Liquidity Everywhere, Not a Drop to Use

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Conundrum: Where did all the liquidity go?

• Unprecedented expansion of central bank balance sheets since the Global Financial Crisis
  • Central banks issue reserves (Central bank liability) to commercial banks (commercial bank asset) while buying bonds from banks
    • Asset swap for bank.
    • Most liquid asset on planet.

• Yet surprisingly fragile liquidity conditions in money markets
  - Unexpectedly large spikes in repo markets in September 2019:
  - Dash for cash in March 2020
Traditional view: Exogenous demand for liquidity

Supply of Reserves

Price of Liquidity = vs.

Exogenous demand for liquidity

• As demand is exogenous, increasing supply of reserves is stabilizing
(Effective Fed Funds Rate-IOR spread) and Reserves to GDP

Source: Lopez-Salido and Vissing-Jorgensen (2022)
Our point: Liquidity demand is affected by reserves

Price of Liquidity = Supply of Reserves vs. Liquidity claims against Reserves

- Supply of reserves creates its own demand, new claims, which can destabilize
Reserves versus Deposits

Values graphed are for the last month of the quarter, 2009Q1-2021Q3.

Source: Lopez-Salido and Vissing-Jorgensen (2022)
Spread vs Deposit-adjusted Reserves

Source: Lopez-Salido and Vissing-Jorgensen (2022)
Three important considerations in whether past issuance of central bank reserves helps or hurts when liquidity is abruptly drawn down.

I. *Ex ante*: How are the reserves financed?

- When the central bank buys bonds, it creates reserves that are typically deposited in commercial banks.
- Do banks rebalance these deposits with new capital issuances, or are reserves primarily financed with deposits (and deposit-like) claims?
- The way reserves are financed matters as demand deposits will be a claim on reserves in future.
Three important considerations...

II. *Ex post*: Additional encumbrances on reserves

- Commercial banks are reluctant to leave reserves idle – therefore they sell other contingent claims on liquidity so that reserves are “fully” utilized.
  - Bank credit lines
  - Back up guarantees to speculators: Margin calls, central clearing guarantee funds, etc.,
- Regulation: liquidity requirements “lock up” reserves in stress scenarios (Diamond and Kashyap, 2016; Vandeweyer, 2019; others)
- Ratcheting: the level of reserves creates its own supervisory demand (Nelson, 2019)
Three important considerations

III. *Ex post*: Will banks with free reserves lend them out?

- There will be a high rate paid in the interbank market for reserves when the system is short.

- However, some surplus banks fear “taint” from lending to needy.

- Instead prefer to stay “safe” and receive flight-to-safety deposits passively (and realize the convenience yield from having excess reserves), rather than lend out reserves in inter-bank markets actively

=> Liquidity hoarding limits the ex post availability of reserves.
In sum

• Central bank reserve expansion works through commercial bank balance sheets.

• Ordinarily, this will mean there is far less spare liquidity than suggested by the simple reserve expansion.

• In extremis, the higher the reserves issued ex ante, more fragile the interbank markets and higher the inter-bank rates in stress

• This can have adverse real consequences on corporate investments (ex post as well as ex ante) -- as in Diamond and Rajan (2011), Shleifer and Vishny (2010), or Stein (2012)
The Basic Model

Firms, Banks, Investors, ... Interbank market to shuffle around liquidity
Firms, Banks, Depositors, Investors

• Bank firm pairs
  • “regionally” or “sectorally” matched
• Firm and bank owners are risk-neutral, expected profit-maximizers
• Firms:
  - Invest $I_0$ at date 0 to obtain returns at date 2, funded by
    - Firm owners’ initial wealth
    - Term loans from banks
  - Place deposits $D^F_0$ with bank.
Firms, Banks, Depositors, Investors

• Banks at date 0:
  - Assets
    ➢ Long term loan to their firm
    ➢ Liquid reserves \( S_0 \) that shrink by encumbrance \( \tau \) at date 1
  - Liabilities I: (Unlimited) Uninsured deposits \( D_0 \) from risk-averse investors at date 0
    - Will run if firm/bank stressed at date 1
  - Liabilities II: (Limited) capital from deep-pocket risk-neutral investors (Warren Buffett)
    - Stable but costly capital funding \( e_t \) available at date \( t \)
    - Quadratic costs \( \frac{\alpha_t e_t^2}{2} \)
Liquidity stress in the economy

- State of the economy \((y)\) at date 1
  - Economy stressed with probability \(q / \theta\), healthy otherwise.

- State of each bank-firm pair \((z)\)
  - Conditional on economy stress, probability \(\theta\) specific firm’s investment is stressed and has to be “rescued” with additional investment.
Healthy Economy

1 - \frac{q}{\theta}

1 - \frac{q}{\theta}

\frac{q}{\theta}

Liquidity stressed Economy

\theta

Healthy firm/bank

Healthy firm/bank

1 - \theta

\theta

Stressed Firm, Rescue Investment

Healthy Bank

Stressed Bank

Inter-bank market
Stressed firm/bank at date 1

• If bank-firm pair stressed
  • Firm will withdraw deposit and ask for additional loan to fund its optimal date-1 “rescue” investment.
  • Risk averse depositors will run.

• Stressed banks will raise funding
  (1) From the date-1 inter-bank market at rate $r_1$.
  (2) They also can raise date-1 capital $e_1$
Healthy bank behavior at date 1

• Only a fraction $\phi$ of healthy banks lend to stressed banks in the inter-bank market.

• Remaining fear being tainted: $(1-\phi)$ “safe” healthy banks forego lending, but being seen as safe, receive flight-to-safety deposits that run from stressed banks.
Bank-firm pairs, date-0 investment

Date 0

Healthy Economy

1

1 - \( \frac{q}{\theta} \)

Liquidity stressed Economy

\( \frac{q}{\theta} \)

Stressed Firm, Rescue Investment

\( \theta \)

Fraction \( \varphi \)

Tainted Bank

Safe Bank

Liquidity Hoarding

Fraction \( 1 - \varphi \)

Inter-bank market

Stressed Bank

Flight To Safety

Date 1
Conditional on liquidity stress in the economy.

- The market for spot loans clears at date 1 at $r_1$.
- Stressed and tainted banks also issue capital at marginal cost $\alpha_1 e_1$. Since banks will not issue at a higher cost than $r_1$, it must be that $e_1 = \alpha_1^{-1} r_1$.

\[
(1 - \theta)\phi + \theta \alpha_1^{-1} r_1 = \theta \left[ (I_1 - D_0^F) + D_0 \right] - [(1 - \theta)\phi + \theta] S_0 (1 - \tau)
\]

- How does the equilibrium rate $r_1$ change with the ex ante level of reserves $S_0$?

Additional liquidity raised via date-1 capital issuances
Firm's requirement for rescue investment
Risk averse depositor run
Unencumbered liquidity with stressed and tainted banks
Ex ante reserves and degree of ex post stress

- Higher ex ante reserves enhance liquidity stress (as measured by $r_1^*$) if

$$\theta > \frac{\varphi(1-\tau)}{\tau + \varphi(1-\tau)}$$

- If the inter-bank market is shut ($\varphi = 0$), the shadow inter-bank rate always increases in reserves.
- If inter-bank market fully open ($\varphi = 1$), then the interbank rate increases whenever

$$\theta > (1 - \tau)$$
Policy Considerations

• Liquidity concerns would imply the central bank should set reserves such that $r_i = 0$.

• But un-modeled monetary policy concerns might require setting reserves at a different level.

• Divergence between concerns most likely when degree of liquidity stress rises in ex ante reserves.
Policy Considerations

• If so, illiquidity effects will offset some of the beneficial effects of monetary policy when reserves are set too high from a liquidity perspective.

• Would capital requirements help?
  • No, when $\varphi$ exogenous, private and social choice in capital structure coincide since we have only a pecuniary externality (unlike Lorenzoni (2008) or Stein (2012)).
Policy implications

• Central bank balance-sheet expansion is not an unmitigated good – may exacerbate financial fragility.
  • Monetary vs financial stability tradeoff

• Seeing ex post stress, some economists recommend
  • More ex ante central bank balance-sheet expansion (Copeland, Duffie and Yang, 2021)
  • Moving target!

• Reserve issuance may not crowd out deposit-like claims, may in fact enhance it.
  • Greenwood, Hanson and Stein (2015, 2016): depends on whether public holds reserves or it is intermediated by banks.
Extension: Flight to safety and hoarding
Endogenizing hoarding and lending

- Recall that deposits fleeing distressed banks migrate to “safe” banks
- Let safe banks earn a (small) convenience yield $\delta$ on extra reserves
  - The value of having liquid assets in case of additional stress
- To be perceived as “safe” and attract deposits, healthy banks must not get “tainted” by lending to stressed banks.
- But they then forego the return $r^*_1$ from lending in the interbank market.
- Equilibrium fraction of banks $\varphi$ that choose to lend in the interbank market equates profits from lending to profits from receiving flight to safety deposits and earning convenience yield $\delta$ on them.
\( \delta = 0.2, \tau = 0.2 \)

\( \theta = 0.6 < (1 - \tau) \)

**Low reserves:**
Banks manage with own funding

**Moderate reserves:**
Banks need liquidity but inter-bank markets shut (Autarky)

**High reserves:**
Banks need liquidity and inter-bank markets open up as \( r_1 \) is attractive

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Interbank rate increases enough to open the inter-bank market
\[ \tau = 0.2 \]
\[ \theta = 0.6 < (1 - \tau) \]

As the convenience yield on reserves increases...

Inter-bank markets remain endogenously shut for longer, and Inter-bank rates in stress times rise more
Implications

• The greater the perceived benefit $\delta$ of reserves hoarding during stress, the more likely it is that higher ex ante reserves lead to financial fragility.

• Endogenous $\delta$ may imply the interbank market never opens.

• Social planner wants lower capital than privately optimal to be held at date 0 to reduce hoarding (contrast with Stein (2012))
  • Higher capital up front lowers the market clearing rate, increases ex post hoarding, increases the liquidity shortage, and costly date-1 capital issuance.
Some Final Considerations
Cannot the central bank intervene ex post?

Yes but

• Crowds out private ex-post lending by surplus banks – more hoarding
• Central banks typically lend against collateral
  - High quality collateral financed with deposits does not add additional liquidity
• Unsecured interventions or lending against all manner of assets
  - In principle, can solve all liquidity problems, BUT... typically distort asset prices
Cannot the central bank intervene ex post?...contd

• Ex-ante moral hazard
  - Create greater balance sheet illiquidity, insolvency, and herding by banks

• Ever increasing intervention
Shadow banking and maturity-matching

• What if reserves are allowed to be held by non-banks (RRP facilities)?
• Shadow banks likely to maturity-match assets and liabilities
  • Same problem unless they are narrow banks (or households)
  • For example, money market funds substitute for banks in holding reserves
Conclusion

- Large central bank balance sheet need not imply the financial system has plenty of spare liquidity.
- Supply of ex ante reserves creates its own ex-post demand for reserves, limiting the central bank’s ability to use an expanded balance-sheet to enhance stability or growth.
- Take care when you shrink the central bank balance sheet: hysteresis.