ECONOMIC PERSPECTIVES

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**Monetary policy with uncertain
estimates of potential output**

**Market value accounting
for commercial banks**

FEDERAL RESERVE BANK
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Monetary policy with uncertain estimates of potential output

Kenneth Kuttner

After years of neglect, potential output has drawn renewed attention as an input to monetary policy, appearing in a broad range of recent Federal Reserve system and academic research.[1] At one level, it is the *raison d'être* of an activist monetary policy. If potential output measures the economy's capacity to produce goods and services without adding to inflationary pressures, the goal of a stabilization policy should be to keep the economy operating as close to potential as possible.

While its significance is widely acknowledged, there is little agreement on the best measure of potential output. Until it was discontinued ten years ago, the series maintained by the Council of Economic Advisors (CEA) and published in the *Economic Report of the President* was probably the most prominent; since then, a number of competing measures have appeared. The first section of this article discusses in greater detail what it is that potential output is supposed to measure, and reviews some of the estimates in current use.

The next section discusses a new technique for estimating potential output. This method differs from existing measures by explicitly modelling potential real GNP as an unobservable variable, using data on output growth and inflation to infer its level. It also offers two significant advantages over existing measures. First, because it is defined in terms of inflation, it is not vulnerable to the structural changes in the labor market that have distorted measures

based on the unemployment rate. Second, it provides a way to calculate the uncertainty associated with the estimate, which is particularly important to policymakers charged with keeping output at or near potential. The final section of the article highlights the practical implications of this uncertainty and examines its role during the rapid expansion of 1988-89.

What is potential output?

In broadest terms, potential output is a measure of the economy's overall productive capacity, or its equilibrium level of output. In other words, potential output is supposed to summarize the state of the supply side of the economy, whose main determinants are labor, capital, and productivity. Fluctuations in these and other supply side factors—oil prices, for example—all contribute to variation in the growth of potential output through time.

In contrast to supply shocks, which affect potential as well as actual output, demand shocks alter the economy's status *relative* to potential. Examples include monetary and fiscal policy, as well as exogenous changes in consumption, investment, or demand for U.S. exports. Insufficient aggregate demand may result in a level of output at which factors of production are less than fully employed; similarly, excess aggregate demand may temporarily lift the economy above its equilibrium level

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of output. This taxonomy of shocks in terms of supply or demand suggests defining potential output as full-employment production, corresponding to the real GNP the economy would produce in the absence of demand shocks. In other words, with the economy operating near potential, labor and capital will be utilized as fully as possible, given any supply side constraints.[2]

An alternative but complementary definition of potential output exploits the link between output and inflation embodied in the aggregate supply curve. The aggregate supply function describes a positive relationship between levels of real output and the inflation rate, much as the well known Phillips Curve describes the negative correlation between the unemployment rate and inflation. However, it has long been recognized that this output-inflation tradeoff works only in the short run; that is, in the long run, the aggregate supply curve is vertical. Therefore, a stable inflation rate—one that is neither increasing nor decreasing—is possible only with output equal to potential.

This connection between potential output and a stable inflation rate inspired Arthur Okun's (1970) definition, in which potential output is the "maximum production without inflationary pressure, ... or more precisely ... the point of balance between more output and greater stability."[3] So long as there is a stable relationship between employment (or capacity utilization) and inflation, this noninflationary characterization of potential output is compatible with its definition as full-employment output. Conceptually, defining potential output in terms of stable inflation simply shifts the focus from its underlying determinants to its inflationary implications. At a practical level, the link between potential output and stable inflation provides the foundation for the potential output measure discussed in this article.

Although potential output is sometimes associated with a simple trend line fitted to real GNP, nothing in either of these alternative definitions implies that the growth rate of potential output remains constant over time. The source of this perception is that throughout much of the 1960s, a log-linear trend was widely used as a proxy for potential output. As described below, events of the 1970s demonstrated that the straight-line method was satisfactory only in the absence of any significant supply shocks. Since then, much of the research on potential output has focused on capturing the time-variation induced by aggregate supply shifts.

An aside on classical versus traditional perspectives on potential output

Not all economists agree that it makes sense to describe business cycles in terms of departures from potential output, a disagreement that surfaces in well known recent intermediate level macroeconomics textbooks. A discussion of potential GNP appears prominently in the introduction to Dornbusch and Fischer's (1990) book, whose view is consistent with the description of potential output sketched above. By contrast, the subject receives no mention at all in Barro's (1990) text.

Barro's omission of any discussion of potential GNP reflects the New Classical approach to business cycles, as embodied in the Real Business Cycle (RBC) theory pioneered by Kydland and Prescott (1982).[4] RBC theory asserts that economic fluctuations are the outcome of competitive equilibria in which wages and prices adjust rapidly to clear all markets. According to this view, supply shocks (usually labelled technology shocks) are the sole source of fluctuations in *real* economic variables, such as output and employment. Demand shocks typically affect only *nominal* variables—the aggregate price level, for instance—without affecting relative prices, real output, or employment.[5] According to the RBC view, therefore, it makes no sense to distinguish between actual and full-employment output. With output determined entirely by the supply side of the economy, potential output is simply equal to actual output.

The policy implications of RBC theory are far reaching. In these models, discretionary monetary policy can play no useful role in stabilizing the economy, as the only effect of monetary policy is on the price level. Furthermore, because the economy's fluctuations result from competitive equilibria, they are economically efficient.[6] Therefore, even in those models in which monetary policy *can* affect real variables, doing so will typically reduce overall welfare.

Clearly, a pure RBC framework has no place either for estimating potential output, or for using it as a guide to macroeconomic policy. Instead, viewing business cycles as depar-

tures from potential output is much more consistent with the so-called traditional approach to macroeconomic fluctuations sketched earlier.[7] Although the methodological differences between the traditional and the classical views are deep, RBC models have had a major impact on research that follows the traditional approach primarily by demonstrating the importance of supply shocks as a source of business cycle fluctuations. The new measure of potential output discussed in this article takes this proposition seriously, and seeks to quantify the relative importance of supply and demand factors.

Existing measures of potential output

Most existing measures of potential GNP have relied on one or more of the following techniques: segmented trends, supply-side analysis, or Okun's law. Of the three, the segmented trend technique is perhaps the simplest. Typically, this involves drawing straight line segments through a plot of (log) real GNP. Giving each line segment its own slope is a simple way to capture local variations in the trend growth rate.

A key distinction among segmented trend measures lies in the choice of the segments' endpoints. One well known example is the mid-expansion GNP series published by the Bureau of Economic Analysis (BEA),[8] plotted in the top panel of Figure 1. (The series is plotted on a logarithmic scale.) As the name implies, the segments' endpoints are the midpoints of business cycle expansions, whose dates are determined *ex post* by the National Bureau of Economic Research. The lower

FIGURE 1
Mid-expansion GNP

SOURCE: Bureau of Economic Analysis, Survey of Current Business.
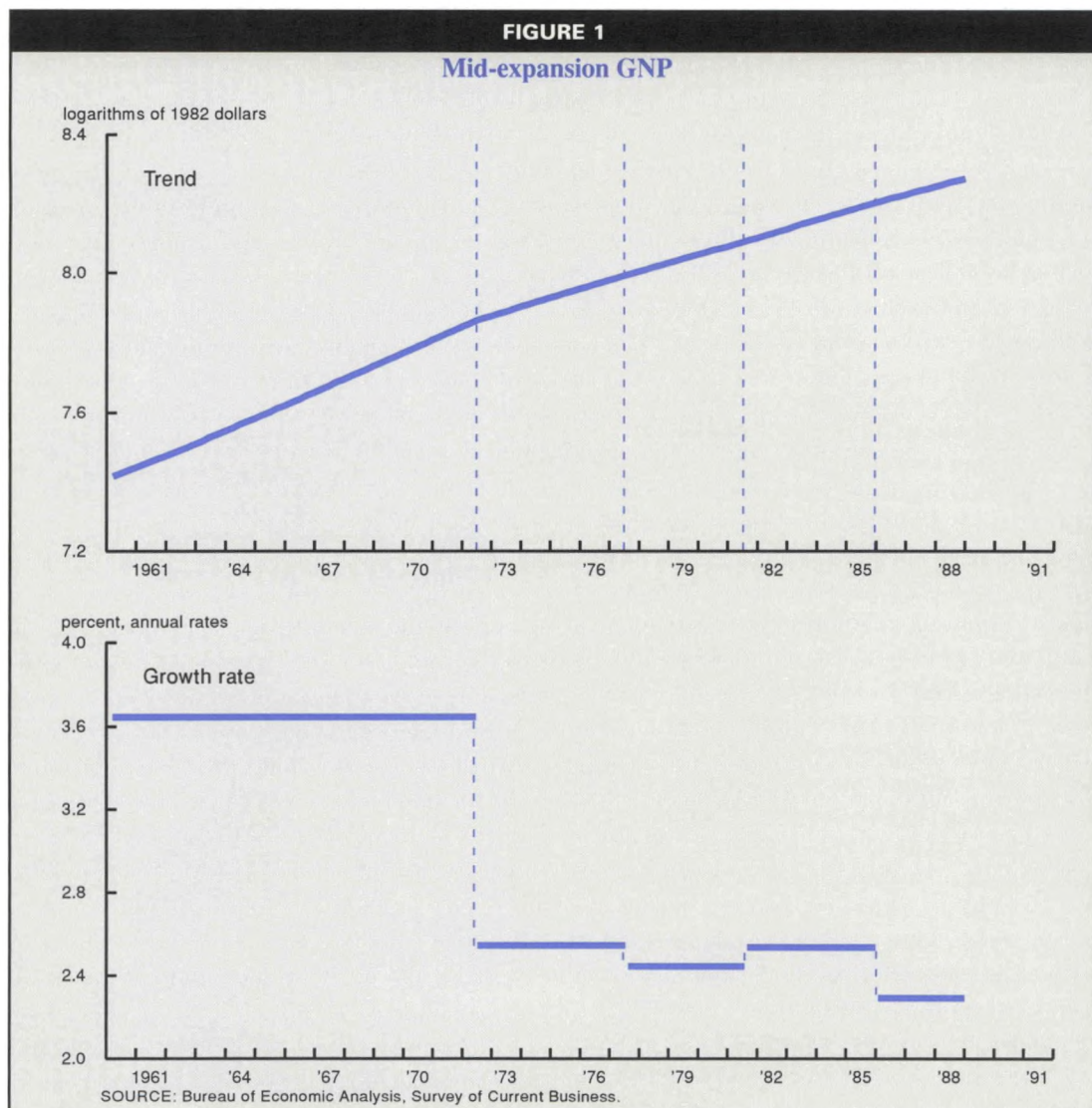
panel of Figure 1 plots the annualized growth rate of mid-expansion GNP, whose stairstep appearance is due to the segmented trend construction of the series.

The supply-side analysis that was the basis for the discontinued CEA estimate is conceptually much more sophisticated than the mid-expansion series.[9] This method gauges potential output by way of an aggregate production function relating factor inputs—labor and capital—to real output. Potential output is then determined by substituting the full-employment values of labor and capital into the production function. The main drawback to this technique is its formidable data requirements. Because quarterly capital stock figures are so unreliable, implementations of this method usually focus on labor inputs. Even so, it requires data on cyclically adjusted employment, hours, labor force participation rates, and productivity to construct its estimate of full-employment output. The Boschen and Mills (1990) series is a related measure which attempts to capture the supply-side effects of oil price shocks and changes in individuals' marginal tax rates.

The third commonly used technique is based on Okun's celebrated law, which uses the unemployment rate as a proxy for the gap between potential and actual output. With U denoting the unemployment rate, and letting GNP* and U* represent potential real GNP and the natural rate of unemployment respectively, Okun's law,

(1) $GNP^* = GNP \cdot [1 + 0.03 \ (U - U^*)]$,

states that the percentage deviation of GNP from potential is proportional to the gap between unemployment and the natural rate. The coefficient of 0.03 means that a 1 percent unemployment gap corresponds to a 3 percent gap between real GNP and potential. If the natural rate is known (Okun assumed it was 4 percent) this equation easily delivers an estimate of potential GNP. During the economically quiescent 1950s and 1960s, a log-linear trend produced estimates of potential output nearly identical to those generated by Okun's law with U* equal to a constant 4 percent. In fact, because it produced a smoother series, Okun recommended using the trend method as an alternative to the above equation.

The events of the 1970s—the oil shock, the 1974-75 recession, and the productivity slow-down—contributed to the breakdown of a variety of potential output measures. The disintegration of measures based on Okun's law with a fixed natural rate of unemployment was especially conspicuous. With unemployment rates well above 4 percent, these measures indicated that output was far below potential, yet inflation continued to rise. The usual measures of potential output no longer seemed to correspond to stable inflation leading some, notably Gordon (1975), to use alternative time-varying measures to explain the behavior of inflation.

The deterioration of Okun's law can be traced to growth in the ranks of the *structurally* unemployed: workers who, because of structural change in the economy, had to retrain or relocate in order to find new employment. In response to the rise in structural unemployment, economists revised their conception of full employment, and the language used to describe it. The awkward phrase "nonaccelerating inflation rate of unemployment" replaced "natural rate," avoiding the implication that stable inflation was necessarily associated with a low unemployment rate. Likewise, the BEA switched to what it called a "high-employment benchmark" rate of unemployment, equal to 6 percent.

This experience exposed the Achilles' heel of Okun's law as a foundation for potential output: the unobservability of the time-varying natural rate of unemployment. If U* is neither fixed nor observable, Okun's law merely describes a relationship between two unobservables, and cannot be used by itself to compute potential GNP; only in conjunction with some independent measure of the natural rate of unemployment will it yield an estimate of potential output.

The potential GNP series proposed by Clark (1983) and Braun (1990) are two recent examples of measures based on independent estimates of the natural rate of unemployment. Braun's series is actually a hybrid measure, combining an Okun's law equation with a segmented trend specification for potential output. Like other segmented trend measures, it also relies on some prior determination of the appropriate dates for trend breakpoints.[10]

Two-sided versus one-sided estimates

One essential distinction between these alternative techniques is the degree to which they rely on *ex post* information, that is, whether they are constructed contemporaneously or

retrospectively. An estimate of a given quarter's level of potential GNP is *one-sided* if it utilizes only data available in that quarter. A *two-sided* estimate, on the other hand, incorporates data that become available later. For instance, an estimate of 1990:4 potential that used 1991:1 inflation would be two-sided; one that relied only on data through 1990:4 would be one-sided. In other words, one-sided estimates use only current and lagged data, while two-sided estimates use both lags and leads.

The BEA's mid-expansion trend GNP is a good example of an explicitly two-sided measure. Because business cycle peaks are dated well after the fact, the expansion's midpoint can be determined only retrospectively—obviously too late to be of any use for a policy designed to avert a recession. To produce a

An econometric model of potential output

The potential output measure proposed in Kuttner (1991) builds on a statistical technique known as a dynamic factor or multiple-indicator model. The basic idea behind these models is to describe the behavior of the observable data in terms of some underlying, unobserved variable. In this application, potential output is the key latent variable; inflation and real growth data are used as indicators of the unobserved level of potential output.

Let x_t represent the natural logarithm of real GNP at time t, and let e_t^d denote a period t shock to real GNP that does not affect potential output, denoted by x_t^*. The Greek letter Δ is the first-difference operator, so that $\Delta x_t = x_t - x_{t-1}$. The first component of the multiple-indicator model is the error-correction equation for real output,

$$(1) \quad \Delta x_t = a_0 + a_1(x_t^* - x_t) + a_2 x_{t-1} + a_3 x_{t-2} + e_t^d + a_4 e_{t-1}^d,$$

where a_0 through a_4 are coefficients to be estimated. If a_1 is positive, x_t^* in excess of x_t implies higher than average future real growth rates (subject to the distributed lag captured by the $a_2 \Delta x_{t-1}$ and $a_3 \Delta x_{t-2}$ terms, and the current and lagged shocks $e_t^d + a_4 e_{t-1}^d$). In this way, output tends towards potential over time, unless perturbed by e_t^d shocks.

The model's second building block is the inflation equation, based on a simple dynamic aggregate supply relationship reflecting the link between potential output and stable inflation. The change in the inflation rate is proportional to the gap between actual and potential output; GNP in excess of potential implies rising inflation, while falling inflation is a symptom of GNP below potential. The growth rate of M2 is allowed to exert an independent effect on the inflation rate. Using π_t to represent the current inflation rate, and letting m_{t-1} and p_{t-1} represent the lagged logarithms of M2 and the price level, the following equation embodies this output-inflation relationship:

$$(2) \quad \Delta \pi_t = b_1(x_{t-1} - x_{t-1}^*) + b_2(x_{t-2} - x_{t-2}^*) + b_3 \Delta(m_{t-1} - x_{t-1} - p_{t-1}) + e_t^\pi + b_4 e_{t-1}^\pi,$$

which includes a moving-average error term, $e_t^\pi + b_4 e_{t-1}^\pi$. The $m_{t-1} - x_{t-1} - p_{t-1}$ term, recognizable as the lagged logarithm of the inverse of M2 velocity, captures the direct effect of money stock changes on the price level.

Having described the link between the unobserved level of potential output and observed realizations of real output growth and inflation, it remains only to specify how potential output, x_t^*, evolves over time. The multiple indicator model replaces the traditional segmented trend with a more flexible stochastic trend specification discussed in Stock and Watson (1988). This specification says that over the long run, output will grow at some average rate, labelled g. However, shocks to potential output, e_t^s, can cause potential output growth to deviate from its mean. Moreover, these shocks are persistent with respect to the level of potential output: once perturbed by an e_t^s shock, x_t^* will show no tendency to return to its trendline. Plotting it alongside a deterministic trend with slope equal to g, the stochastic trend will appear to wander.

The mathematical expression of the stochastic trend specificaion is a random walk with drift:

$$(3) \quad x_t^* = g + x_{t-1}^* + e_t^s.$$

The intercept g is the "drift" term in the random walk, corresponding to the long run growth rate of output. The unit coefficient on lagged x_t^* makes (log) potential output a random walk. By constraining the coefficient a_0 in Equation 1 to equal $g(1 - a_2 - a_3)$, real output is forced to grow at the same rate as potential on average.

The practical advantage of the stochastic trend assumption is to allow smooth variations in the growth rate of potential output unlike the segmented trend with its discrete kinks. While some research has endowed the random walk specification with a deeper economic interpretation, it was chosen for this application as a convenient way to pick up low-frequency time variation in the underlying trend.

One attractive interpretation of the overall model is in terms of supply and demand shocks, along the lines sketched earlier. The notation used here is consistent with this interpretation: the e_t^s in Equation 3 represent supply shocks, affecting the economy's underlying capacity to produce goods and services without additional inflationary pressure. Similarly, the e_t^d shocks in Equation 1 are disturbances to aggregate demand, which can deflect the economy's convergence to potential output.

Two specific features of this interpretation deserve special note. First, the supply shocks are assumed to

contemporaneous estimate would involve departing from the mid-expansion definition in some way, such as extrapolating the local trend from the previous reference cycle. Most segmented trend estimates share this two-sided property, as it usually takes several years of data to discern a change in the economy's underlying growth rate.

Other techniques can yield either one- or two-sided estimates. As described above, the simple procedure using Okun's law with a constant natural rate of unemployment is one-sided. By contrast, the technique described in Clark (1983) is two-sided, utilizing leads as well as lags of the gap between unemployment and a time-varying natural rate.

Frequently, the benchmark natural unemployment rate used as an input to Okun's law is itself two-sided. Estimates of potential output have permanent effects on the economy's productive capacity, while the demand shocks' impact is purely transitory. This distinction reflects the implications of the natural rate hypothesis introduced earlier, in which changes in aggregate demand have no lasting effects on real variables. Second, the combination of the stochastic trend and error-correction specifications of Equations 1 and 3 allows supply shocks to generate business cycle behavior. In other words, demand shocks are not the sole cause of output gaps; some fluctuations of output around potential are attributable to the dynamics of adjusting to a new equilibrium level of output.

TABLE 1

Estimates of the parameters of the potential output model

Output growth equation (1)   Standard deviation of e^d = 0.943

$$\Delta x_t = 0.36 + 0.11(x_t^* - x_t) + 0.45\, x_{t-1} + 0.20\, x_{t-2} + e_t^d - 0.17\, e_{t-1}^d$$
$$\qquad (0.05) \qquad\qquad (0.30) \qquad (0.15) \qquad\qquad (0.31)$$

Inflation equation (2)   Standard deviation of e^π = 0.254

$$\Delta \pi_t = 0.12\,(x_{t-1}^* - x_{t-1}) - 0.10\,(x_{t-2}^* - x_{t-2}) + 0.06\Delta(m_{t-1} - x_{t-1} - p_{t-1}) + e_t^\pi - 0.70\, e_{t-1}^\pi$$
$$\qquad (0.03) \qquad\qquad\quad (0.03) \qquad\qquad\qquad (0.03) \qquad\qquad\qquad\qquad (0.23)$$

Potential output equation (3)   Standard deviation of e^s = 0.702

$$x_t^* = 0.75 + x_{t-1}^* + e_t^s$$
$$\quad (0.07)$$

NOTES: The sample is 1960:1 through 1991:3.
The data are expressed as quarterly percent growth rates.
The numbers in parentheses are estimated standard errors.

Estimating the model

If data on x_t^* existed, one could easily estimate Equations 1 and 2 with the familiar linear regression technique. What complicates matters here is the fact that the key right-hand-side variable, $(x_t^* - x_t)$, is unobservable. One technique that makes it possible to estimate models with unobserved independent variables is the recursive Kalman filter algorithm.[1] Essentially, this algorithm uses the law of motion for potential output in Equation 3 to compute its optimal guess of the unobserved x_t^*. In the next step, it uses that guess in Equations 1 and 2 to generate one-quarter-ahead predictions for $\Delta \pi$ and Δx. The equations' fit is gauged by comparing these predictions to the actual data. A maximum-likelihood routine is then used to determine the coefficients that yield the best predictions. A by-product of this process is an estimate of the unobserved x_t^* series, based on the observable output growth and inflation data and the best-fit coefficients from Equations 1-3.

Table 1 displays estimates of Equations 1-3, fitted to quarterly data from 1960:1 through 1991:3. In Equation 1, the coefficient of 0.11 on $(x_t^* - x_t)$ means that in the absence of any shocks, output will gradually converge to potential at a rate of 11 percent per quarter. However, this adjustment is interrupted by demand shocks with a standard deviation of 0.95 percent per quarter, or almost four percent in annualized terms. In Equation 2, the statistically significant coefficients on the two lags of the output gap are consistent with a strong relationship between aggregate demand and inflation. Similarly, M2 growth (less nominal output growth), appears as a significant additional determinant of inflation. The intercept in Equation 3, which represents the mean quarterly growth rate of potential output, is consistent with an average annual growth rate of roughly 3 percent. The magnitude of the persistent shock to potential output, as measured by its standard deviation, is similar, endowing the potential output series with a relatively large amount of time variation.

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[1]The Kalman filter technique is discussed in many time-series econometrics texts, including Harvey (1981).

based on such measures should therefore be classified as two-sided, even when they use only current and lagged values of the unemployment gap. Rissman's (1986) time-varying estimate of structural unemployment is a good example, as it uses leads and lags of employment growth dispersion. Similarly, the common supply-side measures could fall into either of these two categories, depending on whether they used one- or two-sided methods to cyclically adjust the factor input data.

One area where the two- versus one-sided distinction is key is in the formulation of a policy feedback rule. Some economists, Taylor (1985) for example, have proposed versions of monetary policy rules in which the Federal Reserve would target the gap between real GNP and trend, or potential GNP. To achieve an appropriate balance between inflation and output goals, the output gap target would be subject to feedback: adjusted downwards when the rate of inflation exceeded its target, and vice versa.

Any systematic implementation of such a rule would have to operate in *real time*; that is, the target would have to be adjusted on the basis of currently available information, without the benefit of subsequently available data. In other words, feedback rules could rely only on one-sided estimates of potential output, precluding the use of some of the measures discussed above. This consideration is especially relevant to segmented trend measures like mid-expansion GNP. As noted earlier, extrapolating these series to provide current period estimates would usually fail to track contemporaneously changes in the growth of potential output.

A new, inflation-based measure of potential output

The alternative measure of potential real GNP described in Kuttner (1991) (see Box) uses a technique that differs significantly from those described above, relating potential output directly to the observed behavior of inflation. This method uses real GNP growth and inflation as gauges of the level of potential output, which itself is unobserved. Unlike existing measures, this technique explicitly recognizes the uncertainty involved in extracting a measure of potential output from the available data. An additional advantage of this technique is its ability to produce either one- or two-sided
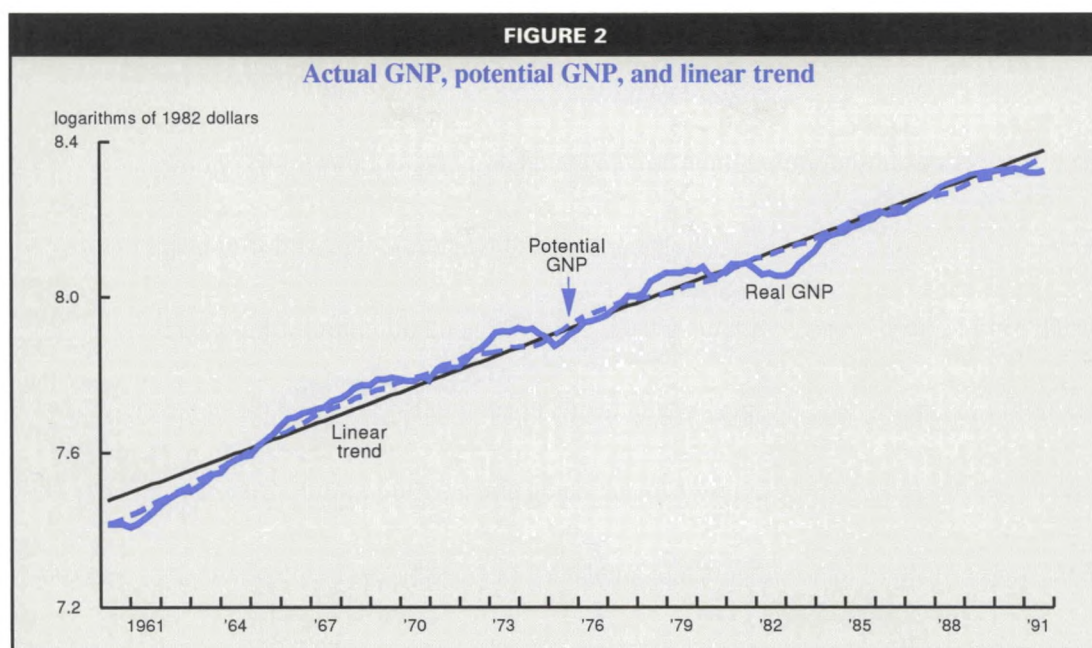
estimates; comparing them brings the distinction into sharp focus. An examination of the expansionary 1988-89 period illustrates the practical importance of this distinction.

This measure defines potential output in terms of two key attributes. First, it corresponds to a sustainable level of production; that is, a level consistent with stable future real growth rates. One way to capture this property is through an *error correction* equation for real and potential GNP. This equation describes the economy's real growth rate as a function of the discrepancy (the "error") between actual and potential GNP, and demand shocks. If output equals potential, the economy will grow at the same rate as potential, in the absence of demand shocks. When output exceeds potential, the economy tends to grow more slowly than potential, restoring equilibrium over time. Similarly, when the economy's real GNP is below potential, output tends to grow more rapidly. In this equation, demand shocks represent those factors that perturb the economy's adjustment process.

The second main feature of this measure is its connection to the inflation rate. As in the usual aggregate supply relation described earlier, potential output is defined as that level of output at which inflation shows no tendency to increase or decrease, holding other factors (money growth, for example) constant. When output exceeds potential, the inflation rate tends to rise, reflecting the upward slope of the aggregate supply curve. Because they both depend on the gap between actual output and unobserved potential output, real growth and inflation data can be used to estimate the size of the gap between the two.

Figure 2 plots the logarithm of potential GNP estimated using this technique, along with a linear trend and the logarithm of observed real GNP. Comparing potential output with the trend highlights the considerable time variation in potential output growth. From a relatively rapid growth rate in the early 1960s, potential output slows late in the decade and into the 1970s, reflecting the well known productivity slowdown of that period. Potential output growth increased once again in the early 1980s as oil prices stabilized, and the economy recovered from the 1981-82 recession.

While this method offers a convenient and appealing way to estimate potential output, it, like the traditional measures discussed earlier,

FIGURE 2

Actual GNP, potential GNP, and linear trend

logarithms of 1982 dollars

[Figure: line chart showing Actual GNP, Potential GNP, and Linear trend from 1961 to 1991, y-axis from 7.2 to 8.4. Labels: "Potential GNP", "Real GNP", "Linear trend". X-axis years: 1961, '64, '67, '70, '73, '76, '79, '82, '85, '88, '91]

is an estimate of a somewhat imprecise entity. As such, it is important to emphasize that Figure 2 plots only the point estimate of potential output. Unlike the traditional measures, however, this new method models the error associated with estimating potential output, and provides an estimate of the magnitude of that error. The following section explores the consequences of this uncertainty for policy based on an uncertain estimate of potential output.

Uncertainty and macroeconomic policy

One of the most important practical problems facing policymakers is the uncertainty associated with contemporaneous measures of macroeconomic performance. Data revisions are evidence of the uncertainty that pervades even the most basic macroeconomic data. The advance estimate of GNP, for example, usually differs significantly from the preliminary and final estimates, released one and two months later. Even the final estimates are revised annually, as well as every five years during the benchmark revision process. Money stock statistics undergo similar revisions.[11]

How should policy respond when economic signals are uncertain? To illustrate this problem with a specific example, consider the effects of data uncertainty. Suppose the Federal Reserve wishes to maintain nominal GNP growth at an annual rate of 7 percent. Suppose also that the advance national income data indicate nominal GNP growth of 8 percent. In

light of the likelihood of a subsequent downward revision to the data, should policy act now to reduce the growth rate of nominal GNP? Clearly, the proper reaction depends significantly on the amount of uncertainty: the less certain the estimate, the smaller the appropriate policy response.

In this example, the Federal Reserve's target is known with certainty, but the true state of the economy is not. The problem is compounded when the policy target itself is uncertain, as in the case of a potential output target.

One- versus two-sided uncertainty in potential output

One useful feature of the multiple-indicator model is that it can yield either one- or two-sided estimates of unobserved potential output. As described in the accompanying Box, the Kalman filter technique delivers the optimal estimate of potential output given the data available at the time. A complimentary algorithm—the Kalman smoother—uses data through the end of the sample to extract an estimate of potential output given both past and future data. At the same time, both the filter and the smoother also produce estimates of the statistical uncertainty associated with the estimate, referred to as filter uncertainty. An additional source of variance, the parameter uncertainty, comes from the estimation of the model's parameters.

Figure 3 displays the size of this uncertainty by plotting the two-sided estimate of potential output along with the 5th and 95th percentiles of its distribution, which represent the 90 percent confidence bounds, calculated using the technique proposed by Hamilton (1986). As reported on the last line of Table 1, the average two-sided standard error is approximately 1.4 percent (relative to the level of potential output), corresponding to a 90 percent confidence bound of over 2 percent. The contributions of the filter and parameter variance to the two-sided standard error, shown on the first two lines of the Table, show how the process of signal extraction and the imprecision of the parameter estimates contribute comparably to the uncertainty of the potential output estimate.
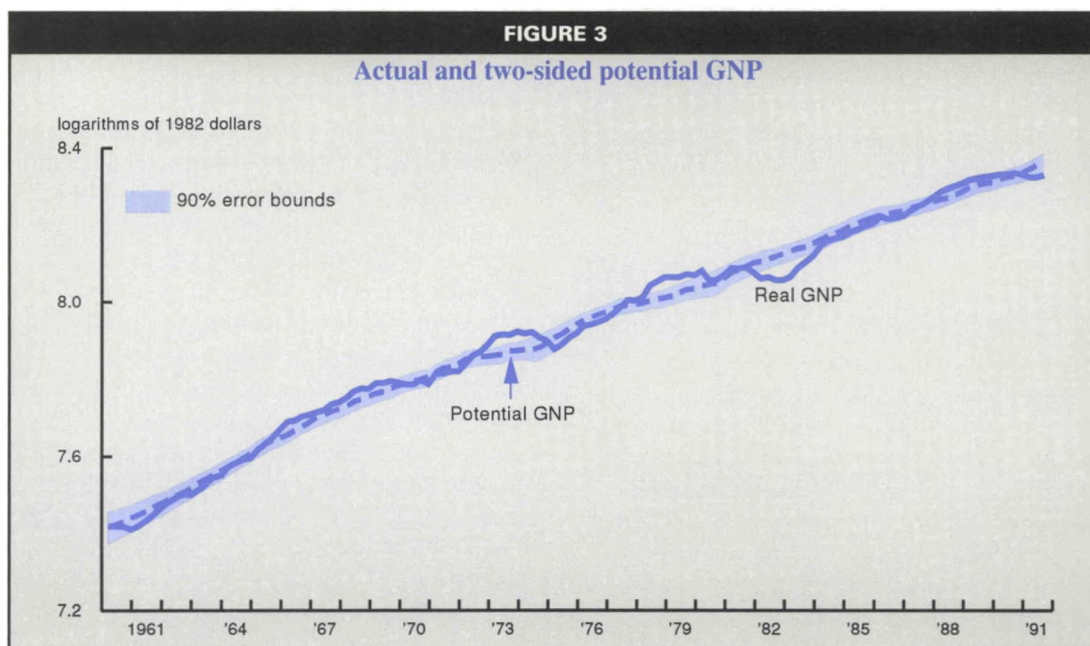
However, because the two-sided estimates rely on data unavailable to policymakers in real time, they understate the amount of uncertainty present in those estimates. A better measure of this uncertainty is that associated with the one-sided estimates. Comparing the two columns of Table 1 shows that with an average standard error of 1.62 percent, the one-sided estimates are less precise than the analogous two-sided series. While the two-sided estimates are more precise on average than the one-sided estimates, this is not true for the last quarter of the sample. Here, in the absence of data on future output growth and inflation, the two- and one-sided estimates, and their standard errors, are identical.

TABLE 1		
Two- vs. one-sided uncertainty		
	Two-sided	One-sided
Filter variance	0.89	1.84
Parameter variance	0.99	0.81
Overall standard error	1.36%	1.62%

Why hindsight reduces uncertainty

Subsequent data improves the estimates' precision for two reasons. First, there is the physical lag. Certain indicators—notably inflation—react to GNP changes with a lag. The inflation equation of the potential output model incorporates this delay by relating the current change in the inflation rate to lagged values of the gap between output and potential. Thus, a widening of the output gap this quarter does not appear as a change in the inflation rate until the following quarter.

A second, more subtle reason for a lag comes from the process of signal extraction itself, in this case, the process of extracting an estimate of the unobserved level of potential output. This lag comes from the fact that the inflation and output data are noisy indicators of the output gap, subject to random movements which may not reflect a change in the level of potential GNP.

FIGURE 3

Actual and two-sided potential GNP

logarithms of 1982 dollars

90% error bounds

Real GNP

Potential GNP

For instance, suppose we were to see an increase in the inflation rate from 5 percent to 6 percent over the span of one quarter. This additional inflation could be the sign of an overheating economy, as the added demand pressure led firms and workers to demand wage and price increases. On the other hand, the rise could be a fluke, the result of a statistical aberration, or special factors. If this were the case, interpreting the inflation as a symptom of a widening output gap would be a mistake.

There are two ways to distinguish mere blips from real demand pressure. First, one might look at the co-movement between inflation and output. If the inflation accompanied slackening output growth, the two indicators together would point to excess demand. Likewise, if the inflation continued over the course of several quarters, it would provide stronger evidence of an output gap. However, waiting around for more data to arrive takes time. And the less reliable the indicator—in time-series parlance, the larger the ratio of noise to signal—the stronger the inclination to wait for corroborating evidence to appear before taking action. In other words, signal extraction uncertainty can be characterized as another source of what Milton Friedman called the recognition lag, referring to the length of time it takes to recognize the appearance of a situation requiring a policy action.

Discerning output gaps in real time

Except for the fact that the parameters of the model are estimated using data from the entire sample, the one-sided estimates roughly correspond to the estimates of potential output that would have been available to policymakers at the time. This raises the question of whether there are instances where the contemporaneous uncertainty surrounding the potential output goal is so large that appropriate policy corrections can be discerned only in retrospect.

The 1965-69, 1973-74, and 1978-79 expansions and the 1981-82 recession all represent statistically significant deviations of output from potential, as measured by the 90 percent bounds. However, the 1974-75 recession and the 1988-89 portion of the most recent expansion are ambiguous. Relative to the two-sided estimates in Figure 3, these two episodes are significant deviations from potential output. However, neither of these deviations is significant with respect to the one-sided 90 percent bounds in Figure 4, suggesting that at the time, distinguishing the appropriate course of monetary policy might have been difficult. The more recent episode is examined in greater detail below.

A closer look at the 1988-89 boom

One especially good illustration of the uncertainty problem is the small boom of 1988-89. After several years during which output fell

FIGURE 4

Actual and estimated one-sided GNP

logarithms of 1982 dollars

90% error bounds

Real GNP
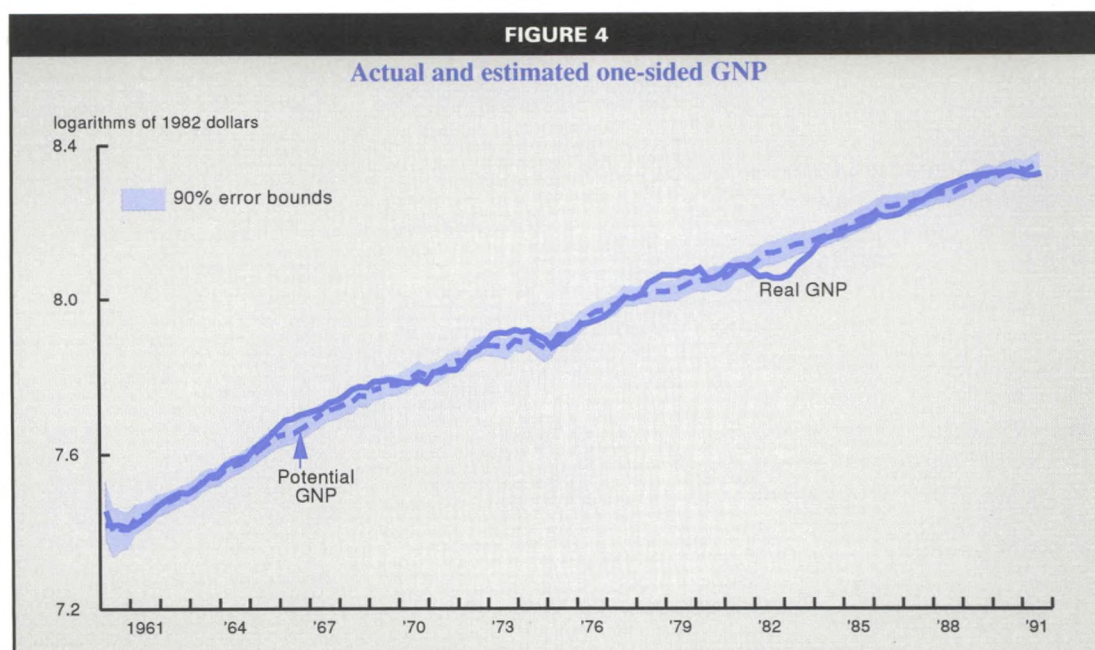
Potential GNP

short of potential, the economy grew rapidly in 1987 and early 1988, achieving annualized real growth as high as 4.5 percent. Reacting to the economy's unforseen strength, Federal Reserve policy gradually tightened throughout 1988, resulting in a rising federal funds rate. Using the term spread (the difference between the ten year Treasury bond yield and the federal funds rate) as a rough measure of monetary policy as suggested by Laurent (1988) and Bernanke and Blinder (1989), this change in policy corresponded to a decline in the term spread from +200 basis points in 1988:1 to –100 basis points in 1989:2. This section examines the question of whether policymakers could have discerned this boom sooner and acted to offset it, given the data available at the time.

This question is explored in Figures 5-7. The bars in each graph represent the output gap—measured real GNP less estimated potential GNP—expressed in percentage terms. A positive output gap describes an overheated economy with increasing inflation pressure. Similarly, a negative output gap corresponds to subsiding inflation pressure. However, because they refer to the *level* of output relative to potential, negative output gaps do not necessarily correspond to recessions, which are typically defined in terms of the growth rate of real output. The solid line in each graph represents the upper 90 percent confidence bound discussed earlier. An output gap in excess of this bound says that the observed behavior of output and inflation is statistically quite unlikely to have come from an economy in which the output gap is zero.

Figure 5 shows the two-sided estimate of the output gap and its upper error bound. From the vantage point of 1991, it is apparent that the very rapid output growth of 1987-88 led real GNP to exceed potential by the first quarter of 1988, where the gap reaches 2.3 percent. Output continues to exceed the 90 percent confidence bound throughout the rest of 1988
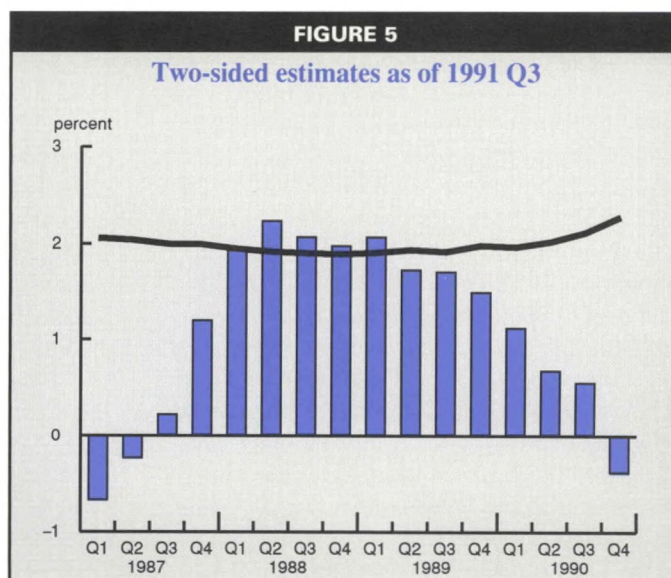
and through the first quarter of 1989, at which point the gap gradually begins to fall. Meanwhile, although monetary policy was slowly tightening over this period, the term spread did not become negative—usually a sign of monetary restriction—until the first quarter of 1990. In retrospect, then, it appears that monetary policy should have tightened more rapidly in early 1988. Did the available data support such an action?

Figure 6 displays the analogous one-sided estimates of the output gap and the upper 90 percent confidence bound. As one-sided estimates, they are similar to those which would have been available at the time. However,

FIGURE 5

Two-sided estimates as of 1991 Q3

percent

FIGURE 6

One-sided estimates as of 1991 Q3

percent
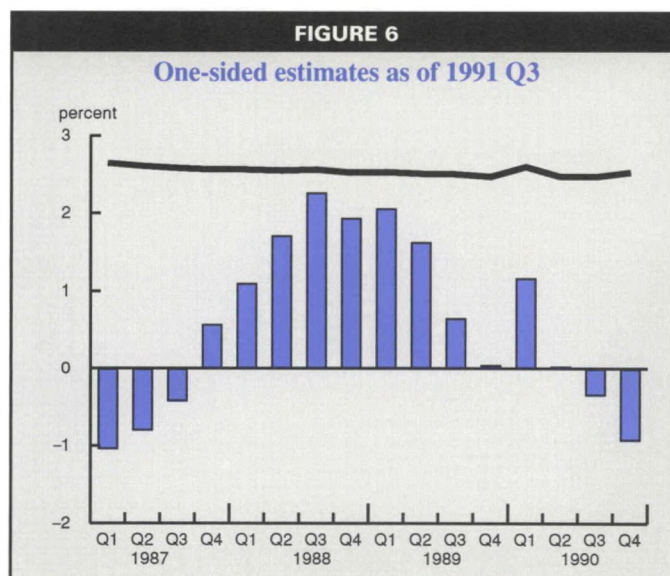
there is an important difference: while they do not explicitly use any post-dated data, the estimates are based on the *revised* GNP and M2 series available as of late 1991. Using these figures, the output gap never exceeds the upper error bound. The estimated output gap changes little between Figure 5 and 6. The main difference between the two is the size of the error bound: the two-sided bound is less than 2 percent, while the one-sided bound is nearly 3 percent. This discrepancy directly reflects the reduction in signal-extraction uncertainty that results from additional data. The policy implication of this comparison is striking: judged by the 90 percent error bounds, the case for faster monetary policy tightening was much less clear in 1988 than it is with hindsight.

Using the *unrevised* GNP data—those data actually available at the time—the evidence for quicker policy action becomes even weaker. Figure 7 shows the output gap based on one-sided estimates using the data available in the fourth quarter of 1989, which include the preliminary estimate of third quarter GNP. More importantly, these data also predate the 1990 annual revisions. Using these data, the one-sided error bounds are comparable to those in Figure 6. However, the output gap over the period is somewhat smaller, reaching a peak of only 1.9 percent, compared with 2.3 percent using the 1991 estimates. Behind this discrepancy is the fact that the initial figures from 1989 showed considerably stronger growth than the revised estimates. Because rapid output

growth is normally associated with output being below potential, the model interprets faster-than-normal growth as one sign of a negative output gap. Thus the two sources of uncertainty—that associated with potential output and the error in estimating GNP itself—combined to distort the true state of the economy, complicating the policy decision.

Conclusions

To the extent that the Federal Reserve takes responsibility for dampening demand-induced fluctuations in the economy, it will—either explicitly or implicitly—base its policy on some appraisal of the economy's level of potential output. This article has proposed a new technique for rigorously constructing such a measure, using inflation and real growth data to determine the level of GNP consistent with stable growth and constant inflation. This new potential output series successfully captures gradual changes in the economy's underlying growth rate, without introducing the abrupt kinks that characterize series based on segmented trends. Furthermore, this new series is unique in the way it delivers a measure of the statistical uncertainty involved in constructing the series. As argued above, a measure of this uncertainty is essential for calibrating the response of monetary policy.

The explicit recognition of this uncertainty also highlights its consequences for real-time policymaking. Because the signal-extraction error associated with a given quarter's estimate of potential output falls as more data become available, situations requiring policy action may not be recognizable until later on. This phenomenon limits the scope of monetary stabilization. Frequently, the best response to uncertainty is to adopt a wait and see attitude until more information becomes available. As demonstrated by the 1988-89 example, by that time it may be too late to respond effectively.

This conclusion is not limited to the case of potential output. So long as there is any uncertainty in policymakers' assessment of economic conditions, monetary policy will never be able to

FIGURE 7

One-sided estimates as of 1989 Q3
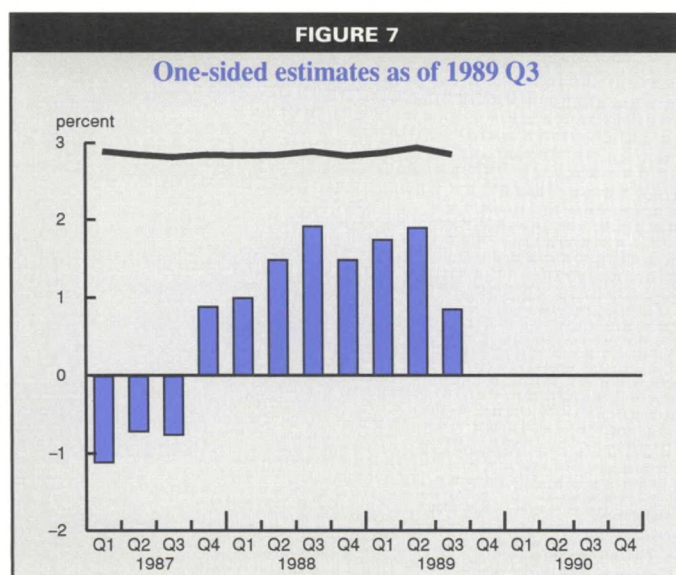
offset the undesirable effects of demand shocks. A less pessimistic restatement of the same conclusion is that reducing the error associated with measures of macroeconomic performance can improve the performance of policy, as more precise estimates enable policy to respond more quickly to changing economic conditions.

One way to improve the measurement of potential output is to incorporate other indicators of the gap between output and potential, such as the unemployment rate, or the rate of capacity utilization. Another way is to augment the model with measures of factor inputs: labor force and the capital stock. Both of these are promising directions for future research.

FOOTNOTES

[1]For example, see Boschen and Mills (1990), Braun (1990), and Hallman, Porter, and Small (1989). Prominent in the academic literature is Blanchard and Quah (1989), who decompose output fluctuations into the distinct effects of supply and demand shocks. See also the references in Boschen and Mills (1990).

[2]The use of the term "full employment" in this context is somewhat misleading. Because supply shocks also create short term economic dislocation, full-employment potential need not correspond to a situation in which no resources go unused. One definition of potential output that takes the full-employment idea to an extreme is the Delong and Summers (1988) measure. They argue that potential output should represent the *maximum* feasible level of output attainable during peacetime.

[3]Okun (1970), pp. 132-133.

[4]Eichenbaum (1991) provides a useful appraisal of the current state of RBC research. Further discussion of the implications for RBC theory for the measurement of potential output appears in Boschen and Mills (1990).

[5]Some recent RBC models do allow demand shocks to affect real variables: Cooley and Hansen (1989) and Christiano and Eichenbaum (1990) are examples.

[6]To be precise, competitive equilibria are Pareto efficient, meaning no individual in the economy could be made better off without making someone else worse off. This is a statement of the well known First Welfare Theorem of general equilibrium economics.

[7]A recent exposition of the traditional approach to macroeconomic fluctuations appears in Blanchard (1989).

[8]DeLeeuw and Holloway (1983) describe the construction and use of the BEA's mid-expansion and high-employment measures.

[9]Papers discussing the CEA's methodology include Perry (1977) and Clark (1979).

[10]This series gained prominence as the potential GNP series used in Hallman, Porter, and Small's (1989) definition of P^*. Aside from the choice of breakpoints, *a priori* judgement is also implicit in the choice of the four w_i distributed lag weights in Braun's Equation C.1.

[11]See Strongin (1986).

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Market value accounting for commercial banks

Thomas Mondschean

One of the repercussions of the savings and loan crisis and recent capital adequacy problems among some commercial banks and insurance companies has been a debate about the system of accounting used by financial institutions. The issue is whether the current method of valuing assets and liabilities conveys information accurate enough to measure the economic net worth of financial institutions. If it does not, then is it possible to design a valuation system for which the benefits of changing exceed the costs? This issue is important to policymakers and taxpayers because better information about the economic net worth of financial institutions could give regulators an opportunity to intervene sooner and potentially reduce the cost of closing insolvent institutions. It is important to shareholders because uncertainty about the actual value of an institution makes it harder to decide whether to invest in its stocks. It is also relevant for creditors since the value of economic net worth affects a bank's ability to absorb future losses and thus is an indication of its ability to bear risk.

One proposal that has been debated in recent years is to require banks to use market value accounting (MVA) to compute the values of their portfolios. MVA would require banks to adjust the values of assets and liabilities periodically for changes in market prices and conditions. This idea is not new in financial circles. For example, futures exchanges require that all futures contracts be marked to market at the end of each trading day. For a variety of reasons, however, marking certain portions of a bank's portfolio to market is more difficult. Opponents of MVA focus on these difficulties and the additional costs a new accounting system would require and contend that such a change is economically impractical. Proponents, on the other hand, emphasize the costs of not changing systems. Under the current historical cost accounting system (HCA), banks record the value of assets and liabilities at the time they are acquired, and these values are not subsequently adjusted until they are sold or written down. Proponents of MVA argue that the current accounting system diminishes the public's confidence in the financial system by not presenting an accurate enough picture of the current economic health of financial firms.

The purpose of this article is to examine the costs and benefits of market value accounting. I focus the discussion on the case of commercial banks; however, much of the analysis presented could be applied to other types of financial intermediaries. Many of the issues discussed here have been examined in greater detail in the chapter on market value accounting in the 1991 U.S. Treasury study on reforming the financial system. After a discussion of the purposes served by an accounting system for banks, I explain how HCA misrepresents the true economic value of financial institu-

tions. Next, the commercial bank balance sheet is examined in detail both to explain how market value accounting would work and to evaluate the difficulty of marking to market various balance sheet items. Once it is known which balance sheet items are most difficult to value, it is then possible to assess how costly the move to MVA would be and whether the cost-benefit tradeoff for market value accounting is different for large banks than for smaller institutions. I then discuss the major criticisms raised about MVA. The issues raised by both sides imply that there may be some middle ground, so I explore possibilities for improving the system of reporting that does not require a complete move to market value accounting. The article concludes by making suggestions for improving the quality of information provided by commercial banks to both bank regulators and the public.

What should an accounting system for banks achieve?

Any bank accounting system must provide useful information to both bank regulators and the public. According to the recent U.S. Treasury study on financial reform, useful information should be: "(a) relevant, timely, and understandable to users of financial statements; (b) reliable, in the sense of being accurate, objective, and verifiable by outside parties; and (c) reported in a consistent manner to facilitate comparisons over time and across firms."[1] But for what purposes are accounting data useful? One goal is to assist in ensuring financial control. As Benston (1989) points out, the current bank accounting system is "... designed to report on the transactions that occurred between the enterprise and other market participants and among control and decision units within the enterprise and the people responsible."[2] Cost accounting allows banks to trace each dollar as it is acquired or spent, leaving a paper trail that assists both banks and independent auditors in detecting fraud as well as in finding and correcting mistakes. Given the volume of transactions a typical bank handles every day, whatever accounting system is in place must allow banks to monitor accurately all transactions as they take place.

Another purpose of an accounting system is to permit accurate appraisals of the value of bank net worth or capital. Net worth is defined as the difference between the value of assets and the value of liabilities. Shareholders need an accurate measure of accounting net worth in order to make informed investment decisions. To the bank's uninsured creditors, net worth represents the amount a bank could lose and still pay its debts. From their perspective, it is more important that the value of net worth not be overstated than that it be accurate. If net worth is understated, uninsured creditors receive additional protection. Appraisals of net worth should be timely in the sense that valuations of net worth should take into account changing economic conditions, so that, for example, a decline in the value of a bank's assets, other things equal, would result in a decline in the value of its net worth. The information provided should also make it possible for users of these data to compare the relative performance of different banks.

No matter which type of accounting system is in place, a related issue is whether banks should be required to disclose more information to permit the public to reach their own conclusions about a bank's net worth. In particular, should banks be required to release the same information to the public as they do to the regulatory authorities? Some argue that greater disclosure of a bank's loan portfolio might affect the competitive position of a bank or its customers if confidential information valuable to other firms was released. Regulators must balance the public's need to learn about banks with the banks' need to protect confidential or proprietary information. Stockholders and uninsured creditors have a legitimate need to know the economic value of a bank to protect their own interests; however, it may not be in the best interest of bank managers to release such information. Some market participants contend that price-earnings ratios for bank holding company stocks might be higher if banks disclosed more and better information about their portfolios. Thus, the public policy issue is not whether banks should disclose confidential or proprietary information but whether they should be required to release more information than they currently do.[3] It is worth noting that other financial services industries disclose more detailed information about their portfolios to the public than banks do. Mutual funds are required by the Securities and Exchange Commission (SEC) to disclose their complete portfolio holdings every quarter. SEC regulated broker/dealers and futures commissions merchants must report market values.
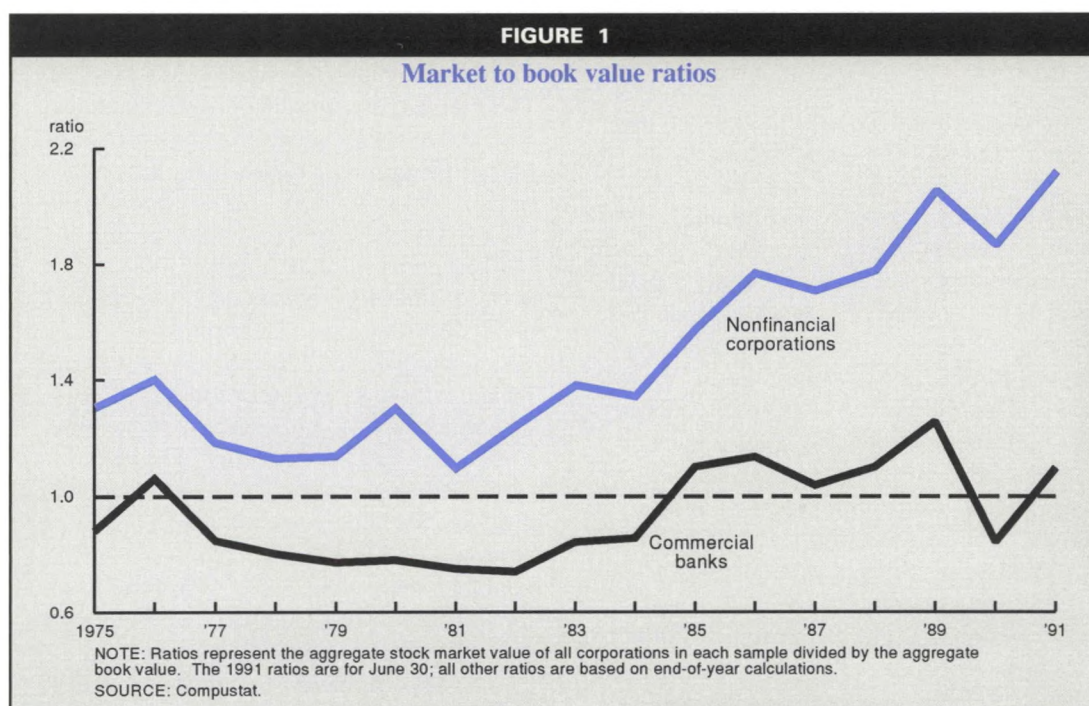
Insurance companies are required to disclose their complete stock and bond holdings as well as state-by-state breakdowns of their long term mortgage loans to regulators once a year.[4]

Problems with the current accounting system

Under HCA rules, a bank records the nominal value of the asset or liability at the time it is acquired.[5] One justification for HCA is that banks were presumed to acquire assets and liabilities and hold them until maturity. As long as they receive repayment of interest and principal at the contracted periods, changes in market value were presumed to have no effect on the asset's cash flow. However, this motivation for HCA violates basic economic principles. First, an asset's purchase price does not represent the best estimate of what it will be worth in the future because it ignores subsequent information about changes in market interest rates, credit risk, and other variables. Second, the assumption that banks hold all of their assets to maturity is outdated. The development of securitization and other techniques means that many types of loans can be easily sold before maturity. Third, for certain assets, banks can lock in current embedded gains or limit future economic losses by hedging even if the asset is not sold before maturity.

The development and use of generally accepted accounting principles (GAAP), which are based in large part on HCA principles, are designed to give all banks a similar set of rules with which they report the value of their portfolios. However, GAAP allows banks some flexibility in determining the timing of valuation changes. For example, a bank with an unrealized gain on a particular asset may choose a particular time to sell the asset, realize the gain, and use it to offset other losses. Alternatively, a bank may prefer to increase loan loss reserves at discrete intervals rather than taking losses as they become apparent.[6] Thus, the book value of bank capital might understate its economic value if a bank has unrealized gains in its portfolio or overstate its economic value if it has unrealized losses. Because GAAP permits such behavior, meaningful comparisons between banks are more difficult. Proponents of MVA believe the best way to solve this problem is to require banks to report changes in values when they occur, rather than allowing banks to choose when to realize them.

Perhaps the best evidence that the current bank accounting system needs to be improved comes from the stock market itself. Figure 1 compares the ratios of market to book values for a sample of 80 bank holding companies to those of approximately 1,400 nonfinancial

FIGURE 1

Market to book value ratios

NOTE: Ratios represent the aggregate stock market value of all corporations in each sample divided by the aggregate book value. The 1991 ratios are for June 30; all other ratios are based on end-of-year calculations.
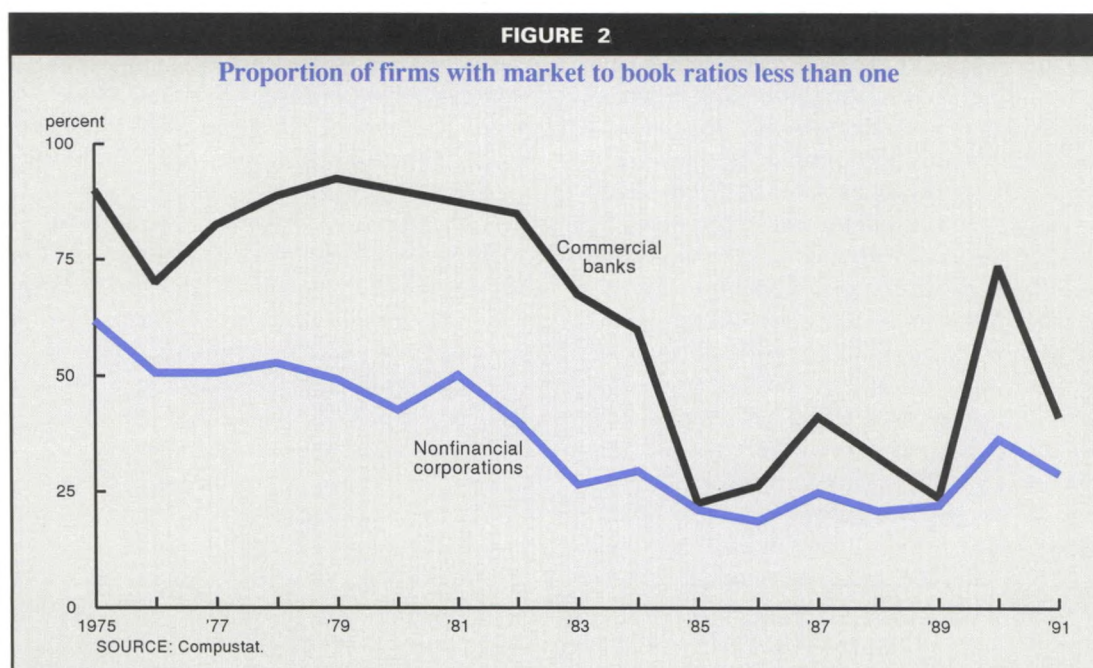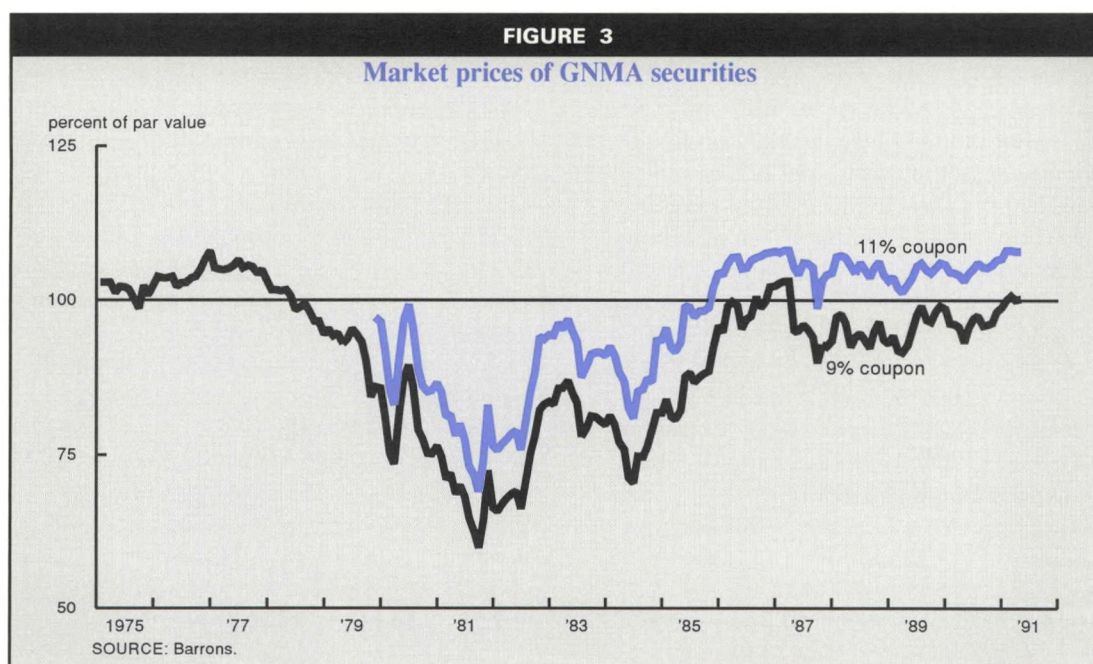SOURCE: Compustat.

corporations from 1975 to 1991. From the perspective of bank creditors, a higher ratio of market to book value is desirable because it indicates a more conservative valuation of accounting net worth, which provides additional protection for the deposit insurer as well as uninsured creditors. Market to book ratios have been consistently higher for nonfinancial corporations than for commercial banks throughout the last fifteen years, and the difference in the ratios has been widening in recent years. This graph also demonstrates that the problems with the system of bank accounting are not a recent phenomenon: market values were below book values in 1975 and from 1977 to 1984. Figure 2 compares the proportion of banks whose market values were less than book value with nonfinancial corporations. In every year, there was a larger proportion of commercial banks than nonfinancial corporations whose market values of net worth did not exceed their accounting values. A system of accounting should produce conservative and relevant assessments of a bank's net worth, but these data show that there were several years when the market did not believe that the book value assessment of bank net worth was low enough.

Changes in market interest rates can cause the market value of bank net worth to differ from its book value. An example of this is illustrated in Figure 3. Market bid prices for mortgage-backed GNMA (Ginnie Mae) securities with 9 and 11 percent coupons are plotted for the last Friday of each month from 1975 to 1991. These securities are backed by federally insured mortgage loans, so that, from the investor's point of view, there is zero default risk. The value of mortgage loans made by a commercial bank would be recorded on its books at the time the loan was made and would not change unless the bank sold the loan. One can observe, however, that the market values of such loans have fluctuated a great deal over the past fifteen years. For example, the market values of GNMA securities with 9 percent coupons were 100.75 percent of their par value at the end of May 1978. By September 1981, these securities were trading at 60 percent of their par value, due to a large increase in long term market interest rates during this period. Because commercial banks held fixed rate mortgage loans during this period, the ratio of market to book value of these loans decreased from 1979 to 1981. In Mondschean (1990), I examined the mortgage portfolios of 75 bank holding companies and found that, on average, the market value of their mortgage loans declined from approximately 90 percent of book value at the beginning of 1979 to approximately 60 percent by the end of 1981. Although banks could have hedged their fixed rate mortgage loans by using futures and options or by

FIGURE 2

Proportion of firms with market to book ratios less than one

SOURCE: Compustat.

FIGURE 3
Market prices of GNMA securities

percent of par value

SOURCE: Barrons.

funding the loans with long term deposits, I also found that banks with larger unrealized losses on mortgage loans experienced greater declines in their stock prices than banks with smaller losses. However, the accounting value of their mortgage loans and hence the book value of net worth did not change unless banks were forced to sell or write down these loans.[7]

Besides market interest rates, there are other factors which can affect the market value of bank net worth. The probability of default can increase unexpectedly, adversely affecting a loan's market value. The duration, a measure of the term to maturity of a financial instrument, can decrease unexpectedly, affecting the timing of payments of principal and interest, thereby altering the present value of the loan's cash flow. Changes in the exchange rate value of the U.S. dollar could affect the dollar value of assets and liabilities denominated in foreign currencies. But why should one care if market and book values diverge? Because commercial banks are highly leveraged, small changes in the market values of their assets have a significant effect on their net worth. For example, suppose a bank has a capital-to-asset ratio of 6 percent and the market value of its assets falls by 1 percent with no offsets elsewhere on or off the balance sheet. While a 1 percent decline in total assets may not seem like a large change, it is equivalent to one-sixth of the bank's total capital. Because of this, it is essential for both regulators and investors to

know when the market value of a bank's portfolio changes relative to its book value.

When the market value of a firm goes down, other things equal, its stock price should be affected. However, when the value of bank net worth declines without a corresponding change in accounting net worth, both the regulators and the public may believe a bank has more capital than it actually has. Since many investors are aware of the fact that a bank has better information about its true economic value, they must forecast the magnitude of a bank's net unrealized gains or losses. Thus, a bank's debt and equity may be priced differently than it would be if investors had an accurate measure of net worth. For example, a bank with unrealized losses that are larger than the market believes might have a higher stock price than it would if investors had accurate information about market values; consequently, investors would not be adequately compensated for the risk of investing in that bank's stock. On the other hand, if a bank has larger unrealized gains than the market believes, then, other things equal, its stock would be underpriced, raising the cost of issuing new equity for the bank.[8]

The existence of deposit insurance exacerbates the problems that can arise if the market value of bank net worth falls below book value. As its market value gets closer to zero, the bank has a greater incentive to increase its risk expo-

sure. Since shareholders would receive nothing if the institution is closed, a market value insolvent bank acting in the best interest of shareholders has a strong incentive to increase risk in the hope of earning above normal returns. If the institution experiences greater losses, the losses are borne by the deposit insurer and not by the shareholders, thereby placing the deposit insurance fund at greater risk. This moral hazard problem underscores the importance of providing accurate market values of bank net worth to regulators. Because the current accounting system does not guarantee that this will be the case, the probability that taxpayers will be required to absorb part of the cost of future bank failures is increased.[9]

Measurement issues in a market value accounting system

Under a system of market value accounting, banks would be required to adjust all assets and liabilities for changes in the market value of those assets and liabilities. Critics of this approach argue that market value estimates of bank net worth would be unreliable due to the difficulty of measuring the value of various

balance sheet items. To evaluate this argument, it is helpful to examine a representative bank's balance sheet in greater detail. In Table 1, bank assets are separated into several categories and asset shares are reported for all banks with total assets of less than $100 million, $100 million to $1 billion, and over $1 billion, respectively, as of the end of 1990. The asset categories are divided into two groups. The first grouping lists assets for which either book and market values are equal or market values can be calculated with little additional cost. The market values of cash assets, representing currency and coin, reserve balances at Federal Reserve Banks, and cash items in the process of collection, are equal to their book values. Assets held in trading accounts are already carried at market value. The market values of overnight federal funds sold and securities purchased under agreement to resell are close to book values because of the short term nature of these financial instruments. The market value of securities held is already reported to regulators.[10]

Deposits due from other banks represent funds one bank may place with another bank. These funds can be interest-bearing or noninter-

	Asset size category in millions of dollars		
	Less than 100	100-1,000	Greater than 1,000
	(percent of total assets)		
Easy to mark to market			
Cash and due from deposits	6.86	6.83	10.61
Federal funds sold and reverse RPs	6.70	5.28	3.65
Assets held in trading accounts	0.04	0.21	1.97
Securities (book value)	30.64	23.85	14.40
Premises and fixed assets	1.69	1.64	1.48
Other real estate owned	0.64	0.66	0.63
Subtotal	**46.57**	**38.47**	**32.74**
Difficult to mark to market			
Total loans and leases	51.58	59.47	62.04
Other assets	1.84	2.06	5.23
Total assets	**100.00**	**100.00**	**100.00**
Number of banks	9,144	2,682	363

TABLE 1

Asset shares of commercial banks
(December 31, 1990)

SOURCE: Federal Reserve Report of Condition.

est-bearing. In general, smaller banks having a correspondent relationship with a larger bank deposit these funds in exchange for services provided by the larger bank. Since there is a great deal of competition for this business among large banks, it is believed that the value of services provided as implicit interest on these balances approximates a market interest rate; hence, the market values of these deposits equal their book values.

Computing market values for other real estate owned (OREO) is somewhat less precise. OREO includes all real estate owned or controlled by the bank excluding bank premises, such as direct and indirect investments in real estate ventures for investment purposes and real estate acquired through foreclosure. Currently, banks report to regulators the book value of these assets less accumulated depreciation, which cannot be greater than fair market value. Fair market values of these assets are generally calculated by independent appraisers. The accuracy of these appraisal reports depends on both the availability of comparable market information as well as the judgment of the appraisers. While they may be imprecise, these estimates would be no less exact under market value accounting than under the current system. Since banks also record bank premises and fixed assets (computers, furniture, etc.) at book value less depreciation, there is no reason why market appraisals could not be used to value these assets as well.[11]

Taken as a group, those assets for which using MVA would entail little or no additional cost to banks represent approximately one-third of total assets for banks with over $1 billion in total assets and just under one-half of total assets for the 9,144 banks with $100 million or less in total assets as of the end of 1990.

Proponents of MVA recognize that certain categories of loans would be difficult to mark to market. While some loans, such as one-to-four family mortgage loans and student loans, are actively bought and sold, most types of loans are not actively traded, and so market values cannot be inferred directly from secondary markets.[12] Although financial institutions must often compute market values of nontraded assets for their own purposes, such calculations are inherently judgmental and could potentially be manipulated. Opponents of MVA point out that the cost of imposing MVA on banks would be high if every bank loan required such a valua-

tion. Proponents counter that banks already use such judgment in determining the appropriate size of their loan loss reserves.

Analyzing the effect of market interest rate changes on loan market values is a primary objective of MVA. Table 2 classifies loans at commercial banks according to the remaining time to repricing or repayment. Floating rate loans are loans whose interest rate is adjusted to reflect market interest rate changes. For banks with over $1 billion in total assets, the majority of loans are made at floating interest rates. The market values of these loans can diverge during the period between repricing dates; however, once the loan interest rate is adjusted, market and book values are equal. Thus, the effect of changes in market interest rates on the market values of bank loans depends on the time period before either the loan is repriced or it is repaid. As Table 2 indicates, for all size classes, the percentage of loans which are repriced or repaid within one year is between 60 and 70 percent.

For loans with longer periods before repricing or repayment, assuming banks revealed accurate cash flow information, market values could be inferred using some form of discounted cash flow analysis. The market value of a loan is equated to the present value of the expected flow of payments accruing from the loan. Assuming, for simplicity, that payments are made at the end of each period, the present value of the flow of payments as of date 0 can be represented by the following:

$$PV_0 = C_0 + C_1/(1 + r_1) + C_2/(1 + r_2)^2 + ... + C_n/(1 + r_n)^n$$

where, for example, C_1 represents the expected payment of principal and interest in period 1, r_1 is the discount rate for period 1, and n is the number of years from today to the date of the final payment. The present value of a bank's existing loans can be affected in two ways. First, the timing of interest and principal payments may be altered in the event of a rescheduling of repayments. Second, the interest rate used to discount future payments may change. Using discounted cash flows to derive market values would have several advantages. As long as banks know when expected payments of interest and principal would occur, they could combine loans and report the expected cash flow of the entire loan portfolio. Thus, they need not report the market value of each loan. As banks make new loans

TABLE 2

Loans at commercial banks by remaining time before repricing or repayment
(December 31, 1990)

	Asset size category in millions of dollars		
	Less than 100	100-1,000	Greater than 1,000
	(percent of total loans)		
Floating rate loans with remaining time to repricing			
Within 3 months	26.51	37.25	45.07
3 months - 1 year	6.59	7.56	6.45
1 year - 5 years	1.81	2.65	1.52
Greater than 5 years	0.10	0.16	0.38
Total floating rate loans	35.01	47.62	53.42
Fixed rate loans and leases with remaining maturity			
3 months or less	12.79	8.02	10.07
3 months - 12 months	16.59	8.93	5.43
12 months - 5 years	26.87	24.70	18.66
Over 5 years	8.75	10.73	12.42
Total fixed rate loans and leases	64.99	52.38	46.58
Total loans and leases	100.00	100.00	100.00
Percent of all loans that mature or are repriced within one year	62.48	61.75	67.02

SOURCE: Federal Reserve Report of Condition.

and receive new information about the timing of expected future payments on existing loans, they could update their cash flow projections. Changes in foreign exchange rates which could affect the expected dollar values of future payments can also be incorporated into these estimates. And the present value of the loan portfolio can be adjusted for changes in market interest rates.

However, there are measurement problems inherent in the present value approach. Even for relatively simple fixed rate term loans, valuations depend on assumptions about the expected payments and appropriate discount factors. Borrowers may have trouble servicing the debt according to the terms of the loan contract because of economic difficulties, or they may choose to repay a loan faster than the bank expects. Whatever the reason, the duration of the loan may increase or decrease and the present value would be affected.[13] In addition, many loans with interest rate caps or collars have embedded options which require more sophisticated valuation methods. These issues

aside, while adjusting the market values of loans for interest rate risk is relatively straightforward, it is more difficult to determine the effect of changes in credit risk on loan market values. One problem is that since banks possess better information about the borrower than the users of financial statements do, a moral hazard problem exists. It might be optimal for a bank not to reveal its best estimate of a loan's market value. As a bank's net worth decreases, its incentive to overstate the value of its loans increases.[14]

Besides loans, there are other assets for which it may be difficult to compute market values.[15] An example is the value of services provided by the bank in exchange for fees. For example, when a bank sells a mortgage loan to FNMA, it often retains the right to service the loan for a fee. While in principle one could take the present value of the fees net of the bank's own cost, the possibility of prepayment or foreclosure makes such calculations problematic. Evaluating the present value of other services provided by a bank presents similar difficulties.[16]

There are also measurement issues which must be confronted when computing the market values of bank liabilities. When computing the value of bank liabilities, it may be inappropriate to use secondary market prices because they incorporate credit risk. While shareholders would prefer to include the value of the bank's option to default on its liabilities in the market value of net worth, debtholders and regulators would not because they would bear the cost of default. One way of protecting uninsured creditors and the deposit insurance fund would be to discount the contractual cash flows of bank liabilities at the risk free interest rate.[17]

Table 3 shows various liability categories expressed as a percent of total assets. Some liabilities are either easy to mark to market or are already carried at market value. The interest rate on money market deposit accounts is generally indexed to a market interest rate. Borrowed funds, such as federal funds purchased and securities sold under agreement to repurchase, are very short term financial instruments, so market and book values are extremely close. Total time deposits are relatively straightforward to mark to market because they are seldom redeemed before maturity and over three-quarters mature or are repriced within a year. Discounted present values can be calculated for subordinated debentures and other long term bonds.

Demand deposits, savings deposits, and NOW accounts are potentially the most difficult items on bank balance sheets to mark to market.[18] Because of the cost a depositor may incur in transferring accounts from one bank to another, banks often pay below market interest rates on their core deposits; hence, these deposits add market value to a bank's net worth. In theory, the additional value of core deposits can be represented by the present discounted value of future cost savings net of servicing costs over the next best alternative funding source. However, calculating these present values is difficult for two reasons. First, when market interest rates increase, the future cost savings per dollar of deposits may also rise, but the deposit quantities may decrease. Since the value of the cost savings each period equals the cost savings per dollar of deposits times the amount of deposits, there is no precise measure

TABLE 3			
Liability and net worth shares of commercial banks (December 31, 1990)			
	Asset size category in millions of dollars		
	Less than 100	**100-1,000**	**Greater than 1,000**
	(percent of total assets)		
Easy to mark to market			
Money market deposit accounts	9.71	12.13	11.21
Time deposits	47.95	42.64	27.28
Borrowed funds	0.99	4.78	14.45
Subordinated notes and debentures	0.03	0.12	0.94
Subtotal	**58.69**	**59.67**	**53.89**
Difficult to mark to market			
Total demand deposits	12.34	13.47	14.26
Other transactions deposits	11.40	9.50	5.17
Other savings deposits	7.49	7.97	5.29
Deposits in foreign offices	0.04	0.53	11.45
Other liabilities	1.08	1.20	4.18
Total book value capital	8.96	7.67	5.76
Total liabilities and net worth	**100.00**	**100.00**	**100.00**

SOURCE: Federal Reserve Report of Condition.

of the magnitude of these cost savings over time. Second, because core deposits have no stated maturity, there is no objective method to determine the duration of these deposits. Thus, any calculation using present values must be based on assumptions which are difficult to verify. On the other hand, imprecise though they may be, estimated valuations of core deposits are routinely done by depository institutions interested in purchasing core deposit accounts from insolvent institutions or when analyzing the value of a bank for a prospective merger or acquisition.

Deposits in foreign offices, which fund over 10 percent of total assets for banks with $1 billion or more in total assets, present similar conceptual difficulties for MVA. Time deposits would be relatively easy to mark to market, but other types of foreign deposits may be more difficult. While banks are currently not required to break down their deposits in foreign offices by type of deposit, we do know that over 95 percent of these deposits pay explicit interest. Thus, if foreign deposits were reported in the same detail as domestic deposits are, accurate market valuations could be made for the vast majority of these deposits. Requiring foreign deposit holdings to be reported in greater detail would impose little additional cost since these deposits are concentrated in the largest banks who need these data for internal purposes.

Another set of measurement issues arises when accounting for off balance sheet contingencies under MVA. Examples of such contingencies include interest rate and foreign currency swaps, forward and futures contracts, loan commitments, letters of credit, and guarantees. Since banks are already required to estimate the market value of interest rate and futures positions for regulators, these pose no additional problems under MVA. However, evaluating the market value of loan commitments is complicated by the possibility that they would become loans. The values of loan guarantees depend on the probability that they will be exercised, which implies some estimate of credit risk is necessary.[19]

In summary, while computing accurate market values for some bank balance sheet items is difficult, many proponents of MVA believe the extent of the problems is exaggerated since the majority of bank assets and liabilities can be marked to market with little additional cost. Many of the problems are inherent in any accounting system, but others are the result of assumptions or subjective judgments which must be made in order to provide estimates of market values. Proponents of MVA contend that if banks start valuing their portfolios using MVA, the experience will spur accounting innovations that can improve the quality of information and reduce measurement errors. Also, they argue that the question should not be whether market value accounting is perfectly accurate, but whether MVA is an improvement over historical cost accounting. If MVA can reduce the bias (the difference between economic and accounting values) and the variance of the bias (the tendency for the bias to fluctuate over time) relative to HCA, it would be an improvement over the current accounting system.

Costs imposed by a market value accounting system

The banking industry maintains that the cost of implementing a new system designed to report market values as a basis for GAAP and regulatory reports would be prohibitively expensive. According to this view, MVA requires costly marking to market of all assets, liabilities, and contingent claims it holds using whatever method—observation of secondary market prices, appraisals, or discounted cash flow analysis—is deemed most appropriate. Many depository institutions claim that MVA would require additional developmental and other costs to obtain necessary data, modify or purchase computer software, perform complex calculations, and train personnel. Because many of these costs are fixed, smaller banks would experience even greater burdens on a unit cost basis. Moreover, because many assumptions required to compute market values are subjective, the cost of auditing banks may also rise as verification of a bank's methods would take longer and be more difficult.

Proponents of MVA respond that the incremental cost of adopting MVA is overstated for small banks. Smaller banks hold a larger proportion of assets which are relatively easy to mark to market, partly because they have a higher percentage of their assets in securities but also because of the nature of their loan portfolios. Table 4 shows how the average loan

TABLE 4

Total loans at commercial banks by type of loan
(December 31, 1990)

	Asset size category in millions of dollars		
	Less than 100	100-1,000	Greater than 1,000
	(percent of total loans)		
Loans secured by real estate	50.07	51.10	35.12
Construction and land development	3.50	5.41	6.47
Secured by farmland	4.93	1.26	0.21
Revolving, open-end loans secured by one-to-four family properties	1.55	3.34	3.00
Mortgage loans—one-to-four family dwellings	26.22	3.26	12.72
Mortgage loans—multifamily dwellings	0.94	1.41	0.88
Nonfarm nonresidential real estate loans	12.93	16.41	10.12
Loans to depository institutions	0.25	0.94	3.06
Agricultural loans	9.68	1.81	0.56
Commercial and industrial loans	19.33	22.45	32.53
Consumer loans—credit cards	1.00	3.78	6.76
Consumer loans—other	17.88	17.10	11.33
Loans to foreign governments and official institutions	0.01	0.06	1.65
Other loans	3.61	4.71	10.03
Total loans and leases, net of unearned income	100.00	100.00	100.00

SOURCE: Federal Reserve Report of Condition.

portfolio for smaller banks differs from their larger counterparts. The data show that, for banks with less than $100 million in total assets at the end of 1990, the proportion of relatively easy to value one-to-four family mortgage loans and non-credit-card consumer loans was significantly larger than for banks with over $1 billion in total assets, and small banks held a smaller proportion of commercial and industrial loans They also have a larger proportion of loans secured by farmland, for which there is a great deal of price data. With few exceptions, smaller banks also do not have any foreign deposits. In other words, because smaller banks have portfolios which are easier to value, the costs of adopting MVA per dollar of earnings may actually be less than for larger banks.

Another point is that it is not necessary to mark individual assets and liabilities to market in order to obtain the majority of the benefits of MVA. One could aggregate loans and deposits

into pools with similar characteristics and estimate market values for each pool. An advantage of such a method is that idiosyncratic differences among assets within a pool would not have as great an effect on its overall value, so measurement error may be reduced. In addition, while implementation and operating costs may be high initially, they would most likely decline over time. New products would be created and marketed to make it easier to collect and process the additional information required for MVA. Economic incentives to lower these costs would lead to the development of standardized databases and software to compute market values of complex financial instruments. The movement toward standardization would also make it easier for users of bank financial statements to compare relative bank performance.

Even if adopting MVA proves to be costly, proponents believe that any incremental cost of

MVA to the banking industry should be compared with the gains society derives by having better information. Regulators and taxpayers would especially benefit by having better and more timely information about a bank's economic value. Bank managers could use the information derived from MVA to improve their management of risk exposure. Investors would have a better measure of the economic value of banks which would allow investors to make more informed choices about which bank investments to hold. Thus, while it may be in an individual bank's interest to oppose MVA because its cost of implementation may not exceed the benefits for the bank itself, MVA may be worthwhile if the total benefit to society exceeds the total cost to society. Indeed, the difference between private and social net benefits is one of the principal justifications given for imposing regulations in general.

Possible economic effects of market value accounting

In assessing the feasibility of changing the accounting system for banks, it is necessary to evaluate the likely economic effects of such a change. Many researchers have studied the impact of changes in accounting regulations on market values of firms.[20] The general conclusion of these studies is that changes in accounting and reporting rules do affect stock market values. While it seems likely that changes in bank accounting rules may affect market values of bank securities, this is hardly a reason for not making needed reforms since firms must often adjust to changes in accounting methods and standards. Thus, a key question is whether the use of MVA will improve the safety and soundness of the banking system. Also, will banks become more or less competitive relative to other firms under MVA? A third question is how will bank portfolio behavior change under MVA.

Whether market participants perceive banks to be safer under MVA than under current accounting practices depends in part on how serious the measurement problems are. Opponents of market value accounting argue that estimates based on subjective and difficult to verify assumptions will increase uncertainty about the true economic value of banks. This will undermine public confidence in the banks, raising their costs of capital and borrowed

funds. Also, MVA opponents argue that current bank earnings will be even more sensitive to fluctuations in interest and exchange rates because they would have to realize capital gains and losses sooner. As a result, investors will demand greater risk premia. Banks may then be induced to focus more on short run profits and avoid long term loans that may be more profitable but also more risky if they must be marked to market.

Proponents of MVA respond that requiring greater disclosure of market values of bank portfolios would allow investors to make better estimates of the economic or true value of bank securities. Thus, MVA comes closer than historical cost accounting to disclosing the true value, and the true risk, of a bank to investors and regulators. In particular, banks' cost of capital will rise under MVA only if banks had been underpaying for capital, deposits, or borrowed funds previously by undercompensating investors or depositors for the risk of investing in or lending to banks. Hence, MVA will benefit investors and lenders because it insures that investors and lenders will be fairly compensated for the risk of investing in or lending to banks. Moreover, since MVA would make it more difficult for banks to overstate their net worth, MVA will benefit regulators by allowing banks that are having capital adequacy problems to be identified more quickly. This would improve the safety and soundness of the banking industry.

The likely consequences of MVA for future bank behavior are difficult to determine. One concern is that banks may reduce credit availability during periods of declining asset prices. Since declining market values would quickly affect capital positions, banks might curtail lending to increase capital-asset ratios. It is also conceivable that if MVA increases the volatility of reported net worth it may also increase the volatility of credit availability. Due to the growth of commercial paper and other types of direct corporate borrowing, the borrowers that would be most adversely affected by increased credit rationing would be those who do not have direct access to capital markets, such as small businesses. Another issue is whether the optimal capital-asset ratio will increase under MVA. If reported earnings under MVA were more volatile and regulators and creditors based their actions on these new

earnings estimates, a bank would increase its equilibrium capital ratio and reduce hedgeable risk in order to reassure its customers that it could withstand shocks that reduced its net worth. This behavioral change could mitigate the need to restrict credit availability when market values are falling, and it may also improve safety and soundness.

Alternatives to market value accounting

Acknowledging some of the criticisms of full MVA, some have argued that most of the advantages of MVA can be obtained by modifying rather than overhauling the current accounting framework. One proposal is to require the reporting of values for those instruments for which secondary market prices exist. Such a step would not be very costly to banks because much of this information is already reported to regulators. Proponents believe that this would represent an improvement over the current system and would reduce the degree of measurement error that currently exists by using HCA. Opponents disagree, contending that many institutions use securities to offset positions taken elsewhere in the balance sheet. For example, a bank might decide to purchase some long term Treasury securities to offset long term certificates of deposit. Marking one and not the other to market would reduce the effectiveness of such a hedging position. Moreover, the difficulty of measuring the duration of core deposits implies that it may be not be easy to determine whether some banks have positive or negative gaps (a gap is the difference between the market value of assets and the market value of liabilities of equal times to repricing or repayment). In this case, it becomes unclear whether an increase in interest rates will reduce the market value of net worth. Thus, only marking a portion of the balance sheet to market for changes in interest rates would distort its meaning and lead to greater confusion about bank net worth, according to MVA opponents. Note that this argument would not hold for credit risk since it is difficult to hedge against credit risk.

Another proposal is to require banks to disclose more information about the performance of their portfolios in their financial reports but not necessarily mark their portfolios to market. An advantage of disclosure is that it avoids many of the measurement problems discussed earlier because it would be up to the users of financial data to determine the effect of the additional disclosures on the market value of net worth. As a result, the cost of auditing the bank would be less than it would be under full MVA. Another advantage of disclosure is that investors, depositors, and bank regulators could use the information to make decisions. Investors could respond to disclosure of negative information by selling a bank's securities, thereby imposing greater market discipline on banks.

Disclosure of market value information would be a useful transitional step toward full MVA, because it would give market participants and regulatory bodies time to assess the usefulness of market value information and its likely economic effects. The Financial Accounting Standards Board (FASB) appears to agree. Statement No. 105 requires additional disclosure in financial statements with off balance sheet risk of accounting loss. It also requires greater disclosure of "... all significant concentrations of credit risk of all financial instruments, whether from an individual counterparty or groups of counterparties." A concentration of credit risk exists when the parties have common economic characteristics, such as operating in similar industries or locations, which would cause their ability to meet contractual obligations to be similarly affected by changes in these characteristics. For more details, see FASB (1990) and Carlson and Mooney (1991).

A recent statement, FASB (1991), goes even further. It requires that all entities disclose information about the market value of all financial instruments, both assets and liabilities on and off the balance sheet, for which it is practical to do so. For instruments for which it is impractical to estimate market value, the statement requires descriptive information that would assist users in estimating market values. The proposed date of implementation is for financial statements issued for fiscal years ending after December 15, 1992, for entities with $150 million or more in total assets. For those entities with less than $150 million in total assets, the effective starting date would be three years later.

Conclusion

The savings and loan crisis has focused attention on the accounting system used by financial institutions. Many economists and other researchers believe that the current system of accounting presents a misleading picture of the

true economic value of commercial banks. They contend this is both raising the cost of capital for banks and placing the deposit insurance fund at greater risk. Market value accounting has been proposed as a better way to measure the economic value of banks. However, MVA has conceptual and measurement difficulties which need to be addressed. Many of these problems can be mitigated, but it must be recognized that no system of accounting can eliminate the use of judgment in valuations.

Until this debate is resolved, there is still a need for better information to protect the deposit insurance fund and ultimately taxpayers from excessive risk taking by banks with low market values. Because managers of banks may not want to voluntarily improve the quality of information submitted to both regulators and the public, banks should be required to report the expected future cash flows (repayment of principal and interest) on their fixed rate loans and time deposits as a function of the time when repayment is made. Currently, banks are only required to report the value of assets and liabilities which fall into different time periods, as shown in Table 2. To compute present values, one needs the expected future cash flows as a function of time, not what is currently reported.

Disclosing this information would greatly assist regulators in examining interest rate risk of commercial banks. Second, banks should not have as much discretion to choose the time to realize gains or losses as they currently do. In particular, accounting rules for reporting nonperforming loans and for increasing loan loss reserves need to be strengthened, and changes in credit risk must be reported sooner to regulators. Third, deposits held in foreign offices should be reported in the same detail as domestic deposits. Finally, greater public disclosure is necessary to enable investors to estimate bank net worth more accurately. If investors are more accurately informed, market prices of bank stocks and subordinated debentures would better reflect the economic condition of commercial banks. Healthy banks would benefit as reduced uncertainty would raise their stock prices and lower their cost of capital. Less well-capitalized banks would be subject to greater market discipline and thus have a stronger incentive to improve their net worth positions. In the absence of requiring market value accounting, I believe these changes would improve the ability of regulators and investors to monitor the safety and soundness of the banking system and to measure bank performance.

FOOTNOTES

[1] See U.S. Treasury (1991), p. XI-3.

[2] Benston (1989), p. 549.

[3] The total value of bank assets which involve truly proprietary information may be overstated. For example, many business loans are made by groups of banks in which information is shared. Currently, there are approximately $800 billion outstanding in the shared national credits program.

[4] Insurance companies must also report a breakdown of their bond holdings by six quality classes. By contrast, commercial banks only report the aggregate amount of securities for different types (U.S. government, state and local government, corporate, foreign, etc.). They do not report which corporations' securities they are holding nor do they classify their bonds by credit quality.

[5] There are some exceptions. For example, banks report their securities holdings at par value less amortization of discount or plus accretion of premium. Other exceptions are discussed in greater detail in the measurement issues section.

[6] An example of such behavior was Citicorp's decision to increase reserves against its Latin American debt by $3.4

billion in the second quarter of 1989. Many large banks followed Citicorp's lead with substantial increases in their own loan loss reserves.

[7] It is also worth noting that since savings and loan (S&L) associations had over three-quarters of their assets invested in mortgage loans and mortgage-backed securities, the rapid increase in market interest rates from 1978 to 1981 had an even larger negative impact on S&L net worth than it did on commercial banks. It is in part because of this experience that the Office of Thrift Supervision has developed a Market Value Model for adjusting the values of S&L portfolios for changes in market interest rates.

[8] Even if stock prices did accurately reflect unrealized gains or losses, the holders of debt contracts with covenants contingent on accounting values may be arbitrarily penalized.

[9] Since deposit insurance can be viewed as a call option, a market value insolvent bank still open for business can increase its risk exposure and thus the value of its deposit insurance. Since this option is capitalized into the price of the bank's stock, such an action can actually *raise* the stock's value.

[10] Even though market price information may be available for all these financial instruments, one must interpret these data

carefully because of the varying liquidity of the markets in which these instruments trade. For example, the municipal bond market is very heterogeneous, so one might simultaneously receive different price quotations from dealers. A bank could use the highest or lowest price quote depending on whether it is trying to overstate or understate the market value of its net worth.

[11]Requiring banks to carry these assets at lower of cost or market value (LOCOM) reduces the likelihood that a bank could use an overestimated appraisal of its real estate holdings to increase its net worth. On the other hand, reporting real estate using LOCOM makes it more difficult for a bank to realize gains on real estate that may have appreciated in value. In any case, these two asset categories represent less than three percent of total bank assets.

[12]It is possible to get market prices for mortgage loans that conform to the standards set by the Federal Home Loan Mortgage Corporation (FHLMC) and the Federal National Mortgage Association (FNMA). However, it is not possible to get detailed pricing information for nonconforming mortgage loans, and there are problems with using FHLMC and FNMA prices. For more information, see U.S. Treasury (1991), pp. XI-14 and XI-15. In addition to mortgage loans, there are active secondary markets in loans to less developed countries (LDCs) and loans for highly leveraged transactions (HLT). The shared national credit program can be a source of market value information. Also, market values of collateral for some loans may be readily available, such as loans secured by farmland.

[13]Duration is a measure of the effective maturity of a stream of future payments, defined as the weighted average maturity of an instrument's future cash flows, with the present values of the cash flows serving as the weights. A change in the market interest rate can affect the duration of a loan. For example, a decrease in market interest rates may induce borrowers to refinance a loan or pay it off sooner, thereby altering the duration of the loan.

[14]In practice, matrix pricing can be used to reduce the degree of subjectivity involved in determining the risk premia of discount factors employed in the analysis [see U.S. Treasury (1991) for more details]. In addition, auditors provide a check on a bank's use of its information advantage. For a detailed discussion of the incentive problem inherent in a bank valuing its loan portfolio, see Berger, King, and O'Brien (1991). These authors stress the importance of developing some incentive compatible

mechanism for getting banks to report truthfully the market values of their loans.

[15]The category "other assets" in Table 1 includes: (1) investments in unconsolidated subsidiaries and associated companies, (2) customers' liability to this bank on acceptances outstanding, (3) intangible assets, which includes loan servicing rights and goodwill, and (4) other assets such as income earned but not collected on loans, net deferred income taxes, and miscellaneous items. Investments in unconsolidated subsidiaries are currently reported to regulators using the equity method of accounting, where the asset is carried at cost and adjusted for earnings and losses of the investee.

[16]Another intangible asset is goodwill, which arises in connection with merger and acquisitions transactions for which the purchase price exceeds the fair value of the identifiable net assets that are acquired. Calculating the market value of goodwill is difficult in any accounting system. One suggestion, contained in U.S. Treasury (1991), is "[b]ecause of the subjective nature of the determination, goodwill under MVA might be handled in much the same way as under current GAAP; that is, goodwill would be recognized only if acquired through arms-length transactions, and its historical cost would be amortized over some appropriate period of time."

[17]For details, see U.S. Treasury (1991), pp. XI-18-XI-19.

[18]The total return on demand deposits and NOW accounts equals the sum of explicit plus implicit interest. Placing noninterest-bearing demand deposit balances with banks represents partial compensation for services provided to the depositor. For corporations and depository institutions with a correspondent relationship, the size of these compensating balances is adjusted for changes in market interest rates.

[19]The current risk-based capital guidelines do require banks to hold additional capital based on the extent of their off balance sheet exposure.

[20]Examples are for mandatory accounting changes in the oil and gas industry [Collins, et. al. (1981)], consolidated reporting requirements [Mian and Smith (1990)], and translation of foreign currency transactions [Salatka (1989)]. The effects of regulatory accounting changes in the savings and loan industry has been studied by Blacconiere (1991).

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Credit Markets in Transition

The 28th Annual Conference on Bank Structure and Competition, May 6-8, 1992

The Federal Reserve Bank of Chicago will hold its 28th Annual Conference on Bank Structure and Competition at the Westin Hotel in Chicago, Illinois, May 6-8, 1992.

Attended each year by several hundred academics, regulators, and financial institution executives, the conference serves as a major forum for the exchange of ideas regarding public policy toward the financial services industry.

The 1992 conference will focus on the changing structure of credit markets and its implications for the banking industry and the economy. Federal Reserve Chairman Alan Greenspan will serve as the keynote speaker. Topics featured at this year's conference will include: ■ the performance of new credit market instruments ■ the performance of credit markets during the "credit crunch" ■ the future role of banks in the credit market ■ the status and future of the life insurance industry ■ managing the consolidation of the banking industry.

The first day of the conference will be devoted to technical papers of primary interest to an academic audience while the final two days are designed to appeal to a more general audience. Invitations to the 28th Bank Structure Conference will be mailed in mid-March.

If you are not currently on our mailing list or have changed your address and would like to receive an invitation to the conference, please send your name and address to:

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