

Figure 1: Use of financial planning and stress test platforms

Figure 2: Use of quantitative models based on statistical analyses
in the financial planning process of banks is a basic trend

1. THE CREATION OF AN ARRAY OF COHERENT SCENARIOS, THE STARTING POINT FOR MODELLING EXERCISES

Bank peer reviews led by the European Banking Authority in 2013 highlighted significant limitations in the stress tests implemented by banking institutions, including stress scenarios that were not relevant enough and did not cover all risks. The regulator notably underlined banks' difficulties in modelling the effects of contagion and diversification between risks, as confirmed by Marc Irubetagoiena, head of group stress testing and financial synthesis at BNP Paribas : 'We are working today on modelling contagion effects. However, these domino effects are based on the use of conditional probabilities, whose calibration requires the accumulation of a significant amount of data, making the exercise a long-term project.'

The financial planning and stress test platform helps in resolving these shortcomings by simulating the profit and loss accounts and risks in banks under different forecast scenarios. The first step in this process consists in obtaining an array of scenarios of growing severity (central, adverse, remediation).

The construction of each scenario depends on the nature of the stress applied. It is common practice to distinguish between historical stress tests, tests inducing the default of the establishment (known as reverse stress tests) and sensitivity analyses (what if analyses). Under historical stress tests, the bank establishes a list of past crises (e.g. Brexit, the subprime crisis or the bursting of the internet bubble in the early 2000s) and creates a record of data from these periods. The reverse stress test is a different process where the bank identifies the principal risk factors susceptible to putting it into default, from which the drivers of these risks, and subsequently a scenario, are inferred. The sensitivity analysis is a more free exercise, where the bank decides upon the perimeter for the application of the stress test as well as its intensity.

The definition of the blocks constituting each scenario is then determined. Marc Irubetagoiena mentions the 'taxonomy of scenarios' and recalls 'that it is essential, to ensure the homogeneity of the scenarios, to define their exact common parameters, including the following:

- Stress intensity – The priority of integrated financial planning and stress test platforms is to communicate a trajectory for the bank's balance sheet and metrics in the central scenario, then in one or multiple stressed scenarios.
- Considered perimeter – One of the advantages of integrated platforms is to be able to perform a forecast and stress test for the entirety of the bank's assets in a shortened timeframe. However, modelling a particular activity is still possible. In this sense, the European Banking Authority encourages banks to combine global stresses with local stresses.
- Stress horizon – For a stress test covering the entirety of the bank's activities, the stress horizon will generally be three to five years long. However, the horizon depends on the calculation in question: a liquidity stress test generally has a horizon of one month to one year, whilst a solvency stress test tends to last three years or more.
- Type of scenario – Stress tests can be slow or fast macroeconomic tests, idiosyncratic or combined.
- Source of data – The integrated platforms look to produce an objective forecast, inasmuch as statistically justified data is prioritised.

Moreover, the construction of coherent scenarios implies the consideration of feedback loops between the different types of risks (e.g. liquidity and credit, credit and interest margin) and the combination of macroeconomic effects and shocks on specific portfolios.

From an operational perspective, the definition of stress scenarios forms part of the process of identification and evaluation of risk in banks. The scenarios must therefore include a stress test for variables that could trigger probable and intense risk events identified during the mapping of risks. For example, if the bank identifies a default risk on its counterparties in Turkey, the stress test scenario can translate into an increase in Turkish corporate spreads or a decrease in Turkish GDP coupled with an increase in unemployment. The stress test exercises also facilitate the definition of banks' risk appetite. Marc Irubetagoiena explains that 'stress tests allow the testing of alert thresholds or risk limits, sometimes generating their recalibration'.

In our experience, three difficulties must be overcome to make the construction of an array of stress scenarios efficient. The first difficulty lies in defining the probability of occurrence of each scenario. If it is important to have a significant number of scenarios, it is also important to be able to determine the classification of the most probable scenarios in order to estimate expected average impacts. The second obstacle lies in the difficult industrialisation of the production of stress test scenarios. In this respect, BNP Paribas launched a project on generators of economic scenarios, in cooperation with Ecole Polytechnique, with the objective of creating a database of models. Finally, the definition of scenarios must be approved by the most senior levels at the bank in order to bring credibility to the exercise.

	Central / Adverse scenario	Idiosyncratic shock
Interest margin	Purely economic scenario. The central scenario is aligned with the budget scenario. The adverse scenario is built on on a severe but plausible base.	Unilateral increase in refinancing cost for example due to reputation risk
Commissions		Regulatory and competition impact Concentration risk: loss of significant client
Market revenues		Market shock on portfolios
Management fees		Increase in certain cost pockets (in relation to an operating risk event like fraud for example) Floor to apply to bonuses
Credit risk		Sectoral deterioration or significant default linked to the scenario
Counterparty risk		Default of major counterparty
Market risk		Shock in xVA from an increase in liquidity cost Disruption of specific coverage on identified portfolio
Operational risk		Occurrence of major event evaluated in risk mapping
Concentration risk		Consideration of aforementioned effects
Other		Risk on pension funds Adverse evolution of exchange rates OCI impacts on solvency ratio

2. THE DEVELOPMENT OF MODELS: A COMPLEX PROJECT ALLYING QUANTITATIVE SKILLS WITH BUSINESS LINE EXPERTISE

The models developed in the context of integrated platforms are primarily statistical forecast models on volumes of activity, interest margins and commissions, as the banks already have risk models from accounting or regulatory work. These new forecast models of net banking income fulfil the regulator's desire to test the robustness of the strategic and financial plans. According to Teresa Mora Grenier, director of management control at Natixis, 'the regulator encourages the development of quantitative models relying on statistical work enabling the isolation of the principal drivers of banking activity models and the realisation of stress tests upon request'. ECB teams are also equipped with models calibrated on data transmitted by the banks, hence the necessity for them to act.

The work undertaken in the context of the models revolves around the following issues.

(i) Defining the right level of detail

Defining the level of detail modelled by the financial planning and stress test platforms is an important step. The business lines generally wish to realise forecasts on portfolios with a high level of detail, whilst the central teams realise forecasts 'top-down' aiming to provide the global trajectory of the balance sheet and performance of the bank. These two complementary objectives can encourage banks to construct models at a finer level and subsequently to consolidate them. However, building models with too much detail complicates the construction, maintenance and use of the integrated platforms.

It is therefore a question of defining an intermediate level of detail, which enables the bank to update forecasts quickly. This level of detail comprises advanced and detailed models for the business lines and the most important aggregates for steering (e.g. market activities, net interest margin, cyclical part of commissions and costs). Discussions with the business lines in advance of the statistical work allows the level of detail to be validated and facilitates the modelling process.

(ii) Defining the forecast methodology and identifying the drivers

The segmentation of activities and the definition of the level of detail enable the construction of forecast models based on coherent business realities. The next step is to project the volumes, then the interest margin and the commissions on these segments. The forecasts rely on groups of complementary models, including for the projection of volumes, statistical regressions, replication models communicated by ALM but also simpler analytical models (some costs can be the object of more in-depth analyses, but bonus models for example are often purely analytical).

For certain activities, the projection of volumes relies on benchmarks or external market projections to complete quantitative models.

For other activities, a model of the global size of the market adjusted for the bank's ambition to win market share can be adopted, notably for activities where the market share of different players is known (M&A advisory, ECM DCM, etc.) or for activities monitored by national statistics authorities (amount of credit produced, deposit pools, etc.).

The 'determinist' forecast of models must be completed with managerial adjustments. These adjustments enable the models to factor in shifts in price policy or commercial conquest, acquisitions or unforeseeable changes in the activity. This layer of managerial adjustments allows the model to consider comments from the business lines and facilitates the integration and use of the platform.

These methods are complementary, but it is vital to conserve the uniformity of models used for a specific metric and type of data in order to conserve a good level of comparability of the results (e.g. coherent forecast NIM models for the entirety of the retail banking business lines).

(iii) Proceeding to statistical projections

The volume models can be based on statistical methods using the historical correlation of projected volumes and macroeconomic variables communicated by the scenario (regression and multivariate classification models, linear or non-linear).

During the calibration of these models, a compromise is often to be found between ease of implementation and appropriation by the business lines on one hand, and predictive power and statistical robustness on the other. The process to follow to ensure the statistical robustness of the model consists of an iterative approach in three steps: (i) collecting and adjusting data, (ii) determining explanatory variables and the mathematical expression of the model and (iii) evaluating its performance.

The mathematical transformations of the series of data can improve the quality of models to test. The relevance of these transformations must be evaluated relatively to the impact of exceptional items and data quality.

The choice of the form of the statistical models depends firstly on the quality and the level of the data collected. For example, the data must be sufficient to represent different economic situations (expansion, crisis) and different contexts in terms of rates (e.g. low rates). Then, linear models are favoured as they are easier to appropriate. Quantile regressions can eventually be used in stress situations. Automatic learning methods can guide the choice of variables, even if these methods are generally not retained because of their complexity and sometimes because of the lack of historical data available.

To be approved by the regulator and the internal audit teams at the bank, the predictive power of the models must be verified by a series of tests. We note that the verifications required for these tests should be weighted for the quality of the available data and the expert judgements essential to modelling certain P&L line items (e.g. management fees or non-financial commissions). The banks must conserve the results of the series of tests performed, as they constitute a key audit item for the regulators' teams.

(iv) Ensuring the communication of the different calculation modules

Once the volume, net interest margin and commissions models have been developed, the integrated financial planning and stress test platform must guarantee the link between the different calculation modules (P&L, risk, liquidity).

Guaranteeing that the forecasts of activity volumes, commercial margins and risks (cost of risk, doubtful debtors, risk-weighted assets) are coherent is a historically complex subject for banks. Indeed, their information systems are generally specific to each business line and rely on non-harmonised data references.

In this way, the integrated financial planning and stress test platforms constitute a veritable step forward. To guarantee the uniformity of the data used by the platforms, certain banks have for example started building databases ('datawarehouses') shared by the ALM, Risk and Finance departments that feed into the different calculation modules of the platform. Once fed with data, the platforms guarantee that the forecasts of the balance sheet, profitability indicators and risk-weighted assets communicate with each other. To this end, the balance sheet forecast becomes the cornerstone of a system tree that enables the forecast of revenues (interest margin and commissions) and the production of risk and liquidity metrics based on outstanding amounts from a shared database. Indeed, calibrating the growth of the commercial balance sheet facilitates the estimation of the increase in the level of exposure at default (EAD) used for the calculation of the cost of risk and risk-weighted assets. Forecasting the commercial balance sheet also serves as the basis to obtain the liquidity balance sheet.

The forecast balance sheet interfaces therefore with the calculation modules. Feedback loops can also be taken into account. The flows linked to going into default calculated in the cost-of-risk calculation module can be reintegrated into the balance sheet and then taken into account when calculating the net interest margin. The projection of generations of new production can allow the calculation of commissions on new productions.

3. STRONG GOVERNANCE: A KEY SUCCESS FACTOR

The implementation of clear governance is a key factor in the proper functioning of integrated financial planning and stress test platforms, as highlighted recently by the European Banking Authority (EBA) when it published its final report on good practices for stress tests on 19 July 2018.

The programme must obtain the support of the bank's senior management, which is responsible for its implementation and performance. Project management (a critical eye on the scenarios used, the main assumptions of the model, exchanges with business lines, etc.) can be delegated to senior managers in charge of creating rules and procedures documenting the work undertaken. Teresa Mora Grenier continues, 'I insist on the importance of building these models together with operational staff to facilitate the integration of the models in the process of managing performance from the very beginning of the project.'

In order to ensure the efficiency of the programme, communication must be vertical, from the executive committee down to the business lines. It must also be horizontal: communication between the business lines, guaranteeing for example the homogeneity of the forecast models used. The horizontal communication can also manifest within a business line itself through strengthening ties between the Finance and Capital and Liquidity Management teams during the creation of models or periods of production.

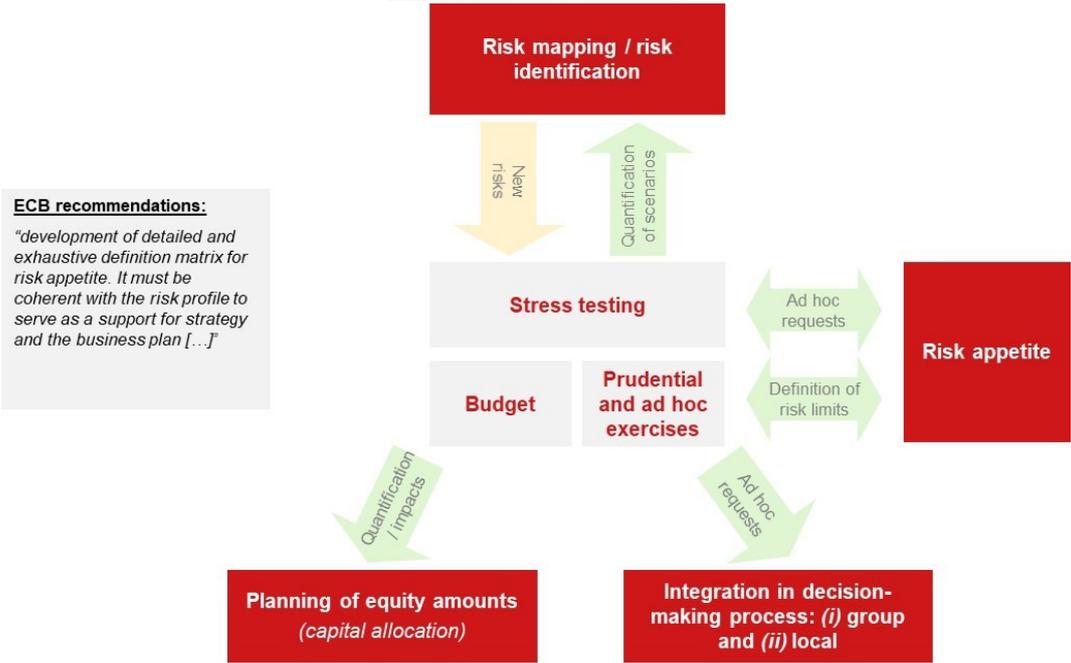
Reshuffling the cards of a game where financial planning is traditionally the domain of the Finance team and stress testing the domain of the Risk team, the integrated financial planning and stress test platforms constitute a cultural shock for the Finance department. The Risk department is used to relying on quantitative models developed in the context of Basel 3 or the implementation of IFRS 9. Whilst the Finance department generally has models for analysing performance indicators, the culture of statistical modelling is often less developed.

However, the PPNR⁴ models developed in the United States and the latest recommendations of the EBA on modelling commissions highlights the need to develop econometric forecast models for net banking income and fees. In this way, the Risk team’s quantitative skills can support the Finance team.

The convergence between the Finance and Risk departments can also present itself, in terms of organisation, in the implementation of mixed teams or ‘joint ventures’ combining risk, ALM and management control profiles. These teams are charged with creating the link between the bank’s different business lines and its management. Setting up these new hybrid teams is not without its challenges, as Marc Irubetagoiena mentions: ‘The gathering of profiles with different cultures within a joint venture is a necessary evil. It constitutes a meeting of expertise capable of dealing with complex questions and attracting new talents.’

Putting together a central team in charge of financial planning and stress tests enables the bank to become more efficient in its operations by reducing production times.

Figure 3: The financial planning and stress platform must become established in the process for the global identification of risks and must aim to feed into (i) the decision-making process and (ii) equity planning



⁴ Pre-Provision Net Revenue.

4. CONCRETE USE

The creation of a financial planning and stress test platform is not a 'baseless' modelling exercise but constitutes above all a recasting of the bank's processes and organisation. Patrick Sommelet insists that 'from this year, the budget process has been amended and the model has been integrated into it. Governance evolves and the weight of the quantitative models in the planning exercises can only grow'. In this context, we identify three principal functions of these platforms.

(i) Responding to specific requests from management or the regulator

The integrated financial planning and stress test platforms revolutionise budget practices by reducing the need for 'expert opinion' and the production time. They allow the creation of financial trajectories based on economic variables and models. This complies with the expectations of the US and European regulators expressed in the context of the CCAR⁵ and EBA stress tests respectively. They also allow the bank to respond to the simulation requests from management quickly, by producing traceable and iterative analyses.

(ii) Facilitating covering the requirements of stress testing and ad hoc simulations

The integrated platforms are flexible tools enabling the realisation of different stress tests (budgetary, regulatory) and regulatory tasks (ICAAP, ILAAP, tasks linked to Recovery and Resolution Plans). In 2018, the commissions component of the EBA stress tests was for example realised entirely using tactical versions of the platforms by two large European banks. Another French bank used the integrated platform in its work linked to Brexit. These central tools limit the loss of efficiency in the production process implied by having to contact different teams in the bank; they therefore limit the production costs of reporting documents. The platforms have become integral to the review of processes, consequently becoming one of the four pillars of SREP.

(iii) Strengthening strategic and financial steering

The financial planning and stress test platforms realign the bank's strategic roadmap, capital planning and allocation, and financing plan, whilst remaining consistent with its risk appetite. They allow detailed steering, coherent with the economic cycle, and offer possibilities of ad-hoc simulations combining varied impacts (cross effects: NPL and NIM volumes, early repayments and commissions...). Finally, they facilitate understanding the stakes of recalibrating business mix to maximise the RONE, with an accrued capacity to identify growth and optimisation levers.

The regulator insists that banks demonstrate the use and added value of their planning models, using notably the notions of operational integration or uses ('use tests'). From this perspective, training the team to use these new tools is a good indicator. As a first approach, using these new tools as 'challenger models' for historical planning methods can also be a first step towards the target use of the platforms.

⁵ *Comprehensive Capital Analysis and Review.*

5. ONE MORE STEP IN THE INTEGRATION OF DATA IN THE DECISION-MAKING OF BANKING ESTABLISHMENTS

The creation of the integrated financial planning and stress test platforms marks an important step on the evolutionary road of budget and risk management practices. Forecast results models now use statistical methods, in the same way as risk models, enabling the better use of growing data flows. Banks have become aware of the added value that can arise from the use of trustworthy and ever more abundant data. Platform-related projects have increased the appetite for projects that structure data sources, by enriching data and making it more reliable. Operational staff should leverage technologies that automate chains of analysis to gain efficiency in handling these projects, which are often costly and time-consuming.

The results and risk models are also interconnected and call for new synergies between the Finance and Risk teams. Nevertheless, the challenges are still numerous and include:

- modelling and allocating operating costs analytically;
- connecting banks' budget processes to their sales processes and marketing tools. The tools are still far from being able to integrate demand.

The road to developing the platforms is therefore still fraught with pitfalls.