

How to construct dynamic simulations in the context of IRRBB

Agenda

1. IRRBB – guidelines and challenges
2. Dynamic Analysis in RiskConfidence
3. Q&A

1

IRRBB – guidelines &
challenges

IRRBB requirements

In a nutshell



*“Earnings measures may, in addition to a run-off view, assume **rollover of maturing items** (ie a constant balance sheet view) and/or assess the scenario-consistent impact on the bank’s future earnings inclusive of future business (ie a dynamic view).”*

As the **Balance Sheet is supposed to be renewed** for the 1-year NII, assumptions are required to maintain it constant over 1 year. Yet BCBS is also giving hints at more advanced simulation approaches.

“...banks should use a variety of methodologies to quantify their IRRBB exposures under both the economic value and earnings-based measures, ranging from simple calculations based on static simulations using current holdings to more sophisticated dynamic modelling techniques that reflect potential future business activities.”

IRRBB requirements and challenges

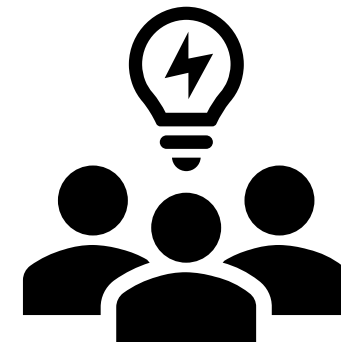
According to a survey conducted by Deloitte together with stress scenario for models and methods, **dynamic analysis is one of the top priorities of banks** : to integrate dynamic simulations within their IRRBB management tool and industrialize their production seems to be a major challenge.

Which makes dynamic balance sheet projections a very relevant topic to be addressed within the **methodology framework** not only to meet IRRBB requirements but also

- Facilitate balance sheet management and **optimization** / internal risk measurement
- **Profitability** and revenue enhancement / business planning and budgeting

Dynamic approaches are dependent on **key variables and assumptions** that can be difficult to project, so with dynamic simulations, a few questions are raised such as

- How to price the new production ?
- What are the characteristics of the rolled deals ?
- How many scenarios ?



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Dynamic Analysis in
RiskConfidence

Dynamic assumptions within our framework

Scenario Building blocks & Results

User can create and save multiple Balance Sheet Strategies, rollover and transformation sets in the system, and add them to **scenarios to process as part of a scenario set**.

Simulated deals can include behavior such as prepayment assumptions for loans, runoff modeling for deposits, and facility behavior for drawdowns and reimbursements.

During the ALM process, **new volume deals are generated and stored in dedicated tables**.

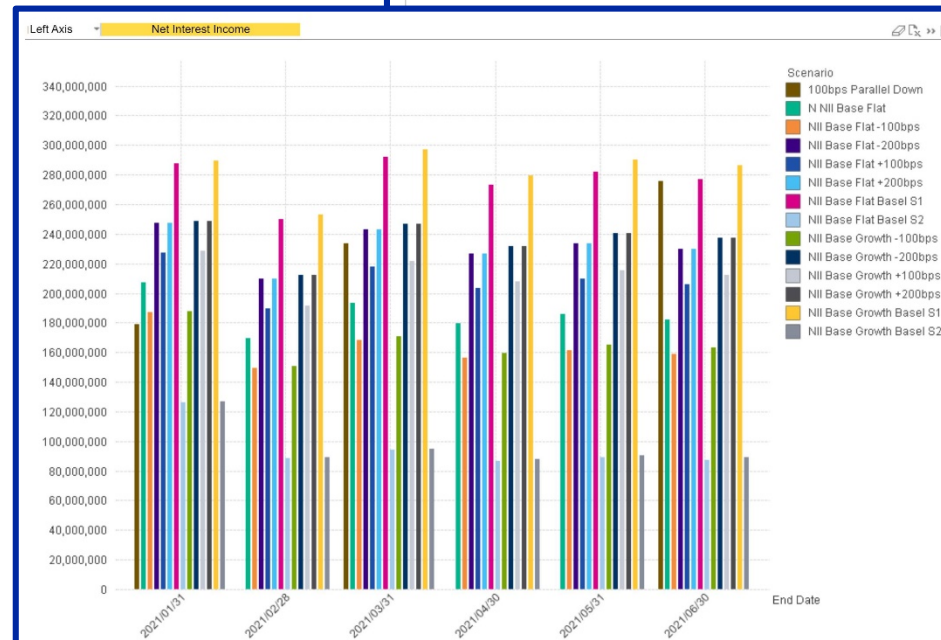
Once deals are generated, the **cash flows, deal results, and time segment results are produced**.

User can **compare the results** for each scenario of the scenario set.

The screenshot displays the 'Scenario Sets' interface. At the top, there is a table with 119 rows. The first row is highlighted and shows ID 32,608, Name 'Dynamic Simulations', and an empty Description. Below this, a sub-table titled 'Scenarios of: Dynamic Simulations' shows 4 rows of scenarios:

| ID | Order | Scenario | Base Scenario |
|--------|-------|--------------------------|-------------------------------------|
| 38,966 | | DynamicSim - constant | <input type="checkbox"/> |
| 38,967 | | DynamicSim - base | <input checked="" type="checkbox"/> |
| 38,968 | | DynamicSim - growth +5% | <input type="checkbox"/> |
| 38,969 | | DynamicSim - growth +20% | <input type="checkbox"/> |

To the right of the table is the 'Scenario Details' panel for 'Dynamic Simulations'. It includes sections for 'New Business' (Balance Sheet Strategy: BSS constant, Allocation Set: test allocation set), 'Selloff and Buyback' (Selloff and Buyback Set, Haircut Set), and 'Hedging Strategy' (System Account Set, Margin Set, Margin Transformation, Rollover: Rollover CorpLoans).



A dedicated feature to define dynamic assumptions

Balance Sheet Strategy

- » The **Balance Sheet Strategy** framework enables **new business assumptions** for loans, deposits, repurchase agreements, bonds, swaps, swaptions, forex and facility to be included in financial simulations.

BSS_Constant

Account Set: RCO_COA Display Accounts with Defined Targets: Enable Override Panel:

Start Period: YYYY/MM/DD End Period: YYYY/MM/DD Filter Clear Filter

| New Volume Target | New Volume Type | Target Definition Type | Formula | 07/01/17 - 06/30/18 | 07/01/18 - 06/30/19 | 07/01/19 - 06/30/20 | 07/01/20 - 06/30/21 | 07/01/21 - 06/30/22 | |
|-------------------|------------------------|------------------------|---------|---------------------|---------------------|---------------------|---------------------|---------------------|------------|
| Off Balance | | | | | | | | | |
| FACILITY | New Business Volume | Limit | Formula | FACILITY_NV | | | | | |
| IRSWAP | | | | | | | | | |
| Liability | | | | | | | | | |
| REPO | | | | | | | | | |
| SAVING | Segment Ending Balance | | Formula | BSS_FLAT | | | | | |
| TERMDP | | | | | | | | | |
| Asset | | | | | | | | | |
| BONDS | | | | | | | | | |
| LOANS | Average Balance | | Amount | | 42,000,000 | 44,000,000 | 47,000,000 | 51,000,000 | 52,000,000 |
| OVERDRAFT | | | | | | | | | |
| RREPO | | | | | | | | | |

Define groups of deals to be renewed

Determine the business volume

Define the characteristics of the new volume deals

Defining assumptions in BSS

Targets

Setting up BSS to determine the **business volume**.

- » There are different **target measures**
- » There are two ways to define the time period targets.
- » The targets can be assigned to an account or at a less granular level or to a user defined group of deals for more **flexibility**.

BSS_Constant

Account Set: RCO_COA Display Accounts with Defined Targets Enable Override Panel

Start Period: YYYY/MM/DD End Period: YYYY/MM/DD Filter Clear Filter

| | New Volume Target | New Volume Type | Target Definition Type | Formula | 07/01/17 - 06/30/18 | 07/01/18 - 06/30/19 | 07/01/19 - 06/30/20 | 07/01/20 - 06/30/21 | 07/01/21 - 06/30/22 |
|-------------|------------------------|-----------------|------------------------|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Off Balance | | | | | | | | | |
| FACILITY | New Business Volume | Limit | Formula | FACILITY_NV | | | | | |
| IRSWAP | | | | | | | | | |
| Liability | | | | | | | | | |
| REPO | Segment Ending Balance | | Formula | BSS_FLAT | | | | | |
| SAVING | | | | | | | | | |
| TERMDP | | | | | | | | | |
| Asset | | | | | | | | | |
| BONDS | Average Balance | | Amount | | 42,000,000 | 44,000,000 | 47,000,000 | 51,000,000 | 52,000,000 |
| LOANS | | | | | | | | | |
| OVERDRAF | | | | | | | | | |
| RREPO | | | | | | | | | |

Defining assumptions in BSS

Targets – focus on formula

The formula gives the possibility to easily define a **constant target** or a growing / decreasing balance.

It also enables

- » to set the target of an account by referring to the target of another or to the target amount at a less granular level.
- » To **use the historical balances** as they can be referred to through formulas.

BSS_Constant

Account Set: RCO_COA

Start Period: YYYY/MM/DD End Period:

Formula Name: OVERDRAFT_NV Formula Type: Balance Sheet Strategy

Description: OVERDRAFT_NV

Status: Valid

Formula: node("Asset").segment[seg].target_amount * 0.25

| | New Volume Target | New Volume Type | Target Definition Type | Formula | 07/01/17 - 06/30/18 | 07/01/18 - 06/30/19 | 07/01/19 - 06/30/20 | 07/01/20 - 06/30/21 | 07/01/21 - 06/30/22 |
|-------------|---------------------------|-----------------|------------------------|--------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Off Balance | | | | | | | | | |
| Liability | | | | | | | | | |
| Asset | Segment Beginning Balance | | Amount | | 120,000,000 | 150,000,000 | 190,000,000 | 230,000,000 | 280,000,000 |
| BONDS | | | | | | | | | |
| LOANS | Average Balance | | Amount | | 42,000,000 | 44,000,000 | 47,000,000 | 51,000,000 | 52,000,000 |
| OVERDRAFT | Segment Ending Balance | | Formula | OVERDRAFT_NV | | | | | |
| RREPO | | | | | | | | | |

- ending_balance(seg) = RD_balance
- new_volume(seg) = if (node("Asset").segment[seg].stock_begin_balance > node("Asset").segment[seg].target_balance) then (node("Asset").segment[seg].target_balance - node("Asset").segment[seg].stock_begin_balance) else 0 endif
- ending_balance(seg) = account("LOANS").balance(segment[seg].end_date - tenor(d:0, m:1, y:0)) * 60% + account("LOANS").balance(segment[seg].end_date - tenor(d:0, m:3, y:0)) * 40%

Defining assumptions in BSS

Simulated deals characteristics

Setting up allocation sets to define the **characteristics of the new volume deals** :

Allocation sets are **templates of deal characteristics** to apply when generating simulated deals.

- » There are distinct allocation sets per Instrument type
- » There are different **New Volume simulation rules**
- » There is a period length to determine the deals to include in the analysis of existing combinations

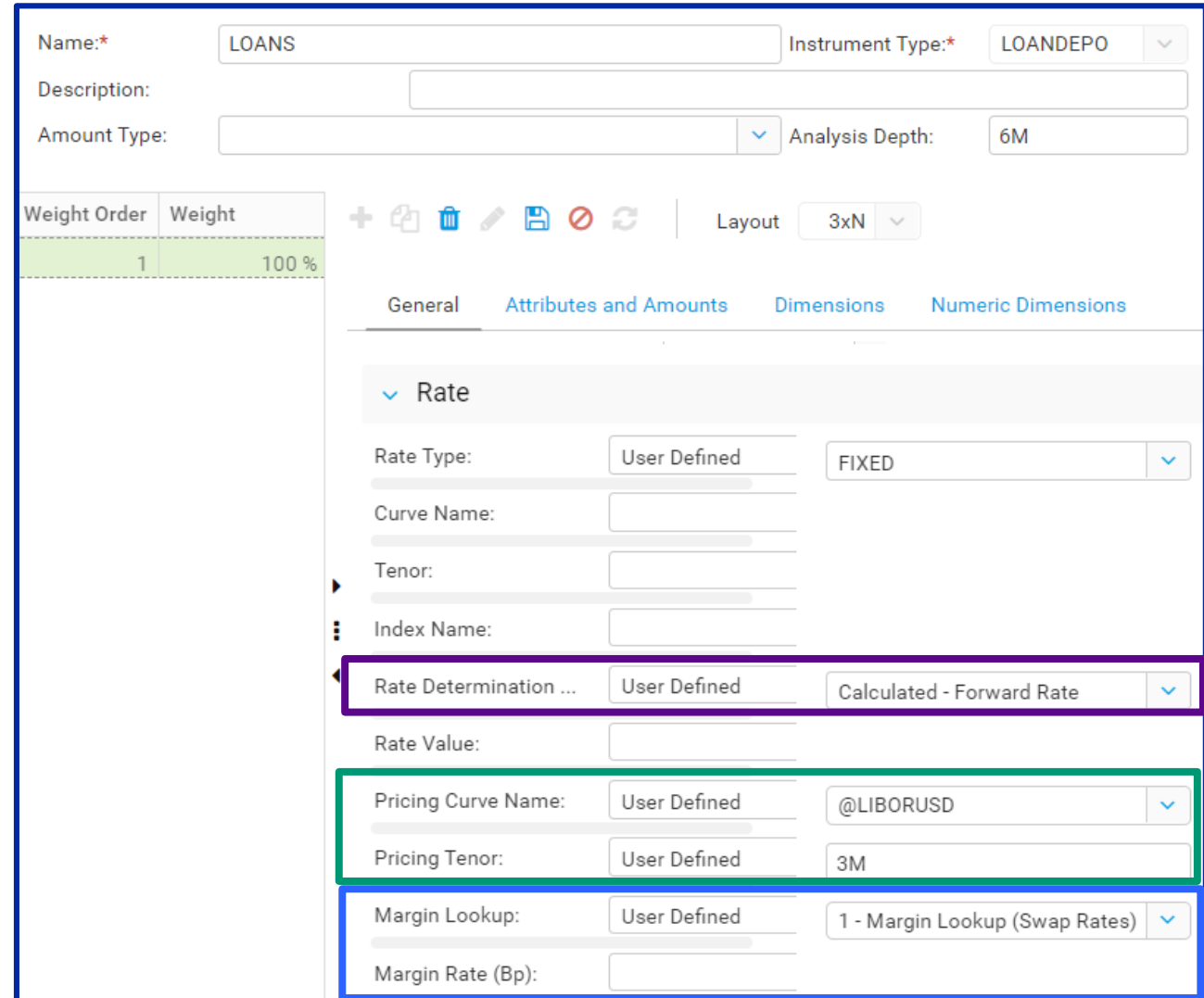
The screenshot displays the 'Allocation Set' configuration interface in BSS. The top section shows a table with 65 rows, listing 'Name' and 'Instrument Type'. The 'LOANS' entry is highlighted, with 'Instrument Type' set to 'LOANDEPO'. Below the table, a form defines the instrument's characteristics: 'Name' is 'LOANS', 'Instrument Type' is 'LOANDEPO', 'Description' is empty, and 'Amount Type' is set to 'Analysis Depth: 6M'. A 'Weight Order' table shows a weight of 100% for the first entry. The bottom section, titled 'General', contains various configuration options: 'Interest Type' is 'User Defined', 'IRR Position Date' is empty, 'Maturity Date' is 'From Stock', 'Nominal' is 'Average Value', 'Payment Day Convention' is empty, 'Nom. Payment Day Conven...' is empty, 'Payment Day Rule' is empty, 'Nom. Payment Day Rule' is empty, 'Payment Day Value' is empty, 'Nom. Payment Day Value' is empty, 'Periodicity' is 'User Defined', and 'Periodicity Tenor' is 'Semi-annual'. The 'Paid in Arrears' option is also visible.

Defining assumptions in BSS

Simulated deals rates

Assumptions for the “**fixed rate**” for new volume deals are also available in the allocation set, they include

- » **method** used to determine the fixed rate at future date
- » assumptions for the pricing curve and pricing tenor
- » assumptions for the **spread** to be added to the derived fixed rate.



Name:* LOANS Instrument Type:* LOANDEPO

Description:

Amount Type: Analysis Depth: 6M

| Weight Order | Weight |
|--------------|--------|
| 1 | 100 % |

Layout 3xN

General Attributes and Amounts Dimensions Numeric Dimensions

Rate

Rate Type: User Defined FIXED

Curve Name:

Tenor:

Index Name:

Rate Determination ... User Defined Calculated - Forward Rate

Rate Value:

Pricing Curve Name: User Defined @LIBORUSD

Pricing Tenor: User Defined 3M

Margin Lookup: User Defined 1 - Margin Lookup (Swap Rates)

Margin Rate (Bp):

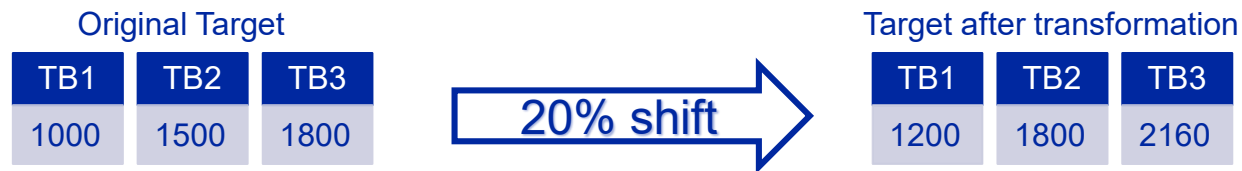
Defining assumptions

Going further

Additional assumptions for specific scenarios, with the possibility to:

- Define a **transformation** on BSS targets

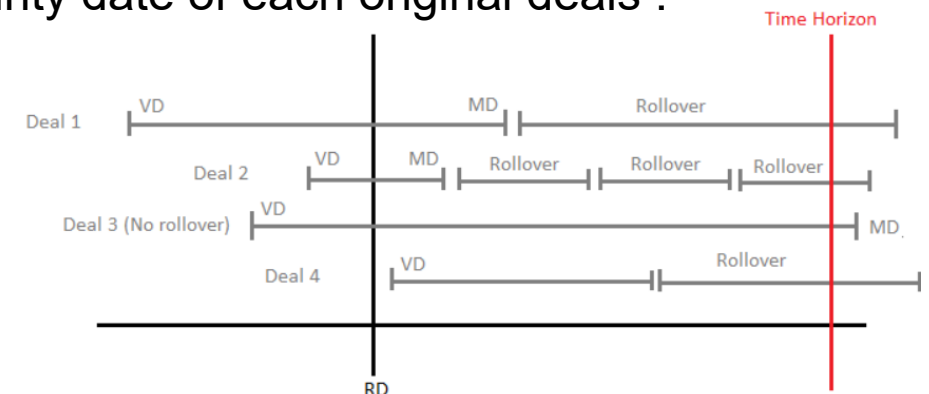
The transformations are shifts that adjust the value of BSS targets and other data within a scenario.



- Define more granular simulation assumptions with the **rollover**.

The rollover enables to generate a simulated deal at the maturity date of each original deals :

Characteristics of the simulated deals are similar to the ones of the original deals except for some characteristics that can be overridden. The nominal of the simulated deals is derived according the Renewal target at value date.



Defining assumptions

Rollover

The Rollover set enables definition of assumptions to apply when generating simulated deals :

- the Renewal Target : the rollover percentage to apply within the user defined horizon segments, 1
- the Rate Det. Method : from stock or calculated (forward rate / strip) 2
- the FX Rate Det. Method (for FOREX instruments)
- the Renewal Spread defined according to Deal size and/or Remaining life 3
- the Renewal Maturity defined as tenor 4

Settings Rollover

Set Model

| Name | |
|--------------------|--|
| model 1 repo | |
| model 1 bond | |
| model 1 collateral | |
| model 1 forex | |
| model 1 loan | |
| model 1 swap | |
| model 2 loan | |
| model1 liq fac | |

Name: model 1 loan

Description:

Instrument Type: Loandepo

Renewal Target: renewal target 1

Rate Determination Method: Calculated - Forward Rate

Pricing Curve: @LIBORUSD

Pricing Tenor: 6M

Renewal Spread: renewal Spread 1

Renewal Maturity: nnYnnMnnD

Model: renewal target 1

Name: renewal target 1 Model Type: Renewal Target

Description:

Factors

| # | Type |
|---|---------|
| 1 | Horizon |

Factor Segments

| # | I/(| From | To | I/) |
|---|-----|------|----|------|
| 1 | [| | 1 | 2) |
| 2 | [| | 2 | 4) |
| 3 | [| | 4 | 6) |
| 4 | [| | 6 | 12) |
| 5 | [| | 12 | 24] |

Horizon Step: Month

Model: renewal Spread 1

Name: renewal Spread 1 Model Type: Renewal Spread

Description:

Factors

| # | Type |
|---|--------------------------|
| 1 | Deal Size |
| 2 | Remaining life of a deal |

Factor Segments

| # | I/(| From | To | I/) |
|---|-----|---------|-----------|-----------|
| 1 | [| | 0 | 100,000] |
| 2 | (| 100,000 | 1,000,000 | 1 |

BALANCE SHEET MANAGEMENT SERIES

Practical Steps in Solving ALM Problems - A “How to” Series

Webinars Available

1

How to Determine Dividend Pay-Outs according to a Bank's Capital Distribution Policies

Thursday, May 20, 2021 | 09:30 BST | 16:30 HKT

Speaker: Wasim Karim, Director - Product Management, Moody's Analytics

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2

How to perform FTP and IRR Stress Testing post IBOR transition

Thursday, June 17, 2021 | 09:30 BST | 16:30 HKT

Speaker: Karen Moss, Director - Product Management, Moody's Analytics

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3

How to perform effective hedging strategies for your balance sheet for Liquidity, IRR & FX gaps

Wednesday, July 7, 2021 | 09:30 BST | 16:30 HKT

Speaker: Nathalie Lahoud, Director - Product Management, Moody's Analytics

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Upcoming Webinars

5

How to calculate Value at Risk using historical or Monte Carlo simulation

Tuesday, September 21, 2021 | 09:30 BST | 16:30 HKT

Speaker: Jingguo Ma, Director - Product Management, Moody's Analytics

UPCOMING WEBINAR

6

How to create bespoke liquidity tests/survival horizons using LCR cohorts

Wednesday, October 13, 2021 | 09:30 BST | 16:30 HKT

Speaker: Clotilde Jlouli, Assistant Director - Product Analyst, Moody's Analytics

UPCOMING WEBINAR

ma.moody's.com/MA-APAC-BSM-Landing-page.html

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Q&A

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