

Comments by Rafael Repullo on

Stop Believing in Reserves

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Introduction (i)

- Since Global Financial Crisis central banks have combined
 - Conventional interest rate tools
 - Unconventional quantitative tools (QE and QT)
 - Going from scarce to ample reserves regime
 - Policy rate becomes interest rate on reserve balances

Introduction (ii)

- Paper addresses key issue for monetary policy implementation
 - What are the effects (and the limits) of QT?
 - How do they compare with increases in the policy rate?
- Paper incorporates institutional features of US financial system
 - Banks and non-banks (MMFs)
- Paper incorporates institutional features of Fed monetary policy
 - Interest rate on reserve balances (IORB) for banks
 - Overnight reverse repo facility (ONRRP) for non-banks

Main results

- For given policy rates and ample reserves
 - QT mainly affects reserves on non-banks
 - Limits of QT depend on holdings of reserves by non-banks
 - “Stop believing in (bank) reserves”
- Switch to scarce reserves regime depends on policy rates
 - More QT with higher rates

Structure of paper

- Aggregate time series evidence
- Theoretical model
- Calibration of model
- Discussion of results

Main comments

- Ambitious paper on important topic for central banks
 - Surprisingly little research so far
- Paper seems work in progress
 - But results are very promising
- Theoretical model has too many peculiar features
 - Focus of my discussion
- Aggregate time series evidence does not add anything
 - Visual correlations of endogenous variables

Part 1

Theoretical model

Model setup (i)

- Two periods and five types of private agents
 - Households, firms, banks, non-banks, and dealers
 - Plus government and central bank
- Households with an initial endowment
 - Invest in bank and non-bank deposits
- Firms produce and sell consumption good to households
 - Households can only pay firms with bank deposits

Model setup (ii)

- Banks funded with households' deposits (no equity capital)
 - Invest in reserves and loans to other (unnamed) agents
 - Subject to linear balance sheet costs
 - Subject to a reserve requirement
- Non-banks funded with households' deposits
 - Invest in reserves and loans to dealers
 - Subject to linear balance sheet costs
- Dealers funded by non-banks
 - Invest in government debt

Model setup (iii)

- Central bank sets
 - Total amount of reserves held by banks and non-banks
 - Interest on reserves by banks r_B
 - Interest on reserves by non-banks r_N , with $r_N < r_B$

Comments on model: peculiar features

- Two types of goods
 - General good produced by government and central bank
 - Special good produced by firms
- Bilateral bargaining to set bank deposit rates and quantities
- Exogenously fixed loan spread

Comments on model: unnecessary elements

- Dealers funded by non-banks and investing in debt
 - Non-banks could directly invest in government debt
- Banks' reserve requirement
 - Does not play any role
 - Calibrated to a very high level: 13% (September 2019)

Comments on model: missing elements

- Lending to banks by non-banks
 - Important adjustment mechanism not in the model
- Leverage constraint for banks
 - Limit borrowing by banks from non-banks
 - Avoid arbitrage opportunity implied by $r_B - r_N > 0$
 - Otherwise non-banks would not keep any reserves

What am I going to do next?

- Sketch simpler theoretical model that yields similar results
- Ingredients of model
 - Conventional central bank
 - Households with bank deposits in utility function
 - Local monopoly banks setting loan and deposit rates
 - Competitive non-banks

Part 2

Alternative model

Model setup (i)

- Two periods and four types of private agents
 - Households, firms, banks, and non-banks
 - Plus government and central bank
- Households with initial endowment
 - Invest in bank and non-bank deposits
- Firms borrow from banks to produce output

Model setup (ii)

- Banks are monopolists with respect to households and firms
 - Borrow from households and (possibly) non-banks
 - Invest in reserves and loans to firms
 - Subject to leverage ratio (upper bound on asset size)
- Non-banks are competitive
 - Borrow from households
 - Invest in reserves, government debt, and loans to banks
- Focus on ample reserves regime

Balance sheet of non-banks

Reserves	R_N	D_N	Deposits
Govt. bonds	B		
Loans to banks	F		

- If $R_N > 0$ zero profit condition implies

Deposit rate = bond rate = loan rate = interest on reserves = r_N

Balance sheet of banks

Reserves	R_B	D_B	Deposits
Loans to firms	L	F	Loans by non-banks

- If $r_B > r_N$ upper bound on asset size will be binding
 - Otherwise there would be an arbitrage opportunity
 - Banks borrow F from non-banks at rate r_N
 - Spread $r_B - r_N$ implies a subsidy to banks

Equilibrium loan and deposit rates

- Interest on reserves r_B is opportunity cost of loans

→ Equilibrium loan rate

$$r_L = \arg \max[(r_L - r_B)L(r_L)]$$

→ where $L(r_L)$ is the firms' demand for loans

- Interest on reserves r_B is marginal revenue of deposits

→ Equilibrium deposit rate

$$r_D = \arg \max[(r_B - r_D)D(r_D, r_N)]$$

→ where $D(r_D, r_N)$ is the households' supply of deposits

Effect of QT on banks

- Loan rates and loan quantities only depend on the interest on bank reserves r_B
- Deposit rates and deposit quantities depend on the interest on bank reserves r_B and the interest on non-bank reserves r_N

→ **QT does not have any effect on banks**

Effect of QT on non-banks

- QT only affects the size of the balance sheet of non-banks

\downarrow	Reserves	R_N	D_N	Deposits
\uparrow	Govt. bonds	B		
	Loans to banks	F		

→ No change in household deposits or in loans to banks

→ **QT is neutral: it has no real effects**

Limits of QT

- Given policy rates, r_B and r_N , QT can proceed as long as $R_N > 0$
 - Same result as in paper
 - Limits of QT depend on holdings of reserves by non-banks
 - “Stop believing in (bank) reserves”

Effect of increase in ONRRP (i)

- By previous results: If $R_N > 0$ zero profit condition implies

Deposit rate = bond rate = loan rate = interest on reserves = r_N

- Effects of an increase in r_N (for fixed r_B)
 - Increase in deposit rate offered by non-banks
 - Shift from bank to non-bank deposits
 - Increase in non-bank lending to banks
 - Reduction in bank profits

Effect of increase in ONRRP (ii)

Balance sheet of non-banks

Reserves	R_N	D_N	Deposits ↑
Govt. bonds	B		
↑ Loans to banks	F		

→ No change in reserves R_N or in holdings of govt. bonds B

Effect of increase in ONRRP (ii)

Balance sheet of banks

Reserves	R_B	D_B	Deposits	↓
Loans to firms	L	F	Loans by non-banks	↑

→ No change in reserves R_B or in bank lending L

Effect of increase in IORB (i)





- By previous results

$$\frac{dr_L}{dr_B} > 0 \quad \text{and} \quad \frac{dr_D}{dr_B} > 0$$

- Increase in loan and deposit rates
- Reduction in bank loans and increase in bank deposits
- Increase in bank reserves (by upper bound on asset size)
- Ambiguous effect on bank profits

Effect of increase in IORB (ii)

Balance sheet of banks

	Reserves	R_B	D_B	Deposits	
	Loans to firms	L	F	Loans by non-banks	

→ No change in size of balance sheet (by leverage constraint)

Effect of increase in IORB (iii)

Balance sheet of non-banks





↓	Reserves	R_N	D_N	Deposits	↓
	Govt. bonds	B			
↓	Loans to banks	F			

→ Shift from non-bank to bank deposits

→ Reduction in reserves R_N (if total reserves are unchanged)

Effect of increases in IORB & ONRRP (i)

Balance sheet of banks

	Reserves	R_B	D_B	Deposits	
	Loans to firms	L	F	Loans by non-banks	

→ No change in size of balance sheet (by leverage constraint)

Effect of increases in IORB & ONRRP (ii)

Balance sheet of non-banks

↓	Reserves	R_N	D_N	Deposits	↑
	Govt. bonds	B			
↑	Loans to banks	F			

→ Shift from bank to non-bank deposits

→ Reduction in reserves R_N (if total reserves are unchanged)

Summing up

- Alternative model avoids shortcomings of model in the paper
- Alternative model yields some similar results
 - Limits of QT depend on holdings of reserves by non-banks
- Alternative model yields some contrasting results
 - Increasing IORB & ONRRP reduces non-bank reserves
 - Less QT with higher rates

Concluding remarks

Concluding remarks (i)

- Paper addresses key issue from a novel perspective
 - Incorporating institutional features of US financial system
 - Incorporating institutional features of Fed monetary policy
- Many interesting questions to be addressed
 - Effects of equating IORB and ONRRP
 - Interactions between monetary policy and bank regulation
 - Differences with ECB's monetary policy implementation

Concluding remarks (ii)

- Much more research is needed
 - Theoretical contributions would be especially welcome
- Richer models are needed
 - Simple models cannot address Bernanke's conundrum
 - “The problem with quantitative easing [or tightening] is that it works in practice, but it doesn't work in theory”**