

Using an options approach to risk measurement, financial institutions can improve loan pricing and structure and gain insights into portfolio risk.

IMPROVING QUANTIFICATION OF RISK-ADJUSTED PERFORMANCE WITHIN FINANCIAL INSTITUTIONS

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The increasing competition fostered by deregulation has made it imperative for banks and other financial intermediaries to better understand the economic performance of their various activities and to make intelligent resource and product decisions based on that understanding. Most activities of financial firms involve risk. Thus, to measure the economic performance of those activities, one must adjust for risk.

Risk may be expressed most simply as a cost.¹ The quantification of this cost involves refined information and delicate calculations. Most early efforts at quantification have used funds-transfer pricing and capital allocation to distribute down to particular products or businesses the risk costs that the finance function sees for the firm overall.

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When margins were wide, this scheme seemed to work. With competition compressing margins, the logical flaws in this method, as usually practiced, have made it unworkable for some business activities. In particular, the approach typically portrays lending to large corporations as extremely unprofitable. At the same time, institutional investors are showing strong appetite for investing in that asset class.

To fix these flaws, analysts, managers, and CFOs should take the following steps:

- Tie required asset returns and prices to detailed, external capital-markets' benchmarks rather than to the bank's internally estimated debt and equity costs. This practice recognizes that returns to bank debt and equity derive from asset returns rather than the reverse.
- Treat risk as dynamic, not static, and use market prices to calibrate frequently the varying, prospective risks associated with exposures to particular market and credit factors.

The above applies best to individual transac-

tions.² For dealing with aggregate activities, Merton's options approach to risk measurement offers a useful framework.³ It also underscores the need for market-based valuations and volatility estimates. This broad approach and the specific suggestions above can deliver important improvements in risk quantification. This hardly solves all of the outstanding problems, however. Many other difficulties remain rooted in current information inadequacies. However, banks will benefit even from imperfect measures of risk-adjusted performance. Those benefits will magnify as risk measurement improves.

RISK-BASED PROFITABILITY MEASURES CONTRADICT MARKET SIGNALS

As banks and other financial firms have begun to compute risk-based profitability, a troublesome dilemma has emerged: These calculations increasingly give results that contradict signals coming from the market. For example, in corporate lending, we witness increased origination volumes and a flurry of new participants, although the prevalent risk-based profitability measures indicate that nearly everyone already is losing money. This might mean that banks are inefficient providers of commercial loans, which could be so. Banks, as asset holders, have a distinct tax disadvantage vis-à-vis mutual funds. Alternatively, one might suspect that current, internally focused, risk-quantification techniques are flawed and lack market reality. We believe that mistakes in measurement account for some of the observed anomalies.

The need for sharper measurement tools enabling better business decisions has arisen from the intensifying competition within financial services. This growth in competitiveness has been particularly acute in corporate banking. Increasingly, competition in this market leaves no room for less efficient providers. In a consolidating environment, less efficient firms must find specialized areas where they can excel or they will be absorbed and disappear. Considering that a commercial bank may have 40% of its assets in commercial loans, much is at stake for those committed to this business.

How did this precarious situation develop? Years ago, if a bank originated a commercial loan, it funded, serviced, and bore the credit risk from that loan. The only investment criteria that

mattered were those of the bank's internal credit policies. The CFO held a noncompetitive position as sole provider of funds. The CCO and others in bank management exercised discretion over loan approval. To bankers, this cozy arrangement seemed to work. As long as loans were illiquid, it was difficult to perceive a problem. There was little reference to market value, and the existing credit provider held a formidable edge over potential rivals in specialized information, access, and funding.

An increasingly liquid loan market makes it harder for banks to sustain competitive advantage based upon privileged information or access.

These advantages are waning. Increasingly, the bank need not fund the loan. The CFO no longer stands out as the only possible source of funding. And, more troubling for many, an increasingly liquid loan market is starting to provide market-value information. This makes it harder for banks to sustain competitive advantage based upon privileged information or access. The customer is far better informed, barriers to competition have eroded, and a new group of investors have become comfortable with commercial loans in their portfolios. In short, the loan market is increasingly being absorbed into the broader spectrum of competitive capital markets.

Also, over this period, the commercial customer relationship has grown more complex. It has evolved from one in which commercial loans defined the dominant relationship, where loan spreads were wide, tenor short (generally one year or less), and covenants generic. Now the industry is moving to multiple relationships with a customer; complicated, interrelated products; much narrower spreads; longer tenors; and intricate, customized loan agreements. Thus, the business has grown technically more challenging as it has become more competitive.

In response to rising competition, banks have

made a concerted effort to reduce operating costs. This laudable goal has its limits. Beyond a point, to maintain profitability, banks will need to invest in new technology, business process, and knowledge. Taken too far, a preoccupation with cost reduction could lead to soaring risks and plummeting customer satisfaction. Especially in today's environment of increasingly complex customer relationships, the successful banker must weigh carefully costs against benefits.

This returns us to our initial concern with measuring risk-adjusted performance. In banking, to compare costs with benefits and make well-informed business decisions, one must adjust for risk. How can one do that?

RISK EXPRESSED MOST SIMPLY AS A COST

Risk exists if the future payoffs from an undertaking are at best known probabilistically. Gambling provides the classic example of an activity involving risk. A wager entitles one to a probabilistic payoff. Lending resembles gambling in this respect. In a loan, as in a bet, one puts money at risk in the hope of getting more than that amount back. The odds of unfavorable outcomes are usually much lower in loans than in games of chance, however. Thus, one would regard a one-year loan to a BBB borrower as involving less risk than the same amount bet on a number in roulette. Similarly, one would regard a one-year loan to a AAA borrower as involving less risk than the same loan to a BBB borrower.

How does one make these comparisons of greater or lesser risk? This isn't a trivial matter. Typically, one risky venture will turn out better than another in some circumstances and worse in others. Merton has recently restated the standard answer.⁴ Risk may be expressed most simply as a cost, specifically the cost of a fair insurance policy. In other words, we define the value of risk in an activity as the smallest amount that a knowledgeable third party would accept as compensation for bearing the risk in our place.

This quantification facilitates decision making. By expressing risk in dollars, one may immediately compare bearing risk with other competing options. Suppose, for example, a bank could streamline its credit process and trim annual operating costs by \$10 million, with some increase in risk. If we established that the process change would raise the bank's annual risk premi-

um by \$15 million (without compensating upside potential), then we would conclude that the streamlining was ill-advised.

Standard valuation methods embody this risk quantification. Following best practice, one determines a position's worth by computing the present discounted value of its expected future cash flows *in a risk-neutral world*. By risk neutral, we mean a situation in which both expected and unexpected losses appear as negative cash flows, or costs. (Also, expected and unexpected revenues appear as positive cash flows.) Since all risks get deducted as costs, one discounts the remaining net cash flows using the risk-free rate.

While this approach has acquired the status of convention, it hardly reduces risk measurement to a simple task. Quantification remains challenging and often controversial, since risk is opaque and generally not traded in liquid markets. Nonetheless, financial intermediaries must estimate risk costs as an essential ingredient to rational pricing and decision making. Thus, they have developed algorithms for placing values on various risk categories. We describe such algorithms below.

RAROC: THE FIRST WIDELY USED RISK-ADJUSTED PERFORMANCE METHOD

Risk-adjusted return on capital (RAROC) is today's most common approach to valuing risk-based performance. RAROC was first applied to the financial services business by Bankers Trust more than a decade ago. Since that time, several banks have experimented with variants of this approach. RAROC is fundamentally a top-down procedure that tries to align objectives of management with those of shareholders. It attempts to distribute down to products, businesses, customers, or even individual loans the risk costs that the finance function calculates for the entire firm. RAROC uses funds-transfer pricing and capital allocation in apportioning aggregate risk.

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capital to solvency risk. As commonly applied today, RAROC starts with a desired credit rating translated into an annual default rate. For example, a single A rating might represent 5 basis points (bps) of annual default risk.

Next, often by policy or obscure logic, this annual default rate gets converted into a capital requirement of n , where n represents the standard deviation of the value of the firm's total net assets. For instance, after analyzing the shape of the overall loss distribution, management might conclude that, to limit annual default risk to 5 bps, the bank needs enough equity to cover a 5 standard deviation annual loss event. The total of debt plus equity capital might correspondingly amount to 10 standard deviations.

RAROC then distributes this amount of capital based on each activity's marginal contribution to an n annual loss. We compute this marginal contribution and capital allocation as n , in which n represents the activity's own annual value volatility and ρ its correlation with the value of the total portfolio. Applying this allocation rule, we obtain the basic RAROC formula

$$\text{RAROC} = \frac{(\text{NIM} - \text{NIE} - \text{EL})(1 - \tau)}{n} = \frac{(\text{GI} - \text{COF} - \text{NIE} - \text{EL})(1 - \tau)}{n} \quad (1)$$

in which NIM denotes net-interest income (fully funded), NIE noninterest expense, EL expected loss, τ the effective marginal tax rate, GI gross interest income, and COF the cost of funds, with all components in dollars. This yields a risk-adjusted performance measure expressed as a percentage. Alternatively, one can translate this into dollars

$$\text{RAP} = (\text{GI} - \text{COF} - \text{NIE} - \text{EL})(1 - \tau) - (\text{ROK} - \text{RFR})n \quad (2)$$

in which RAP denotes risk-adjusted performance in dollars, ROK the firm's annual hurdle rate, and RFR the risk-free rate at which capital gets invested.⁵ Using the first formula, one concludes that an activity is profitable if and only if RAROC exceeds the firm's hurdle rate, ROK. Equivalently, using the second formula, an activity is profitable if and only if RAP is positive. In this second formula, risk appears as a cost.

What accounts for the popularity of RAROC? *First*, the approach amalgamates the notions of risk adjustment and capital allocation. It therefore seems to address solvency (that is, portfolio management) and value with a single all-purpose formula. *Second*, capital-adequacy rules form the basis for regulatory controls on risk. Bankers are familiar with those rules and their rationale. Thus, they are predisposed toward a capital allocation approach to risk adjustment. *Third*, RAROC evaluates each activity's performance by comparing its return with the institution's cost of capital. To the CFO, therefore, RAROC seems to instill shareholder-oriented incentives throughout the organization. *Fourth*, the method can run mostly using standard accounting information, such as net-interest income and loan-loss provisions. This also encourages acceptance by traditional line bankers. *Fifth*, the RAROC capital allocation formula, n , is deceptively simple. At first glance, RAROC appears easy to implement.

Banks using RAROC generally apply it through rules that determine funding costs, operating charges, loss provisions, and capital allocations for various categories of activities. Thus, a two-year, floating-rate, term loan to a BB-equivalent borrower could get a funding cost of Libor, a NIE charge of 35 bps, a loan-loss provision of 50 bps, and a capital allocation of 8% of the outstanding amount. A business line that handled middle-market relationships might be assigned capital in the amount of 8% of its term-loan-equivalent exposures, additional capital to cover operational risk, 30 bps of operating costs for loan origination and administration, and 150 bps of expenses (expressed relative to deposits but derived from detailed transactions data) covering cash management and other nonloan services.

The evaluation of costs and risk-adjusted performance occurs at least annually. This involves assessing capital for the firm, each business unit, and each product line. In theory, higher risk activities face higher capital charges and, over time, inappropriate risk taking gets squeezed out of existence. Also, units that perform poorly receive diminishing capital amounts, contracting their operations, until they either start earning acceptable returns or are liquidated. Units that perform well receive increasing resource endowments, fueling growth. This is an intuitively appealing picture. What possibly could be wrong with it?

Too much, possibly. In recent years, RAROC, as customarily applied, has become unworkable in some competitive settings. We particularly observe this in corporate banking.

Since 1992, corporate lending spreads have fallen substantially.⁶ Most RAROC models now depict corporate lending as very unprofitable and the entire corporate business as meagerly profitable at best. However, corporate spreads have merely moved in line with prices in other competitive capital markets. Furthermore, institutional investors are showing a healthy appetite for those loans. How does one reconcile these contrasting signals?

We see two basic options. One could accept that the RAROC results are flawed and try to fix them. Alternatively, one could draw a far-reaching conclusion—either that capital markets are underpricing risk generally or that banks no longer are competitive in corporate lending. In our experience, RAROC measurement errors account in part for the observed anomalies.⁷

In our view, errors enter into RAROC calculations on account of two common practices:

- deriving asset risk premiums from tenuously related estimates of aggregate debt and equity costs,
- relying heavily on long historical average experience in evaluating the risks currently associated with particular categories of assets.

MARKET INFORMATION CAN IMPROVE PERFORMANCE MEASUREMENT

To mitigate the problems in the current RAROC systems, we feel that one should make two adjustments:

- Use detailed, external capital-markets benchmarks rather than the institution's estimates of overall debt and equity costs in determining required asset returns and prices.
- Regard risk as dynamic, and use market prices to recalibrate frequently the varying, prospective risks associated with exposures to particular market and credit factors.

These steps suggest that, like mutual funds, banks must look to the market for the key inputs

used in evaluating risk and value. In particular, one would tie risk charges to prices observed in capital markets. Thus, if credit premiums in capital markets fall (rise), one would similarly reduce (raise) the risk charges used internally. This motivates the formula:

$$\text{RAP} = \text{GI} - \text{COF} - \text{NIE} - \text{PREMIUM} \quad (3)$$

in which *PREMIUM* denotes the annualized, market-based, dollar risk premium and all other variables are as before.⁸ Interpret the risk premium as a competitively determined insurance charge reflecting current market conditions. Note that capital doesn't appear in this formula. The market informs us about premiums. It's silent on capital. One could split each risk premium into a capital amount and a spread. Some insist on this, since the idea of capital allocation is so deeply ingrained. However, this added step is unnecessary.

Banks need to view risk as dynamic and use market prices.

In our formula, COF represents risk-free commercial funding, perhaps Libor, not the transfer price. The variable, *PREMIUM*, fully accounts for risk.⁹ One needs no additional adjustment. This doesn't deny that an institution's actual funding costs may include a margin over Libor. This margin reflects the overall asset risk and capital position of the institution. It's not allocable to particular deals.

Suppose, for example, that we've estimated that the credit premiums on three-year-duration BBB exposures are currently 15 bps drawn and 6 bps undrawn. Then, for a three-year duration, \$5 million, 30% utilized, revolving line to a BBB borrower, we would compute an annual risk premium of \$4,350 (*Exhibit 1*). Suppose further that we've priced the loan at 35 bps drawn and 10 bps undrawn and we assess a funding cost of Libor and marginal NIE expenses of 15 bps on drawn and 5 bps on undrawn. Then we compute a total annual risk-adjusted performance (RAP) on the loan of \$400. Over the loan's expected duration, the cumulative RAP is \$1,200. Thus, by originating the loan, the bank adds almost \$1,200 to

EXHIBIT 1 Calculation of Annualized Risk-Adjusted Profit

Item	Calculation	Annual Amount
Spread	\$1.5 million \times 35 bps	\$5,250
Fees	\$3.5 million \times 10 bps	\$3,500
NIE	\$1.5 million \times 15 bps + \$3.5 million \times 5 bps	(\$4,000)
Risk premium	\$1.5 million \times 15 bps + \$3.5 million \times 6 bps	(\$4,350)
RAP		\$400

NIE: noninterest expense

RAP: risk-adjusted performance

shareholder value.¹⁰

This profitable outlook doesn't preclude the possibility that circumstances could change, causing a prudent deal to turn sour. To earn profits, one must bear risk. At best, one can strive for positive profits on average over all scenarios. But, as has happened many times, the risk outlook can shift suddenly, turning profitable positions into losses. A bank's capital and portfolio policies need to deal with these contingencies. They need to help assure survival or, more immediately, the firm's good standing in credit-sensitive businesses such as derivatives dealing.

These solvency considerations don't enter into the risk-based profitability formula above. This in no way downplays the importance of these concerns. A financial institution obviously must take great care in addressing solvency. However, the institution can pursue that aim largely separately from its search for value.

In the near future, the financial institution will be able to seek value creation with little concern over portfolio constraints. The institution might originate business concentrated in a few sectors or regions, thereby realizing efficiency through specialization. Then, after having originated such deals, the institution could promote solvency by balancing its portfolio through NPV-neutral transactions such as swaps or asset purchases and sales. In short, the business line needs to focus on value. A centralized risk-management function then can focus on value at risk. Assuming that the institution has developed a broad set of nearly NPV-neutral, portfolio-management

tools, the business line and portfolio management can work largely independently and yet be compatible with the institution's best interests.

With commercial loan spreads settling within a narrower range, more of a loan's value relative to other competing assets arises from its structure.

Increasingly important, at the transaction level, the current RAROC systems have flaws related to their neglect of structure. This problem has grown more serious with the evolution of the commercial loan market. With spreads settling within a narrower range, more of a loan's value relative to other competing assets arises from its structure (prepayment, grid pricing, covenants, etc.). RAROC has a hard time going beyond the formulation described earlier and handling loans with different tenors, much less varying embedded options. The typical RAROC approach simply wasn't developed for the current corporate market.

Consider, for example, a five-year, fixed-rate, bullet loan with no prepayment permitted, no grid pricing, and no covenants. In other words, the loan has no embedded options. Assume we run the typical RAROC model and get a 12% return. Now change the loan to permit prepayment. We still get 12%. Now put in call protection. We still get 12%. Add grid pricing. We still get 12%. Alter the grid. We still get 12%. Thus, if we change the initial deal to look more like the loan that we might actually see in the market, RAROC fails to recognize the effect of the change in structure. More unsettling, this creates moral hazard. The relationship manager has an incentive to weaken structure to facilitate the closing of a deal at the RAROC hurdle rate.

To avoid this danger, the institution must use valuation tools that evaluate loan structure as well as price. KPMG, after extensive effort has developed such a tool, the Loan Analysis System (LAS).¹¹ This tool can quantify the importance of different elements of loan structure.

After analyzing more than 2,500 large corporate and middle-market loans, we've found that structure plays a major role in enhancing (or dissipating) NIM, fee income, and portfolio value.

MERTON'S APPROACH: AN ALTERNATIVE FRAMEWORK FOR AGGREGATE MEASUREMENT

The framework just described works best when applied to individual loans. Here one can most easily find market benchmarks describing risk premiums. For analyzing aggregate activity, such as whole business or product lines, one may need a different approach.

One could simply adjust a RAROC model to account for the recent drop in risk premiums and loan losses. For example, as evidenced by the recent surge in stock prices, some analysts believe that the typical U.S. equity premium now stands at about 400 bps, far below the historical average of 700 to 800 bps. We've already noted the large decrease in debt premiums. Combining both of these reductions with the large fall in commercial loan loss rates, one obtains a marked decline in risk premiums and spreads (*Exhibit 2*). Note that we adjust for the drop in unexpected loss through a lower risk premium, not a smaller capital allocation. If we also had reduced the capital allocation, we would have double-counted the change in risk.

We actually prefer a somewhat different method for estimating aggregate risk premiums—an options approach introduced by Robert Merton and colleagues.¹² This method starts with the observation that the payoff to capital splits

into a risk-free position, a long call, and a short put (*Exhibit 3*). The put option corresponds to an insurance policy guaranteeing at least a risk-free return. Its option premium represents the risk cost chargeable to the entire institution. Merton and Perold show that one can closely approximate the Black-Scholes cost of such an annual insurance policy with the formula

$$\text{PREMIUM} = 0.4 \quad (4)$$

in which σ again denotes the standard deviation in overall net asset value. An incremental change in one activity results in the following variation in the premium

$$\frac{\text{PREMIUM}}{\sigma} = 0.4 \quad = 0.4 \quad (5)$$

in which ρ and β represent the correlation and asset volatility of the activity and β its beta with respect to the institution's portfolio. One can't miss the resemblance to the RAROC formula. However, one no longer need specify a desired number of standard deviations n . Consistent with the Modigliani-Miller theorem, this approach quantifies cost and value without specifying a capital allocation or solvency goal.

As shown by Merton and Perold, this approach gives us a way of measuring risk-adjusted profits.¹³ In doing this, one uses the formulas (4) and (5) in determining risk costs. This option-based method, however, is uninformative on required returns and spreads. The approach

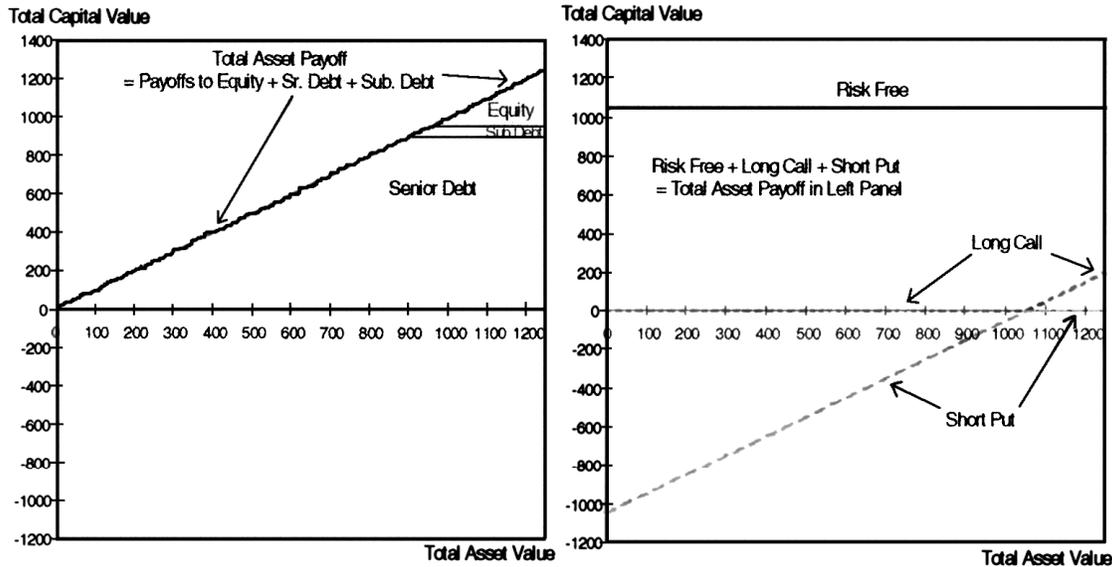
EXHIBIT 2

Hypothetical RAROC Estimates of Risk Premium and Break-Even Spread for Middle-Market Term Loans^a

Period	Expected Loss Rate (1)	Capital Allocation (2)	Debt + Equity Spread (3)	Risk Premium (4) = (1) + [(2) × (3)]	NIE +Tax + Options (5)	Spread (6) = (4) + (5)
	(basis points)					
Average History	40	800	405	72	45	117
Current	20	800	202	36	40	76

^aDebt + equity spread assumes 50% equity financing. Uses historical average spread on equity of 800 bps and 10 bps on debt. Assumes current spread values of 400 for equity and 5 for debt. Risk premium excludes tax effects, which we include with operating costs. This table illustrates calculations for a possible loan product class. The calculations for non-loans or business lines would involve more detail.

EXHIBIT 3
Capital Payoff and Its Decomposition



starts with asset values, which already embody returns. Thus, required returns are an input, not an output, of this approach.

To estimate required returns and values, one could use the market-benchmark techniques described in the preceding section and sum values over all assets in a portfolio. In addition, one needs to estimate volatilities and correlation coefficients. KPMG, J.P. Morgan, KMV, and others have developed ways of estimating these elusive parameters. Then, given this array of information, one may derive the insurance premiums for use in measuring risk-adjusted performance (*Exhibit 4*).

INFORMATION REMAINS A PROBLEM

We've described ways of using market information for improving an institution's evaluation of risk-adjusted performance. However, the tech-

niques described require refined data and delicate calculations that will create controversy and stress some institution's capabilities. Many institutions will find their efforts hampered most by scarce information.

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The needed market benchmarks can only be estimated within a fairly wide margin of error and experts will disagree on matters such as the current equity premium and forward par credit spreads on loans. Also, for a given risk rating, some asset classes, such as commercial real

EXHIBIT 4
Derivation of Annual Risk Premiums for Asset Pool

Period	Portfolio Volatility (1)	Correlation With Total Bank (2)	Stand-alone Premium (3) = .4 × (1)	Marginal Premium (4) = .4 × (2) × (1)
Avg. History	202 bp	0.5	81 bp	40 bp
Current	122 bp	0.5	61 bp	30 bp

estate, project finance, sovereign debt, and smaller middle-market loans, consistently command higher credit spreads than large-corporate C&I loans. Also, even within an asset class, one sees persistent differences across regions with fully convertible currencies. Analysts disagree on whether such gaps reflect risk or market imperfections. Further, even where the data are relatively clean and plentiful, as in the U.S. large-corporate bond and loan markets, one has difficulty separating risk premiums from the other price components.

These challenges in developing the external market benchmarks are surpassed by the difficulties in estimating the internal data. The options approach just described requires asset valuation and correlation estimates for a wide range of nonloan activities. Consider, for example, the task of estimating asset values and correlation coefficients for cash management and other non-asset-based businesses. Usually, one must impute asset-value information from product and line-of-business earnings data. We've developed approaches for doing this, using overall debt and equity prices, stock betas, and line-of-business earnings data. Others have also attempted to tackle this problem.¹⁴ No simple, objective method yet exists.

Also, the allocation of operating costs within most organizations creates as much controversy as the apportioning of capital costs. Much of the operating costs within financial institutions arise from fixed facilities, such as the information infrastructure. There may be no objective way of allocating these costs among joint users.

Finally, as noted by Merton and Perold, observed market prices may include spreads, other than those described above, as compensation for adverse selection, moral hazard, and agency costs.¹⁵ These items contribute to the true economic costs of risk. Such deadweight costs encourage institutions to consider the benefits and costs of transparency and other concerns beyond the scope of this article.

PERFORMANCE MEASURES INCORPORATING RISK WILL IMPROVE AS MARKET INFORMATION IMPROVES

Information shortcomings clearly create concerns over the accuracy of current risk-based performance measures. Despite these inaccuracies,

we believe that financial institutions are able to make far better decisions guided by the currently prevalent measures than by using earlier performance measures that paid little or no attention to risk. These benefits will magnify as institutions improve risk quantification.

NOTES

¹Risks ultimately create claims on income, just like interest expense and overhead. Risk claims are prospective and contingent, however. Thus, the cash-equivalent costs don't initially appear on the books unless the institution purchases third-party insurance.

²The use of external benchmarks often will require extrapolations using risk ratings and possibly asset classes to define comparable groupings. These extrapolations will inevitably add some error to the estimation of par pricing.

³See Merton and Bodie, "On the Management of Financial Guarantees," *Financial Management* (Winter 1992) and Merton and Perold, "Management of Risk Capital in Financial Firms," in *Financial Services: Perspectives and Challenges*, edited by Samuel L. Hayes (Cambridge: Harvard Business School Press, 1993).

⁴See Merton and Perold, "Management of Risk Capital in Financial Firms."

⁵Taxes may not be treated properly in this accounting. Under this formulation, equity rises with risk and so too does the tax burden. Alternatively, one can treat rising risk as contributing to a higher spread on a fixed amount of capital. Under this view, the tax burden is a fixed cost independent of risk. Since most banks have surplus capital at present, this alternative view may be more accurate.

⁶See *Gold Sheets: 1996 Annual*, Loan Pricing Corp.

⁷If loan spreads were out of alignment with risk premiums in other markets, then the view that loans were being underpriced would be more persuasive. However, loan spreads seem basically consistent with equity yields and bond spreads, which also are low. One might still believe that capital markets in general are underpricing risk. In that case, one should acknowledge holding a speculative view relative to the market.

⁸Under this approach, loan officers and line managers get rewarded based on their ability to beat their peers, as represented by the market.

⁹Premium here refers to expected plus unexpected loss, not just the latter. This conforms to standard insurance practice.

¹⁰We ignore taxes here, since this involves overall firm financing issues not germane to a particular deal. Indeed, the contribution to shareholder value net of tax would be less than \$1,200. However, the calculations would still discriminate properly between good and bad deals, irrespective of the bank's tax status.

¹¹See Aguais and Santomero, "Incorporating New Fixed Income Approaches into Commercial Loan Valuation," *Journal of Lending and Credit Risk Management* (February 1998) and Aguais, "Creating Value from Both Loan Structure and Price," *Commercial Lending Review* (Spring 1998).

¹²See Merton and Bodie, "On the Management of Financial Guarantees," and Merton and Perold, "Management of Risk Capital in Financial Firms."

¹³See Merton and Perold, "Management of Risk Capital in Financial Firms."

¹⁴See Matten, *Managing Bank Capital* (Swiss Bank Cor-

poration, 1996).

¹⁵Merton and Perold, "Management of Risk Capital in Financial Firms."