

Embedding Liquidity & Interest Rate Risk into Stress Testing

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June, 2020

Nordics Webinar Series

Episode 1
Monday, 15 June

10:00 BST | 11:00 CEST

The Economic Outlook for
the Nordics - Impact of
COVID-19

Episode 2
Thursday, 18 June

14:00 BST | 15:00 CEST

Embedding Liquidity and
Interest Rate Risk Stress
Testing into Your
Organisation

Key Takeaways from Episode 1

The Economic Outlook for the Nordics - Impact of COVID-19

- 1) 2020 output reduction in Nordics will be substantial despite declining rate of infections but the increase in unemployment is smaller than elsewhere.
- 2) Strong fiscal position allows the Nordic countries to support their economies.
- 3) Actions of central banks help to reduce the level of short and long term interest rates.
- 4) Risks to the expected recovery include subsequent breakouts of the COVID-19, rising debt, trade wars, and oil prices for oil exporters such as Norway.

Introduction & Speakers



Juan Licari, PhD
Managing Director



Karen Moss
BSM/ALM Senior Practitioner



Olga Loiseau-Aslanidi
Head of Business Analytics, APAC

Risk & Finance Solutions and Economics & Business Analytics

Agenda

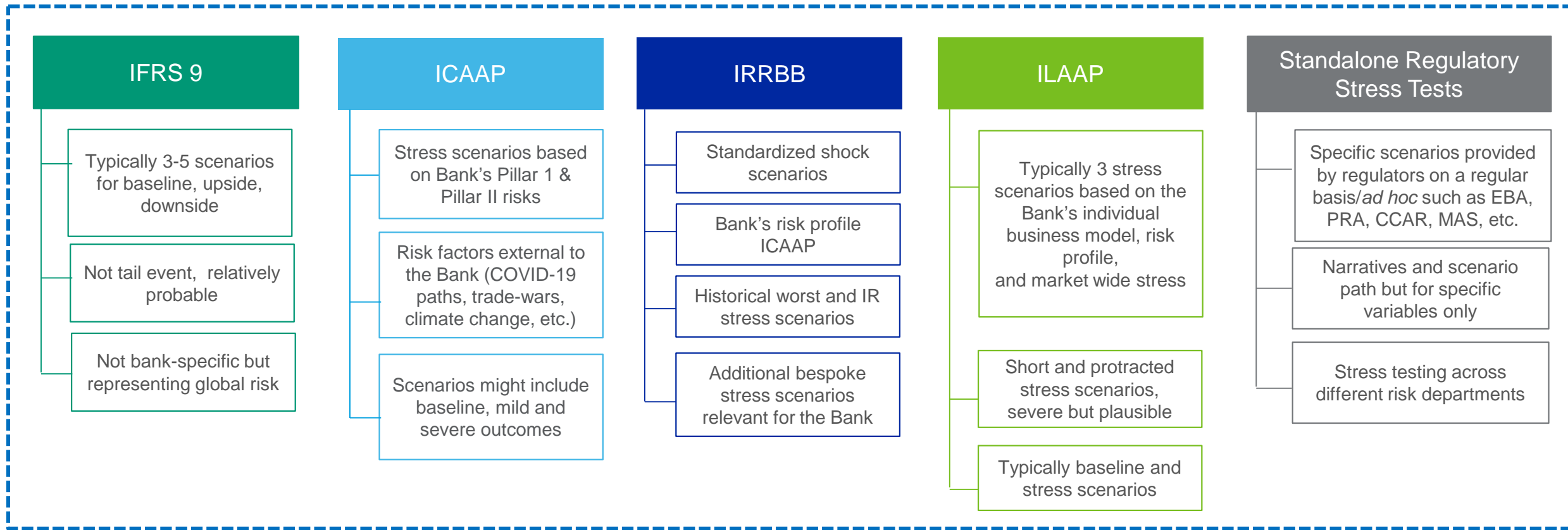
1. The Case: Common Scenarios and Behavioral Models
2. A Framework: Common Scenarios and Behavioural Models
3. Case Studies: Forward-looking Behavioural Models

1

The Case: Common Scenarios and Behavioral Models

Achieving an Integrated Balance Sheet View

Cross-discipline scenario alignment



Discipline-specific Scenario Examples

Example: IRR shocks with an host of artificial assumptions

Parallel up	<p>A constant parallel shock up across all time bucket</p> $\Delta R_{parallel,c}(t_k) = +\bar{R}_{parallel,c}$	Flattener	<p>Involves rotations to the term structure Short rates move up and long rates move down</p> $\Delta R_{flattener,c}(t_k) = +0.8 \cdot \Delta R_{short,c}(t_k) - 0.6 \cdot \Delta R_{long,c}(t_k) $
Parallel down	<p>A constant parallel down across all time buckets</p> $\Delta R_{parallel,c}(t_k) = -\bar{R}_{parallel,c}$	Short rate up	<p>Rates are shocked up such that greatest uplift is at the shortest tenor midpoint & diminishes towards zero at the longest point in the term structure</p> $\Delta R_{short,c}(t_k) = \pm \bar{R}_{short,c} \cdot S_{short}(t_k) = \pm \bar{R}_{short,c} \cdot e^{\frac{-t_k}{x}}$
Steepener	<p>Involves rotations to the term structure. Short rates move down and long rates move up</p> $\Delta R_{steepener,c}(t_k) = -0.65 \cdot \Delta R_{short,c}(t_k) + 0.9 \cdot \Delta R_{long,c}(t_k) $	Short rate down	<p>Long rates shock down such that the largest uplift is in the longest tenor & diminishes to zero at the shortest point in the term structure</p> $\Delta R_{short,c}(t_k) = \pm \bar{R}_{short,c} \cdot S_{short}(t_k) = \pm \bar{R}_{short,c} \cdot e^{\frac{-t_k}{x}}$

Integrating Across Disciplines – Business Case

An opportunity for better risk management



Cost saving

Unified approaches can be handled in a single system to manage different risks. This will help save a lot of money for the Bank.



Comparable reports

Producing reports based on both operational and regulatory dimensions is key to take the good decisions.



Regulatory Compliance

Banks need to be prepared for new regulatory requirements and must be able to forecast accurately the regulatory analytics.

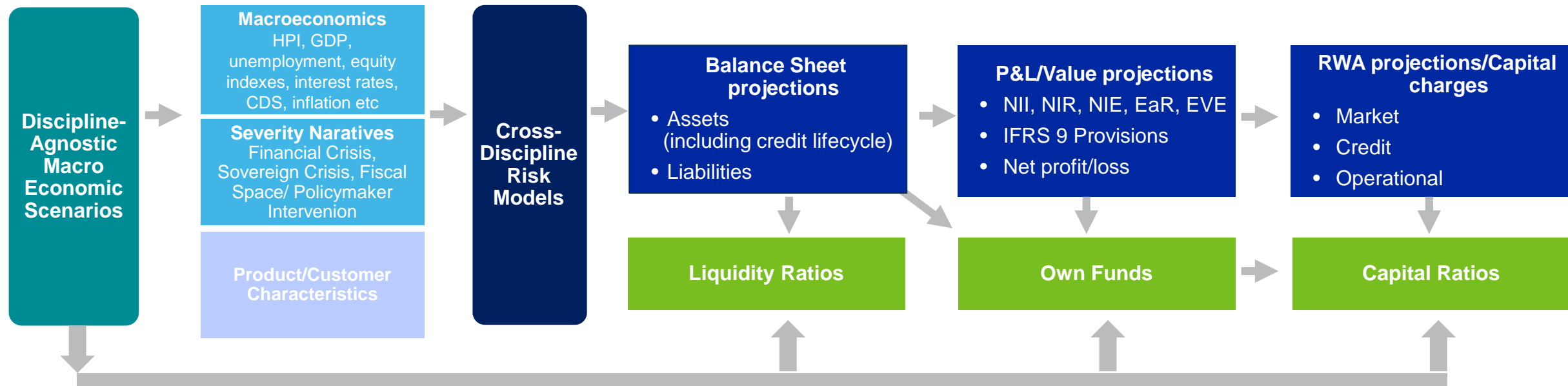


Risk Limits & Risk-adjusted pricing

Models need to be shared by the Bank and be consistent for all risks. The price of each transaction should reflect the variety of these risks.

Discipline-Agnostic Scenarios

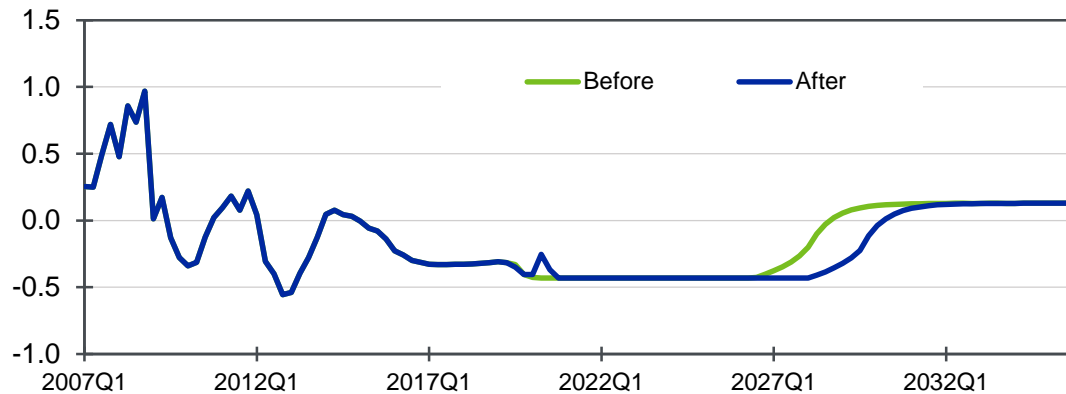
Combine a comprehensive macro-framework with severity variables



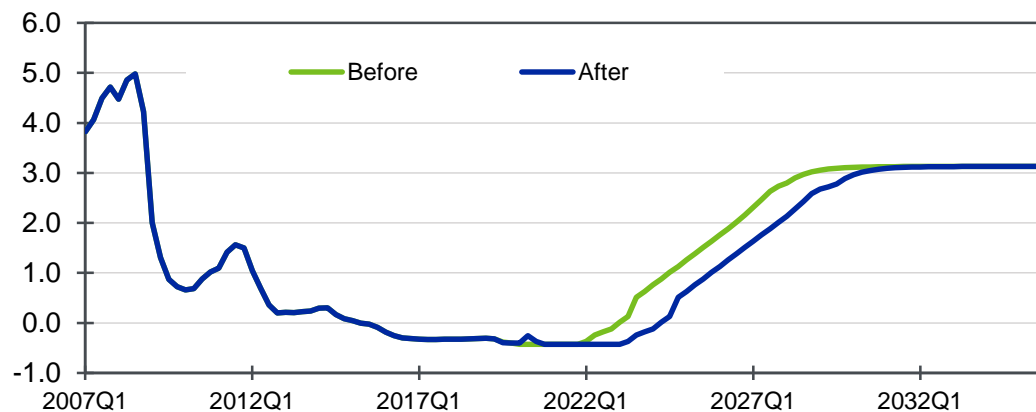
Discipline-Agnostic Scenarios

A comprehensive macroeconomic framework

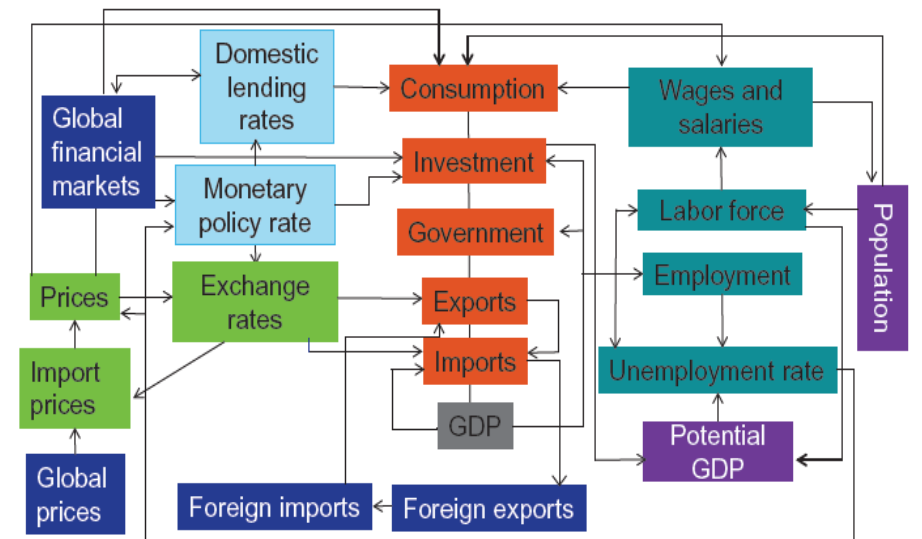
Baseline Scenario- Policy Rate/Euribor spread, %



Baseline Scenario- Euribor



Core Economic Indicators



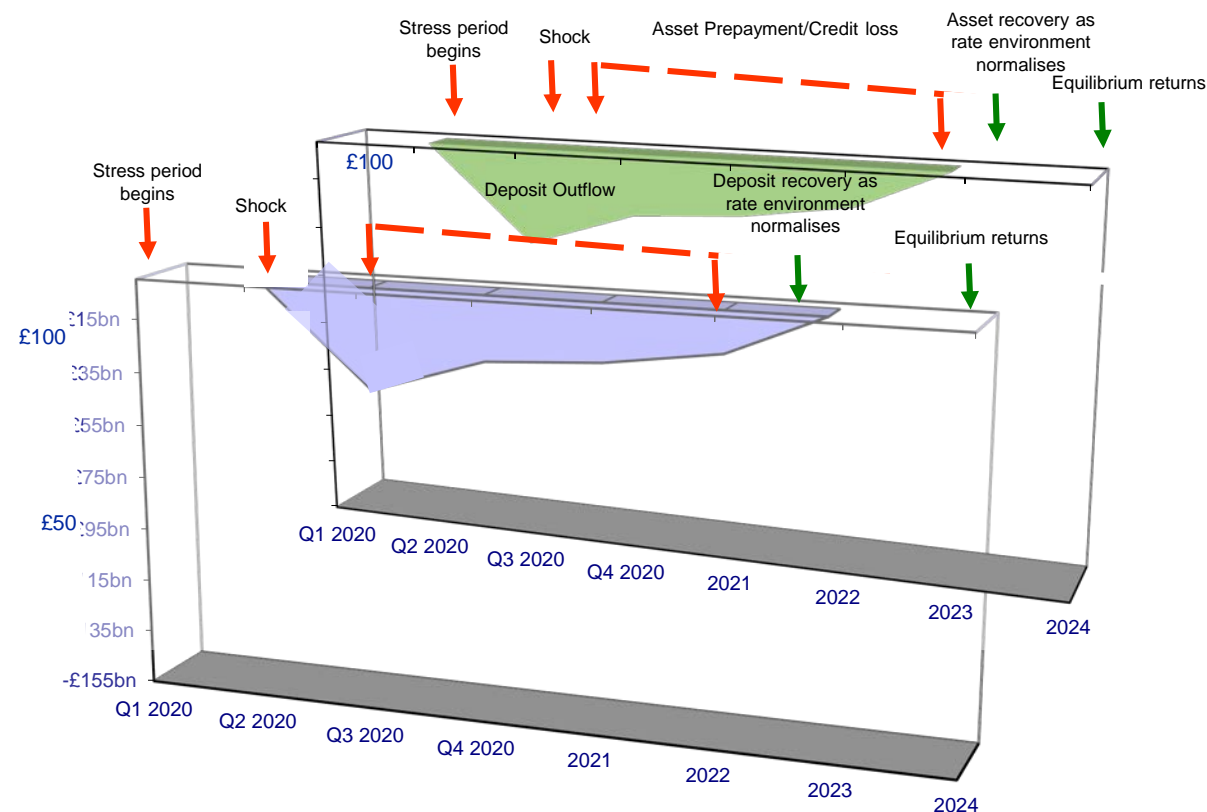
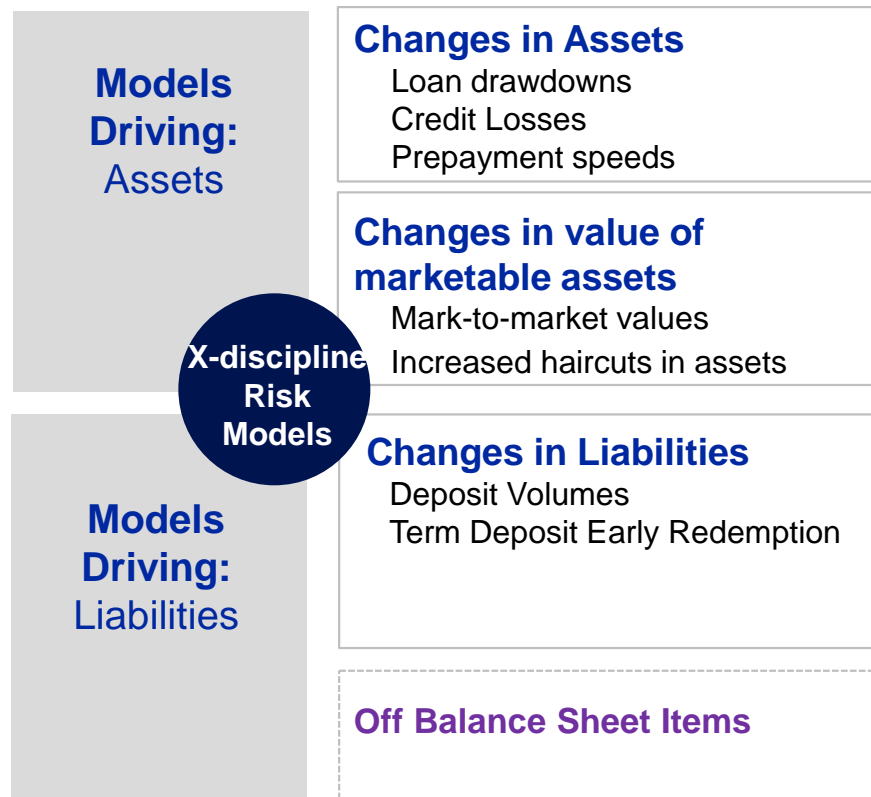
Additional Risk Indicators

Swap Rates Curves
Sovereign Bond Yield Curves
Stock Market Indices
Financial and Sovereign CDS by Sector and Rating
and many more...

Discipline-Agnostic Behavioural Models

Leverage inter-linkages between disciplines

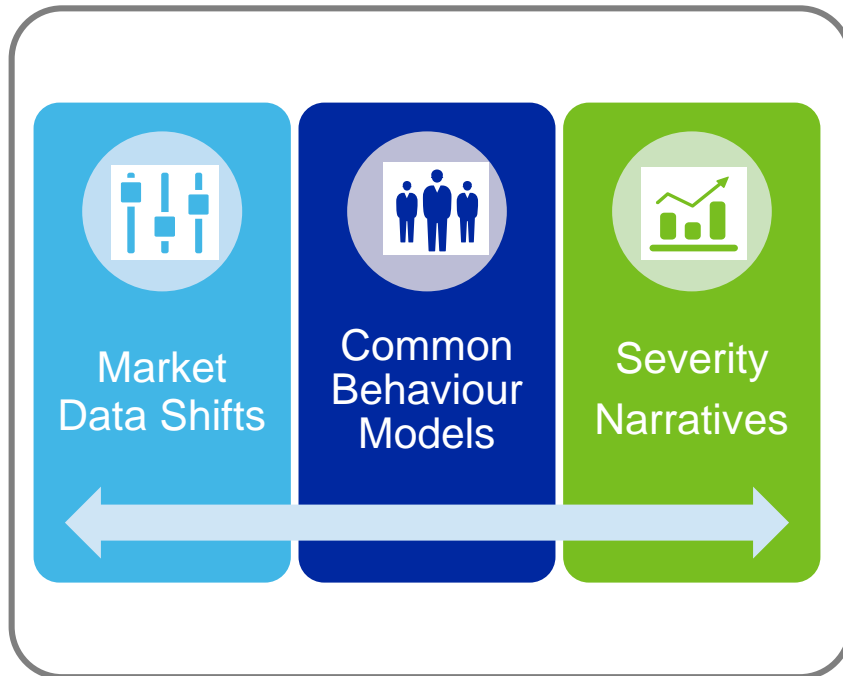
Modelling Impact on balance sheet



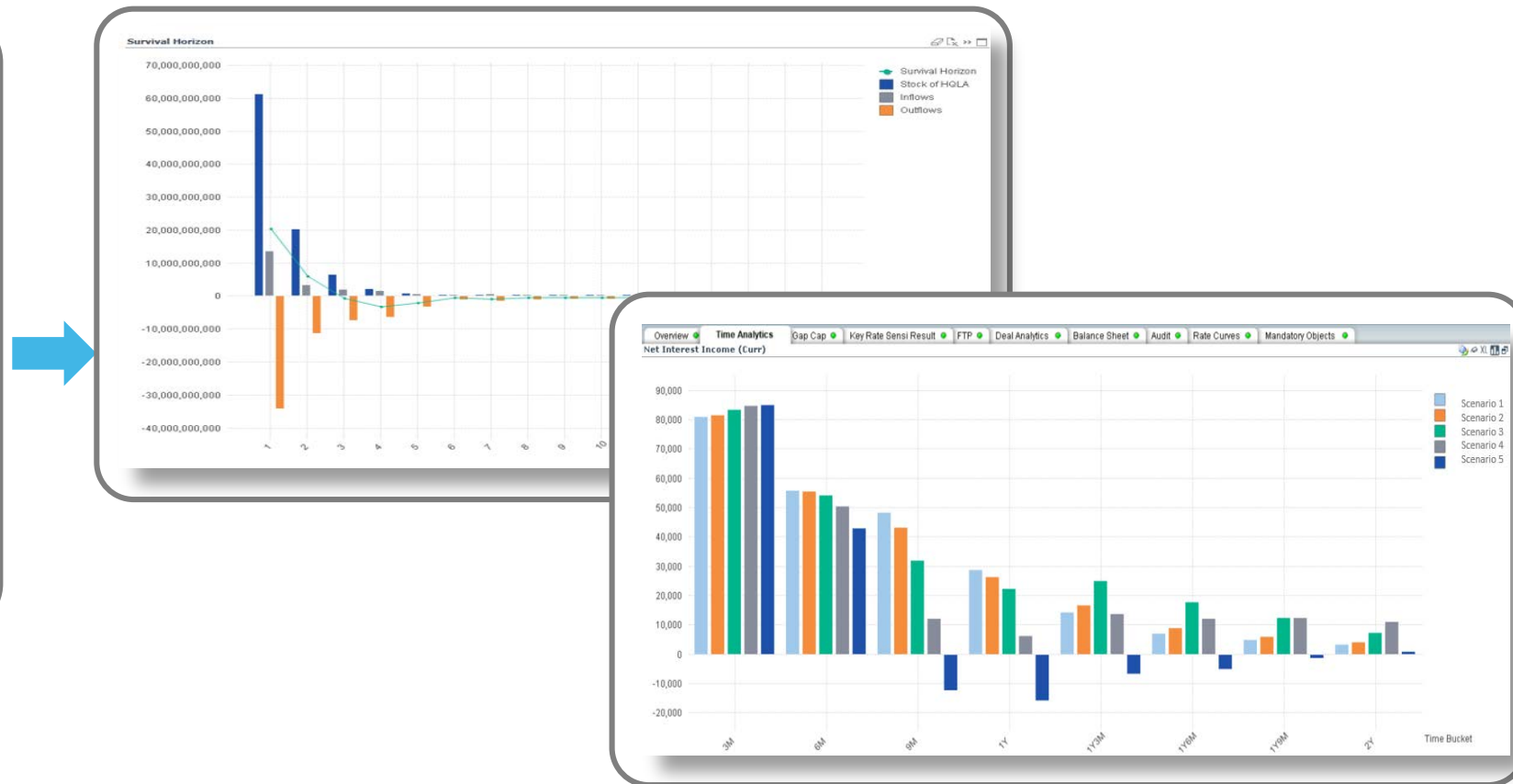
Assess Risk Accurately and Protect Profitability

Realistic and bank-specific analysis

Common Scenarios & Models



Interest Rate Risk, Credit & Liquidity Results per Scenario to Influence Decision-Making

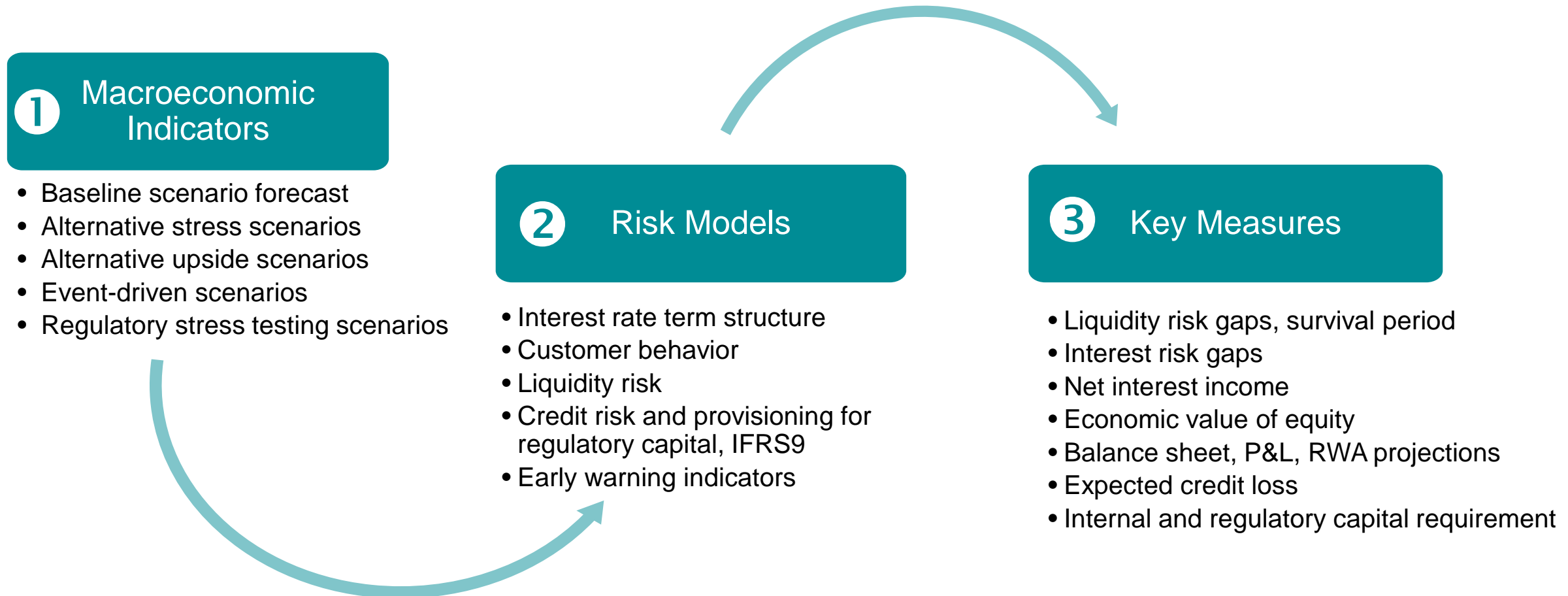


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A Framework: Common Scenarios and Behavioural Models

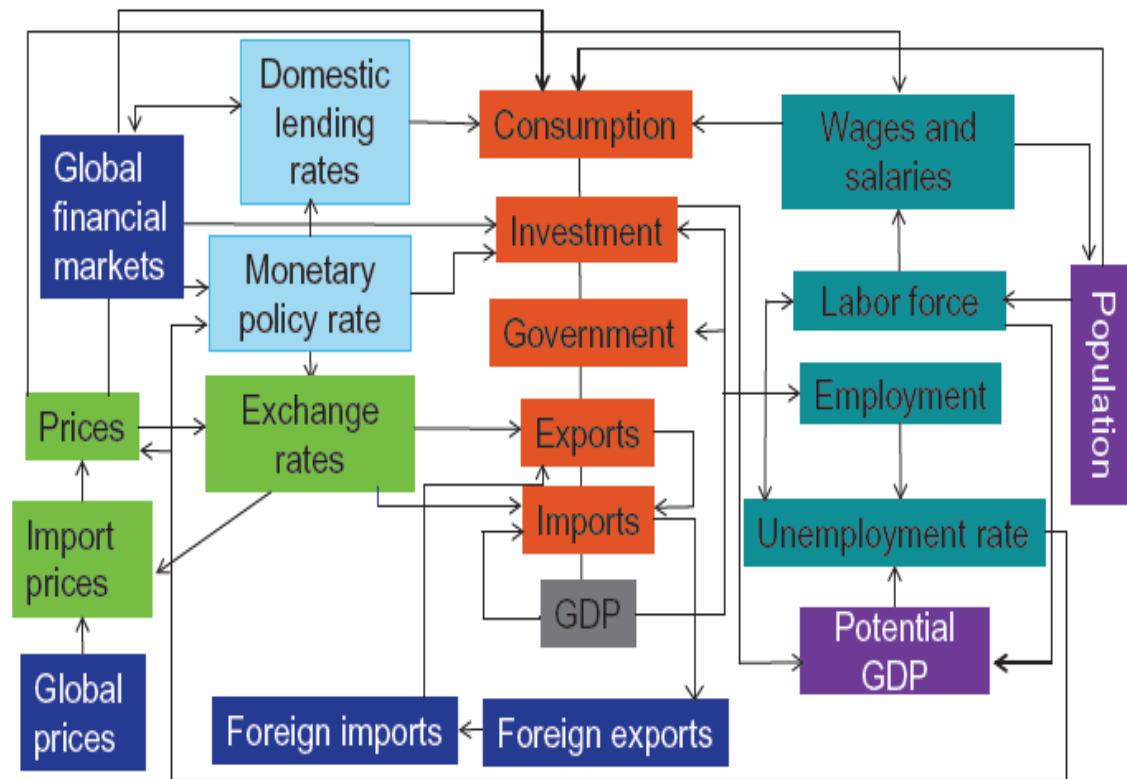
Linking Macro Indicators with Risk Models

Critical for forward-looking capital and liquidity planning



Scenario Generation Framework

Shocks to forecast factors for modelling behaviours



Core Economic Concepts

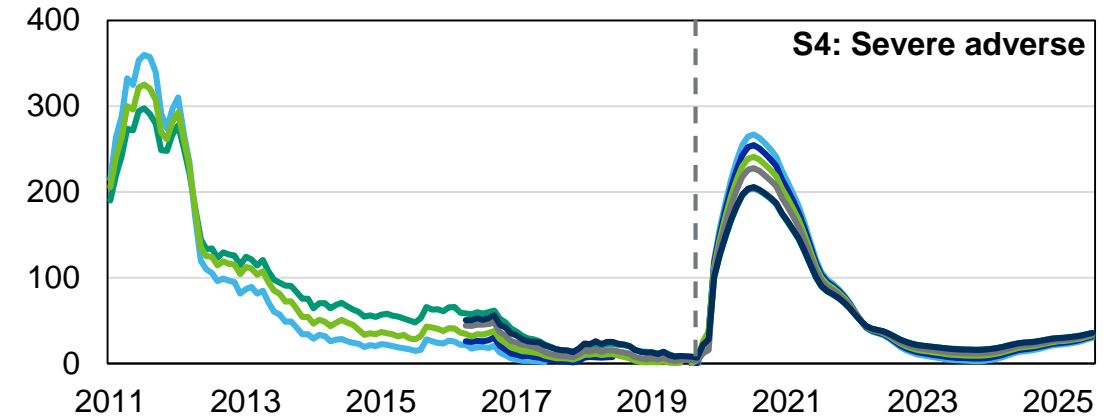
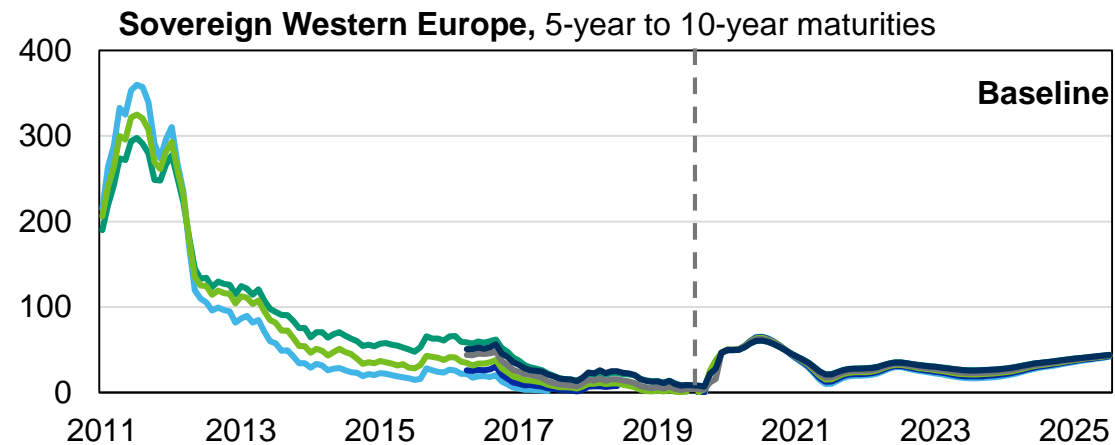
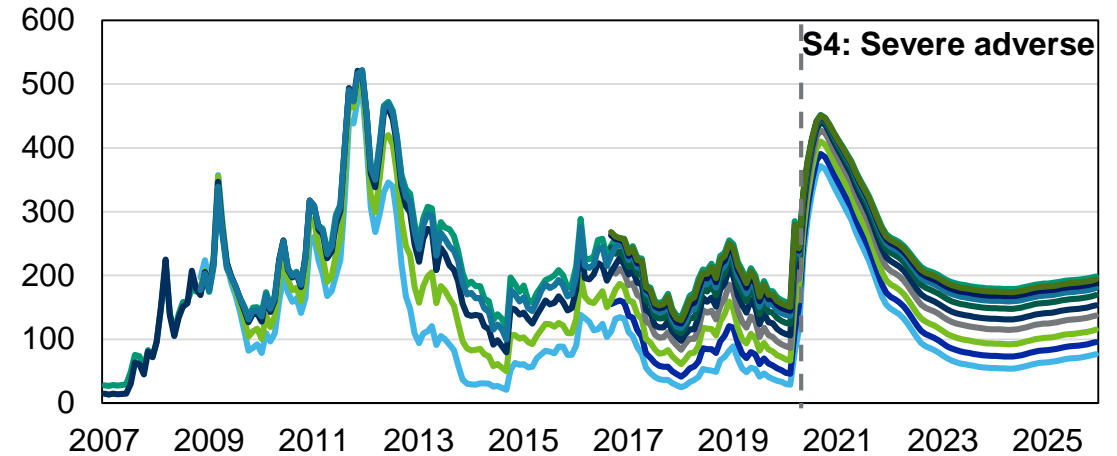
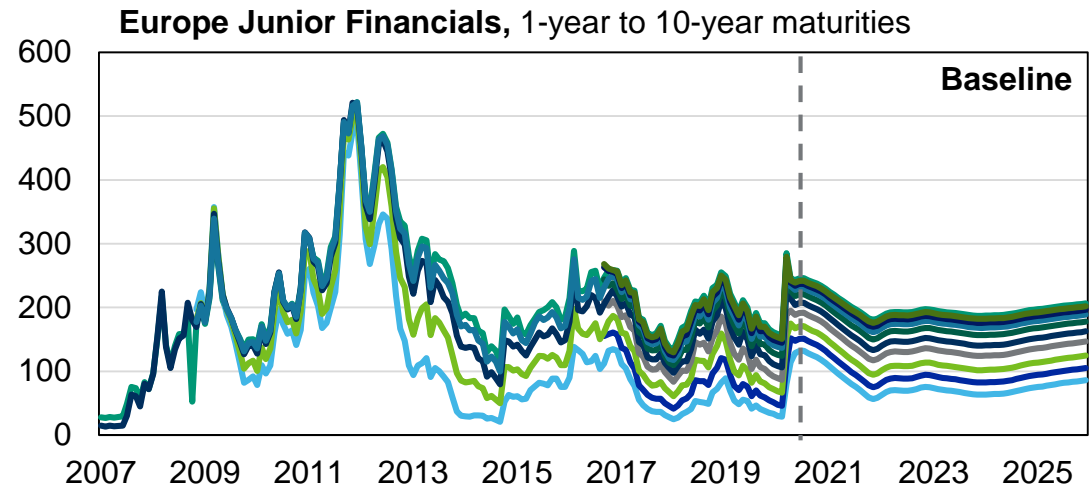
National Accounts
Balance of Payments
Government Finance
Industrial Production
Price Indices
Interest Rates
Labor Markets
Home Price Indices
and many more...

Additional Market Risk Indicators

Swap Rates Curves
Sovereign Bond Yield Curves
Stock Market Indices
Implied Market Volatilities
Asset-backed Securities
Mortgage-backed Securities
Corporate and Sovereign CDS by Sector and Rating
Corporate and Sovereign Credit Migrations
and many more...

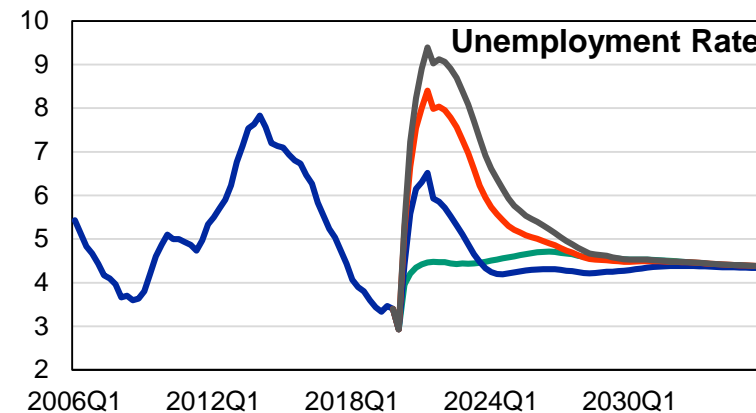
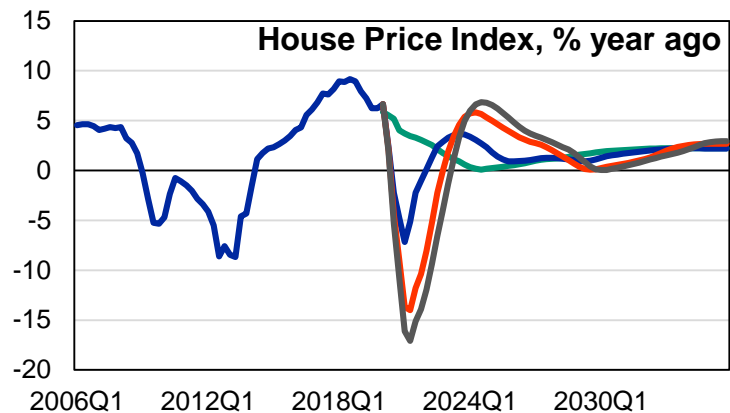
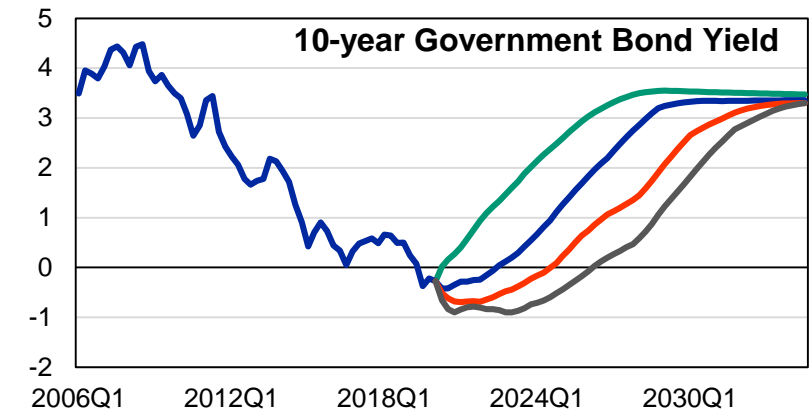
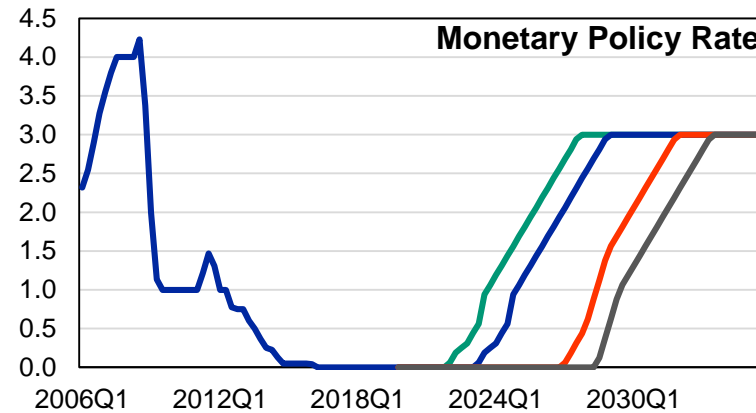
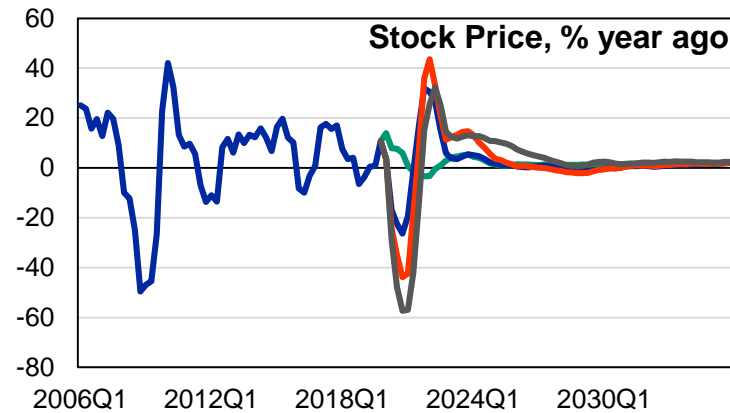
Scenario Forecast of Key Behavioural Factors

iTraxx CDS in Europe, example of baseline and stress scenarios



Scenario Forecast of Key Behavioural Factors

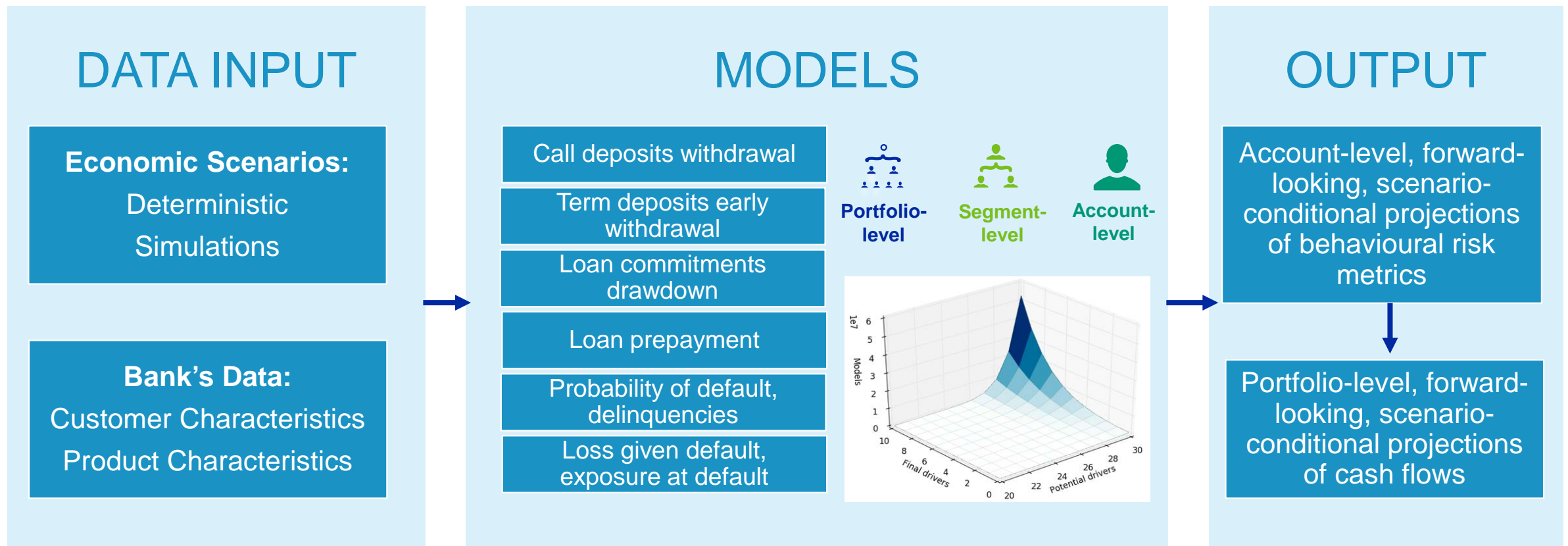
Severity shift for baseline and two alternative scenarios, examples



- Baseline pre-pandemic
- Baseline
- S3: Downside
- S4: Severe downside

Modelling Expected Behaviours

Linking scenarios with net cash-flows from assets and liabilities



Challenges of Behavioural Modelling

For interest rate risk in the banking book, liquidity and credit metrics

Data Availability

- Granularity, frequency, consistency, completeness, and quality
- Limitations can put constraints on the type of modeling techniques
- Macroeconomic scenarios historical data and forecast

Framework Integrity

- Single view of risk across the bank
- Enforce consistency of results by establishing and common modeling framework
- Model governance, re-calibration updates, monitoring, use test



Model Design

- Building robust models using relevant quantitative methods
- Finding appropriate model specification using variable search algorithms
- Detailed documentation and knowledge transfer

Model Implementation

- Implementation into key interest rate risk and liquidity metric calculations
- Implementation into credit risk metric calculation
- Ensuring continuity through detailed user manuals

3

Case Studies: Forward-looking Behavioural Models

Example Drivers for Different Behavioural Models

For interest rate risk in banking book, liquidity and credit risks

Loans subject to prepayment risk

- Loan size, LTV
- Borrower characteristics
- Contractual and current interest rates
- Geographical location
- Demography
- Taxes
- Changes in family composition
- Original and remaining maturity
- Seasoning
- **Macroeconomic variables (e.g. stock price index, unemployment rates, inflation and HPI)**

Loan commitments drawdowns

- Borrower characteristics
- Geographical location, including competitive environment and local premium conventions
- Customer relationship with bank
- Remaining maturity of the commitment
- Seasoning and remaining term
- **Macroeconomic variables**

Term deposits subject to early withdrawal risk

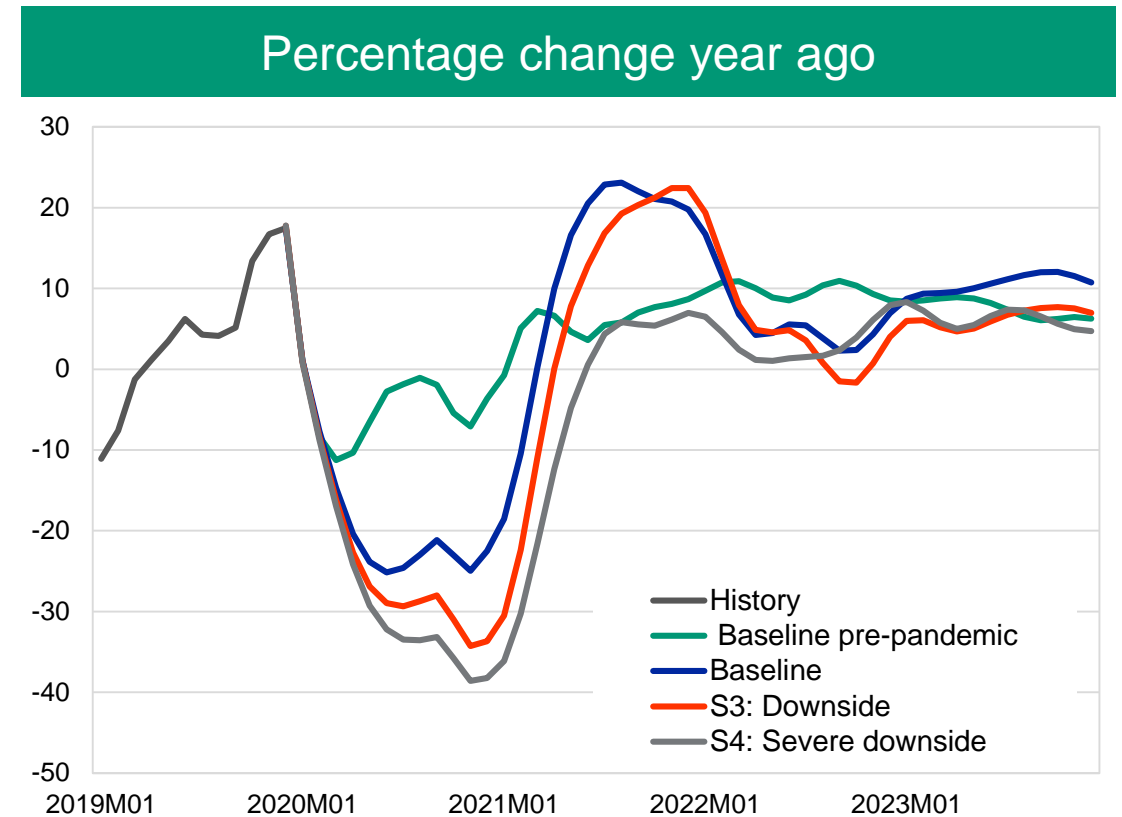
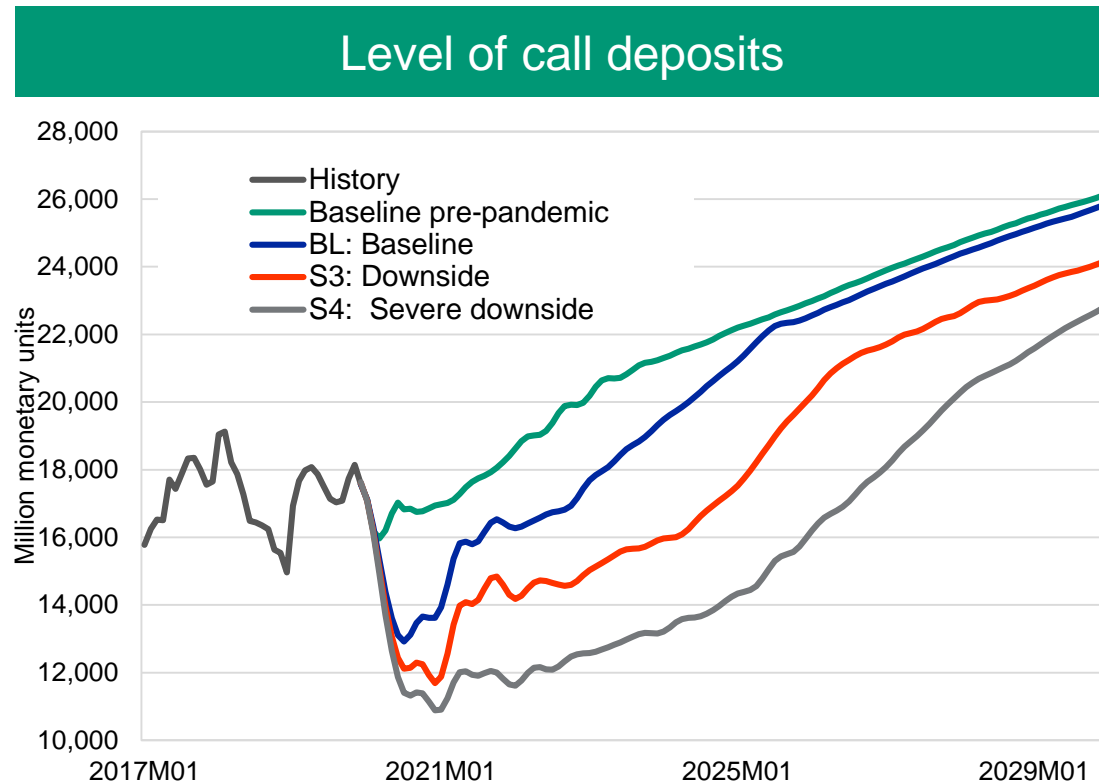
- Deposit size, depositor characteristics
- Funding channel
- Contractual interest rates
- Seasonal factors, geographical location and competitive environment
- Remaining maturity and other historical factors
- Insurance coverage
- Bank's reputation
- **Macroeconomic variables**

Call deposits

- Responsiveness of product rates to changes in market interest rates
- Current level of interest rates
- Spread between a bank's offer rate and market rate
- Competition from other banks
- Bank's reputation, geographical location and demographic characteristics of customer base
- Insurance coverage
- **Macroeconomic variables**

Propensity to Withdraw Modelling Example

Capturing motives for willingness to withdraw and place funds

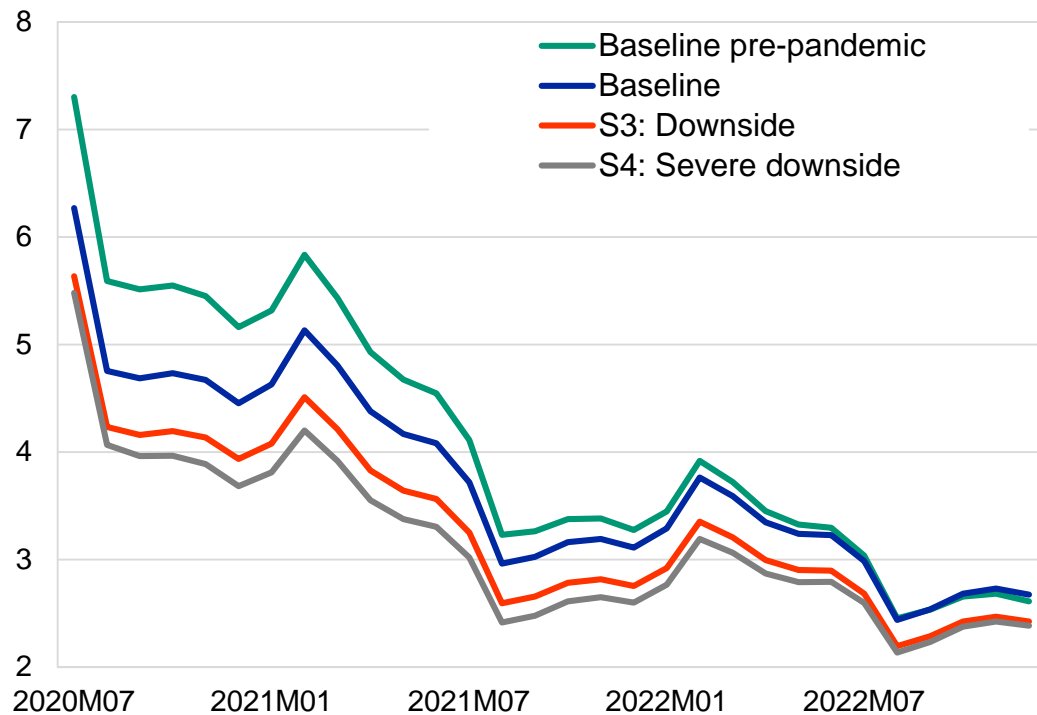


*Assuming complete pass-through

Prepayment Risk Modelling Example

Capturing incentives for early amortization

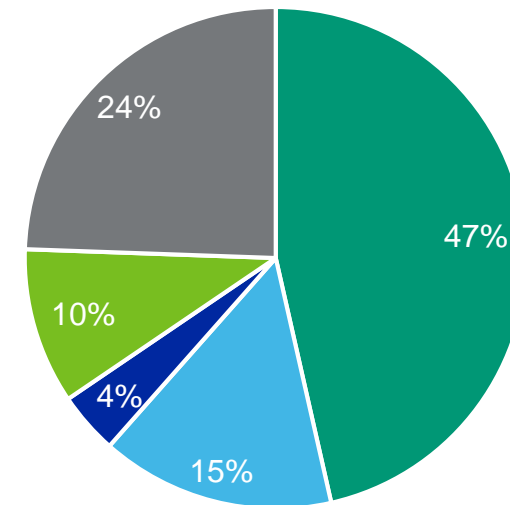
Prepayment Rate, %



Sources: Mortgage Portfolio Analyzer, Moody's Analytics

Driver Composition

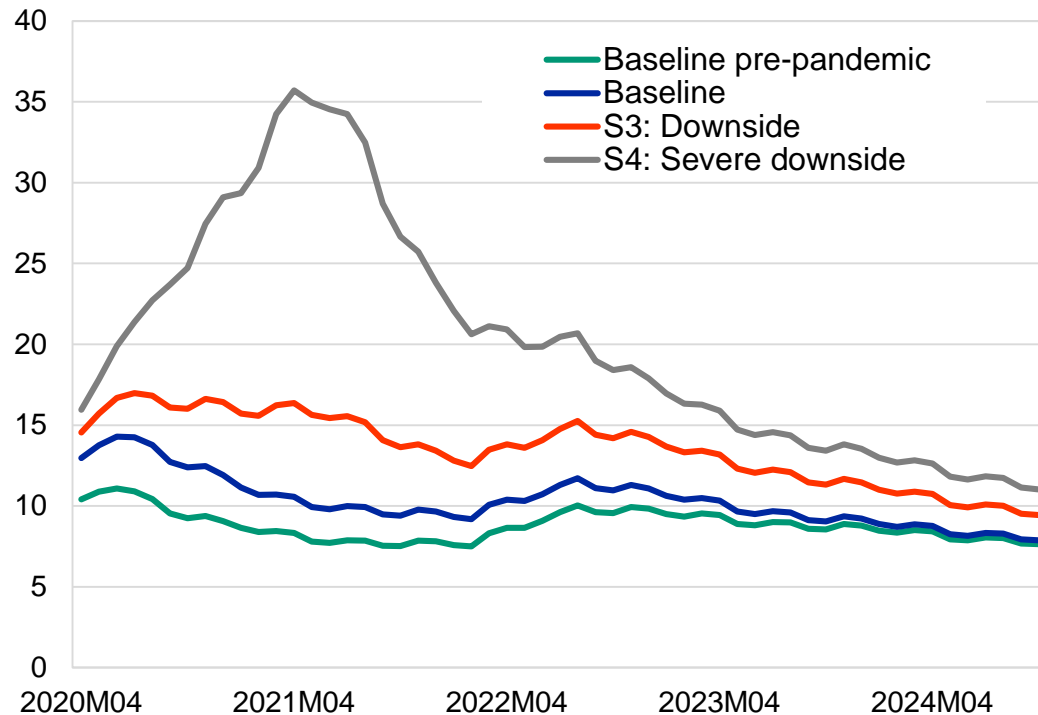
- Loan lifecycle
- Customer characteristics
- Updated LTV with HPI
- Other loan characteristics



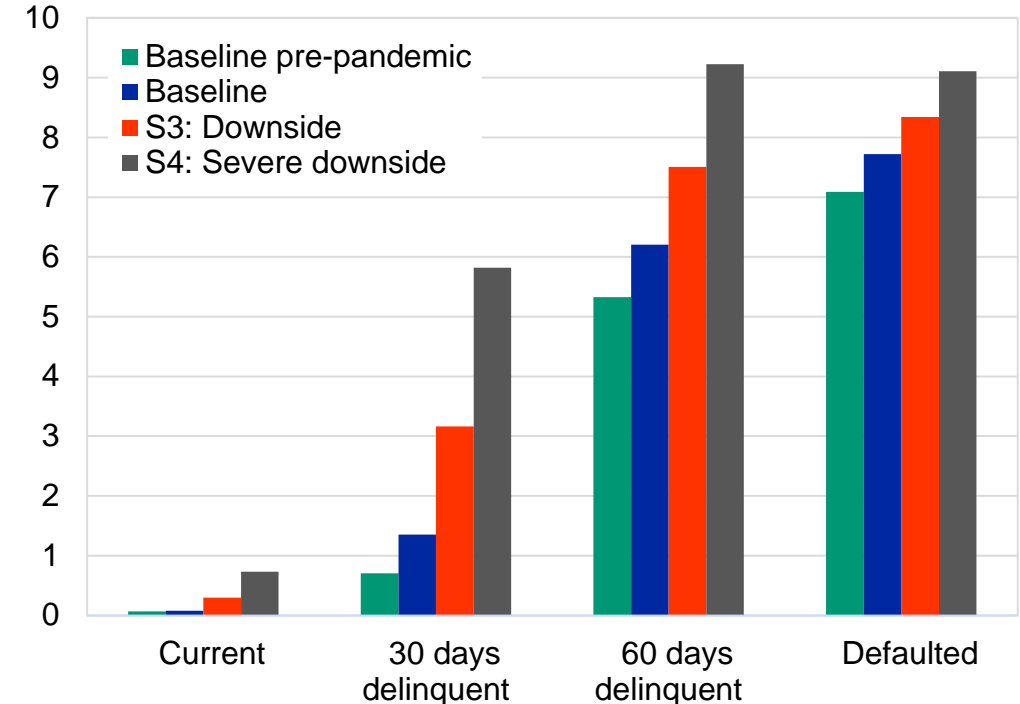
Delinquency and Credit Loss Modelling Example

Capturing borrowers' ability to repay and corresponding losses

Probability of Default, %



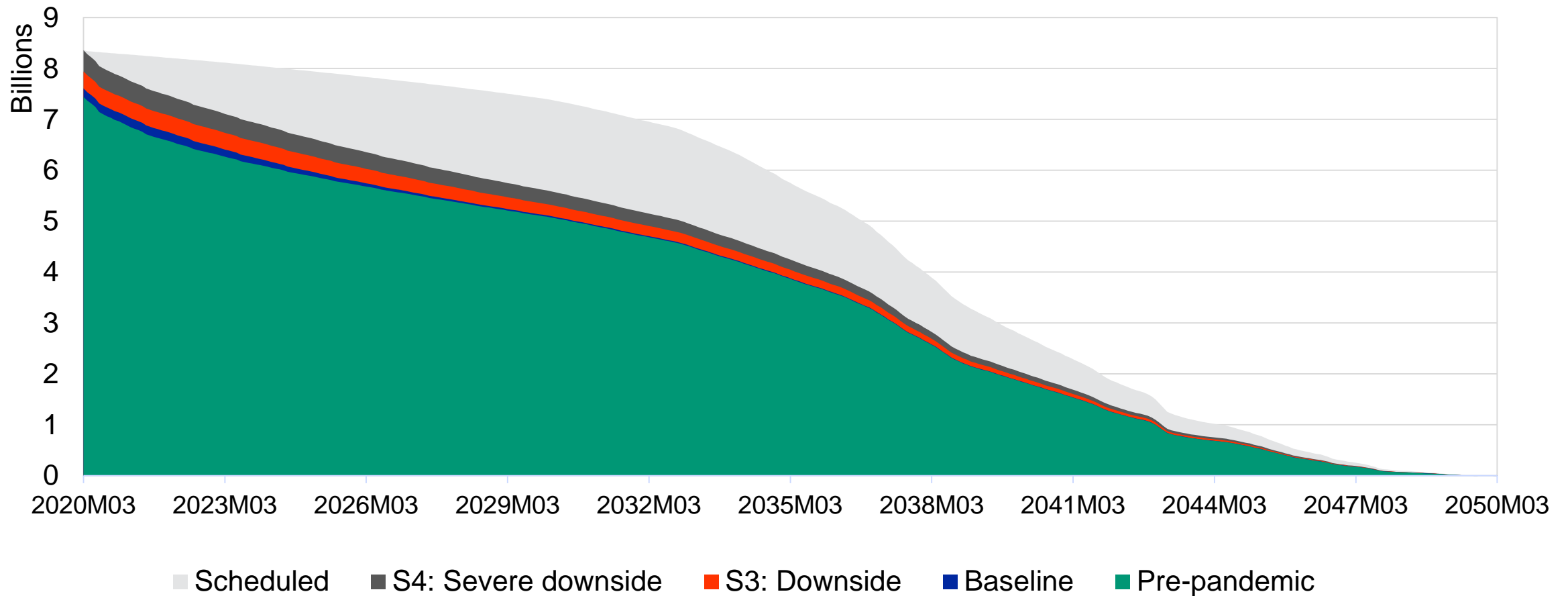
Expected Credit Loss, %



Sources: Mortgage Portfolio Analyzer, Moody's Analytics

Cash Flow Projection Example

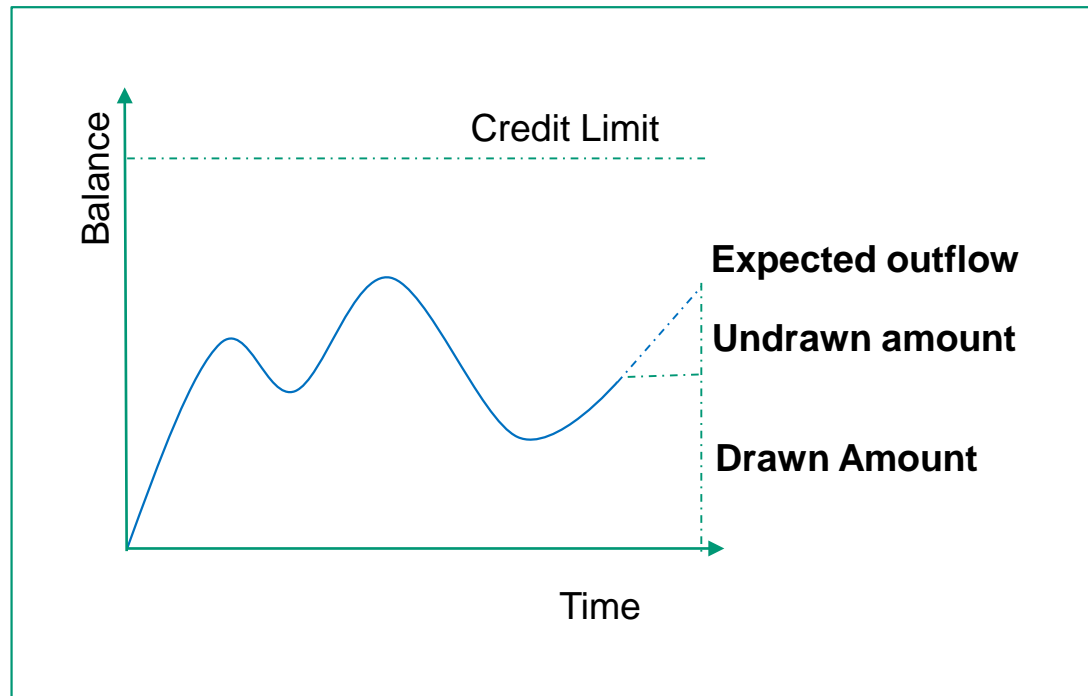
Uncertainty of inflows affected by prepayments, delinquencies & losses



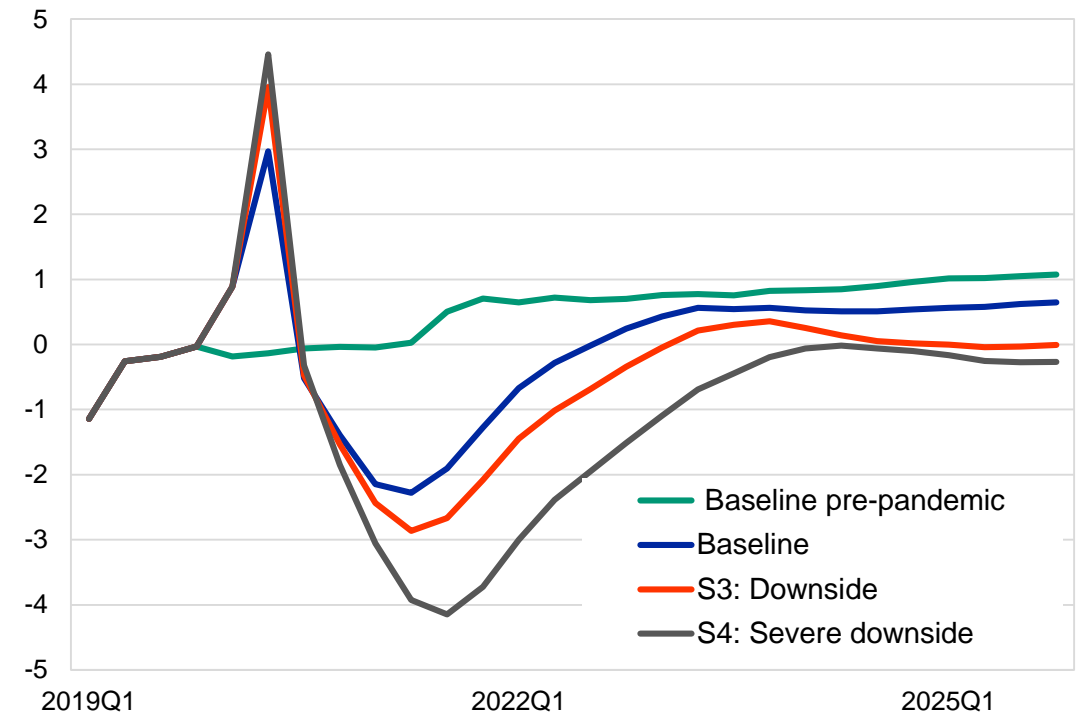
Credit Facility Drawdown Modelling Example

Capturing the behaviour of committed facility counterparties

Sample Facility Usage



Outstanding Indebtedness, % change



Key Takeaways

A great opportunity for better risk management



Combine scenarios &
granular data for forecast
models



Develop robust models,
monitoring & validation



Integrate models and
systems



Create detailed &
comparable documentation
& reporting



Set up framework
integrity through
governance



Establish a single
view of risk across
bank

Q&A

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