BNY MELLON

INTEREST RATE RISK IN THE BANKING BOOK

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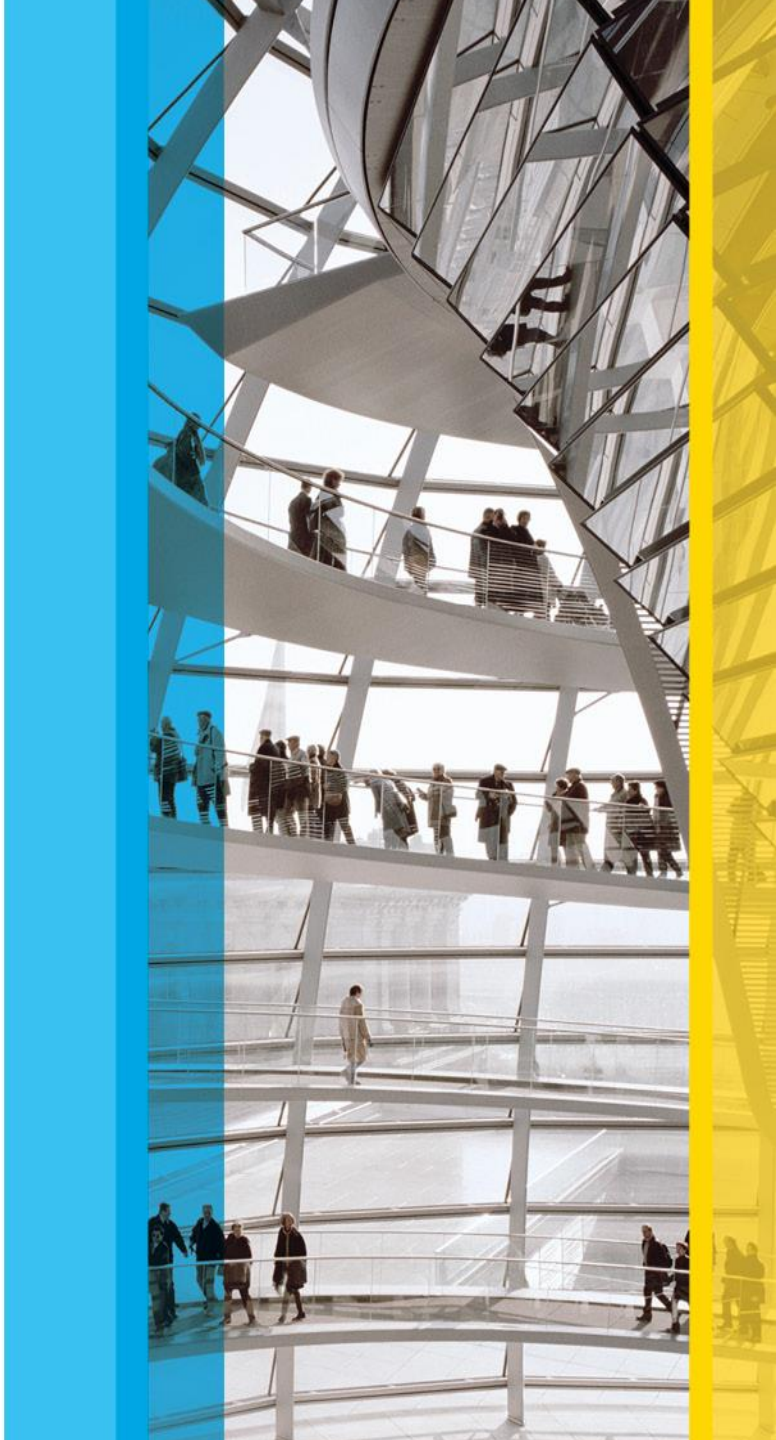

TOOLS & GENERAL REQUIREMENTS

- “Each institution is expected to design its own quantitative tool set by selecting a range of quantitative tools and measures, so that all aspects of the IRRBB are adequately captured.”
- Range of risk types to be covered:
  - Repricing risk
  - Yield curve risk
  - Basis risk
  - Option risk.
- These risk types will be capture by a combination of quantitative tools captures and stress scenario

ECONOMIC VERSUS EARNINGS

- Earnings measures
  - short-term effect of the interest rate changes on the earnings ➔ short-term solvency effect
  - Significant steepening or flattening of the yield curve caused by changes in short-term rates.
- Economic value
  - long-term effect of the interest rate changes.
  - Capture the full effects of interest rate changes ➔ business strategy, capital planning
  - Do not capture extreme temporary shocks
- The longer the duration of a transaction, the stronger the stabilising effect on earnings, but the greater the impact on economic value under stress.

STATIC VS DYNAMIC MODELS

- Static models
  - Effects of interest rate changes on a portfolio – no assumption related to changes of the assumption of the model or composition of the balance sheet
- Dynamic models
  - Takes into account possible assumptions concerning the cash flows and customer behaviour in the event of interest rate changes
  - Takes into account balance sheet change, according to the interest rate scenario

MODEL 1: GAP ANALYSIS

- Gap analysis measures the arithmetic difference between the nominal amounts of interest-sensitive assets (A) and liabilities (L) of the banking book in absolute terms.
  - If A > L ➔ increasing value/income of the banking book with rising value/income of assets.
- Gap analysis allocates all relevant interest sensitive assets and liabilities into a certain number of predefined time bands according to their next contractual repricing date or behavioural assumptions regarding the maturity or the repricing date.

  ➔ multiplied by an assumed change in interest rates

  ➔ approximation of the change in net annualised interest income that would result from such an interest rate movement.

MODEL 2: DYNAMIC MODEL OF EARNINGS AT RISK

- E@R measures the loss of NII over a particular time horizon resulting from various types of interest rate movements
- E@R is the difference in NII between a base scenario and alternative scenario.
  - In the alternative scenario, the interest rate and spread shifts are added onto the forward rates used in the base scenario.
  - The approach then uses a range of stress scenario in order to measure the earnings at risk

MODEL 3: CAPITAL AT RISK / ECONOMIC VALUE OF EQUITY – V1.0

- C@R/EVE measures the theoretical change in the net present value of the current balance sheet and therefore of its equity value resulting from an interest rate shock.
- The value of equity under stress scenarios is compared with the value under a base scenario.
- The value of equity is computed as the present value of assets less liabilities, including or not assumptions about equity capital.

MODEL 4: MODIFIED DURATION OF EQUITY AND PV01 OF EQUITY

- Modified duration shows the relative change in the market value of a financial instrument corresponding to marginal parallel shifts of the yield curve by one percentage point.
- PV01 of equity expresses the absolute change of the equity value resulting from a one basis point parallel shift of the yield curve. It is derived by multiplying the modified duration of equity by the value of equity (assets – liabilities) and divided by 10,000 to arrive at basis point value.

MODEL 5: PARTIAL MODIFIED DURATIONS AND PARTIAL PV01

- Partial modified durations and PV01 are computed for the net interest rate positions in sub-portfolios representing different time bands of the banking book. These partial measures show the sensitivity of the market value of the banking book to a marginal parallel shift of a yield curve in particular maturity segments.
- To each sub-portfolio's partial measure a different magnitude of a parallel shift can be applied by which the effect of the change of the shape of the yield curve can be computed for the entire portfolio.

MODEL 6: CAPITAL AT RISK / ECONOMIC VALUE OF EQUITY – V2.0

- A more sophisticated version of the static measure, where the cash flows are re-calculated dynamically to take into account the fact that their size and the timing may differ under the various scenarios as a result of customer behaviour in reaction to the chosen scenario.

MODEL 7: EFFECTIVE DURATION OF EQUITY

- Effective duration measures value changes due to marginal parallel shifts of the yield curve.
  - It will capture the modified duration that additionally arises from the interest rate sensitivity of embedded optionality.
- The computation derives the change in value of a portfolio due to an interest rate increase or decrease compared to a base scenario
  - changes in the discount rate
  - interest rate-related changes in the magnitude of the expected cash flows for instruments containing embedded options.

MODEL 8: VALUE AT RISK

- The V@R method measures the expected loss of market value that can be incurred under normal market circumstances over a given time horizon and subject to a given confidence level.
- The VaR approach covers three different techniques:
  - Historical simulation
  - Variance-covariance matrix: interest rates of different tenors for simulations derived from historical observations and variance-covariance matrix used to account for the correlations of the rates between tenors.
  - Monte Carlo simulation: interest rate yield curves and interest rate paths randomly simulated.

SUMMARY

	Earning vs capital	Repricing Risk	Yield curve Risk	Basis Risk	Option Risk	Static vs Dynamic	Sophistication
Gap analysis	E	Y				S	L
E@R	E	Y	Y	Y	Y	D	H
C@R & EVE V1.0	C	Y	Y			S	M
Modified duration	C	Y				S	L
Partial modified duration	C		Y			S	M
C@R & EVE V2.0	C	Y	Y	Y	Y	D	H
Effective duration of equity	C	Y			Y	D	M
V@R	C	Y	Y	Y	Y	D	H