

# *Innovations in Performance Measurement in Banking*

For Zvi Griliches, my thesis advisor. His willingness to accept me as a student may have kept me from a life as an accountant.

—Dedication in *Getting It Right: Markets and Choices  
In A Free Society*, by Robert Barro.

**A**ccountants are rarely portrayed as heroic innovators. Yet in banking over the past 10 years, cost or management accountants have played such a role. Management accounting is dedicated to collecting and analyzing internal data so as to provide top management with the information needed to make sound operating and strategic decisions. This article argues that management accountants have been instrumental in the creation of new management processes and performance measurement systems.<sup>1</sup> Their innovations have enabled banks to create internal capital markets, measure risks so as to facilitate their proper hedging and pricing, and create risk-based performance standards for lines of business. Such standards are particularly important in avoiding the misallocation of resources. Moreover, management accountants have made great progress in creating data bases and analytical tools to resolve strategic conflicts.

The first section of the article discusses the evolution of commercial banks into semiautonomous lines of business over the past 20 years and the managerial issues and challenges that this organizational change has created. The development of funds transfer pricing systems is then described, followed by a discussion of the allocation of risk-based capital and the creation of risk-adjusted hurdle rates. Approaches to measuring customer, product, and organizational profitability are described, along with examples of the key findings of such analyses. Still unresolved issues in bank management accounting are discussed, such as the problems of “adding up” in the allocation of capital, the valuation of customer relationships, and the creation of objective measures of credit risk. The final section offers conclusions.

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## *I. The Organizational Evolution of Commercial Banks*

Over the past 30 years the organizational structure of large commercial banks and the way these banks are managed have evolved to permit greater specialization and focus on the part of management. In the 1960s most banks, even the largest, were organized geographically and managed as a single, undifferentiated line of business. Branch managers were responsible for all of the business of customers assigned to their branch, whether that of a Fortune 500 corporation or the smallest retail customer. Reacting to a perceived need for increased expertise in credit extension, banks began removing their large corporate customers from the branches and placing them in specialized corporate banking units. This trend to specialization accelerated as corporate customers began to be grouped by size in large corporate, middle market, and small corporate units. Product lines requiring specialized expertise, such as cash management, international banking, or asset-based lending, were also carved out and designated as lines of business. The retail business began to fragment as specialized distribution channels began to emerge for products such as credit cards, residential mortgages, and auto loans, and for high-net-worth customers. Increasingly banks began to organize and manage themselves not as a unit but as a collection of disparate and semiautonomous lines of business, each with a different product, customer, distribution channel, or geographic mandate.

While the creation of distinct and semiautonomous lines of business permitted greater management focus and specialization, it also gave rise to new issues concerning performance measurement, risk management, and resource allocation, and it resulted in strategic conflicts as business units clashed in the marketplace. To assess the contribution of each line of business, top management needed profitability reports for each business unit, but calculating disaggregated organizational profitability in banks had inherent methodological problems, since the businesses often shared customers, products, distribution chan-

nels, and back offices. How were shared revenues and costs to be divided? In addition, since the lines of business tended to define themselves based on their customers, their products, or their distribution channels, managers needed more information than organizational profitability if they were to make sound operating or strategic decisions. New approaches to profitability measurement based on products, customers, or distribution channels were needed if the profitability dynamics of the new lines of business were to be understood and exploited.

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With respect to risk, two overriding issues emerged. The first was how to identify, measure, and aggregate different types of risks across the lines of business so that they could be managed from a bankwide perspective. Each line of business, depending on its type and size, generated different exposures to interest rate, credit, prepayment, and operating risks. In some cases a particular risk exposure generated by one business offset that of another. But in other cases, the risk exposures might not offset each other but instead be positively correlated across business units, exposing the bank to the possibility of serious losses.

Identifying and aggregating risks across multiple independent lines of business became a major issue for top management, since in the evolving organizational structure they themselves were no longer engaged in the day-to-day management of the business units but were dependent upon formal reporting mechanisms for operating information. A second major issue was how to prevent the development of a rogue business. Because of the highly leveraged nature of banking, a single poorly managed business could generate sufficient losses to result in failure of the bank. Top

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<sup>1</sup> To date, the innovations discussed in this article are concentrated for the most part in the largest bank holding companies. Karr (1996–97) reports that 18 of the 25 largest U.S. bank holding companies disclosed line-of-business results in their 1995 annual reports. Only six of the next 25 largest and only one of the second 50 largest did so. Of the 25 largest bank holding companies that reported line-of-business results, 64 percent disclosed return on equity, indicating some form of capital allocation.

management came to realize early on the need for reporting systems that would allow them to monitor not only business unit financial results, but also key risk and operating variables.

As lines of business within banks came to view themselves as having distinct identities, they also began to compete with one another for resources in the form of budget authorizations for new employees, systems investments, and marketing programs. Access to such resources was particularly important for those business units with ambitious growth plans. Because lines of business differed fundamentally in their riskiness, making such resource allocations based solely on gross profitability was not sufficient. Instead, top management became increasingly aware of a need to measure returns on a risk-adjusted basis, and to be able to compare new investment projects within the bank with projects outside.

Finally, conflicts among the business units arose as their strategic mandates often overlapped. On the corporate side, representatives from different business units found themselves sitting together in the same waiting room to see the same client. How should calling on important customers be coordinated across organizational lines? Who should be making decisions concerning products or distribution channels that served multiple lines of business? Should business units be permitted to “own” customers? For example, should a capital markets group be permitted to promote investment products to retail customers if the sale of such products promised to “cannibalize” existing deposit accounts?

As these issues emerged and gained urgency, most banks found they lacked information that would enable them to analyze the issues in an objective way. What was needed were new performance reporting and risk management systems, new data bases, and new analytical approaches permitting top management to objectively weigh costs, benefits, and risks. The stage was set for the emergence of the bank management accountant as a somewhat unlikely hero.

## *II. Funds Transfer Pricing*

If business units were to be created and operated as semiautonomous lines of business, then each line of business would need its own income statement and balance sheet so that its performance could be assessed. An important issue in creating these organizational profitability reports was how to divide the net interest margin, which usually accounts for anywhere

from 60 to 80 percent of bank revenue, among the business units. This was not an issue for those business units that generated equal amounts of assets and liabilities. But most lines of business generate disproportionate amounts of either assets or liabilities and thus are net funds generators or net funds users. For example, branches typically generate far more deposits than assets, while lending units such as corporate banking or consumer lending do the opposite. Which business, the funds-using or the funds-generating one, should receive credit for the net interest margin earned on the asset or the liability overhang?

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Some banks, fearing that a division of the net interest margin would create continual internal conflict, attempted to finesse the situation by crediting both funds-using and funds-generating businesses with the entire net interest margin. This double-counting approach, while minimizing conflict, made it difficult to reconcile the profitability reports of the individual lines of business with those of the bank as a whole. More serious, this approach made it impossible to identify businesses with operating problems since all the businesses tended to look profitable, even if the bank did not.

As a result, most banks began to develop and implement funds transfer pricing systems.<sup>2</sup> Conceptually, funds-generating businesses were seen as originating funds to be sold in an internal capital market to funds-using businesses. The transfer prices used to value the transferred funds were the rates at which the bank could acquire or sell funds in the external capital market. For a funds-using business, the balance sheet would consist of the loans it generated on the asset side and funds purchased from the transfer “pool” on the liability side. On its income statement, the net

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<sup>2</sup> For discussions of funds transfer pricing, see Ernst & Young (1995, Chapter 10, pp. 178–183); Webb (1994); and Kimball (1988).

interest revenue of a funds-using business would consist of the spread between the rates it earned on the loans it generated and the transfer rate paid to acquire funds from the transfer pool. For funds-generating businesses, the balance sheet would show funds sold to the transfer pool as the principal asset, while deposits would be the principal liabilities. The net interest revenue of such a business would consist of the spread between the transfer pool rate received on funds sold to the pool and the rates paid on deposits. Thus, the transfer rate served to divide the overall net interest margin of the bank into two submargins, one from asset origination and one from liability origination. Each submargin would measure the economic value of a deposit or loan origination, using an external capital market metric.

### *Single-Rate Funds Transfer Pricing Systems*

Most banks began funds transfer pricing using a single transfer rate and a single funds "pool" into which businesses sold funds and from which they purchased funds. The single transfer rate used in such systems often was a weighted blend of the various sources of funds available to the bank in the external capital markets. The concept of a single funds transfer rate failed to take into account the existence of a sloped yield curve, and such single-rate funds transfer systems often gave line-of-business managers incentives to operate in ways that were not optimal from a bankwide viewpoint. For example, a bank facing positively sloping yield curves in asset and liability markets often found that a single-rate funds transfer system encouraged the acquisition of longer maturity loans, as such loans would maximize the spread between the rates received on the loans and the pool rate. Conversely, a single-rate funds transfer system encouraged managers of funds-generating businesses to avoid long maturity deposits, since the spread between such deposits and the pool rate was substantially less or even negative compared to that on short-term deposits. With funds-using businesses focusing on long maturity assets, and funds-generating businesses generating short-term deposits, banks found that line-of-business managers not only were avoiding opportunities that would be profitable for the bank but also were making asset-liability management more difficult. Moreover, business managers complained that while the bank as a whole might be hedged against interest rate risk, the individual businesses were not. Fluctuations in the level of rates or in the slope of the yield curve would affect the net

interest margin reported by each business. For example, under a single-rate funds transfer pricing system, a funds-generating business that generated short-term deposits would show a positive net interest margin during periods when the yield curve had a positive slope and a negative net interest margin during periods with a negatively sloped yield curve.

### *Multiple-Rate, Matched-Maturity Funds Transfer Pricing Systems*

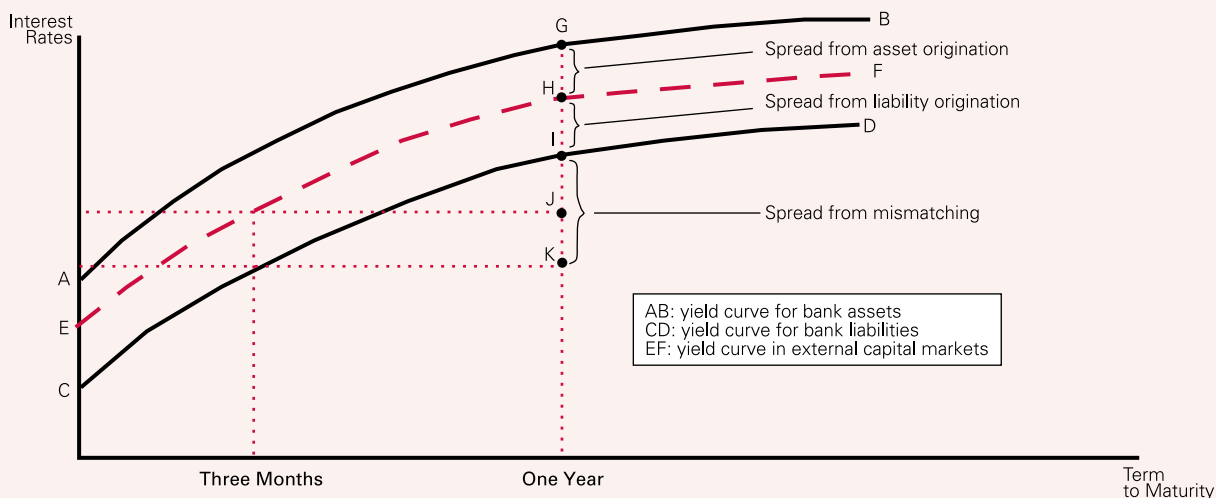
As problems became apparent, banks moved quickly to remedy these unforeseen consequences by implementing multiple-rate, matched-maturity funds transfer systems. Multiple funds transfer pricing pools differing by maturity were created, each with its own transfer rate. A business generating a three-month certificate of deposit would sell the deposit to the designated three-month funding pool. The CD would be assigned the three-month transfer rate existing at the time of origination and would carry this rate until maturity. In effect, the business would lock in a spread on the CD that would not change even if market rates fluctuated. Implementation of multiple-rate, matched-maturity funds transfer systems gave managers an incentive to originate assets and liabilities regardless of their maturity, and the systems also insulated the business units from most interest rate risk. Because assets and liabilities were either funded or sold to pools with corresponding maturities or repricing periods, the balance sheets of the individual businesses were hedged with respect to interest rate risk. This was an important contribution, since business managers were no longer affected by asset/liability management and could focus their efforts on managing product volumes and expenses. Although multiple-rate, matched-maturity funds transfer systems required substantial expenditures to implement, their demonstrable superiority over single-rate systems meant that over time they have become the standard for best practice in bank funds transfer pricing systems.

### *Funds Transfer Pricing and Asset/Liability Management*

In most banks, the treasury function was chosen to administer the funds transfer system, both because the treasury's connections with the external capital markets made it a logical source for the market-based transfer rates, and because the treasury was the key user of aggregated information from the funds trans-

Figure 1

*Disaggregation of Net Interest Margin Using Matched-Maturity Funds Transfer Systems*



fer system for purposes of bankwide asset/liability management.

From the viewpoint of each individual business, interest rate risk was eliminated by matching the asset or liability with the appropriate maturity transfer rate pool. However, from a bankwide perspective, discrepancies in the volume of assets and liabilities originated in a particular maturity pool would become visible at the pool level, and it would then be the responsibility of the treasury to manage this excess. For example, if on a bankwide basis more three-month assets than liabilities were generated, then the treasury would be responsible for funding the difference. Similarly, if more three-month liabilities than assets were generated, the treasury would be responsible for investing the funds.

The effect of multiple-rate, matched-maturity funds transfer pricing systems is to cause asset and liability mismatches to accumulate at the treasury level. The treasury can either hedge the mismatch in the external capital markets, or alternatively it can manage the mismatch to take advantage of its forecast for the future course of interest rates. No matter which choice is made, multiple-rate, matched-maturity funds

transfer pricing systems are the key source of information for asset/liability management within banks. Moreover, because the individual lines of business all operate on a fully hedged basis, any profits earned by the bank from the mismatching of assets and liabilities accumulate at the treasury level. Thus, the effects of interest rate fluctuations on the net interest margin of the bank can be identified and separated from the results of individual lines of business. This disaggregation of the net interest margin is illustrated in Figure 1.

Figure 1 shows three positively sloped yield curves. Yield curve AB represents the yield curve faced by the bank for those assets it originates. Yield curve CD represents the yield curve faced by the bank for its liabilities. Yield curve EF is the yield curve faced by the bank in the external capital markets, and represents the rates at which the bank can acquire either external funds or assets. Thus, yield curve EF also represents the yield curve for internal transfer fund pricing. To simplify matters, assume the bank consists of three business units, one that originates only one-year loans, one that originates only one-year CDs, and a treasury function responsible for asset/

liability management. In the example shown in Figure 1, the funds-generating business and the funds-using business generate the same volume of assets. The funds-generating business sells its funds to the matched maturity pool, receiving the spread HI. The asset-generating business funds its assets by purchasing funds from the matched maturity pool, receiving a spread equivalent to GH. The treasury function, however, believes that market interest rates and the associated yield curves will remain constant over the next year, and thus it chooses to fund the bank with cheaper three-month money rather than one-year money. To do so it sells the one-year money purchased from the funds-generating business in the external money markets and purchases instead an equal amount of three-month money. If its forecast for market rates is accurate, then the asset/liability mismatch will result in an increment to net interest margin equal to HJ. If the assumption is made that the spread on three-month money (JK) is equal to the spread on one-year money (HI), then the net interest margin due to asset/liability mismatching is equal to the distance IK. The total net interest margin, equivalent to the distance GK, can be broken down into its components: GH earned from asset origination, HI from liability origination, and IK from asset/liability mismatching.

While a multiple-rate, matched-maturity funds transfer system removes most interest rate risk from the purview of the individual businesses, some remains. In particular, the businesses are still subject to basis risk, the possibility of fluctuations in the spread between either the asset yield curve AB or the liability yield curve CD on the one hand and the funds transfer yield curve EF on the other. For example, suppose a bank's internal funds transfer yield curve is based on corresponding U.S. Treasury yields, but that a business unit makes a floating-rate loan priced off LIBOR. To the extent that the spread between LIBOR and short-term Treasuries fluctuates over the life of the loan, the spread earned by the business unit will vary. Some banks have addressed this problem by creating multiple pools at the short end of the yield curve, each based off a particular source of funds. Thus, a business unit making a loan priced off LIBOR would purchase funds from the LIBOR-based pool, while one making loans priced off T-bills or prime would purchase funds from the T-bill based pool.

### ***Funds Transfer Pricing and Prepayment Risk***

Perhaps a more serious issue is that multiple-rate,

matched-maturity pools do not insulate business units against prepayment risk. Most bank loans can be prepaid by the borrower at will, and such prepayments usually adversely affect a business unit operating under a multiple-rate, matched-maturity funds transfer system. For example, assume a business unit generates a three-year, fixed-rate loan and funds the loan by purchasing funds from the three-year pool. After one year, interest rates decline and the borrower prepays the loan. The business unit no longer has an asset but still retains a liability with two years of life left. Because rates have fallen, even if the business unit can generate a two-year asset to utilize the funds, it will probably be adversely affected since the new, two-year loan rate will be substantially below the year-ago, three-year loan rate.

Economists have long recognized that loans subject to prepayment are conceptually equivalent to a term loan containing an embedded call option. That is, the borrower in effect has a call option, which allows him to purchase the loan back from the bank at any

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time before it matures. If the borrower is long (owns) the embedded call option, then the bank must be short the call option. Banks are beginning to use this conceptual approach in their funds transfer pricing systems, to ensure that customers are charged for these embedded options and that the treasury is aware of the extent of the bank's exposure. This is accomplished by requiring the business unit to purchase a long call option (equivalent in value to the short call option granted to the borrower) from the treasury when the loan is funded through the funds transfer pool. In effect, the business unit is now hedged against prepayment risk, because it is short a call option on the loan to the customer and long a call option on the loan to the treasury. The treasury in turn is now short a call option on the loan, and these individual call options accumulate at the treasury level. The treasury

Table 1  
*The Effect of Allocating Equity to Assets*

Lines of Business	Assets	Deposits	Equity	Earnings	Return on Equity
Commercial Lending	\$ 900	\$ 100	\$72	\$ 5	6.94%
Consumer Deposits	\$ 100	\$ 900	\$ 8	\$ 5	62.50%
Bank	\$1,000	\$1,000	\$80	\$10	12.50%

then has the responsibility to hedge this aggregated exposure to prepayment risk. Moreover, by charging the business unit for the implicit embedded option, the treasury encourages the business unit in turn to charge the customer an appropriate premium for the prepayment risk borne by the bank.

### *III. Allocation of Capital and Creation of Risk-Adjusted Hurdle Rates*

Most banks moved quickly to develop measurement systems that would permit them to construct income statements by line of business, but the development of business balance sheets was delayed. Construction of complete balance sheets required the allocation of equity capital to each line of business, and until the late 1980s most banks either did not allocate capital or allocated it on an undifferentiated basis according to the amount of assets employed. While the construction of income statements permitted banks to measure the contribution of businesses in dollar terms, it did not permit them to do so relative to the capital resources consumed by the business or the risk incurred.

Gradually, however, banks came to recognize the need to allocate capital on a risk-adjusted basis. In part this was the result of regulatory initiatives that imposed risk-driven capital requirements on a bankwide basis, but also banks came to realize that businesses with few assets, such as transactions-processing businesses, can be significant users of capital. Failure to allocate capital based on the amount of risk involved can lead to serious performance measurement errors. This is illustrated in Table 1, which compares the return on equity for two lines of business. The commercial lending business generates \$9 in assets for every \$1 in liabilities, whereas the consumer deposit business generates \$9 in deposits for every \$1 in assets. Both businesses have the same total amount of footings, defined as the sum of deposits and loans, and the

same after-tax earnings. If, however, equity capital is allocated to each business solely on the basis of assets, then the return on equity for the consumer deposit business far exceeds that for the commercial lending business. Although businesses with few assets may not incur much credit risk, they often generate substantial prepayment and operational risk.

While there are sound conceptual reasons for allocating equity capital to individual businesses, implementation of such a scheme is problematic. One solution is to allocate equity on the same basis as bankwide regulatory requirements. But the regulatory guidelines assign capital on the basis of asset category and thus are biased in favor of businesses that are not asset intensive, such as branch banking or mortgage

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servicing. Moreover, the regulatory guidelines assign equity on the basis of exposure to credit or counterparty risk and ignore other forms of risk such as market, operations, prepayment, and general business risk. Furthermore, while directionally correct, the regulatory guidelines may not accurately reflect the equity capital the market would require for an investment of similar risk. For example, the regulatory guidelines assign an 8 percent Tier 1 capital requirement to credit card assets, but based on the average

equity capital of a sample of specialized credit card banks, the market-based capital requirement for credit card portfolios is closer to 11 percent (Nash and Sinkey 1997). Finally, the regulatory guidelines implicitly assume that the returns on assets are perfectly positively correlated, and they do not take into account the effect of diversification in reducing bank-wide risk.

One alternative to regulatory requirements is to base capital allocations on the capital structure of independent, "pure-play" peers.<sup>3</sup> To do so, a bank would construct a group of publicly traded peers and allocate capital according to the capital ratios of the peer group. For example, the mortgage banking business would be assigned equity as though it were an independent, publicly traded mortgage banker. While such market-based proxies are preferable to regulatory guidelines, they present several methodological problems. The number of independent, publicly

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traded peers may be small, and these peers may differ in important respects from the business being analyzed. Even if a sufficient number of publicly traded peers exist, their capital ratios may differ significantly, so that management must choose among a possible range of capital allocations rather than a closely clustered point estimate. Moreover, the "pure-play" approach does not take into account covariances in returns across different lines of business. To the extent that the returns of the various lines of business are less than perfectly positively correlated, then the overall risk of the bank will be less than the sum of the risks of the individual businesses.

Initially, most banks designated a single bank-wide hurdle rate as the appropriate measure against

which to compare business return on equity. Usually this bankwide hurdle rate equaled management's objective for return on equity for the bank as a whole. Over time, however, banks began to recognize that a single bankwide hurdle rate discriminated against low-risk businesses and in favor of high-risk ones. Low-risk businesses would have difficulty in meeting a bankwide hurdle rate, while high-risk businesses would not. If resources and strategic decisions were based at least in part on the return on equity of the business relative to the bankwide hurdle rates, the high-risk businesses would receive a disproportionate share of the resources, and over time the portfolio of the bank would shift to include a higher proportion of high-risk businesses. Such a result would be especially pernicious if the high-risk businesses, while exceeding the bankwide hurdle rate, were not earning returns comparable to those of their stand-alone peers. Indeed, one could argue that the real estate lending crisis of the late 1980s was exacerbated by the application of unitary bankwide hurdle rates that led banks to expand commercial real estate lending in the mistaken belief that this line of business offered attractive returns relative to the then-current bankwide hurdle rates.

As banks recognized that their businesses varied in their riskiness, and therefore in the amount of capital allocated to them, they began to apply hurdle rates that reflected differences in business risk. Increasingly banks are moving away from a single bankwide hurdle rate to specific rates for each line of business, based on the perceived riskiness. Some banks have resisted using differentiated hurdle rates, arguing that allocating different amounts of capital adequately addresses differences in risk. This argument fails to distinguish between the different roles of capital for creditors and for investors. To creditors, capital is a shield that protects them against losses. As the risk of loss increases, creditors will demand higher proportions of capital to protect themselves against losses. The capital allocation process addresses this need for additional capital to offset differences in perceived risk. Investors, on the other hand, view equity capital as a scarce resource to be invested where the risk-adjusted returns are highest. Investors in riskier businesses require higher returns to offset greater uncertainty regarding expected returns. Thus, allocating different amounts of capital addresses the concerns of debtholders, depositors, and regulators, while applying differentiated hurdle rates addresses the desire of shareholders to be adequately compensated for the risks borne.

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<sup>3</sup> For a review of the issues connected with the allocation of capital to lines of business, see Kimball (1993) and Payant (1996).



For banks using risk-adjusted hurdle rates, the bankwide target return on equity is a weighted average of the risk-adjusted hurdle rates for each of the individual businesses, where the weights are the dollar amounts of capital assigned to each business. Thus, the hurdle rate of a high-risk business will be substantially above the bank's overall return on earnings (ROE) target, while the hurdle rate of a low-risk business will be substantially below the overall target. Risk-based hurdle rates tend to tilt the bank's strategic decisions away from higher-risk businesses and toward lower-risk ones. Because higher-risk businesses receive both greater capital allocations and higher hurdle rates, the earnings required to meet their hurdle ROE are substantially greater than those of a low-risk business of comparable size.<sup>4</sup>

#### ***IV. Profitability Measurement***

While funds transfer pricing systems were a great step forward, both in disaggregating the net interest margin and in identifying and managing bank exposure to interest rate risk, they are not sufficient in and of themselves to calculate organizational profitability. Much additional work needed to be done, especially in the area of expense allocation, before credible profitability reports by line of business could be obtained. Beginning in the early 1980s, application of new cost accounting methodologies, often called activity-based accounting, permitted banks both to better understand the forces driving their costs and to allocate these costs to their sources.

Traditionally, cost allocation systems have been based on either organizational units or the hierarchy of cost centers that is called the general ledger. Costs allocated to cost centers in turn are allocated to organizations, products, customers, markets, or distribution systems. A drawback to such approaches is that they provide little information about the relationship of revenues and expenses, since it is rarely possible to trace the marginal expenses associated with an increase in volume across different organizational units.

The innovation of activity-based costing was to build cost allocation systems not around a hierarchy of organizational units or the general ledger chart of accounts, but around business processes. A business

process consists of all of the activities associated with a particular customer interaction. For example, the business process of loan origination includes completion of the application, credit checks, pricing of the loan, and preparation and mailing of the loan documentation. A business process can be completed within an individual organizational unit, but more frequently it will involve several, each responsible for some subset of activities. By concentrating on business processes and their constituent activities, management accountants have been able to develop a much clearer view of the relationship between transactions volumes and incremental costs.

Moreover, because activity-based costing encourages management to focus on complete business processes, increasingly they are taking a broader, cross-organizational view of expense management. Previously, in part because they lacked an understanding of business process cost dynamics, and in part because they could affect only the expenses under their direct control, managers tended to focus only on the marginal expense savings they could achieve within their own organizational units. By focusing on complete business processes, activity-based costing has highlighted opportunities for substantial expense

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reductions that occur through the reengineering of the entire business process rather than incremental improvements to its constituent parts.

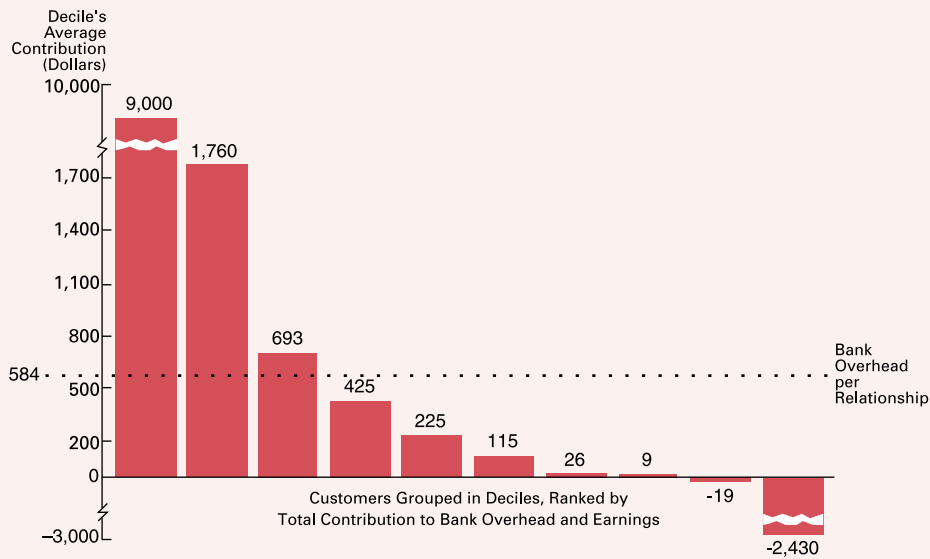
Activity-based costing systems have been particularly effective in addressing the issue of shared costs. Shared costs are prevalent in banking because business units often share products or distribution channels. For example, while branches are viewed primarily as serving consumers, they also service small and even medium-sized corporate customers for such products as coin and currency. Similarly, a revolving loan system may service both the credit card and the home equity products. While the costs of such facili-

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<sup>4</sup> For a case study of the allocation of capital and the calculation of risk-adjusted returns by line of business, see Zaik, Walter, Kelling, and James (1996).

Figure 2

*Middle-Market Customer Profitability at a Texas Bank*



Source: Gemini Consulting.

ties and systems obviously should be allocated among their users, it is not at all easy to do so in a way that is both economically rational and perceived as just by the managers affected.

Activity-based costing, with its emphasis on understanding the business process and the activities that constitute it, made it possible to reduce the proportion of shared costs treated as overhead and instead allocate such costs to the products or customers responsible for generating them. For example, most banks have one cash management product which they sell to all corporate customers, whether large or small. Large customers often demand special features or product upgrades not needed by the smaller customers. Small customers, on the other hand, constitute the overwhelming number of customers. If the costs of system and product upgrades are allocated out to the businesses on the basis of the number of customers using the system, as is common in many banks, then the small corporate business will bear most of the costs of upgrading the cash management product, even though most of its customers will never need or use the new product features. Under an activity-based costing system, the cost of the product

upgrades would be allocated to the organizational unit requesting them.

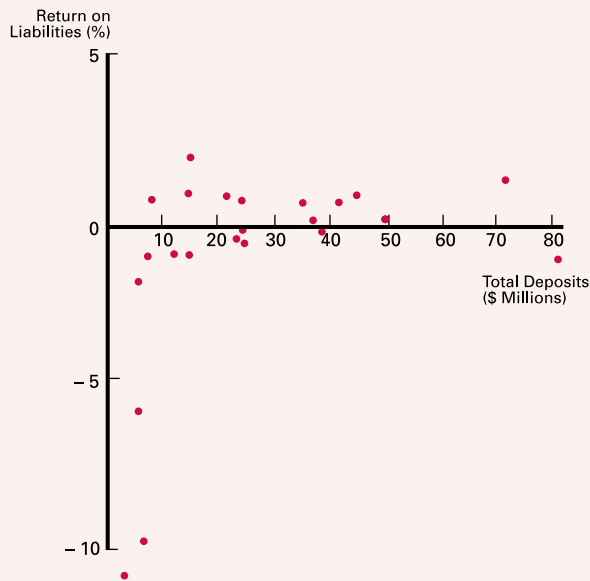
Despite the difficulties experienced in allocating costs, most banks have persevered to build systems that permit them not only to calculate profitability by line of business, but also to measure profitability of customers, products, and distribution channels. When they did so, dramatic and important insights began to emerge.

One of the most important insights was the vast differences among customers in their profitability to the bank. Figure 2 shows the middle-market corporate customers of a Texas bank, grouped into deciles on the basis of their profitability to the bank.<sup>5</sup> For example, the 10 percent of the customers that were most profitable were grouped in decile 1, the second 10 percent in decile 2, and so on. As can be seen from Figure 2, only 30 percent of the customers were profitable or broke even for the bank, and the profits from these customers were more than twice the profits of the whole business unit. Moreover, similar results seemed

<sup>5</sup> Profitability is defined here as pre-tax contribution towards overhead and earnings.

Figure 3

*Branch Profitability at a Midwest Bank*



to appear no matter which customer group was being analyzed. Although the “80/20” rule had long been known to marketers, somehow it came as a shock to many banks. The finding has caused many banks to realign service levels and product pricing to better match the revenues and expenses generated by different customer groups, and to analyze customers to understand the sources of these differences in profitability.

Analyses of branch profitability generate similar valuable insights. Figure 3, for example, shows the profitability of individual branches of a Midwest bank arrayed by the amount of branch liabilities. Clearly, branch profitability would appear to be a function of size, with small branches experiencing substantial losses. Many of the expenses associated with running a branch are either fixed or quasi-fixed in nature, such as occupancy, utilities, and minimum staffing levels. Revenues, on the other hand, are highly positively correlated with footings (the sum of deposits and loans), so that profitability is very sensitive to changes in branch footings. Such insights contributed to the

decisions of many banks to undertake acquisitions, since such acquisitions permitted banks to consolidate branches with overlapping service areas and obtain economies of scale at the branch level.

Although analyses of customer, product, and channel profitability yield extremely valuable insights, many of the strategic issues faced by banks can be analyzed only in a dynamic context. For example, what would be the increase in noninterest expense resulting from a major acquisition? Table 2 addresses this question for the branch-based retail business of a money center bank. As shown in the table, the percentage increase in noninterest expense associated with a 25 percent increase in volumes will differ by activity, but is consistently less than the increase in volumes, indicating substantial economies of scale in all activities.<sup>6</sup> In particular, strong economies of scale exist with respect to the systems and support/overhead areas. Overall, noninterest expense will increase by only 10 percent.

Like Figure 3, Table 2 can be used to explain the decision of many banks to expand through acquisitions. If the acquired bank had overlapping distribution systems and the same cost structure as the acquiring bank, then Table 2 would indicate that approximately 60 percent of the noninterest expense of the acquired bank could be eliminated after a merger. Indeed, analyses such as those shown in Table 2 are valuable, not just because they indicate the existence of potential economies of scale, but also because they indicate the source of such economies. As a result, such analyses are often used by banks to set specific goals, by organizational unit, for expense reductions resulting from mergers and consolidations.

### V. Unresolved Issues in Bank Performance Measurement

While great progress has been made in measuring performance on a risk-adjusted basis for both individual lines of business and the bank as a whole, several major issues remain. Some of these issues result from intractable conceptual problems, while others require substantial investments that banks have not yet been prepared to make. These unresolved issues include

<sup>6</sup> Academic studies using cross-sectional bankwide data have failed to find significant economies of scale except at the smallest banks. Managers and consultants, using internal data organized by line of business, have argued that such economies of scale exist and are significant. For the academic point of view, see Humphrey (1985). For the opposing view, see McCoy, Frieder, and Hedges (1994, p. 217).

Table 2

*Volume Relationships*

Percent Increase in Noninterest Expense Resulting from a 25 Percent Increase in Volumes in the Branch-Based Retail Business of a Money Center Bank

Function	Branches	Operations	Systems	Support/Overhead	Total
Marketing	7	—	—	—	7
Sales	11	11	2	—	7
Transactions Processing	18	15	2	—	15
Account Maintenance	—	13	3	—	11
Customer Service	11	5	2	—	10
Support/Management	6	1	—	4	5
Total	12	12	2	4	10

Source: Gemini Consulting.

the “adding up” problem of bank capital, the calculation of credit risk premiums for individual borrowers, and the valuation of products and customer relationships.

*The “Adding Up” Problem and Bank Capital*

One important issue concerns the allocation of capital. As discussed above in Section III, most banks are moving to allocate capital on a risk-adjusted basis to individual lines of business. A problem arises, however, when such individual business allocations of capital do not aggregate to the total equity capital held by the bank. Indeed, in most cases the individual allocations aggregate to a number substantially higher than the bank’s actual equity. This difference between the aggregated individual allocations and actual bankwide capital is known as the “adding up” problem.

The source of the “adding up” problem is well understood, although a solution is not. Capital allocations are usually based on regulatory requirements or on publicly traded, “pure play” comparables. If one attempts to calculate the required capital of the bank by adding the allocated capital of the individual businesses, then one is making the implicit assumption that the risks of each of the individual businesses are perfectly positively correlated. Instead, it is more realistic to conceive of a bank as a portfolio of businesses, with the risks of the businesses being positively but imperfectly correlated. In such a case, the overall risk of the bank will be reduced by the imperfect correlation of the individual business risks, and the required capital of the bank will be less than the sum of the capital allocations of the individual busi-

nesses. In effect, the required capital of the bank is reduced as a result of diversification across multiple lines of businesses, a fact recognized by both regulators and the capital markets.

The discrepancy between the sum of market-based capital allocations and actual capital creates obstacles to evaluating businesses and their managers. Ultimately, the larger the capital allocation, the more difficult it is for a line of business to earn sufficient profits to meet its required hurdle rate for return on equity. If capital allocations to individual businesses exceed the actual capital of the bank, then managers may believe that this “ghost capital” unfairly biases downward the reported return on equity of each business. The excess allocated capital can also create strategic issues, since theoretically it would be possible for each line of business to fail to earn its required hurdle return on equity, but for the bank to surpass its required hurdle return on equity based on actual capital. In extreme cases, a bank might choose to exit a business based on an insufficient return on equity earned on allocated capital, when the return on equity on actual capital might be quite satisfactory.

The simplest way to address this problem is to allocate capital to each business using a stand-alone, market-based method and then adjust the allocations to reflect the actual (or optimal) capital of the bank. For example, if the sum of the capital allocations exceeds the actual capital of the bank by 33 percent, then the allocation to each line of business is reduced by 25 percent to bring the sum of the allocations into line with actual capital. However, this approach has conceptual drawbacks, especially if the return on equity calculated using capital allocated in this fashion is to be used to evaluate the desirability of entering or

exiting a particular line of business.

To see this, it is necessary to distinguish between the amount of risk capital required as a stand-alone business and the marginal risk capital required by a business if it is added to or deleted from a portfolio of businesses.<sup>7</sup> The marginal risk capital required by a line of business is the addition to (reduction in) capital required if that line of business were to be added to (deleted from) a portfolio of other businesses. This can be computed by calculating the risk capital required for the bank without this line of business and then calculating it again including the business.<sup>8</sup> Because this marginal risk capital, rather than stand-alone risk capital, represents the cost to the bank's shareholders of entering the business, it should be used for making marginal investment decisions.

Unless the returns on the various lines of business are perfectly positively correlated, the marginal risk capital required for each business will be less than the

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*Even if the stand-alone risk capital requirements of each bank business are scaled down to match the actual (optimal) capital of the bank, they will still exceed the marginal risk requirements for each line of business.*

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amount of capital required if the business were free-standing. In effect, the businesses in the portfolio coinsure one another, reducing the amount of external equity capital required. However, a problem arises because the sum of the marginal risk capital requirements will also be less than the risk capital required by the bank, even when the latter is calculated taking into account the correlations in return among the businesses. That is, the sum of the risk capital requirements calculated for each business on a stand-alone

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<sup>7</sup> For a discussion of the conceptual difficulties in allocating risk capital, see Merton and Perold (1995).

<sup>8</sup> While conceptually it is easy to calculate marginal risk capital, in practice it is extremely difficult. To do so requires extensive historical data on returns for each line of business so that correlations among them can be calculated. Because of mergers, acquisitions, divestitures, and reorganizations, such data do not exist for most banks.

basis is greater than the risk capital requirement for the bank calculated as a portfolio of imperfectly correlated businesses, which in turn is greater than the aggregated marginal risk capital required for each business. Thus, even if the stand-alone risk capital requirements are scaled down to match the actual (optimal) capital of the bank, they will still exceed the marginal risk requirements for each line of business.

The discrepancy between the sum of the marginal capital required and the bankwide risk capital required creates a conundrum. If the bank allocates all of its capital to the lines of business, then these businesses will report a lower return on equity than if marginal risk capital is allocated. New lines of business will also appear less attractive if evaluated on the basis of scaled-down, stand-alone capital rather than marginal capital. Thus, the bank will tend to exit more businesses and enter fewer new ones than if marginal capital is used. Moreover, as the bank exits businesses, the reductions in risk capital for the bank will be less than the capital allocated to the line of business.

However, if the bank proceeds to allocate capital based on marginal risk capital requirements, it will result in residual capital not being allocated to any line of business.<sup>9</sup> While the return on equity calculated for each line of business will be higher if risk capital is allocated on a marginal basis, and the bank will thus be less likely to exit viable existing business and more likely to enter new ones, the return on equity for the bank as a whole will no longer be the weighted sum of the returns on equity for each line of business, where the weights are the proportion of bank capital allocated to each business. Indeed, under a marginal capital allocation scheme, it would be possible for the return on equity for each line of business to match or exceed its hurdle rate, but for the bank as a whole to fall short.<sup>10</sup>

Today, there is no widely accepted solution for this problem. Banks that allocate capital to lines of business employ a variety of methodologies, and an individual bank may employ more than one methodology. Moreover, the lack of consistent historical data on line-of-business ROEs makes it difficult if not impossible to calculate covariances across businesses. As a result, few banks have the data base needed to tackle the "adding up" problem.

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<sup>9</sup> This unallocated capital is not excess but is required to protect depositors and creditors against the positive correlation of returns on the individual businesses.

<sup>10</sup> A useful analogy is to a firm that sets its prices based on marginal costs. If it does so it will maximize profit, but there is no guarantee that the profit will be great enough to cover its fixed costs.

### *Calculating Credit Risk Premiums*

Another important and unresolved issue is how to calculate credit risk on a more objective basis. While the trend is towards centralizing the management of risk in the treasury function, the exception to this general trend is credit risk, in part because no analytical algorithm exists that permits a subjective assessment of risk to be translated into a quantitative risk premium.

In all banks the loan approval process involves the analysis of the borrower and the assignment of a credit risk rating. The analysis often involves a financial analysis, comparison with peers, and an analysis of the applicant's competitive situation and quality of management. This analysis is sometimes performed by an individual and reviewed by the credit function

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*Another important and unresolved issue is how to calculate credit risk on a more objective basis.*

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or, alternatively, performed by a committee. The resulting customer-risk rating is usually on an 8- to 10-point scale, with higher ratings indicating an increasing risk of default. This numerical risk rating is then used to determine the expected loan loss provision attached to the loan. Banks use a variety of methods to determine the size of the provision, but two of the most common are based on historical average charge-offs and peer group comparisons. Many banks use a two-dimensional grid that shows expected loan loss provisions (as a percentage of the amount outstanding) as a function of the customer's risk rating and industry.<sup>11</sup>

This loan approval and pricing process is subject to two conceptual problems. First, the assignment of a risk rating is highly subjective. To the extent that errors in assignment occur, they will result in either a too high or a too low risk premium being charged the customer. Second, the concept of the "grid" often has serious methodological problems. Ideally a larger grid would be more efficient than a smaller one in discriminating among risks. However, the larger the grid, the

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<sup>11</sup> See The Globecon Group, Ltd. (1995, pp. 189–200).

fewer the observations in each cell and the less likely the risk premium based on historical information is a good estimate of future loss experience. Banks need a more objective way to measure and price credit risk that is not based on the subjective assessment of individuals, however experienced.

Bankers, regulators, and academics are currently struggling with this issue, and no consensus has emerged as to the best approach. One line of attack has been to apply value-at-risk (VAR) methodologies to calculate the maximum potential loss associated with default.<sup>12</sup> This maximum potential loss is then used to allocate capital to the asset. In turn, the amount of allocated capital and the hurdle rate required on the capital are used as inputs to compute the risk premium.

Another possible line of attack is to use embedded options to price the credit risk. Economists have long recognized that a lender holding (long) a risky loan can be viewed as being long a riskless loan and short a put on the assets of the borrowing firm, where the exercise price of the put is the face value of the loan (see Merton 1974). Intuitively, the firm's equity holders are long a put on the assets of the firm. If at the end of the period when the loan is due, the value of the assets exceeds the amount of the loan, the loan will be paid off and the equity holders will maintain their ownership position. On the other hand, if the value of the assets is less than the amount owed, the equity holders will default and the bank will assume the assets, in the process experiencing a loss equal to the shortfall in the assets. In effect, the equity holders are long a put and by defaulting can force the bank to purchase the assets of the firm for the face value of the loan.

In this embedded option approach, the risk premium on the loan is equivalent in value to the short put position held by the bank. Unfortunately, little progress has been made in actually being able to calculate the value of the short put. Sufficient income statement and balance sheet data to calculate the value of the short put are not available, although application of simulation methodologies may prove useful in this regard.

### *Valuing Products and Customer Relationships*

Banks have made a good deal of progress in measuring the profitability of individual customers, but most do so only over a limited time horizon.

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<sup>12</sup> For a review of the VAR approach, see Simons (1996).

Table 3  
*Present Value Approach to Product Profitability*  
 Example: 5-Year Certificate of Deposit

	Year					
	0	1	2	3	4	5
Account Acquisition <sup>a</sup>	(\$ 275.00)	—	—	—	—	—
CD Issuance <sup>a</sup>	(5.15)	—	—	—	—	—
Interest Payments <sup>b</sup>	—	(17.08)	(17.08)	(17.08)	(17.08)	(17.08)
Annual Account Maintenance <sup>a</sup>	—	(6.78)	(6.78)	(6.78)	(6.78)	(6.78)
CD Redeemed <sup>a</sup>	—	—	—	—	—	(4.54)
Total Noninterest Expense	(280.15)	(22.86)	(22.86)	(22.86)	(22.86)	(28.40)
Net Interest Revenue <sup>c</sup>	—	180.00	180.00	180.00	180.00	180.00
Cash Flow Before Taxes	(280.15)	156.14	156.14	156.14	156.14	151.60
Taxes <sup>d</sup>	112.06	(62.46)	(62.46)	(62.46)	(62.46)	(60.64)
Net Cash Flow	(168.09)	93.68	93.68	93.68	93.68	90.96
Present Value of Cash Flow	(168.09)	81.46	70.83	61.60	53.56	45.22
Net Present Value <sup>e</sup>	\$ 144.58					

<sup>a</sup>Author's assumption.

<sup>b</sup>Assumes four quarterly interest payments per year at a cost of \$4.27 per transaction.

<sup>c</sup>Assumes an account balance of \$12,000 and net interest margin of 1.5 percent.

<sup>d</sup>Assumes a tax rate of 40 percent.

<sup>e</sup>Assumes a discount rate of 15 percent.

Source: Board of Governors of the Federal Reserve System, *Functional Cost Analysis: 1995, Commercial Banks*.

Perhaps because organizational profitability is usually measured on an annual basis, banks have tended to measure customer profitability based on the difference between revenues and expenses occurring within a limited period, usually a year. Yet many bank products, and thus many customer relationships, have multiyear lives with positive and negative cash flows being generated over several years. Thus, a “snapshot” approach to customer or product profitability may substantially over- or underestimate true profitability, depending on when in the customer or product life cycle the “snapshot” is taken.

For example, a five-year certificate of deposit involves substantial origination costs in the first year and significantly smaller servicing costs in subsequent years. Depending on when in the year the account is originated, net interest income may be relatively small in the first year and substantially greater in succeeding years. The true economic profit of the CD is not the revenues less the expenses in any one year, but the present value of the positive and negative cash flows generated over its life.

Because many banks calculate customer profitability as the sum of a bundle of “snapshot” product profitability reports, they tend to misestimate the value of customers. In particular, as banks increase

marketing expenditures and customers become more inured to marketing messages, the cost of acquiring new customers has been rising. If customer profitability is calculated as the sum of product cash flows, then the resulting calculation will neglect the costs of customer acquisition and will result in an overestimate of customer profitability. Moreover, by failing to include the customer acquisition costs, the importance of customer retention is underestimated.

Table 3 uses stylized data from the Federal Reserve’s Functional Cost Analysis to illustrate the net present value approach to product profitability for a five-year, \$12,000 certificate of deposit. As shown in the table, the CD has a negative cash flow at origination of \$168.09, due primarily to the substantial costs associated with account acquisition. In subsequent years, the cash flows become positive as net interest income exceeds the costs of account maintenance and crediting interest. If these positive and negative cash flows are discounted to the present, the net present value of the CD to the bank is a positive \$144.58.

The net present value approach has the advantage of highlighting key factors that determine profitability. In Table 3, for example, it is clear that the key non-interest expense item is the cost of account acqui-

sition. Any decrease in account acquisition costs will increase the pre-tax, net present value of the account to the bank by an equal amount. Similarly, the net present value approach lends itself to simulations to compare changes in key variables. For example, a decrease in account acquisition costs of \$10 will increase after-tax net present value by \$6, while an increase in the net interest margin of 10 basis points will increase the net present value by \$24.12.

Instead of treating customer profitability as an aggregated bundle of product profitability reports, banks need to move to a capital budgeting framework, where both positive and negative cash flows are generated over the course of the relationship and the value of the customer is the present value of those cash flows. Only by so doing can the bank understand the true value of the customer and accurately evaluate programs designed to acquire new customers or retain old ones.

## VI. Conclusion

Over the past 30 years the organizational structure of large banks has evolved into a collection of

focused and semiautonomous lines of business, each with a different product, customer, distribution, or geographic mandate. This decentralized organizational structure has created issues concerning performance measurement, risk management, and resource allocation. As these issues emerged and gained urgency, banks found they needed new ways to measure and evaluate the performance of different lines of business. In response, bank management accountants have developed and introduced a number of innovative solutions to such problems as how to value the transfer of funds among lines of business, how to assign capital allocation and hurdle rates to businesses that differ in riskiness, and how to account for shared costs. While much remains to be done, banks have made great progress in understanding both where and how they make money, as well as the potential risks involved. As a result of these innovations in management accounting, banks have been successful in creating risk-based performance standards for lines of business, so as to avoid the misallocation of resources to risky businesses that appear superficially attractive. Thus, the less than flattering stereotype of the bank cost accountant is undeserved. Of course auditors are another matter completely.

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