Dynamic Risk Management

Education Session

IASB Meeting, May 2017
Agenda Paper 4

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May 2017

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Meeting Objective

Why and how of Dynamic Risk Management (DRM)

Why are demand deposits different?

- Why is modelling a means to an end?

Demonstrate how derivatives are used to transform a portfolio

Discuss DRM cash reconciliations

Next steps

Case Studies

There are a number of case studies included which are meant to:

1. Demonstrate numerically and graphically how a risk manager would think about Net Interest Margin (NIM) stability;

2. Re-inforce the concepts discussed throughout the presentation; and

3. Show how a risk manager manages – what actions do they take and why?

Stabilise NIM

Banks often describe the objective of DRM as NIM stabilisation.

However, the term ‘stable’ can have multiple interpretations.

The following pages will discuss the above. As a starting point, the assumed objective of DRM is to minimize NIM fluctuations period over period.

Other potential objectives are considered later in the presentation.

Focusing on NIM will help explain why the DRM objective has multiple interpretations.

Net Interest Margin

DRM would define NIM numerically as:

Yield on Loans − Cost of Funding = NIM

Cost of funding can be further broken down into two components:

- Term funding – Interest bearing debt with a contractual maturity such as term deposits, covered bonds or issued debt. The holder has limited ability to return the debt for cash.
- Deposits – Funds placed with the bank for safekeeping. Funds must be returned to customers within days, if requested.

Yield on Loans − (Cost of Term Funding + Cost of Deposits) = NIM

Net Interest Margin

Further examining the NIM equation in the context of product maturities highlights two important facts.

A: **Yield on Loans** – (Cost of Term Funding + B: **Cost of Deposits**) = NIM

A – The vast majority of loans have a contractual maturity date. New loans will be originated to replace the matured loans. They will be priced based on market factors at the time of origination. Perpetual life fixed rate loans do not exist.

B – A significant portion of deposits are non interest bearing and likely will never be interest bearing. As such, portfolios of perpetual life zero cost deposits exist. The cost of these portfolios is effectively a constant in the long run at zero.

Assets mature.

A significant portion of funding does not.

NIM – Deposit Portfolios

NIM for deposit funded loan portfolios is:

Yield on Loans − **Cost of Deposits (0%)** = **NIM**

However, if the cost of deposits is zero, and will always be zero, then the equation is:

Yield on Loans = **NIM**

For deposit funded portfolios, NIM is dominated by the asset yield.

NIM – Deposit Portfolios

NIM stabilisation is an asset problem for deposit funded portfolios because:

Yield on Loans = **NIM**

- Fixed rate perpetual life assets do not exist, loans will mature and they will be replaced by new loans;
- Loans are priced based on the interest rate environment at the time of origination. Therefore, loan pricing is a function of interest rates;
- As NIM for deposit funded portfolios is dominated by loan yields and loan yields are a function of interest rates, this means that as loans mature and are replaced, NIM will change; and
- As long run NIM is a function of interest rates, NIM cannot be perfectly stable period over period into perpetuity.

As such, how should the term ‘stable’ be interpreted?

NIM – Deposit Portfolios

Portion of loans funded by deposits

Yield on Loans = **NIM**

As loan yields are the only aspect of the equation that can change, efforts to manage NIM require an asset focus.

As the assets must mature and re-price, the DRM perspective has two parts:

- What is the desired profile for NIM re-pricing? How quickly should NIM respond to changes in the interest rate environment?
- What actions are required to align the originated loan portfolio with the target profile?

By managing the asset profile, it is possible to manage NIM fluctuations.

See case study # 2 for more details – page 31

Core Deposits

Evaluating customer behaviour is only relevant when determining what portion of the deposit base is core versus non core.

Once a balance is determined to be core (i.e., perpetual funding), management must decide how it would like NIM to re-price as the assets originated with those core deposits will mature and re-price.

This decision regarding NIM re-pricing defines the DRM target profile.

However, as banks cannot force customers to originate loans that are perfectly aligned with the target profile, mitigating actions are required to align the actual asset profile.

To inform the required mitigating actions, the target profile must be measured. The modelling of deposits is the quantification of the target profile.

Demand deposit modeling is a means to an end.

Case Study # 1

Objective

- Demonstrate how derivatives are used to transform an asset profile
- Why is demand deposit modelling a means to an end?

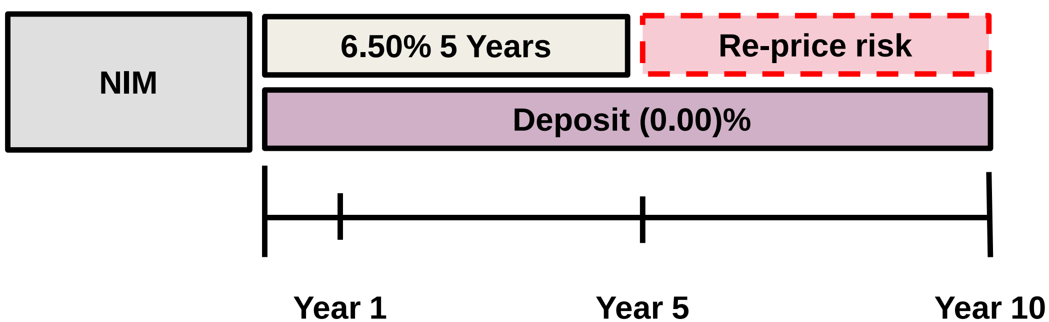
Case Study # 1

AB Bank manages NIM. Their balance sheet is as follows.

All products are non-amortising. Management has assessed their deposit base and is comfortable it is effectively zero rate perpetual funding.

Product	Balance	Yield
Assets		
5YR Fixed Loans	1,000.0	6.50%
Liabilities		
Core Deposits	1,000.0	0.00%

Over a ten year horizon, the NIM profile is as follows. 100% of NIM is subject to re-pricing at the end of T^5.

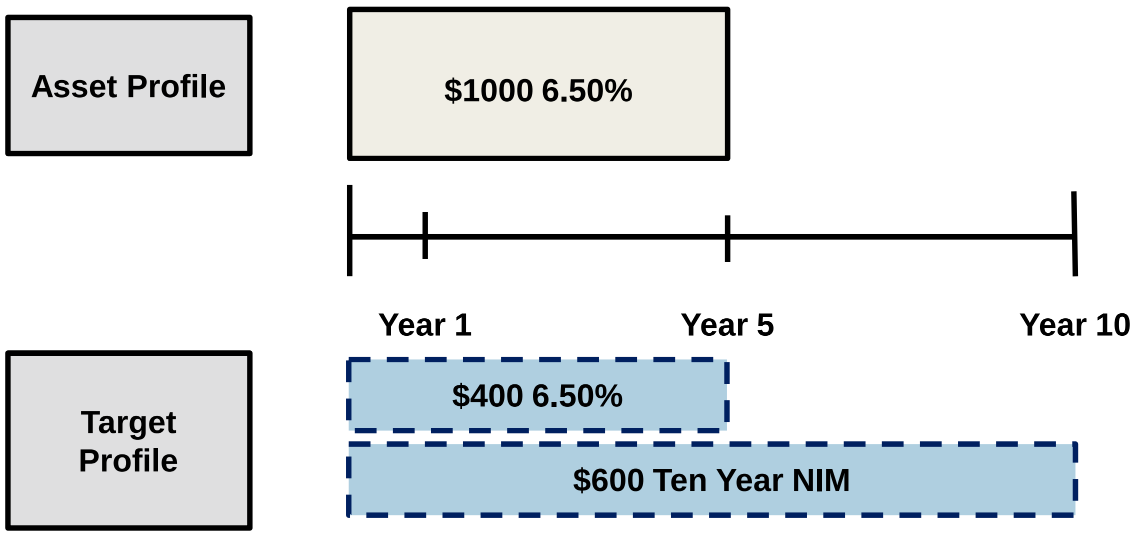


Management is uncomfortable with 100% NIM re-pricing at end T^5.

Case Study # 1

Management decides to fix re-pricing such that $400 re-prices after 5 years and the remaining $600 of the portfolio re-prices after 10 years.

Management compares the target profile with the actual profile below, highlighting the necessary transactions to transform the portfolio.



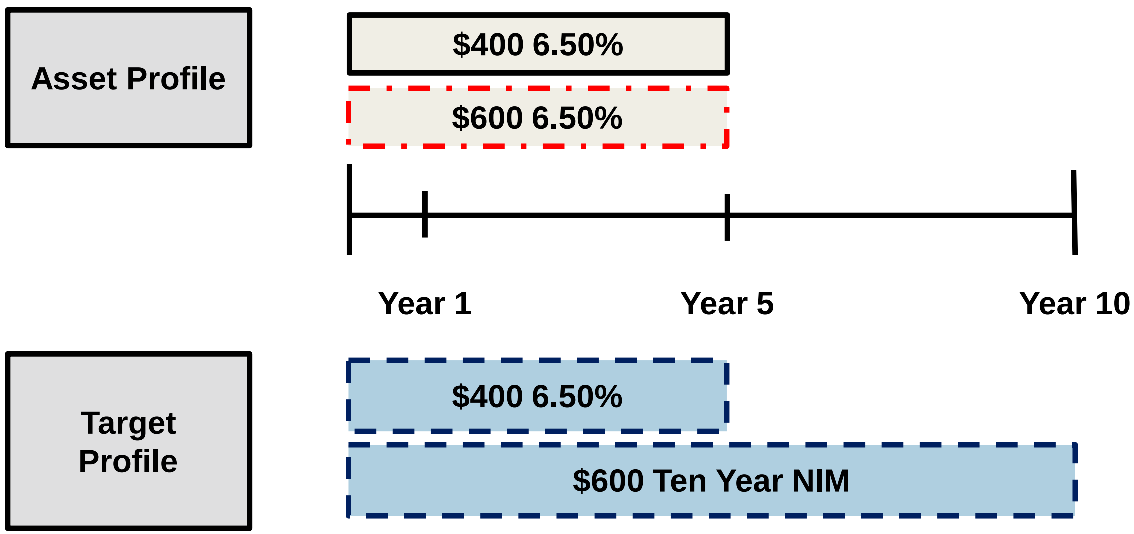
In order to transform the portfolio to the target, certain actions must be taken at T^0 and certain actions are required at T^5.

Case Study # 1

The following actions will transform the portfolio.

Step 1 – Split the actual portfolio

As management wishes $400 to re-price at T^5, and $400 will naturally re-price at that time, no action is required. Management will focus on the $600 which they do not want to re-price at T^5.

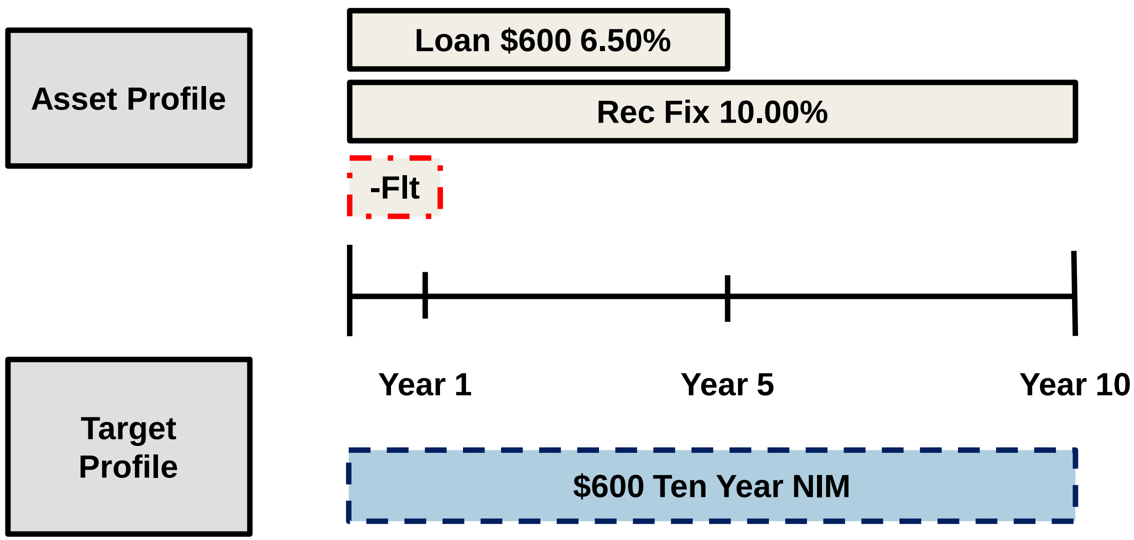


The above demonstrates that the target profile has been obtained for $400 out of the $1000.

Case Study # 1

Step 2 – Secure 10 year yield

Focusing on the $600 where management wishes re-pricing to take place at T^{10}. A 10 year receive fix, pay float swap will provide a fixed rate asset (i.e., the receive leg) for 10 years.

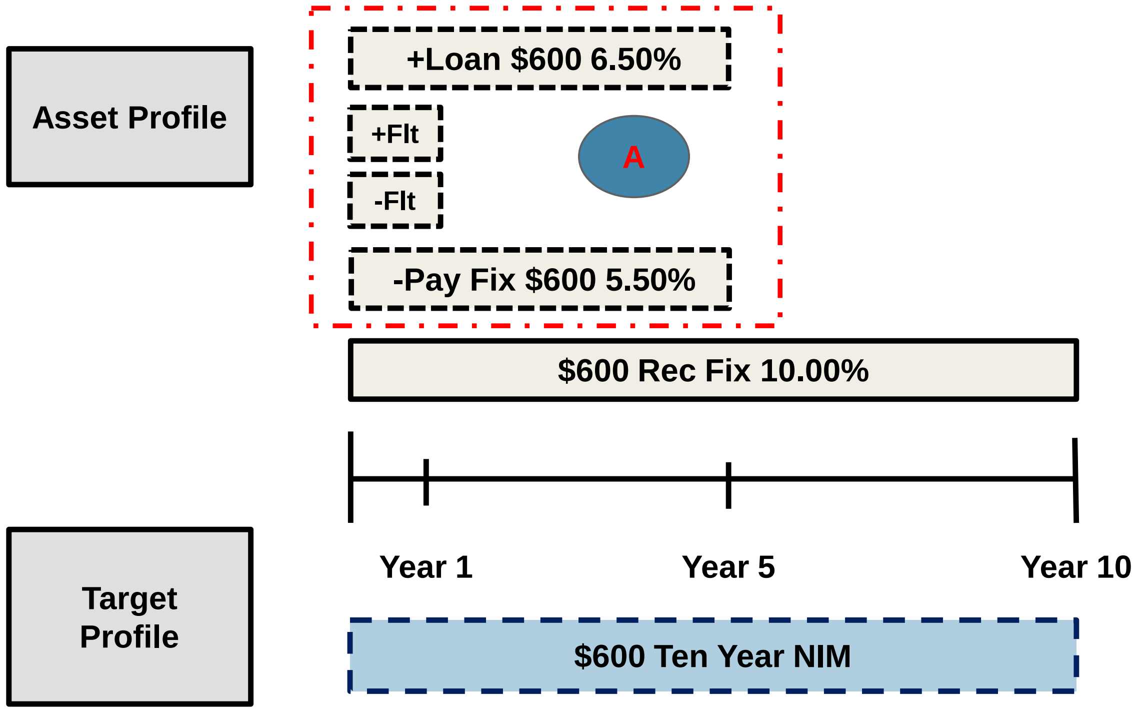


While the 10 year asset has been obtained, management is now funding a 5 year asset with floating rate debt (i.e., the swap pay leg).

Case Study # 1

Step 3 – Close out position

The final action taken at T^0 is to eliminate the residual re-pricing risk by executing a 5 year pay fix, receive float interest rate swap.



A – The four instruments in the red box net to a notional of $0 with but earn 1.00% of $600 each period.

NIM has changed from 6.50% to 11.00% after aligning the asset and the target profile.

No more actions are required until T^5.

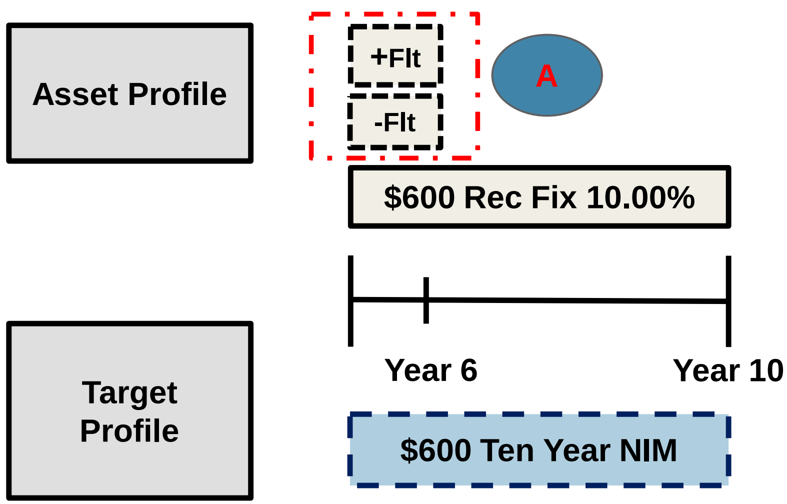
Case Study # 1

Step 4 – T^5

At the end of year 5, three events will occur which the risk position must consider:

- $600 of cash will be received as the loan matures;
- The 5 year pay fix, receive float interest rate swap will mature; and
- The $600 of cash will be used to originate another loan.

After these events, the risk position will be as follows assuming the bank funds a year 5 floating rate loan earning float + 1%.



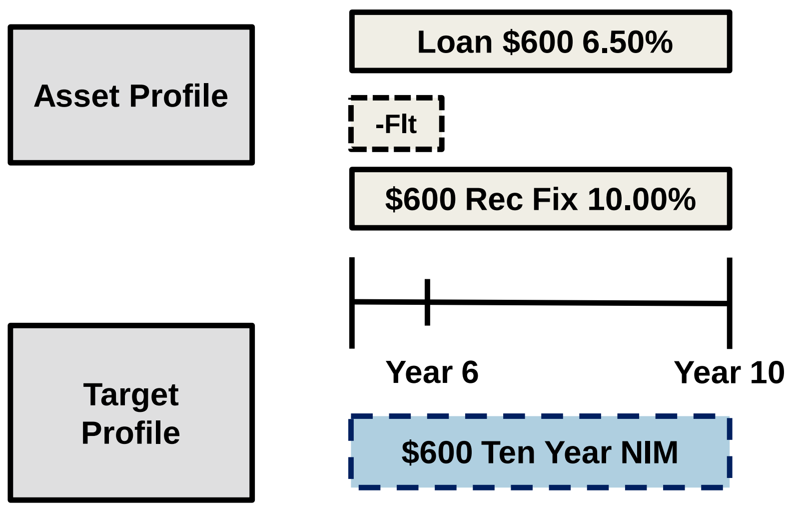
A – The new loan earns the float rate, which is offset by the pay float leg on the 10 year swap executed at T^0.

The actual profile matches the target, no action is required. NIM is maintained at 11% until the end of T^{10}.

Case Study # 1 – What if

Step 4 – T^5

The case assumed a floating rate loan would be originated at the end of T^5. Given management cannot control what type of loans are originated, what would occur if a fixed rate loan had been originated?

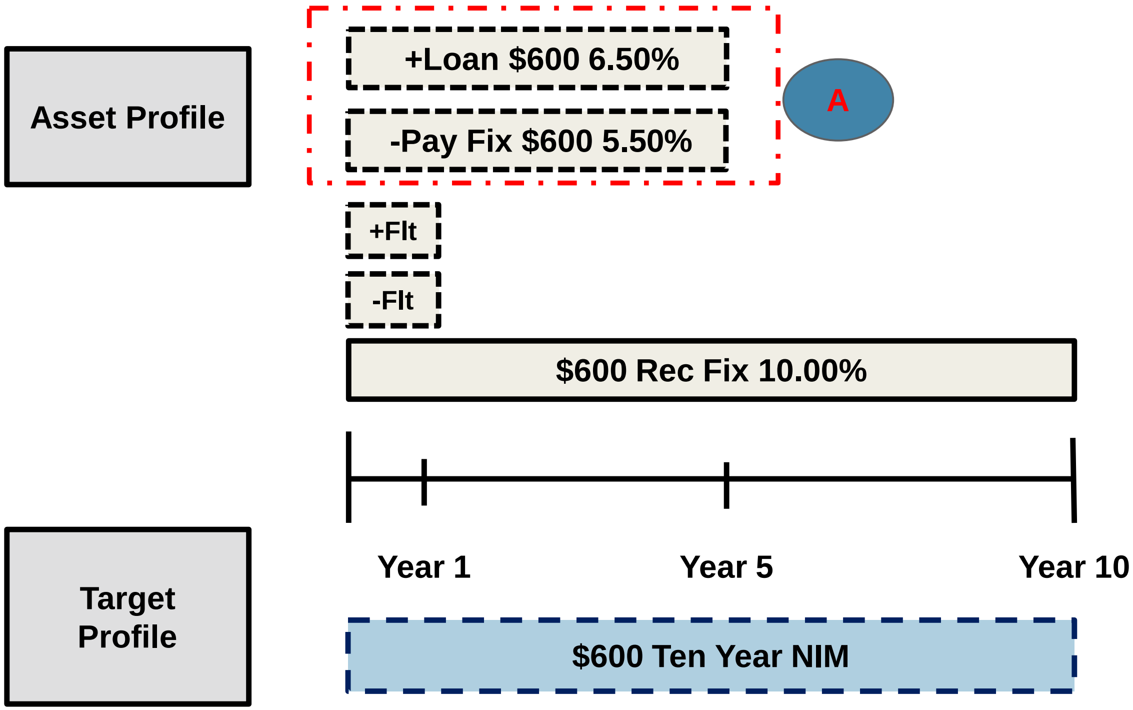


The profile above is very similar to that on page 16 where the fixed rate loan is funded by the float leg of the swap creating re-pricing risk.

Case Study # 1 – What if

Step 5 – Close out the T^5 position

The final action taken at T^5 is to eliminate the residual re-pricing risk by executing another 5 year pay fix, receive float interest rate swap.



A – As the loan and the swap will be priced at the same time, there is limited risk that these two instruments will impact NIM going forward.

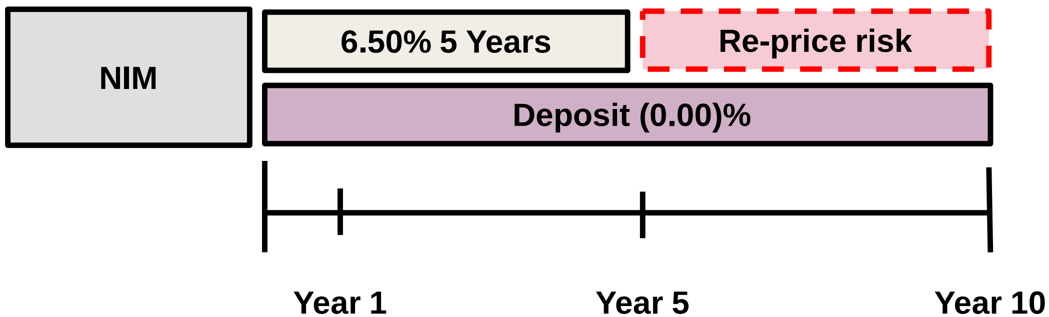
NIM is maintained at 11% until the end of T^{10}.

Management is indifferent to which type of loan is funded at the end of T^5. Management has the flexibility to react to customer actions.

Case Study # 1A

What would change if management decided to focus on the modelled liability profile rather than match the asset profile to the target profile?

To answer this question, we will reuse the beginning balance sheet and management strategy from page 13.



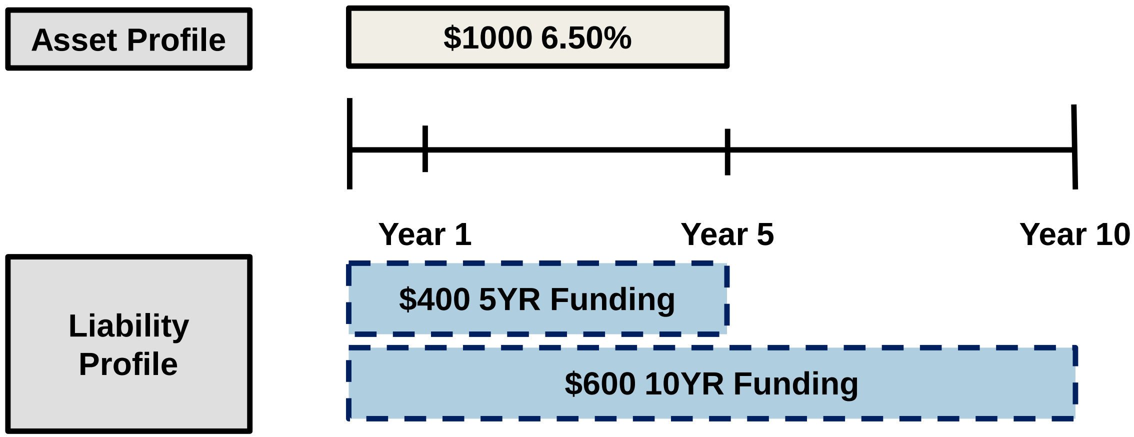
Management is comfortable that the deposits represent effectively zero rate perpetual life funding.

A liability profile equal to 60% 10 year funding and 40% 5 year funding is modelled.

Case Study # 1A

The demand deposit profile created through modelling is:

- $400 fixed rate funding for 5 years; and
- $600 fixed rate funding for 10 years.



A risk manager would compare the profiles and focus on two areas:

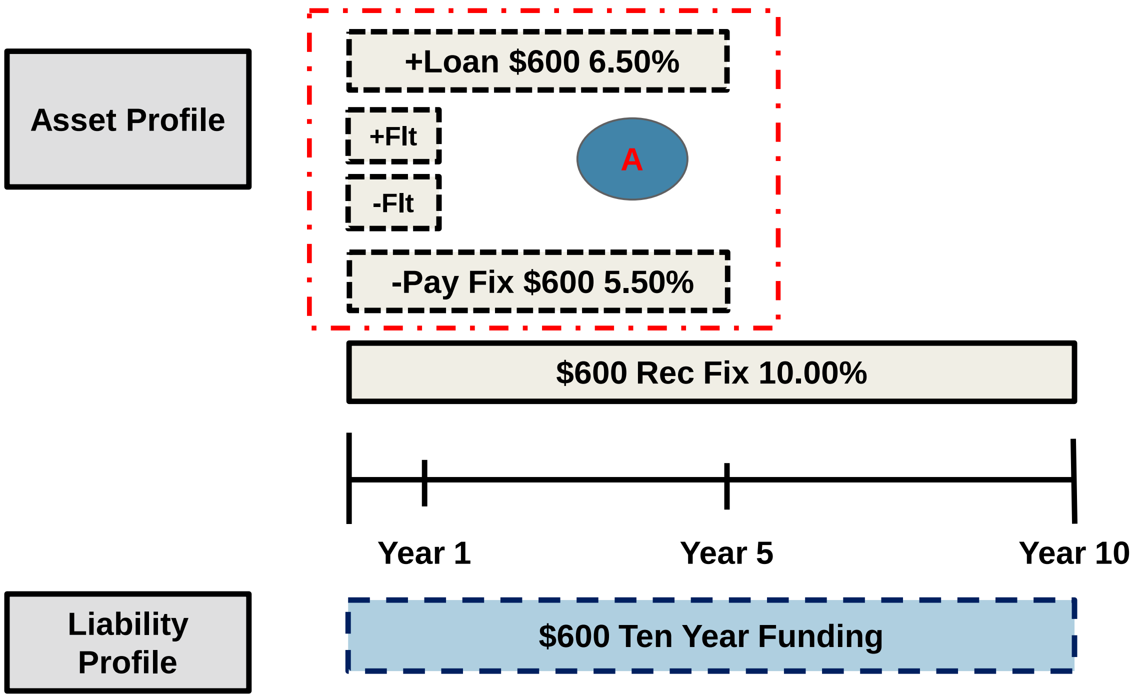
1. $400 of fixed rate five year loans are funded by five years of fixed rate funding – no mitigating action required; and
2. $600 of fixed rate five year loans are funded by ten years of fixed rate funding. Mitigating actions are required.

These observations are the same as those made on Slide 15.

Case Study # 1A

Focusing on the $600 where the bank is funding 5 year loans with 10 year deposits, the bank would execute two derivative transactions to manage the position:

1. A ten year receive fix interest rate swap, providing the required asset duration; and
2. A five year pay fix interest rate swap, to offset the 5 year fix loan duration.

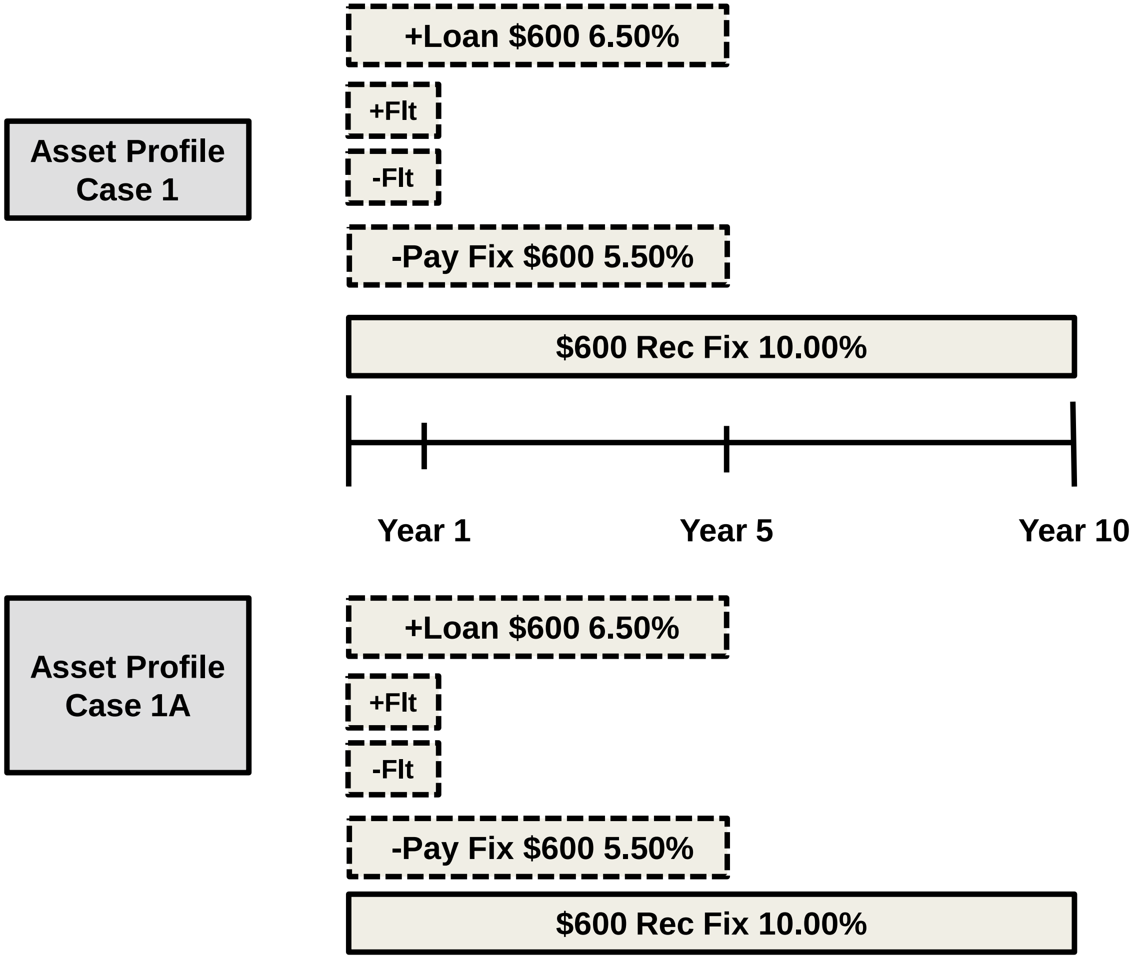


A – The four instruments in the red box net to a notional of $0 with but earn 1.00% of $600 each period.

NIM has changed from 6.50% to 11.00% after aligning the asset and the target profile.

No more actions are required until T5.

Case Study # 1 versus 1A



Comparing the asset profiles and the executed derivatives between pages 17 and 23, it should be apparent that they are identical.

The actions taken at T^5 would also be identical.

The actions and resulting NIM profile are identical irrespective of the choice to match a target profile or hedge deposits.

Reconciliations

If the objective is to manage period over period changes in NIM, management should have a thorough understanding of NIM and what factors could cause a change.

If management is often surprised by differences in NIM versus their expectations, this implies an incomplete understanding of the factors that can impact NIM.

As such, the accuracy of the DRM function can be measured by comparing actual NIM with expected NIM periodically.

NIM Reconciliations

Focusing on the figures from Case Study # 1, after the hedges have been executed, there are three groups of products that have an impact on cash flows.

- Original loan;
- Swap fix legs; and
- Swap float legs.

NIM Reconciliation

Focusing on the $600 investment from Case 1, based on the data* in the case, management targeted a ten year NIM comprised of 10% from base interest rate levels and 1% of loan margin for a total of 11%.

		A	B	C = A * B	D	E
Group	Item	Notional	Yield	Actual $s	Expected $s	Difference
Asset	Loan	600	6.50%	39.0		
	Asset Net	$ 600.0		$ 39.0		
Fix Leg	5YR Pay Fix	-600	5.50%	- 33.0		
	10YR Rec Fix	600	10.00%	60.0		
	Fix Leg Net	$ -		$ 27.0		
Flt Leg	5YR Rec Flt	600	1.50%	9.0		
	10YR Pay Flt	-600	1.50%	- 9.0		
	Flt Leg Net	$ -		$ -		
Liability	Deposit	600	0.00%	-		
	Liability Net	$ -		$ -		
	Total	$ 600.0	11.0%	$ 66.00	$ 66.00	$ -

In this example, the actual NIM matches that of the target profile and so no differences would be identified.

In any reconciliation, the expected NIM figure would be derived from the target profile.

* A data capture process to determine the expected ten year NIM would be required

NIM Reconciliation

To highlight the potential of the reconciliation, if there was a delay in derivative execution and rates changed during that time, the reconciliation would show as follows.

		A	B	C = A * B	D	E
Group	Item	Notional	Yield	Actual $s	Expected $s	Difference
Asset	Loan	600	6.50%	39.0		
	Asset Net	**$ 600.0**		**$ 39.0**		
Fix Leg	5YR Pay Fix	-600	5.50%	- 33.0		
	10YR Rec Fix	600	9.95%	59.7		
	Fix Leg Net	**$ -**		**$ 26.7**		
Flt Leg	5YR Rec Flt	600	1.50%	9.0		
	10YR Pay Flt	-600	1.50%	- 9.0		
	Flt Leg Net	**$ -**		**$ -**		
Liability	Deposit	600	0.00%	-		
	Liability Net	**$ -**		**$ -**		
	Total	**$ 600.0**	**11.0%**	**$ 65.70**	**$ 66.00**	**$ -0.30**

The reconciliation can capture errors throughout the DRM process

NIM Reconciliation

The example reconciliation created a final NIM expectation which does not provide management insight into which part of the process created the error (i.e, management would not know where the problem arose). The more disaggregated the expected NIM calculation the more information management has to diagnose the error in the DRM process.

		C = A * B	D	E
Group	Item	Actual $s	Expected $s	Difference
Asset	Loan	39.0	39.0	-
	Asset Net	**$ 39.0**	**$ 39.0**	**$ -**
Fix Leg	5YR Pay Fix	- 33.0	- 33.0	-
	10YR Rec Fix	59.7	60.0	- 0.3
	Fix Leg Net	**$ 26.7**	**$ 27.0**	**$ -0.3**
Flt Leg	5YR Rec Flt	9.0	9.0	-
	10YR Pay Flt	- 9.0	- 9.0	-
	Flt Leg Net	**$ -**	**$ -**	**$ -**
Liability	Deposit	-	-	-
	Liability Net	**$ -**	**$ -**	**$ -**
	Total	**$ 65.70**	**$ 66.00**	**$ -0.30**

If the report could be completed at the product type level, then this error would be identified quickly as being related to the Rec Fix Swaps and could be investigated.

Accounting Model Relevance

The IASB has acknowledged that any solution will need to consider the information needs of constituents concerning DRM activities, and that its approach should consider disclosures, recognition and measurement to arrive at a consistent set of proposals to address those needs.

Given the DRM actions and activities described, relevant information to be considered for the purposes of financial reporting could include:

1. What target profile has been chosen and why?
   - Optimisation versus stabilisation
2. How successful is management in achieving that target profile?
3. What factors are considered when determining core versus non core balances?
   - Could errors in assumptions create liquidity risk? What is the quantum of loss that could arise from errors in assumptions?

Next Steps

Q2 / Q3

Q3

What is the business of DRM?

- What are the challenges?
- What are the objectives?
- Why do they take the actions they do?

How is DRM Currently reflected in the Financial Statements?

How do we evaluate a proposed accounting model?

- User needs
- Establish Criteria

To complete "What is the business of DRM" we will discuss two more topics:

- Prepayment risk
- The dynamic nature of portfolios

Prepayment risk poses an economic risk that must be considered by the model.

The dynamic nature of the portfolio will not invalidate the target profile discussions held to date.

IFRS Foundation

Case Study # 2
Reinvestment Risk and Core Deposits

IFRS

Case Study # 2

Objective

- Deposits increase profitability of a portfolio
- Deposits make it difficult to stabilise NIM in the long run
  - Perpetual life assets do not exist, however, perpetual funding does
- Why risk managers focus on deposits and equity when stabilising NIM

Case Study # 2

1234 Bank Incorporated does not manage NIM. Their balance sheet is as follows. All products are non-amortising.

Product	Balance	Yield
Assets		
2.5YR Fixed Loans	500.0	5.00%
5YR Fixed Loans	500.0	6.50%
Liabilities		
Core Deposits	1,000.0	0.00%

Re-arranging the balance sheet to align source and use of funds will highlight the stability of NIM.

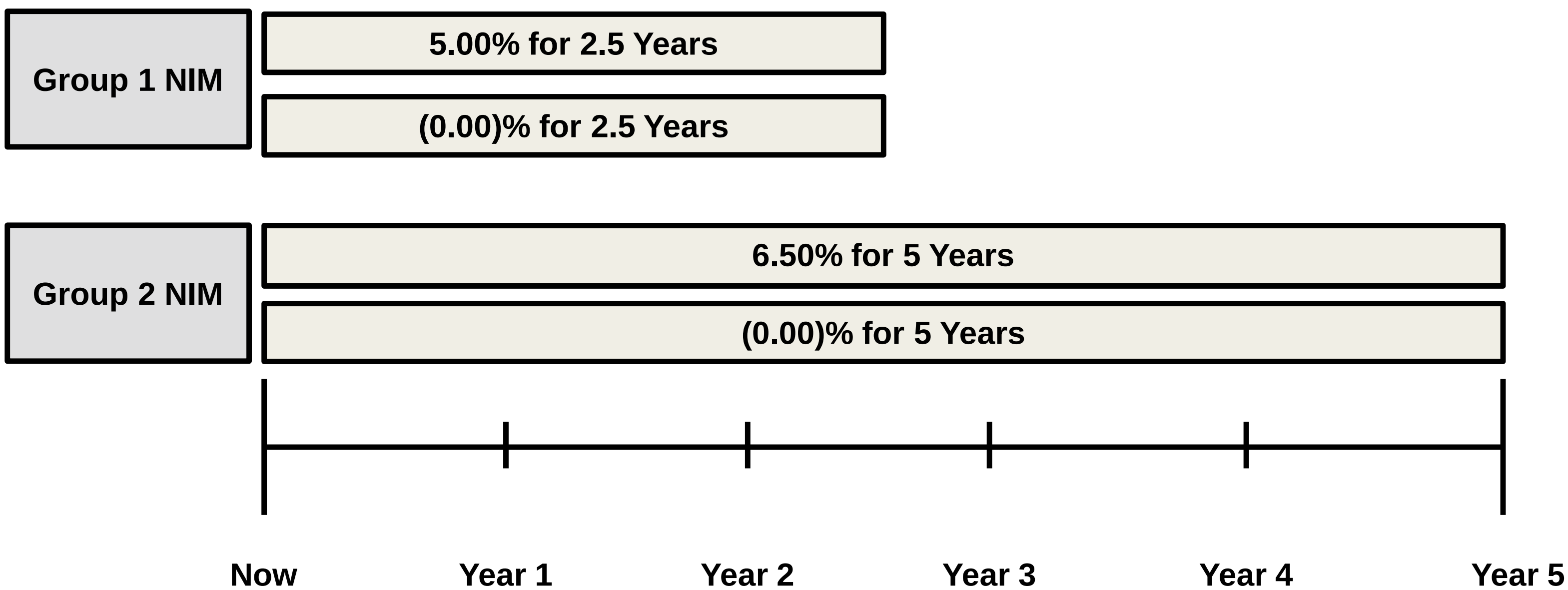
Product	Balance	Yield
Group 1		
2.5YR Fixed Rate Loans	500.0	5.00%
Core Deposits	500.0	0.00%
Group 1 NIM		**5.00%**
Group 2		
5YR Fixed Rate Loans	500.0	6.50%
Core Deposits	500.0	0.00%
Group 2 NIM		**6.50%**

NIM is 5.75%.

NIM is the loan yield

Case Study # 2

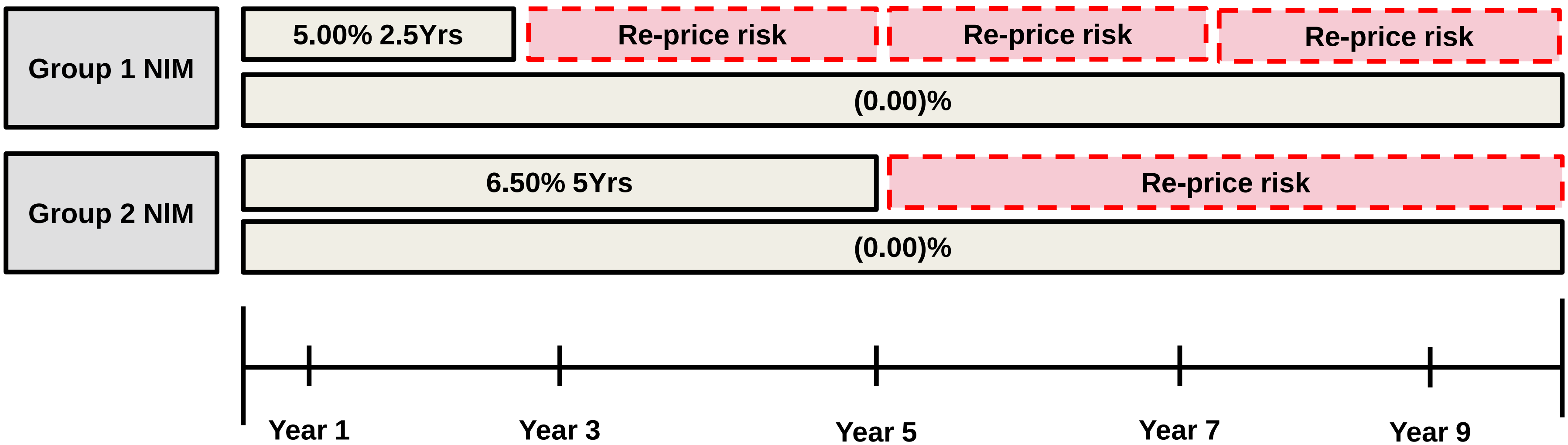
NIM shown graphically over a 5 year period is as follows:



However, the above chart is inaccurate as it implies the core deposits will re-price at $T^{2.5}$ and at T^{5}. Given the deposits are core in nature, it is likely that they will never re-price.

Case Study # 2

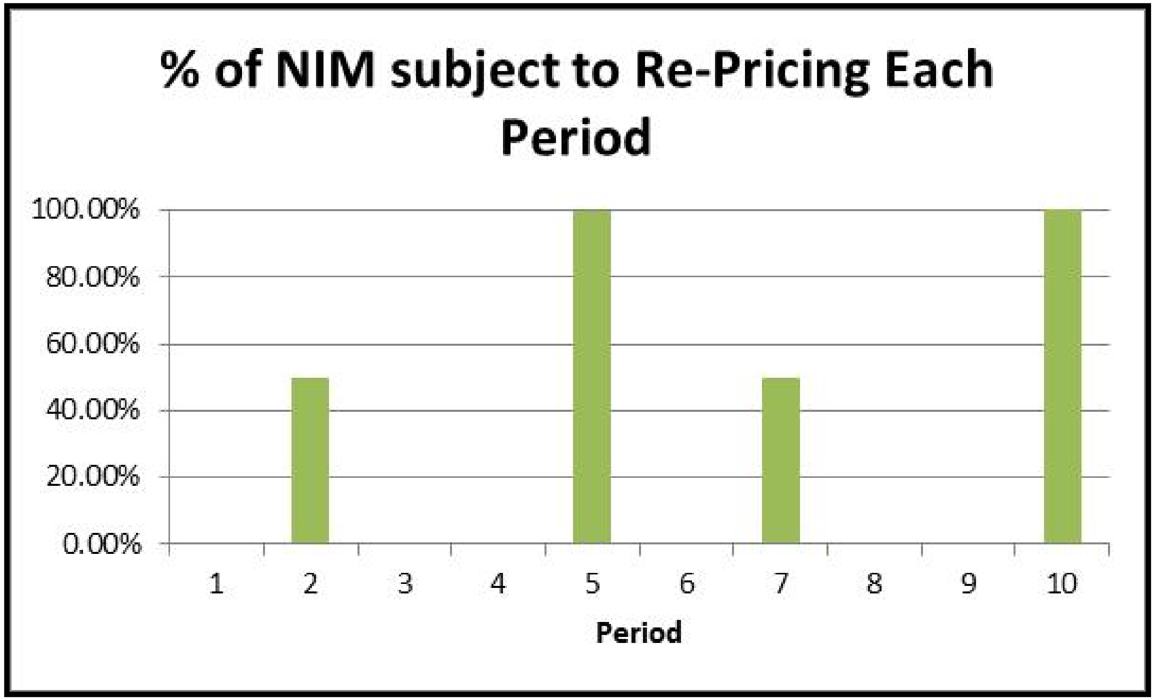
This is apparent after expanding the time horizon to 10 years.



The loans will re-price four separate times over the ten year time horizon. The deposits will likely not re-price at all over that time horizon regardless of the interest rate environment.

Case Study # 2

The chart below shows the percentage of NIM subject to re-pricing at each period between T^0 and T^{10}.



If the percentage of NIM re-pricing each period fluctuates between 0 and 100%, is that consistent with stable NIM?

Thank you