Risk-modelling techniques: analysis and application for supervisory purposes[1]

The BE has for many years set great store in its continuous supervision of institutions by the verification and evaluation of risk control and management. As mentioned above, the introduction of the SABER methodology makes the importance of this area explicit, owing to its role in determining the institutions' risk profile.

For some years now institutions have been developing and improving their own models to assess, manage and control risk. The latter includes overall risks affecting the whole balance sheet, such as interest-rate, liquidity and foreign-exchange risks; risks specific to operations, such as credit and market risk; and risksof a more general nature, such as operational risk. These are the types of risk that were discussed above when describing the SABER approach. Institutions have developed internal models, and will continue to do so in future, for their own management requirements, irrespective of the regulatory requirements that may exist from time to time in this area.

Until now, these requirements have referred mainly to qualitative aspects and have been of a general type, although they have given sufficient support to the supervisory function. The legislation has sought to underscore the significance of such requirements up to the point that one of the requirements to be able to engage in banking activity, according to Royal Decree 1245/1995 of 14 July 1995 on the formation of banks, cross-border activity and other issues relating to the legal regime for credit institutions, is to "have sound administrative and accounting procedures, as well as adequate internal control procedures to ensure sound and prudent management of the institution".

Recently, a new direction has been observed in the prudential regulation of credit institutions, whereby the use of well-founded and verified internal risk management models has or will have effects both on the accounting valuation of assets and commitments subject to credit risk (calculation of provisions) and on the determination of the own funds needed to cover certain banking risks (credit, market and operational). This trend is embodied in three initiatives:

- Directive 93/6/EEC of 15.03.1993 on the capital adequacy of investments firms and credit institutions provided for the possibility of institutions' using internal models to calculate the capital needed to cover market risk. Spanish institutions will be able to make use of this possibility very soon, when this directive is fully incorporated into Spanish law.

- CBE 9/1999 of 17 December 1999 regulated the so-called statistical fund, and provided that, in addition to the standard model, the institutions could also use calculation methods based on their own experience of default, provided that they form part of an appropriate system to measure and manage credit risk.

- The New Capital Accord (Basel II) provides, in relation to the so-called Pillar 1, that institutions may even use their own internal advanced calculation methods to measure their own funds requirements, not only for market risk, as is currently envisaged, but also for credit risk (until now

[1] REPORT ON BANKING SUPERVISION IN SPAIN 2002. Chap.II.6, pages 98 to 104

only the standard system could be used) and for operational risk (a type of risk that will be subject to capital requirements for the first time under the New Accord).

As mentioned above, the BE is aware of the importance of risk-management models in the organisation of institutions' administration, and of their increasing use not only in management itself, but also for the purposes of valuing assets and calculating own funds. Accordingly, in 1996 it set up, within its Directorate General Banking Supervision, a specialised Treasury and Models group, which has been progressively assigned advanced technical resources and staff with the appropriate financial/mathematical profile. Its purpose is to gain an in-depth knowledge of the systems used by institutions and their constant advances, so as to be able to establish appropriate inspection procedures and to facilitate their dissemination among the BE's supervisory staff.

1 Market risk

The management and control of market risk by means of different sensitivity measures, duration or other techniques is being done by practically all institutions. Those with more active treasury departments have been using so-called value at risk (VaR) techniques for some years now. In fact, the institutions that use advanced models to manage this risk, while not a majority of those registered, account for about 90% of the system's market risk.

The BE has been analysing these models for some time, paying special attention to the integrity of the data used and to the design and results of so-called back testing and stress testing. In some institutions these internal models are already potentially suitable for acceptance by the BE for the purposes of determining the minimum own funds for market risk, when the incorporation of the aforementioned Directive 93/6/EEC into Spanish law has been completed.

Basel II is not going to entail any change in the methodology for calculating the minimum own funds for market risk. However, it will probably modify its scope of application, by widening the definition of trading book, bringing the regulatory definition more into line with that used by the institutions for management purposes.

2 Credit risk

A large number of institutions have for some years now had internal credit risk models, based on rating or scoring systems, integrated into their management processes. More common are the scoring-type systems, which have traditionally been used to authorise or reject transactions. The larger institutions and, of course, internationally active ones have introduced, or are in the process of introducing, internal credit risk models into the main homogenous segments of their lending, with a view to their results being used in future to calculate own funds requirements. For this to be possible these models will have to comply with the Basel II requirements for foundation or advanced approach internal rating based (IRB) systems. The number of institutions either developing their own internal credit risk models or participating in joint projects to develop such models is difficult to estimate, but they account for around 70% of the lending of the Spanish financial system.

The BE has already attempted to promote the development by institutions of internal models for credit risk management, through CBE 9/1999 of 17 December 1999, which introduced the so-called statistical fund, with effect from July 2000.

This new provision for bad debts supplements the specific provision (for non-performing and other problem loans) and the general provision. The aim is to ensure appropriate provisioning for latent losses on loans for which specific weaknesses have still not been identified. These are capital losses that cannot be attributed to individual borrowers, but which can be estimated overall by statistical methods.

The calculations may be based on a standard system, whereby each of the six risk categories, defined in accordance with their objective characteristics, is assigned a percentage representing the average expected loss. However, it is also envisaged that institutions may estimate their

provisions using methods of calculation based on their own experience of default and on the expected losses for homogenous risk categories. These methods of calculation must be part of an adequate system for measuring and managing credit risk, must use an historic database spanning a complete business cycle and must be verified by the BE.

The introduction of the statistical fund has three advantages:

1 It provides incentives for the adoption of better credit risk management techniques, stimulating institutions to develop as soon as possible internal models that may be used for different purposes: management of credit risk, setting transaction prices, calculating provisions, calculating economic capital, introducing return on risk adjusted capital (RORAC) approaches and, in future, calculating minimum own funds requirements for credit risk (Basel II).

2 It addresses a constant concern of international supervisors: that institutions should apply realistic and prudent accounting standards in their valuation of assets. The application of standards of this type increases confidence as to the quality of the assets in the balance sheet and thus the efficacy of rules to calculate own funds based on such valuations, thereby reconciling the objectives of good risk management and sound and prudent accounting practices.

3 Finally, the statistical fund is counter-cyclical, since the provisioning requirements are conceived in relation to a complete cycle. This means that the rate of provisioning is adjusted to the stage of the cycle (simplifying, statistical fundprovisioning is higher when provisioning to the specific provision is lower, and vice-versa).

The use of internal models to calculate statistical fund provisioning requires prior verification by the Banco de España, in accordance with CBE 9/1999 (referred to above). In order to specify the scope of the new provisions and the criteria to be used in the verification procedure, the Banco de España notified the institutions, by means of a letter dated 14 December 2000, of the quantitative and qualitative requirements that should be taken into account in the design and introduction of internal models. Notable among them are:

- Responsibility for the choice of model is the institutions'.

- Senior management should actively participate in the review and approval of credit risk strategies and policies.

- There should be an appropriate structure for the control of credit risk based on a correct separation of functions.

- The system should be integrated into the general structure for the control of credit risk and be used, at least, in the transaction selection process.

- Procedures for granting loans and the measurement system should be adequately documented in manuals.

- Institutions should have appropriate data-processing and management information systems to identify, measure, control and monitor credit risk.

- Institutions shall have an internal audit report on the model, containing a positive opinion with regard to the coherence and integrity of the databases from which the information used in its design was drawn.

Provisioning to the statistical fund began in 2000. Two and a half years on an initial assessment can be made with regard to its efficacy and acceptance by institutions. First, its relative importance has been increasing: as at 31.12.2002 it accounted for 25% of all the provisions in the Spanish banking system (22% as at 31.12.2001). As for the role it may have had in boosting the introduction and improvement of credit-risk management systems, its influence seems to have been limited so far. However, as will be seen below, this statement may be qualified.

As at 31.12.2002 the BE had received nine formal applications for the authorisation of internal methods to calculate statistical provisions, with the following results:

In five cases, its compliance having been verified, the model was approved by the BE. One of the authorisations has recently been revoked as the institution was found not to be using the approved method.

In four cases the model is still under consideration.

There are basically three reasons why there have been relatively few applications:

1 First, in many cases the savings on provisions that may be generated by using internal calculation methods instead of the standard system may not be very significant since the BE, when setting the average expected loss percentages for the various categories of risk defined in the standard system, avoided making them very demanding, in view of the fact that the new fund was additional to and not a substitute for existing provisions. As a result, given the difficulty some institutions have had introducing an integral credit-risk management model, they have preferred to direct their efforts towards compliance with Basel II, for which they have a somewhat longer time horizon.

2 Second, although two and a half years have already elapsed since the entry into force of the new fund, as pointed out above, this is still a very limited time period in which to fine-tune all the mechanisms that an adequate credit risk management model requires. In fact, as at the aforementioned date of 31.12.2002, the BE was aware of twenty institutions, accounting for 50% of the system's credit risk, in which internal models were being developed. In most cases the intention was to apply to the BE for authorisation to use them to calculate statistical provisions. All this confirms a very broad interest on the part of institutions, not just the larger and internationally active ones, although their current degree of participation in specific projects depends on the priorities of each institution and the costs involved.

3 Third, the development of projects for the introduction of internal models for credit risk management that may be considered suitable by the BE for the purposes of calculating provisions and, in future, calculating own funds, is a very complex process in which, as was to be expected, institutions are encountering difficulties. Among these, the most significant, according to the evidence obtained by the Treasury and Models Group of the Directorate General Banking Supervision of the BE, are:

The scoring and rating systems used by the institutions are not properly integrated into their risk management and, in some cases, are only used to supply information to risk analysts.

There is a lack of sufficiently long data series, spanning a complete business cycle, for default and loss given default (LGD, the percentage of final loss to the institution, once default has occurred). Institutions usually have four to five years of data at most, which means that assumptions and estimations have to be made to have information on a complete cycle, with the consequent risk of loss of reliability.

The LGD data are moreover, incomplete, since they do not incorporate all the costs and recoveries in relation to non-performing transactions.

Some scoring systems introduced in the past have not been calibrated, i.e. the different scores are not correlated with the probability of default (PD).

In certain homogeneous lending segments the base data on default are not sufficiently extensive to allow their statistical treatment. This makes it necessary to resort to links with external systems in order to be able to calculate PDs and LGD percentages. This is very frequent in the investment banking and promoters segments.

Institutions have used different definitions of default, so that the available data must be homogenised in order to adjust them to the definition currently used (any payment obligation 90 days past due).

In sum, the development and introduction of internal models for the management of credit risk is a complicated process requiring the commitment of time and resources by institutions. Validation by the BE of such models is equally complex and time-consuming, as an initial superficial review is not sufficient. Involvement of the institutions in the validation process is essential, as they must propose suitable solutions to the deficiencies and problems that emerge. The significance of this process will be multiplied with the entry into force of the New Capital Accord (Basel II).

3 Operational risk

Although institutions and supervisors have long been well aware of the existence and importance of operational risk, in recent years greater attention has begun to be given to the need to design methods that enable it to be adequately measured and managed. This risk has usually been addressed using measures of a qualitative and management kind, but the recent original contribution has been the attempt to measure the exposure of institutions to this kind of risk, as well as the capital that needs to be assigned to it.

In fact, under the New Capital Accord (Basel II) operational risk will be included, together with the traditional types of market and credit risk, in the category of risks that need to be specifically covered by own funds. As in the case of market and credit risk, it is also envisaged that, along with the standard system for calculating capital, institutions may design their own internal models for the management of operational risk, which may be used to infer the amount of own funds necessary for this type of risk. However, this process is at an even earlier stage than in the case of other risks.

The design of internal models for the measurement and control of operational risk is still at the stage of consideration, analysis and progressive introduction by institutions, especially the larger ones, who are aware that no methodology has yet been unreservedly accepted internationally. The BE, within the process of continuous supervision of institutions, is currently concentrating on analysing and evaluating the systems that have begun to be introduced by the institutions or that are being developed by consultants for identifying, mitigating and controlling operational risk.