What is funding liquidity risk and how can a bank manage it?

Iain Ritchie

Actuarial Research Centre

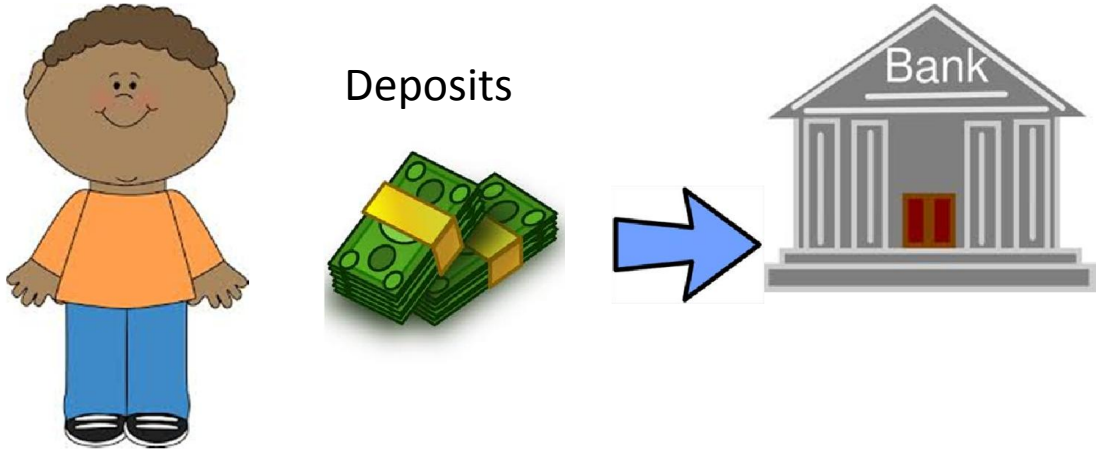
16 September

LEHMAN BROTHERS

BEAR STEARNS

Bank

How do banks work?



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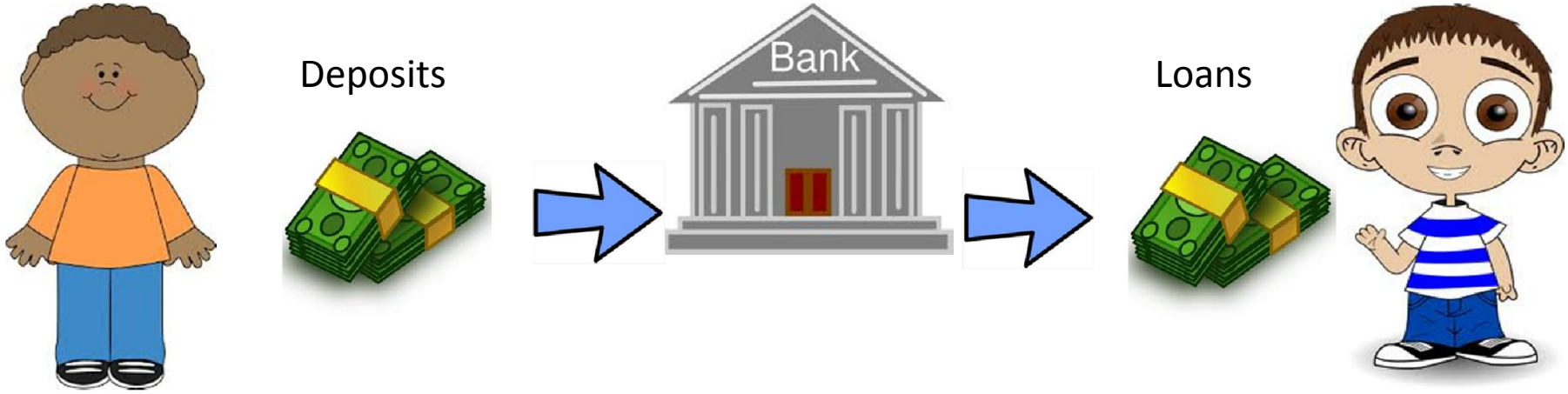

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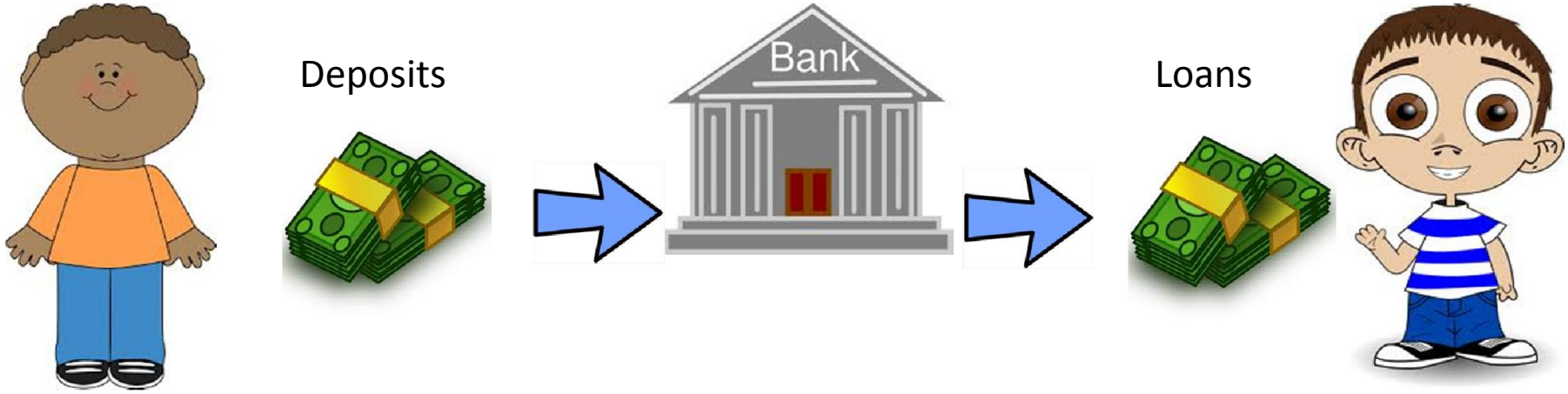

Liabilities

Assets

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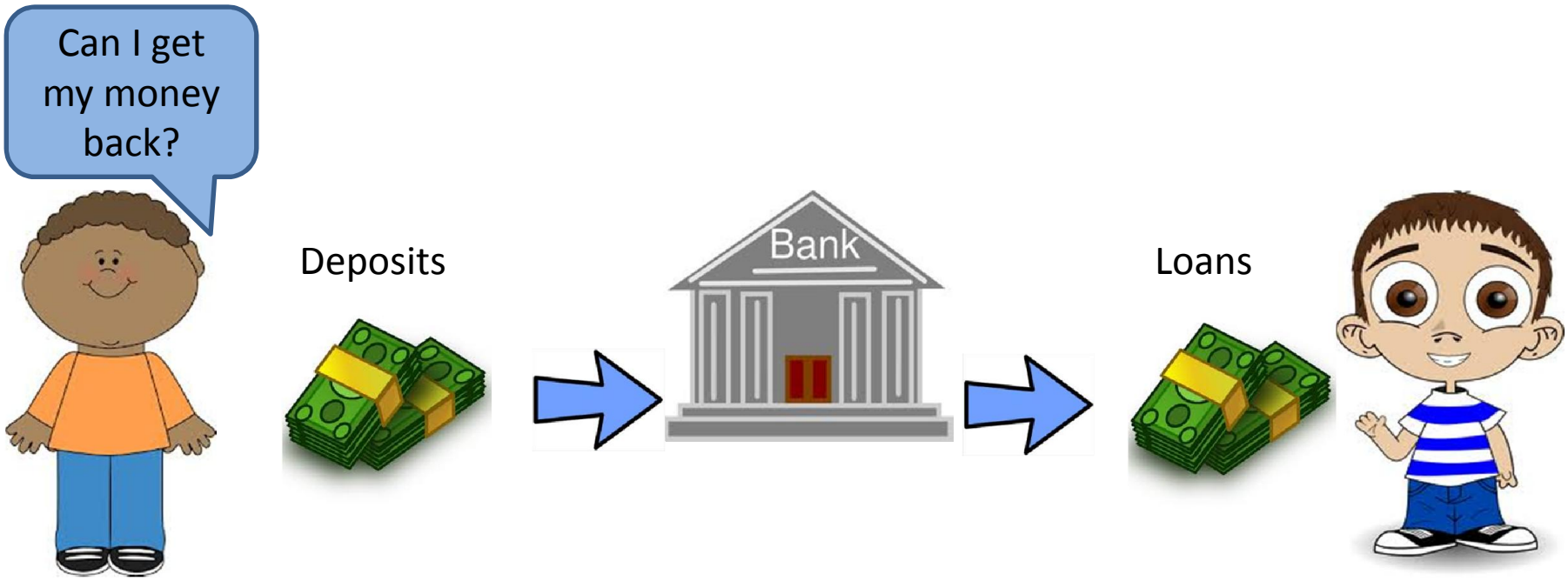

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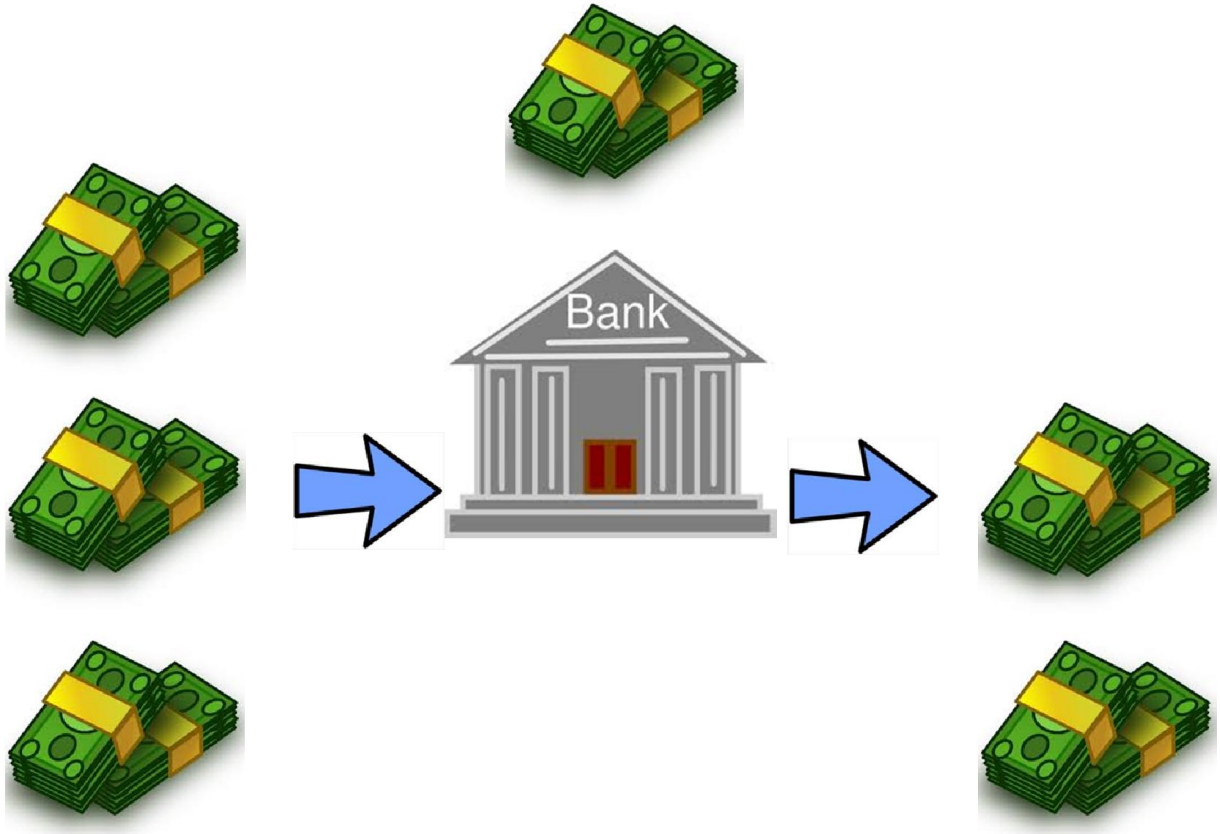

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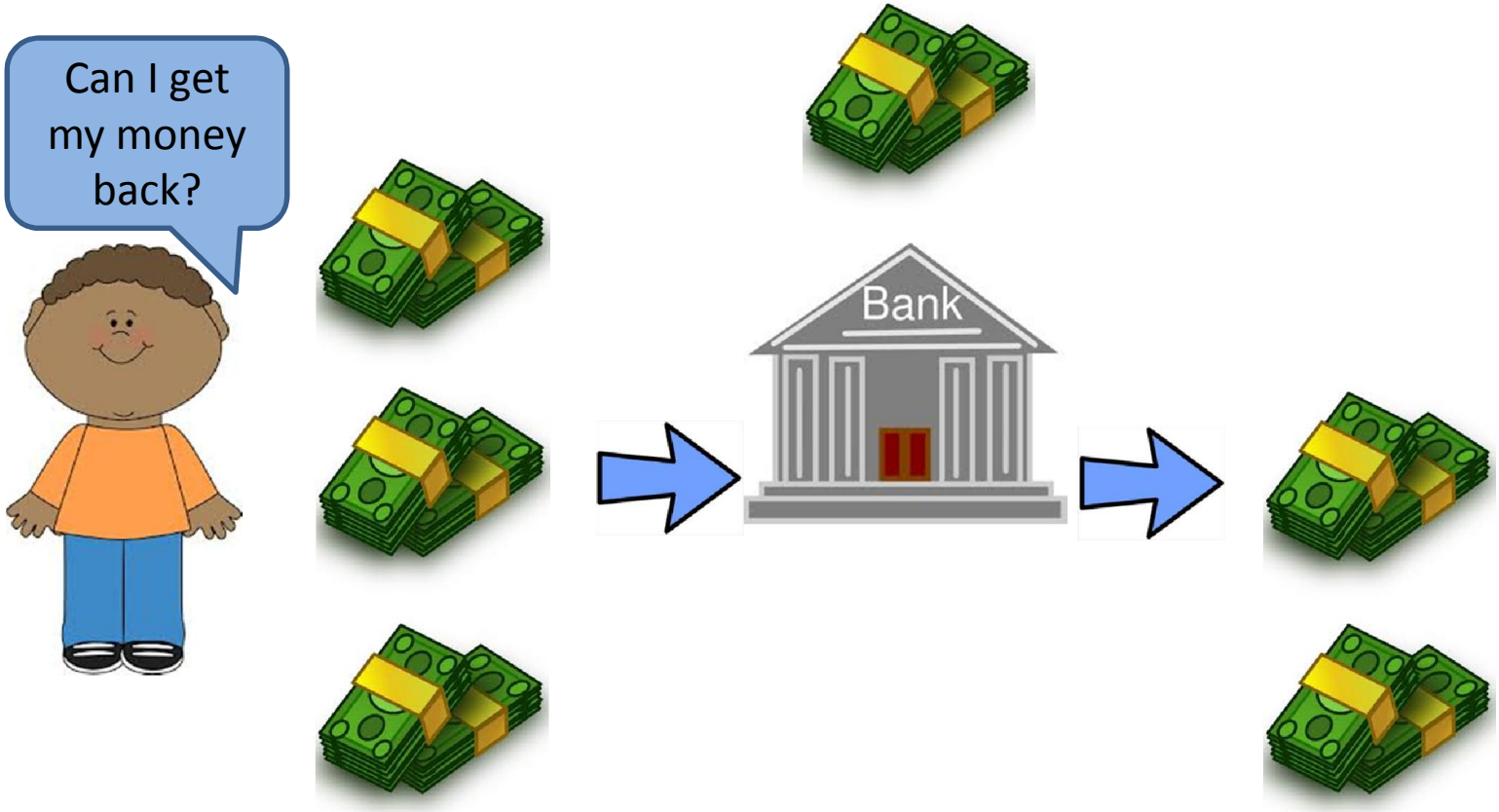

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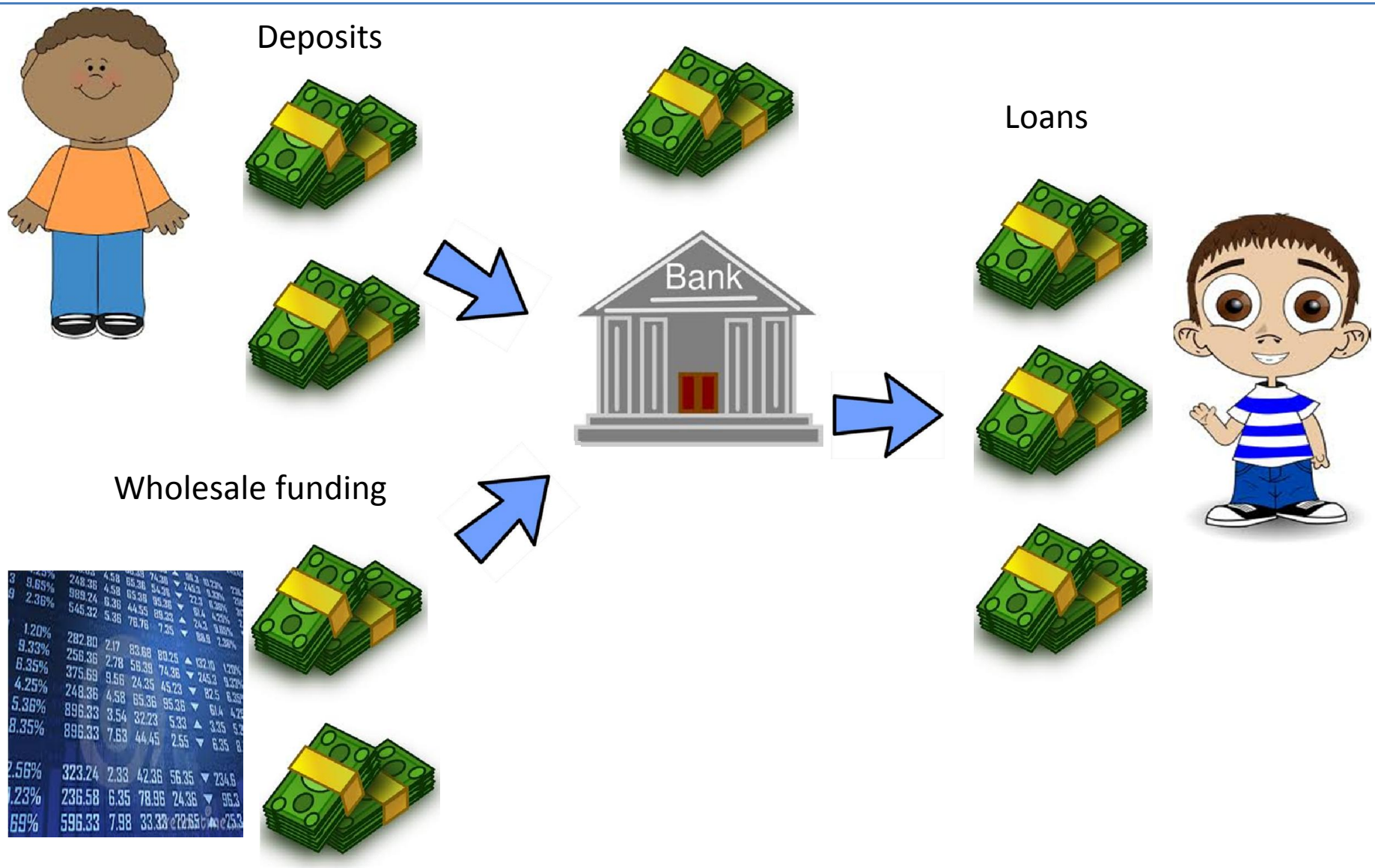


Depositors

Run on the bank!

Managing Liquidity

Maturity mismatch

ILLUSTRATIVE

Purpose: To measure the net funding requirement (or surplus) per maturity bucket. This is the main regulatory requirement for liquidity measurement.

Measure: Measures the net cash flow for each maturity bucket.

Analysis: In the short-term, when commitments (cash outflows) exceed assets (cash inflows) the Money Markets desk need to raise additional funding. In the longer-term, structural imbalances, ALCO will determine the appropriate funding strategy.

Maturity Mismatch Ladder

	Sight	8 Day	1 month	3 mo	6 mo	1 year	3 years	5 years	5 years+	TOTAL
Inflows	805	383	273	268	143	129	276	657	742	3,675
Outflows	980	813	838	1,563	277	52	11	0	0	4,533
Mismatch	(175)	(430)	(570)	(1,295)	(134)	77	265	657	742	(858)

FX mismatch

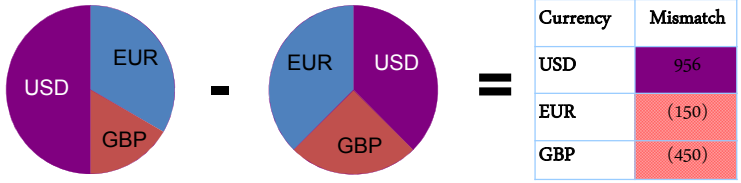
ILLUSTRATIVE

Purpose: To measure the gap between funding and lending in each currency.

Measure: Funding minus lending, per currency.

Analysis: By measuring FX mismatch, the bank gains an understanding of its exposure to the risk that FX swap markets become illiquid which could force a large open FX position or make it difficult to meet commitments in a particular currency.

Funding **Lending** **FX mismatch**



Currency	Mismatch
USD	956
EUR	(150)
GBP	(450)

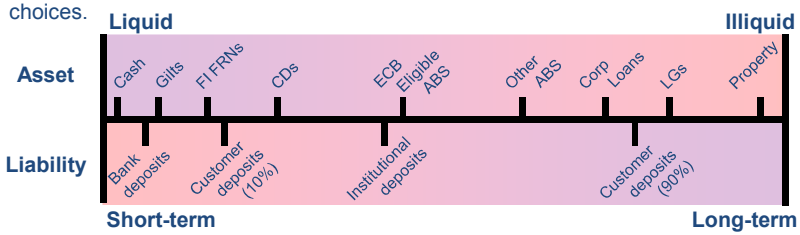
Asset / liability liquidity ladder

ILLUSTRATIVE

Purpose: To measure the asset liquidity and likely stickiness of liabilities.

Measure: Each asset/liability type (per COA) is rated based on size of holding, contractual maturity, behavioural stickiness, yield, cost to liquidate.

Analysis: A detailed understanding of the attributes and behaviour of the bank's balance sheet allows ALCO to make better informed strategic choices.



Funding concentration

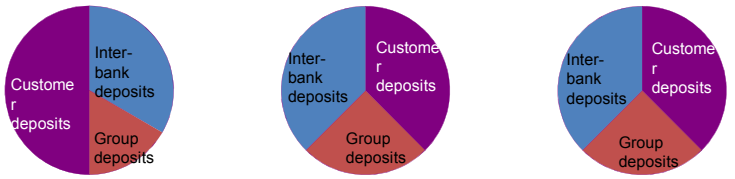
ILLUSTRATIVE

Purpose: To measure the relative concentration of each funding source.

Measure: % concentration of each funding source per maturity bucket.

Analysis: Analysing funding concentration risk allows the bank to develop effective diversification strategies.

Sight – 8 days **1 month** **1 year**



Source: M.Choudry, Bank Liquidity Risk Management, John Wiley & Sons, 2012

Fund Transfer Pricing

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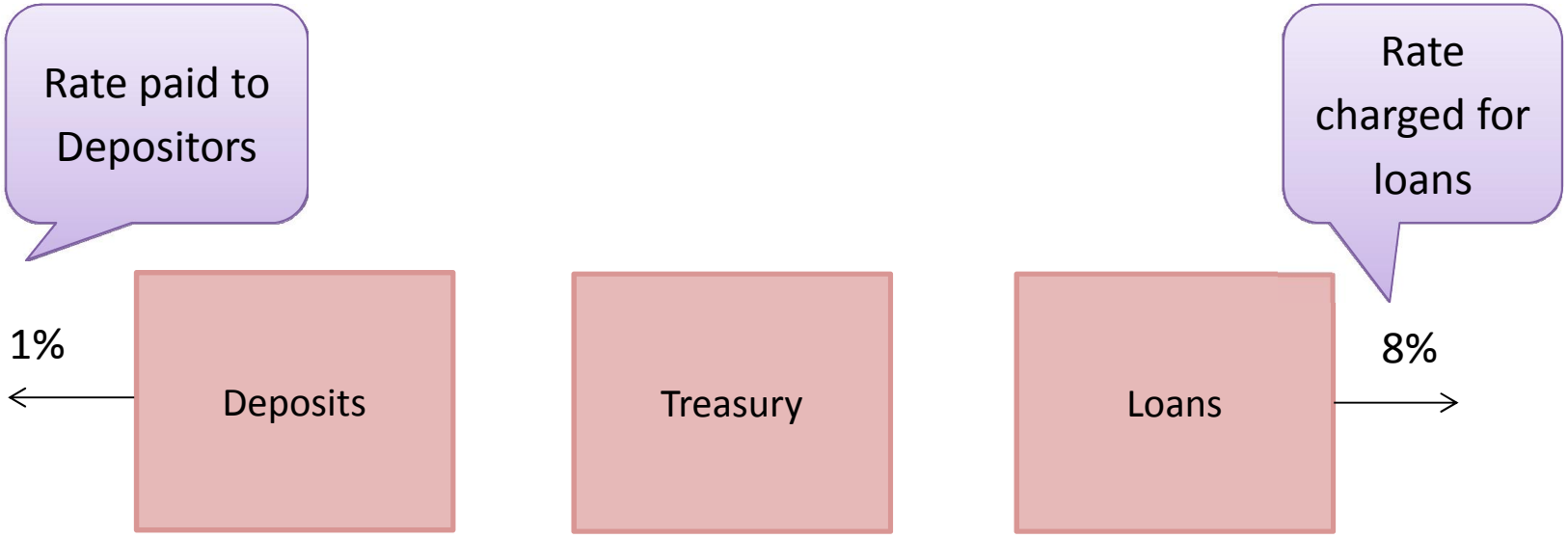

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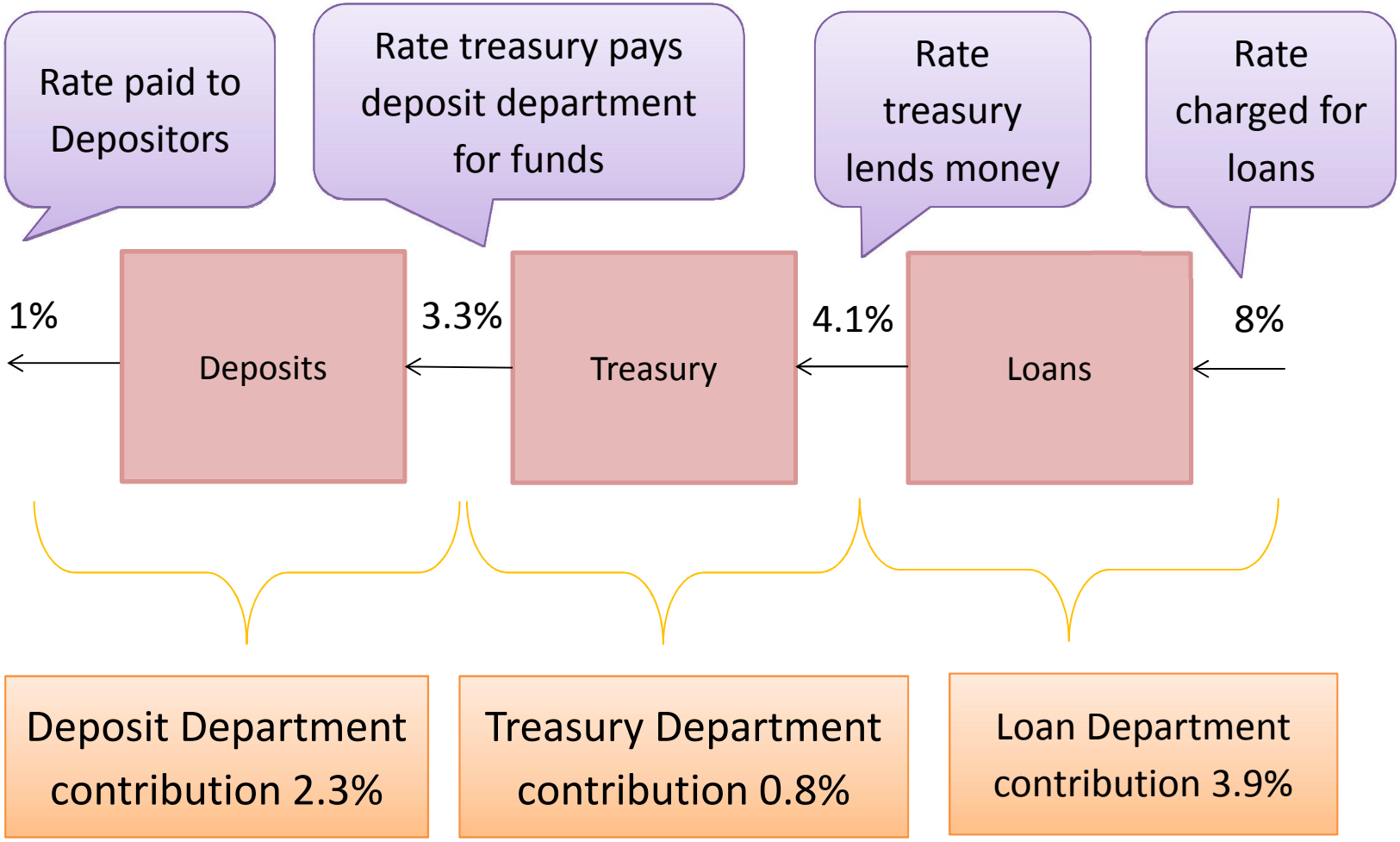

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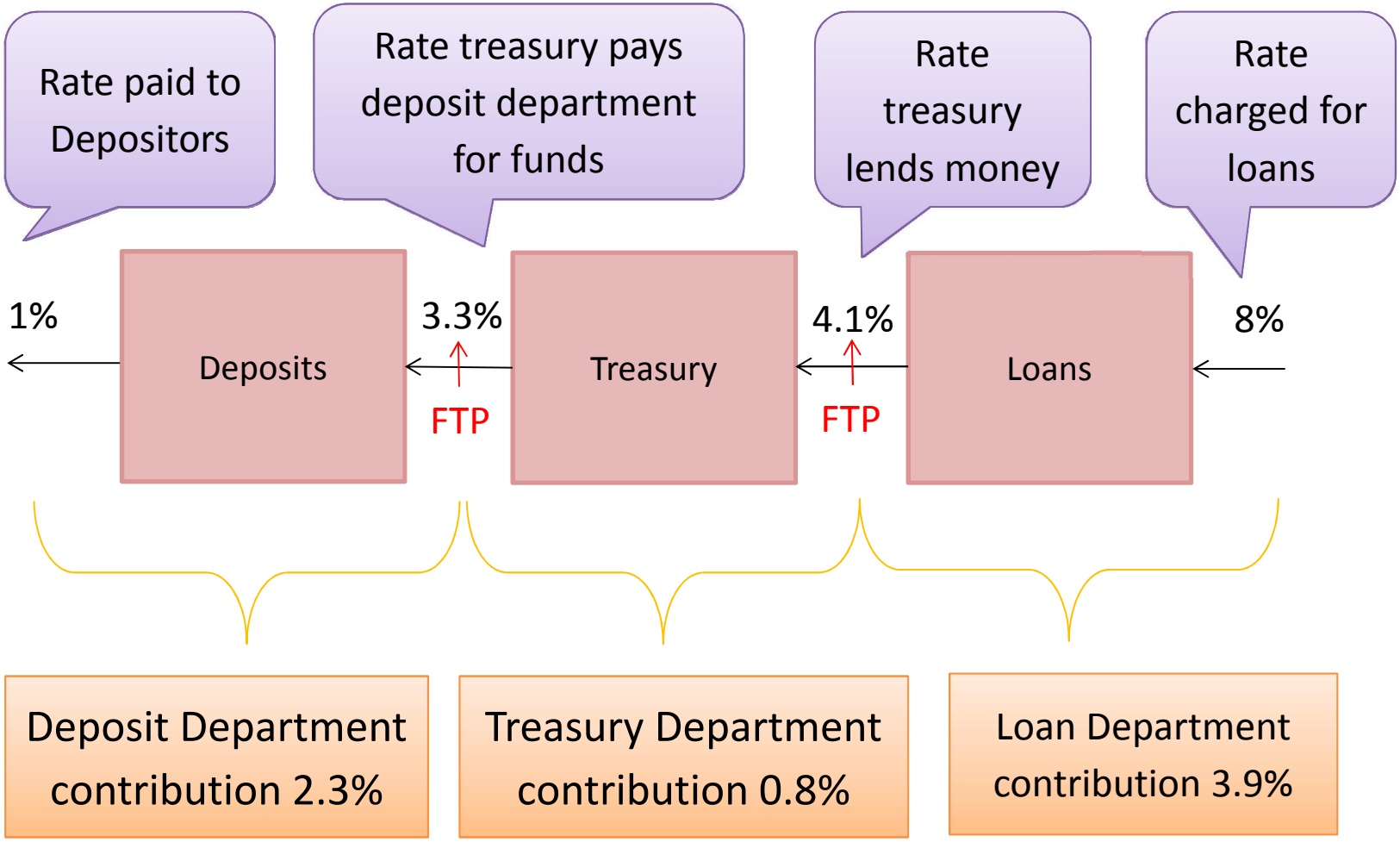
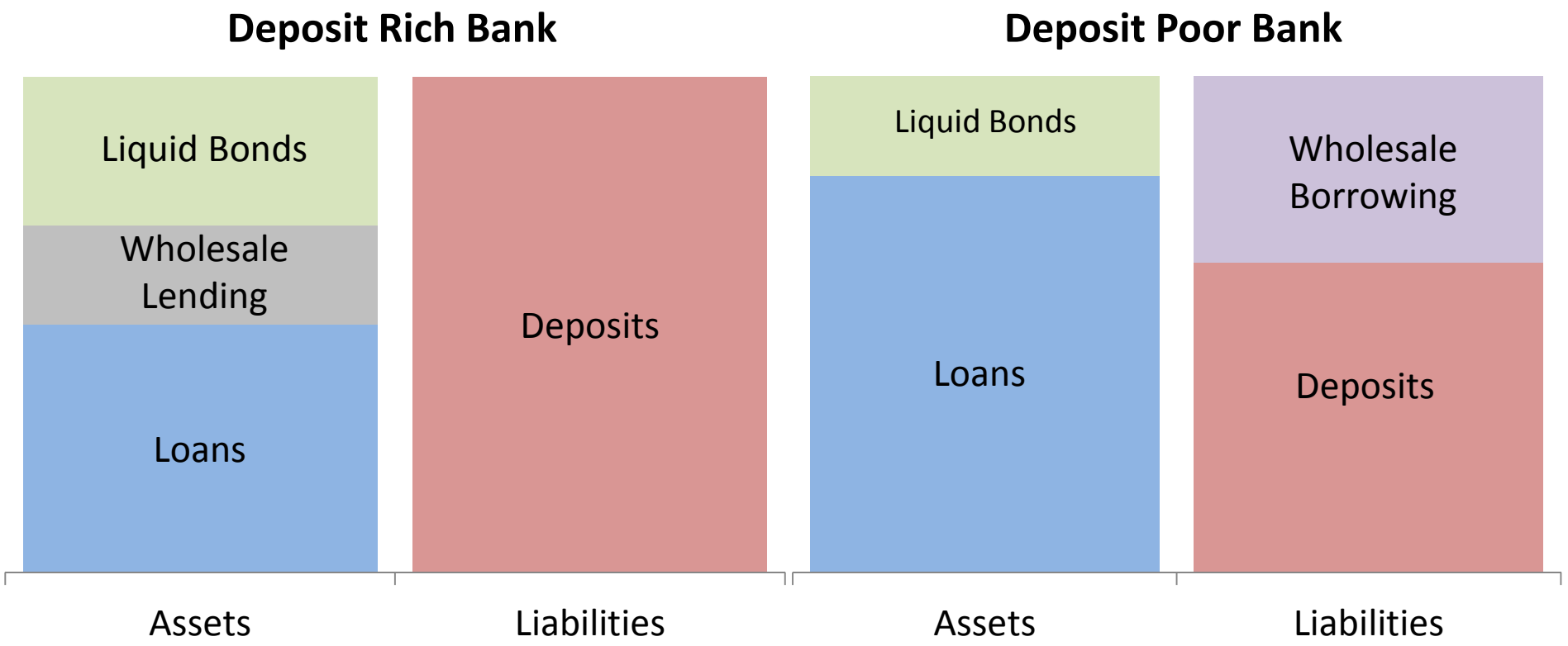


Bank's Balance Sheet

- Either be deposit rich or poor as shown in the graphs.



Profit Maximisation

Want to Maximise Profit from the following equation:

$$P = \underbrace{Li_L + M_L W_O + Bi_B}_{\text{Assets multiplied by asset return}} \underbrace{- Di_D - M_B W_B}_{\text{Liabilities multiplied by rate of return}}$$

Regulatory Requirements for Liquid Bonds:

$$B = \alpha D + \beta M_B$$

Comments

Comments on Profit Maximisation Formula

Bank sets i_L, i_D:

$$L \equiv L(i_L)$$
$$D \equiv D(i_D)$$

Wholesale market: Borrowing or Lending

Normally $M_B > 0, M_L = 0$

or $M_B = 0, M_L > 0$

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FTP Results

Deposit Rich (M_B=0):

$$P = L(i_L)(i_L - W_O) + D(i_D)\big((1-\alpha)W_O + \alpha i_B - i_D\big)$$

FTP Rate when bank is Deposit Rich:

For Loan Unit, FTP Rate is W_O

For Deposit Unit, FTP Rate is $(1-\alpha)W_O + \alpha i_B$

FTP Results

Similarly:

FTP Rate when bank is Deposit Poor (M_L=0):

For Loan Unit, FTP Rate is $\frac{W_B}{1-\beta} + \frac{\beta i_B}{1-\beta}$

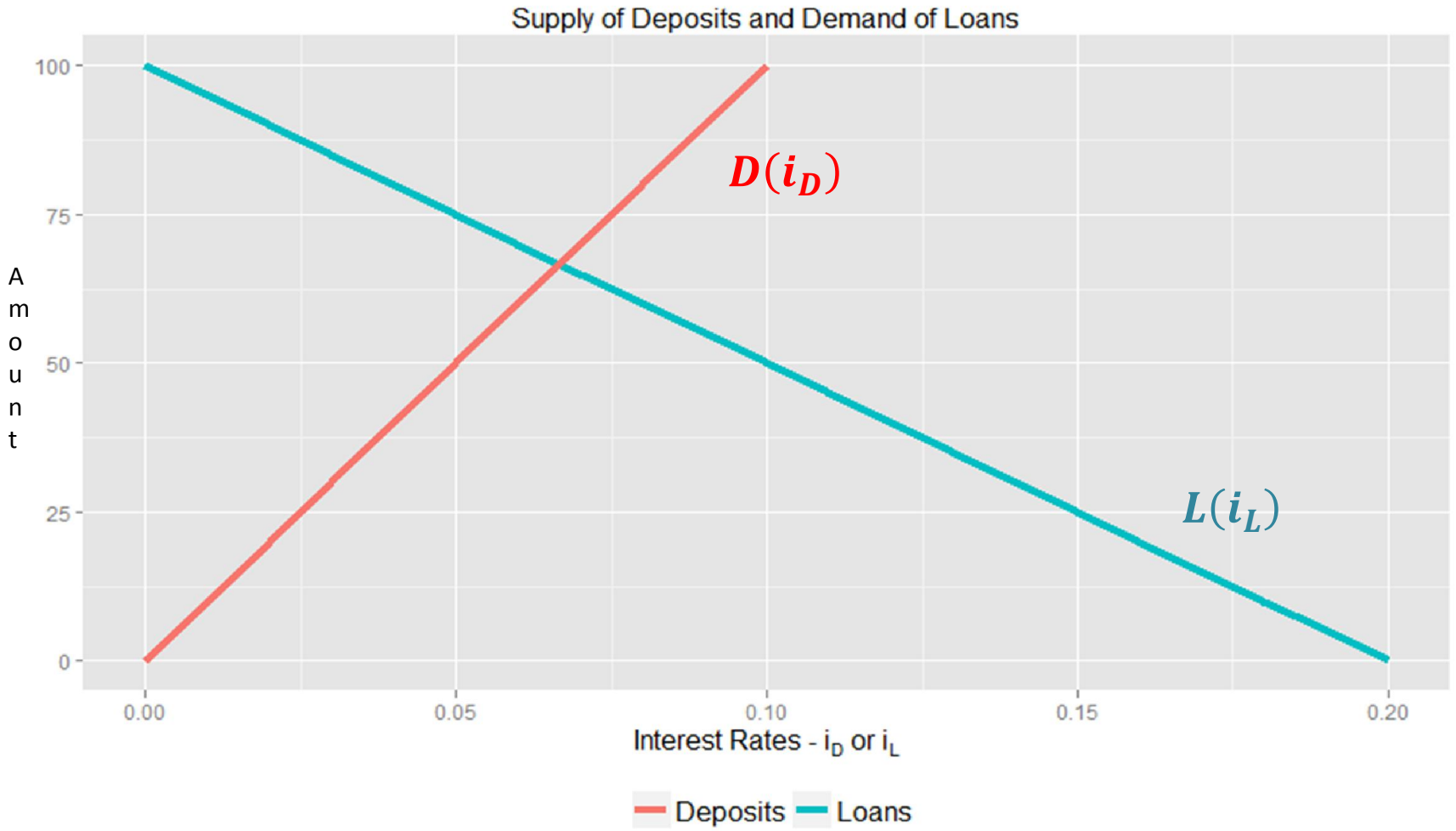
For Deposit Unit, FTP Rate is

$$(1-\alpha)\left(\frac{W_B}{1-\beta} + \frac{\beta i_B}{1-\beta}\right) + \alpha i_B$$

FTP: What we have learned

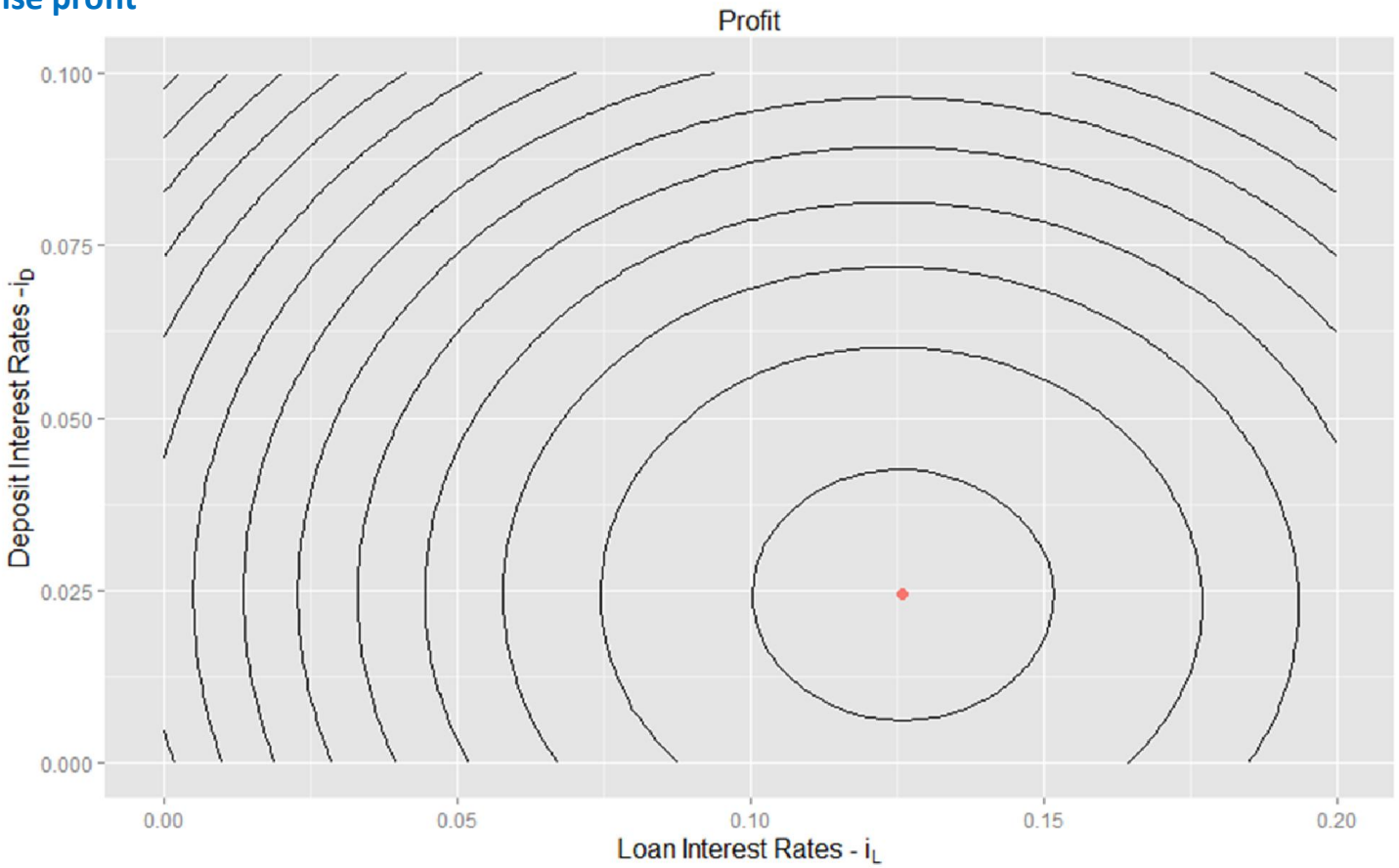
- FTP can be separated independently between business units
- FTP rates are independent of demand and supply functions
- FTP can be used to maximise overall profits of the bank
- Liquidity constraints can be incorporated within the FTP system

$$P = L(i_L)i_L + M_L W_O + B i_B - D(i_D)i_D - M_B W_B$$



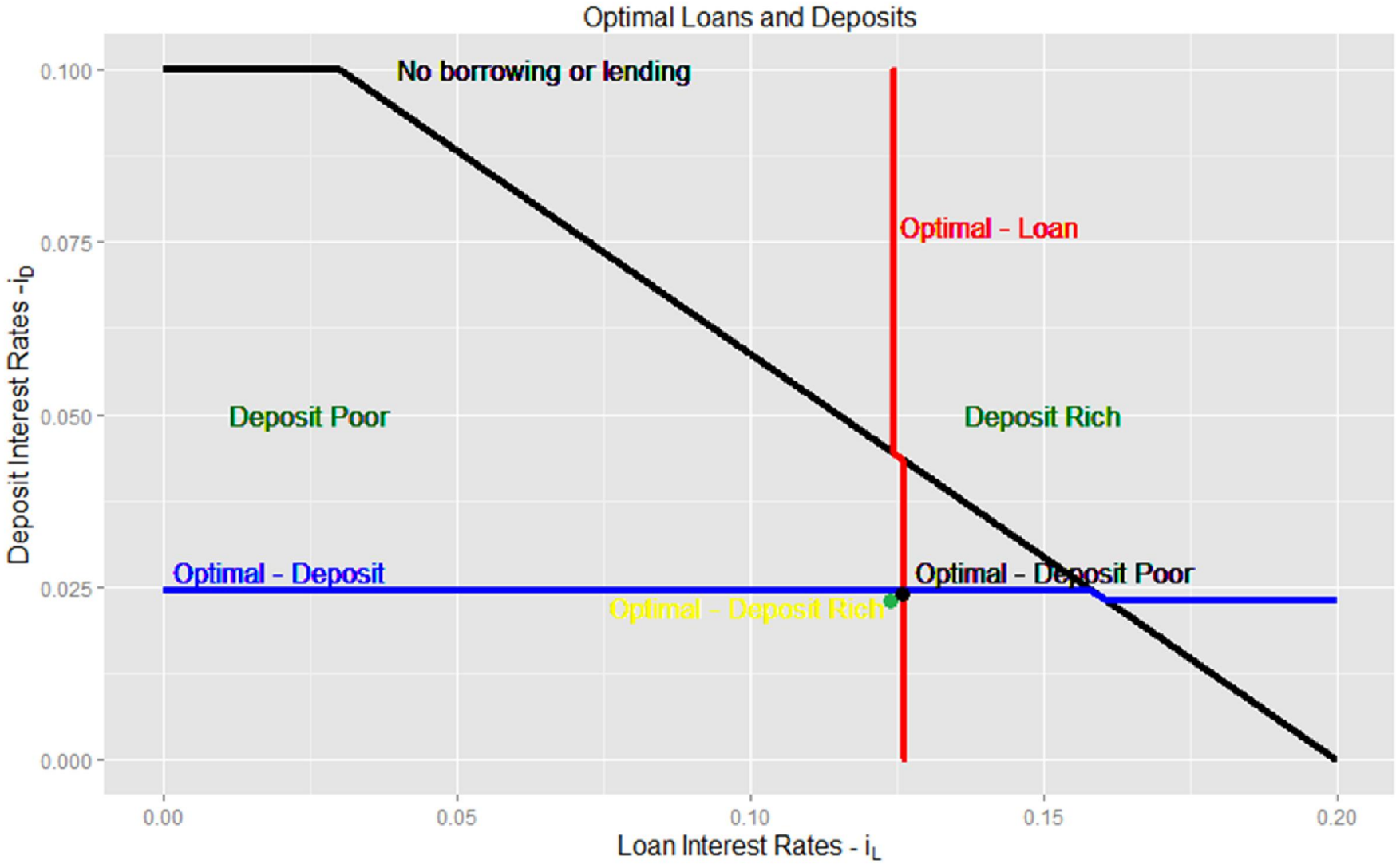
Profits

Maximise profit



Maximum Profit is £3.33m when $i_L = 12.61\%$ and $i_D = 2.44\%$

Deposit Poor



Multi-Period Model

- So far we have only looked at one time period
- Loans and deposits are often granted for multiple time periods
- There is uncertainty on when loans may be repaid due to the option of prepayment
- Customers have the right to withdraw their money anytime
- These options have a cost for the business and need to be reflected in the FTP

Conclusion

- FTP can be separated independently between business units
- FTP rates are independent of demand and supply functions
- FTP can be used to maximise overall profits of the bank
- Liquidity constraints can be incorporated within the FTP system
- More work needs to be done to estimate the appropriate α and β in the FTP system