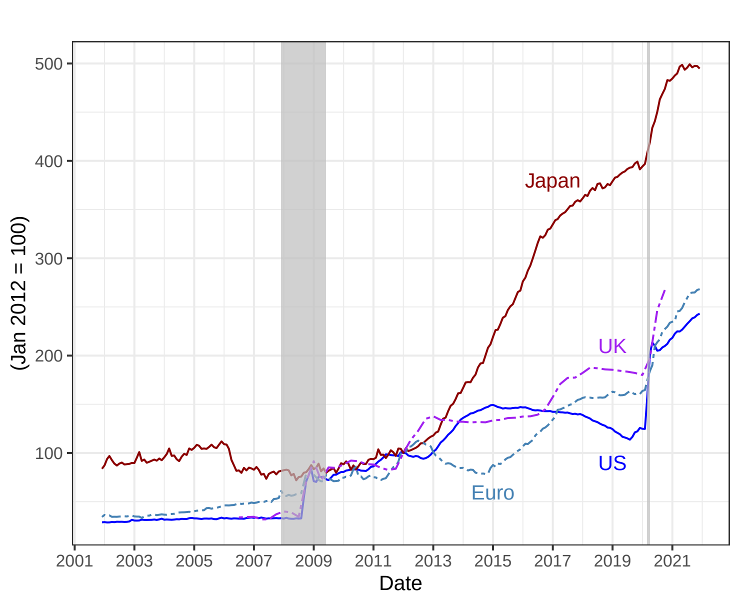
BS Policy Above the ELB by A. Vissing-Jorgensen

Bank of Spain, 2023

by S. Bigio
on November 23, 2023

> Large Balance Sheets



> Motivation

* What is the optimal size of CB balance sheets?

> Motivation

* What is the optimal size of CB balance sheets?

* Classic answer: Friedman rule
  * very large balance sheet
  * satiate banks with reserves
  * use IOR to control policy

> Motivation

* What is the optimal size of CB balance sheets?

* Classic answer: Friedman rule
    * very large balance sheet
    * satiate banks with reserves
    * use IOR to control policy

* V-J paper
    * estimate reserve/bond demand elasticities
    * recommend optimal balance sheet size

> Discussion

* variant of model
* comment: QE needs seigniorage/fiscal support
* comment: interference with traditional channel
* comment: objective function unclear with two assets, costs
* comments on the empirics:
    * tighter estimation

Model Discussion

* Bank Block - Frictionless
* Exogenous Liquidity Demand
* Endogenous Liquidity Demand
* Bonds

> Timing

* two-period: $t = 0, 1$

> Timing

* two-period: $t = 0, 1$
* focus on static $t = 0$ effects
  * inflation expectations are anchored
  * set to meet target

> Notation

- i nominal rates (between $t = 0$ and $t = 1$)

- R real rates:

> Notation

* i nominal rates (between $t = 0$ and $t = 1$)
* R real rates:

$$R^x = \frac{1 + i^x}{1 + \pi}$$

* Quantities:
  * lower-case: real
  * upper case: nominal

> Non Banking: Asset Demand System

* foundations
  * loan demand: working capital loans
  * deposit supply: DIA + quasi-linear good

> Non Banking: Asset Demand System

* foundations
  * loan demand: working capital loans
  * deposit supply: DIA + quasi-linear good

Demand System

Deposit supply:

$$d = \left(R^d_{t+1}\right)^{\epsilon^d}$$

Loan demand:

$$\ell = \Theta \left(R^\ell_{t+1}\right)^{\epsilon^\ell}$$

> Central Bank

* Standard Instrument (fixed):

$$i^m \to R^m \equiv \frac{1+i^m}{1+\pi}$$

* Central Bank Balance sheet
    * private sector loans (Euro)
    * bonds (US)
    * reserves
* Income statement
    * T^h transfers to households
    * discount-window loans
    * purchase loans with M

Model Discussion

* Bank Block - Frictionless
* Exogenous Liquidity Demand
* Endogenous Liquidity Demand
* Bonds

> Bank's Probℓem | No Frictions

* Euro model

* Bank maximizes:

$$\max_{\{\ell,m,d\}\geq 0} \underbrace{R^{\ell}\ell + R^{m}m - R^{d}d}_{\{\text{Portfolio Returns}\}}$$

budget:

$$\ell + m = d$$

> Bank's Problem w|o Frictions

* No frictions | no arbitrage

Return Parity

$$R^{\ell} = R^{m} = R^{d}.$$

Model Discussion

* Bank Block - Frictionless
* Exogenous Liquidity Demand
* Endogenous Liquidity Demand
* Bonds

> Bank's Problem | Settlement Frictions

* Portfolio Return:

$$\underbrace{R^{\ell}\ell + R^{m}m - R^{d}d}_{\text{Expected Portfolio Returns}} + \underbrace{\mathbb{E}\left[\chi(s|\theta)\right]}_{\text{Expected Settlement Costs}}$$

> Bank's Problem | Settlement Frictions

- Portfolio Return:

$$\underbrace{R^{\ell}\ell + R^{m}m - R^{d}d}_{\text{Expected Portfolio Returns}} + \underbrace{\mathbb{E}\left[\chi(s|\theta)\right]}_{\text{Expected Settlement Costs}}$$

- Balance at central bank:

$$s = m - \delta d$$

or

$$s = m$$

  - χ: liquidity risk

> χ encodes interbank market

* χ capture settlement costs:

$$\chi(s) = \begin{cases} \chi^- \cdot s & \text{if } s \leq 0 \\ \\ \chi^+ \cdot s & \text{if } s > 0 \end{cases}$$

> Consequences

- Liquidity service and risk:

$$R^{\ell} = R^m + \underbrace{\frac{1}{2}\left[\chi^+ + \chi^-\right]}_{\mathcal{L}} = R^d + \underbrace{\frac{\delta}{2}\chi^-}_{\mathcal{S}}$$

Liquidity Premia (convenience yield)

$$R^{\ell} > R^d > R^m$$

- Exogenous spread $v \equiv \mathcal{L} - \mathcal{S}$
  - no QE

Model Discussion

* Bank Block - Frictionless
* Exogenous Liquidity Demand
* Endogenous Liquidity Demand
* Bonds

> χ encodes interbank market

* Recall:

$$\chi(s; \theta) = \begin{cases} \chi^- \cdot s & \text{if } s \leq 0 \\ \\ \chi^+ \cdot s & \text{if } s > 0 \end{cases}$$

> χ encodes interbank market

* Recall:

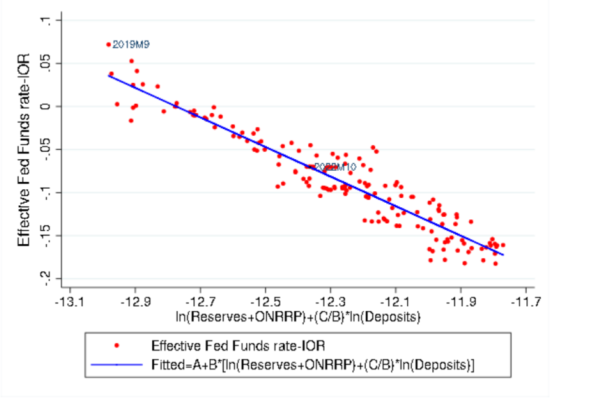
$$\chi(s;\theta) = \begin{cases} \chi^{-} \cdot s & \text{if } s \leq 0 \\ \\ \chi^{+} \cdot s & \text{if } s > 0 \end{cases}$$

* Tightness (interbank)

$$\theta = \underbrace{-\frac{\overbrace{m/d - \delta}^{\text{deficit}}}{m/d}}_{\text{surplus}}$$

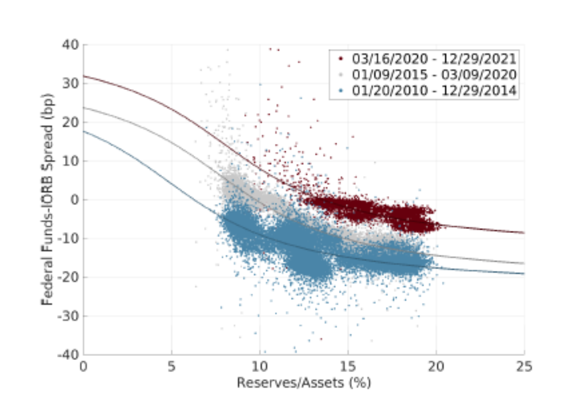
* $\chi(s;\theta)$ related to tightness
  * $\bar{R}(\theta)$ endogenous interbank rate
  * $\psi^{-}(\theta)$ discount-window access

> Data Counterparts



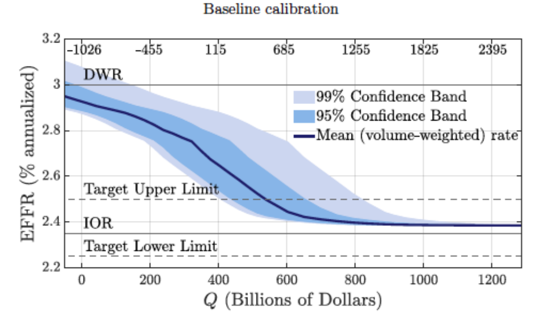
Lopez-Salido Vissing-Jorgensen (2023)

> Data Counterparts



Afonso, Gianone, LaSpada, Williams (2023)

> Data Counterparts



Lagos Navarro (2023)

> Consequences

* Rates now depend on liquidity service and risk:

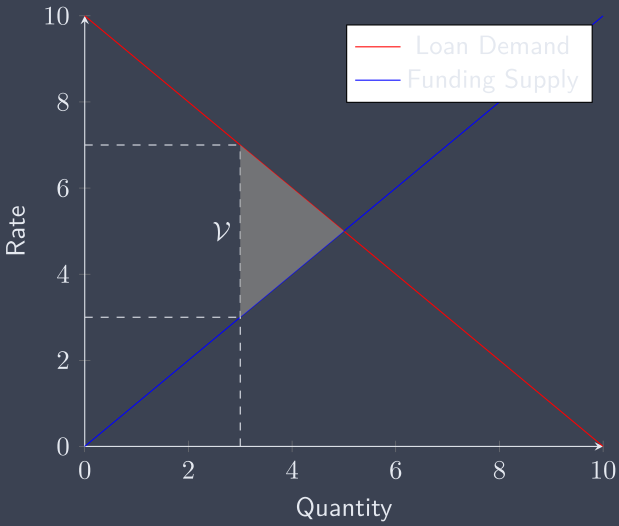
$$R^{\ell} = R^{m} + \frac{1}{2}\underbrace{\left[\chi^{+}(\theta) + \chi^{-}(\theta)\right]} = R^{d} + \frac{\delta}{2}\underbrace{\chi^{-}(\theta)}_{\Sigma(M/P,d)}$$

Recall:

$$\theta = \underbrace{-\frac{\overbrace{M/P/d - \delta}^{\text{deficit}}}{M/P/d}}_{\text{surplus}}$$

$$R^{\ell} - R^{d} = \mathcal{V}\left(M/P, d\right)$$

> Non Banking: Asset Demand System



> Harberger Triangle

* Why?

$$W(\ell, d) = U(\ell) + V(d)$$

* Then:

$$\Delta \equiv W(\ell^\star, d^\star) - W(\ell, d) = \int_{\mu_0}^{\mu^\star} U'\left(\ell\left(m\right)\right) + V'\left(d\left(\mu\right)\right) d\mu$$

* Equilibrium conditions:

$$U'\left(\ell\right) = R^b - R^m \quad V'\left(d\right) = R^d - R^m$$

* Then, we have:

$$\Delta \approx -\frac{1}{2}\left(\underbrace{\mathcal{L}\left(M/P, d\right)}_{\text{spread}}\left(\ell^\star - \ell\right) + \underbrace{\mathcal{S}\left(M/P, d\right)}_{\text{spread}}\left(d^\star - d\right)\right)$$

* Comment: supply/demand elasticities appear in optimal

> Optimal: Flooded Market

* flood interbank market

$$\mathcal{V} = 0$$

> Optimal: Flooded Market

* flood interbank market

$$\mathcal{V} = 0$$

Friedman Rule

Asset purchase L under satiation:

$$\uparrow M < \uparrow m(\mathcal{L}) \cdot \underbrace{P}_{\text{fixed}}$$

> Optimal Balance Sheet

- Comment: need fiscal support (seigniorage or transfers)

> Optimal Balance Sheet

* Comment: need fiscal support (seigniorage or transfers)

$$\ell = d + e^{cb}(P)$$

* Return conditions

$$R^{\ell} = R^{m} + \mathcal{L}(M/P, d)$$
$$R^{d} = R^{\ell}(\ell) + \mathcal{S}(M/P, d)$$
$$d = \left(R^{m} + \mathcal{S}(M/P, d)\right)^{\epsilon^{d}} \to \bar{d}(M/P)$$

> Optimal Balance Sheet

* Comment: need fiscal support (seigniorage or transfers)

$$\ell = d + e^{cb}(P)$$

* Return conditions

$$R^{\ell} = R^{m} + \mathcal{L}(M/P, d)$$
$$R^{d} = R^{\ell}(\ell) + \mathcal{S}(M/P, d)$$
$$d = (R^{m} + \mathcal{S}(M/P, d))^{\epsilon^{d}} \to \bar{d}(M/P)$$

* Aggregate resource constraint:

$$\Theta (R^{m} + \mathcal{L}(m))^{\epsilon^{b}} = (R^{m} + \mathcal{S}(m))^{\epsilon^{d}} + e^{cb}(P)$$

> Optimal Balance Sheet

- Comment: need fiscal support (seigniorage or transfers)

$$\ell = d + e^{cb}(P)$$

- Return conditions

$$R^{\ell} = R^{m} + \mathcal{L}(M/P, d)$$
$$R^{d} = R^{\ell}(\ell) + \mathcal{S}(M/P, d)$$
$$d = (R^{m} + \mathcal{S}(M/P, d))^{\epsilon^{d}} \rightarrow \bar{d}(M/P)$$

- Aggregate resource constraint:

$$\Theta (R^{m} + \mathcal{L}(m))^{\epsilon^{b}} = (R^{m} + \mathcal{S}(m))^{\epsilon^{d}} + e^{cb}(P)$$

- Optimal balance sheet

$$\mathcal{L}(M/P, d) = \mathcal{S}(M/P, d) = 0$$

- Comment: need fiscal counterpart

> without fiscal counterpart

Neutrality I: Wallace Neutrality

Asset purchase L under satiation:

$$\uparrow M < \underbrace{m(\mathcal{L})}_{\text{fixed}} \cdot \uparrow P$$

zero-effect on spreads, all to P!

> Loan demand - wage/price rigidity

Price/Wage rigidity

Loan demand (firms):

$$\ell\left(\bar{R}^{\ell}, P\right)$$

> Loan demand - wage/price rigidity

Price/Wage rigidity

Loan demand (firms):

$$\ell\left(\bar{R}^{\ell}, P\right)$$

* comment: conflicting targets

> Iso-Fed Funds

* Iso-Fed Funds:

$$\bar{R} = R^m + \phi(m)$$

* Then, we

$$0 = dR^m + \phi'(m)\left(\frac{dm}{m}\right)$$

> Iso-Fed Funds

* Iso-Fed Funds:

$$\bar{R} = R^m + \phi(m)$$

* Then, we

$$0 = dR^m + \phi'(m)\left(\frac{dm}{m}\right)$$

* Comment: if target is aggregate demand
    * right target: R^d

Model Discussion

* Bank Block - Frictionless
* Exogenous Liquidity Demand
* Endogenous Liquidity Demand
* Bonds

> Non Banking: Asset Demand System

* Bond supply
  * exogenous aggregate supply b^{agg}

> Non Banking: Asset Demand System

* Bond supply
  * exogenous aggregate supply b^{agg}

Demand System

Money Market Funds:

$$f = \left(R^f_{t+1}\right)^{\epsilon^f}$$

> Shadow Bank's Probℓem

- Bank maximizes:

$$\max_{\{f,m\}\geq 0} \underbrace{\left(R^m - R^b\right) m - \left(R^f - R^b\right) f}_{\{\text{Expected Portfolio Returns}\}}$$

$$b + m = f$$

$$b \geq \delta f$$

- We end with:

$$R^m > R^b > R^f$$

> Tradeoffs

* Much richer responses:

$$b + \Theta\left(R^m + \mathcal{L}\left(m^b\right)\right)^{\epsilon^b} = \left(R^m + \mathcal{S}\left(m^b\right)\right)^{\epsilon^d} + \delta\,\overbrace{\left(b - b^{cb}\right)}^{f} + e^{cb}(P)$$

* Bank balance sheet

$$b^{cb} = m + e^{cb}(P)$$

* Bank reserves

$$m^b = m - \frac{\delta}{1-\delta}\left(b - b^{cb}\right)$$

> Harberger Triangle Again

* Welfare now:

$$\Delta \approx -\frac{1}{2}\left(\underbrace{\mathcal{L}(m)}_{\text{spread}}(\ell^\star - \ell) + \underbrace{\mathcal{S}(m)}_{\text{spread}}(d^\star - d) + \underbrace{\phi(m)}_{\text{spread}}(f^\star - f)\right)$$

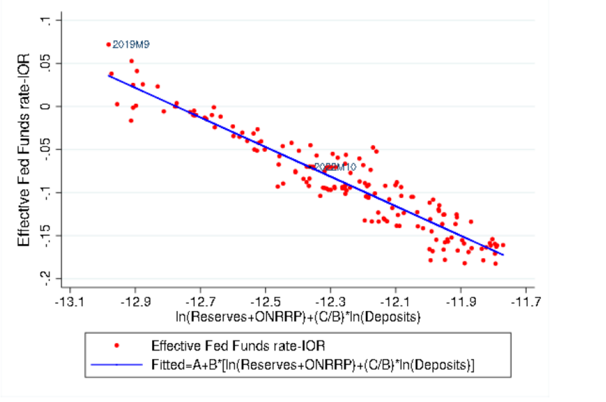
* Increase in $\Uparrow m$

$$\Uparrow \overbrace{\underbrace{\mathcal{L}(m)}_{\text{spread}}(\ell^\star - \ell) + \underbrace{\mathcal{S}(m)}_{\text{spread}}(d^\star - d)}^{\textit{bank}} + \Downarrow \overbrace{\underbrace{\phi(m)}_{\text{spread}}(f^\star - f)}^{\textit{shadow}}$$

* Comment: here, funding demand elasticities pop up

Empirical Effort

> Data Counterparts



Lopez-Salido Vissing-Jorgensen (2023)

> Estimation Issues

* Demand equation:

$$\mathcal{L}\,(M, D)$$

  * estimates: not H1
  * problematic for monetary model

* Potentially polluted by demand shocks:
  * heterogeneity
  * demand shifters

* Use interbank spreads to capture demand

Conclusion

> Conclusion

* Paper after right question
  * use money demand elasticities as sufficient statistics

> Conclusion

* Paper after right question
  * use money demand elasticities as sufficient statistics
* Key issues
  * sufficient stats not enough
  * demand elasticities are key
  * conflicting policy goals