Fiscal Consequences of Paying Interest on Reserves

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- Not present at the beginning of QE1, replaced coordinated action with Treasury
- Resulted in an underappreciated enormous expansion of Fed fiscal powers

Plan of the Talk

- Lay our textbook environment of interaction between Treasury, CB
- Illustrate public finance implications of different CB strategies
- Match CB strategies with alternative Treasury strategies that would yield same fiscal risk

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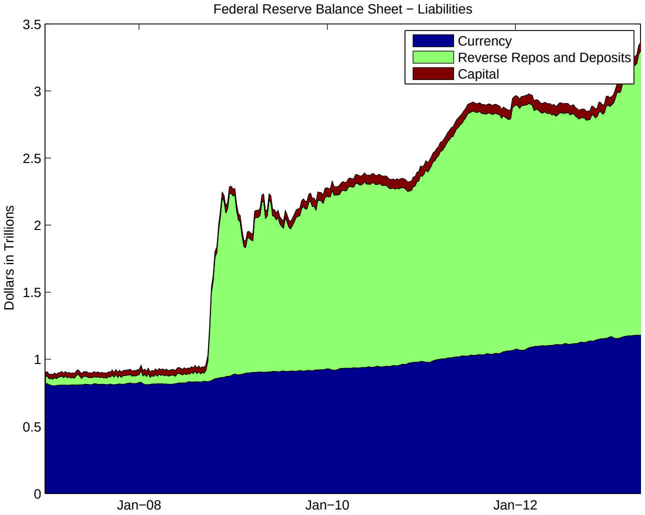
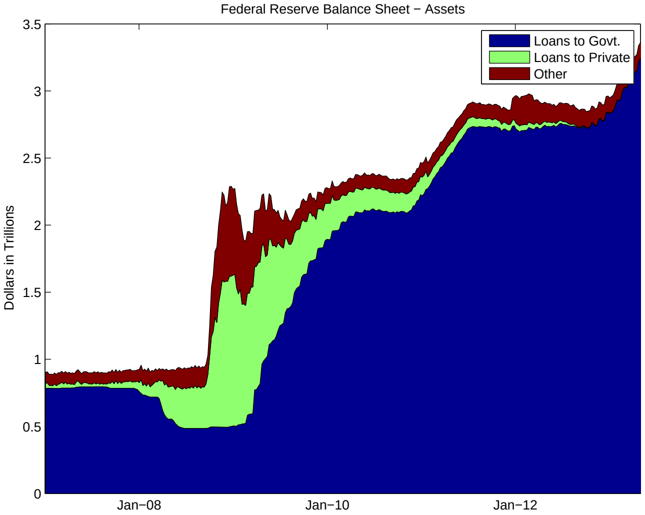
- Match CB strategies with alternative Treasury strategies that would yield same fiscal risk
- Ultimate question: if alternative Treasury strategies are possible, who should decide fiscal risk?

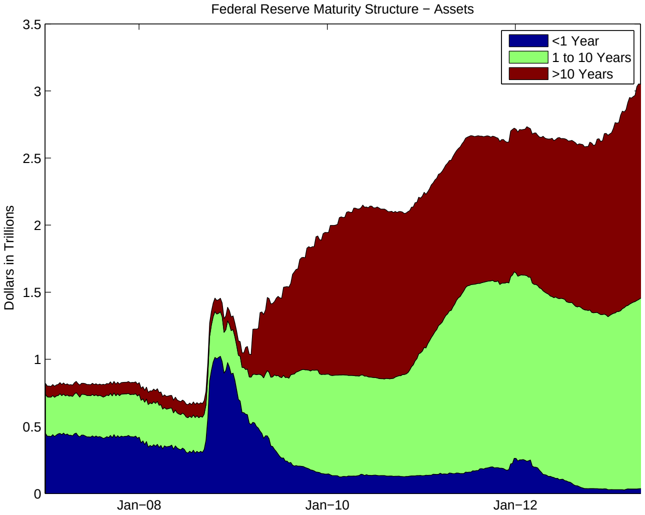
Fed Liabilities since 2007



Fed Assets since 2007



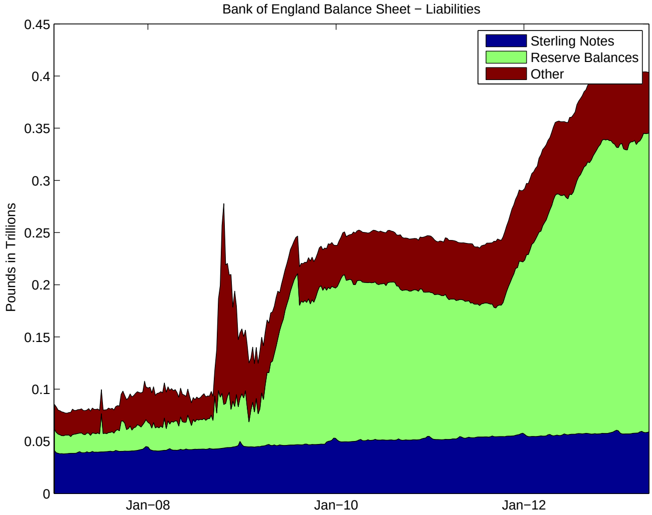
Fed Maturity Structure of Assets since 2007



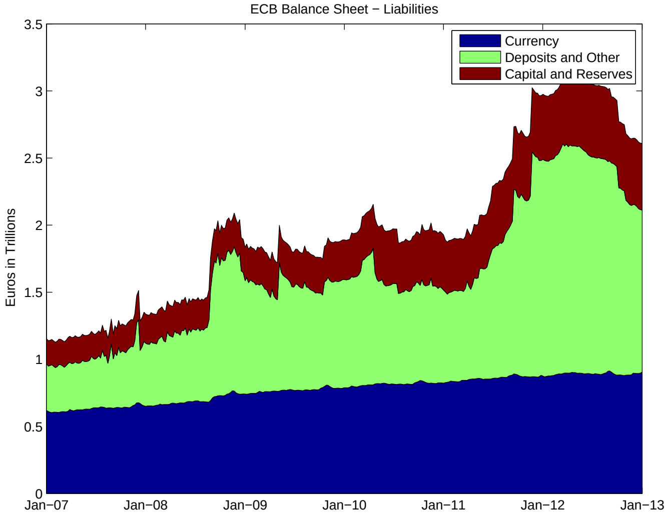
Interest on Reserves at the ECB and B of E

- Always part of their powers
- Not used by B of E before QE
- Deposits were nontrivial at the ECB, grew after 2008

Bank of England Liabilities since 2007



ECB Liabilities since 2007



The Model: Agents

- Households (identical)
- Treasury
- Central Bank
- Households: maximizers, Treasury and CB: automata

Technology

- Goods produced with labor, CRS technology, productivity 1
- Cash-in-advance on all goods (leisure is credit good)

Preferences

$$E_0 \sum_{t=0}^{\infty} \left(\prod_{s=0}^{t-1} \beta_s \right) [u(c_t) - \phi y_t]$$

Discount rate shock: only shock in the economy

Traded Assets

- One-period securities issued by Treasury: B_t (B_t^B held by CB), interest rate R_t
- Consols issued by Treasury: D_t (D_t^B held by CB), price Q_t
- Money (cash, used for CIA): M_t
- One-period reserves at the CB: X_t, must pay R_t if positive

Equilibrium Conditions from Private Optimization

- Money demand: $M_t / P_t = L(R_t)$
- Fisher relation (Euler equation): $1 = \beta_t E_t[(1 + R_{t+1})P_t / P_{t+1}]$
- Ex-dividend price of consols:

$$Q_t = \frac{1}{1 + R_t}\left[1 + \beta_t E_t\left(\frac{(1 + R_{t+1})P_t}{P_{t+1}} Q_{t+1}\right)\right]$$

- (Nominal) asset pricing kernel:

$$z_t = \frac{1 + R_t}{1 + R_0}\frac{P_0}{P_t}\prod_{s=0}^{t-1}\beta_s$$

Budget Constraints in Flows

- Treasury:

$$B_{t-1} + D_{t-1} = \frac{B_t}{1+R_t} + Q_t(D_t - D_{t-1}) + S_t + T_t$$

- CB:

$$M_t - M_{t-1} =$$
$$\frac{B_t^B}{1+R_t} - B_{t-1}^B + Q_t(D_t^B - D_{t-1}^B) - D_{t-1}^B + S_t - \frac{X_t}{1+R_t} + X_{t-1}$$

Budget Constraints, Present-Value Form

- Treasury:

$$B_{t-1} + (1 + Q_t)D_{t-1} = \frac{1}{z_t} E_t \sum_{s=t}^{\infty} z_s (S_s + T_s)$$

- CB:

$$B^B_{t-1} + (1 + Q_t)D^B_{t-1} - X_{t-1} - M_{t-1} + \frac{1}{z_t} E_t \sum_{s=t}^{\infty} z_s \left(M_s \frac{R_s}{1 + R_s} \right) = \frac{1}{z_t} E_t \sum_{s=t}^{\infty} z_s S_s$$

Ricardian Equivalence, Modigliani-Miller

- Ricardian equivalence holds (within the spanned set)
- Modigliani-Miller for CB: given CE, construct a new CE by:
  - Increase S_{t_1} by ΔS
  - Decrease B_s between t_1 and t_2 by $\Delta S \prod_{v=t_1}^{s}(1+R_v)$
  - Decrease CB holdings B_s^B by same amount, or increase X_s by same amount
  - Decrease S_{t_2} by $\Delta S \prod_{v=t_1}^{t_2-1}(1+R_v)$

Does CB Dividend Policy Matter?

- Modigliani-Miller says timing of dividend payments does not matter
- But it may matter for decisions taken over time when conflict is present. Example:

$$S_0 > B^B_{-1} + (1 + Q_0) D^B_{-1} - X_{-1} - M_{-1} + \sum_{s=0}^{\infty} \mathrm{PV}_0 \left(M_s \frac{R_s}{1 + R_s} \right)$$

  Then CB starts period 1 with net liabilities greater than future profits, needs a transfer from Treasury.
- Timing may not matter, PV of seigniorage payments (and risk profile) does matter

Accounting for CB profits

- At historical cost:

$$\Pi_t^{HC} := \frac{R_{t-1}}{1+R_{t-1}}(B_{t-1} - X_{t-1}) + D_{t-1}^B + (Q_t - \bar{Q}_{t-1})(D_{t-1}^B - D_t^B) I_{D_{t-1}^B > D_t^B},$$

- Marked to market:

$$\Pi_t^{MM} := \frac{R_{t-1}}{1+R_{t-1}}(B_{t-1} - X_{t-1}) + D_{t-1}^B + (Q_t - Q_{t-1}) D_{t-1}^B$$

Roadmap

- Sequence of CB strategies
- Increasingly aggressive
- Review implications for CB profits

1. Bills Only

Strategy:

- No interest on reserves ($X_t = 0$);
- All CB assets invested in short-term debt ($D_t = 0$).

Implications:

- $$\Pi_t^{HC} = \Pi_t^{MM} = \frac{R_t}{1+R_t} B_t^B \geq 0$$
- Inequalities strict, unless CB holds no assets (pure fiat money)

2. Hold to Maturity

Strategy:

- No interest on reserves ($X_t = 0$);
- Consols are never sold ($D_t \geq D_{t-1}$).

Implications:

- $$\Pi_t^{HC} = \frac{R_{t-1}}{1 + R_{t-1}} B_{t-1} + D_{t-1}^B \geq 0$$
- $$\Pi_t^{MM} := \frac{R_{t-1}}{1 + R_{t-1}} (B_{t-1} - X_{t-1}) + D_{t-1}^B + (Q_t - Q_{t-1}) D_{t-1}^B$$

  Could turn negative, but within bounds (more to come)

3. Active Trading, but no Interest on Reserves

Strategy:

- No interest on reserves ($X_t = 0$);
- Consols are bought and sold (but no short sales of any government debt)

Implications:

- Even Π_t^{HC} can turn negative when capital losses are realized:

$$\Pi_t^{HC} := \frac{R_{t-1}}{1+R_{t-1}} B_{t-1} + D_{t-1}^B + (Q_t - \bar{Q}_{t-1})(D_{t-1}^B - D_t^B) I_{D_{t-1}^B > D_t^B},$$

A Special Case: Pure Fiat Money

- Assume that $M_t \geq M_{t-1}$; then
- $$M_{t-1} \leq \frac{1}{z_t} E_t \sum_{s=t}^{\infty} z_s M_s \frac{R_s}{1+R_s}$$
- CB assets are not used to back money, money is "fiat"

Fiat Money and CB Solvency

With fiat money and no interest on reserves, $S_t \geq 0$ can be ensured independently of portfolio trades

$$S_t = M_t - M_{t-1} + B^B_{t-1} + (1 + Q_t)D^B_{t-1} - \frac{B^B_t}{1 + R_t} - Q_t D^B_t$$

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An Equivalence Result

- Start from CE with CB buying long-term bonds
- New CE that respects bills only:
  - Set
$$\frac{\hat{B}_t^B}{1+R_t} = \frac{B_t^B}{1+R_t} + Q_t D_t^B$$
  - Set
$$\hat{S}_{t+1} = S_{t+1} + [Q_t(1+R_t) - (1+Q_{t+1})]D_t^B = S_{t+1} + \left(\beta_t E_t\left[(1+R_{t+1})\frac{P_t}{P_{t+1}}\right] - 1\right) Q_{t+1} D_t^B$$
  - Adjust B_t, D_t so that $B_t - B_t^B$ and $D_t - D_t^B$ is unaffected
- New CE has same price system, allocation, same private holdings by maturity
- CB profits always positive, fiscal risk borne by Treasury

4. Interest on Reserves

Strategy:

- Interest is paid on reserves (so $X_t > 0$ is possible);
- Proceeds may be invested in long-term securities

Implications:

- Leveraged bet on interest rate movements
- Value of portfolio side can turn negative:

$$B^B_{t-1} + (1 + Q_t)D^B_{t-1} - X_{t-1}$$

- CB can take unbounded fiscal risk

Zero Interest Rates

- At zero interest rates, $X_t > 0$, arbitrarily high risks can be run
- But if no IOR is allowed, fiscal loss immediately recognized on exit (must liquidate portfolio)
- Early warning system
- Also, under bills only, still guaranteed positive profits

Conclusion

- CB portfolio management causes fiscal risk
- Fiscal risk is unbounded with IOR
- QE can be equally well performed by Treasury by managing maturity structure
- Common instrument, conflicting objectives