Client Webinar Series

Webinar II:
Interest-Rate Risk in the Banking Book (IRRBB)

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Agenda

- Webinar I: Updating your liquidity risk management framework
- **Webinar II: Interest-rate risk in the banking book (IRRBB)**
  - Implementing Basel III/IV guidance for IRRBB and CSRBB
  - Managing earnings and present value risk, best-practice
  - ALCO responsibility and monitoring: good-practice risk dashboard for IRR
- Webinar III: Artificial Intelligence (AI) and Bank Balance Sheet Management

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Let's start with this…

- Banks have been using a kind of "modified duration" measure of interest-rate risk exposure – "Dollar Value 01 (DV01)" or "Present Value of a Basis Point (PVBP)" – since at least the 1980s…
- National regulation surrounding "Interest-Rate Risk in the Banking Book (IRRBB)" takes its cue from the Basel Committee for Banking Supervision (BCBS) guidance published in 2016 ("BCBS368")
- So….after 10-40 years….
- https://www.linkedin.com/posts/alm-partners_almday2026-activity-7471156103196844032-XJQ0?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAG7zdQBpdD9TkMl4SCOznoe0xiBjFrJhoA

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IRRBB nuances

- Banks have always had to manage their “interest-rate risk” (IRR)….
  - Ten years after BCBS 368 supervision authorities are still publishing guidance on this topic and banks are still debating what the IRRBB rules mean for their origination and optimisation strategy!
  - The European Banking Authority (EBA) published a Final Report on IRRBB in 2018 and another Final Report in 2022. Its guidance is perhaps closest to what is contained in BCBS368, and it expands on the latter when describing credit-spread risk in the banking book (CSRBB). (The EBA does depart from Basel in allowing banks to include their equity base in the EVE Delta calculation: that has proved very useful for some banks’ sensitivity values.)
  - The guidance has been implemented at varying pace across jurisdictions: Bank Negara Malaysia published Exposure Draft 029-38 (a consultation) on IRRBB only in Sep-2025….
  - In the European Union every bank is obliged to follow IRRBB guidance, but this is not the case in every jurisdiction. In the USA and Australia, for example, only banks designated as “systemically important” are so required.
  - This became a debating point after the failures of Silicon Valley Bank and First Republic Bank in 2023; both were large institutions but below the balance sheet size at which point Basel-related guidance kicks in. This in itself leaves potentially grey areas for banks that may not be obliged to follow the rules but would wish to still manage their IRRBB. In essence, complying with IRRBB rules is one challenge for banks; working with the rules in a way that enables a bank to optimise its balance sheet structure is quite another.

Banking Book Interest Rate Risk

- *Interest rate risk in the banking book (IRRBB)* refers to the current or prospective risk to the bank's earnings, and thereby its capital base, arising from movements in interest rates that affect the institution's banking book positions
  - Subtle change from the regulator's definition!

- In the Banking Book, balance sheet transactions are recorded at original or historic cost and any change in value during the life of assets and liabilities is not directly captured in the P&L

- This is distinct from the Trading Book where balance sheet transactions are recorded at 'fair value' and reported P&L will capture changes in the value of trading book assets and liabilities

Definition of Banking Book

- To quote Newson (RISK, 2017), "there is no direct or explicit regulatory definition of the banking book; instead it is defined as everything that is not in the trading book – which therefore means the regulatory definition of the trading book needs to be considered first."
- The Basel standards on trading book define it as one comprising instruments held for one or more of the following purposes:

- Short-term resale
- Profiting from short-term price movements
- Locking in arbitrage profits
- Hedging risks that arise from the above

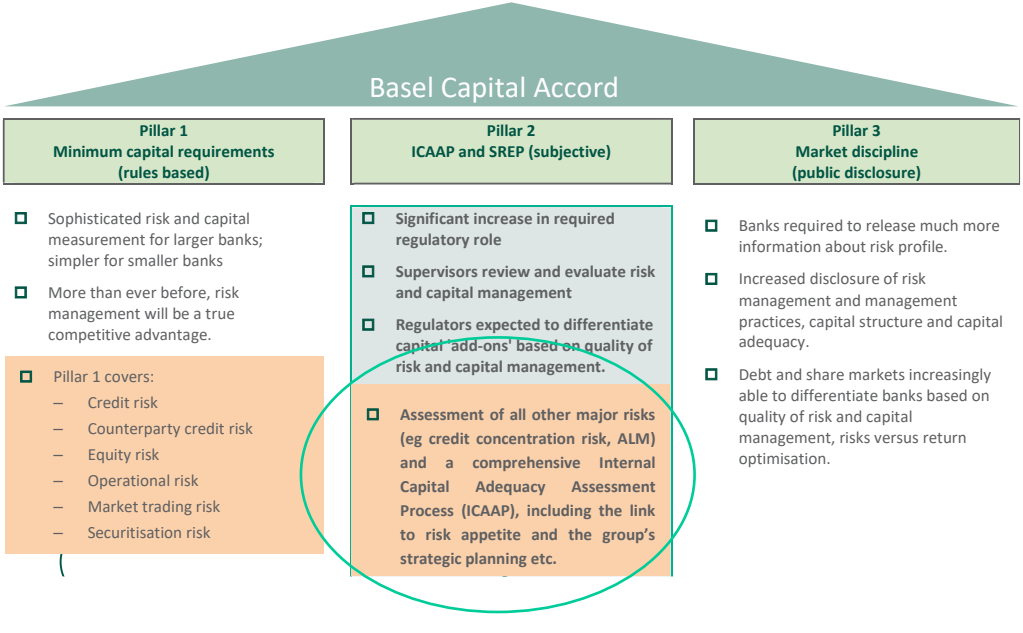
- Note that the last item does not explicitly cover hedging instruments which are derivatives, but derivs used to hedge banking book market risk exposure is treated as a trading book item with daily marking-to-market

Banking book items

- Extract from Newson (2017), p.56
- The grey column items are "slightly more problematic…they are traded on wholesale markets with observable prices and …may still be actively managed with reference to current market prices."
- That said…for IRRBB purposes we treat the grey column and manage it as Banking Book
  - "Hedge accounting" of course….

Regulatory Banking Book	**Regulatory Trading Book**	
Internal non-traded book	**Internal Traded Book**	
Customer deposit accounts	Money market	Derivative instruments
Retail loans	loans and deposits	Bond positions
Commercial loans	Liquid asset holdings	Equity positions
Mortgages	FVOCI asset holdings	Commodity positions
Leasing	Derivatives hedging above items	Open FX positions
Equity holdings as venture capital		
Derivatives hedging above items		

Regulatory Framework Governing the Management of IRRBB



- ***Under the Basel Framework, IRRBB is captured within Pillar 2a***
- In Europe the Basel approach is reflected in both:
- ✓ EBA Guidelines on the Management of Interest Rate Risk arising from Non-Trading Activities and
- ✓ The PRA's Methodologies for setting Pillar 2 Capital

What EU firms would follow (EBA Final Report July 2018 and October 2022):

The implementation date was June 2019 (Jan 2020 for SREP Cat 3 and 4 firms). The PRA expects firms to prepare "written record of assessments in relation to IRRBB" (SS31/15) and where IRRBB considered material and pose significant risk should undertake robust development implementation and validation of their IRRBB model" (SS3/18).

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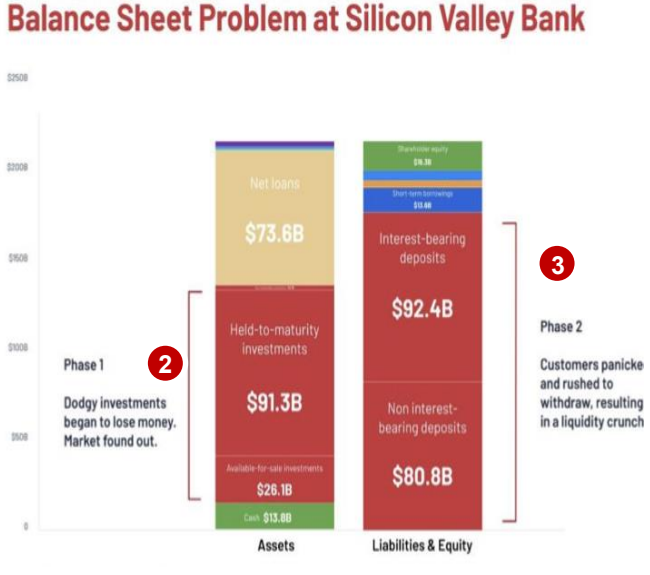
Interest Rate Risk in the Banking Book: why should you care?

Silicon Valley Bank

1 Aggressive maturity transformation, 2 losses in HTM assets treated as unrealised (masked in Accounting view), no reporting ('tight-lipped') on EVE view, 3 IRRBB induced liquidity run

SIVB (DH from 10k)	Balance Sheet ($millions)		Duration (years)	
Assets	YE 2022	YE 2021	2022	2021
Cash	13,803	14,586		
AFS	26,069	27,221	3.6	3.5
HTM (2)	91,321	98,195	6.2	4.1
Other	2,664	2,543		
Tot Inv Securities (1)	**120,054**	**127,959**	5.6	4.0
Net loans	73,614	65,854		
Total assets	**211,793**	**211,308**		
Noninterest DD	80,753	125,851	*1.0*	*1.0*
Interest-bearing DD	92,356	63,352	*1.0*	*1.0*
Total deposits	**173,109**	**189,203**		
Short-T borrowings	13,565	71	*1.0*	*1.0*
Other (incl Lease)	3,454	2,855		
Long-term debt	5,370	2,570	6.1	6.1
Total liabilities (1)	**195,498**	**194,699**	1.1	1.1

Source: Based on David Harper, LinkedIn, March 2023



Source: Genuine Impact, 2023

Interest rate raise led to unrealised losses (greater than the bank's equity). Management plan to raise capital to prevent rating downgrade preceded by Liquidity Run

https://www.netinterest.co/p/the-demise-of-silicon-valley-bank

https://www.reuters.com/markets/us/silicon-valley-banks-demise-began-with-downgrade-threat-sources-2023-03-11/

Types of Interest Rate Risk in the Banking Book

Interest Rate Risk	Definition
Gap Risk	The risk arising from the timing of instrument rate changes (estimated assuming parallel shifts in the yield curve) due to mismatch in contractual and "behavioural" tenors between assets and liabilities: in effect, "funding repricing risk"
Basis Risk	The impact of relative changes in interest rates for financial instruments that have similar tenors, but are priced using different interest rate references. This is an "earnings sensitivity" item
CSRBB	Credit spread risk in the banking book, the risk of negative impact on earnings and capital arising from change in credit spread, ignoring jump-to-default risk. (In practical terms, really applicable to non-customer credit-risky assets on the b/s. Although not formally…!)
Option Risk (Prepayment)	The potential effect on income/value arising from a fixed rate borrower's or depositor's option to repay their loan or withdraw their deposit ahead of the scheduled maturity date
Option Risk (Pipeline)	The potential effect on income/value arising from a borrower's or depositor's option not to drawdown on a bank's fixed rate loan or deposit offer; or to drawdown some time after the product offering was confirmed

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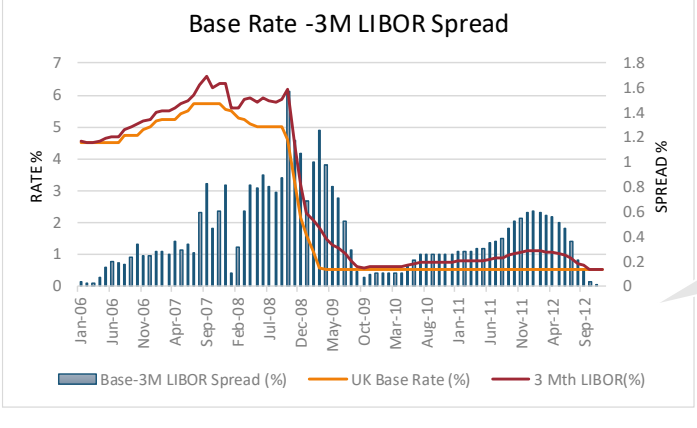
How Significant is Structural Interest Rate Risk for Banks?

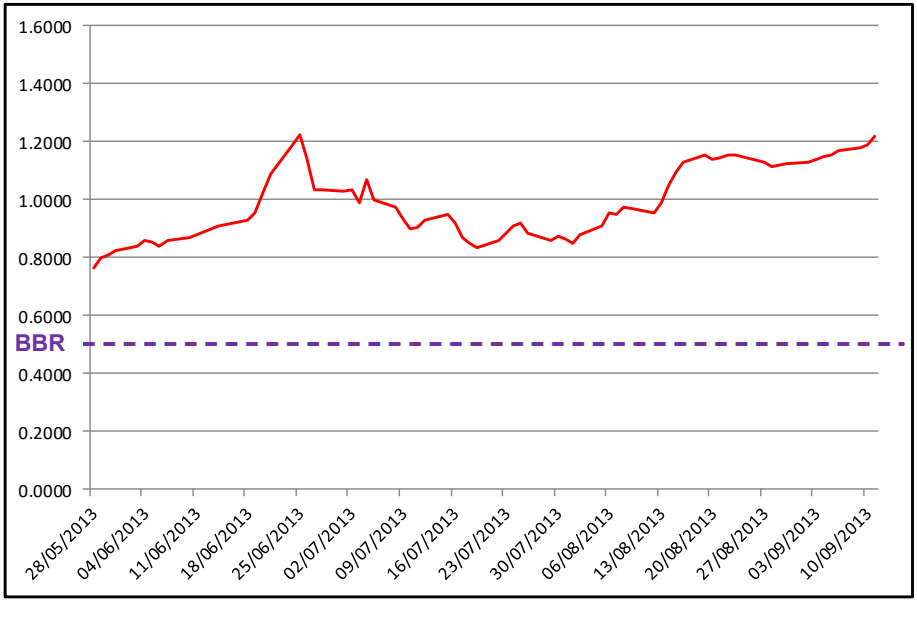
- It is rarely, if ever, likely to cause existential risk exposure but that doesn't mean that structural interest rate risk doesn't matter to banks
- Yield curve/gap, basis and option (pipeline and prepayment) risks can all have a material adverse effect on profitability, and if well managed, represent a source of competitive advantage



Many banks suffered in the aftermath of the financial crisis due to mismatches between Assets and Liabilities re-pricing off Base Rate and LIBOR

Source:BoE Statistics

Even in a “stable” environment, there is “risk”: EG., GBP 2-yr Libor swap rate over a 4-month period when Bank Base rate remained unchanged



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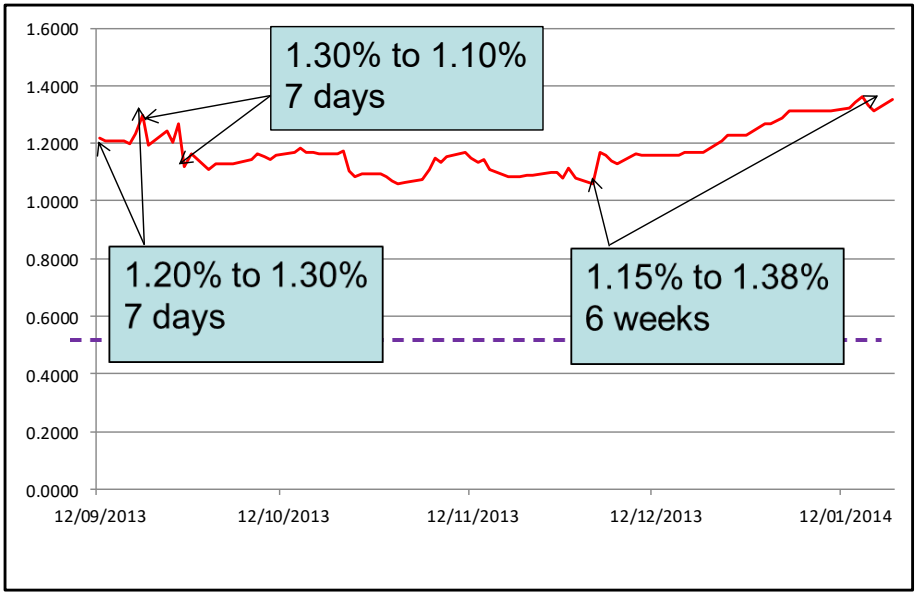

Basel guidelines

- There are 9 key principles (“guidance”) from the BCBS (and 3 for Regulators)
- I’ve summarised them in the Appendix
- So now we can get started….!

Interest Rate Risk in the Banking Book

1 Items in scope, 2 definition, 3 challenges and 4 metrics.

2 Definition

IRRBB refers to the current or prospective risk to the bank's capital and earnings arising from adverse movements in interest rates that affect the bank's banking book positions.

Basel Committee (2016)

3 Challenge

In the banking book, a bank has to manage both:

i) the stability of the income produced by assets and liabilities;

ii) the stability of the underlying value of assets and liabilities

4 Two risk management metrics*

Net Interest Income (NII)

By how much would NII change in response to a change in IR?

Economic Value of Equity (EVE)

By how much would the net present value of the banking book change in response to IR changes?

1 The main items included in the banking book are loans and debt securities portfolios (assets), and deposits and debt securities issued (liabilities)

* The two metrics are discussed in detail in the EBA Guidelines on the management of interest rate risk arising from non-trading activities and in the BCBS Standards on IRRBB

Source: ECB, 2017

Why is IRRBB measured through two different metrics?

Interest rate shifts have effect on the earnings as well as the value of a bank.

Net Interest Income (NII)	▪ When IR move, instruments with a **short duration** (e.g. Euribor-indexed loans) drive fluctuations on interest income / expenses ▪ NII fluctuations are measured over a **limited time period** (usually next 12 months assuming BAU balance sheet growth / reduction ➢ This metric reflects the **effect on earnings of interest rate shifts over a short to medium-term horizon**
Economic Value of Equity (EVE)*	▪ When IR move, instruments with a **long duration** (e.g. long dated fixed rate bonds) drive fluctuations in the net value of assets and liabilities ▪ EVE fluctuations capture the **exposure to IR movements over the entire life** of the balance sheet ▪ EVE also better captures changes in the **valuation of fair value instruments**, such as bonds and derivatives ➢ EVE reflects the **effect of interest rate shifts on the value of a bank**

* The Economic Value of Equity excludes capital from the banking book liabilities since fluctuations in the net present value of the banking book are ultimately born by equity investors

Source: ECB, 2017

Enhanced Disclosure Requirements

- Under the specific requirements:
  - ✓ Own equity should be excluded from the EVE computation (Basel)
    - ✓ Some regulators (e.g., EBA) give banks the choice
    - ✓ This then brings in the treatment of reserves (IR repricing tenor) into the debate
  - ✓ Banks should disclose whether they have excluded or included commercial margins and other spread components in their cash flows
  - ✓ Cash flows should be discounted using either a risk free rate or a risk free rate including commercial margins and other spread components (EBA: “expect” that risk-free rate curve will be used)
  - ✓ EVE should be calculated on a run-off balance sheet
  - ✓ NII sensitivity should be computed using an assumed BAU growth balance sheet and disclosed as the difference in future interest income over a rolling 12 month period [Moorad’s recommendation]
  - ✓ ***Further BCBS details in the Appendices***

Supervisory Outlier Test

Looks like this is rising to 300bps…!!!

- All institutions will be required to perform 2 separate but unrelated calculations assessing the impact of pre-defined interest rate shocks on EVE/capital
- A prescriptive set of principles must be followed when performing the tests:
  - ✓ +/- 200bp yield curve shock. If the impact is >20% of a bank's own funds then the bank must inform the supervisor immediately – *a hard limit*
  - ✓ 6 BCBS pre-defined shocks. If the impact is >15% of Tier 1 Capital, then the relevant supervisor must also be informed immediately. However, this is not a hard threshold, but *a trigger for enhanced supervisory dialogue*
- The requirements are structured in this way to ensure adherence to the BCBS Standards

Shock rates testing approach

- Stress testing of IRRBB should be captured as part of a bank's stress testing programme (and feed into the institution's ICAAP). Extreme scenarios required to be considered are:
  - ✓ sudden parallel interest rate shocks larger than 250 basis points (including extreme shifts) ***(for NII or EVE Sensitivity)*** (Note originally 200 bps for USD, EUR and CHF)
  - ✓ substantial tilts and shifts in the shape of the yield curve (for instance based on those for ongoing internal management, but with more extreme rate changes) ***(EVE Sensitivity only)***
  - ✓ substantial changes in the relationships between key market rates (***basis risk***)
  - ✓ a breakdown in key assumptions about the behaviour of asset and/or liability classes
  - ✓ significant changes to current market and macro conditions and to the competitive and economic environment, and their possible development and
  - ✓ specific scenarios that relate to the individual business model and profile of the institution which should be severe, yet plausible and focus upon key vulnerabilities ***(best applied by banks adopting the dynamic modelling approach)***

Net Interest Income (Earnings) and Economic Value of Equity Sensitivity

- Net Interest Income or Earnings sensitivity measures the effect of a (parallel) change in the general level of market interest rates on short-term earnings, normally for 1 year

- Economic Value of Equity (EVE) is a form of entity valuation based on discounting all future cash flows to produce a net present value

- In the management of interest rate risk, we are interested to measure how NII and the EVE change in different interest rate scenarios.

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Steps to Calculating NII Sensitivity

Step 1 – Project all notional re-pricing cash flows arising from *current* balance sheet interest rate sensitive assets, liabilities and off-balance sheet instruments for the next 12 months.
Assume BAU projected balance sheet growth over next 12 months and slot the interest income and interest expense from this assumed future business into the relevant bucket for next 12 months
A notional re-pricing cash flow is any repayment of principal, any re-pricing of principal or any interest payment on a tranche of principal that has not yet been repaid or re-priced, arising from the *current* balance sheet position and expected future balance sheet items in next 12 months

↓

Step 2 – Slot the Cash flows into the month in which they occur, and sum the net interest income (NII). This is the baseline NII

↓

Step 3 – Apply the yield curve shock, which will impact all floating-rate cashflows, to determine the new NII value. Make and apply assumptions on (i) time lag and magnitude of interest rate changes feeding through to customer products (ii) behavioural assumptions regards impact on volume notionals (eg., prepayment of floating rate loans)

↓

Step 4 – The NII sensitivity is the difference between the Baseline NII and Shock Scenario NII.

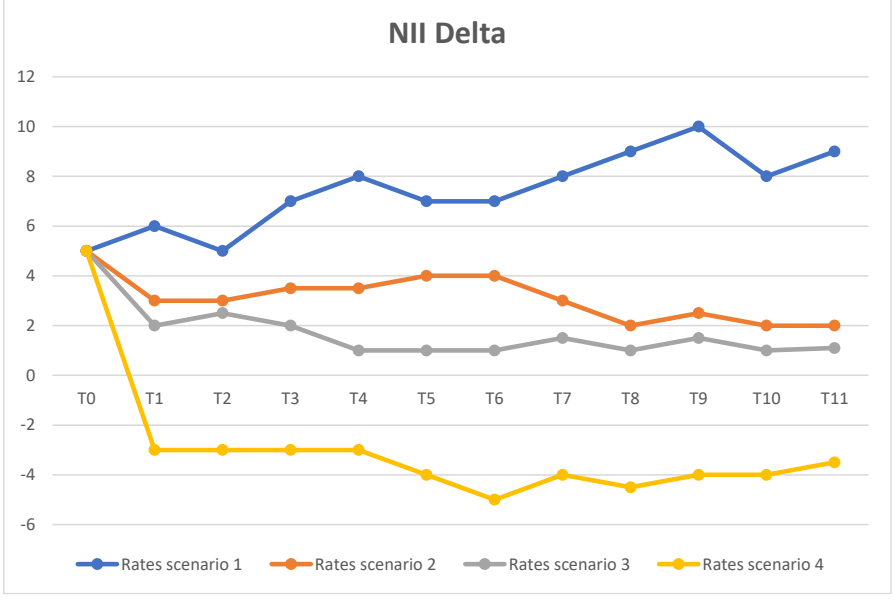
NII Sensitivity Calculation in a Maturity Ladder Format

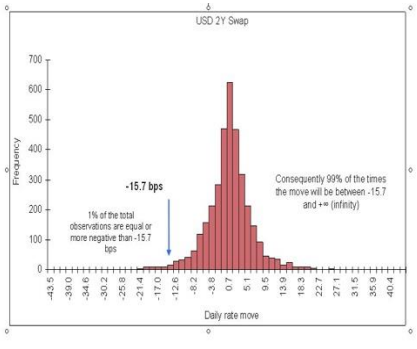
Re-Pricing Bucket Currency (£m)	Assets	Liabilities	Interest Rate Gap	IR Gap x Rate Shock x Remaining Months/12		(£m)
0 - 1 month	500	-175	325	325 x 1% x 12/12	=	3.25
1 - 2 months	0	0	0	0 x 1% x 11/12	=	0.00
2 - 3 months	0	0	0	0 x 1% x 10/12	=	0.00
3 - 4 months	0	0	0	0 x 1% x 9/12	=	0.00
4 - 5 months	0	0	0	0 x 1% x 8/12	=	0.00
5 - 6 months	0	0	0	0 x 1% x 7/12	=	0.00
6 - 9 months	0	-75	-75	-75 x 1% x 6/12 x 0.25	=	-0.09
9 - 12 months	0	0	0	0 x 1% x 1.5/12	=	0.00
12 -15 months	0	0	0			
15 - 18 months	0	0	0			
18 - 24 months	0	0	0			
2 years - 3 years	0	0	0			
3 years - 4 years	0	0	0			
4 years - 5 years	0	0	0			
5 years - 6 years	275	-500	-225			
6 years - 7 years	0	0	0			
7 years - 10 years	0	0	0			
10 years +	50	-125	-75			
						3.16

When measuring NII sensitivity, we will generally only be interested in the cash flows out to the 12 month time bucket. Why is this the case?

Interest Rate Risk in the Banking Book
Delta Net Interest Income

To inform the ICAAP: run a range of scenarios (different interest rate environments) to understand "earnings at risk"…these are in addition to the regulator prescribed tests
Example: a dynamic rates path, and informed management actions





Example detailed product level assumptions:

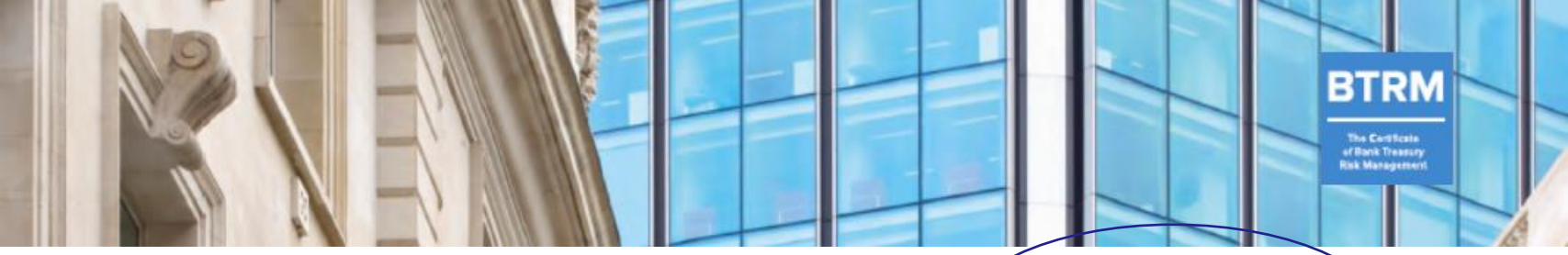
- margin for new business
- growth volume
- new business maturity
- management actions

Interest Rate Risk in the Banking Book
Economic Value of Equity (EVE)

EVE defined as difference between the present value of assets and liabilities (and off balance sheet exposures).

Assets	Liabilities
Σ present value of assets (includes unrealised gains)	Σ present value of liabilities
	Equity (Surplus)
Σ present value off balance sheet	

Source: based on Lukas, Witte, Universität Kassel, 2008



Steps to Calculating EVE Sensitivity

Note that EVE measure requires:
-- Static balance sheet, no future business assumptions
-- Positive changes to EVE Delta from rate moves are to be weighted by 50%

Step 1 – Project all notional re-pricing cash flows arising from *current* balance sheet interest rate sensitive assets, liabilities and off-balance sheet instruments. Note, BCBS suggest excluding fixed assets, equity exposures in the banking book and capital
A notional re-pricing cash flow is any repayment of principal, any re-pricing of principal or any interest payment on a tranche of principal that has not yet been repaid or re-priced, arising from the *current* balance sheet position

↓

Step 2 – Slot the Cash flows into the re-pricing maturity gap schedule time buckets

↓

Step 3 – Net the notional re-pricing cash flows in each time bucket and weight them by a continuously compounded discount factor (representing the existing level of interest rates). Sum the weighted net positions to determine the EVE

↓

Step 4 – Repeat the process for each interest rate shock scenario. Compare the results to the base case to establish EVE sensitivity

Illustrative Maturity Schedule Time Buckets for EVE Calculation

	A	B	A-B	C	(A-B)*C
	Assets	Liabilities	Net Position	Discount Weighting Factor	
Overnight				0.999917812	
Overnight - 1 Month				0.998767883	
1 Month - 3 Months				0.995012479	
3 Months - 6 Months				0.988813045	
6 Months - 9 Months				0.981424688	
9 Months - 1 Year				0.974091536	
1 Year - 18 Months				0.963194418	
18 Months - 2 Years				0.948854321	
2 Years - 3 Years				0.927743486	
3 Years - 4 Years				0.900324523	
4 Years - 5 Years				0.873715912	
5 Years - 6 Years				0.847893704	
6 Years - 7 Years				0.822834658	
7 Years - 8 Years				0.798516219	
8 Years - 9 Years				0.774916498	
9 Years - 10 Years				0.752014254	
10 Years - 15 Years				0.687289279	
15 Years - 20 Years				0.591555364	
20 Years +				0.472366553	
					Sum = EVE

Discount factors based upon 3% interest rates at all tenors

What interest rate curve should we use to perform this calculation?

- Risk free? (EBA expectation)
- The bank's COF curve?
- The long dated rate?
- A flat curve?
- The bank's current long-dated lending rate?

What cost should we NOT use?

Illustrative Maturity Schedule Time Buckets for EVE Calculation

	A	B	A-B	C	(A-B)*C
	Assets	Liabilities	Net Position	Discount Weighting Factor	
Overnight				0.999917812	
Overnight - 1 Month				0.998767883	
1 Month - 3 Months				0.995012479	
3 Months - 6 Months				0.988813045	
6 Months - 9 Months				0.981424688	
9 Months - 1 Year				0.974091536	
1 Year - 18 Months				0.963194418	
18 Months - 2 Years				0.948854321	
2 Years - 3 Years				0.927743486	
3 Years - 4 Years				0.900324523	
4 Years - 5 Years				0.873715912	
5 Years - 6 Years				0.847893704	
6 Years - 7 Years				0.822834658	
7 Years - 8 Years				0.798516219	
8 Years - 9 Years				0.774916498	
9 Years - 10 Years				0.752014254	
10 Years - 15 Years				0.687289279	
15 Years - 20 Years				0.591555364	
20 Years +				0.472366553	
					Sum = EVE

Discount factors based upon 3% interest rates at all tenors

When a shock is applied to the level of interest rates, the discount factors change and, if interest rate risk is present, will result in a movement in the calculated EVE

C	(A-B)*C
Discount Weighting Factor	
0.999863023	
0.997947315	
0.991701293	
0.98142468	
0.969233234	
0.957193226	
0.939413063	
0.916218872	
0.882496903	
0.839457021	
0.798516219	
0.759572123	
0.722527354	
0.687289279	
0.653769785	
0.621885056	
0.535261429	
0.41686202	
0.286504797	
	Sum = EVE

Discount factors based upon 5% interest rates at all tenors

A generalised risk position of most banks…..!

ECB 2017: "An interest rate increase would be beneficial for NII but have a negative EVE impact for most banks."

Distribution of changes in NII (1-year horizon) **and EVE in parallel-up IR shock**
(% of banks in the sample)

	Delta EVE > 0	Delta EVE < 0
Delta NII > 0	19%	**57%**
Delta NII < 0	4%	20%

NII increase for 76% of banks

NII decrease for 24% of banks

EVE increase for 23% of banks

EVE decrease for 77% of banks

- Banks with positive impact on both NII and EVE (19%) are characterized by a large fraction of floating rate loans on their asset side
- Banks with a negative exposure under both profiles (20%) show vulnerabilities related to a hypothetical sudden large IR shock, mostly due to long asset duration (e.g. fixed rate mortgages)

Note: Figures refer to aggregate values across all major currencies

Source: ECB, 2017

Which metric should a bank prioritise?

- NII Delta and EVE Delta are conceptually different metrics.
  - The first measures the sensitivity of earnings over the next 12 (or 24, or 36) months to a shock change in interest rates.
  - The second measures, in essence, the sensitivity of the balance sheet net present value to the same shock change in interest rates.
- Unsurprisingly, for most bank balance sheet structures the two deltas move in opposite directions under the same scenario….
- The exhibit overleaf is a typical example: it shows the two values for a regional bank of just over £1bln balance sheet size and a Tier 1 capital base of £90mln. With this level of exposure, what metric should the bank's ALCO prioritise? Or, put more relevantly for the bank's Board, what balance sheet structure should the bank adopt?

Which metric...

- ***The exhibit shows*** a typical example: it shows the two IRRBB metric values for a UK regional bank of just over £1bln balance sheet size and a Tier 1 capital base of £90mln.
- With this level of exposure, what metric should the bank's ALCO prioritise? Or, put more relevantly for the bank's Board, what balance sheet structure should the bank adopt?
- This question does not elicit a single answer at any time; it was perhaps easier to answer in the second half of 2021, because pf the overwhelming consensus that the next move in rates was only going to be upwards.
- Today it is even more of a conundrum. Should the bank immunise its balance sheet so that earnings are unaffected, or enhanced, by the rate movement? Or should it address the preservation of its economic value?

	NII (1 Year)	Total EVE
Baseline	£34,585,714	£195,584,318

Stress scenarios - Delta		
Parallel Up (200 bps)	£11,205,353	-£11,942,380
Parallel Down (200 bps)	-£8,297,873	£12,214,743
Steepener		-£6,208,372
Flattener		£3,172,580
Short-rate up		-£1,370,497
Short-rate down		£1,166,354
Parallel Up (25bps)	£1,400,669	-£2,119,585
Parallel Down (25bps)	-£1,061,516	£2,583,562

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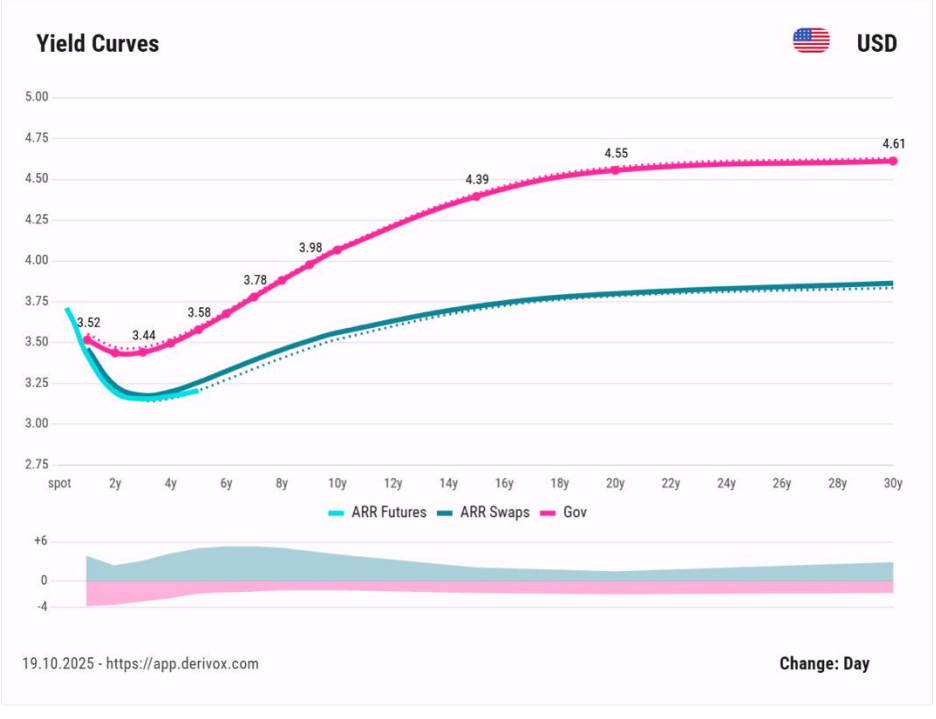
Which metric…

- The interest rate picture today is slightly less clear cut than in 2021.
- For every commentator urging the Federal Reserve to cut rates aggressively, there is another urging restraint.
- The US Treasury yield curve in Nov-2025 reflected an orthodox view as it is positively sloping [The Fed cut rates a week after I wrote this ☺]
- When addressing IRRBB concerns, how should the bank look to position its balance sheet? And as important: what ALCO MI data does it need to help it reach a decision?



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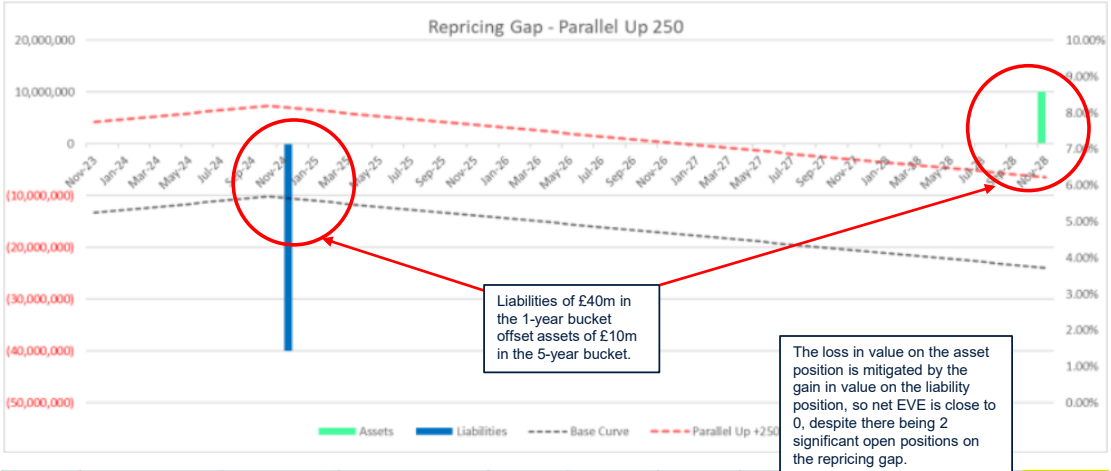
Which metric…

- The EVE concept is based on the traditional “DV01” market risk metric of the bond trading desk, itself based on the “modified duration” concept that followed Macauley Duration.
- Calculation of DV01 assumes a parallel shift in the yield curve. Of course no yield curve ever moves in a parallel shift. This fact presents another ALCO, and data analytics challenge: banks must address the non-parallel shift exposure of their balance sheet, by modelling changes in interest rates that do not move uniformly across the yield curve.
- It is essential to understand how different segments of the yield curve affect a bank's interest rate risk profile.
- Non-parallel shocks offer more comprehensive understanding of the rate repricing gap and hidden risks, which parallel shocks may not reveal.
- ***A simple hypothetical example illustrates…..***

Which metric…

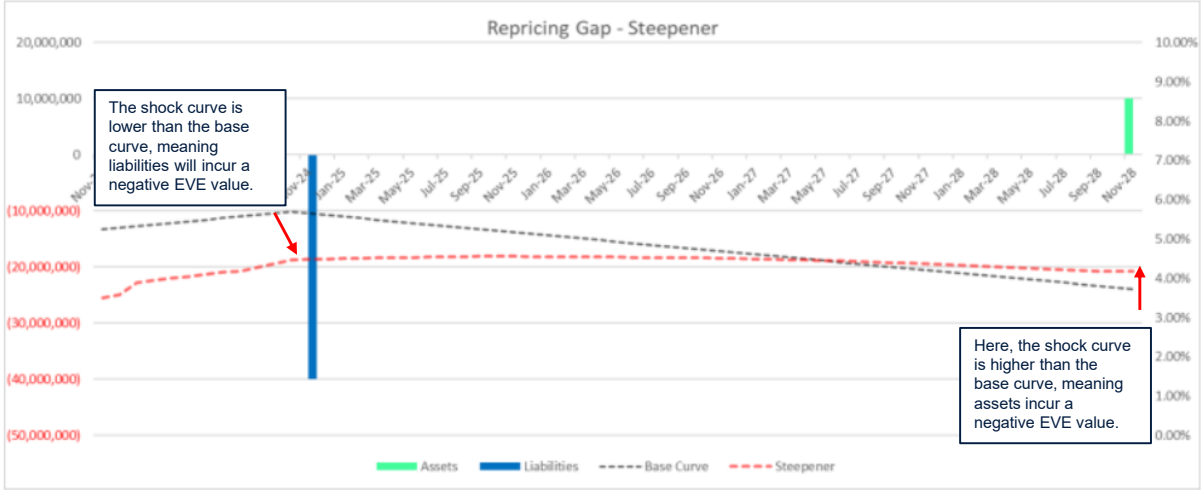


Period	Assets	Liabilities	Net←	Base Curve	Parallel Up +250bps	DF BC	DF PU	Net Base	Net Shock	EVE
Nov-24		(40,000,000)	(40,000,000)	5.65%	8.15%	0.94	0.92	- 37,687,850	- 36,744,972	942,878
Nov-28	10,000,000		10,000,000	3.73%	6.23%	0.83	0.74	8,301,427	7,354,901	- 946,526

Exhibit 5 IRRBB Shock Example Parallel Up 250
Source: © Claire Trythall, Faculty BTRM 2024. Used with permission.

- We see how the orthodox EVE metric shows no material exposure for a parallel shock 250bps move, whereas the steepener shock reveals significant PV mismatch
- The six standardised shock tests required by Basel III do include steepening and flattening rate moves. However they are very broad and scatter-gun based. In practice a bank will need to look at the specific tenor bucket mismatches that are relevant to its balance sheet. Its ALCO MI reporting should address those buckets and adjust the EVE Delta metric accordingly.

Which metric…



Period	Assets	Liabilities	Net←	Base Curve	Steepener	DF BC	DF PU	Net Base	Net Shock	EVE
Nov-24		(40,000,000)	(40,000,000)	5.65%	4.48%	0.94	0.95	- 37,687,850	- 38,145,273	- 457,423
Nov-28	10,000,000		10,000,000	3.73%	4.17%	0.83	0.81	8,301,427	8,124,715	- 176,712

Exhibit 6 IRRBB Shock Example Steepener

Source: © Claire Trythall, Faculty BTRM 2024. Used with permission.

- As the exhibit makes clear, both the asset and the liability position incur a negative value for EVE, exposing the open positions as a double hit to EVE, rather than offsetting each other. The non-parallel IRR shock, the steepener, shows a negative EVE impact for both of the open positions, highlighting the importance of non-parallel shocks in IRRBB management.
- In other words, banks need to look beyond the regulation when addressing IRRBB.

IRRBB Shock Example - Comparison

Period	Assets	Liabilities	Net←	Base Curve	Parallel Up +250bps	DF BC	DF PU	Net Base	Net Shock	EVE
Nov-24		(40,000,000)	(40,000,000)	5.65%	8.15%	0.94	0.92	- 37,687,850	- 36,744,972	942,878
Nov-28	10,000,000		10,000,000	3.73%	6.23%	0.83	0.74	8,301,427	7,354,901	- 946,526

Despite both repricing gaps being exactly the same, the EVE position according to a Parallel up scenario shows that there is almost no interest rate risk.

Period	Assets	Liabilities	Net←	Base Curve	Steepener	DF BC	DF PU	Net Base	Net Shock	EVE
Nov-24		(40,000,000)	(40,000,000)	5.65%	4.48%	0.94	0.95	- 37,687,850	- 38,145,273	- 457,423
Nov-28	10,000,000		10,000,000	3.73%	4.17%	0.83	0.81	8,301,427	8,124,715	- 176,712

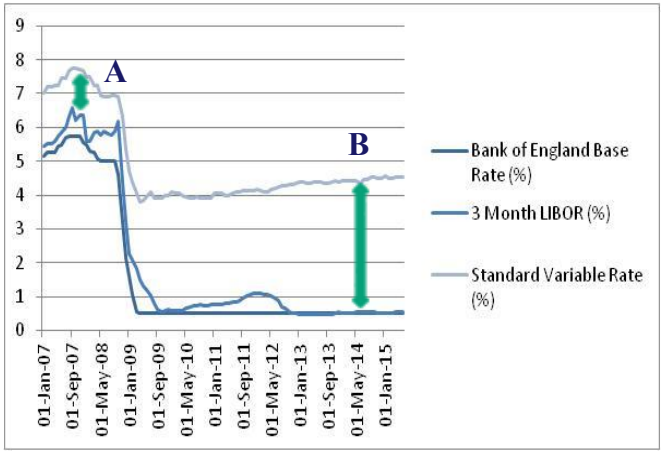
On the other hand, the non-parallel IRR shock, the Steepener, shows a negative EVE impact for both of these open positions, highlighting the importance of non-parallel shocks in IRRBB management.

Measuring Basis Risk

- There is no single approach adopted by banks
- NII sensitivity calculations based upon a BAU assumed growth balance sheet cannot readily make allowances for basis and option risks
- However, basis risk can be reflected in NII calculations:
  - ✓ ***Basis Risk*** – by designing scenarios under which there is a divergence in the different base rates to which a bank is specifically - *and explicitly* – sensitive, impacting earnings (NII)
- Alternatively, these risks could be measured separately. For example, in the case of basis risk, historic data could be used to assess the maximum likely divergence between two different reference rates and this could be multiplied by the size of the asset-liability mismatch and the time period during which the mismatch is assumed to occur to deliver an indication of potential gain/loss

Managing Basis Risk

- Basis risk may be evident for both wholesale market reference rates, such as 1m or 3m LIBOR and retail market reference rates, such as a bank's Base Rate or Standard Variable Mortgage Rate (which is linked to BoE Base) or any combination of the two categories
- For example, a Bank borrowing funds at 3m £ LIBOR and lending in the UK mortgage market at the Standard Variable Rate would have experienced a basis risk and observed sharp swings in NII between 2007 and 2015.



A – 2007, 1% Net Interest Margin
B – 2015, 4% Net Interest Margin

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Managing Basis Risk – Potential Alternative Approaches

- Measure the change in earnings for a 1bps change in the "basis" – whichever references that happens to refer to – in either direction ("BR01")
  - A BR01 measure for widening of spread based on one reference move
  - A BR01 measure for compression of spread based on one reference move
  - Approximate a BR25 or other measure
  - …to inform the NII sensitivity measure

- Hedge the exposure with basis swaps – for Retail rates such as 'Base Rate' or 'Standard Variable Rate' the derivative markets are not deep or liquid enough to be of any use to large banking organisations. Also, the hedges often appear expensive and may 'wipe out' any underlying product NIM

- Develop products pricing off the same underlying interest rate on both sides of the balance sheet to provide a natural hedge – e.g., LIBOR-linked loans/deposits and Base Rate linked loans/deposits
- …in other words, stop originating the risk to start with!

- Seek to manage exposure by adjusting product pricing – a viable approach if many market participant have the same exposure, but note the issues faced by LIBOR funded specialist mortgage providers when there was a breakdown in the historic relationship between LIBOR and SVR/Base Rate

FYI: "PRA Updated Basis Risk Return"

what is this actually telling you?

??? Please enter Firm Name in above cell (A1) ???	Basis Risk Summary as at:	31/10/2021	*Please DO NOT change the structure*					
Interest rate basis *after hedging*	Average interest rate assets	Average interest rate liabilities	as at 31-Oct-2021 Assets	as at 31-Oct-2021 Liabilities (including capital)	Net Mismatch	Future contractual reversion within next 12 months Mortgage Assets	Future contractual reversion within next 12 months Retail Liabilities	Future contractual reversion 1-2 years Mortgage Assets
	%	%	£m	£m	£m	£m	£m	£m
Administered (firm can change the rate at its discretion)					-			
Fixed rate less than 3 months to maturity					-			
Fixed rate 3 months - 6 months to maturity					-			
Fixed rate 6 months - 12 months to maturity					-			
Fixed rate longer than 12 months to maturity					-			
3 month LIBOR linked (contractual link to LIBOR fixings) including swaps					-			
Other LIBOR linked (contractual link to LIBOR fixings) including swaps					-			
SONIA linked (contractural link to SONIA fixings) including swaps					-			
Bank Base Rate linked (contractual link to Bank Base Rate)					-			
Other including non-interest bearing assets and liabilities #					-			
Grand Totals			-	-		-	-	-

Insert details of any other categories with a narrative explanation in text box opposite. ?

Please also provide details and a narrative of any caps or floors, including those on administered rate products, in box opposite. ?

**** Only complete cells highlighted in green ****

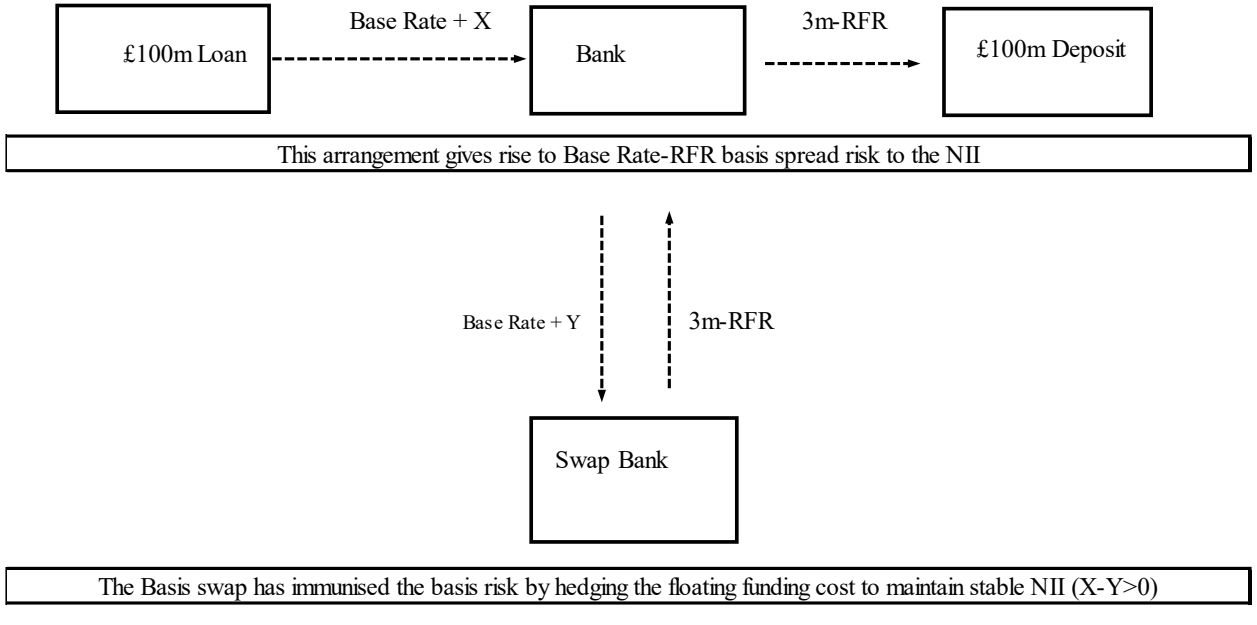
Ensure you read the instuctions tab first before completion!

Basis Risk sensitivity: textbook illustration

- Assuming BoE rate remains unchanged whereas SONIA increases by 1bp .
- The return on cash at the Bank of England is not increasing whereas the net cost of (Bond Issued at SONIA + 100bps – Loans issued at SONIA +300) would increase.
- The decrease in NII as a % of annual NII is 0.11% and 0.04% of Equity.
- That means that in extreme 100bps↓ of (SONIA-BBR) impact = 4% of the Equity position

	Assets in £	Liabilities in £	Mismatch in £	Current Rate	Current NII in £	BR01 (1bp↑ BBR-SONIA)	New NII in £	ΔNII in £
Administered		-50	-50	3.5%	-2	3.5%	-2	0.000
Fixed rate < 3m			0	0.0%	0	0.0%	0	0.000
3m < Fixed rate < 6m			0	0.0%	0	0.0%	0	0.000
6m < Fixed rate < 12m		-110	-110	4.5%	-5	4.5%	-5	0.000
3m LIBOR linked			0	0.0%	0	0.0%	0	0.000
Other LIBOR linked			0	0.0%	0	0.0%	0	0.000
SONIA linked	80	-200	-120	6.73%	-8	6.74%	-8	-0.012
BBR linked	110		110	3.75%	4	3.75%	4	0.000
Other		-30	-30	0.0%	0	0.0%	0	0.000
							ΔNII as%NII	-0.11%
							ΔNII as%Equity	-0.04%

Basis swap hedge hypothetical example



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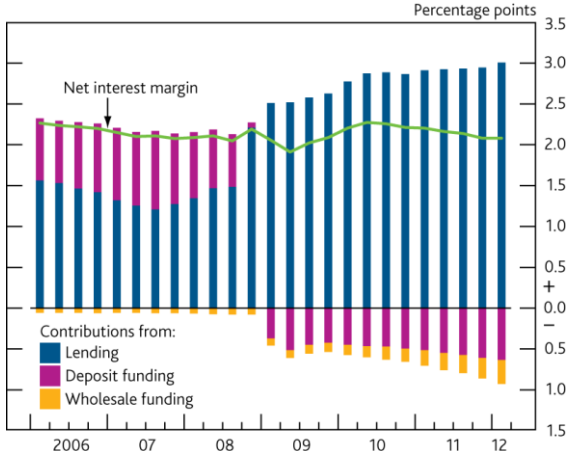
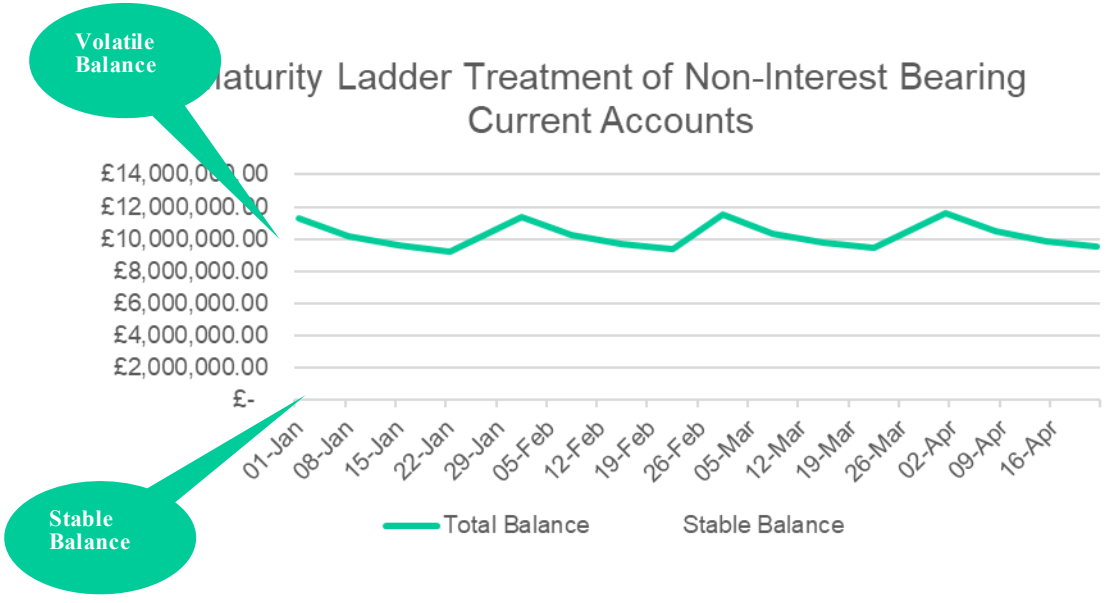
Assets and Liabilities without a Defined Maturity

- Many banking book assets and liabilities do not have a defined re-pricing maturity. So, how should they be treated in the maturity ladder? The process of defining a treatment is known as 'behaviouralisation'
- A key objective of the ALM/treasury team is to stabilise NIM in the banking book
- Stable sources of income are more highly valued by the investment community than volatile income streams and can be built into valuation models for future years, whilst items like abnormal trading profits cannot be assumed to recur
- UK Banks have been successful in managing NIM, even during a period of financial turbulence



Source: Bank of England, Bank NIMs from UK Households and Corporates

The Treatment of Non-Interest Bearing Current Accounts



- Non-interest Bearing Current Account balances tend to be stable over time, but volatile intra-month (partly due to the salary cycle)
- The stable element of the balance will typically be spread over 3-5 years in the maturity ladder, whilst the volatile element will be captured in the 1 month bucket
- Note that the regulator definition of “core” is those “stable” deposits that are deemed non-IR sensitive wrt balance movements
- In this example, the stable element is calculated as 90% of the average account balance over the previous 12 months

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NMDs treatment: one practical approach*

- PRA guidance (see over~) enables a bank to model NMDs by first identifying which category the deposits fall under – Retail, “Other Deposits” etc - and subsequently splitting into core vs non-core deposits.
  - Non-core deposits are modelled as repricing overnight.
  - Core deposits are split into rate sensitive vs rate insensitive…
  - with rate sensitive deposits again assumed to reprice overnight…
  - …and rate insensitive core deposits modelled to reprice longer tenor
- Behaviouralization methodology
  - ***Core vs non-core split***
  - Looking at “Instant Access” (call deposit a/c) over a specified period (say, “last 3 years”), the bank is conservatively not taking into account any increase in balances and including only the amount that remained up to [end date considered] and capping it at the initial invested amount. This disregards any additional amounts posted and focuses only on how much was withdrawn from initial accounts.
- In case study: approximately 60% of the initial amount invested in the accounts remained. That amount can be considered ***core***.
- The core portion is then capped to 50% by assuming the deposits fall into the “other deposits” as per PRA methodology 9.32

~ PRA ref...

- The relevant rules of PRA as per PRA Rulebook chapter 9 show in exhibit (from Internal Capital Adequacy Assessment - Prudential Regulation Authority (prarulebook.co.uk))

9.32 31/12/2021 For non-maturing deposits as determined in 9.19, a *firm* must allocate each position into one of the following categories:

(1) retail deposits defined as deposits placed with a *firm* by a natural *person* and where either regular transactions are carried out or the deposits are non-interest bearing;

(2) any other deposits with a *firm* by a natural *person* which are not covered in (1); or

(3) other deposits.

9.33 31/12/2021 For the purposes of 9.32(1) deposits made by small businesses, legal entities, sole proprietorships or *partnerships* managed as retail exposures provided the total aggregated liabilities are less than £877,000 may also be treated as retail deposits.

9.34 31/12/2021 For each category in 9.32, a *firm* must allocate each position to the following categories:

(1) the core portion, consisting of deposits that are found to remain undrawn with a high degree of likelihood using data history of an appropriate length, and unlikely to reprice even under significant changes in the interest rate environment; and

(2) the non-core portion, consisting of deposits not allocated to the core portion.

9.35 31/12/2021 For non-maturing deposits as determined in 9.34, the notional repricing cash flows in currency *c* for each interest rate scenario *i*, $CF_{i,c}$, must be:

(1) for the core portion, the initial notional repricing cash flows $CF^{a}_{i,c}$ in currency *c* for interest rate scenario *i* with the *firm's* own estimates of tenors; and

(2) for the non-core portion, the initial notional repricing cash flows $CF^{a}_{i,c}$ in currency *c* for interest rate scenario *i* with an overnight tenor.

9.36 31/12/2021 For the allocation in 9.34 and the calculation of CF_i in 9.35, a *firm* must ensure that the proportion and average repricing date of core deposits is no greater than the caps in Table 3:

Table 3: Caps on core deposits

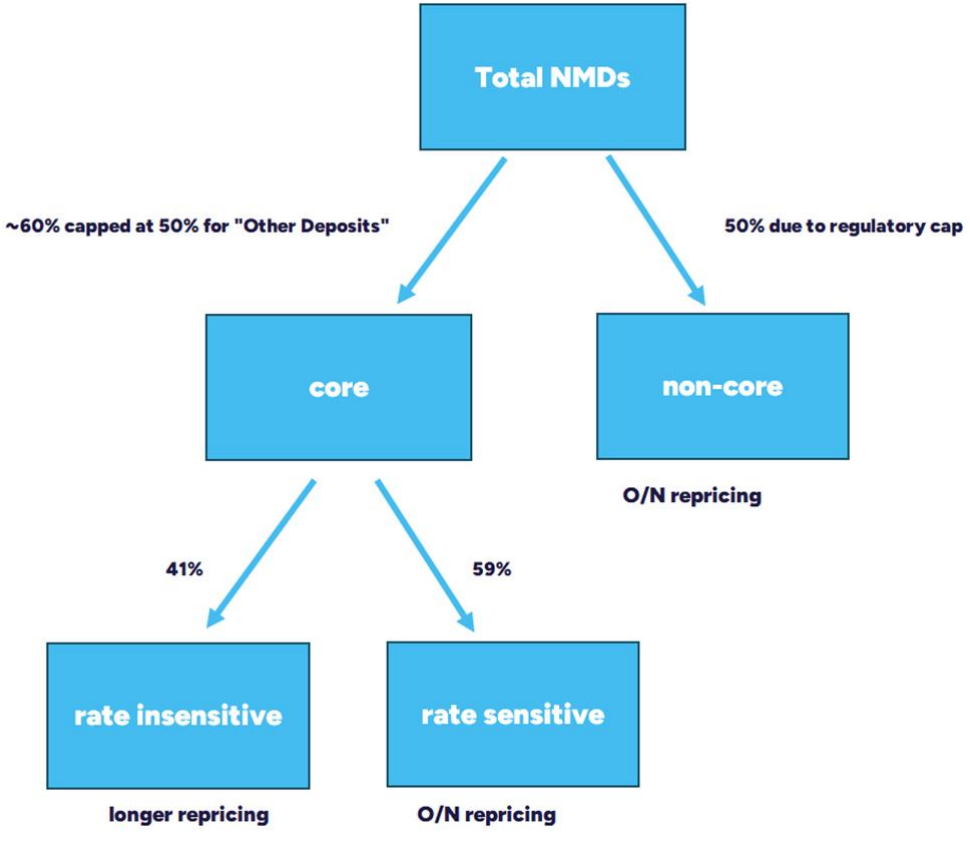
	Cap on proportion of core deposits (%)	Cap on average repricing date of core deposits (years)
Transactional retail deposits (as referred to in 9.32(1))	90	5
Other retail deposits (as referred to in 9.32(2))	70	4.5
Other deposits (as referred to in 9.32(3))	50	4

NMDs behaviouralisation…case study

- **Rate sensitive vs rate insensitive split**
  - We consider the rise in rates from BoE (basis points increases for the same period) versus the basis points increase that were passed on by the bank during the same period to these accounts. The weighted average percentage of rate increases passed on to customer deposits was ~59%.
  - Therefore the percentage of Call Deposits modelled as longer tenor would be:
    - 50%*41% = 20.5%.
  - Similar exercise performed with the 95-day Notice A/C with similar results – slightly less sticky and also the bank passed on a slightly higher percentage of BoE rate increases.
  - These percentages that apply to the book as of [start date of account opening in this assessment] are proposed to apply to the rest of the book as there is no qualitative reason why a deposit opened at the bank after the start date assessed would be less sticky or more rate sensitive than a deposit before that cut-off point.
  - Banks that have less customer data history (EG., neo banks) can apply this percentage of deposits to be modelled at the tenor bucket of 1-2y and as history is being built to revisit the bucketing.
  - Additionally this exercise of calculating the percentage split between core vs non-core and rate sensitive vs rate insensitive can be repeated on a quarterly basis in order to recalibrate the percentages.
- See approach summarised next slide >>>

NMDs....

- Approach summary



Determining Stable and Core Balances

The BCBS Standards (2016) and EBA Guidelines (2018, 2022) expect banks to do the following 2-stage classification for the principal NMD books.

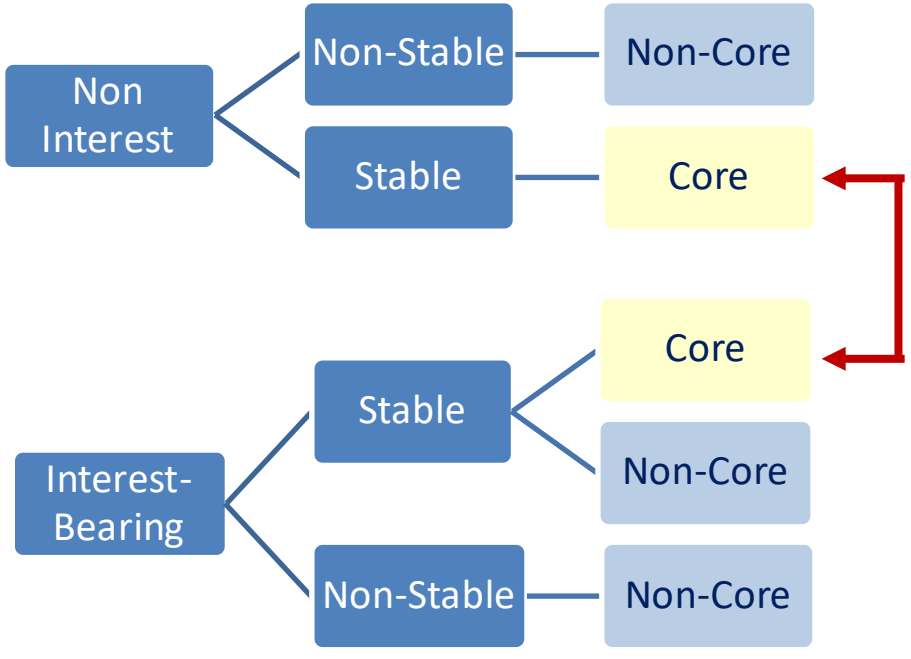
- Split NMDs into **stable** and **non-stable**. Stable is "… the portion that is found to remain undrawn with a high degree of likelihood" - a kind of irreducible minimum.

- Split stable into **core** and **non-core**. Core is "… the proportion of stable NMDs which are unlikely to reprice even under significant changes in the interest rate environment". Core can include contractual non-interest sensitive liabilities (current accounts) and modelled non-interest sensitive liabilities (a proportion of demand deposits).

Core is the number that is invested in a continuously reinvested fixed income portfolio. Non-core is usually assumed to be invested at overnight but in some cases can be longer (but generally no longer than a year at max).

Determining Stable and Core Balances

Graphically –

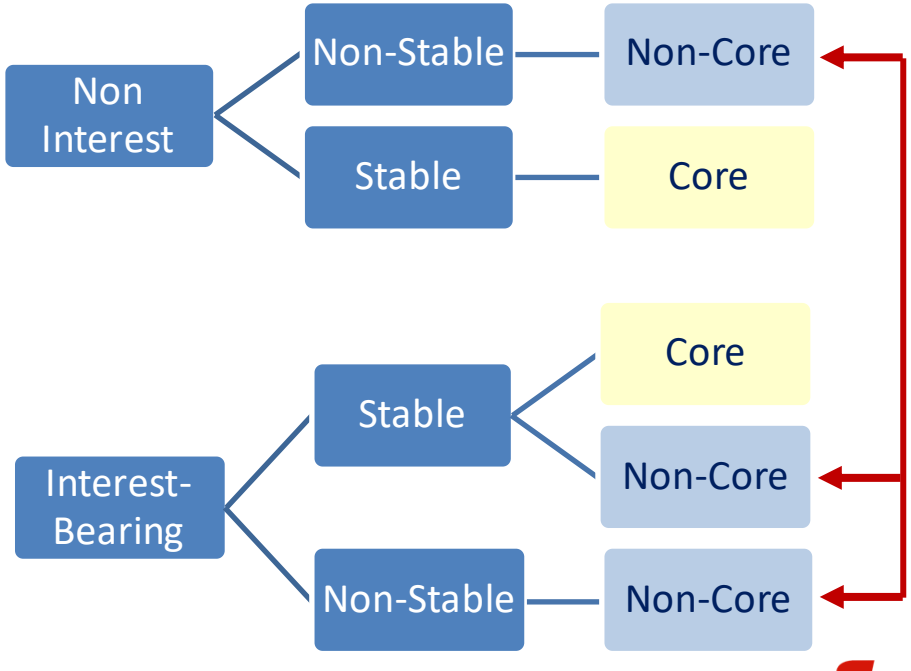


Invest long-term

Contractual core (non-interest) and modelled core (interest bearing) are not necessarily invested to the same AL.

Determining Stable and Core Balances

Graphically –

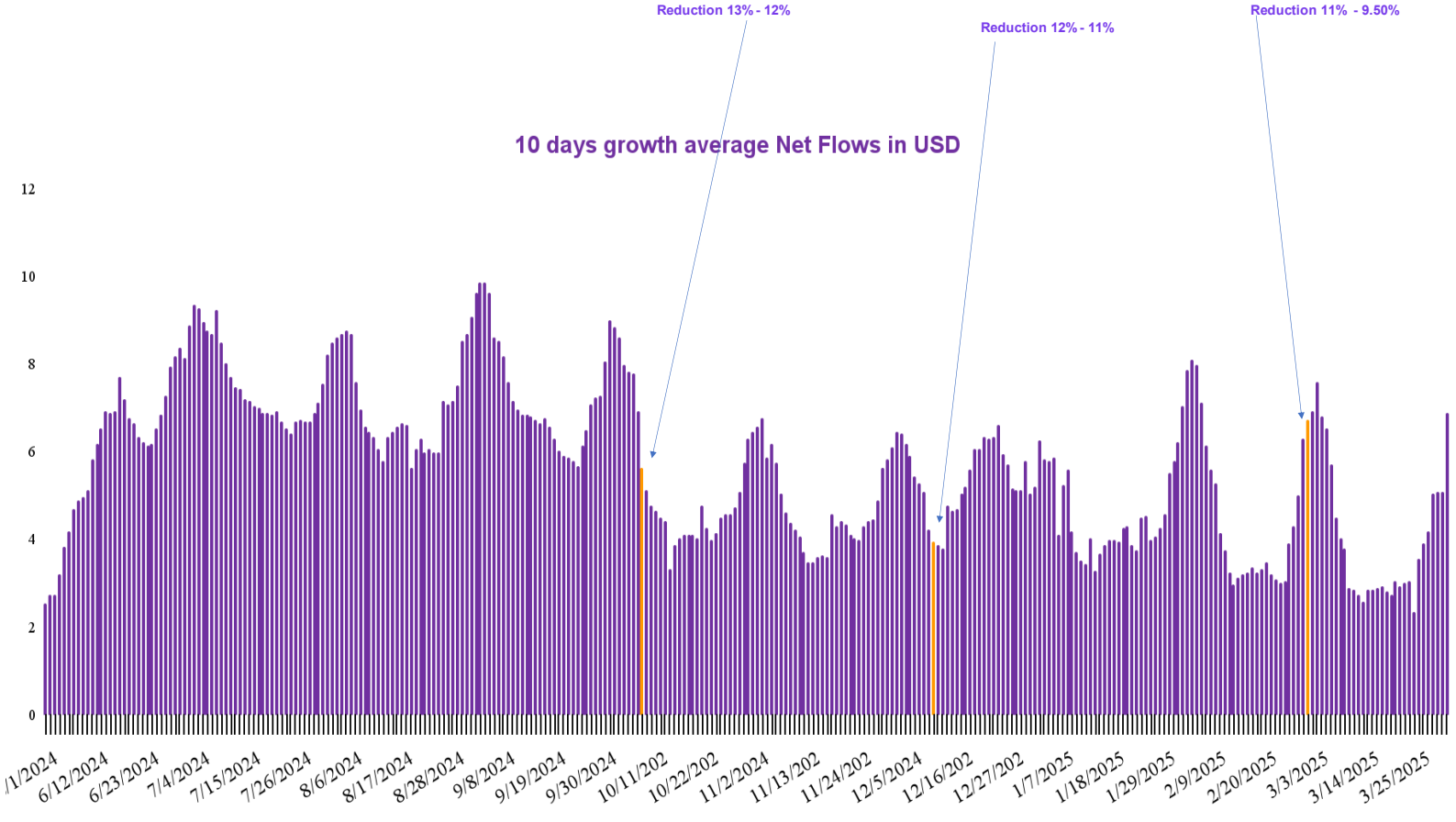


Invest shorter term

Not necessarily all invested to the same Ave Life

Observation of balances is perfectly acceptable…

- What balance is “stable” and “core”…?!



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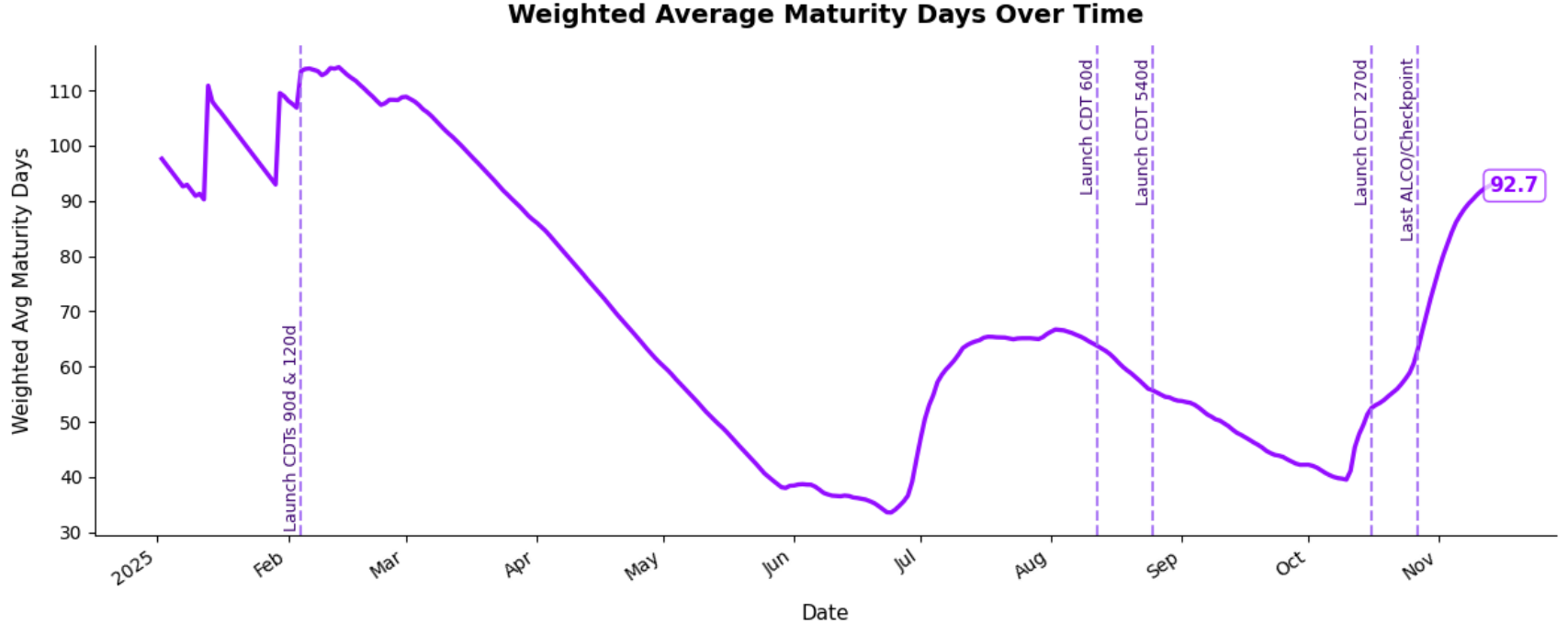
Another example time-series observation

- Deposits weighted-average tenor over time and as products are introduced



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RAS and capital

- IRRBB is Pillar 2a add-on
- The Risk Appetite Statement is key…the risk appetite in effect "drives" the capital add-on.
- By definition, the more IRRBB exposure in the ICAAP the higher the add-on to Pillar 2
- Mitigate the IRRBB as per policy (see IRRBB Policy: available on request)
- Set the RAS in line with appetite and "wearable" capital add-on

- Note:
- ALCO pack: format it in same way as RAS so meeting can determine instant compliance with RAS limits

RAS extract

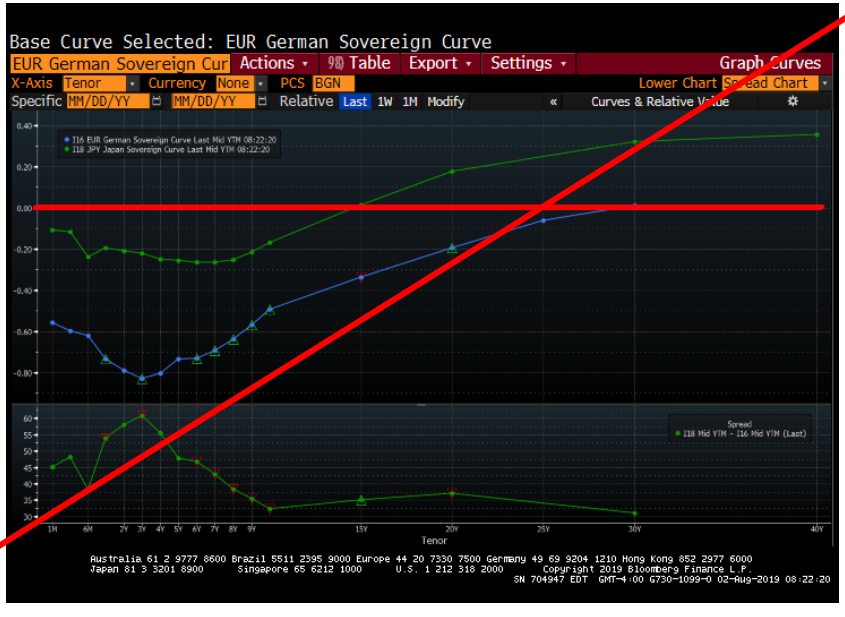
	Executive Responsible	Indicator	Red	Amber	Yellow	Green	Rationale	Comments	RP (EBA)
IRRBB		IRRBB Shock loss exposure	>£5m	>£4m	>£3m	<£3m		Capital loss exposure in IRR shock scenario (200 bps)	
		Δ Net Interest Income (200 bps shock)	>2%	>1.75%	>1.5%	<1.5%		Δ is with respect to change against baseline NII value	
		Δ Net Interest Income (25 bps move)						Δ is with respect to change against baseline NII value	
		Δ EVE (200 bps shock)	>15%	>10%	>5%	<5%		Δ is with respect to change against baseline EVE value	
		Optionality Risk							
		Basis Risk							
RP: Recovery Plan									
* Indicates referenced in EBA minimum set of indicators for Recovery Plan (RP)									
# Indicates substitution against EBA minimum indicator for firm-specific relevance									

ALCO Pack:

IRRBB	Red	Amber	Yellow	Green	Comments
Δ Net Interest Income (200 bps shock)				1%	

ALM and Negative Rates environment

Eurozone
August 2019



IRRBB and negative rates

Treatment of non-maturing deposits?

- Large corporates pass on the rate
- Retail and SME pay 0% essentially "Fixed Rate" product since 2009
- Can't raise fixed term deposits

Behaviour of loans

- Incentive not to pay off but to keep rolling loans over

EVE assessment?

- Can match in same IRR repricing bucket?

NII impact?

- Can we treat the loans and deposits as "1-month floating" to match IRR repricing buckets

Hedging?

- Treat NMDs as fixed rate and swap to receive fixed/pay floating, at behavioural tenor
- If possible hedge with "balance guarantee" IRS to match notionals and respond to customer behaviour

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IRRBB and Liquidity Risk

- IRRBB directly impacts liquidity risk by altering cash flows and the market value of assets, which can tighten funding and reduce high-quality liquid assets (HQLA). Rising rates can decrease the market value of fixed-rate assets and trigger deposit outflows (customer behavior shifts), forcing banks to tap more expensive, less stable funding sources, thus reducing liquidity buffers.

(1). Impact on HQLA

As interest rates rise, the market value of fixed-rate bonds and assets in the banking book drops. If a Bank needs to sell these assets for cash, they may face capital losses, reducing LCR.

Asset value & liquidity impact when interest Rates rise, bond prices fall >> reducing liquid asset value.

Result: Drop in LCR

(2). Deposit Behavior Shifts

Higher interest rates often trigger customer outflows as clients chase higher yields, impacting short-term liquidity, while falling rates might increase loan demand beyond the Bank's ability to fund them with deposits.

Higher interest rates >> Deposit outflow as clients seek higher yields

Lower interest rates >> Boost loan demand but lower deposits

(3). Funding Cost & Access

A mismatch in maturities (e.g., funding long-term assets with short-term deposits) means that a rapid change in interest rates can force a Bank to re-price its liabilities rapidly, increasing costs and affecting net interest margins.

(4). Behavioral Option Risk

Changes in rates may affect client behavior, such as higher prepayments on loans, which alters expected cash inflows.

Maturity Mismatches: Creates dual risk, wherein a Bank funding long-term loans with short-term deposits is exposed to both IRRBB via fixed-rate risk and liquidity risk via refinancing needs.

Integrated Risk Management

- For banks, success lies in balancing profitability with regulatory compliance and systemic stability. The banking sector must be prepared to comply with these guidelines and strategically utilizing IRRBB through gap analysis, behavioral modeling and validation.
- The framework highlights the interconnected nature of liquidity and interest rate risk, particularly in a deposit-driven banking system. As banks prepare to meet new expectations around stress testing, behavioral modeling and governance, success will depend on integrating IRRBB considerations into liquidity planning while maintaining regulatory compliance and financial resilience.

Stress Testing: Banks must simulate scenarios that combine interest rate shocks with deposit outflows to ensure adequate liquidity buffers.

Integrated Reporting: Monitoring IRRBB and liquidity metrics (like LDR: Loan to Deposit Ratio) together is essential for assessing the full impact of market changes.

Regulatory Focus: Regulators emphasize that while IRRBB and liquidity are separate, they are deeply interconnected, especially during periods of market stress.

Interplay between Liquidity & IRRBB:

Liquidity and IRRBB risks are interconnected. Funding choices, such as reliance on short-term deposits, influence both liquidity ratios and IRRBB sensitivity. Assumptions about deposit behavior affect compliance with LCR and NSFR, as well as IRRBB modeling. Regulators expect banks to adopt an integrated risk management approach so that measures to strengthen liquidity do not inadvertently increase IRRBB vulnerabilities.

Liquidity and IRRBB are core risks that banks must manage prudently. Regulators' guidelines create a framework consistent with Basel III while catering to local market dynamics. By emphasizing robust liquidity buffers and sensitivity to interest rate shocks, the guidelines enhance the resilience of the banking sector.

Credit Spread Risk in the Banking Book (CSRBB)

- CSRBB is driven by changes in market perception about the credit quality of groups of different credit-risky instruments, either because of changes to expected default levels or because of changes to market liquidity
- BCBS 368 has 4 lines in 31 pages on this risk. For some banks this is not an issue as the risk is negligible, but for others it is material (eg., RBS example below)
- See next slide

The market risk exposures that arise as a result of RBS's retail and commercial banking activities are measured using a combination of value-based metrics (VaR and sensitivities) and earnings-based metrics, as explained in greater detail for each of the key non-traded risk exposure types disclosed in this section.

Following the approval of an enhanced non-traded market risk appetite framework in early 2016, VaR disclosures reflect a more complete economic risk measure for the banking book.

The following table presents 1-day internal banking book VaR at a 99% confidence level, analysed by type of risk.

	2016				2015 (1)*
	Average £m	Maximum £m	Minimum £m	Period end £m	Period end £m
Interest rate	10	19	5	18	19
Euro	3	4	2	4	4
Sterling	10	24	5	21	14
US dollar	3	5	2	2	5
Other	2	2	1	1	2
Credit spread	57	67	42	63	31
Structural FX rate	13	20	10	10	11
Pipeline risk	1	1	—	—	1
Diversification (2)	—	—	—	(19)	(29)
Total	57	72	41	72	33

Source: RBS Annual Report and Accounts 2016

CSRBB

- The Basel Committee on Banking Supervision, in its 2016 Standards on Interest Rate Risk in the Banking Book, defines Credit Spread Risk in the Banking Book (CSRBB) as:
  - "*any kind of asset/liability spread risk of credit-risky instruments that is not explained by IRRBB and by the expected credit/jump to default risk*",
- stating that "*CSRBB is a related risk that banks need to monitor and assess in their interest rate risk management framework*."
- On the other hand, the European Banking Authority, in its 2018 Guidelines on the management of interest rate risk arising from non-trading book activities (EBA/GL/2018/02), defines CSRBB as:
  - "*The risk driven by changes in the market perception about the price of credit risk, liquidity premium and potentially other components of credit-risky instruments inducing fluctuations in the price of credit risk, liquidity premium and other potential components, which is not explained by IRRBB or by expected credit/(jump-to-) default risk.* "
- In the Guidelines (§18), EBA also states that "*Institutions should monitor and assess their CSRBB-affected exposures, by reference to the asset side of the non-trading book, where CSRBB is relevant for the risk profile of the institution.*"

Related sensitivity: CS01

- The EBA final guide requires an earnings-related sensitivity measure to capture “credit spread” risk
- One of the most common applications of this would be for an FVOCI portfolio of Eurobonds, whose value will change to changes in rates that impact the bond / portfolio value outside of the “shock” scenario changes, as a result of credit spread changing
- Possibly a better sensitivity measure to apply rather than VaR is “credit spread per basis point” delta, denoted by “CS01” – although this is conceptually closer to the EVE measure (it measures the change in PV for a 1bp change in credit spread) than the NII measure
- Banks with this type of exposure should calculate the CS01 per bond to enable a calculation of the bond and portfolio change in value for a 1, 25 or 200 bps change in credit spread

CSRBB: What is in scope?

- Assets only (EBA GL)
  - Newson (2017) notes that the Swedish regulatory authority also includes a bank's own issuance – so its own credit spread – in the CSRBB calculation. Of course that will move with an opposite sensitivity to asset CSRRB so perhaps this is a good way to negate the whole concept altogether!
- Items accounted for at Fair Value (as per BCBS)
- FVTOCI (asset only)
- FVTOCI and FVPL assets

Sensitivity metric can be one or both of EV and Earnings

- The use of VaR models (most often based on Historical Simulation) is common, especially within larger banks, although the choice of confidence level and, even more significant, holding period, is quite heterogeneous. EV sensitivity, either based on deterministic/parallel shocks, or more elaborated stress scenarios, is also a commonly used approach

In the definition of the (shock) scenarios, how is credit spread determined for the purpose of CSRBB?

- Difference between specific instrument yields and swap rates
- Difference between government or corporate bonds yields (based on rating cluster) and swap rates
- Difference between specific instrument yields and swap rates, net of credit/jump-to-default risk

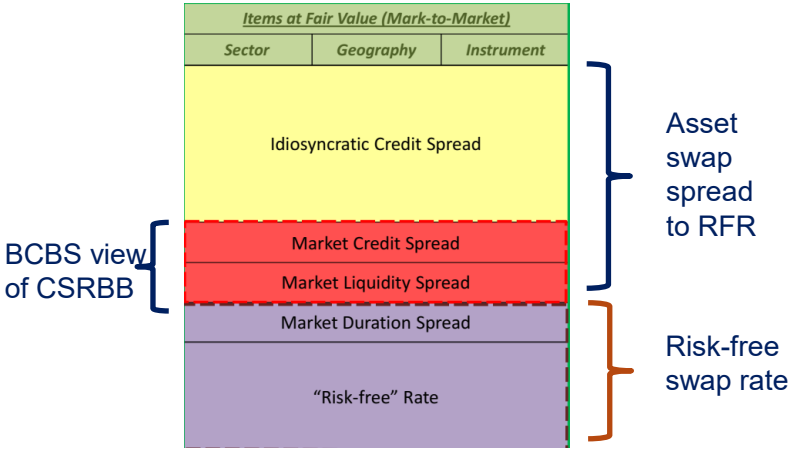
The identification of credit spread, for CSRBB assessment, is mainly related to a broad "asset swap spread", both by specific instrument or by cluster, but not explicitly excluding so called idiosyncratic or jump-to-default risk premium.

UBA UK

Original sin (BCBS368 paper)

For reference

- **Regulatory View of CSRBB**
- Regulators view CSRBB as a related risk to IRRBB and emphasise that banks must measure and monitor it, but they have never stated clearly how they expect it to be measured. BCBS view is that it is the systematic component of credit spread risk plus any liquidity spread that matters. The following diagram is from the BCS IRRBB Standards April 2016 (***labels added***).



This is a very theoretical concept of CSRBB. No guidance from BCBS as to how it expects spreads to be de-composed. (See my reference on estimating term liquidity premium (TLP) in Chapter 12 of "*Moorad Choudhry Anthology*").

And what about….in the case of highly rated sovereigns, asset swaps have been negative. Decomposition has no clear meaning.

Most (probably all) banks ignore the prior slide concept of CSRBB and focus on the total spread, since it is the variation in the total spread that hits the financials.

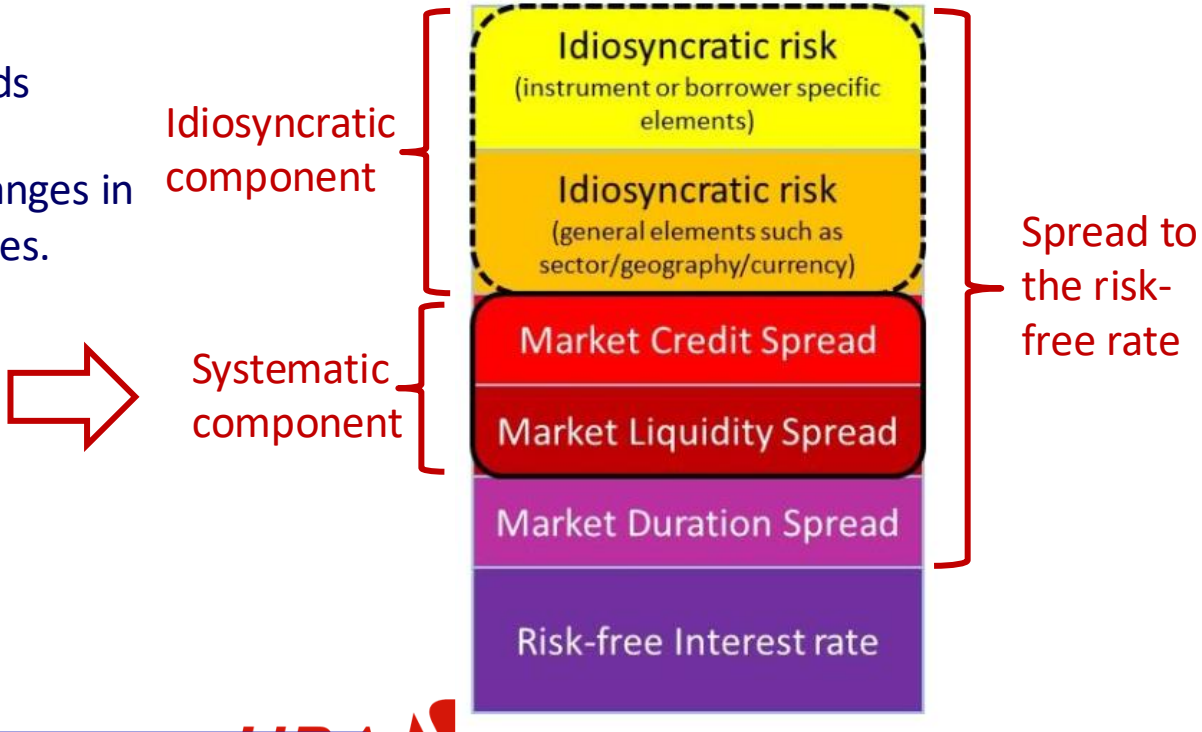
BCBS advises banks not to double count spread risk capital and default risk capital, again without guidance. It is likely that few banks try to do this.

The Definition of CSRBB

Basel and EBA use the graphic below to explain their concept of CSRBB.

Regulators want banks to isolate the systematic components of spreads using data that is not 'contaminated' by changes in EL / ratings downgrades.

Driver of CSRBB per BCBS and EBA



The Definition of CSRBB

This view of the CSRBB is problematic.

- The components of credit spreads are unobservable and individual banks' attempts at estimation are likely to lead to materially inconsistent results.
- The concept of idiosyncratic risk is unconventional. Sector, geography and currency are systematic factors because they are a source of correlation in spread movement.
- Doubtful that the approach suited to sovereign risk
  - Are sovereign spreads driven by a market factor or are they predominantly idiosyncratic (which would generate zero CSRBB under this approach)?
  - What data series will proxy this systematic factor?
- Market liquidity is notoriously difficult to measure.

Sidebar: Portfolio "CS01"

- EBA guidance suggests we look at the "CSRBB" of the credit-risky portfolio
- On a specific asset or security basis, we would calculate dPV for a 1bp change in credit spread ("CS01")
- However, this is not any kind of "shock" scenario, and also, we require the portfolio CS delta
- Hence, we suggest estimating the portfolio CS01 and then approximating a CS50 or CS100 from that…
- ….and determining a risk appetite and capital exposure from that
- ***Q: shall we do this for the securities portfolio only, and explain that for the customer portfolio we address CS risk via the IFSR9 ECL process?***

Sidebar: Portfolio "CS01"

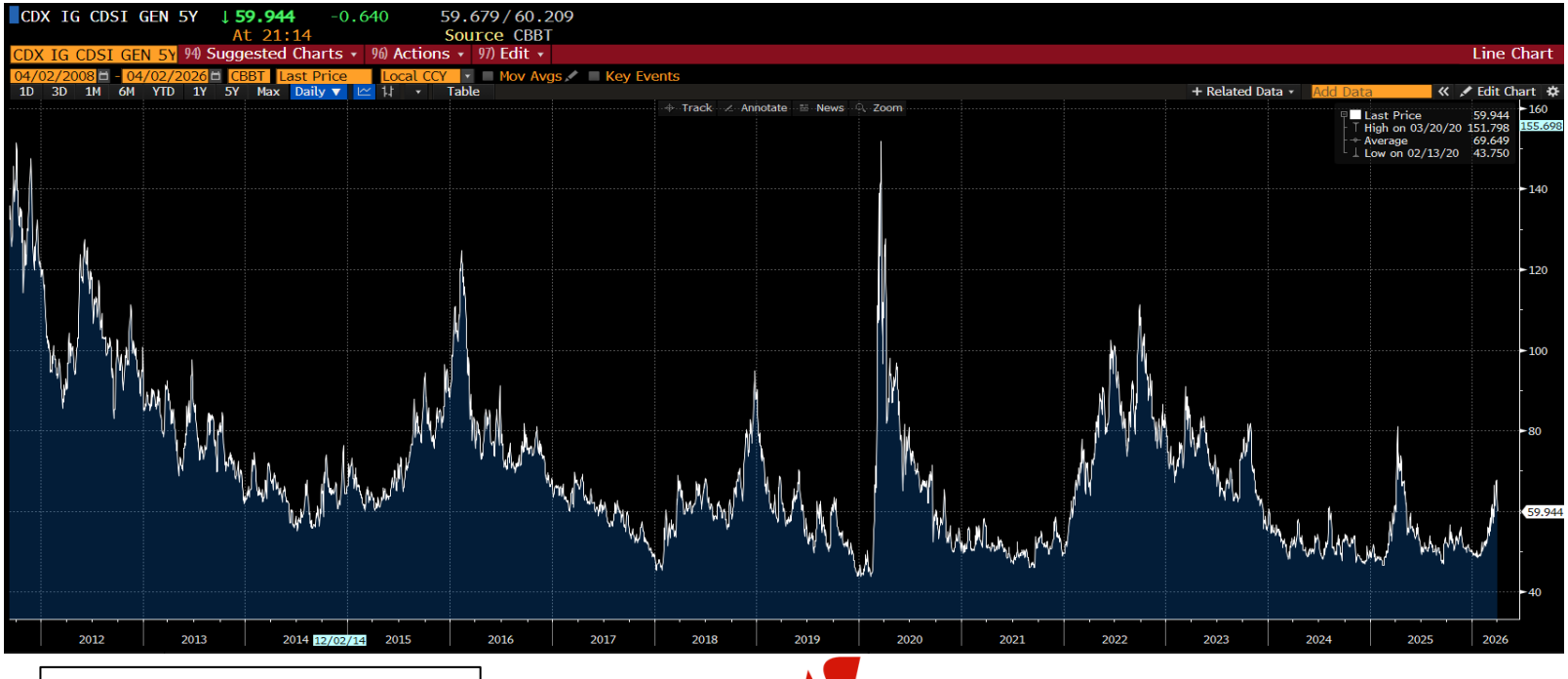
- We create a Bloomberg portfolio with 3 bullet fixed-rate Bonds of $10m Notional each, total value $23.9m
  - Microsoft 5.30% maturing on 8th Feb 2041
  - Amazon 3.85% maturing on 13th Mar 2028
  - General Electric 6.75% maturing on 15th Mar 2032

Clear Filters	Position	MktPx	MktVal	MktVal Port Ccy	Accrued Interest	Notional	DV01	IRGamma1bp	Theta	Vega	Expiry Date
[-] Portfolio Totals				23,984,051				14.27	2,852.39	.00	
1				23,984,051				14.27	2,852.39	.00	
MSFT 5.3 02/08/41	10k	104.205	10,500,000	7,940,100	79,500.00	10,000,000.00	10,804	14.79	1,301.19	.00	
AMZN 3.85 03/13/28	10k	99.690	9,989,269	7,553,886	20,319.44	10,000,000.00	1,846	.52	1,107.66	.00	
GE 6 3/4 03/15/32	10k	111.954	11,227,275	8,490,065	31,875.00	10,000,000.00	5,530	3.55	1,363.14	.00	

- The CS01 of the portfolio = portfolio DV01 in the sense the change of 1 basis point in rates, regardless of whether this change is in the risk-free rate or the credit-spread, affects the portfolio value the same way.
- Therefore CS01 = $10,804 + $1,846 + $5,530 = $18,180 which means that:
  - An increase in the credit spread of 50bps would result in a loss of $909,000
  - An increase in the credit spread of 100bps would result in a loss of $1,818,000
  - An increase in the credit spread of 200bps would result in a loss of $3,636,000
- Another observation is that DV01 – and CS01 by extension – is proportional to duration and hence the Microsoft Bond has the highest sensitivity to changes in interest rates followed by Amazon.

Sidebar: Portfolio "CS01"

- The 2nd line is responsible for setting the appropriate credit spread widening stress scenario as well as the risk appetite. If the change in PV exceeds the stated risk appetite, the Bank has a P2A add-on to consider.
- The most appropriate CDS benchmark for this portfolio would most likely be the Markit CDX North America Investment Grade Index is composed of 125 equally weighted credit default swaps on IG entities



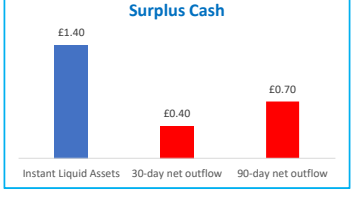
ALCO MI Dashboard

Add the key IRRBB MI!

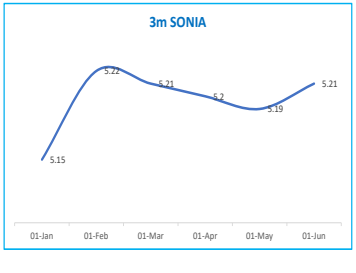
ChoudWest BANK

Board / ALCO 1-pager 21-Jun-2024

Key observations
- reduced survival days due to higher loan pipeline
- pressure on NIM as peer rates raising funding cost



BoE Reserve Account
£0.91bln
HQLA £1.01bln
Base rate 5.25%
Balance sheet £12.2
Non-equity liabilities:
Retail £6.4bln
SME £ 4.1bln
Corp £1.09 bln

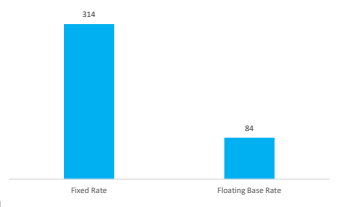


CET 1 ratio	✓	23%	>21%	<21%	<18%
Excess over TCR	✓	88bps	>75	<75	<50
IFRS9 Stage 3 of loan book	✓	1.1%	<1.5%	>1.5%	>2.0%
EVE Delta T1 Shock	✓	4.10%	<7.5%	>7.5%	>10%
NII Delta 12M T1 Shock	✓	3.90%	<5%	>5%	>8.5%
LCR	✓	218%	>160%	<160%	<140%
Survival Days	✓	182	>180	>120	<90
LDR	✓	78%	<85%	>85%	>95%
WA Contractual Tenor Funding	✓	93	>90	<70	<60
Liquidity Risk Factor	✓	7.2	>5.5	<5.5	<3.5
NIM		380bps			

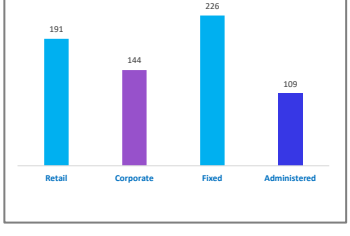
Weighted Average Rates

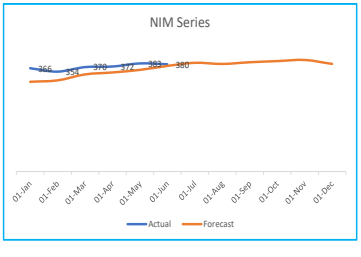
Lending Excl. Credit Cards	7.66%
Lending Credit Cards	23.10%
Liabilities Customer	3.84%
Liabilities Wholesale	5.01%

Loan Book £10.28bln
Pipeline 90d £398mln



Notice Savings Deposits
On-notice outflow £335mln





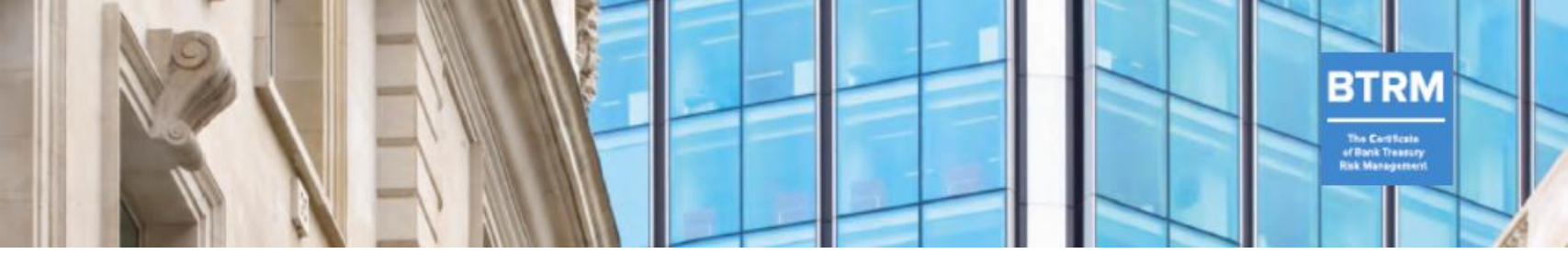
Interest Rate Risk in the Banking Book
Closing thoughts…

Donald van Deventer (*LinkedIn, November 2018)*

What are the 3 biggest mistakes in ALM and interest rate risk management?

1. Hedging net income, not market value
2. Using 1-factor models to simulate yields movements
3. Not using a high scenario count Monte Carlo process

- IRRBB is a data analytics exercise in the same way that intra-day liquidity is...
- …but after that, in terms of capital optimisation (rather than NII maximisation) it is punitive on fixed-rate risk
- Therefore from a P2a perspective the objective will be to minimise and/or immunise fixed rate risk
- Alternatives are:
  - Hedge organically
  - Minimise originating it



The Times, 23/11/2021

- Comment is superfluous…

bringing the Dow Jones industrial average to a close of 35,619.25, up only 17.27 points, or 0.05 per cent.

of medium-sized banks. Yesterday things looked brighter, with the shares ticking up 1½p, or 1.4 per cent, to 102½p, That was only back to levels before the Carlyle bid, but it reminded the market that Metro might have other suitors.

The stock was boosted, too, by speculation that the Bank of England may increase the cost of borrowing by more than expected, potentially at its rate-setting monetary policy committee meeting next month. Such a move would enhance banks' ability to make a margin between payments to savers and charges to borrowers. Shares in **Barclays** rose by 2 per cent, or 3¾p, to 194¾p and **NatWest** was up by 1.4 per cent, or 3p, at 223¾p.

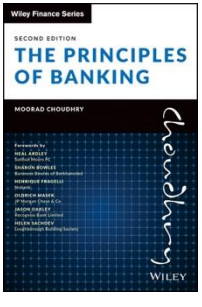
People buying more goods online, all of which have to be delivered, lifted **Royal Mail** by 2.9 per cent, or 14¼p, to 512¾p.

BT and **Vodafone** also rose as part of a wider increase in the telecoms sector after KKR, the huge American

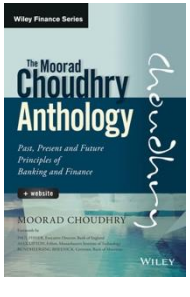
Final word on IRRBB

- https://www.youtube.com/watch?v=Q7FBfdErGgw

Further reading on IRRBB



The Principles of Banking, 2nd Edition, Singapore: John Wiley & Sons Ltd 2022, chapter 7



Moorad Choudhry Anthology: Past, Present and Future Principles of Banking and Finance, Singapore: John Wiley & Sons Ltd 2018, chapter 13

Email: mooradchoudhry@gmail.com

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Appendices

Definition of the Trading Book and TB / Banking Book Boundary

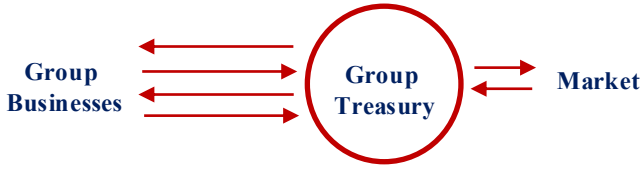
- FRTB replaces the subjective and ambiguous "intent to trade" criterion with one based on
  - the economic purpose of the position
  - the instrument – with a presumptive list of BB and TB instruments
  - the accounting treatment (FV)

- FRTB prohibits moving positions between TB and BB except in the most exceptional circumstances. Supervisory approval is required and no capital benefit can result.

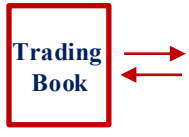
- FRTB sets very restrictive rules on risk transfers (internal hedging) from BB to TB. In the case of credit risk transfer (an internal CDS) this is understandable. It is less understandable for interest rate risk. [See over.]

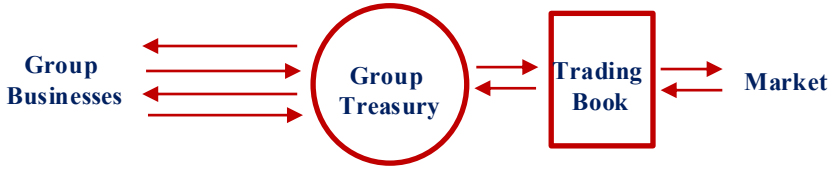
Definition of the TB and TB/BB Boundary

Two widely used operating models for IRRBB hedging



IRRBB goes directly to market and TB is a pure external-facing entity. This structure is FRTB friendly.



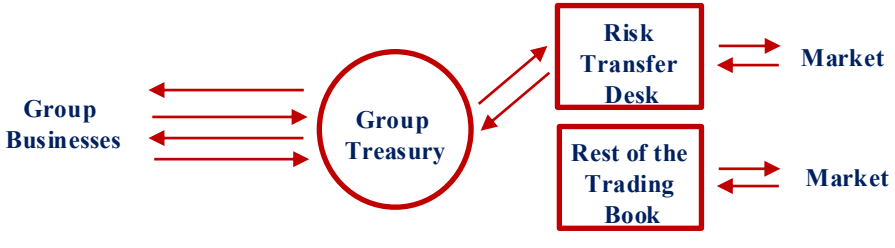


IRRBB goes to market via the TB. This is not FRTB-friendly and banks must either move to the structure above or overleaf

Definition of the TB and TB/BB Boundary

A bank that does not hedge IRRBB directly with the market must set up a ring-fenced Risk Transfer Desk within the TB whose exclusive purpose is to act as a conduit for BB risk to the market.

It is isolated from the rest of the TB and separately capitalised. No offset between the risk transfer desk and the broader trading book can be recognised for capital purposes.



BCBS Standard on IRRBB – Bank Principle 1

IRRBB is an important risk for all banks that should be specifically identified, measured, monitored and controlled.

- New Product Approval Process
- Hedging/Position Taking
- Approval by Board or delegated committee
- Operational procedures and risk control systems

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BCBS Standard on IRRBB – Bank Principle 2

The board of directors of each bank is responsible for oversight of the IRRBB risk management framework, and for agreeing the bank's risk appetite for IRRBB. Directors should collectively have adequate knowledge and understanding of IRRBB for this task. Monitoring and management of IRRBB may be delegated by the board to appropriate expert individuals or groups/committees.

- **The board has ultimate responsibility**
- **Minimum semi-annual updates**
- **The board must ensure that senior management have the requisite skills**
- **Delegation may be to ALCO (Asset and Liability Committee)**
- **Monitoring and control processes should be regularly reviewed by an independent party (e.g., internal or external auditor)**

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BCBS Standard on IRRBB – Bank Principle 3

The risk appetite of a bank for IRRBB should be calibrated in terms of both risk to economic value and risk to earnings. Risk appetite should be expressed through appropriate policy limits and internal controls

- **Risk Appetite Statement – a written articulation of the level and types of risk that a bank will accept**
- **Delegated powers, lines of responsibility and accountability**
- **Approval by the Board**
- **Limits should be appropriate to the nature, size and complexity of the organisation**
- **Procedures for exceptions**

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BCBS Standard on IRRBB – Bank Principle 4

Measurement of IRRBB should be based on outcomes for both economic value (EV) and earnings (NII)arising from a wide and appropriate range of interest rate shock scenarios (including stress scenarios) that result in changes to interest rates across the term structure

- EV measure should focus on instruments already on the balance sheet (static approach)
- Earnings measure, in addition to the static view, may incorporate future business flows (dynamic view)
- Interest rate shock scenarios assessed should include: internally selected rate shock scenarios to comply with the ICAAP process, the six supervisory prescribed interest rate shock scenarios and any additional rate shock scenarios required by the supervisor
- The bank should estimate how interest rates that are administered or managed will re-price in each of the scenarios

BCBS Standard on IRRBB – Bank Principle 5

In measuring IRRBB, key behavioural and strategic assumptions should be fully understood, conceptually sound and documented. Such assumptions should be rigorously tested and aligned with the corporate plan. Assumptions should not be adjusted solely to take account of expectations for changes in interest rates

- **Key behavioural assumptions are required for items such as:**
  - ✓ **Expected prepayments of loans/early redemption of deposits**
  - ✓ **Non-Maturity Deposits**
  - ✓ **Pass through assumptions for market interest rate changes**
- **The most significant assumptions should be documented, together with supporting evidence and regularly reviewed**

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BCBS Standard on IRRBB – Bank Principle 6

Measurement systems and models used for IRRBB should be based on complete and accurate data, and subject to appropriate documentation, testing and controls to give assurance on the accuracy of calculations. Models used to measure IRRBB should be comprehensive and covered by strong internal validation processes.

- As every risk measurement system has its limitations, the Basel Committee recommends that banks should rely on a variety of measures; both earnings and EV based with both static and dynamic views
- An effective validation framework should include:
  - ✓ evaluation of conceptual soundness
  - ✓ ongoing monitoring, including process verification and benchmarking
  - ✓ outcomes analysis including back-testing

BCBS Standard on IRRBB – Bank Principle 7

Measurement outcomes of IRRBB levels and hedging strategies should be reported to management and the board on a regular basis, at relevant levels of aggregation (by consolidation level and currency).

- **Reports detailing the IRRBB exposure of the bank should be reviewed by the board on a regular basis**

- **Reports prepared for the board and various levels of management should include:**

  - ✓ **summaries of the bank's aggregate exposures**
  - ✓ **reports demonstrating compliance with policies and limits**
  - ✓ **key assumptions**
  - ✓ **results of stress tests**
  - ✓ **summaries of findings of internal and external auditors**

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BCBS Standard on IRRBB – Bank Principle 8

Information on IRRBB positions and limits should be reported to supervisors when requested and public disclosure should be made on a regular basis

- Banks should notify their supervisors ahead of any significant changes planned for:
  - ✓ Internal limits
  - ✓ Internal modelling systems or methodologies
  - ✓ Behavioural assumptions on options
- Public disclosure should cover EV and earnings measures using the Bank's internal model as well as the Standardised framework outlined, together with key assumptions across both processes

BCBS Standard on IRRBB – Bank Principle 9

Internal capital should be specifically allocated to IRRBB as approved by the board in line with the agreed risk appetite

- The level of internal capital should be commensurate with the both the actual measured level of risk and the bank's risk appetite and be duly documented in their ICAAP report
- Banks should not only rely on supervisory measures of capital required for IRRBB, but should develop their own methodologies for internal capital allocation

Basel Committee Enhanced Disclosure Requirements – Qualitative Disclosure

Qualitative disclosure	
a	A description of how the bank defines IRRBB for purposes of risk control and measurement.
b	A description of the bank's overall IRRBB management and mitigation strategies. Examples are: monitoring of EVE and NII in relation to established limits, hedging practices, conduct of stress testing, outcomes analysis, the role of independent audit, the role and practices of the ALCO, the bank's practices to ensure appropriate model validation, and timely updates in response to changing market conditions.
c	The periodicity of the calculation of the bank's IRRBB measures, and a description of the specific measures that the bank uses to gauge its sensitivity to IRRBB.
d	A description of the interest rate shock and stress scenarios that the bank uses to estimate changes in the economic value and in earnings.
e	Where significant modelling assumptions used in the bank's IMS (ie the EVE metric generated by the bank for purposes other than disclosure, eg for internal assessment of capital adequacy) are different from the modelling assumptions prescribed for the disclosure in Table B, the bank should provide a description of those assumptions and of their directional implications and explain its rationale for making those assumptions (eg historical data, published research, management judgment and analysis).
f	A high-level description of how the bank hedges its IRRBB, as well as the associated accounting treatment.
g	A high-level description of key modelling and parametric assumptions used in calculating ΔEVE and ΔNII in Table B, which includes: For ΔEVE, whether commercial margins and other spread components have been included in the cash flows used in the computation and discount rate used. How the average repricing maturity of non-maturity deposits in (1) has been determined (including any unique product characteristics that affect assessment of repricing behaviour). The methodology used to estimate the prepayment rates of customer loans, and/or the early withdrawal rates for time deposits, and other significant assumptions. Any other assumptions (including for instruments with behavioural optionalities that have been excluded) that have a material impact on the disclosed ΔEVE and ΔNII in Table B, including an explanation of why these are material. Any methods of aggregation across currencies and any significant interest rate correlations between different currencies.
h	(Optional) Any other information which the bank wishes to disclose regarding its interpretation of the significance and sensitivity of the IRRBB measures disclosed and/or an explanation of any significant variations in the level of the reported IRRBB since previous disclosures.

Basel Committee Enhanced Disclosure Requirements – Quantitative Disclosure

Quantitative disclosures	
1	Average repricing maturity assigned to NMDs.
2	Longest repricing maturity assigned to NMDs.

Accompanying narrative: Commentary on the significance of the reported values and an explanation of any material changes since the previous reporting period.

In reporting currency	ΔEVE		ΔNII	
Period	**T**	**T–1**	**T**	**T–1**
Parallel up				
Parallel down				
Steepener				
Flattener				
Short rate up				
Short rate down				
Maximum				
Period	**T**		**T–1**	
Tier 1 capital				

Standardised Approach

Caps on core deposits and average maturity by category

	Cap on proportion of core deposits (%)	Cap on average maturity of core deposits (years)
Retail/transactional	90	5
Retail/non-transactional	70	4.5
Wholesale	50	4

CPRs under the shock scenarios

Scenario number (i)	Interest rate shock scenarios	γ_i (scenario multiplier)
1	Parallel up	0.8
2	Parallel down	1.2
3	Steepener	0.8
4	Flattener	1.2
5	Short rate up	0.8
6	Short rate down	1.2

Term deposit redemption rate (TDRR) scalars under the shock scenarios

Scenario number (i)	Interest rate shock scenarios	Scalar multipliers u_i
1	Parallel up	1.2
2	Parallel down	0.8
3	Steepener	0.8
4	Flattener	1.2
5	Short rate up	1.2
6	Short rate down	0.8

Source: Basel Committee on Banking Supervision

The proportion of non-maturity deposits that banks may treat as core and the average maturity of core deposits are both capped

Either banks calculate or regulators supply a standard prepayment or deposit redemption rate for fixed rate assets and liabilities. These are scaled in each of the scenarios by the scalar or scenario multipliers

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Standardised Approach – Specified Size of Interest Rate Shocks

- The assessment of IRRBB is based upon 6 interest rate scenarios: *(i)* parallel shock up; *(ii)* parallel shock down; *(iii)* steepener shock (short rates down and long rates up); *(iv)* flattener shock (short rates up and long rates down); *(v)* short rates shock up; and *(vi)* short rates shock down
- Different shocks apply in different currencies (calibrated according to interest rate movements 2000-2015)
- Short-term rates are defined as < 2 years and long-term rates are over 7 years

Table 1. Specified size of interest rate shocks $\bar{R}_{shocktype,c}$

	ARS	AUD	BRL	CAD	CHF	CNY	EUR	GBP	HKD	IDR	INR
Parallel	400	300	400	200	100	250	200	250	200	400	400
Short	500	450	500	300	150	300	250	300	250	500	500
Long	300	200	300	150	100	150	100	150	100	350	300

	JPY	KRW	MXN	RUB	SAR	SEK	SGD	TRY	USD	ZAR
Parallel	100	300	400	400	200	200	150	400	200	400
Short	100	400	500	500	300	300	200	500	300	500
Long	100	200	300	300	150	150	100	300	150	300

Source: Basel Committee on Banking Supervision

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