ICAAP quantitative tools
Pillar 2 risk quantification and capital planning
AGENDA

1. Global Overview
2. Risk identification
3. Risk quantification
4. Capital planning
Leveraging on its experience and in line with market practices, Avantage Reply has developed several assets for the ICAAP covering risk quantification and capital planning.

Flexible and easy to use, it provides financial institutions with a toolkit which allows them to easily perform internal assessment of the following risks and integrate outcomes into decision-making processes.

This tools are covering the following themes:

1. Risk identification
2. IRRBB
3. Credit Concentration risk
4. Operational risk
5. Capital planning

**ICAAP QUANTITATIVE TOOLS**

**Risk identification**
- Self-assessment for Material risk identification

**IRRBB**
- Sensitivity of EVE and NII

**Credit Concentration Risk**
- HHI Methodology

**Operational Risk**
- Value at Risk calculation

**Capital modeling and planning**
Based on its experience, Avantage Reply has developed **a self-assessment for the material risk identification processes**.

It is based on a series of questions to **qualify the risks to which the bank is exposed**. This assessment is based on:

- **Risk inventory**
  - **Credit risk**
    - Credit default
    - Concentration risk (Credit)
    - Sovereign risk
    - Counterparty credit risk
    - ....
  - **Market risk**
    - Traded market risk
    - IRRBB
    - FX risk in the banking book
    - Concentration risk (Market)
    - ....
  - **Op risk**
    - ....
  - **ALM risks**
    - ....
  - **Strategic risk**
    - ....
  - **....**

- **Relevancy of the risk to the business model**
- **Materiality before/after controls**
- **Mitigation of risk by capital**
- **Capitalization**
- **Risk quantification**
- **Risk treatment decision tree for the ICAAP**
  - Material before controls?
    - Yes
    - No
  - Material after controls?
    - Yes
    - No
  - Is capital an effective mitigant?
    - Yes
    - No
  - Is risk be quantified and capitalized?
    - Yes
    - No
  - Covered in stress tests?
    - Yes
    - No
  - Covered by Pillar 1?
    - Yes
    - No

- **Economic approach**
  - Risks quantified and possibly capitalised

- **Stress tests**
  - Stress scenarios design, capital impact or reverse stress tests analysis

- **To be covered in Pillar 2?**
  - Yes
  - No

- **ICAAP economic**
  - Pillar 1

- **ICAAP Internal ST**
IRRBB\(^1\) 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.

### Two Measured Values

<table>
<thead>
<tr>
<th>EVE (Economic Value of Equity)</th>
<th>NII (Net Interest Income)</th>
</tr>
</thead>
</table>
| • Represents the valuation of balance sheet and off-balance sheet income and is calculated by discounting future cash flows at a given date.  
  • Measures the impact of interest rates on the price of balance sheet and off-balance sheet instruments  
  • Reflects changes in product prices and their sensitivity to interest rates | • Changes in interest income are measured over a short period of time (3 Years according to the EBA guidelines\(^2\)).  
  • The NII sensitivity measures changes in net interest income over a given period as a result of changes in interest rates. |

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\(^1\) [https://www.bis.org/bcbs/pubd368.pdf](https://www.bis.org/bcbs/pubd368.pdf)  
\(^2\) Guidelines on the management of interest rate risk arising from non trading book activities EBA/GL/2018/02
RISK QUANTIFICATION UNDER THE PILLAR 2
Practical tool for IRRBB modeling (2/2)

- **Market Parameters:**
  - Rate curves: Index Overnight, 1M, 3M, 6M, 9M, 12M by Currency.
  - Exchange rate

- **Products:**
  - Outstanding amounts and average spread by type of rate and currency

1. Parallel shock up
2. Parallel shock down
3. Steepler shock
4. Flatterer shock
5. Short rate shock up
6. Short rates shock down
7. Outlier test (+/- 200 bps)

4 Categories of Assets and Liabilities:
- Interbank
- Client portfolio
- Securities portfolio
- Others

5 Significant currencies for each product:
- EUR, GBP, USD, CHF, JPY
- Possibility to add other currencies

- **Outputs:**
  - Outcome of the EVE and NII computations and their sensitivities to different shocks
  - Graphics
RISK QUANTIFICATION UNDER THE PILLAR 2
Practical tool for Operational risk modeling

- The Loss Distribution Approach (LDA) is an advanced method of calculating operating losses consisting to estimate severities and occurrences distribution laws of operational risk events in order to determine the economic capital for operational risk.
- The idea is to consider that bank's total annual loss due to operational risk is assessed in terms of two elements: occurrence and severity.
- This method is broken down into 3 steps as follows:

1. **Choice and calibration of frequency and severity distribution**
   - Modelling the loss distribution and frequency will be done for each type of Basel event. It consists of adjusting probability laws both on frequency and severity data of operational risk incidents over a given time horizon.

2. **Construction of total loss distribution**
   - Monte-Carlo simulation is used to simulate the different distributions of severity and occurrence of losses.

3. **Calculation of Value At Risk (VAR)**
   - The Value At-Risk (VAR) of level $\alpha$ (or equivalently a confidence level of $1-\alpha\%$) is finally obtained by calculating the quantile of order $\alpha$ of the distribution of the total loss.
The tool makes possible to calculate the VaR using different distribution laws allows to choose the probability distribution that fit to financial institution data. Results are presented by Basel category with different distribution:

1. **Frequency** distribution : Poisson.
2. **Severity** Distribution : Log-normal, Gamma, Weibull, Exponential.
The PRA, UK supervisory authority, recommend the Herfindahl-Hirschman Index (HHI) method to assess the credit concentration under Pillar 2. The HHI allows to evaluate the margin of conservatism in basis point that a financial institution for sector or geography or single name credit concentration.

The HHI method is a three time process:

1. Data collection and mapping
2. HHI calculus
3. Evaluation of the margin of conservatism in basis points

The HHI is the sum of the squares of the portfolio shares of all exposures. These shares are measured using RWAs:

\[ HHI = \sum_{i=1}^{N} \left( \frac{RWA_i}{\sum RWA} \right)^2 \]

with \( i \in \text{sector, geography or single name} \)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Data collection and mapping</th>
<th>HHI calculus</th>
<th>Evaluation of the margin of conservatism in basis points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>RWA par Secteur</td>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Financial industry (bank and non-bank)</td>
<td></td>
<td>11,10%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td></td>
<td>20,30%</td>
<td>0,20%</td>
</tr>
<tr>
<td>Services and other</td>
<td></td>
<td>25,60%</td>
<td>0,50%</td>
</tr>
<tr>
<td>Transport, storage and utilities</td>
<td></td>
<td>41,70%</td>
<td>0,80%</td>
</tr>
<tr>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67,40%</td>
<td>1,25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100,00%</td>
<td>1,40%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geography</th>
<th>Data collection and mapping</th>
<th>HHI calculus</th>
<th>Evaluation of the margin of conservatism in basis points</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>RWA by geography</td>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
</tr>
<tr>
<td>South/Latin America and Caribbean</td>
<td></td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Europe (west) area</td>
<td></td>
<td>11,10%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
<td>24,90%</td>
<td>0,20%</td>
</tr>
<tr>
<td>Supranational</td>
<td></td>
<td>34,50%</td>
<td>0,50%</td>
</tr>
<tr>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47,80%</td>
<td>0,80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77,90%</td>
<td>1,25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100,00%</td>
<td>1,40%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Single name</th>
<th>Data collection and mapping</th>
<th>HHI calculus</th>
<th>Evaluation of the margin of conservatism in basis points</th>
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</thead>
<tbody>
<tr>
<td>Contrepartie 1</td>
<td>RWA by single name</td>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
</tr>
<tr>
<td>Contrepartie 2</td>
<td></td>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Contrepartie X</td>
<td></td>
<td>0,29%</td>
<td>0,50%</td>
</tr>
<tr>
<td>HHI RWA</td>
<td>Capital add-on (% of portfolio RWA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,59%</td>
<td>1,00%</td>
<td></td>
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</tr>
<tr>
<td>1,15%</td>
<td>2,00%</td>
<td></td>
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</tr>
<tr>
<td>1,65%</td>
<td>3,00%</td>
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</tbody>
</table>
CAPITAL PLANNING
Practical tool for capital modeling and planning

**Inputs**
- Synthesis - Outputs

**Projections**
- Details - Outputs

**Outputs**
- Exports - Exports

**Controls**
- Regulators reports: COREP, FINREP
- Internal reports: Internal data extracts for the projection of RWA, CCF, Provi, CRM, …

**Numerator**:
- One form used to define the assumptions of the projected values according to 7 levers to CET1. It also allows to integrate a lever to the global capital amount.

**Denominator**:
- Two dedicated forms including one to select projection levers (8 in total) with the type of projection to be associated. The 2nd form used to enter the forecast values.

**Operational risk controls and global consistency checks** related to the use of capital planning tool.

**Solvency ratios medium term projections (CET1 ratio, Global solvency ratios…)**
- Graphic presentations in normal and stressed situations (including the potential activation of management buffer)

**Calculations and outcomes of numerator projections**
- Calculations and outcomes of denominator projections

**Data backup and backtesting on historical windows**
- (also include reports for internal or external purposes)
Expert and methodological support in ALM, Finance and Risk around strategic risk management and management processes, governance of Finance and Risk functions, risk modeling and scarce resources (capital, liquidity) and stress tests.

- Our teams support CROs and CFOs from the design of target systems to operational implementation at Group or entity level.
- Our missions last from 1 month to 1 year. On average, they last 6 months.
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