Funding, Wealth Transfer and Financial Stability in the post-LIBOR Era

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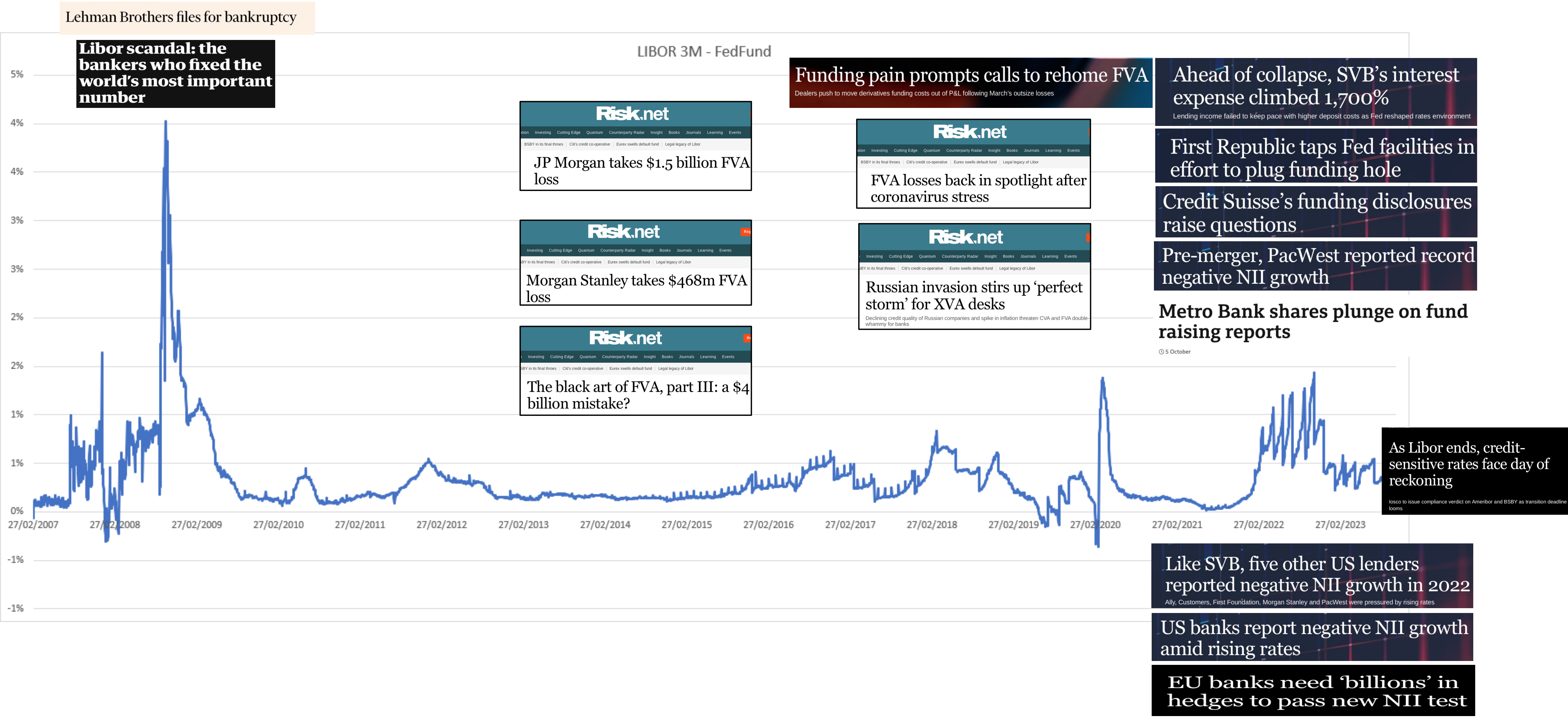
Interest rate 101

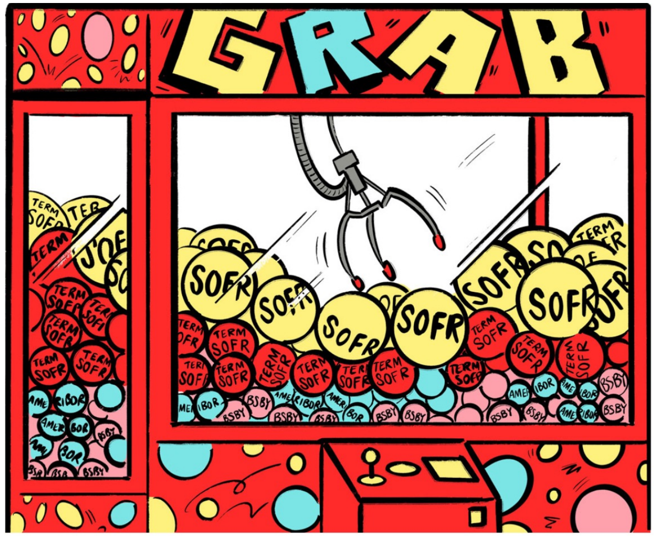
The reference interest rate synthetizes an inter-temporal exchange of wealth and a transfer of intermediation costs.

The funding risk Pandora's box



LIBOR transition miss-concepts

- LIBOR did not generate any wealth transfer
- The LIBOR transition could generate a one-off wealth transfer, which is consistent between parties
- SOFR, Term-SOFR, Synthetic-LIBOR, AXI, BSBY, Ameribor, etc., no one rate to rule the transition



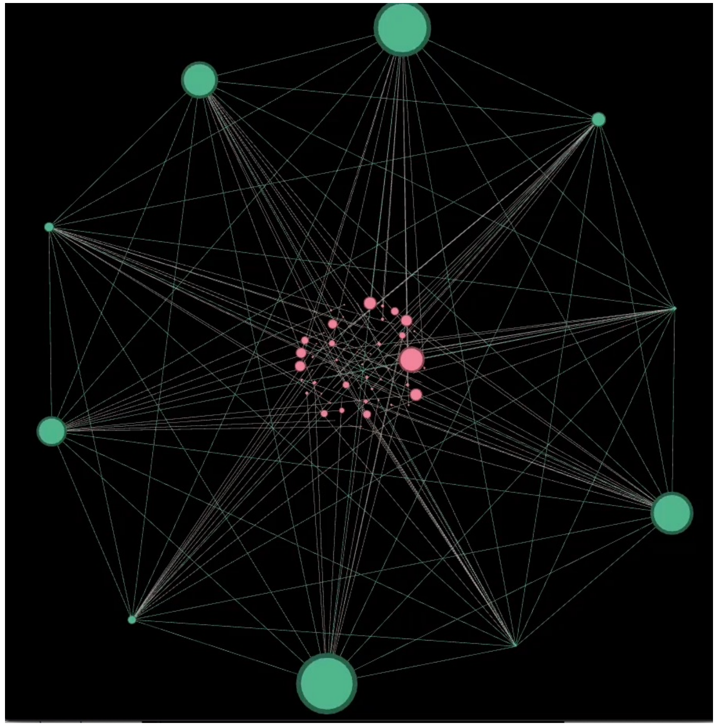
Mark Long, www.nbillustration.co.uk

The LIBOR-transition: hidden opportunity

The LIBOR transition is a unique opportunity to:

- Eliminate wealth transfer
- Enhance banking-system resiliency
- Optimize client’s allocation incentives
- Drive economic and financial growth

A dynamic-network model



Banks

- The evolution of a bank's balance-sheet

Liabilities	Assets
$\overbrace{L_b(t_i)}^{\text{Liabilities}} = \overbrace{E_b(t_0)}^{\text{Equity}} + \overbrace{D_b(t_i)}^{\text{Debt}} + \overbrace{\sum_{j=0}^{i} min(N_b(t_j), 0)}^{\text{Cumulative Losses}},$	$\overbrace{\mathrm{A}_b(t_i)}^{\text{Assets}} = \overbrace{\mathrm{I}_b(t_i)}^{\text{Loans}} + \overbrace{\mathrm{R}_b(t_i)}^{\text{Reserves}} + \overbrace{\mathrm{H}_b(t_i)}^{\text{Cash}}$
$D_b(t_i) = \sum_{\substack{\kappa \in K' \\ s.t.\ \kappa \neq b}} w_{\kappa,b}(t_i).$	$\mathrm{I}_b(t_i) = \sum_{\substack{\kappa \in K \\ s.t.\ \kappa \neq b}} w_{b,\kappa}(t_i).$
	$\mathrm{R}_b(t_i) = 8\% \cdot \mathrm{L}_b(t_i)$

- Default event

$$\tau^b = \inf[t_i | E_b(t_i) < \underbrace{\alpha}_{\text{Regulatory Default Threshold}}]$$

Banks

- The evolution of a bank's P&L

Profits	Losses
$\displaystyle\sum_{\substack{\kappa\in K\\ s.t.\ \kappa\neq b}} \overbrace{\underbrace{\phi^{+}_{b,\kappa}(t_i)}_{\text{See later}}\cdot w_{b,\kappa}(t_i)\cdot\delta t}^{\text{Receivable IRs}}$	$\displaystyle\sum_{\substack{\kappa\in K'\\ s.t.\ \kappa\neq b}} \overbrace{\phi^{-}_{\kappa,b}(t_i)\cdot w_{\kappa,b}(t_i)\cdot\delta t\cdot \underbrace{1_{D_b(t_i)\leq M}}_{\text{Max leverage}}}^{\text{Payable IRs}}$

$$\phi^{-}_{\kappa,b} = \overbrace{r_f(t_i)}^{\text{Risk-free Rate}} + \underbrace{l_b(t_i)}_{\text{Leverage}}\cdot\overbrace{\gamma_b(t_i)}^{\text{Funding Rate}}$$

$$\begin{cases} dr_f(t) = \kappa_r\cdot(\theta_r - r_f(t))\cdot dt + \sigma_r\cdot\sqrt{r_f(t)}\cdot dW_r(t), \\ d\gamma_b(t) = \kappa_b\cdot(\theta_b - \gamma_b(t))\cdot dt + \sigma_b\cdot\sqrt{\gamma_b(t)}\cdot dW_b(t), \\ dW_r(t)\cdot dW_b(t) = \rho\, dt, \end{cases}$$

Real investors

- The evolution of a real agent's balance sheet

$$\overbrace{E_c(t_i)}^{\text{Equity}} = \overbrace{A_c(t_i)}^{\text{Assets}} - \underbrace{D_{b,c}(t_i)}_{\text{Debt,}}$$

including payable IRs $\left(\underbrace{\phi^{-}_{b,c}(t_i)}_{\text{See later}}\right)$

$$dA_c(t_i) = A_c(t_i) \cdot \mu_c \cdot dt + A_c(t_i) \cdot \sigma_c \cdot dW_c(t_i)$$

At each t_i, non-defaulted banks compete for non-defaulted clients. We assume that clients are rational, i.e., they always prefer the bank $b^* \in B$ that offers the lowest rate, i.e.

$$b^* = \inf_{b \in B} \phi^{-}_{b,c}(t_i)$$

A migration occurs if a client chooses a bank different from the one that previously funded him.

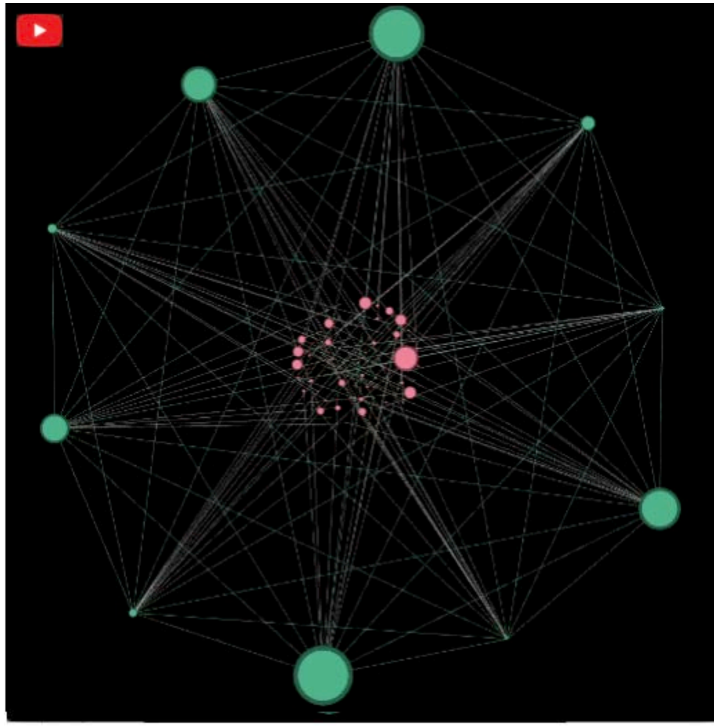
- The real agent's default event

$$\tau^c = \mathbf{inf}[t_i | E_c(t_i) \leq 0]$$

Characterizing Interest Rates $\left(\phi\ (t_i)\right)$

1) Risk-free rate-centric system (e.g., SOFR)

$$\phi^{+}_{b,\kappa}(t_i) = \underbrace{r_f(t_i)}_{\text{Risk-Free Rate}} + \underbrace{\psi_\kappa(t_i)}_{\text{Credit-risk add-on}}$$

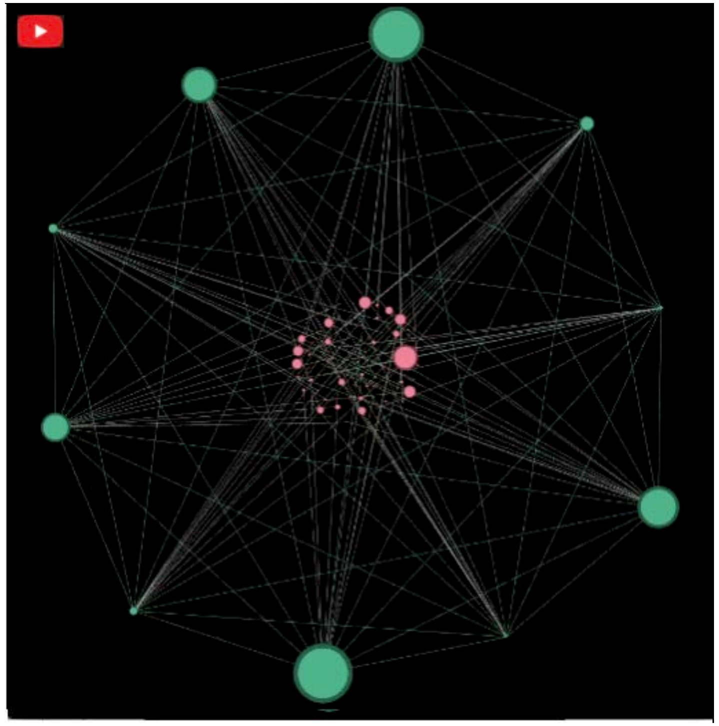


Characterizing Interest Rates $(\phi\ (t_i))$

2) Risk-free rate plus static funding premium (e.g., current FVA practices)

$$\phi^{+}_{b,\kappa}(t_i) = \underbrace{r_f(t_i)}_{\text{Risk-Free Rate}} + \underbrace{\psi_\kappa(t_i)}_{\text{Credit-risk add-on}} + \underbrace{\epsilon}_{\text{Static Funding add-on}}$$

with $\epsilon = l_b^\kappa \cdot \gamma_b(t_0)$, and l_b^κ the marginal contribution of the kth client to the bank's funding costs, as recorded at the trade's inception

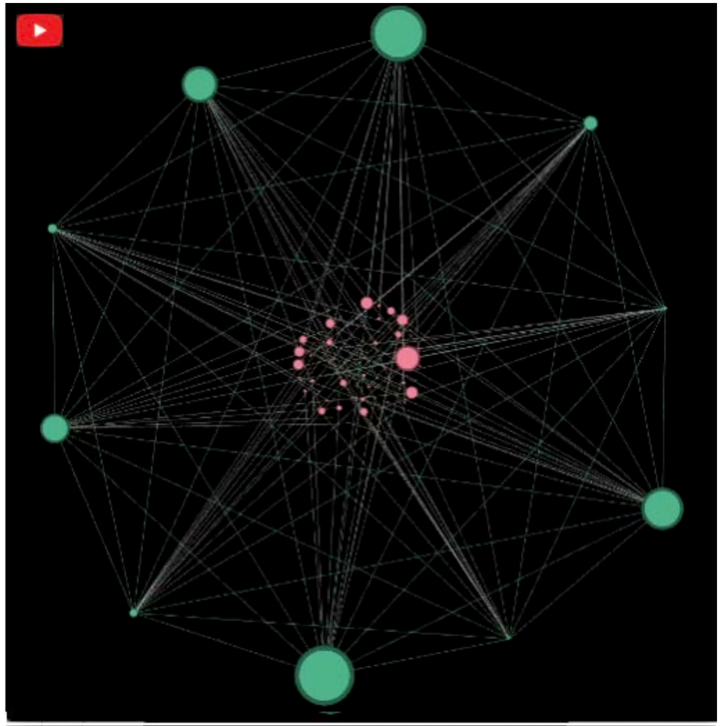


Characterizing Interest Rates $(\phi\ (t_i))$

3) Risk-free rate plus floating average funding premium (e.g., LIBOR, AXI, BSBY)

$$\phi^{+}_{b,\kappa}(t_i) = \underbrace{r_f(t_i)}_{\text{Risk-Free Rate}} + \underbrace{\psi_\kappa(t_i)}_{\text{Credit-risk add-on}} + \underbrace{\bar{\epsilon}(t_i)}_{\text{Floating Avg. Funding Rate}}$$

with $\bar{\epsilon}(t_i) = \sum_{x \in B} \gamma_x(t_i) \cdot \xi_x(t_i)$, and $\xi_x(t_i) = \frac{D_x(t_i)}{\sum_{y \in B} D_y(t_i)}$ the debt's volume weight



Characterizing Interest Rates $\left(\phi\ (t_i)\right)$

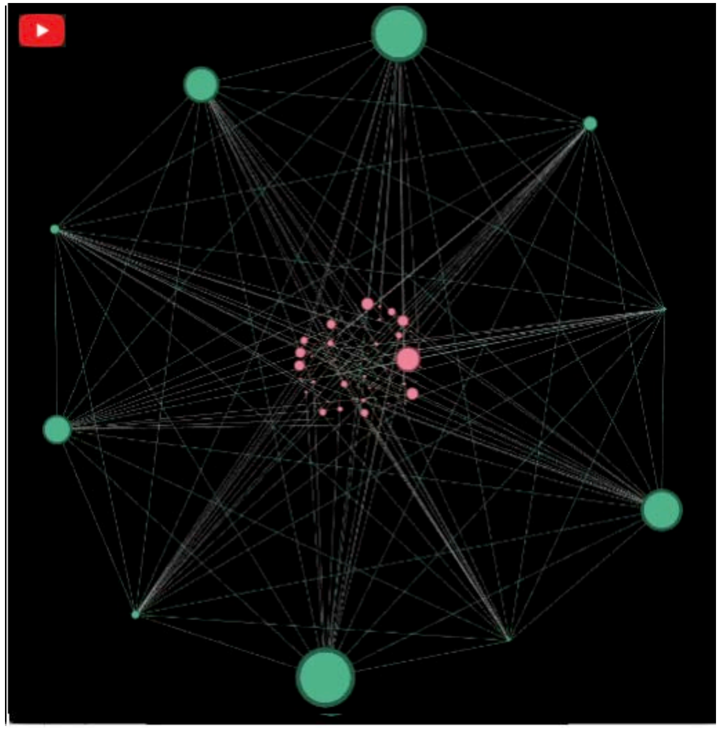
4) Risk-free rate plus elastic rates (aka, FVA Resets)

$$\phi^{+}_{b,\kappa}(t_i) = \underbrace{r_f(t_i)}_{\text{Risk-Free Rate}} + \underbrace{\psi_\kappa(t_i)}_{\text{Credit-risk add-on}} + \underbrace{\epsilon_{b,\kappa}(t_i)}_{\text{Elastic Rates}}$$

with

$$\epsilon_{b,\kappa}(t_i) = \left[\left(1 - \frac{A^\kappa_b(t_i)}{A_b(t_i)}\right) \cdot \gamma_b(t_i) \cdot l_b(t_i) \cdot \sum_{x \in K'} w_{x,b}(t_i) \cdot 1_{D_b(t_i) \leq M}\right]^+,$$

in which the term $A^\kappa_b(t_i)$ is the marginal impact to the bank's asset value of funding the κ^{th} client.

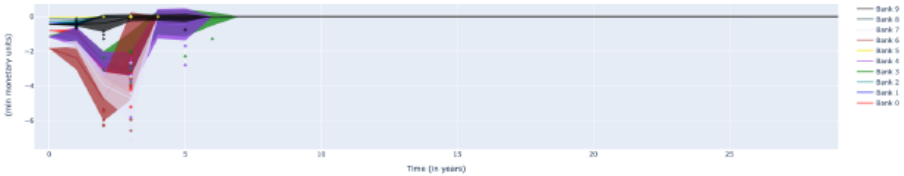


* Ref. Albanese, Iabichino, and Mammola. Risk managing the LIBOR transition (2020) for more details on the computation angle.

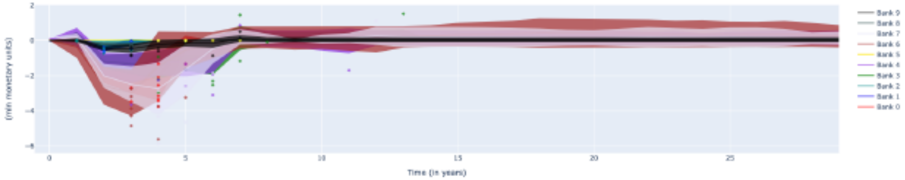
Under the hood

Bank's Funding P&L (NII)

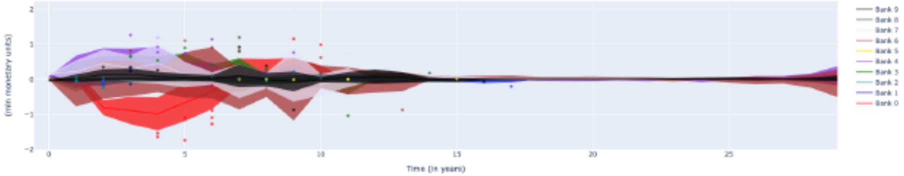
1) Risk-free rate-centric system (e.g., SOFR)



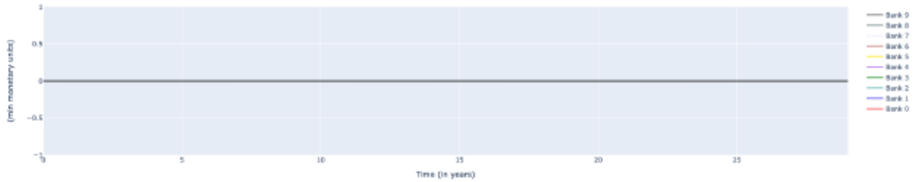
2) Risk-free rate plus static funding premium (e.g., FVA)



3) Risk-free rate plus floating average funding premium (e.g., LIBOR, AXI, BSBY)

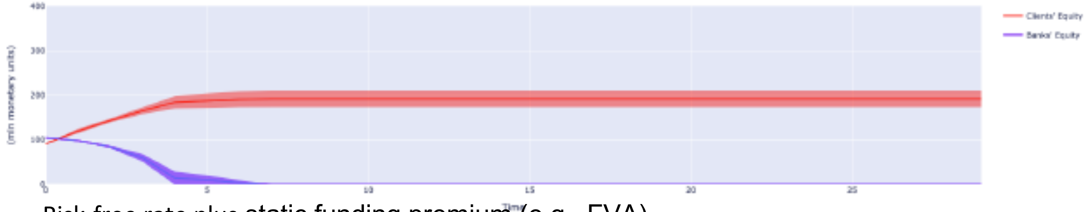


4) Risk-free rate plus elastic rates

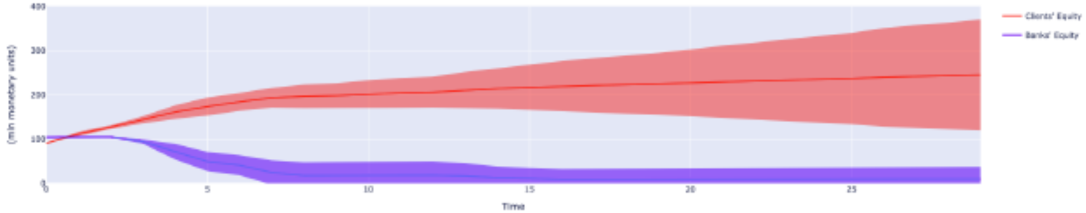


Wealth Transfer

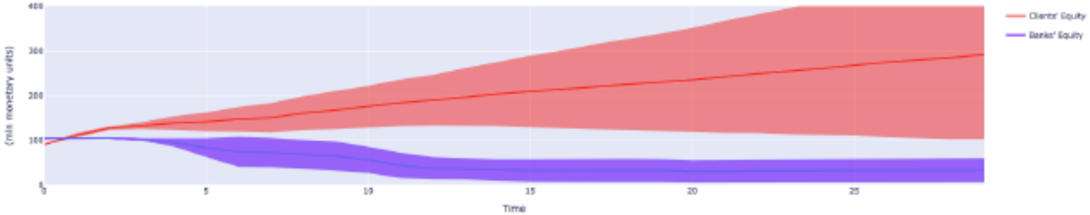
1) Risk-free rate-centric system



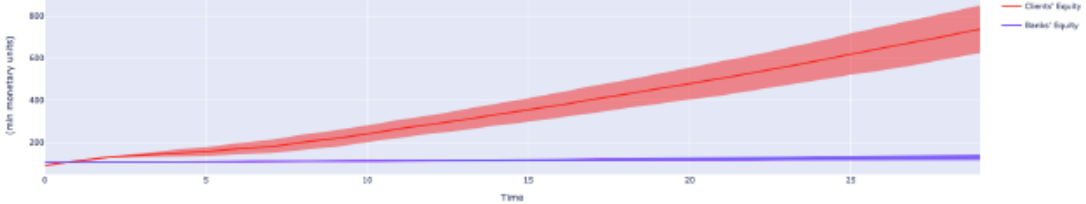
2) Risk-free rate plus static funding premium (e.g., FVA)



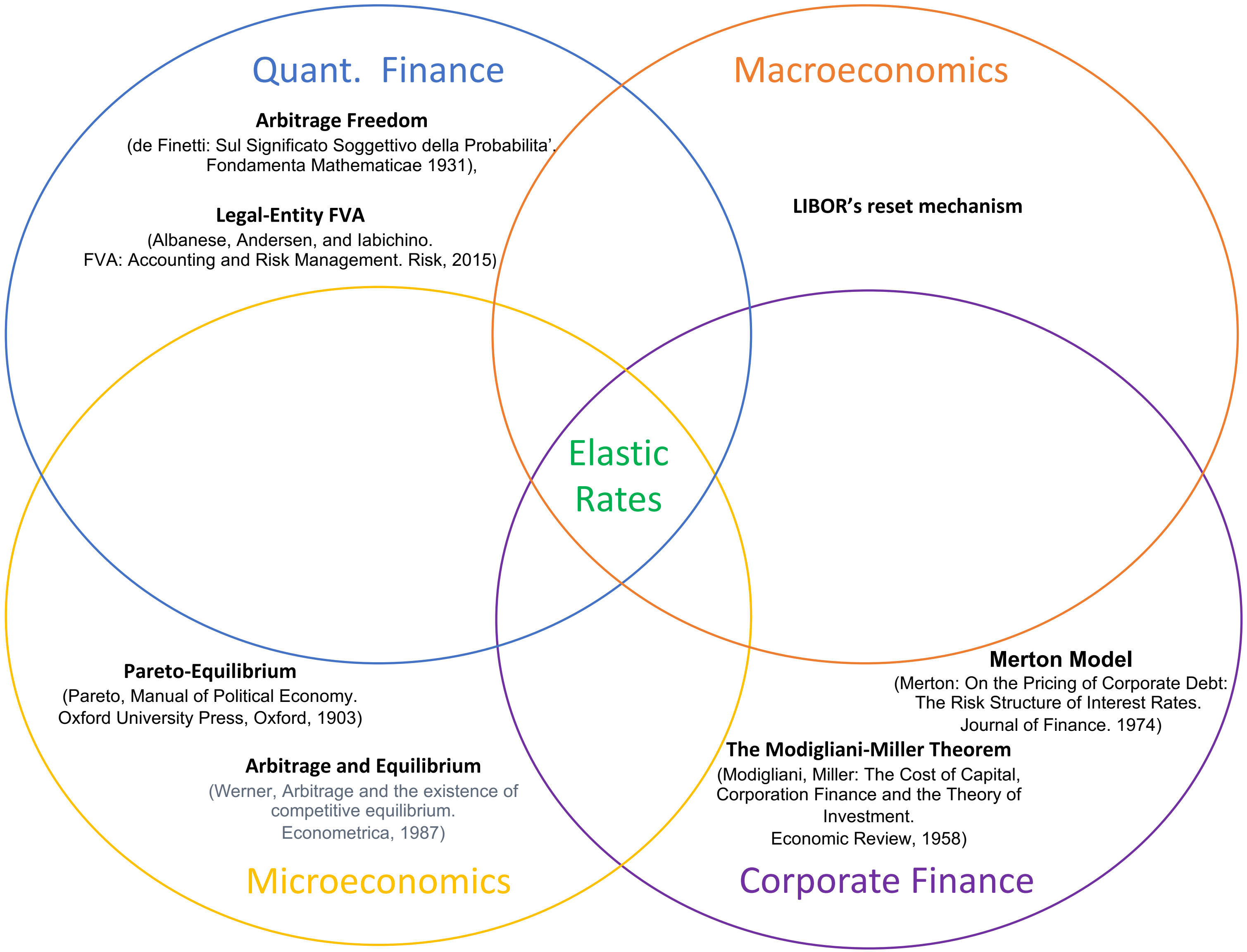
3) Risk-free rate plus floating average funding premium (e.g., LIBOR, AXI, BSBY)



4) Risk-free rate plus elastic rates



Elastic Interest Rates



Conclusion

Elastic Interest rates to:

- Promote the fair exchange of a bank's marginal funding costs
- Eliminate wealth transfer
- Preserve volumes in stressed periods without the need for external intervention
- Provide clients transparency and optimal allocation incentives to safeguard their intermediary channel.