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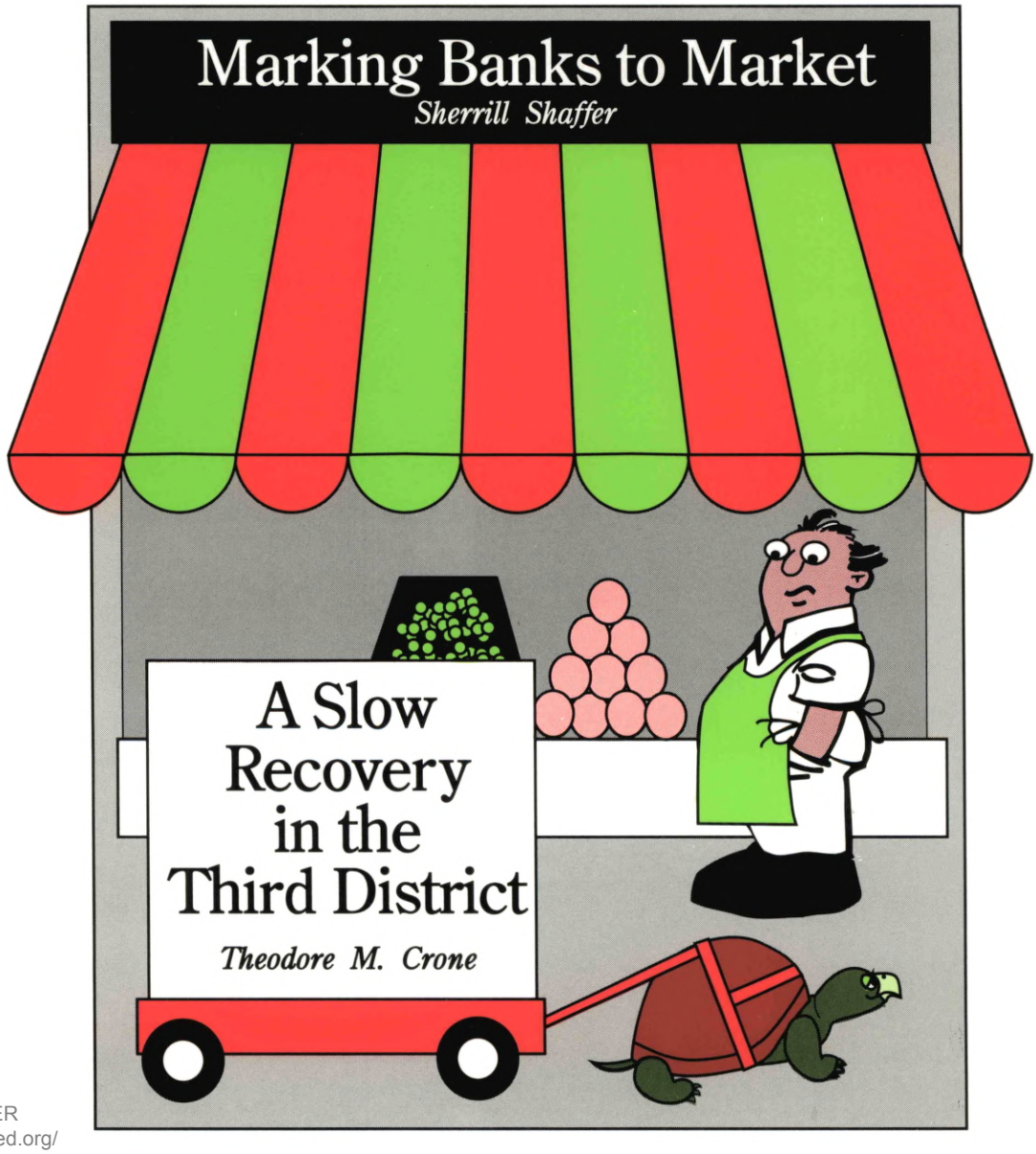

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A Slow Recovery in the Third District: Evidence From New Time-Series Models

*Theodore M. Crone**

A state budget director wants to know how much income tax revenue will be collected in the coming fiscal year. A department store manager wants to know whether sales will increase next quarter. A plumbing contractor wants to know how many new houses will be built in the spring and summer. Each of these persons will rely on some implicit or explicit forecast to make decisions about spending, inventory, or employment levels. Sometimes the forecast will be based on private information or just "gut feelings"; at other times it will be based on a more formal statistical model. In either case, the value of the forecast will depend on how accurate and how relevant it is. For example, if personal income is likely to vary significantly from the forecast or if the forecast is only for income at the national level, the budget director may not be able to accurately predict income tax revenue. And she may not know whether to recommend a reduction in spending in order to balance the state's budget.

The need for accurate forecasts of regional economic conditions has spurred the development of forecasting models for individual states. Recently, separate models have been developed for each of the states in the Third Federal

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Reserve District—Pennsylvania, New Jersey, and Delaware. These models are based on time-series techniques and are currently forecasting a slow and gradual recovery from the recent recession.

TIME-SERIES MODELS DIFFER FROM EARLIER STRUCTURAL MODELS

The earliest regional forecasting models were developed in the 1960s and early 1970s and were fashioned after the national models of the day. They are often referred to as "structural models" because they are designed to capture in a set of equations the basic economic relationships or the "structure" of the regional economy.[1] Economic theory plays a critical role in the construction of these models. Theory dictates which variables are to be explained by the model (the endogenous variables) and which variables are inputs into the model but are not explained by the model (the exogenous variables). Theory also determines how the variables in the model interact. For example, as a family's income increases it will tend to spend more money, so the level of personal income should affect the level of retail sales in a region. Most of the items we buy, however, are produced and sold by many firms in nationwide, or even worldwide, markets on a competitive basis. So this increased demand for goods in a relatively small region will not necessarily put pressure on the prices of those goods and raise the general price level. On the other hand, since local manufacturers tend to use business services that are close by, an increase in manufacturing employment in a region may increase local jobs in business services. A complete structural model would consist of hundreds of equations specifying the full range of economic relationships. In practice, the small number of data series available at the state and local level severely limits the number of equations in a regional structural model.

In the 1980s several new regional forecasting models were developed applying time-series techniques (see *State Forecast Models Developed at Federal Reserve Banks*). These models differ from the more traditional structural models in their relationship to economic theory. More important for time-series models than any specific theory are the statistical regularities among economic variables. There may be a consistent pattern, for example, between personal income growth in a given quarter and the change in personal income and employment in the previous two quarters. Time-series models attempt to determine these consistent patterns from historical data and use them to forecast the future.

Even though statistical relationships form the basis of time-series models, the models are not totally divorced from economic theory. Model-builders will naturally include variables that theory suggests have some economic relationship to one another. Moreover, they sometimes impose restrictions on how certain variables may influence others. In a regional model, for example, it is often the case that past values of regional variables are not allowed to affect the current national variables. Past regional data are already contained in the national data included in most time-series models. Last quarter's employment in New Jersey, for example, is already incorporated into last quarter's national employment data, and New Jersey's employment should influence the national economy in basically the same way as employment in any other state.

Both structural and time-series models are in common use for national as well as regional forecasts. In terms of accuracy it is not clear that one has an advantage over the other. In studies that have compared time-series and structural

[1]For a brief description of some of these models, see Norman J. Glickman, *Econometric Analysis of Regional Systems* (Academic Press, 1977); and Roger Bolton, "Regional Econometric Models," *Journal of Regional Science*, 25 (1985), pp. 495-520.

State Forecast Models Developed at Federal Reserve Banks

Economists at several Federal Reserve Banks have developed state forecast models based on time-series techniques. The following is a list of articles on the major models developed over the past decade.

Amirizadeh, Hossain, and Richard M. Todd. "More Growth Ahead for Ninth District States," *Quarterly Review*, Federal Reserve Bank of Minneapolis (Fall, 1984).

Gruben, William C., and Donald W. Hayes. "Forecasting the Louisiana Economy," *Economic Review*, Federal Reserve Bank of Dallas (March, 1991).

Gruben, William C., and William T. Long III. "Forecasting the Texas Economy: Applications and Evaluation of a Systematic Multivariate Time-Series Model," *Economic Review*, Federal Reserve Bank of Dallas (January, 1988).

Gruben, William C., and William T. Long III. "The New Mexico Economy: Outlook for 1989," *Economic Review*, Federal Reserve Bank of Dallas (November, 1988).

Hoehn, James G., and James J. Balazsy. "The Ohio Economy: A Time-Series Analysis," *Economic Review*, Federal Reserve Bank of Cleveland (Third Quarter, 1985).

Hoehn, James G., William C. Gruben, and Thomas B. Fomby. "Time Series Forecasting Models of the Texas Economy: A Comparison," *Economic Review*, Federal Reserve Bank of Dallas (May, 1984).

Kuprianov, Anatoli, and William Lupoletti. "The Economic Outlook for Fifth District States in 1984: Forecasts from Vector Autoregression Models," *Economic Review*, Federal Reserve Bank of Richmond (February, 1984).

models of the national economy, neither type has been found to be consistently more accurate than the other.[2] Less rigorous comparisons have been made between time-series and structural models of regional economies, and the evidence again suggests that neither method is obviously superior.[3] Thus, the choice of which type of model to prefer will depend on the resources available and the ultimate use of the model.

Time-Series Models Have Some Advantages. The loose link between time-series models and economic theory can be an advan-

[2]Stephen K. McNees, "Forecasting Accuracy of Alternative Techniques: A Comparison of U.S. Macroeconomic Forecasts," *Journal of Business and Economic Statistics*, 4 (1986), pp. 5-15; Robert B. Litterman, "Forecasting with Bayesian Vector Autoregressions--Five Years of Experience," *Journal of Business and Economic Statistics*, 4 (1986), pp. 25-38; and Roy H. Webb, "Vector Autoregressions as a Tool for Forecast Evaluation," *Economic Review*, Federal Reserve Bank of Richmond (January/February, 1984).

[3]Paul A. Anderson, "Help for the Regional Economic Forecaster: Vector Autoregression," *Quarterly Review*, Federal Reserve Bank of Minneapolis (Summer, 1979).

tage. Even when two analysts disagree about how economic variables influence one another, both might accept the results of a time-series forecast because the models do not pretend to capture theoretical relationships. One can question the set of variables selected for a time-series model on theoretical grounds, but the historical pattern among the variables can be recognized without appealing to any economic theory.

Because time-series models do not have to account for the many relationships that define the structure of the economy, they require fewer variables than the traditional structural models. For this reason, they are better suited for state forecasts where data are limited. Typically, regional time-series forecasts contain only four to 10 variables for any individual state.

Time-series models can be estimated with a small number of variables and without the need to specify the theoretical relationships among them, and this reduces the amount of research time and computer resources needed to develop the models. As a result, economic analysts are able to develop and maintain time-series models more easily than traditional structural models.

Time-Series Models also Have Limitations. The greater accessibility of time-series models does not imply that they should always be the model of choice or that constructing them presents no difficulties.

Time-series models do not attempt to reproduce basic economic relationships, rendering them less useful than structural models in analyzing the effects of policy changes. In a structural model, exogenous policy variables, such as government spending or tax rates, directly affect other variables in the system. By generating forecasts using different assumptions about these policy variables, one can gauge how changes in policy would work their way through the economy.[4] In time-series models, there are no strictly exogenous variables, and policy variables are seldom represented in the models. Thus, the effects of policy changes are not so easily tracked.

This does not imply that time-series models are of no use for policy analysis. The baseline forecast from a time-series model implicitly assumes that policymakers will respond to any future shocks to the economy as they have in the past.[5] The time-series forecaster can, however, construct a "what if" scenario. A change in policy is likely to immediately affect some variable, such as a short-term interest rate, that is included in the model. For policy analysis, the forecaster must decide to what extent a policy change is likely to cause that variable to deviate from the baseline forecast. He can then use the model to estimate how the path of all the variables in the model would be altered as a result of the change in policy.

The development of time-series forecasting models often poses another problem. These models are susceptible to "overfitting." The problem arises when the number of explanatory variables in an equation is nearly as large as the number of observations we have on each variable. For example, we might try to predict this quarter's employment level using the past values of 30 other economic indicators for which

[4]This use of structural models for policy analysis is appropriate when analyzing small or marginal changes in some policy variable such as a tax rate. When there is a significant policy change, however, such as the introduction of a new tax, the various participants in the economy may react differently under the new policy than they would have under the old one. Since the parameters of the structural model are estimated under the old set of rules, they may tell us little about how the economy will respond to the new policy. See Robert E. Lucas, "Econometric Policy Evaluation: A Critique," *The Phillips Curve and Labor Markets*, Carnegie-Rochester Conference Series on Public Policy, 1 (1976), pp. 19-46.

[5]See Robert B. Litterman, "Forecasting and Policy Analysis with Bayesian Vector Autoregression Models," *Quarterly Review*, Federal Reserve Bank of Minneapolis (Fall, 1984).

we have only 40 quarters of data. In this case the estimated model may explain the historical data very well, but it may not be a good model for forecasting purposes. The estimated model may reflect not only the stable relationships among the variables but also those relationships that were peculiar to the period from which the data were drawn to estimate the model. When the model is then used to forecast, these temporary patterns will be projected into the future, diminishing the accuracy of the forecast.

There are several ways to overcome the overfitting problem. The models developed for the states in the Third District employ the so-called Bayesian Vector Autoregression (BVAR) method. Basically, this technique begins by limiting the weight that each explanatory variable can have on the forecast based on the model-builder's belief about how important that variable is likely to be. These initial restrictions are then gradually adjusted to improve the forecasting ability of the model. Each adjustment produces another specification of the model. After numerous adjustments, the specification that has the smallest forecast errors for a period not used in the estimation is chosen as the forecasting model. This method of choosing the final specification of the model makes it less likely that temporary patterns among the variables will be projected into the future.[6]

THE NEW MODELS FOR THE THIRD DISTRICT STATES

The selection of variables for a time-series model depends heavily on how the model is to be used and, of course, the available data. Since the new models for Pennsylvania, New Jersey, and Delaware are intended to forecast overall economic conditions in each state, three general state-level variables were included—establishment employment, personal income, and the unemployment rate. We would have included gross state product among the state variables, but the data are available only on an annual basis and are published with a long lag, rendering them of little use for forecasting purposes. Since we do not have a timely measure of gross state product, employment is often viewed as the most comprehensive measure of economic activity at the state level.[7] Personal income, the chief component of which is wages and salaries paid in the state, also reflects the general level of economic activity. And even though some components of personal income, such as rents, dividends, and interest, may be earned outside the state, they are likely to influence future economic activity in the state. The third variable of primary interest in these new models is the state unemployment rate, an indicator of the overall slack in the economy.

Besides the three variables reflecting general economic activity, the models for Pennsylvania

[6]For an excellent introduction to BVAR models and the overfitting problem, see Richard M. Todd, "Improving Economic Forecasting with Bayesian Vector Autoregression," *Quarterly Review*, Federal Reserve Bank of Minneapolis (Fall, 1984). For a more technical discussion see Thomas Doan, Robert Litterman, and Christopher Sims, "Forecasting and Conditional Projection Using Realistic Prior Distributions," *Econometric Reviews*, 3 (1984), pp. 1-100. Economists at the Dallas Fed and at the Cleveland Fed have devised a two-step method for limiting the number of explanatory variables in time-series models and thus mitigating the overfitting problem. See James G. Hoehn and James J. Balazsy, Jr., "The Ohio Economy: Using Time-Series Characteristics in Forecasting," Federal Reserve Bank of Cleveland, Working Paper 8508 (1985); and William C. Gruben and William T. Long III, *Economic Review*, Federal Reserve Bank of Dallas (January, 1988).

[7]We use nonfarm establishment employment rather than resident employment because the establishment employment series contains smaller measurement error. For smaller states like Delaware, resident employment is estimated using nonfarm establishment employment and an estimate of self-employed and agricultural workers.

and New Jersey contain two more state-level variables, and the model for Delaware contains one more (see *State-Level Variables in the Forecast Models*). Housing permits are included in the models for all three states. The residential construction industry often leads the economy over the business cycle, since the purchase of a new house generally results in the purchase of other goods, such as appliances and furniture, and relatively good data are available on housing permits. The models for Pennsylvania and New Jersey also include retail sales to reflect the strength of the consumer sector at the state level. These sales data are not available for Delaware. In each of our models any state-level variable is permitted to influence any other state-level variable.

Since the national economy plays such an important role in most state economies, several national variables are included in the models (see *National Variables in the Forecast Models*). According to common practice, the national variables are allowed to influence any of the state variables, but the state variables are not allowed to influence the national variables. The national counterparts to the five state-level variables are included in the forecast models. In addition, the models include gross domestic product and the spread between the 10-year Treasury bond yield and the federal funds rate. Gross domestic product, or the value of all goods produced in the U.S., is included because it is the most comprehensive measure of the domestic economy. The final national variable, the spread between the 10-year Treasury bond yield and the federal funds rate, reflects conditions in financial markets. Several recent studies have found that interest rate spreads contain valuable information in forecasting the national economy.[8] And the inclusion of this particular spread substantially improved the state forecasts.

Three major adjustments are made to both the national and state-level variables in the time-series models for Pennsylvania, New Jersey, and Delaware. First, all the variables except the interest rates are adjusted for seasonal variation. There is no seasonal variation in interest rates. Second, all variables expressed in dollar terms (gross domestic product, personal income, and retail sales) are in constant dollars, that is, in 1982 dollars for personal income and retail sales and in 1987 dollars for

State-Level Variables in the Forecast Models

Nonagricultural Establishment Employment
Personal Income
Unemployment Rate
Housing Permits
Retail Sales (Pennsylvania and New Jersey)

National Variables in the Forecast Models

Gross Domestic Product
Nonagricultural Establishment Employment
Personal Income
Unemployment Rate
Housing Permits
Retail Sales
Spread Between 10-Year Treasury Yield and Fed Funds Rate

[8]See Ben Bernanke, "On the Predictive Power of Interest Rates and Interest Rate Spreads," NBER Working Paper 3486 (October, 1990); and Benjamin M. Friedman and Kenneth N. Kuttner, "Why Does the Paper-Bill Spread Predict Real Economic Activity?" Federal Reserve Bank of Chicago, Working Paper Series on Macro-economic Issues 91-16 (September, 1991).

gross domestic product. Third, in estimating the models and producing forecasts, we use the log of each variable except for the unemployment rates and the interest rates.

The new models were estimated using quarterly data, and the previous four quarters of all the variables in the models were allowed to influence the forecast of each state-level variable. The final specification chosen for each model was based on how well it would have forecast the state's economy between 1981 and 1990.[9]

WHAT LIES AHEAD FOR THE THIRD DISTRICT STATES?

The overall economic condition in each state is best reflected by three variables in the new forecast models: employment, personal income, and the unemployment rate. Historical data on employment and personal income show that the recession that began on the national level in July 1990 was more severe in each of the three states in the Third District than in the nation generally. The current forecasts of employment and personal income from the new time-series models indicate that the region's economy will recover slowly from the recent recession. In fact, growth will not be rapid enough to significantly lower unemployment rates from their current levels.

The timing of the recent downturn varied from state to state in the Third District. Employment in New Jersey began to decline three years ago, in the second quarter of 1989. One year later, job levels began to fall in Pennsylvania. Delaware followed the national pattern much more closely; jobs began to decline in the third quarter of 1990. The resumption of job growth in the three states is occurring in the reverse order. Delaware seems to have entered a period of sustained job growth in the fourth quarter of 1991. Jobs in Pennsylvania also increased in the final quarter of 1991 but backtracked somewhat in the first quarter of this year. Employment was still declining in New Jersey in the first quarter of 1992 (Figure 1).

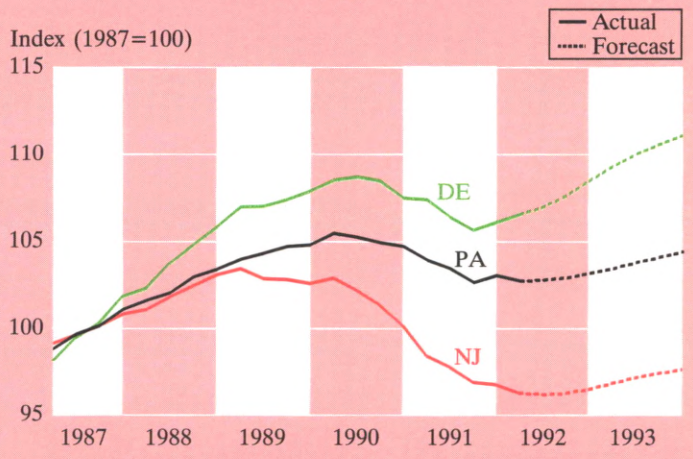
The forecasts of employment growth from the first quarter of 1992 to the first quarter of 1993 reflect this staggered timing of the recovery: Delaware's job growth over the next four quarters is projected to be greater than 2.5 percent, Pennsylvania's to be 0.7 percent, and New Jersey's only 0.6 percent.[10] These projected growth rates are well below the average first-quarter to first-quarter growth rates during the 1982 to 1990 national expansion, which ranged from 2.1 percent for Pennsylvania to 4.1 percent for Delaware. For the region as a whole, the new forecasts signal a slow, gradual recovery from the recent recession.

During the 1990-91 recession, the decline in real personal income in the region lasted for a much shorter period than the decline in employment. Real personal income fell for three consecutive quarters in Pennsylvania and New Jersey and for two consecutive quarters in Delaware. The percentage decline in each state, however, was greater than the decline at the national level. In all three states real personal income has already recovered somewhat from its recession low, and further improvement is forecasted through 1992 (Figure 2). Each state's real personal income should increase about 1 percent or more from the last quarter of 1991 through the last quarter of this year. The increase in Delaware is projected to be much greater than the increases in the other two

[9]The models are re-estimated as new data become available, and the estimates are based on the constraints imposed when the models were first developed.

[10]All the forecasts reported in this article are based on the data available May 15, 1992. At that time employment and unemployment rates were available through the first quarter of 1992. Personal income at the state level was available only through the fourth quarter of 1991.

Figure 1
Employment Growth in the Region 1987



Establishment Employment
Percent Change 1992:I to 1993:I

	Pennsylvania	New Jersey	Delaware
Model Forecast	+0.7%	+0.6%	+2.6%
Range (+/- mean absolute forecast error 1981:I to 1990:IV)	-0.2% to +1.6%	-0.1% to +1.3%	+1.0% to +4.2%

states. But each state's projected growth rate of personal income is lower than the average fourth-quarter to fourth-quarter growth rate during the 1980s' expansion, which ranged from 2.6 percent for Pennsylvania to 4.6 percent for Delaware.

These patterns of slower than average growth will keep the state unemployment rates above their prerecession levels through the first quarter of 1993. The forecasted rates for the first quarter of 1993 for Pennsylvania (7.1 percent) and for Delaware (5.0 percent) are virtually unchanged from the first-quarter 1992 rates. In New Jersey the unemployment rate is projected to decline to 6.2 percent, but this is still well above its prerecession level of less than 4 percent.

HOW ACCURATE ARE THESE FORECASTS LIKELY TO BE?

All forecasts, whether derived from structural or time-series models, are subject to error. Some indication of the possible error in these new state forecasts is available from the past performance of the models. In developing the models, we calculated the errors these models would have produced for forecasts one quarter ahead and four quarters ahead of the latest available data. The mean absolute forecast errors from 1981 through 1990 are presented in the table on page 12.

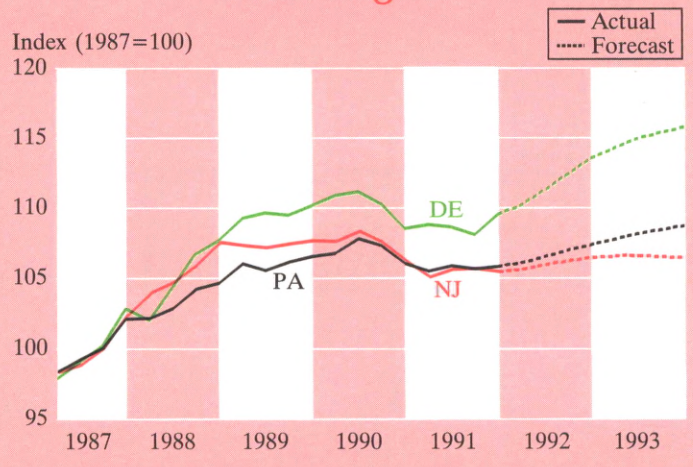
Two general patterns appear in these forecast errors. First, the errors for any particular variable become larger as the time horizon increases. The further into the future one looks, the more difficult it is to predict the course of the economy. Second, the errors are generally larger for the small state of Delaware than for the two larger states of Pennsylvania and New Jersey.

What do these historical errors imply about the current forecasts? They underscore how slow the regional recovery is likely to be. Employment in Pennsylvania and New Jersey is currently forecast to grow so slowly that the

predicted growth rates over the next four quarters are less than the average absolute forecast errors in the 1980s. In other words, given the history of the forecasts and the slow growth scenario being predicted, we cannot rule out no growth in employment in those two states for the year (see the ranges in Figure 1). This is not the most likely outcome but a possible one.

Time-Series Forecasts Should Not Be Used in Isolation. These new forecasts, like all forecasts, are not precise, and therefore they should be used with other information about the nation or the region. The models generate their own forecasts of the national variables. But it is possible to add information by substituting forecasts of national variables from other time-series or structural models. In this way several state forecasts can be derived under alternative scenarios for the national economy. Currently the new models are projecting a pattern for the national economy similar to that of the major forecasters, so the use of other national forecasts at this time would have little effect on the state forecasts.[11]

Figure 2
Real Personal Income Growth in the Region



Real Personal Income
Percent Change 1991:IV to 1992:IV

	Pennsylvania	New Jersey	Delaware
Model Forecast	+1.5%	+0.9%	+3.6%
Range (+/- mean absolute forecast error 1981:I to 1990:IV)	+0.5% to +2.5%	-0.9% to +2.7%	+1.6% to +5.6%

Historical forecast errors also suggest that econometric forecasts should not be used to the

[11]State-level forecasts were generated from the new models using DRI's forecasts for the national variables. The employment and personal income growth rates for the three states were little changed from the forecasts reported in Figures 1 and 2. The first-quarter over first-quarter employment growth estimate was reduced by 0.1 percentage point for New Jersey and Delaware and was increased by 0.1 percentage point for Pennsylvania. The fourth-quarter over fourth-quarter personal income growth estimate was increased by 0.4 percentage point for Delaware, 0.3 percentage point for Pennsylvania, and 0.1 percentage point for New Jersey. In a procedure similar to our use of the DRI forecast, researchers at the Dallas Fed used the *Blue Chip* consensus forecast of national variables in the forecasting phase of their model of the Louisiana economy. See Gruben and Hayes, *Economic Review*, Federal Reserve Bank of Dallas (March, 1991).

exclusion of other types of information about future conditions. For example, the Philadelphia Fed conducts a monthly survey of manufacturers in the District (*Business Outlook Survey*), inquiring about current business conditions and expectations for the following six months. This survey has been found to contain reliable information about the future course of the regional economy.[12] The index of current activity from the survey has recently turned positive, and expectations are still high, indicating continued improvement in manufacturing. This is consistent with the evidence from the new forecast models.

CONCLUSION

Like all tools of economic analysis, time-series models have certain advantages and limitations. They are not as useful as structural models in analyzing changes in policy. They are particularly helpful, however, in forecasting regional economies for which data are limited. The new models for the Third District states are intended to forecast general economic conditions in the region. Current forecasts suggest that a sustained but gradual recovery will be in place throughout the region in the second half of 1992. Like all forecasts, these are subject to error and should not be used to the exclusion of other information.

[12]See John Bell and Theodore Crone, "Charting the Course of the Economy: What Can Local Manufacturers Tell Us?" this *Business Review* (July/August, 1986).

Average Absolute Errors of the Forecasts

One Quarter and Four Quarters Ahead
1981:I to 1990:IV

	PA	NJ	DE
Employment Growth			
One Quarter	0.3%	0.3%	0.5%
Four Quarters	0.9%	0.7%	1.6%
Real Personal Income Growth			
One Quarter	0.5%	0.6%	0.8%
Four Quarters	1.0%	1.8%	2.0%
Unemployment Rate			
One Quarter	0.4%	0.3%	0.4%
Four Quarters	1.0%	0.6%	0.7%

Marking Banks to Market

*Sherrill Shaffer**

The concept of market value accounting (MVA) has generated heated controversy over its potential application to banks. Although many academics and some bankers agree that MVA has theoretical advantages—at least when applied outside the banking industry—other bankers have tended to resist any departure from more traditional accounting methods, citing special factors unique to banks. The issue won't go away, though: recent legislation requires federal banking regulators to develop some form of MVA for banks to use in parallel with traditional methods, and current regulations already require banks to apply MVA to their trading account securities, securities held for sale, and loans held for sale. What are the issues in extending the use of MVA to the rest of the bank's balance sheet, and is it possible to steer a clear course through them?

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WHY CONSIDER MARKET VALUE ACCOUNTING?

The impact of any financial decision on the true interests of a bank's owners and regulators derives from its effect on the bank's discounted net present value, which equals the difference between the discounted present value of its assets and that of its liabilities. The discounted present value of a given asset or liability, in turn, is calculated from its expected future cash flows.

MVA, also known as marking to market, is the valuation of an asset, firm, or financial portfolio according to the price for which it would sell. In an idealized world of perfectly competitive markets, perfect information, and risk-neutral buyers and sellers, the selling price would coincide with the discounted present value of the asset or portfolio. Otherwise, an investor could buy or sell the asset and profit from the difference between its price and its present value.

If each individual asset and liability were marked to market, the whole bank's market value would be known as well. However, it is usually easier to think about MVA in terms of an individual asset. For example, suppose a borrower could repay only $900 of a $1000 loan, in a lump sum after one year. If we discount future cash flows at an interest rate of 10 percent, the present value of this loan would be $900/1.10 = $818.18. This would be the price the loan could command in an idealized market,[1] since investing $818.18 today at an interest rate of 10 percent would yield $900 after a year. The loan's market value would fall if the amount repaid declines or is delayed farther into the future or if the interest rate rises. For example, if the $900 repayment occurs after two years rather than one, the present value would equal $900/$(1.10)^2$ = $743.80. If instead the interest rate rises to 12 percent and repayment occurs after one year, the present value would equal $900/1.12 = $803.57.

A contrasting approach, currently used in the commercial banking industry, is called historical cost accounting (HCA). It carries assets and liabilities on the firm's books at their original valuation or book value, even if subsequent changes in interest rates, borrowers' conditions, or other factors have altered the anticipated cash flows or present value of the assets. Adjustments are made to net out any loan loss reserve set up by the bank in anticipation of losses and to remove a bad loan from the books if it is actually charged off.

In the example above, HCA would effectively continue to value the loan at $1000 until the bank adds to its loan loss reserve or charges off some amount. If the bank had correctly anticipated the loss and previously reserved for it, then deducting the reserve from the total loan figure could approximate the impact of credit risk on the loan's market value. However, MVA and HCA would give exactly the same answer only if the bank established a reserve for the full expected present value of the loss, including forgone interest.

Whenever HCA and MVA give different answers, it becomes necessary to ask which measure more closely approximates present value. Mounting evidence points to shortcomings in HCA as a guide for either owners or regulators.

Owners' Interests. To the extent that owners use publicly reported HCA figures to evaluate managers, the latter can have some latitude—or even direct incentive—to make decisions not in the owners' best interests whenever MVA and HCA give different answers.[2]

[1]Of course, the world is not ideal, so the price at which an asset could be sold differs in many instances from its expected present value—for example, if either the buyer or seller lacks good information about the asset's future cash flows, has some monopoly power, requires some premium or additional return to accept risk, or discounts the future at a different rate from the rest of the market. In such instances it is necessary to define whether MVA will be used to mean the present value or the actual price; both definitions can be used, but here I will adopt the latter.

[2]When owners have less information than the managers hired to act on their behalf, an agency problem is said to exist. In this case managers may have an incentive to pursue their own objectives at the expense of owners. (See Mester, 1989, for a discussion of this problem within banks.) Given this problem, a natural question is why owners would evaluate managers largely on the basis of HCA if publicly available data would allow them to derive better approximations of discounted present value; evidence is mixed on

The following example describes such a practice that, despite being discouraged by regulators, was common among savings and loan associations in the 1980s (O'Brien, 1991) and even affected commercial banks in 1991 (Atkinson, 1992).

Suppose that among a bank's assets are two types of securities, each originally worth $100. Suppose further that, after a year, interest rates in the market have fallen, so that the first security can now be sold for $105. Under HCA, the increase in value will not appear on the bank's books unless the security is sold—but selling will forfeit the opportunity for owners to benefit from any further increases in its value. Selling now would improve the bank's publicly reported financial statement under HCA. If investors evaluate the performance of bank management primarily according to the accounting statements, management would have an incentive to sell the security.[3] MVA could benefit owners in this case by removing the distorted incentives.

Conversely, suppose the issuer of the second security fell on hard times and might default. The market price of the security would decline, perhaps to $95. If bank owners knew this, they might want the managers to sell the security and limit their exposure to further losses. But if managers are evaluated under HCA, they would have an incentive to gamble because the decline from $100 to $95 is not reflected on the bank's books unless the security is sold. Therefore, unless the gamble pays off, owners would benefit from MVA in this case as well.

Forms of accounting that encourage such practices are one factor underlying the decline of many bank stock prices below book value in recent decades, and permanently arresting this downward trend requires that we rectify the incentives by adopting more accurate financial reporting (Benston, 1989). MVA, properly implemented, can avoid the problem: both the increase to $105 and the decline to $95 would be reflected on the bank's books, regardless of whether the bank sold or held the securities. In this example, MVA would induce the bank's management to make whatever choices were truly in the best interest of the bank's owners, assuming sufficient competition in the banking industry and in the labor market for managers.

Even some bankers strongly opposed to MVA for regulatory use admit that "mark-to-market portfolio assessment can be a valuable internal management tool" (O'Brien, 1991). Such benefits are one reason current regulations require banks to apply MVA to those securities held in designated trading accounts (see *Recent Steps Toward MVA for Banks*, p. 16), but most bank assets and all liabilities lie outside this category.

Regulatory Concerns. Similarly, MVA could theoretically aid bank regulators. HCA can conceal the point at which a failing bank becomes insolvent, but it cannot change reality for the better; a bank that is weak or insolvent remains so whether the books reflect it or not. By the time a bank's net worth reaches zero according to HCA, it is usually negative by MVA—and market value is what the FDIC actually receives if it must liquidate the bank or orchestrate an assisted merger. (If the FDIC must liquidate the bank in the example above, it will receive only $95 from the second security

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this point, but—as described in the text—historical behavior suggests that managers tend to act in accordance with HCA rather than MVA. Moreover, Clinch and Magliolo (1991) find evidence that compensation of bank CEOs is positively related to a bank's income from certain discretionary transactions that appear beneficial under HCA but possibly not under MVA.

[3]The sale of securities accounted for the *entire increase* in aggregate bank profits from 1990 to 1991 (Atkinson, 1992). However, at least some of these sales may have been in the best interest of owners, particularly since regulators attempt to discourage the early sale of securities not in designated trading accounts, and any securities in trading accounts must be marked to market. (See *Recent Steps Toward MVA for Banks*, p. 16.)

Recent Steps Toward MVA for Banks

- For years, banks have been required to designate a separate trading account for those securities they do not intend to hold to maturity and to mark such securities to market.
- The FDIC Improvement Act of 1991 requires regulators to develop "methods for institutions to provide supplemental disclosure on estimated fair market value of assets and liabilities, to the extent feasible and practicable."
- The Federal Reserve Board's Supervisory Policy Statement on Securities Activities, developed under the auspices of the Federal Financial Institutions Examination Council, took effect in February 1992. It extends the original trading account requirements by requiring banks to report loans and securities "held for trading" at market value and loans and securities "held for sale" at the lower of cost or market value.[a] In addition, it stipulates that stripped mortgage-backed securities, residuals, and zero-coupon bonds "may only be acquired to reduce an institution's interest rate risk and must be reported in the trading account at market value, or as assets held for sale at the lower of cost or market value."
- The Financial Accounting Standards Board (FASB) is developing a proposal for MVA that would apply to banks as well as to other companies. The proposal has been deferred for further discussion but is scheduled for release during the third quarter of 1992. Other recent actions by FASB that affect banks include Statement 105, requiring disclosure of off-balance-sheet risk, and Statement 107, requiring disclosure of fair (market) value of all financial instruments.

[a]A bank must be well capitalized and have strong earnings and adequate liquidity to be permitted to maintain a trading account. Otherwise, items that do not qualify for its investment portfolio must be designated as "held for sale."

rather than the $100 at which it is valued under HCA.) HCA, by obscuring the true condition, can cause regulators to leave open a failing bank too long and so incur larger losses.[4] The fact that HCA tends to conceal weaknesses also explains why bank managers might prefer it to MVA.

Regulators have responded to this problem in part by increasing the amount of capital banks are required to hold. Capital provides a cushion before the bank becomes insolvent; but when capital itself is measured with error, a larger cushion is needed. MVA could ideally help regulators in at least three ways here.

First, by providing a more accurate measure of true net worth, it can make current capital guidelines and prompt intervention laws more effective and assist regulators in timely closure of failing banks, thereby limiting losses. Second, to the extent that some banks might need to increase their capital under MVA to meet the current minimum requirements, the additional

[4]Even if regulators have enough information to close a failing bank promptly, their actions are legally tied to officially reported capital ratios, and there may be political resistance or even legal challenges to early closure. During the 1980s, substantial losses from failed banks and thrift institutions were made worse by keeping open some institutions after their true net worth had turned negative. Recent federal legislation helps in this regard by authorizing regulators to close banks before their measured net worth actually turns negative, but a more accurate measure of net worth (such as MVA could provide) would help even more.

capital would reduce the probability of failure for those banks by providing a larger cushion to absorb losses. Finally, banks file financial statements more frequently than they are examined, so MVA can improve the timeliness of available information even if regulators have access to all the information required to mark a bank to market during an examination. All three effects would tend to reduce average losses to the federal deposit insurance fund; if the banking industry is ultimately required to bear the full cost of deposit insurance, MVA could reduce the industry's costs as well.

OBJECTIONS IN PERSPECTIVE

Given these apparent benefits of MVA, why would anyone favor HCA? In fact, bankers have raised a number of objections to MVA. Some are easily addressed, but others raise issues that may never be fully resolved.

Liquidation Value. One argument is that MVA measures the current liquidation value of a given asset, improperly incorporating "fire sale" losses and undervaluing the asset. In economic terms, this concern reflects a belief that the market for a quick, forced sale would be imperfectly competitive, so that the sale price would be less than the asset's discounted present value.

Since, as mentioned above, the information needed by owners, managers, and regulators is really the discounted present value, the most useful method of valuation from that standpoint would not incorporate "fire sale" losses. But there is a distinction between the price attainable in a quick, forced sale versus that attainable over a longer period of time. Not all market prices are the same, and problems with one do not invalidate all others. Thus, this objection is really about *implementation* of MVA, not the underlying concept.

For example, in valuing the mortgage portfolio of a large bank, one might want to use observed market prices for similar assets, rather than trying to estimate what the particular bundle could be sold for within a short deadline. Indeed, the FDIC, when it must liquidate a bank, usually sells off the assets slowly enough to receive favorable prices, rather than attempting to sell them all at once.

Volatility. Another objection is that MVA would increase the volatility of reported earnings, thereby raising a bank's total cost of capital in at least two ways. First, so the argument goes, investors in the capital market would demand a higher return to compensate them for the extra risk posed by the volatility. However, if MVA is conceptually correct, as many experts believe, net worth and retained earnings really are volatile, and HCA masks the true volatility. Either investors are being fooled under HCA, in which case we should adopt MVA even if it costs the banks more, or investors see through the smoke screen and are already pricing the risk implied by MVA, in which case a transition to MVA would not cost the banks a higher risk premium. (For an excellent discussion of this point, along with evidence from the Danish experience, see Bernard et al., 1991.)

The other way in which greater volatility could increase the cost of capital is that a bank's reported net worth could fluctuate more under MVA, forcing the bank to hold larger average amounts of capital to ensure that it never falls below the regulatory minimum requirements. But this outcome confers some offsetting benefits, since, as discussed above, higher capital ratios for banks could reduce both their likelihood of failure and the expected cost to the deposit insurance fund.

Both effects point to the fact that volatility imposes real costs. But banks have some control over their own volatility through their investment and lending decisions; therefore, if volatility is accurately measured and if the associated costs are explicitly borne by banks, then banks will have an incentive to choose less volatile portfolios than otherwise. In this respect too, MVA across the entire bank could

ideally encourage safer, sounder banking practices. By contrast, however, applying MVA only to the asset side of the bank's balance sheet, or to some but not all assets and liabilities, could overstate true volatility by failing to reflect certain hedges such as those created by matching the maturities of assets and liabilities or by using futures contracts.

Ultimate Collectibility. A third argument maintains that it is incorrect to devalue an asset on the bank's books if its market price falls today but may recover tomorrow—that is, if the asset's "ultimate collectibility" is not threatened. In terms of the previous example, the second security's price may rebound from $95 to $100 if the issuer can successfully work through its financial problems.[5]

But the initial decline to $95 reflects the market's best current information about the likely pattern of future cash flows and possibility of default. Therefore, this objection assumes, at a minimum, that an individual banker knows more about the value of an asset (including its ultimate collectibility) than the rest of the market. It further assumes that the banker will accurately reveal his unique information and that the resulting value, on average, works out to exactly the original (historical or "book") value! Clearly, that's a lot to swallow.

In fact, for those assets that are *liquid* (i.e., can be sold quickly without incurring the "fire sale" losses discussed above), an individual banker is unlikely to be better informed than the combined market. (Even if bankers are better than others in valuing financial assets, remember that the combined market includes other bankers as well. Also, any banker who *did* know more than the market could make more money by trading the assets than by being a banker.) MVA is the right approach for such assets: a decline in the market price reflects a consensus expectation that the asset's ultimate collectibility—or probable future cash flow—is indeed threatened.

On the other hand, there are certain important types of bank assets that are *illiquid* and for which an individual bank should have a better idea of the true economic value than the rest of the market. Indeed, according to some experts, the very reason why banks exist necessarily precludes any effective secondary market to price commercial loans (Diamond, 1984; Berger et al., 1991). The idea here is that because of its ongoing financial relationship with the borrower, a bank has better information about the prospects of repayment than any other party can acquire. If others could replicate the bank's information, so the story goes, there would be no point in having banks, and so financial markets would be structured very differently.[6]

A major implication of this view is that market value does not correspond reliably to present value for many bank loans, and we can never hope to close this gap beyond a certain point. This conclusion is admittedly bleak—but even if it is true, it still does not imply that HCA is the best alternative, both because it is unlikely that the true value will happen to equal the historical value and because any genuine movement in the direction of present value could improve the incentives and performance of managers and regulators.

[5]One variant of the idea would argue that a loan paid back more slowly than anticipated should not be marked down if full repayment will ultimately occur. But this is clearly wrong, since, as shown in the first example above, the timing of repayment affects the discounted present value—a dollar tomorrow is worth less than a dollar today.

[6]At least two pieces of evidence tend to support this view. First, the recent rapid growth of the commercial paper market shows that those borrowers (such as large, well-known corporations) that can shift away from bank credit have tended to do so. Second, loans to borrowers (such as small business and agricultural borrowers) that cannot easily shift to alternative sources of credit are almost never sold to third parties and thus do not generate an observable market price.

Indeed, the current practice of deducting loan loss reserves from total loans recognizes the need to make some adjustment for credit risk. The issue, then, is not whether perfect present value accounting is possible, but to what extent we can improve on current practice. This issue is one of *feasibility*.

IS MVA FEASIBLE FOR BANKS?

Since many banks are not actively traded on any market, we cannot generally use the stock price as a proxy for the market value of a bank's net worth.[7] Therefore, a careful evaluation of feasibility necessarily involves going through a bank's balance sheet category by category and requires some degree of technical detail. Such detail should never obscure the fact that the goal is to measure the one piece of information that really affects owners and regulators—the net present value of a bank's entire portfolio of assets and liabilities.

The issue, then, is not whether perfect present value accounting is possible, but to what extent we can improve on current practice.

Liabilities. For a few liabilities, such as overnight interbank loans, market value equals book value. Some others, such as large certificates of deposit, trade on active secondary markets and have an observable price. For yet others, the difference between market value and book value either is negligible or can be computed from cash flow data, as illustrated in the first example above. Two major questions affecting this computation are the effective maturity or repricing interval of deposits and unexpected changes in interest rates, since, as shown in the first example, the timing of cash flows and the level of interest rates both affect market value (see also Mengle, 1990, and Morris and Sellon, 1991, for further discussion of this issue).

For instance, demand deposits theoretically have zero maturity, since they are payable on demand. In practice, though, they behave like long maturity accounts during normal economic conditions (see Flannery and James, 1984, for evidence on this point). One might even be tempted to argue that the effective maturity is infinite, since withdrawals by any one depositor tend on average to be offset by new deposits from other sources.

Actually, the effective maturity of deposits is likely to depend on many factors that can change quickly over time, such as the bank's asset quality, net worth, the regulatory climate, deposit insurance, and the bank's overall probability of failure. If a bank weakens, its previously stable deposit base may suddenly run out the door.

More research is needed on these questions before deposits can be precisely valued. In the meantime, though, research has shown that even rough estimates of the effective maturity of deposits, based on publicly available data, can significantly improve our estimates of a

[7]Moreover, the stock price also reflects the value of mispriced deposit insurance, the implicit subsidy of a governmental policy of "too big to fail," the capitalized value of any local monopoly power exercised by the bank, and other regulatory and market distortions, not just the market value of the bank's assets minus liabilities. Therefore, even for an actively traded bank, the stock price is not an ideal measure of economic value from the standpoint of regulators or society.

depository institution's true value (Simonson and Stock, 1991).[8]

Assets. Some assets are likewise easy to mark to market, such as cash and securities (some of which are already marked to market). However, very few banks fail because of such items. The major challenge on the asset side, as noted above, is loans—especially commercial loans, which account for nearly 30 percent of bank loans or 18 percent of bank assets in aggregate (FDIC, 1990).

Because of credit risk, the present value of many loans is less than their book value. In some cases, as with LDC debt, loan sales, and securitized assets such as collateralized mortgage obligations, a secondary market exists—the loans are liquid—and we can observe a market price that should be representative of the expected present value of the particular asset. Such cases usually involve some combination of large borrowers or homogeneous risk characteristics of the assets. For assets without an observable market price, an alternative approach is required.

A Hybrid Approach for Valuing Nontraded Loans. Possibly the best current idea for the nontraded portion of the loan portfolio is to use the book value of loans net of some combination of loan loss reserves (or allowance for loan losses) and nonperforming loans (that is, loans that are past due or not being paid according to schedule) as an estimate of the market value of loans corrected for credit risk (Berger et al., 1991). Adjusting for these factors, which banks already report separately, is a way of valuing the overall loan portfolio rather than individual loans.

Federal regulators require all banks to maintain a loan loss reserve (Mengle, 1990; Walter, 1991). Bank managers add to this reserve each quarter out of current income at levels that are supposed to represent their estimate of future credit losses. In turn, when a loan defaults, that loss is subtracted both from the total loans on the bank's asset statement and from the loan loss reserve.

However, loan loss reserves may not be a good predictor of future loan losses for a given bank, especially since they are set largely at the bank's discretion and are subject to other incentives such as income or tax management goals or conformity to peer group averages (Walter, 1991).[9] Among other things, netting the reserves out of reported net worth creates an incentive for a bank to reduce its reserves relative to known risk, especially if the bank has adverse inside information.[10] Such behavior not only impairs the accuracy of the regulatory measure of market value but also directly reduces safety and soundness. Auditors and regulators monitor each bank's loan loss reserve practices to try to contain this incentive problem (Mengle, 1990), but this monitoring occurs at intervals longer than those at which a bank is required to file financial reports, and the task is essentially as hard as marking the loans themselves to market.

The amount of nonperforming loans is harder for a bank to manipulate and can be broadly verified by examiners. But nonperforming loan figures are not particularly forward-looking: some delinquent loans are subsequently

[8]A simple adjustment based on duration gaps was found to explain more than half of the variation in net worth as measured by more sophisticated techniques designed to avoid the objections raised in footnote 7.

[9]Loan loss reserves are audited by accounting firms and regulators (Mengle, 1990), but the bank retains significant latitude in adjusting their level.

[10]Even though loan loss reserves are currently deducted from reported net worth, they can be counted toward regulatory capital subject to restrictions. Under the multinational Basle Accord on Risk-Based Capital, reserves up to 1.5 percent of risk-weighted assets may be counted as Tier 2 (supplementary) capital, of which up to 10 percent may be counted as Tier 1 capital, through the end of 1992; thereafter, reserves up to 1.25 percent of risk-weighted assets may be counted as Tier 2 capital exclusively.

repaid, while others reflect only the final stages of long-standing problems.

A combination of the two approaches, using both loan loss reserves to embody some forward-looking information and nonperforming loans to reduce the incentive problem, has been shown to forecast future losses and bank failure better than either approach alone (Berger et al., 1991). It minimizes the distortion in loan loss reserves that can occur between examinations or audits and allows a more accurate measure of capital ratios, which legally circumscribe many of the regulators' permissible actions toward the bank. And it avoids the need to estimate a discounted present value for each loan individually, a very time-consuming and expensive undertaking. At a minimum, therefore, this hybrid approach may represent an improvement over pure HCA, even if it does not constitute either present value accounting or MVA in the strictest sense.

A BALANCED PERSPECTIVE

Most of the objections to MVA for banks have some merit—a few have great merit—but we must resist jumping to the attractively simple conclusion that HCA is therefore best. What can we conclude, taking account of all the necessary complications of the issue?

Perhaps the most important finding is that certain practical changes could improve on HCA by yielding measures of a bank's net worth that are closer to present value. One aspect of a better approach is to begin supplemental reporting of MVA for certain items now, while retaining HCA for "official" purposes until a large enough part of the portfolio has been marked to market. This is the approach embodied in last year's federal legislation (see *Recent Steps Toward MVA for Banks*, p. 16). It has the advantages of minimizing the disruption of the changeover, spreading the learning and transition costs over time, avoiding the distorted incentives of marking only part of the portfolio to market, and affording flexibility in the pace and direction of further changes. Another advantage of beginning with supplemental reporting is that it would give bankers and regulators a low-cost opportunity to identify and correct any unforeseen distortions to incentives embodied in the new accounting system.

For the part of a bank's loan portfolio that cannot reliably be marked to market, a hybrid valuation reflecting loan loss reserves and nonperforming loans holds promise as a better approximation of present value than HCA. Such a method could be adopted when we progress to the stage of using MVA for more official purposes and could largely solve many problems that arise from marking to market only part of the balance sheet.

A program of this sort could move in the right direction without incurring the costs of a more radical change. It could give banks' owners and managers a clearer picture of their institution's true financial condition. It could improve the information available to regulators, both by supplementing the five-category examination ratings[11] and—if implemented by the bank rather than by regulators alone—by updating market-value data on the bank more frequently than examinations are conducted. Perhaps more important, it could improve the accuracy of reported capital ratios, which limit many of the legally permissible regulatory actions toward banks. If these benefits lead to a lower cost of deposit insurance, bank owners could eventually participate in such savings.

Market value accounting for banks is a complex issue. Nevertheless, the problems engendered by historical cost accounting are severe enough to make even marginal improvements desirable. Supplementary marking to market, as required by recent federal legislation, is a useful first step.

[11]The current examination procedure rates each bank on a scale of 1 through 5, where 1 is the best rating and 5 the worst.

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