^d$?
- Can your policy experiment avoid this spike?
- Can you show that avoiding the LIBOR spike is welfare improving?

Summary

- Interesting research topic
- Ambitious model – take more care with how you define variables and explain equations
- Do more with your results, now you have solved the model