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Banking and Actuaries

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Banking & Actuaries



An actuarial journey into banking



A simple model of a bank – risks are universal



Parallels between Insurance and banking – how skills transfer



Tactical uses of the actuarial skill set in retail banking

An actuarial journey into banking

Actuarial experience at Scottish Life

- Offshore life office: Single premium bonds / derivative based
- Pricing Group Personal Pensions / Endowments
- Strategic questions around stakeholder pensions.
- Sale of business to Royal London

Actuarial interest in London Reinsurance

- Family “Name co” and Lloyds.
- Set underwriting appetite and put own money on the line

Moved to banking with the Royal Bank of Scotland

- Started in Group Strategy
- Developed NPV pricing models for retail bank (loans, mortgages, credit cards)
- Developed Customer Value for retail bank ($\text{Income} - \text{Costs} - \text{Expected Loss} - \text{Cost of Capital}$)
- Technical specialist for major regulatory investigations
- Developing CV wider across the bank

What is real life like in a bank?

Experts exist in areas where actuarial skills apply

- Credit risk and fraud
- Capital management
- Treasury
- Market risk and derivatives
- Product teams manage operational complexity

Banks are siloed

- Focus on specific area of responsibility
- Limited cross team sharing
- Pricing focuses on short term P&L (owned by product teams)
- Pricing highly “deterministic”

Statutory roles are occupied

- Finance owns P&L accounts
- Audit owns overall risk

Its not easy ... but our toolkit is valuable

We can cross siloes

- Risk Underwriting ⇔ Credit score card developers
- Reserving ⇔ Credit risk portfolio managers
- Solvency ⇔ Basel III
- Asset – Liability ⇔ Treasury
- ALM & Investment theory ⇔ Market risk and derivatives
- We understand P&L

We have unique characteristics

- Longer time scales (embedded value / model office)
- Look for inhomogeneity (banks are so big they often use averages)
- Consider trade offs
- We can consider long term probability of ruin (not just capital optimisation)

But no open door

- Nobody knows what we do (no critical mass, no demand for skills)
- We are a threat to some roles.

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Understanding what is a bank from history

History

- Merchants need somewhere safe to store their gold
- Goldsmiths had big safes



- Goldsmiths hold gold securely for a fee



- But other merchants want to borrow... the gold smith can lend out gold in his vault for another fee



Deposits

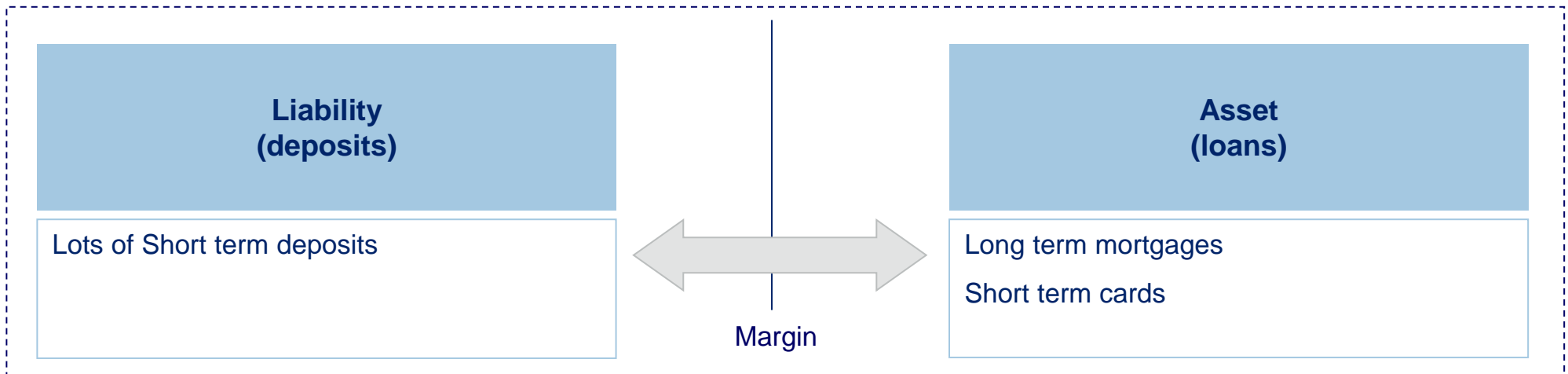


Lending



A bank is an intermediary that manages a balance sheet and margins

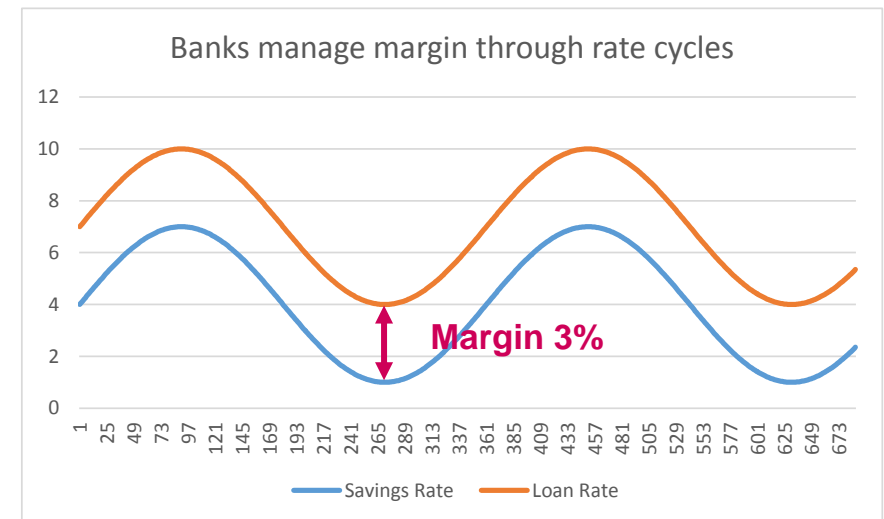
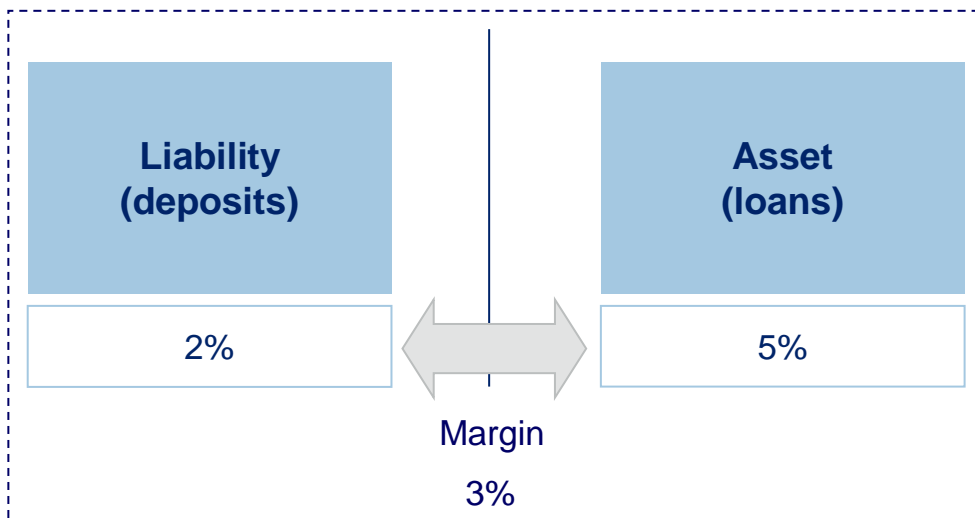
Borrowing and lending create a bank's balance sheet



- Pay a rate to depositors to bring in savings
- Receive a rate from lenders for lending out mortgages etc
- The difference is the margin and this is what all banks strive to manage
- Suitable for a 1 year P&L view – main difference to insurance

Margins needs to be maintained through different conditions

Borrowing and lending create a bank's balance sheet



- Need to manage the margin through all interest rate conditions
- Changing interest rates can be an opportunity or a threat:
 - Falling rates (Churn, savings floor, crisis, credit bubble)
 - Rising rates (Bad Debts, asset values fall, less lending)
 - Need price elasticity models
 - Need to segment balances to identify when to re-price

A balance sheet creates two key risks a bank must manage

History shows risks



Credit risk – Loan not repaid



Liquidity risk – Depositors all want their money back at the same time... But its been lent out

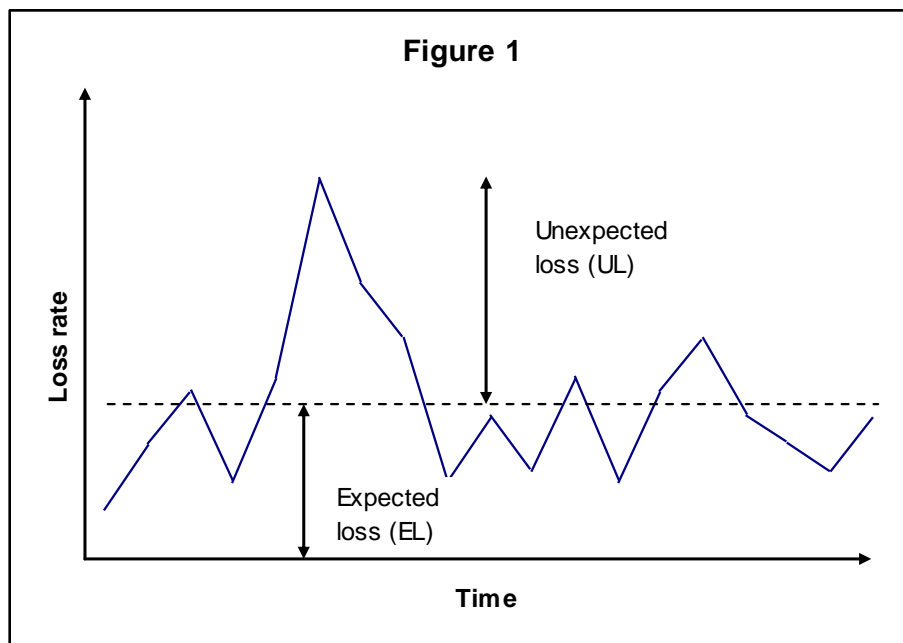


"I'd like to make a withdrawal"



Two credit risk issues: Expected & unexpected losses

- We allow for expected losses when setting lending rates and fees ... but losses will vary over time
- Peak losses don't occur every year, but when they do, they can be large



Need a buffer in case of unexpected losses

Capital held for this risk

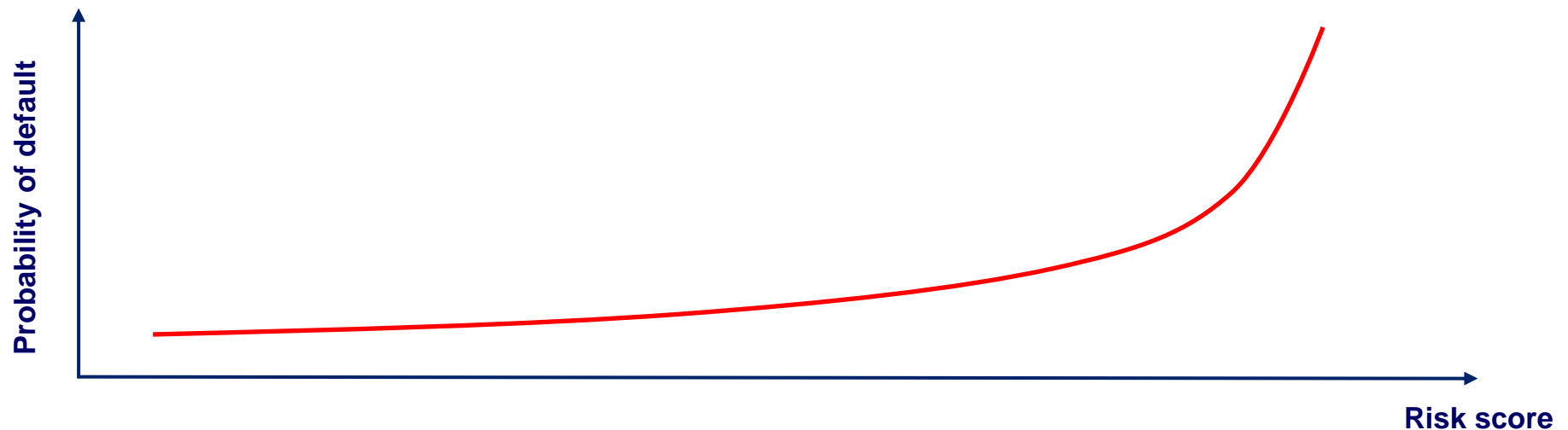
Day to day business – price and make decisions on expected losses

Scorecards and pricing manage this risk

Managing expected losses with credit scorecards

The process is very like car insurance

- Score cards bring in a lot of customer data
- Score cards built by looking at the correlation of this data against historic loss
- Score cards use this past behaviour to rank customers in order of risk

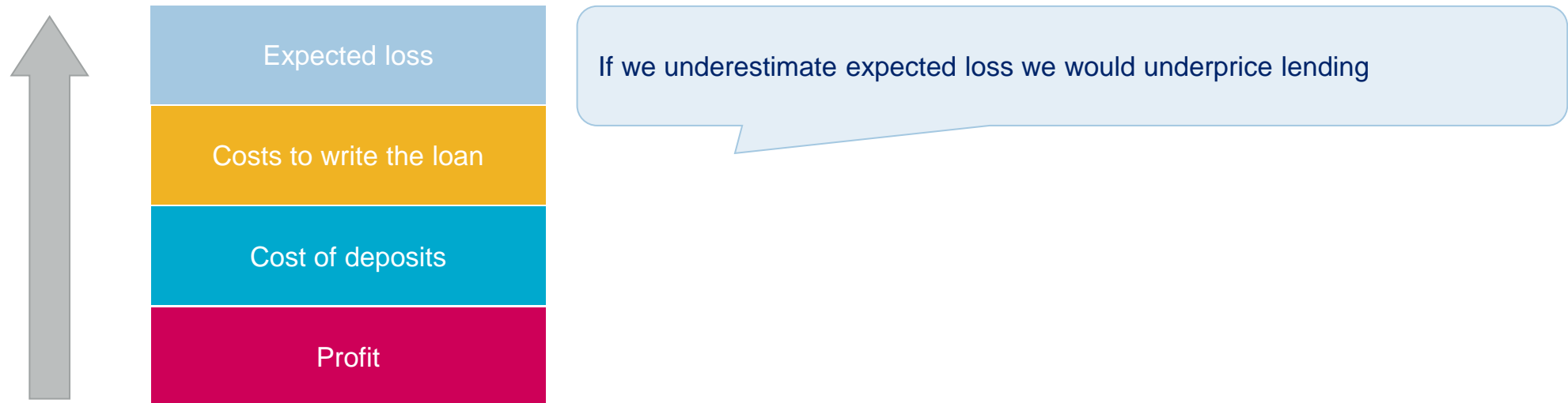


- Banks make money by taking risk and lending
- The more accurately risk and expected loss can be predicted the easier it is to manage

Credit lending decisions need to price in expected losses

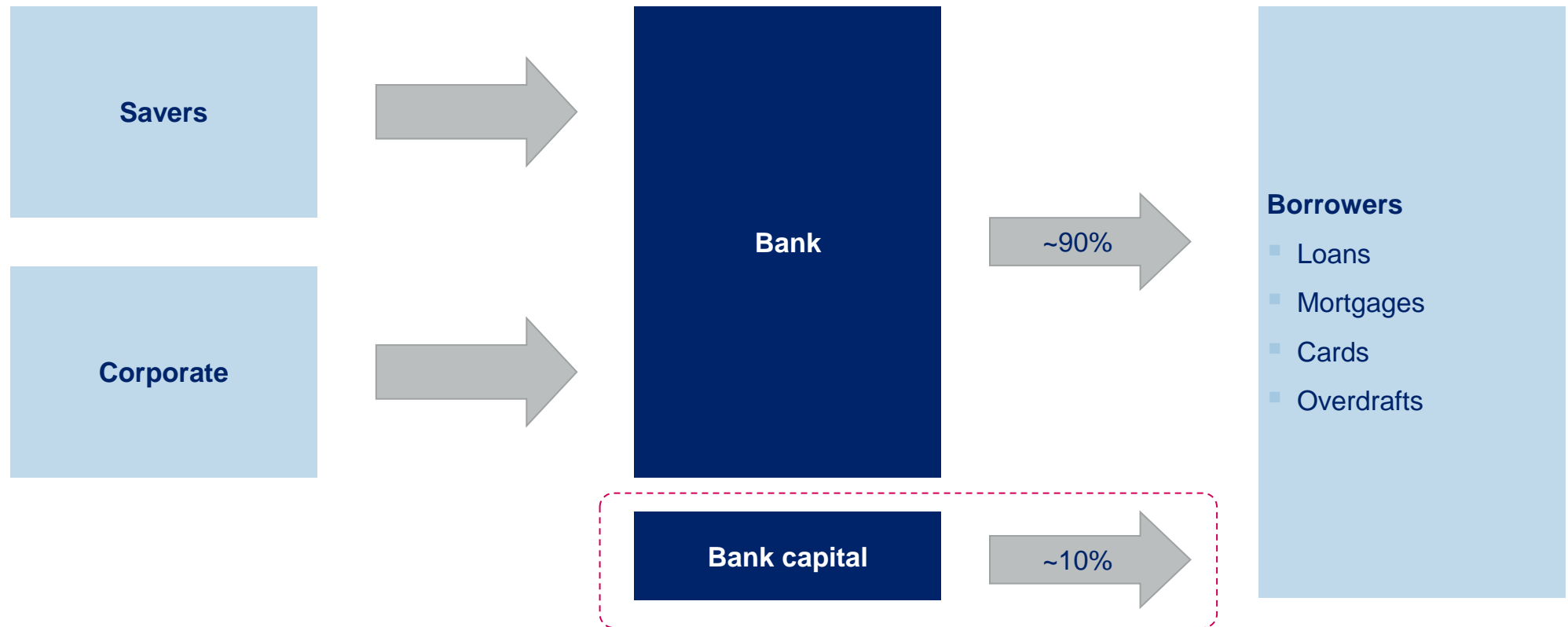
The loan rate would normally allow for the following

Sustainable loan rate includes



- Normally bad debts don't arise until a few years after a loan is written (seasoning)
- We may not know we have "mispriced risks" until later

Unexpected losses are managed with capital



Bank lends funds borrowed from savers and wholesale – **& its own capital**



Banks hold capital to protect savers from unexpected losses

Note capital models based on own experience only works in a nice steady state world

To differentiate between this risk

Basel II capital became sensitive to through the cycle risk



Basel III (2013–2018) seeks to plug some gaps

Better definition of Capital

- We have described Tier 1 capital as retained profit
- But profit is an **accounting concept** that includes goodwill, Deferred Tax Assets, Pension Fund shortfalls etc.
- Basel III standardises deductions to calculate Tier 1 capital
- This still ignores the issue with accounting profits that assets can be valued in either the trading book (mark to market) or banking book (face value unless impaired)



Brings in protection for liquidity risk

Liquidity Coverage Ratio (LCR)

- Hold enough liquid assets to cover cash outgoing for 30 days (arrange rescue)

Net Stable Funding ratio (NSFR)

- Ratio of sticky deposits to longer term lending
- To protect against too great term mismatch to profit from normal yield curve



There is a second balance sheet risk a bank must manage

History shows risks

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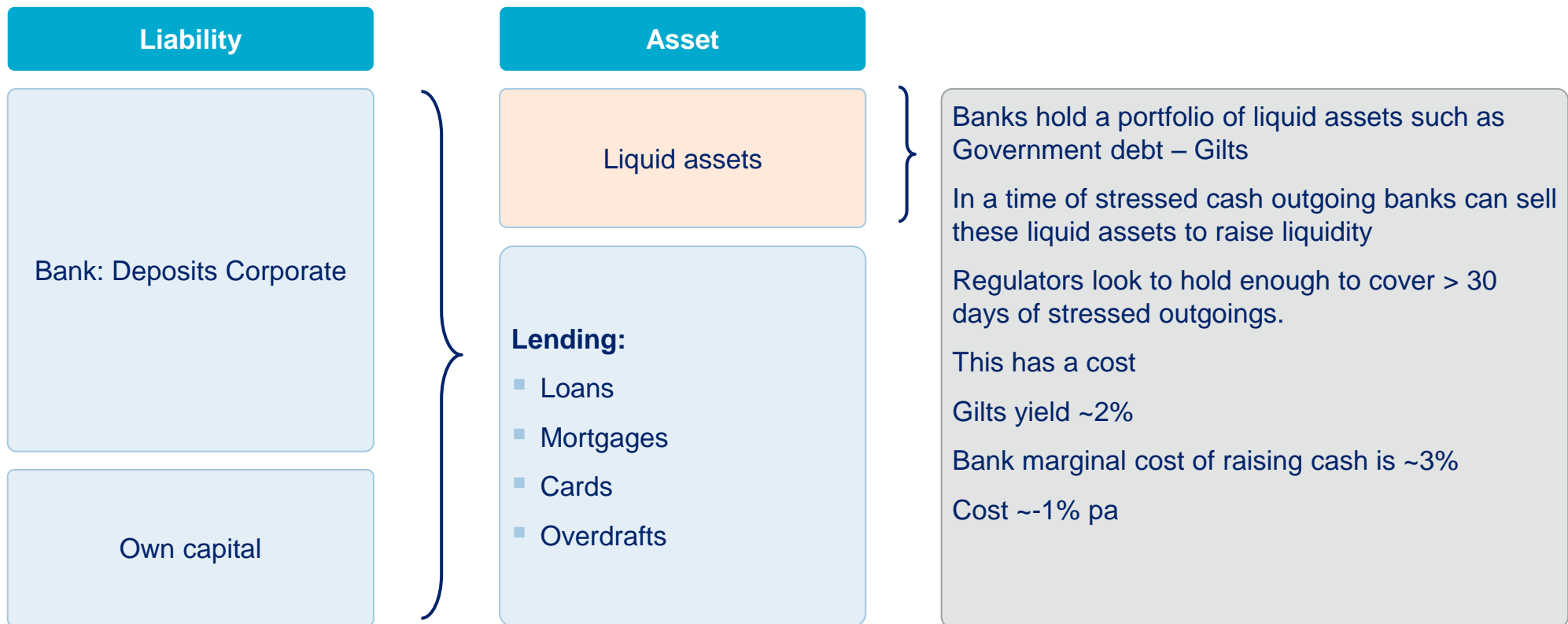
"I'd like to make a withdrawal"



Controlling liquidity risk – Liquidity buffer

Liquidity buffers

Easy to confuse with capital – But not the same thing



Banks need to control liquidity risk

Diversify funding

Many small depositors

- Current accounts
- Instant access savings
- Savings bonds

Corporate money

- Securitisation
- Corporate bonds



Confidence!

Regulators

- Capital
- Liquidity buffer
- Loan: Deposit
- Term matching

Government

- Lender of last resort
- Deposit guarantee

Discussion topics

Credit score cards

- Similarity of credit score cards and underwriting
- Expectation of selection risks
- Pricing for risks

Capital management

- Solvency II versus Basel I, II, III
- Does Solvency II carry “unseen” risks that damaged Basel II? (eg model risk)
- How does probability of ruin / tail risk translate to stress testing in banks?

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Banks have a lot of specialist “siloes”

Treasury

- Manage liquidity risk
- Manage margins
- Manage fixed . Variable rates
- Analogous to Asset – Liability management
- Lot of cohort analysis

Credit risk

- Credit score cards
- Cut off decisions
- Provisions
- Analogous to underwriting
- Provisions subtly different from reserves / claims

Capital management

- Another risk focus
- Standardised or Advanced
- “ROE” rather than NPV focus
- Analogous to Solvency II
- Increasing links to stress testing

Finance

- Income
- Costs
- Pricing
- Analogous to company actuary role

But don't forget banks have massive operational complexity

ATM stats

- # Withdrawals made
- Value withdrawals made
- Weight of cash withdrawn
- Size of cash pile withdrawn
- Cost of global cash handling



Card scheme stats

- # POS terminals UK/Worldwide
- Value UK Transactions



But don't forget banks have massive operational complexity

ATM stats

- # Withdrawals made **2.8bn**
- Value withdrawals made **£187bn**
- Weight of cash withdrawn **15,000 minis**
- Size of cash pile withdrawn **1,200 Km**
- Cost of global cash handling **\$300bn**

Source: BBA statistics, own calculations,



Card scheme stats

- # POS terminals UK/Worldwide **1.3m / 24m**
- Value UK Transactions **£482bn**

Source: Mastercard



Can actuaries can link these siloes?

No specific “magic bullet” roles

- No reserved roles that make it easy to transition over
- Actuaries could develop careers in any of these siloes by applying specific skills
- More interesting to bridge siloes:
 - Develop Net Present Value models
 - Brings together pricing and credit cut off decisions
 - Brings together finance, risk and treasury inputs
 - Develop Customer Value models
 - Helps tactical and strategic decisions
 - Many judgment calls to split value by assets / liabilities
 - Work with product teams, finance, analytics, risk, treasury

Discussion topics

Push factors for the profession

- Automation in insurance
- Loss and run off of final salary schemes
- Consolidation of life offices

Pull factors in banking

- Siloes create an opportunity for a skill set that can understand all of them
- Offer new ways to think of problems (short / long term, risk / reward, tail risk models)
- Big systemic pool the profession has hardly touched

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NPV pricing and cut off models

Loans and mortgages

- Very standard approach
- Project forward contractual cashflows
- Adjust for pre-payment
- Discount cashflows after capital flows to support lending are applied

Credit cards

- Mix of contractual and behavioural
- Behavior determines balances and cashflows (transactor / revolve / spend transactor)
- Jamie Dimon head of JP Morgan observed that investment banking is not that complex, whats hard is understanding how credit cards work

Customer Value is a measure of profitability

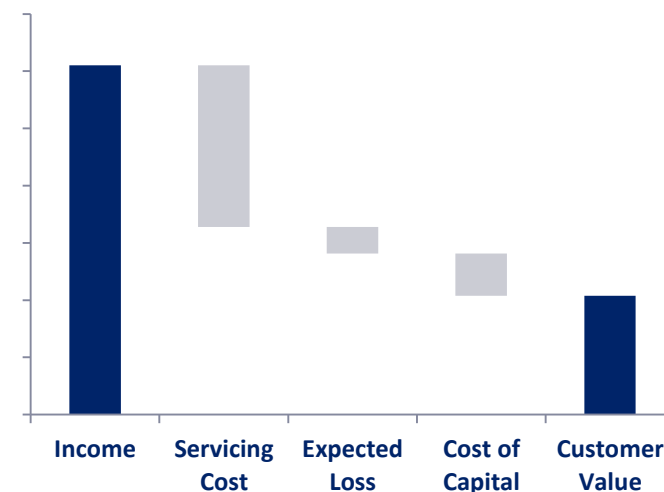
Customer Value is:

Income – Servicing Cost – Expected Loss – Cost of Capital

This is an Economic Value view

It is calculated at account or transaction level and aggregated to customer

PB Average
Customer
Value
(£ per year per
customer)



Income

=

NII

+

Fees

less

*Customer Rate – Fund Transfer Price – Liquidity
Clearing House adjustment*

Directly attributable to an account

Servicing Cost

=

Direct Costs

+

Overhead Costs

less

c 50% of total costs applied using a unit cost model

c 50% of total costs spread in proportion to usage

Expected Loss

=

12 month forecast of bad debt

less

*P&L bad debt outcome, spread to good book
accounts using Basel Expected Loss*

Cost of Capital

=

Core Tier 1 Capital * 17%

*Pre-tax Return on Equity, allocated by account RWA
or income*

CV is generated at the most granular level

In Personal, as illustrated below, seven key inputs (comprising 20 high level inputs and an extensive number of sub-inputs) are required to apply the CV allocation methodology. This methodology currently enables Personal to generate CV and product profitability for ~99% of its customers

CV = Income received – funding costs – service cost - bad debt – cost of capital supporting the account

