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

\[
\text{Price of Liquidity} = \quad \text{Supplied Reserves vs. Exogenous demand for liquidity}
\]

- 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

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 $D_0^F$ 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 Buffet)
    - 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.
Bank-firm pairs, date-0 investment

Healthy Economy

$\frac{q}{\theta}$

Liquidity stressed Economy

$1 - \frac{q}{\theta}$

Healthy firm/bank

$1$

Healthy firm/bank

$1 - \theta$

Stressed Firm, Rescue Investment

$\theta$

Stressed Bank

Healthy 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 $\varphi$ of healthy banks lend to stressed banks in the inter-bank market.

• Remaining fear being tainted: $(1- \varphi)$ “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

Healthy Economy

Healthy firm/Bank

1 - \frac{q}{\theta}

Liquidity stressed Economy

\frac{q}{\theta} 

Healthy firm/Bank

1 - \frac{1}{\theta}

Stressed Firm, Rescue Investment

\theta

Fraction

1 - \phi

Safe Bank

Liquidity Hoarding

Tainted Bank

Inter-bank market

Flight To Safety

Stressed Bank
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 $e_1 = \alpha_1^{-1} r_1$

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

- 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

Increases one for one with $S_0$
Ex ante reserves and degree of ex post stress

- Higher ex ante reserves enhance liquidity stress (as measured by $r_1^*$) if
  \[ \theta > \frac{\phi(1-\tau)}{\tau + \phi(1-\tau)} \]

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

Interbank rate increases enough to open the inter-bank market

Autarky (inter-bank market endogenously shut)
\[ \tau = 0.2 \]
\[ \theta = 0.6 < (1 - \tau) \]

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.