Performance of Models-Based Capital Charges for Market Risk

1 July-31 December 1998

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1. Overview

With the implementation of the Basel Committee's Market Risk Amendment to the Capital Accord in 1998 (the "Amendment"), an institution with significant trading activity must now calculate a capital charge for market risk using either its own internal risk measurement model (the "internal models approach") or a "standardised" process developed by the Committee. In order to assess the adequacy of capital charges based on the internal models approach, the Models Task Force conducted a survey analysing over 40 banks, located in 9 countries, that were subject to the requirements set forward in the Amendment.[1] The survey covers the third and fourth quarters of 1998, a period of high market volatility. The evidence gathered is anecdotal in nature and is based on a fairly short time period; consequently the survey does not permit strong conclusions to be drawn concerning the robustness of the models. Nevertheless, it should be noted that the capital charge under the internal models approach provided an adequate buffer against trading loss[2] at these institutions during this period. Looking forward, the Models Task Force believes that banks that use the internal models approach should continue to reassess the performance of these models, and continue to complement them by a robust stress-testing program, in line with the requirements of the Amendment.

2. Survey Results

The survey compared daily trading losses to the capital charge for market risk calculated under the internal models approach, and to banks' 99th percentile value-at-risk (VaR) estimate calculated for a one-day holding period; the latter measure is the basis for the Amendment's backtesting procedures. The capital charge is calculated based on the 99th percentile VaR estimate, calculated over a 10-day holding period, and the supervisory multiplier (a number of three or higher). The capital charge would be expressed as the higher of (a) the previous day's VaR measure, calculated based on the above parameters, or (b) the average of the daily VaR

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[1] The number of banks surveyed is approximate due to (a) mergers between respondent banks during Q3 and Q4, and (b) unavailability of Q4 data from certain banks. Some banks participating in the survey received model recognition during this period. The discussion also draws on information provided by several banks that have not yet applied for formal supervisory approval of their internal models.

[2] The risks subject to this requirement are the risks pertaining to interest rate related instruments and equities in the trading book, and foreign exchange risk and commodities risk throughout the bank. For purposes of this document, the losses stemming from these risks will all be referred to as "trading" losses.

measures during the preceding sixty business days, times the multiplier. The Amendment's backtesting framework involves calculating the number of times over the prior 250 business days that observed daily trading losses exceed the bank's one-day, 99% confidence level VaR estimate (so-called "exceptions"). The Amendment directly relates the size of the supervisory multiplier used to calculate the capital charge to the number of exceptions observed in the last 250 business days[3].

The survey results suggest that the market risk capital charge provided an adequate buffer against trading losses over this period. In particular, ***none of the institutions surveyed reported trading losses over any ten-day consecutive period that exceeded the capital requirement in force at the start of the period***.

Despite the increased volatility of the second half of 1998, almost half of the institutions surveyed reported no cases where one-day losses exceeded the daily VaR estimate over the two quarters. Of those banks that experienced exceptions, the majority reported between one and four such incidences. Three banks reported between five and seven exceptions during the second half of 1998. For those banks that reported exceptions, the one-day loss generally did not exceed the one-day VaR estimate by more than two times; a few banks reported cases where such losses fell between 2 and 3 times the VaR estimate. Under the Amendment, banks may, in principle, compare their VaR estimates with actual trading results that include fee income. The survey found that on a few occasions, daily fee revenue prevented some banks from exceeding their VaR loss estimate.

3. Distribution of capital charges

The importance of trading activity as a proportion of overall business varied widely among the institutions surveyed. Capital charges resulting from trading activity accounted for between one and forty-five percent of total risk based capital at these banks. Within the trading book, the distribution of capital charges between the three main risk classes also varied: Counterparty risk accounted for a significant portion of trading book capital charges, and exceeded the general market or specific risk charges at nearly half of the banks surveyed. Some of the banks attributed this fact to the preponderance of money market trading activity, including repo transactions. Separately, the general market risk charge exceeded the charge for specific risk at the majority of institutions.

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[3] The Amendment classifies the number of exceptions into three categories: green, yellow and red. Banks reporting four or fewer exceptions during the prior 250 business days fall into the green zone, which is perceived to be consistent with an acceptable model. The range from 5 to 9 exceptions constitutes the yellow zone. Finally, outcomes in the red zone (ten or more exceptions) were generally expected to lead to an automatic presumption that a problem with the model exists. As noted in the text, the multiplier is based on the number of exceptions. The multipliers applied by the supervisors participating in this survey generally ranged between 3 and 4 over this period. In some countries, however, the determination of the size of the multiplier was not only based on the ex-post performance of the model, but also included an add-on factor based on certain qualitative standards, such as the bank's risk management processes.

4. Other insights into risk management practices

In the survey, the Task Force also examined the frequency and timeliness with which model parameters were updated, and the use of stress testing at the reporting banks. While the responses to these questions were anecdotal in nature, they highlighted a broad range of practice and suggested areas for further work by the industry.

Although the Amendment requires institutions to update data sets on at least a quarterly basis, the majority of the banks surveyed engaged in more frequent updates during this period. Many institutions updated key parameters on a bi-weekly basis. A considerable number of the reporting banks relied on VaR systems based on historical simulation; most of these systems were updated daily to include the previous day's market data. Furthermore, banks that had typically updated model parameters monthly or quarterly did so more frequently in the second half of 1998, particularly after large movements in key markets were observed. A minority of banks maintained their standard quarterly updating schedules; at these institutions, trading activities in the affected markets did not generally represent a large proportion of overall business. A few institutions reported that the process of updating parameter estimates was particularly time-consuming; at the extreme, a few noted that the process of calibrating new data and incorporating it into the VaR framework could take up to four weeks.

In the survey, banks also discussed their experiences with stress-testing, a process that aims to identify those events that could have a significant adverse impact on a bank's portfolio, and to reassess exposures and risks in light of that information. Although most of the surveyed banks reported having a well-developed system of stress testing, their experiences with these tests were mixed over the survey period. A number of institutions noted that their tests provided an accurate representation of actual market developments, and offered a conservative prediction of the losses incurred. Other institutions, however, had more limited success with their programs, noting that the stress tests did not anticipate the incidence or magnitude of certain shocks.

The banks in the survey utilised a wide variety of techniques to stress-test their portfolios, ranging from tests which incorporate single factor shifts, to the of use of both historical scenarios and scenarios that aim to anticipate the potential impact of hypothetical crises. Banks' experiences with these various methods were mixed. Statistical stress tests that utilised multiple standard deviations of market moves were generally not a good predictor of third quarter market events. Stress tests that were based on historical analysis of long data series generally proved to be more robust, and hypothetical scenarios, such as a flight to quality, were at times directionally correct, though they did not fully forecast the magnitude and duration of the shocks that occurred.