

VI. A Risk/Evaluation program

The factors described above place practical burdens on even the most sophisticated financial institutions. They must address matters which have not generally been within the expertise, or sometimes even the perceived purview of, senior management or regulatory authorities. As a result, insufficient time, attention and resources have been devoted to risk monitoring systems. Few have in place, as a practical matter, the kind of systems contemplated by the Bank of England or Bank of Finland. The problem is compounded by the fact that even the definition of what is "risk", particularly for some of the more complex instruments, is not clear, and when it has been defined, it is often difficult to compare the risk on a given product with the same standardised measures as exist with respect to other products. It is not an easy task, therefore, for senior managers to establish a risk monitoring system which would enable them to evaluate and implement a risk control mechanism. The sections that follow suggest a format to address these matters.

1. *The Information Base*

First, an information base must be available which :

- a) provides up-to-date information on the precise status of prices in the market for each product in which the firm takes on risk;
- b) records precisely the firm's position in each product, long or short, including the hedges that are outstanding, if any;
- c) records on-line and on time any change in (a) or (b) and their values;
- d) summarises the "relevant" information for senior managers on an on-line, on-time basis;
- e) reflects, through sensitivity analyses, different future scenarios which will affect the market and the firm's own positions;
- f) reflects how such changes would affect the firm's profit and loss and balance sheets;
- g) reflects the economic gain or loss for such change for off-balance sheet exposures and/or derivative products, whether or not convention requires their value is marked to market.

These are basic systems and within each are the variations and subtleties, some of which are described below.

Most firms have numerous systems, both manual and automative, which store basic data. These must be organised so that the basic data about the market and the firm's positions cover each activity in which personnel can engage in transactions which create risk. The problem is not made easier when positions are taken in the same products from various locations around the world, either simultaneously or at different times of the day. The concept is straightforward: the system must record immediately and report exactly what any trader or position-taker is doing and relate that even to any other positions the firm is taking to determine whether or not it increases or decreases the firm's risk.

The system must encompass off-balance sheet risk occasioned by contracts (swaps or options, for example) where the risk of divergent exchange rates may not be reflected in the prevailing accounting systems. Typically, where contracts are drafted, as in swaps, which theoretically offset each other, the underlying risk is not easily captured by conventional accounting systems. A risk monitoring system, however, must record off-balance sheet financial risk whether or not it appears on traditional accounting statements. In effect, the so-called counterparty credit risk will be captured if the underlying financial obligations are reflected as the market changes. (Even this, however, will not fully capture all of the risk, as the legal authority to offset a breach of contract by withholding a simultaneous payment to the breaching party is not clear -- particularly if there are other creditors involved.)

2. *The Analytics*

The financial services firm must develop empirical evidence to assess whether hedges do what they are supposed to do. Every hedged position must be risk-adjusted by the extent to which the betas are such that the risk is greater than they would be by precisely offsetting long with short positions in the same security and market. Thus, hedges which are based upon different securities from the underlying one or in different markets (cash versus futures) or are of a different maturity, or have characteristics which make them not identical to the underlying cash security must be evaluated in order to determine, in probabilistic terms, the extent to which the hedge does or does not perfectly match the underlying security. It is of little value to hedge a five-year corporate with a seven-year government unless one knows the relationship between the two mismatches of government versus corporate and five years versus seven years. In many cases, basis risk and aberrations in the market create situations where there are losses in both long and short positions.

It is critical, therefore, for a financial service firm to develop an adjusted net risk taking position which will take into account the uncertainty of the hedges. Each product must be evaluated separately, and the specific hedge, if any, used to theoretically lessen the risk of a given position must be identified up front and the "quality" of that hedge continually assessed.

3. *Treasury Bill and Bond Future Equivalents*

A next step would be to convert the adjusted positions as described above to a three-month T-bill and twenty-year bond future equivalent. This will enable the firm to know, across products or securities, its relative risk in each product or contract in which it has an exposure and to compare dissimilar products to a uniform benchmark.

4. *Future Scenarios*

The next step is to develop sensitivity analyses which describe the firm's risk taking posture in Treasury bond equivalents and their market values should there be changes in the yield curve from a few basis points to 100 B.P. This position should be disaggregated across the *entire yield curve*, that is, 0 to 1 year; 1 to 3; 3 to 5; 5 to 10; 10 to 20; and over 20 years. Thus, the firm should be able to determine exactly where on the yield curve, for each product, whether case, derivative or synthetic, the firm is at risk.

Sensitivity analyses should be prepared which project changes in the market, *not linear*, across each part of the curve or each product so that shifts in the slope and direction of any part of the yield curve are immediately transparent in increments of five basis points. Thus, the firm will know where its potential risk is on each part of the yield curve for each instrument in terms of its net beta adjusted position in twenty-year bond future equivalents. Annex D shows, by way of example, in a simplified version, the long and short positions stated in bond future equivalents and one-year Treasury bill equivalents (as well as the net positions) for each maturity range. The top and bottom of the columns, shown as shaded areas, identify the increased risk occasioned by the beta analyses of the hedges, which do not perfectly offset the apparent long and short positions.

Annex E provides, in a simplified table, a format which would permit evaluation of the P&L impact of various changes in the slope or direction of different parts of the yield curve for a product, after beta adjustments, for seven different yield curve scenarios.

5. *The Profit and Loss statement*

The final step is to develop a full projected profit and loss statement which is on line and on time which adjusts the potential future profit and loss at each part of the yield curve should markets move as described under alternative scenarios given the firm's net risk adjusted position across all of its products. The system should be able to immediately determine which particular products and maturities, given such changes, are responsible for the greatest impact on the P & L statement. To use a simplified example, an institution should be able to quickly determine that its holdings in, say,

five-year governments, after assessing the hedges attributed to that position will produce an "x" loss should the market for that particular maturity move ten basis points, and that there is "y" probability that it would be offset by its current position in the ten-year Treasury, after beta adjustments, only if the market moves in the opposite direction by "z" basis points.

This kind of analysis will require the co-ordination of those responsible for the accounting systems, trading analytics, information and retrieval, and computer technology, and ordinarily can only be done with the full support of the most senior manager of the firm or institution.

6. *Reporting/Management*

Reports should be available on-line during the day, as well as at the end of the day, for senior management which summarise the nature of the risk by product, the concentration of risk, the nature of the hedges, the profit and loss implications of future changes in the market, as well as the purpose of the hedges.

More generally, the senior managers must be aware why positions are taken: were they incidental, speculative, to service others, for arbitrage, etc., and the extent to which the firm is vulnerable to event or liquidity risk and, if so, in what particulars.

But that will not be sufficient. A staff *solely* dedicated to re-evaluating the analytics, particularly the character of the hedges, as well as the underlying risk potential of derivative instruments should be established. This group, while working with the traders, should report to a senior risk manager who should have substantial experience across a broad range of products. In short, qualified "financial engineers" should be assigned, not just to developing products for customers or clients, or to identify aberrations or market opportunities for traders, but to providing the analytics for the risk manager on a continual basis. Their responsibility would be to provide up-to-date information of the volatility, as well as the uncertainties of the time frames used, for example, to measure betas in establishing risk-adjusted positions. The risk manager should have the full authority to order reduction or changes in both the gross and risk-adjusted net positions of any given product at any time and should report to the most senior principals of the financial institution.

Perhaps most important for managers is simply to manage. That means they must be aware of uncertainty and unsuredness. It is no diminishment of their own skills or expertise to admit to what they do not know and, indeed, what is unknowable, or to seek the advice and expertise of highly trained specialists who can quantify that uncertainty. If markets were predictable, then there would be neither buyers nor sellers, for all of us could identify precisely that product which results in the highest rate of return. But markets are neither predictable nor under our control. Perhaps the best single characteristic one might look for in managing risk is modesty, which, assuredly, is not a commodity in abundant supply in the world of international finance. The ability, nonetheless, to say, "I don't know," or "I'm not sure" will go a long way to managing risk.