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

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Actuarial Research Centre

06 May 2016

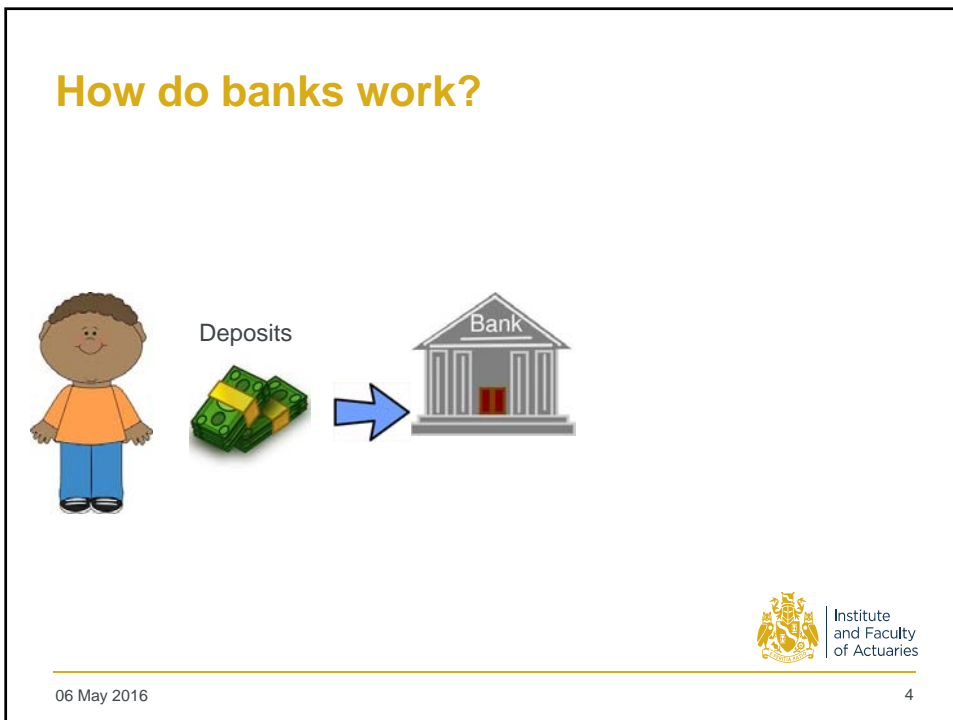06 May 2016

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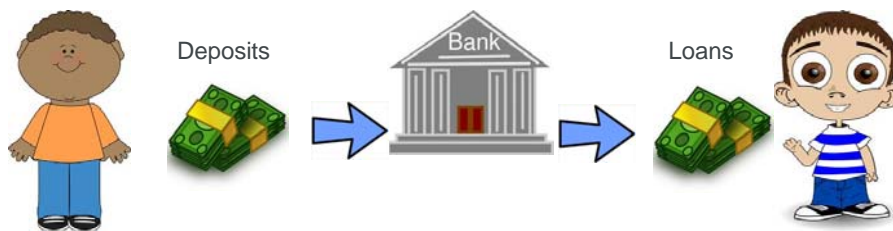Institute
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How do banks work?

Deposits

Bank

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How do banks work?

Deposits

Bank

Loans

Liabilities

Assets

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How do banks work?
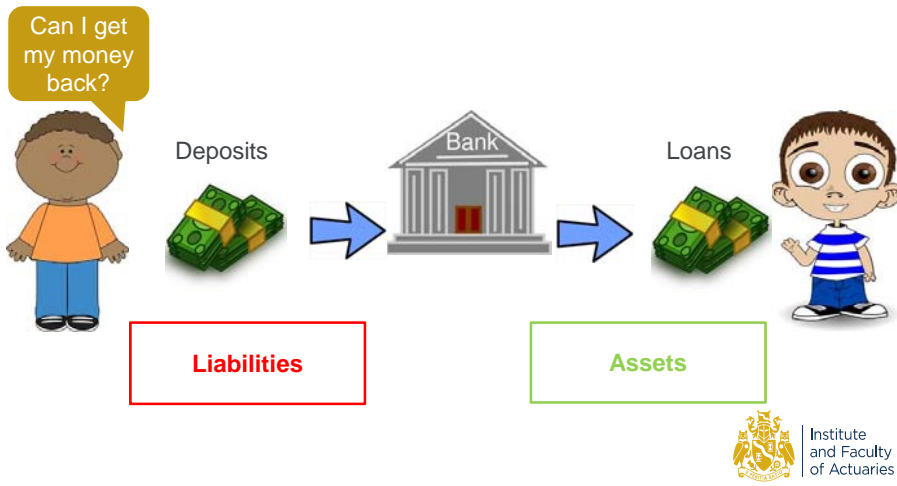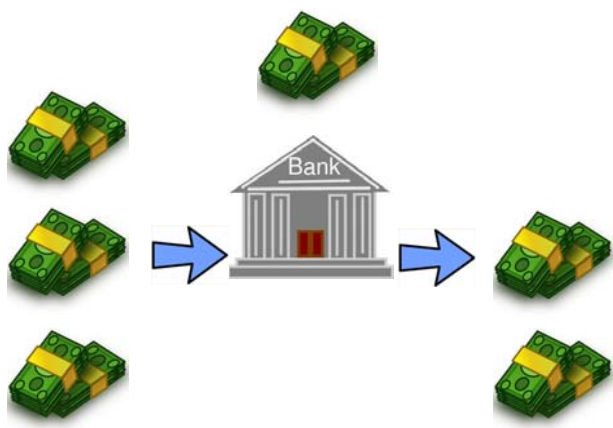
Deposits

Bank

Loans

Liabilities

Assets

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Depositors

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Run on the bank!

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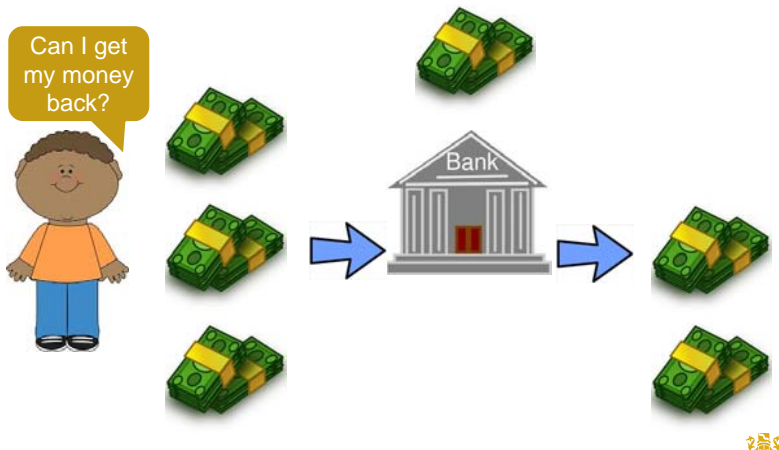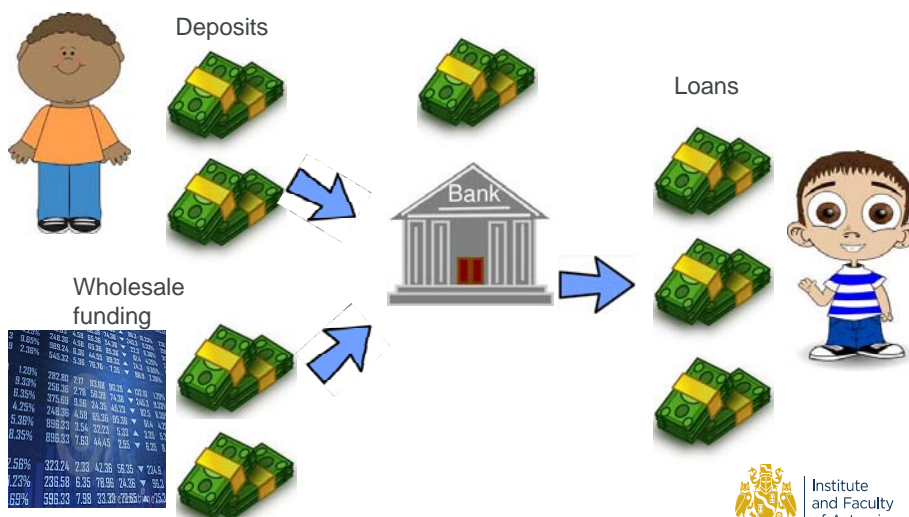
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Managing Liquidity

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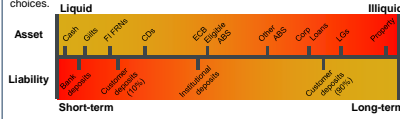**Analysis:** In the short-term, when commitments (cash outflows) exceed liquid assets (cash inflows) the Money Markets desk need to raise additional funding. In the longer-term, structural imbalances, ALCO will determine the appropriate funding strategy.

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 =

Currency	Mismatch
USD	956
EUR	(458)
GBP	(498)

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.

Liquid — Illiquid
Asset: Cash, Gilts, FI FRNs, CDs, ECB Eligible ABS, Other ABS, Corp Loans, LGs, Property
Liability: Bank deposits, Customer deposits (10%), Institutional deposits, Customer deposits (90%)
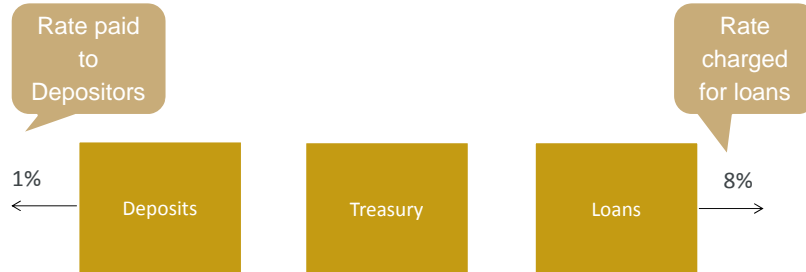Short-term — Long-term

Funding concentration

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.
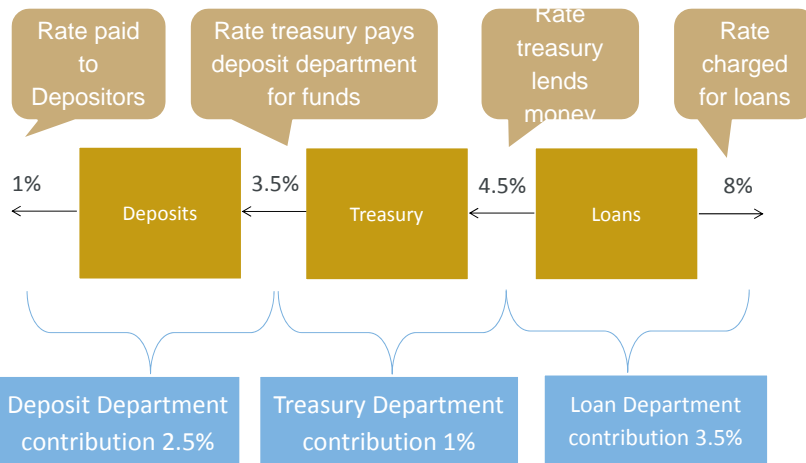
Sight – 8 days | 1 month | 1 year
(Customer deposits, Inter-bank deposits, Group deposits)

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Fund Transfer Pricing

Deposits	Treasury	Loans

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Fund Transfer Pricing

Rate paid to Depositors

Rate treasury pays deposit department for funds

Rate treasury lends money

Rate charged for loans

1%   **Deposits**   3.5%   **Treasury**   4.5%   **Loans**   8%

FTP

FTP

Deposit Department contribution 2.5%

Treasury Department contribution 1%

Loan Department contribution 3.5%

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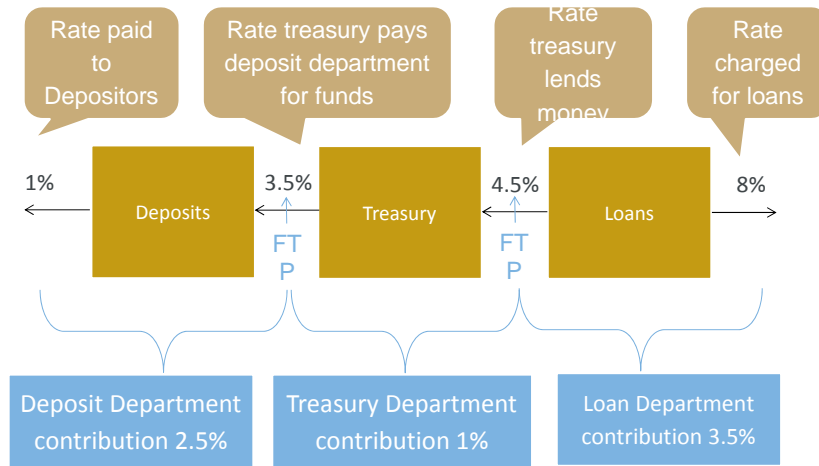
Bank's Balance Sheet

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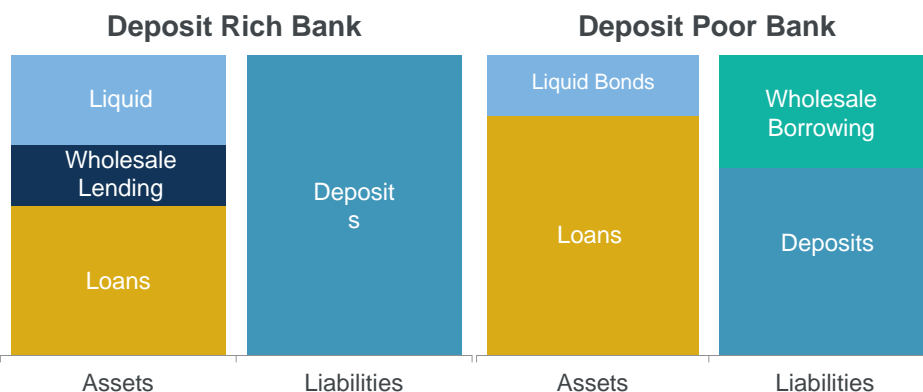
Deposit Rich Bank

Liquid

Wholesale Lending

Loans

Deposits

Assets

Liabilities

Deposit Poor Bank

Liquid Bonds

Wholesale Borrowing

Loans

Deposits

Assets

Liabilities

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Profit Maximisation

Want to Maximise Profit from the following equation:

$$P = Li_L + M_L W_O + Bi_B - Di_D - M_B W_B$$

Assets multiplied by asset return

Liabilities multiplied by rate of return

Regulatory Requirements for Liquid Bonds:
$$B = \alpha D + \beta M_B$$

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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 $\quad M_B > 0, M_L = 0$

or $\quad M_B = 0, M_L > 0$

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Profit Maximisation

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Profit Maximisation

Want to Maximise Profit from the following equation:

$$P = Li_L + M_LW_O + Bi_B - Di_D - M_BW_B$$

Assets multiplied by asset return

Liabilities multiplied by rate of return

Regulatory Requirements for Liquid Bonds:
$$B = \alpha D + \beta M_B$$

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Profit Maximisation

Want to Maximise Profit from the following equation:

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Profit Maximisation

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Assets multiplied by asset return

Liabilities multiplied by rate of return

Regulatory Requirements for Liquid Bonds:
$$B = \alpha D + \beta M_B$$

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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 $(1 - \alpha)W_O + \alpha i_B$

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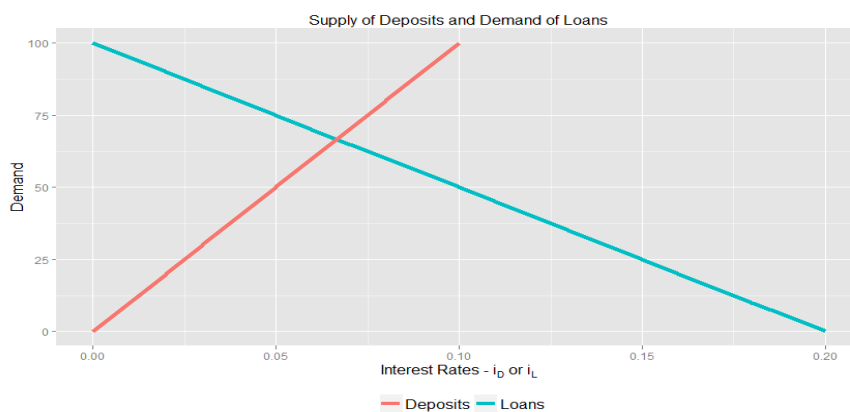of Actuaries

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FTP Results

Similarly:

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

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

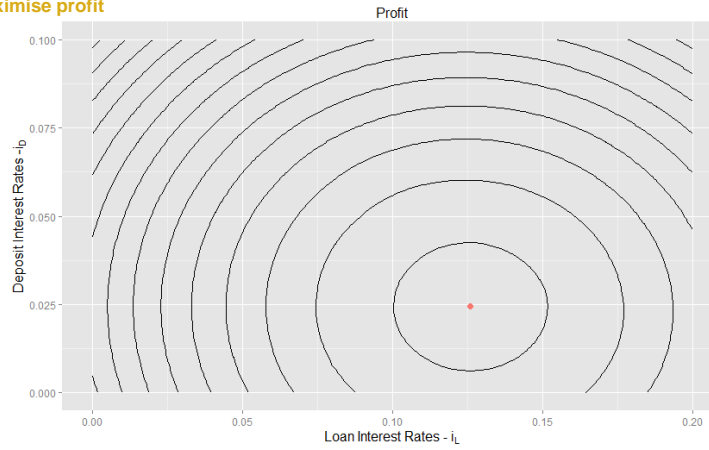For Deposit Unit, FTP Rate is $(1 - \alpha)\left(\frac{W_B}{1-\beta} + \frac{\beta i_B}{1-\beta}\right) + \alpha i_B$

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

Supply of Deposits and Demand of Loans

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Profits

Maximise profit

Profit

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

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Deposit Poor

Optimal Loans and Deposits

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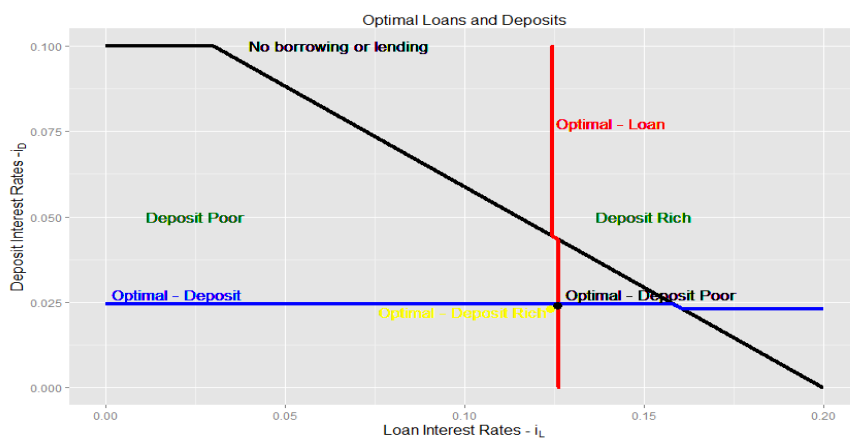
Multi-Period Period Model

- 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

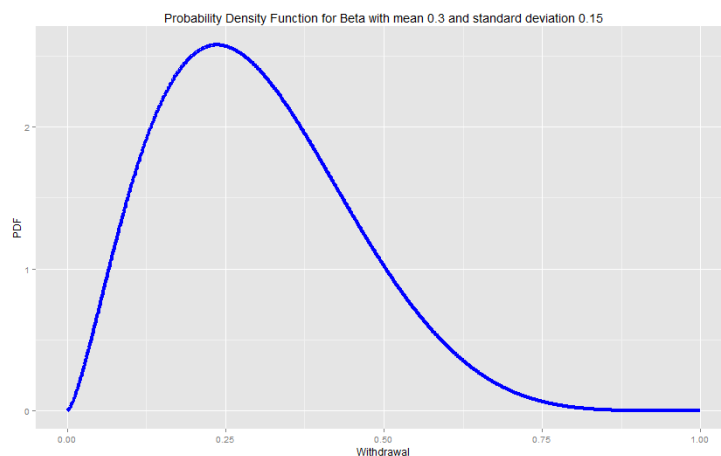- These options have a cost for the business and need to be reflected in the FTP

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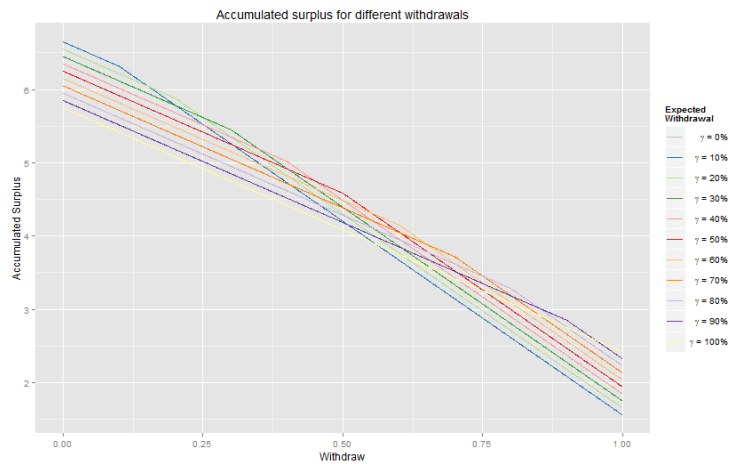06 May 2016

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Uncertain Withdrawal

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Impact of Uncertainty

Accumulated surplus for different withdrawals

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

Questions

Comments

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