

Interest Rate Risk 1: Repricing Model & Maturity Model

Repricing Model Steps

FOCUS: Net Interest Income

Calculating the Repricing Gap:

1. Determine Rate Sensitive Assets (RSAs) and Rate Sensitive Liabilities (RSLs)

Rate-Sensitive = means that the asset or liability reprices or matures within a given time bracket (e.g. 1 year)

Repricing Sensitivity Test:

To fit the one year rate or repricing sensitivity test:

- **Maturity within 1 year (≤ 1 year)** → must be refinanced/reinvested, which exposes it to new market rates; OR
- Floating-rate instruments that **reprice within 1 year** → directly rate-sensitive

NB: Either of these criteria will make the asset/liability sensitive to repricing

2. Calculating the Repricing Gap (CGAP)

Calculating GAP:

$$GAP_i = RSA_i - RSL_i$$

Calculating CGAP (Cumulative Gap):

CGAP = sum of GAPs over multiple time buckets (up to a certain horizon)

3. Interpreting the CGAP (Effect on Interest Rate Sensitivity):

CGAP	Impact of Interest Rate Increase / Decrease on Net Interest Income (NII)
Positive CGAP (CGAP > 0)	<u>Positive Relationship between interest rate changes and changes in NII</u> <ul style="list-style-type: none"> • Negatively impacted by a DECREASE in interest rates (as this would lower NII) • Positively impacted by an INCREASE in interest rates (as this would increase NII)
Negative CGAP (CGAP < 0)	<u>Negative Relationship between interest rate changes and changes in NII</u> <ul style="list-style-type: none"> • Negatively impacted by an INCREASE in interest rates (as this would lower NII) • Positively impacted by a DECREASE in interest rates (as this would increase NII)
CGAP = 0	No immediate exposure to rate changes in that bucket

Calculating the Change in NII (Net Interest Income):

$$\Delta \text{NII} = (\text{RSA} \times \Delta R_{\text{RSA}}) - (\text{RSL} \times \Delta R_{\text{RSL}})$$

Exam-Style Question: If we foresee some negative interest rate shock, what are some strategies to reduce interest rate risk (using Repricing Model)?

1. Identify whether it is a Positive or Negative CGAP

- If Positive GAP → sensitive to interest rate fall
- If Negative GAP → sensitive to interest rate rise

2. Assess the Scenario (Impact of Falling vs Rising Interest Rates)

Scenario	Worry about Positive or Negative CGAP?
Falling Interest Rates	A <u>positive repricing gap</u> ($\text{RSA} > \text{RSL}$) will hurt the bank → interest income falls faster than interest expense
Rising Interest Rates	A <u>negative repricing gap</u> ($\text{RSL} > \text{RSA}$) will hurt the bank → interest expense rises faster than income

3. Set Out Strategies to Reduce the Gap

	Strategies
Addressing Negative GAP (need to reduce it or ideally make it positive)	The bank needs to either increase RSAs or decrease RSLs
Addressing Positive GAP (need to reduce it or ideally make it negative)	The bank needs to either decrease RSAs or increase RSLs

Weaknesses of the Repricing Model

- **Market Value Changes are Not Considered:** Ignores how changes in interest rates also affect the underlying market value of assets and liabilities
- **Over-Aggregation Effects:** The model often uses "time buckets" which might be too broad (e.g. issues arise if assets, on average, reprice earlier than liabilities within a given bucket)
- **Ignores Runoffs:** Does not account for runoff cash flows, which are assets repaid before maturity or liabilities unexpectedly withdrawn
- **Ignores Off-Balance Sheet Activities:** Many financial institutions engage in off-balance sheet activities that may be exposed to interest rate risk, but these are typically not included in the repricing model
- **Assumes the Position is Unaltered Over the Full Period:** The model assumes that the balance sheet position remains unchanged over the full planning horizon, which may not be realistic

Maturity Model Steps

FOCUS: Change in Market Value of Assets / Liabilities

Calculating the Weighted Average Maturity for Assets (M_A) and Liabilities (M_L):

FORMULAS:

$$M_A = \Sigma (\text{Market Value of Asset} * \text{Maturity of Asset}) / \text{Total Market Value of Assets}$$

$$M_L = \Sigma (\text{Market Value of Liabilities} * \text{Maturity of Liability}) / \text{Total Market Value of Liabilities}$$

1. For each Asset/Liability, multiply its market value by its maturity
2. Sum these products for all assets
3. Divide the sum by the total market value of all assets
4. Formula: $M_A = \Sigma (\text{Market Value of Asset} * \text{Maturity of Asset}) / \text{Total Market Value of Assets}$ (same for M_L but using liabilities instead)

Calculate the Maturity Gap (MGAP):

$$M_{GAP} = M_A - M_L$$

Interpretation of MGAP

MGAP	Impact of Interest Rate Increase / Decrease on Market Value of Equity (MVE)
Positive MGAP (MGAP > 0)	<p><u>Negative Relationship between interest rate changes and changes in MVE</u></p> <ul style="list-style-type: none"> Negatively impacted by an INCREASE in interest rates (as this would decrease MV of assets more than it would decrease liabilities) Positively impacted by a DECREASE in interest rates (as this would increase MV of assets more than it would increase liabilities)
Negative MGAP (MGAP < 0)	<p><u>Positive Relationship between interest rate changes and changes in MVE</u></p> <ul style="list-style-type: none"> Negatively impacted by an DECREASE in interest rates (as this would increase MV of liabilities more than it would increase assets) Positively impacted by an INCREASE in interest rates (as this would decrease MV of liabilities more than it would decrease assets)
MGAP = 0	Little to no change in MVE from interest rate shocks → Maturities of assets and liabilities are matched, so their value changes roughly offset each other

Note: If interest rate changes, need to recalculate the MV based on the new interest rate

Steps:

1. Need to recalculate the market value of each interest-sensitive asset and liability based on the new interest rate

Credit Risk Part 3

Credit Risk Pt 3 – Theory

Managing Credit Risk:

- Three main alternative ways to manage credit risk from the commercial banks perspective:
 - Loan Sales
 - Asset Securitisation
 - Credit Derivatives

Loan Sales

Loan Assignment vs Loan Participation

Loan Assignment (loan sold without recourse)	Loan Participation (type of loan sale with recourse)
<ul style="list-style-type: none"> • Type of loan sale contract where "all rights [are] transferred on sale of loan" • Constitutes the bulk of the US loan sales market (~ 90%) • Credit risk is entirely transferred to the buyer • Original owner of the loan (seller) able to remove the loan from their balance sheet • Buyer has no claim back to the seller in the case of default • Complete transfer of rights and risks 	<ul style="list-style-type: none"> • Type of loan sale contract where there is "limited contractual control" for the participant • E.g. loan syndications • Credit risk is still present for the originator because the buyer could transfer ownership of the loan back to the originator • NB similar to a partial recourse – less than a full transfer of risk ("limited contractual control") • From the perspective of the buyer, loans with recourse bear a lower amount of credit risk

Motivations for Loan Sale (besides Managing Credit Risk):

- **Reduced Regulatory Reserve Requirements:** selling loans without recourse can decrease the number of deposits needed for funding → therefore lowering regulatory reserve requirements
- **Boosts Current Income:** Originating and selling loan is a significant source of income for FIs
- **Improvement of Capital Ratios:** Selling loans can reduce assets, which is often a less expensive way to improve capital ratios than increasing capital (lowers their risk adjusted assets – denominator of Capital Ratio)
- **Manages Liquidity Risk:** The expansion of the loan sale market has made FI loans more liquid, reducing FI liquidity risk; able to source cash through the loan sale

Reasons Against the Growth of Secondary Market (e.g. In Australia):

- **Substantial growth of Commercial Paper Market:** short term security which is usually unsecured → only very reputable firms are able to issue (otherwise nobody would buy)
 - Very short-term
 - Commercial paper market has grown substantially over time → banks have alternative ways to source fast cash need (rather than needing second market)

- **Lender-borrower relationship:** credit relationship between the bank and the borrower is very important
 - Shareholders of the borrowers are expecting that the lender undertakes very standard monitoring
 - However, if the lenders instead sell the loan (and keep initiating and selling as opposed to monitoring) – hurts commercial bank's reputation + damages

Asset Securitisation

- **Asset Securitisation** = Process where illiquid assets, such as loans, are pooled together and transformed into marketable securities that can be sold to investors
- **Two types:** Pass-Through Securities AND Other (CMO, CDO – Collateralized Mortgage/Debt Obligation, etc)

Pass-Through Securities vs CMOs (/ CDOs)

Similarities	Differences
<ul style="list-style-type: none"> • Both involve the pooling of loans (like mortgages) and the passing through of principal and interest payments from the borrowers to investors • A CMO is fundamentally a series of pass-through securities 	<p><u>With Pass-through Security:</u></p> <ul style="list-style-type: none"> • When loans are collected and transformed into just one type of tradable security <p><u>In a CMO:</u></p> <ul style="list-style-type: none"> • The securities are allocated into different groups or tranches • Each tranche typically has a different interest rate (coupon) – from trench A to trench C with decreasing credibility • Crucially, any defaults on the entire CMO typically are allocated to the tranche with the shortest maturity first • This structure means that tranches with lower credit ratings (indicating higher risk) also receive the highest returns • These lowest-rated tranches, often referred to as the "equity" tranche, suffer credit losses ahead of the other tranches once the initial "equity" tranche has been exhausted

CMOs - Redistribution of Credit Risk through Market Segmentation

- The originator of a CMO can use market segmentation to redistribute credit risk among investors
- This is achieved by creating tranches with varying risk-return profiles. Investors can choose a tranche based on their risk appetite:
 - Higher-rated (senior) tranches receive payments first and are less exposed to default risk, appealing to risk-averse investors, but typically offer lower returns
 - Lower-rated (subordinated or "equity") tranches incur any credit losses first, bearing higher risk but offering higher potential returns