ESTIMATING INTERTEMPORAL ELASTICITY OF SUBSTITUTION: THE CASE OF LOG-LINEAR RESTRICTIONS

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1. Introduction

The modern theory of consumer behavior is concerned with how consumption adjusts to changing prices over time. When time is not involved, the demand for a normal consumer good declines as its relative price rises. Similarly, consumption at different points in time can be regarded as different goods, in which case the price that determines consumer behavior is the cost of today's consumption in terms of tomorrow's, or, equivalently, the cost of borrowing against the future. This price is called the real interest rate. When the expected real interest rate rises, consumers will attempt to defer current consumption by saving. Economists refer to the substitution between consumption at different points in time in response to changes in the real interest rate as intertemporal substitution in consumption.

The mechanism of intertemporal substitution plays an important role in the theory of consumption and macroeconomics in general. For instance, it implies that consumers will smooth their consumption given the expected time profile of real interest rates and lifetime wealth. Thus, consumers respond to an increase in current income by raising both current and future consumption. This effect has been widely used in analyzing a number of important issues. These include the behavior of aggregate consumption over time, the volatility of stock prices, and the burden of government deficits and social security. Because the smoothing of consumption tends to propagate current shocks into the future, this mechanism also helps explain persistence of business cycles. Furthermore, the willingness of consumers to substitute intertemporally is a key determinant of the effectiveness of many government policies. Consider the recent debate over the reduction of capital gains tax rates. Proponents of the tax cut argue that it would encourage saving by making current consumption more expensive relative to future consumption, i.e., by raising the after-tax real return to saving. In fact, however, the influence of the tax cut on saving and investment depends crucially on the response of consumption to the corresponding changes in the intertemporal terms of trade. Thus, to evaluate the empirical effect of the tax cut, or in fact any policy that is meant to promote saving and economic growth, one must know the intertemporal elasticity of substitution.

While many authors have attempted to use actual data to estimate the intertemporal elasticity of substitution, their results are widely different. For example, using time series data in the United States, Hall (1988) concluded that there is no strong evidence that the elasticity is positive. By contrast, other studies have suggested a much stronger tendency of intertemporal substitution. The estimate obtained by Hansen and Singleton (1982, 1983), for instance, lies between 0.5 and 2, while the estimate obtained by Eichenbaum, Hansen, and Singleton (1986) can be as high as 10 depending on the data set used. The estimation by Hansen and Singleton (1988) even produces a negative elasticity estimate. At the very least, this wide range of figures raises questions regarding the reliability of the elasticity estimates.

This paper explores the reliability of estimates of the intertemporal substitution effect using Monte Carlo simulation. A model economy is specified in which the modeler himself selects the intertemporal elasticity of substitution. Then, using conventional statistical techniques, data generated from model simulations are used to estimate the elasticity. Since the elasticity's true value is known, one can check how closely the estimates conform to the value that was chosen in constructing the data. This technique allows one to evaluate the performance of the conventional strategies for estimating the intertemporal elasticity of substitution. Since many of the empirical

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studies on intertemporal substitution ignore the potential wage effect on consumption, this paper also examines the consequence of misspecification error for a simulated model in which changes in the real wage have effects on consumption behavior. It is shown that ignoring the wage effect can cause a substantial bias in the estimation of the elasticity of substitution in consumption.

The next section outlines the notion of intertemporal substitution using a simple two-period model. Section 3 introduces a formal maximization problem, derives its first-order condition and discusses the estimation method. Section 4 lays out a model economy which serves a laboratory to generate simulation data. Section 5 summarizes the estimation results and Section 6 discusses the misspecification bias.

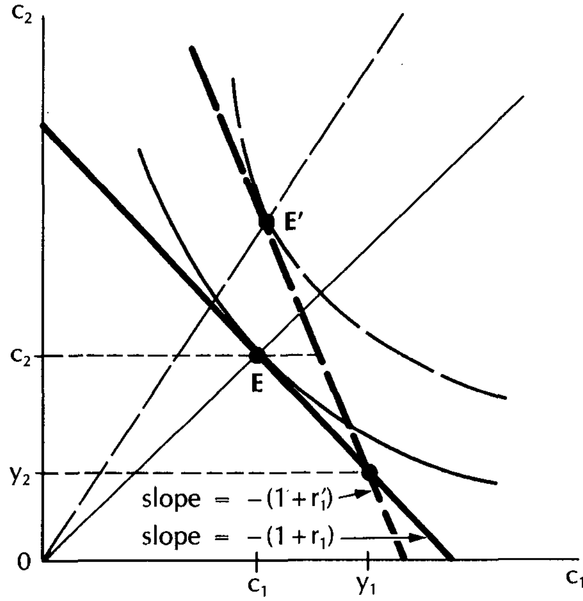
2. Intertemporal Substitution: A Two-Period Model

To clarify the notion of intertemporal substitution, consider a simple two-period consumer's problem. The consumer is assumed to be endowed with a fixed income y_1 in the first period and y_2 in the second period. In period 1, there is a capital market where the consumer may borrow or lend at a competitive real interest rate r_1. Let c_1 and c_2 denote consumption in period 1 and period 2, respectively. Then the budget constraint, expressed in present-value form, is $c_1 + c_2/(1+r_1) = y_1 + y_2/(1+r_1)$. That is, the present value of current and future consumption must exhaust but not exceed the present value of the consumer's income stream. The consumer's problem is to choose c_1 and c_2 in order to maximize his utility, $u(c_1, c_2)$, subject to the budget constraint. This is a standard textbook problem. The consumer will adjust his borrowing or lending so as to equate the marginal rate of substitution of c_1 for c_2 with one plus the real interest rate.[1] In equilibrium, the consumer may be a net borrower or lender depending on his initial endowment position.

Figure 1 depicts the consumer's equilibrium in which the horizontal and vertical axes measure c_1 and c_2, respectively. In equilibrium, the consumer will choose to consume at point E at which the indifference curve is tangent to the budget line, which has slope $-(1+r_1)$. As depicted, this consumer is a net lender and saving is equal to $(y_1 - c_1)$. Now, suppose the real interest rate rises from r_1 to r_1', so that the budget line rotates clockwise around the endowment

[1] In mathematical notation, this condition can be expressed as $u_1/u_2 = (1+r_1)$, where u_i ($i = 1, 2$) is the marginal utility of consumption in period i.

Figure 1



point (y_1, y_2) and has a steeper slope. A key question is how the consumption ratio c_2/c_1 will respond to such a change. First, because consumption becomes relatively more expensive in period 1, there is a substitution effect that induces the consumer to substitute c_2 for c_1 by making more loans in the bond market. Because the consumer is lending, however, there is also an income effect that tends to raise consumption in both periods. Whether or not the consumption ratio c_2/c_1 will rise depends upon the relative magnitude of these effects. For the purpose of this paper, the standard assumption seems reasonable, namely, that on balance c_2/c_1 increases or that the income effect on c_1 is not strong enough to outweigh the substitution effect and the income effect on c_2.[2] As a result, the new equilibrium will be reached at point E' where the consumption ratio c_2/c_1 is higher. Because of the assumption of constant elasticity, the increase in c_2/c_1 is proportional to the increase in the real interest rate. The ratio of the percentage change in the rate of growth of consumption to the percentage change in the real

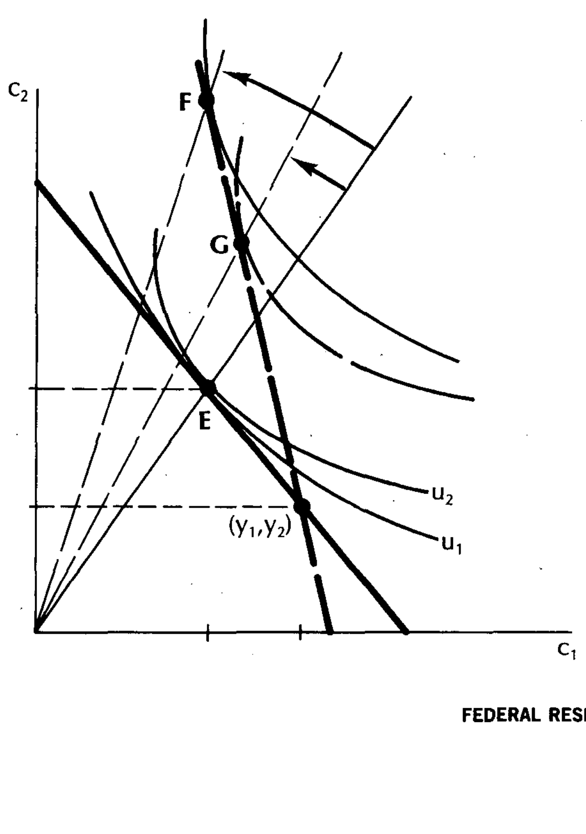
[2] To be precise, the consumer's utility function is taken to be homothetic and constant elastic. This assumption implies that the consumption good in each period is normal and that the slope of the indifference curve is constant along a given ray from the origin. Note that a utility function is called homothetic if the marginal rate of substitution depends only on the consumption ratio, and it is called constant elastic if the marginal rate of substitution is proportional to the consumption ratio. An explicit utility function will be specified in the next section.

interest rate is called the intertemporal elasticity of substitution.

It is clear that the curvature (or the elasticity) of the indifference curve will determine the extent to which the consumer responds to changes in the real interest rate. The more elastic or less curved is the indifference curve, the greater the response will be. Figure 2 depicts the difference in the intertemporal substitution effect of two utility functions with different curvatures. For simplicity, assume that the initial equilibrium is the same so that both indifference curves u_1 and u_2 are tangent at the same point E to the budget line. Note that the curve u_1 has flatter curvature and is therefore more elastic. Suppose the real interest rate rises from r_1 to r_1'. Then the new equilibrium will move from point E to point F in the case of u_1, and to point G in the case of u_2. Comparing the consumption ratio c_2/c_1 at point F and G reveals that consumption grows faster when the indifference curve is more elastic. Thus, there is a positive relationship between the intertemporal elasticity of substitution and the elasticity of the indifference curve.

Now, suppose an econometrician who observes data on consumption and real interest rates over time wishes to estimate the intertemporal elasticity of substitution. How would he go about doing this? The preceding analysis suggests that a natural approach is to think of each observation in time as represented by the tangent point between the indifference curve and the budget line. As one traces out these equilibrium points over time, one essentially looks at the change in these tangent points which are determined by the curvature of the indifference curve. Thus, to estimate the elasticity one could simply regress the rate of growth of consumption on the real interest rate. This approach has been widely used by many authors to study the dynamic behavior of consumption [e.g., Hansen and Singleton (1983) and Hall (1988)].

Figure 2



The foregoing discussion illustrates how equilibrium conditions can be used to interpret economic data. Its implementation, however, requires more rigorous elaboration. For example, because of the stochastic nature of the data one must consider individual behavior under uncertainty. Also, in order to account for the evolution of consumption over time a fully dynamic model needs to be developed. Accordingly, the next section presents a formal maximization problem in which the equilibrium conditions are explicitly used to construct the regression equation to be estimated.

3. The Optimization Framework

To start with, the consumer is assumed to have a time-separable utility function of the following form:[3]

$$u(c_t) = \begin{cases} \frac{1}{1-1/\sigma}\,[c_t^{\,1-1/\sigma} - 1], & \text{if } \sigma > 0 \text{ and } \sigma \neq 1 \\ \ln(c_t), & \text{if } \sigma = 1 \end{cases}$$

This utility function, which has been widely used in the literature, has the property that the elasticity of substitution in consumption[4] is constant and is equal

[3] A utility function is called time-separable when the marginal utility of consumption in a given period is independent of the level of consumption in other periods. This assumption simplifies the analysis.

[4] The elasticity of substitution in consumption is defined as the partial derivative of the rate of change in consumption with respect to the marginal rate of substitution holding the level of utility fixed. In notation, this can be expressed as:

$$\left.\frac{\partial \ln(c_{t+1}/c_t)}{\partial \ln[u'(c_t)/u'(c_{t+1})]}\right|_{u=\bar{u}},$$

where $u'(.)$ denotes the marginal utility of consumption and $\bar{u}$ a constant utility level. Note that this quantity measures an income-compensated substitution of consumption along a given indifference curve which is different from the uncompensated notion of intertemporal substitution. The two notions, however, turn out to be equivalent for two reasons. (1) The income effect is proportional to changes in wealth due to the homotheticity of the utility function. (2) The real interest rate will pin down the marginal rate of substitution in equilibrium.

to the parameter σ. As will be seen shortly, this parameter will control the interest rate effect on consumption.

Now, let us consider the budget constraint. At the beginning of time t, the consumer carries k_t units of capital from the last period. The capital is traded in a competitive market and yields a *stochastic* rate of return r_t in units of consumption goods. At the end of period t, the consumer collects interest income $r_t k_t$ and principal k_t. This sum is the only income that the consumer allocates between consumption c_t and new capital k_{t+1} to be carried into the next period. Thus, the consumer's budget constraint for period t is $c_t + k_{t+1} = (1+r_t)k_t$.

The consumer's problem is to choose a path of consumption and capital, contingent on the realization of capital returns, that satisfies the budget constraint each period and maximizes the expected present value of lifetime utility over an infinite horizon.[5] That is, given the initial capital stock k_0, the consumer solves

$$\max E_0[\sum_{t=0}^{\infty} \beta^t u(c_t)]$$

$$\text{subject to } c_t + k_{t+1} = (1+r_t)k_t \text{ for all t}$$

where β is the time preference discount factor that lies between 0 and 1, and E_0 is the expectation operator conditional on information at time 0.

The first-order condition (or Euler equation) of this problem is

$$u'(c_t) = \beta\ E[u'(c_t+1)\ (1+r_{t+1}) |\ I_t] \qquad (1)$$

where I_t denotes the information set at time t.[6] This equation is precisely a stochastic version of the equilibrium condition that the budget line must be tangent to the indifference curve as depicted in Figure 1.[7] This equilibrium condition states that the marginal cost of investing an extra unit of consumption good at time t (i.e., the foregone marginal utility of consumption) should equal the marginal benefit from investing — this return being composed of the expected present value of the marginal utility of consumption times the investment proceeds at time t + 1 (principal plus interest). This condition implies that a small deviation from the optimal consumption plan will leave lifetime utility unchanged.

From an empirical standpoint, the above first-order condition is all that is needed to estimate the intertemporal elasticity of substitution. Obtaining the estimate involves use of a simple procedure to derive a regression equation from (1). First, given the constant-elastic utility function specified at the beginning of this section, (1) takes the form

$$E[\beta\ (c_{t+1}/c_t)^{-1/\sigma}\ (1+r_{t+1})\ -1 | I_t] = 0. \qquad (2)$$

This equation says that the residual (i.e., the term defined in the bracket) has a zero mean conditional on information available at time t. It implies that any variable included in the information set should be uncorrelated with the residual. These restrictions, referred to as orthogonality conditions, admit a class of instrumental variables procedures for estimating the parameters β and σ [e.g., Hansen (1982) and Hansen and Singleton (1982)]. As can be seen, equation (2) is highly nonlinear and difficult to work with. A common procedure is to make distributional assumptions on certain variables at hand, and to transform the equation into a linear representation. This transformation renders the equation easy to estimate but its tractability is obtained at the cost of an extra assumption which may not be true.[8]

Specifically, assume that the measured growth of consumption c_{t+1}/c_t as well as the real interest rate $(1+r_{t+1})$ has a lognormal distribution.[9] This assumption implies that $\ln(x_{t+1})$, where $x_{t+1} = \beta(c_{t+1}/c_t)^{-1/\sigma}(1+r_{t+1})$, has a normal distribution with a constant variance ν and a mean μ_t conditional on I_t. Using the lognormality assumption, we have $E[x_{t+1}|I_t] = \exp[\mu_t + \nu/2]$. Comparing with equation (2) yields $\exp[\mu_t + \nu/2] = 1$, which in turn implies $\mu_t = -\nu/2$. Since, by definition, $\mu_t \equiv E[\ln x_{t+1}|I_t]$, it follows that

$$-\nu/2 = \mu_t = \ln\beta - 1/\sigma\ E[\ln(c_{t+1}/c_t)|I_t] + E[\ln(1+r_{t+1})|I_t].$$

[5] The assumption that the consumer lives forever is here employed for analytical convenience only. The specification of a finite horizon problem will not alter the results of this paper.

[6] The information structure is unspecified here. Note, however, that its specification is necessary for computing the conditional expectation.

[7] Ignoring the expectation operator, equation (1) simply says that the ratio of the marginal utilities (expressed in units at time t) is equal to one plus the real interest rate, which is the first-order condition for the two-period model in Section 2.

[8] It should be noted, however, that distributional-independent methods such as the generalized method of moments proposed by Hansen (1982) is available for dealing with nonlinear problems. The results pertaining to this procedure are beyond the scope of this paper, and are presented in Mao (1989).

[9] A random variable X is lognormally distributed if the natural logarithm of X has a normal distribution. By definition, XY is lognormally distributed if both X and Y are lognormally distributed. If ln(X) has a normal distribution with mean μ and variance ν, then the mean of X is $\exp[\mu+\nu/2]$.

Multiplying both sides by σ and arranging terms yields

$$E[\ln(c_{t+1}/c_t)|I_t] = \beta_0 + \sigma\, E[\ln(1+r_{t+1})|I_t],$$

where $\beta_0 = \sigma[\ln \beta + \nu/2]$. Let $\epsilon_{t+1} = \ln(c_{t+1}/c_t) - E[\ln(c_{t+1}/c_t)|I_t]$, then

$$\ln(c_{t+1}/c_t) = \beta_0 + \sigma\, E[\ln(1+r_{t+1})|I_t] + \epsilon_{t+1}. \quad (3)$$

Note that the expectational error ϵ_{t+1} is uncorrelated with the variables included in the information set, and is normally distributed with a zero mean and a constant variance. As can be seen, the parameter σ identifies exactly the intertemporal elasticity of substitution. This equation is used later to estimate the parameter σ.

Equation (3) implies that the mean of the rate of growth of consumption is shifted only by the *conditional* mean of the real interest rate. That is, information at time t is helpful in predicting the rate of growth of consumption only to the extent that it predicts the real interest rate. Since the *expected* real interest rate is determined endogenously within the model, an instrumental variables procedure will be used to estimate the parameter σ. This procedure amounts to two-stage least squares in which the first stage estimates the expected real rate using variables (instruments) contained in the information set consisting of observations on past consumption growth and real interest rates. The projected real interest rates are then used in equation (3) to estimate σ. This procedure yields a consistent estimate of the intertemporal elasticity of substitution.

As mentioned before, it has been difficult to pin down the parameter σ. The point estimates vary widely, ranging from near 0 to 10. These results suggest that the linear regression equation (3) may not be a proper model for estimating the intertemporal elasticity of substitution. To examine this issue more closely, consider the following question. Given that the the true value of σ is known, how accurately can that value be recovered by using (3) and the econometric procedure outlined above? A Monte Carlo experiment is carried out to answer this question.

4. The Data Generating Process

The first step of the Monte Carlo experiment is to write down a model economy whose output will be used to simulate the data. In particular, the economy is represented by a general equilibrium model in which the underlying production process is explicitly specified.[10] This approach allows quantities as well as prices to be endogenously determined within the model.

The economy is similar to that described in Section 3 with the exception that the consumer now *also* plays the role of producer. In each period, the consumer carries from the previous period k_t units of capital which are used to produce output. Due to the weather and other uncontrollable random factors, however, the volume of output is uncertain. To capture such uncertainty, the technology is represented by a production function of the form: $y_t = \lambda_t F(k_t) = \lambda_t k_t^{\alpha}$, $0 < \alpha < 1$, where y_t is output produced at time t and λ_t is a random shock with a known probability distribution. The output may be consumed or invested. If invested, the capital will depreciate at a constant rate δ $(0 < \delta < 1)$ so that the investment at time t is defined to be $i_t = k_{t+1} - (1-\delta)k_t$. The agent is assumed to have a constant-elastic utility function as specified above. His problem is to choose a contingent plan for consumption and investment so as to maximize his expected lifetime utility. That is, the agent solves

$$\max E_0[\sum_{t=0}^{\infty} \beta^t u(c_t)]$$

$$\text{subject to } c_t + i_t = \lambda_t F(k_t) \text{ for all t.}$$

The solution of the above maximization problem consists of a sequence of consumption and investment outcomes over time, contingent on the realization of the random shock λ_t. In this way the model generates the consumption data for estimating the intertemporal elasticity of substitution σ in (3) above. The model also generates an implied real interest rate time series, needed to estimate (3). To see this, consider the first-order condition:

$$u'(c_t) = \beta\, E_t\{u'(c_{t+1})\,[\lambda_{t+1}F'(k_{t+1}) + (1-\delta)]\}. \quad (4)$$

The intuition behind (4) goes as follows. Suppose at time t the agent decides to carry one extra unit of consumption good to the next period, which will cost him, in utility terms, the marginal utility of consumption. The gain that results is the expected present value of the marginal utility of consumption times the extra output that can be produced at time t+1, which is equal to the sum of the marginal product

[10] Readers familiar with the literature on economic growth will recognize that the model specified is a standard optimal growth model as studied by Brock and Mirman (1972).

of capital and the amount of capital that is left over after depreciation. Equating the cost and benefit in equilibrium yields equation (4). As can be seen, equation (4) is identical to the first-order condition of the consumer's problem [equation (1)] except that the real interest rate is replaced by the rate of return on investment, i.e., the marginal product of capital minus the depreciation rate.

Because the optimization problem does not have a closed-form solution, a numerical method will be used to solve the problem. Specifically, a dynamic programming algorithm is employed to approximate the solution over a discrete state space.[11] It is assumed that the production shock λ_t can take 5 distinct values over the set [0.9, 1.1], i.e., 0.9, 0.95, 1.0, 1.05, 1.1, and that it evolves over time according to the following Markov transition probability:[12]

$$\begin{bmatrix} 0.50 & 0.30 & 0.20 & 0 & 0 \\ 0.25 & 0.50 & 0.25 & 0 & 0 \\ 0 & 0.25 & 0.50 & 0.25 & 0 \\ 0 & 0 & 0.25 & 0.50 & 0.25 \\ 0 & 0 & 0.20 & 0.30 & 0.50 \end{bmatrix}$$

This transition matrix implies that the random shock will be, to some degree, persistent over time because the probability of staying in the same state is higher than that of switching to other states. The choice of this transition matrix is motivated in part by the fact that the actual production shocks in the United States, as measured by the Solow residual,[13] are positively correlated over time. The estimation results reported below do not appear to be sensitive to the specification of this transition matrix. Other parameters that are held constant throughout the experiment are: $\beta = 0.96$, $\alpha = 1/3$ and $\delta = 0.1$. These numbers are also chosen to reflect data actually generated from the United States economy. For example, the value of β implies a real interest rate of about 3 percent a year, which is close to what is observed in the United States. The α value is chosen to reflect the output elasticity of capital in the United States—that elasticity figure being roughly one-third and holding fairly steady over a long period of time. Given these parameters' values, the model is solved for a set of four different values for σ (0.1, 0.25, 1.0, and 2.5).

Since no interest attaches to the numerical solution per se, it is not reported. It is crucial, nevertheless, to have some idea about the accuracy of the approximation procedure before the solution can be used to generate random samples. This accuracy can be assessed by checking whether the data generated from the model satisfy the first-order condition, i.e., equation (2). Let $h_{t+1} = \beta(c_{t+1}/c_t)^{-1/\sigma}(1+r_{t+1}) - 1$, then (2) can be rewritten as $E[h_{t+1}|I_t] = 0$. As mentioned before, this condition implies a set of orthogonality conditions which require that the residual h_{t+1} be uncorrelated with any variable included in the information set. Let $\mathbf{z}_t$ be a subset of I_t; then these conditions imply that the first sample moment of the cross product $h_{t+1}\mathbf{z}_t$ should be close to zero for a sufficiently large sample. The vector $\mathbf{z}_t$ consists of a constant of ones plus the past observations on consumption growth c_{t+1}/c_t and the real interest rate $(1+r_{t+1})$. The constant term is included because the unconditional mean of h_{t+1} must be zero. Reported in Table I are, for each σ value, the sample means of the product $h_{t+1}\mathbf{z}_t$ based on a realization of 2000 observations. The number of lags used for consumption growth and the real interest rate is 2, so in total there are 5 variables in the vector $\mathbf{z}_t$. The same set of variables will be used as instruments in the econometric procedure of the next section. As can be seen, the means are very small and insignificantly different from zero (standard deviations of the mean are reported in parentheses). This result also holds for smaller sample sizes which are not reported here. To conclude, the data generated from the solution procedure fulfill the Euler equation and have negligible approximation error.

5. Estimation Results

This section pursues the second step of the Monte Carlo experiment. The intertemporal elasticity of substitution σ is estimated using equation (3) and data generated from the simulated economy discussed in Section 4. The objective here is to see if this strategy produces a reliable estimate of σ.

A brief description of the simulation procedure follows. First, for each of the four σ values considered in the experiment are generated a number of random samples from the artificial economy. These observations are then employed to estimate the parameter σ. This process produces a sampling distribution of

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[11] The algorithm, known as the value successive approximation, iterates on the problem's value function over a discrete state space. Technical details can be found in Bertsekas (1976).

[12] The elements of this transition matrix assign the probability of moving from one state to another. For example, if the value of the production shock at time t is 1.0 (the third row), then there is 25 percent chance that it will move to 0.95 or to 1.05 in the next period and 50 percent chance that it will stay in the same state.

[13] Whether the Solow residuals, i.e., the residuals arising from the regression of a production function, truly represent the underlying shocks of the economy is a controversial matter. This issue is ignored here.

Table I

ORTHOGONALITY CONDITIONS

σ	Sample means of the cross product between h_{t+1} and				
	constant (one)	$(c_{t+1}/c_t)_{-1}$	$(c_{t+1}/c_t)_{-2}$	$(1+r_{t+1})_{-1}$	$(1+r_{t+1})_{-2}$
0.10	0.000048	0.000078	0.000052	0.000014	0.000026
	(0.002415)	(0.002417)	(0.002416)	(0.002508)	(0.002507)
0.25	−0.000017	−0.000016	−0.000014	−0.000025	−0.000021
	(0.001073)	(0.001073)	(0.001073)	(0.001117)	(0.001117)
1.00	−0.000000	−0.000000	−0.000001	−0.000001	−0.000000
	(0.000218)	(0.000218)	(0.000218)	(0.000227)	(0.000227)
2.50	0.000003	0.000003	0.000003	0.000003	0.000003
	(0.000004)	(0.000004)	(0.000004)	(0.000004)	(0.000004)

Note: Calculation is based on 2000 random observations.
Standard deviations of the mean are reported in parentheses.

the point estimate $\tilde{\sigma}$ for a given sample size. To examine the convergence property of these estimates, the experiment is repeated using four different sample sizes, ranging from 50 to 500. As in Section 4, five variables are chosen as instruments, which include two lags of the the consumption growth $\ln(c_{t+1}/c_t)$ and two lags of the real interest rate $\ln(1+r_{t+1})$. The estimation results reported below are not sensitive to the number of lags included in these instruments.

Sampling Distribution of the Point Estimate $\tilde{\sigma}$. Consider Table II wherein are reported the means and the standard deviations of the elasticity estimate $\tilde{\sigma}$. These statistics are calculated for each of the four σ values and each of the four sample sizes considered in the experiment. At first glance, the sampling distribution of the point estimate $\tilde{\sigma}$ appears to have a relatively small standard deviation and a mean that is close to the true value of σ. Although the means are slightly higher than the true value, the bias is not significant and is probably due to the approximation error of the solution procedure in Section 4. In fact, as the sample size increases, the bias as well as the standard deviation vanishes, a clear indication that the estimate $\tilde{\sigma}$ is asymptotically unbiased and consistent. Notice that, even for a relatively small sample, one cannot reject the hypothesis that the mean of the estimate $\tilde{\sigma}$ is equal to the true σ value. Extensive simulations indicate that these results are robust to the specification of the stochastic process of the production shock λ_t. For example, using an independently and identically distributed random shock the sampling distribution of the elasticity estimates is virtually identical to that reported in Table II.

The implication is clear: Equation (3) as an empirical model of consumption is capable of producing a reliable estimate of the intertemporal elasticity of substitution, at least for the cases considered in this paper. This result is somewhat puzzling because the data used in the estimation procedure do not necessarily satisfy the lognormal restriction that renders the regression model linear. Violation of this distributional assumption tends to cause the estimate to be biased and inconsistent. This issue warrants closer examination. Figure 3a-3d plots, respectively for each of the σ values, the frequency distribution of the random variable $\ln(x_{t+1})$, where $x_{t+1} = \beta(c_{t+1}/c_t)^{-1/\sigma}(1+r_{t+1})$. As mentioned in Section 3, this random variable should have a normal distribution if the lognormality assumption is correct. The figures indicate that while such a distribution appears to be the case when $\sigma = 2.5$, it is apparently violated when $\sigma = 0.1$, 0.25, and 1.0. How can we reconcile this finding with the simulation results? In particular, how does one explain the unbiasedness of the estimates even if the distributional assumption is violated? It turns out that the answer is quite simple. What happens is that, under certain conditions, the Euler equation (2) can be approximated by a linear regression model without directly invoking the lognormality assumption. Recall the following approximation: $\ln(x_{t+1}) \equiv \ln(1+h_{t+1}) \cong h_{t+1}$

Table II

SAMPLING DISTRIBUTION OF THE POINT ESTIMATE $\tilde{\sigma}$ [a]

True σ	Number of observations	Number of simulations	$\tilde{\sigma}$ Mean	s.d.
0.10	50	780	0.257039	0.155508
	150	520	0.172956	0.070608
	300	480	0.142281	0.048254
	500	400	0.129667	0.038071
0.25	50	780	0.414662	0.205668
	150	520	0.321207	0.100773
	300	480	0.286916	0.070803
	500	400	0.273533	0.056699
1.00	50	780	1.126016	0.275207
	150	520	1.044132	0.150668
	300	480	1.017989	0.105218
	500	400	1.009004	0.084706
2.50	50	780	2.504959	0.021614
	150	520	2.503065	0.011713
	300	480	2.502775	0.007199
	500	400	2.502399	0.005670

[a] These results are based on assumed highly persistent shocks specified in the text. Experiments with independently and identically distributed (iid) shocks yield similar results.

for x_{t+1} close to one or h_{t+1} close to zero. Since the condition that h_{t+1} be close to zero is approximately true for our data (see Table I and Figure 3), the linear regression equation (3) can be viewed as an approximation to the Euler equation (2). It is worth mentioning that in the United States the rate of growth of consumption is about 2 percent a year and the annual real rate of interest is about 3 percent, suggesting that x_{t+1} is close to one.

Hypothesis Testing Based on the regression model, a number of hypotheses can be tested. This subsection focuses on the simple hypothesis that the parameter σ is equal to its true value. As usual, this hypothesis can be tested using a conventional t statistic. Since we know the true σ value that is used to generate the data, we are interested in the Type I error for testing this hypothesis, that is, the proportion of time that the null hypothesis is rejected when it should have been accepted. The test results are summarized in Table III. As can be seen, the rejection frequency of the true model is higher than expected. This is particularly clear when σ is small. For example, at a 5 percent significance level, about 20 percent of the time one will reject $\sigma = 0.1$ even though the sample size is relatively large (say, 500). At a 10 percent significance level, the proportion rises to above 30 percent. Although the rejection frequencies are somewhat moderate for other cases, it seems reasonable to conclude that the risk of committing the Type I error is still too high. Again, this result may appear puzzling because the point estimate is fairly close to the true parameter value. A moment's reflection reveals that these errors stem from the standard error of the estimate's being so small that the true parameter value lies outside of the confidence region.

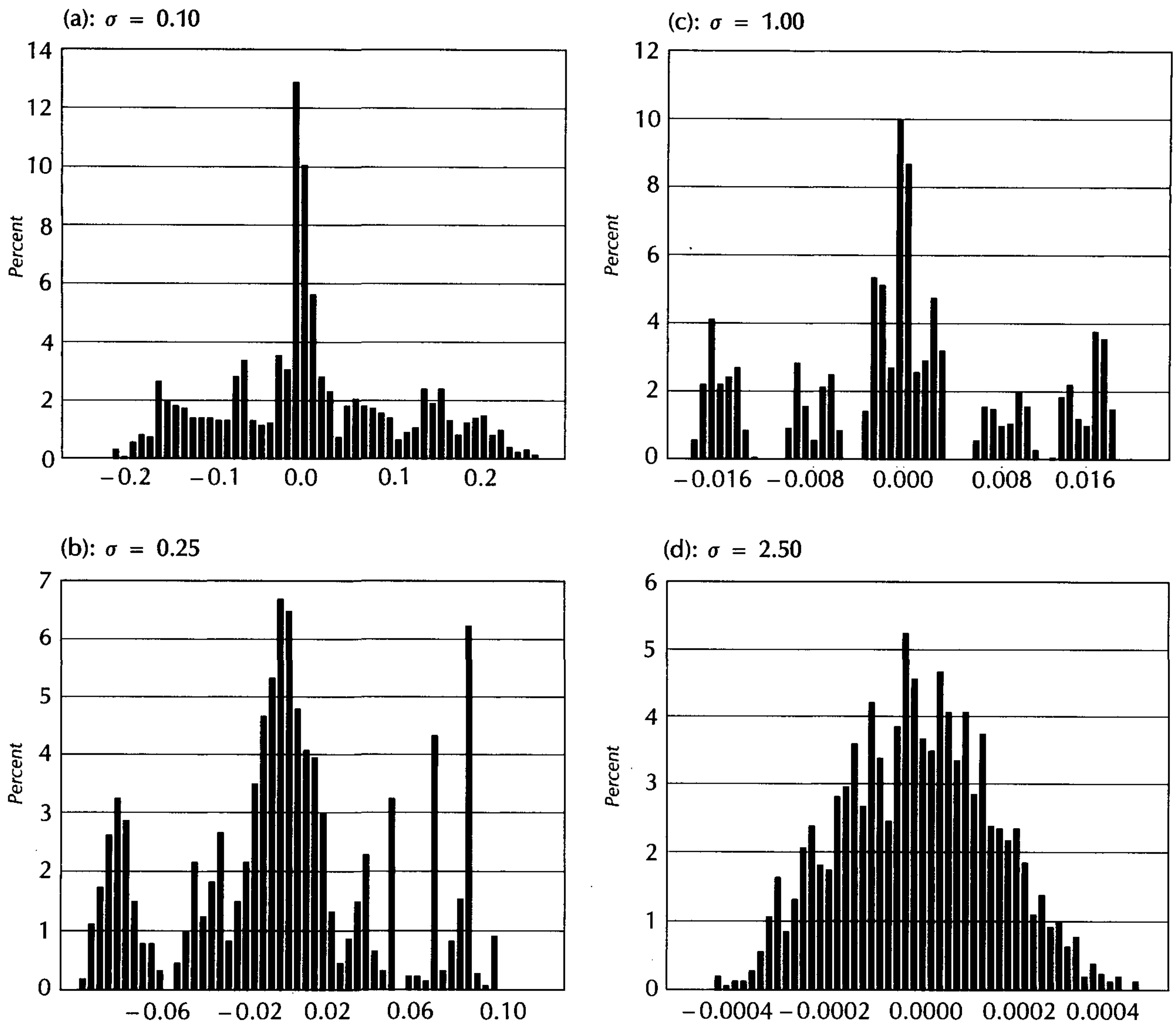
6. Misspecification Bias with Variable Labor Supply

Many of the empirical studies on intertemporal substitution abstract from the interaction between consumption and labor supply decisions and thereby ignore the potential effect on consumption of changes in the wage rate [for example, Hansen and Singleton (1983) and Hall (1988)]. As noted before, such a simplification implies that the growth of consumption is determined only by the expected real interest rate. This section examines a more realistic model in which an individual chooses both consumption and labor supply at the same time. Such a model implies that changes in the real wage can have important effects on consumption behavior. It will be shown that failure to incorporate these effects can result in a sizable bias in estimating the intertemporal elasticity of substitution.

As in the previous case, the starting point is a simple two-period model. For comparison, refer to Figure 1 in which the equilibrium moves from point E to E′ when the real interest rate rises. What would

Figure 3

FREQUENCY DISTRIBUTION OF THE TRUE RESIDUALS



happen if the consumer is allowed to supply work effort in the labor market and earn wage income? In general, the point E′ will no longer be an equilibrium because the labor supply decision, even if the wage rate remains unchanged, is likely to alter the rate of substitution in consumption. In this case, the equilibrium point can go in either direction depending upon the extent to which labor supply affects the marginal utility of consumption. In order to make a specific prediction, one needs an explicit model.

The model considered below is similar to that described in Section 3. First, the consumer's utility function is assumed to depend on consumption c_t and leisure time l_t and has the following form:

$$u(c_t,l_t) = \begin{cases} \frac{1}{1-1/\sigma}\{[c_t^{\theta}\, l_t^{(1-\theta)}]^{1-1/\sigma} - 1\}, & \text{if } \sigma > 0 \text{ and } \sigma \neq 1 \\ \theta \ln c_t + (1-\theta) \ln l_t, & \text{if } \sigma = 1 \end{cases}$$

This utility function is similar to that specified before and is constant elastic with respect to a "composite good" defined as a Cobb-Douglas function of consumption and leisure. The parameter θ lies between 0 and 1. As will be seen shortly, the parameter σ can still be identified as the intertemporal elasticity of substitution. But, more importantly, the σ parameter controls the effect of leisure on the marginal utility of consumption. Specifically, when

Table III

REJECTION FREQUENCY OF THE NULL HYPOTHESIS: σ = true σ[(a)]

(Type I Error)

True σ	Number of observations	Significance level 5 Percent	10 Percent
0.10	50	26%	39%
	150	21%	32%
	300	18%	29%
	500	19%	33%
0.25	50	23%	35%
	150	16%	24%
	300	12%	19%
	500	11%	20%
1.00	50	19%	29%
	150	13%	19%
	300	7%	14%
	500	9%	14%
2.50	50	11%	19%
	150	9%	19%
	300	10%	20%
	500	12%	20%

(a) These results are based on assumed highly persistent shocks specified in the text. Experiments with iid shocks yield much higher rejection frequencies (more than 50 percent).

$\sigma > 1$, consumption and leisure are gross complements because an increase in leisure will raise the marginal utility of consumption.[14] The opposite is true when $\sigma < 1$. The value of σ will dictate the effect of the real wage on consumption.

It is important to note that the wage effect on consumption will depend on the form of the utility function. In particular, if the utility function is additively separable,[15] then the marginal utility of consumption will be independent of the choice of leisure. In this case, changes in the real wage have no effect on consumption. Consequently, equation (3) will still be the correct specification for consumption. This assumption has been maintained by most authors [e.g., Hall (1988)]. Since there is no direct evidence on whether the utility function is separable, it is useful to check how serious the misspecification bias could be.

To proceed, suppose the consumer solves the following maximization problem:

$$\max E_0[\sum_{t=0}^{\infty} \beta^t u(c_t,l_t)]$$

$$\text{s.t.} \quad c_t + k_{t+1} = (1+r_t)k_t + w_t n_t \text{ for all } t$$

where w_t is the wage in terms of consumption goods and $n_t = 1 - l_t$ is work effort. Following the same derivation procedure as in Section 3 and assuming lognormality, it can be shown that consumption now obeys the following equation:

$$\ln(c_{t+1}/c_t) = \beta_0 + \sigma E[\ln(1+r_{t+1})|I_t] + \beta_1 E[\ln(w_{t+1}/w_t)|I_t] + \epsilon_{t+1} \quad (5)$$

where $\beta_1 = (1 - \theta)(1 - \sigma)$. Except for the additional term that captures the effect of wage growth on consumption, this equation is similar to equation (3) which abstracts from the labor supply decision. As can be seen, the parameter σ still measures the interest rate effect on consumption. However, the wage will have a positive effect ($\beta_1 > 0$) on consumption growth if $\sigma < 1$, and negative effect ($\beta_1 < 0$) if $\sigma > 1$. This is so because $\sigma < 1$ implies $u_{cl} < 0$, so that when the real wage rate rises, leisure will decline and the marginal utility of consumption will rise. As a result, consumption must rise to restore the equilibrium. Note that when $\sigma = 1$, a change in the real wage has no effect on consumption because the utility function is additively separable in this case.

What would happen if the true data were generated from the above model, and yet the econometrician erroneously ignored the wage effect and instead used (3) to estimate σ? This is a typical specification error in which an important variable is omitted from the regression. Apparently, the estimate for σ will be biased, with the magnitude of the bias measured by the true value of β_1 times the auxiliary regression coefficient of the wage growth on the real interest rate.[16] Thus, if the real interest rate and the growth of real wages are positively (negatively) correlated, then ignoring the wage effect leads to a downward (upward) bias if $\sigma > 1$, and an upward (downward) bias if $\sigma < 1$. Notice that, if the real interest rate and the growth of real wages are un-

[14] That is, $u_{cl} > 0$ if $\sigma > 1$, where u_{cl} is the partial derivative of the marginal utility of consumption with respect to leisure time.

[15] A utility function u(x,y) is additively separable if it has the form: m(x) + n(y). This class of utility functions is not limited to the logarithmic case specified in the text.

[16] This is a standard result on specification bias. See Maddala (1977).

correlated, then the elasticity estimate using (3) will be unbiased.

One way to evaluate the extent of the above misspecification bias is to conduct a Monte Carlo simulation. As in Section 4, the data are generated from a model economy in which the production function is assumed to be $y_t = \lambda_t k_t^{\alpha} n_t^{(1-\alpha)}$, $0 < \alpha < 1$.[17] The production shock is generated in the same way as before. Other parameters fixed in the experiment are $\beta = 0.96$, $\delta = 0.1$, $\alpha = 1/3$, and $\theta = 0.3$. Following the same procedure, σ is estimated using (3) as well as (5). Because of the difference in the specification, the instruments used in estimating equation (5) include lags of $\ln(c_{t+1}/c_t)$, $\ln(1+r_{t+1})$ and $\ln(w_{t+1}/w_t)$. These instruments are used to project the expected real interest rate as well as expected wage growth. Table IV summarizes the means and the standard deviations of the estimated bias. It is clear that when the model is correctly specified, i.e., equation (5), the estimated bias is small and insignificant. However, the bias associated with equation (3) is sizable. In particular, when $\sigma = 0.25$, the point estimates are scattered around the value of 2, and when $\sigma = 2.5$, the point estimates are less than one and in some cases close to zero. These results show that ignoring a potential wage effect on consumption can introduce a substantial bias in the estimation of the elasticity of substitution.

7. Concluding Remarks

The results of this paper can be summarized succinctly. First, for a moderate sample size (perhaps in the range of 100 to 150), the point estimate of the intertemporal elasticity of substitution produced by the linear model tends to be unbiased with small standard errors. This result implies that the loglinear model, despite its simplicity, is a useful and convenient framework for estimating the intertemporal elasticity of substitution. Second, the conventional t test tends to over-reject the true model. Therefore, one must be careful in drawing conclusions from this test. Third, if the estimated equation is erroneously specified and omits the effect of the real wage on consumption, then the bias of the elasticity estimate is sizable. One should not conclude, however, that it is always necessary to use the extended model to estimate the elasticity; similar biases could arise in the extended model if it is also misspecified.

In general, any econometric method founded on an intertemporal maximization problem and its resulting Euler equation is bound to be sensitive to measurement errors. Such errors are particularly characteristic of consumption data, especially data on durable goods consumption. They are perhaps

[17] Specifically, the data are generated from a real business cycle model:

$$\max E_0\left[\sum_{t=0}^{\infty} \beta^t u(c_t, 1-n_t)\right]$$

$$\text{s.t.} \quad c_t + k_{t+1} = \lambda_t F(k_t, n_t) + (1-\delta)k_t$$

where F(.,.) is the production function which depends on capital and labor. As in Section 4, the equilibrium prices can be computed directly from the solution of the optimization problem. In particular, the real interest rate is the marginal product of capital minus the depreciation rate while the real wage is just the marginal product of labor.

Table IV

MISSPECIFICATION BIAS

			Bias: $\hat{\sigma} - \sigma$			
			Correct: Eq. (5)		Incorrect: Eq. (3)	
True σ	Number of observations	Number of simulations	Mean	s.d.	Mean	s.d.
0.25	50	600	0.119739	0.066889	1.958582	0.667838
	150	400	0.053412	0.049080	1.732927	0.453833
	300	400	0.030032	0.033670	1.692648	0.326624
	500	300	0.022194	0.027314	1.670278	0.267501
2.50	50	600	0.433372	0.522541	−1.770626	0.310914
	150	400	0.174026	0.330437	−1.657668	0.189137
	300	400	0.080718	0.220140	−1.607193	0.129013
	500	300	0.057523	0.184815	−1.596351	0.108533

the most important reason why empirical studies have not been able to pinpoint the intertemporal elasticity of substitution. As shown above, however, even if the data are properly measured, the econometrician still must choose a correct specification. Ironically, the data themselves are supposed to aid in this task. There is no easy solution to this identification problem. There are at present more sophisticated test procedures, such as tests of overidentifying restrictions, that may be used to discriminate among different models. However, the properties of such test statistics under misspecification are not clear.

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LABOR MARKET DATA

*Roy H. Webb and William Whelpley**

This article is part of a series that will be published by this Bank under the title Macroeconomic Data: A User's Guide. *The book will contain introductions to important series of macroeconomic data, including prices, employment, production, and money. The articles in the book are designed to help the reader accurately interpret economic data and thereby allow the numbers to be useful analytical tools.*

Aggregate data on jobs, unemployment and earnings are closely watched by millions of Americans. The unemployment rate is probably the single most widely followed economic indicator. Among financial market participants, the number of people employed is perhaps the most closely followed macroeconomic statistic that appears monthly. These and other selected labor market indicators are described in this article.

HISTORICAL DEVELOPMENT

Statistics describing the labor market were estimated as early as 1820, based on questions from the decennial Population Census. In the last decade of the nineteenth century, the newly formed Bureau of Labor—the predecessor of the Bureau of Labor Statistics (BLS)—began to collect detailed data on wages and earnings. In 1915, the Bureau began a monthly survey of employers to collect wage and employment data. This survey is still conducted, and data from it are reported on a monthly basis; it is often referred to as the *establishment survey*, or also as the *payroll survey*.

After a century of collecting data on labor markets, there was surprisingly little systematic information on the extent of unemployment. When national attention focused on unemployment during the Great Depression, it was not immediately obvious how to define or to gather relevant information. In 1940 a monthly survey was designed, which is now known as the *Current Population Survey*. Information from the survey allowed an unemployment rate to be calculated. By 1945 the questions were developed which form the basis of the Survey used today, which is usually referred to as the *household survey*.

MAJOR DATA SERIES

Data From the Household Survey

Each month over fifty thousand households are interviewed by the Census Bureau for the BLS as part of the household survey. The BLS then analyzes the survey results and reports its findings near the beginning of the next month, usually on the first Friday. Many statistics from this survey could be discussed; the key concepts in this section are the unemployment rate, the number of people employed, and the labor force participation rate.

Unemployment rates are calculated for the entire nation and also for more narrowly defined demographic groups and geographic areas.[1] An unemployment rate is defined as the number of people unemployed as a percentage of the *labor force*. The size of the labor force, in turn, is defined as the number of people *employed* plus those *unemployed*, that is, people without jobs who are willing and able to work.

All three terms, employed, unemployed, and labor force, have very specific definitions. A person is counted as unemployed if he or she did not work during the survey week and:

(a) made a specific effort (which can be anything from talking to friends to interviewing for a specific opening) to find a job within the previous four weeks, and was available for work during the survey week; or

(b) was waiting to be called back to a job after being laid off; or

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The authors gratefully acknowledge helpful comments from Dan M. Bechter, Timothy Q. Cook, William E. Cullison, Thomas M. Humphrey, Janice Shack-Marquez, and employees of the Bureau of Labor Statistics.

[1] Press reports often mention two unemployment rates. One is calculated by removing military personnel from the calculations and is slightly smaller than the overall rate.

(c) was waiting to report to a new job within 30 days of the survey.

A person is defined to have been employed if he or she:

(a) did any work at all as a paid employee, as a proprietor or farmer, or worked 15 hours or more as an unpaid worker in an enterprise operated by a member of the family; or

(b) had a job but was not working during the survey week due to a temporary absence resulting from illness, bad weather, vacation, labor-management disputes, or personal reasons. Employment status is not affected by whether or not pay is received during the absence, nor by whether or not another job is being sought.

Finally, the labor force is simply the sum of persons who are employed plus those who are unemployed. The overall *participation rate* is defined as the labor force as a percentage of the population at least sixteen years of age. Participation rates are also calculated for smaller segments of the population, again defined as the labor force as a percentage of the relevant population segment.

There are many reasons why a person may not be in the labor force, such as age, health, home responsibilities, being in school, not wanting to be employed, or not believing that job search would be fruitful. The latter category is referred to as *discouraged workers*; they are counted as those who would like a job but are not looking for work for one of the following reasons listed in the household survey:

"thought no jobs were available in their line of work or area."

"previously tried unsuccessfully to find work."

"lacked the necessary schooling, training, experience, or skills."

"felt employers considered the person too young or too old."

"had some other personal handicap in finding work."

One's intuitive definitions of employment or unemployment may be somewhat different from the specific definitions given above. In particular, people who are not working vary tremendously in the amount of thought and effort spent on finding work; it is inherently arbitrary to divide people without jobs into only two categories, unemployed or not in the labor force. Some analysts would add discouraged workers to the unemployed, thereby boosting the reported unemployment rate. Others would lower the unemployment rate by defining those who did not actually contact potential employers as being out of the labor force.

Behavior Over Time Chart 1 shows the unemployment rate over the post-World War II period. One notable feature is that sharp swings are associated with the business cycle, the alternating periods of expansion and recession in the whole economy. Another feature is the general upward drift for much of the chart after abstracting from business cycles.

Chart 2 shows the participation rate. Especially notable is the substantial increase over the past 25 years. The major factor behind that increase can be seen in the table, which contains the current demographic composition of the labor force and contrasts it with the labor force in 1948 and 1969. The rapidly growing fraction of adult women in the labor force more than counteracts a decline in the fraction of men in the labor force, resulting in a growing participation rate for the whole population. The table also reveals relatively high unemployment rates for blacks and teenagers.

DATA FROM THE ESTABLISHMENT SURVEY

The establishment survey covers the industry, hours, and earnings of most employed members of the labor force. State agencies send survey forms to over 300,000 establishments, who then record the requested information and return the forms to the state agencies for processing. These agencies then forward the tabulated information to the BLS in Washington, D.C. The information is sent back and forth between the collecting agencies and participating establishments for one year; a written record of the numbers can therefore be reviewed by both the providers and collector of the information.

Employment and earnings figures are classified by each worker's characteristics, such as sex, industry, and job category. A person is counted as *employed* if he or she is on the payroll of an establishment for the pay period which includes the 12th of the month.[2] This measurement excludes proprietors, unpaid volunteers, family workers, farmers and farm workers, and domestic household workers. Salaried officers of corporations, civilian government employees, and part-time workers are included, however.[3]

Industry *hours and earnings figures* also originate in the establishment survey. Figures are presented in

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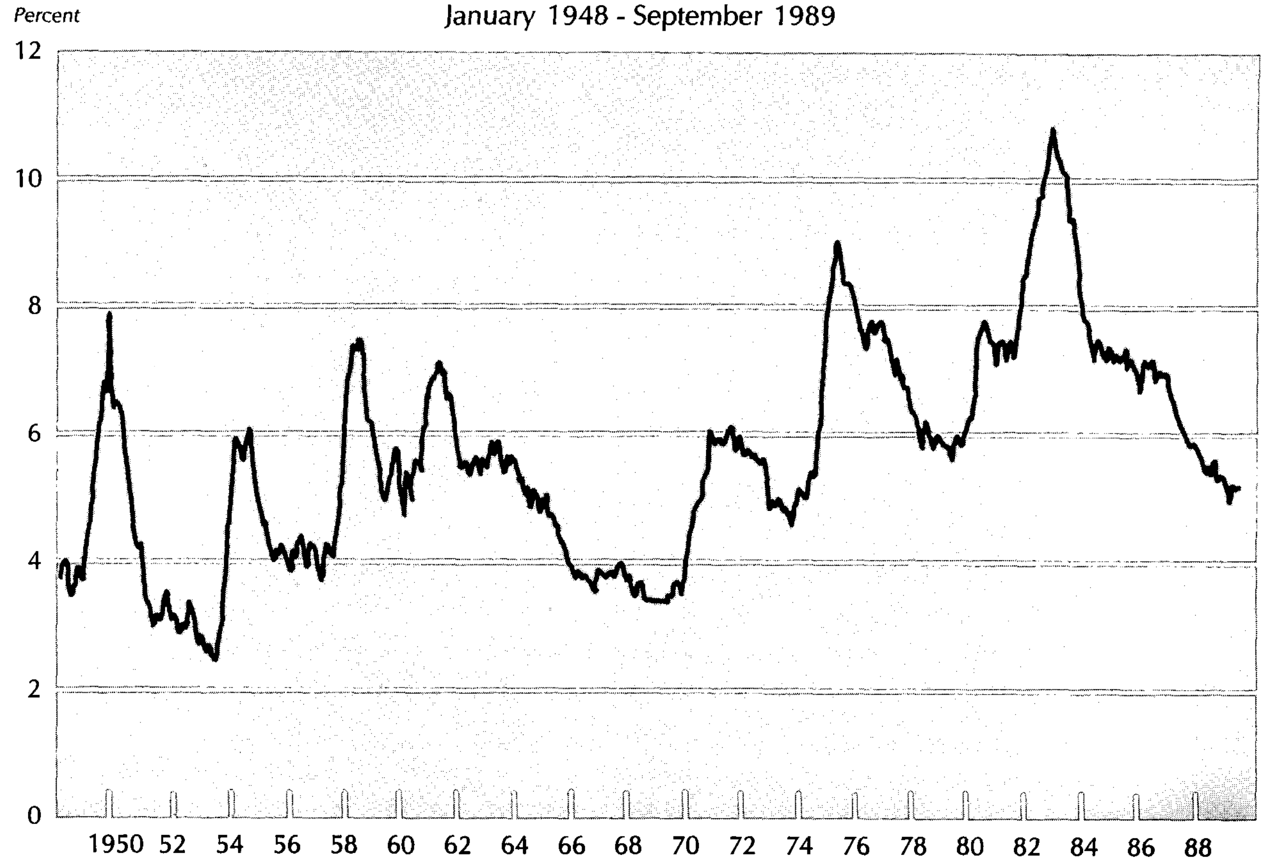
[2] Employees of the federal government are counted if they occupy a position as of the last day of the calendar month.

[3] Employees of the Central Intelligence Agency and the National Security Agency are explicitly excluded from the survey.

Chart 1

UNEMPLOYMENT RATE
January 1948 - September 1989



detail for Production and Related Workers in manufacturing and mining, Construction Workers, and Nonsupervisory Employees in service industries. The *hours* statistic reports the number of hours paid for by the employer in the current reporting period, not the number of hours actually worked. This figure therefore includes items like holidays, vacations, and sick leave. *Overtime hours* includes that time for which a premium is paid. Weekend and holiday hours are included separately only if overtime premiums are paid. Hours which have only incentive premiums attached, such as shift differential and hazard premiums, are excluded from the overtime hours measurement.

Average hourly and weekly earnings for nonsupervisory workers are estimated from data reported in the establishment survey. Three features have led some observers to question the relevance of that concept for studying certain problems. First, the data do not include fringe benefits, which play a major role in the compensation of most workers. Second, the data do not cover executive, administrative, and managerial workers in private industry, nor do they cover state and local government workers. And finally, the data are affected by changes in the composition of employment.

To address those problems, the BLS also publishes a quarterly *employment cost index* (ECI),[4] which is based on a special survey of employers. It is designed to cover all workers in private industry plus state and local government. The ECI adds the cost of providing a wide range of fringe benefits to wage and salary payments; some of the most expensive benefits are social security and unemployment insurance taxes, paid vacation and sick leave, health and disability insurance, and retirement plans. The ECI is also based on a fixed industry and occupational structure. Shifts between industries or occupations do not directly affect the index.

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[4] A more accurate title might be employee compensation index, however. Significant elements of labor cost that are not included are the costs of hiring, training, and strike activity.

Chart 2

PARTICIPATION RATE

January 1948 - September 1989

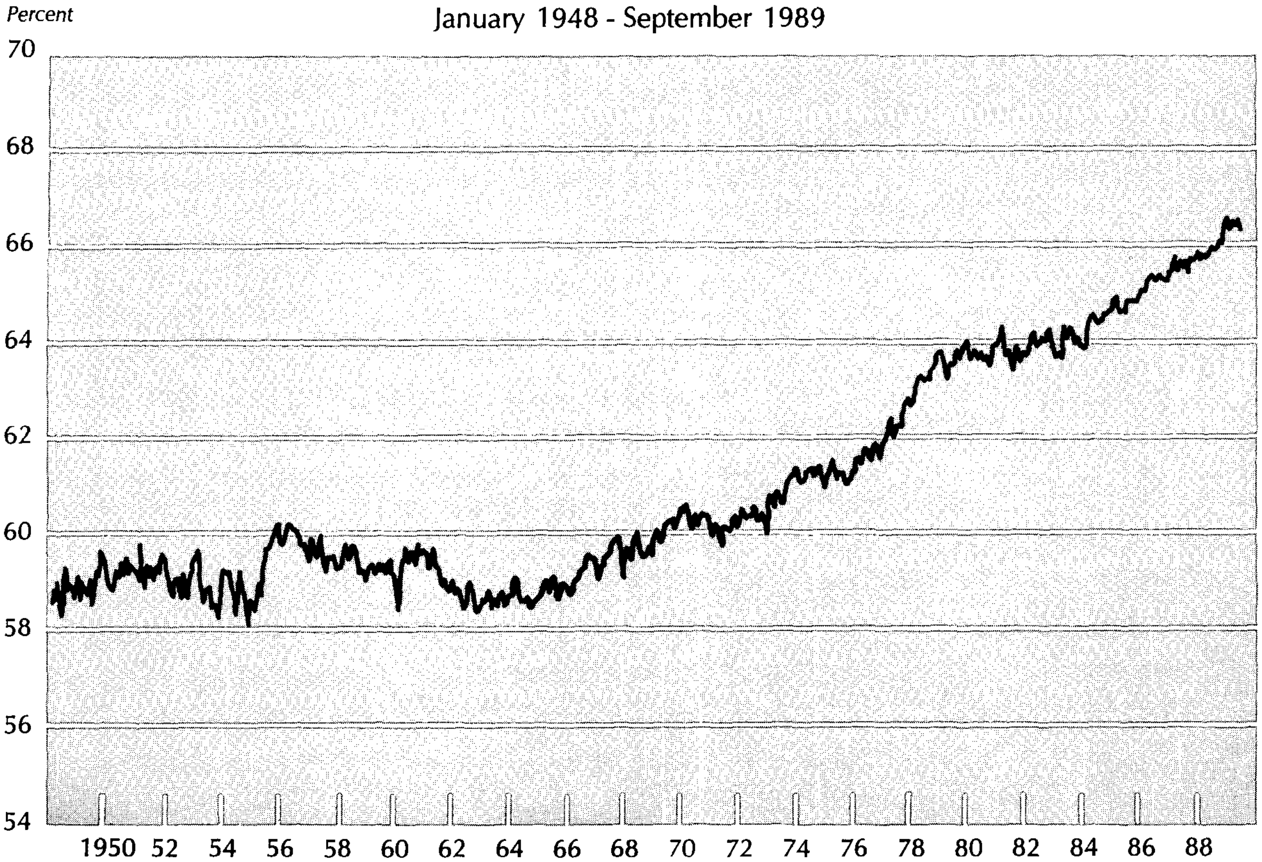


Chart 3 compares the ECI and average hourly earnings statistics. Both show a substantial decline in the growth rate of compensation since the early 1980s, as general price inflation also declined substantially. The ECI has grown faster than average hourly earnings for much of the period, however, reflecting the growing relative importance of fringe benefits.

CAUTIONS

The data series described above provide a wealth of timely, relevant information. The data can be misinterpreted, however. The following cautions are designed to help place data series in perspective. The first two concern the exact meaning of widely used terms.

Meaning of Terms

Unemployment Some observers tend to equate the level of unemployment with an unambiguous measure of economic hardship. The unemployment rate, however, is a much more complex statistic. It does not refer to an unchanging group totally composed of desperate individuals. It instead is a snapshot—a view at an instant of time—of people who are entering and leaving the labor force, and of those who are starting and ending particular jobs. Some unemployed persons find jobs quickly, others more slowly, and some people move directly from outside the labor force to employment. Some job changes are voluntary, others are involuntary.[5]

To help put unemployment rates in perspective, note that it is often not in the best interest of an unemployed person to take the first available job. It may take time to achieve a good match between a person's interests, skills, and abilities on the one hand, and a job's skill requirements, working conditions, and promotion possibilities on the other.

[5] In June 1989, for example, 42 percent of the unemployed had lost their last job, 15.5 percent had quit their last job, and 42.5 percent were new entrants or reentrants into the labor force. Half were unemployed less than six weeks, while 9.1 percent were unemployed more than a half year.

DEMOGRAPHIC COMPOSITION OF THE LABOR FORCE IN THE UNITED STATES

(Thousands of persons unless otherwise indicated)

Characteristic	1948	1969	1989
TOTAL			
Civilian Labor Force	60,621	80,733	123,291
Percent of total population	58.8	60.1	66.4
Employed	58,344	77,902	116,900
Unemployed	2,276	2,831	6,391
Unemployment rate	3.8	3.5	5.2
MEN, AGE 20 & OVER			
Civilian Labor Force	40,687	46,351	63,468
Percent of adult male population	86.6[a]	83.0	78.1
Employed	39,382	45,398	60,642
Unemployed	1,305	963	2,827
Unemployment rate	3.2	2.1	4.5
WOMEN, AGE 20 & OVER			
Civilian Labor Force	15,500	27,413	51,890
Percent of adult female population	31.3[a]	41.5	57.6
Employed	14,936	26,397	49,514
Unemployed	564	1,016	2,376
Unemployment rate	3.6	3.7	4.6
TEENAGERS (16-19)			
Civilian Labor Force	4,435	6,969	7,933
Percent of teenage population	52.5	49.4	55.2
Employed	4,026	6,117	6,745
Unemployed	409	852	1,188
Unemployment rate	9.2	12.2	15.0
WHITE			
Civilian Labor Force		71,778	105,964
Percent of white population	58.2[b]	59.9	66.7
Employed		69,518	101,338
Unemployed		2,260	4,626
Unemployment rate	3.5	3.1	4.5
BLACK[c]			
Civilian Labor Force		8,959	13,444
Percent of black population	64.0[b]	62.1	64.4
Employed		8,384	11,898
Unemployed		570	1,561
Unemployment rate	5.9	6.4	11.2

Note: Data represent the first quarter of 1989 and the full years of 1948 and 1969, and are taken from the *Monthly Labor Review* and the *Economic Report of the President*, various issues. Unless otherwise indicated, all population figures exclude military and institutionalized personnel, and young persons less than sixteen years old.

[a] Age 14 and over.

[b] Data are for 1954, not 1948.

[c] Nonwhite before 1972.

Recognizing the inevitability of such *search unemployment* implies a positive unemployment rate.

In short, a normally functioning economy will have some unemployment, and every unemployed person does not experience substantial hardship.[6] To provide a perspective for business cycle analysis, some economists refer to a *natural rate of unemployment*, defined in one textbook[7] as "that rate of unemployment at which flows in and out of unemployment just balance, and at which expectations of firms and workers as to the behavior of prices and wages are correct." The natural rate is neither constant nor precisely known; at the present time many economists believe that it is between five and six percent in the United States. If actual unemployment were much higher, that would be evidence of cyclical slack in the economy; and if the actual rate were much lower, that would signal an overheated economy.

The term "natural" is widely used but may be misleading, since there should be no presumption that the current natural rate is either optimal or immutable. The natural rate is affected by the incentives and constraints facing persons and firms; anything that affects the average frequency or duration of unemployment will also affect the natural rate. Some important factors affecting the natural rate

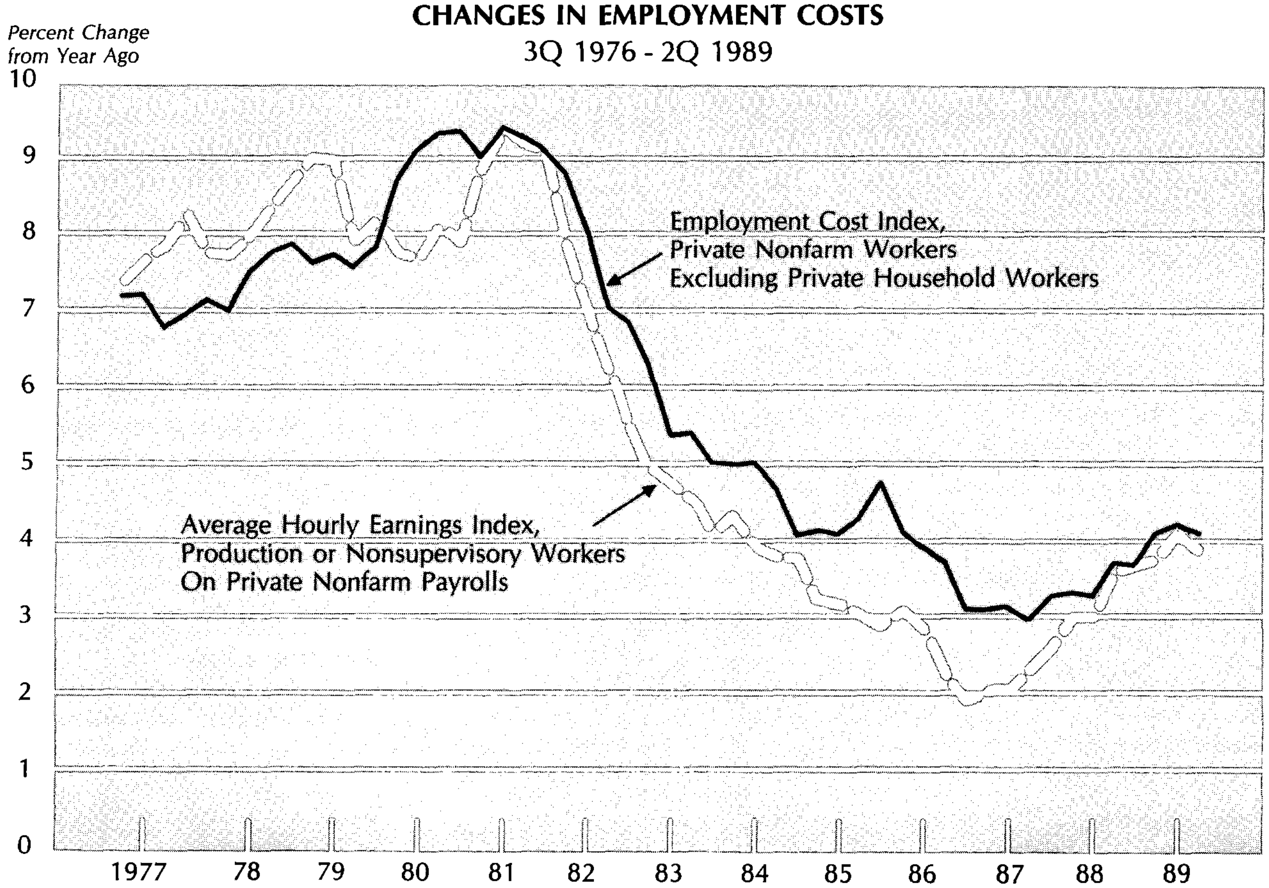
[6] An individual's hardship is also affected by household wealth and by whether transfer payments, such as severance pay or unemployment insurance, are received. In addition, some unemployed persons are on temporary layoff and will almost certainly be recalled; others may have accepted a job that begins in more than a month.

[7] Rudiger Dornbusch and Stanley Fischer, Macroeconomics, 3rd ed. (New York: McGraw-Hill) 1984, p. 466.

Chart 3

CHANGES IN EMPLOYMENT COSTS

3Q 1976 - 2Q 1989



are the unemployment insurance system, household wealth, minimum wage legislation, the demographic composition of the labor force, the mobility of labor, and the dispersion of skill levels in the labor force.

Compensation of Employees Many forms of compensation are ignored in the wage figures reported each month, including some that are growing especially rapidly. Fringe benefits are excluded, as are contingent payments such as lump sum payments in lieu of wage increases, bonuses, profit-sharing payments, and stock options. In addition, some benefits are not even included in the ECI. For example, medical benefits for retirees have been promised by many employers with no provision having been made for funding those costly benefits. They are thus not included in the ECI.

Two Definitions of Employment

The next caution involves one concept, employment, that is estimated from both the household and establishment surveys. The two should move together closely in the long run; however, in any month they can diverge substantially.

To see why employment totals can differ, note the slightly different definitions of employment for each survey. The establishment survey counts jobs, not people; dual job holders are therefore double-counted. The household survey only covers the number of people employed, so that a person is never double-counted. The household survey also counts self-employed persons, agricultural workers, and household workers, all of whom are omitted from the establishment survey.

Many observers may prefer to ignore monthly changes and focus on the longer run; for them it probably does not matter which series they focus on. But those with a short-run perspective often have to choose one or the other when the two series give conflicting signals. Many choose the establishment series, since its growth is more closely correlated with real GNP growth than is the other estimate.[8] Also, the number of firms surveyed is much larger than the number of households surveyed, which could in principle result in a more accurate estimate from the establishment survey. And finally, it is noted below that some analysts question the accuracy of survey responses from households.

Volatile Monthly Observations

Sampling Error A final set of cautions warns a user not to overemphasize a single month's data. A basic reason is sampling error—that is, statisticians are attempting to *estimate* a statistic for a large population from a relatively small survey. It is especially important as smaller segments of the labor force or smaller geographic areas are studied. As Geoffrey Moore put it:

> A rise, say, from 5.0 to 5.3 percent in the unemployment rate is statistically significant, whereas a rise from 9.7 to 10.4 percent in the unemployment rate for blacks is not. The reason is that the population of whites is about ten times that of blacks, so that the sample of whites is also about ten times as large. Coupled with the fact that the unemployment rate for blacks is about twice that for whites, this means that the sampling error of the unemployment rate for blacks is about four times as large as for whites.[9]

The key concept is that of *statistical significance*, that is, whether a result is likely to have resulted simply from chance; a statistically significant result is not likely to be due to sampling error. Moore uses a 0.2 percent change for the total unemployment rate, and a 0.8 percent change for the black unemployment rate, as thresholds for statistical significance.

One should therefore be cautious in attaching much importance to a single month's changes without having some idea of how large a change must be to be statistically significant. This caution applies more forcefully as the size of the relevant population becomes smaller. On the other hand, consistent movements for several months considerably reduce the likelihood of the fluctuations being due to chance. Also, one's confidence in a single month's change can be bolstered or reduced by movements in related statistics. For example, suppose that employment growth is reported to have been relatively strong but also that average weekly hours were relatively soft. In that case one could reasonably question the economic importance of the employment figure.

Responses to Survey Data Individuals responding to the household survey may respond for themselves and any other adults in the household without checking written records. Some observers have questioned the reliability of that information. It is, of course, difficult to know the exact relevance of answers to questions from any survey. One piece of evidence is a test in 1977 that compared individual responses with employer records.[10] Relative to employers' records, household respondents overstated the number of hours worked and understated both average hourly and weekly earnings.

Irregular Events All the monthly data series described in this article are adjusted to remove predictable seasonal fluctuations such as the swell in Christmas employment, or the effects of summer vacations for students. Events that occur on an irregular basis can be more difficult to take into account. Strikes, for example, lower employment estimates from the establishment survey but do not directly lower employment (or raise unemployment) estimates from the household survey. And while the BLS may note an estimate for the direct effect of a strike, the indirect effects may be substantial but not estimated; an example of an indirect effect would be layoffs of railway and port workers after a coal strike reduced coal shipments. Extreme weather conditions can also affect the data, even after routine seasonal adjustment.

SUGGESTIONS FOR FURTHER READING

Many books, professional journals and government reports have been written about labor market data. For an overview of labor markets and how they fit into the larger economy, readers may wish to look at a macroeconomics textbook such as Robert Barro, *Macroeconomics*, John Wiley and Sons; or Dornbusch

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[8] To check the validity of that common assertion, we regressed real GNP growth on four own lags plus four lags of quarterly employment growth, from 1948 to 1989. For the household series, the $\bar{R}^2$ statistic was 0.36; for the payroll series it was 0.56. Since both employment statistics are subject to sampling error, it is possible that the average of the two might be better than either one individually. We therefore substituted the average of the two for the employment variable in the regression equation; the $\bar{R}^2$ statistic was 0.51. For monitoring the overall economy, it therefore looks like the payroll series is the better choice, and that averaging the two does not improve matters.

[9] Geoffery H. Moore, Business Cycles, Inflation, and Forecasting (Cambridge: Ballinger Publishing Co. for the National Bureau of Economic Research, 1980) p. 111.

[10] Accounts of this test are taken from Joseph R. Antos, "Analysis of Labor Cost," in Jack E. Triplett ed., *The Measurement of Labor Cost*, (University of Chicago Press for the National Bureau of Economic Research, 1983) p. 162.

and Fisher, op cit. For a more detailed analysis of labor supply and demand and market institutions, see a text on labor economics, such as Ronald G. Ehrenberg and Robert S. Smith, *Modern Labor Economics*, Scott Foresman and Co. A good discussion of problems in the data can be found in the report of the *1979 National Commission on Employment and Unemployment Statistics*. The report contains a number of background papers in addition to the summary of recommendations.

The data series described in this article only hint at the large quantity of statistics that describe the labor market; many more series can be found in two monthly publications of the BLS. *Employment & Earnings* summarizes current and historical statistics collected from both the household and establishment surveys. The *Monthly Labor Review* also summarizes labor market statistics. It also contains articles that discuss many aspects of labor markets, data concepts, data collection procedures, and the series themselves; several of the articles were helpful in preparing this paper, such as an article contrasting the payroll and household estimates of employment in the August 1989 issue. Finally, the *BLS Handbook of Methods*, revised and published periodically, presents a discussion of the technical aspects of how the BLS collects, transforms, estimates, and presents labor market data.

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TOP PERFORMING SMALL BANKS: MAKING MONEY THE OLD-FASHIONED WAY

*Benton E. Gup and John R. Walter**

Introduction

Average profit rates of small banks (assets less than $100 million) declined in the 1980s, but about 2 percent had persistently high returns. Some have attributed persistent profits to collusion, risk-taking, or chance. In contrast, this study finds that consistently profitable small banks were those that stressed basic banking, in other words, acquiring low-cost funds and making high-quality investments.

Small bank average profitability declined in the 1980s for several reasons. Losses at many small banks, especially at those located in regions of the country beset with problems in the agricultural or oil industries, accounted for much of the decline. Some of the decline may have resulted from the increased competition in the retail loan and deposits markets. Federal legislation expanded the number of retail deposit products banks and thrifts could offer and deregulated interest rates on existing deposits while allowing thrifts to compete more effectively with banks for both deposits and loans. The specific acts were the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA) and the Garn-St. Germain Depository Institutions Act of 1982.

In this study we compare small banks having persistently high profits to all small banks over the period 1982 through 1987. We identify differences in portfolio structure, income, and expense between the two groups of banks located throughout the country. Moreover, to determine how the factors associated with high performance may have differed from region-to-region, high performers and all small banks are grouped by region and compared on a regional basis.[1] Table I summarizes the significant differences between the average high-performance small bank and the average small bank.

Theories of Persistent Profits

Mueller (1986) observed that in the long run, above- and below-average profits tend to converge toward the industry norm. Competition should eliminate abnormally high profits over time. Where *persistent* high profits occur, as they did at the 206 high-performance banks in our study, economists offer a variety of explanations, including the following four:

Collusion It has been argued that firms can maintain high profits by agreeing explicitly or tacitly to limit their competitive behavior. Collusion becomes more difficult as the number of competitors in a market increases; that is, as market concentration declines. We would expect the number of competitors in banking markets to be larger in more populated areas. Thus, if collusion is important to profitability, high-profit banks should be found more frequently in less populated areas. In our study, we defined a populated area as any metropolitan statistical area (MSA). While our data did show that non-MSA small banks were likelier to be persistently profitable than were MSA small banks, the difference was not significant. Therefore we find no evidence that collusion may have been responsible for the strong performance of the high-profit small banks. Using different proxies for market concentration, Kwast and Rose (1982) and Wall (1985) reached the same conclusion.

Greater Risk-Taking The consistently above-normal profits produced by the 206 high-performance small banks identified in our study cannot be explained by greater risk-taking since these banks operated in a less risky manner than average for all small banks. They had fewer loan losses than their peers, indicating that they were taking less credit risk. They were less dependent on debt financing because of stronger equity-to-assets ratios. Finally, they limited their credit and liquidity risks by holding more securities than did their peer group.

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[1] The regions are shown in Table II and are the same as those used by the Federal Deposit Insurance Corporation (FDIC) in its "Quarterly Banking Profile" (1989).

Table I

SUMMARY OF MAJOR FINDINGS OF STUDY

SIGNIFICANT DIFFERENCES BETWEEN HIGH-PERFORMANCE SMALL BANKS AND ALL SMALL BANKS:

Area of Difference	High-Performance Small Banks vs. All Small Banks
Interest Income/Total Assets High-performance small banks produced significantly more interest income relative to assets than the average for small banks while bearing less credit risk	Higher
Loans/Total Assets The high-performance small banks had a significantly lower ratio of loans to total assets than the average small bank, meaning that they bore less credit risk since loans generally are more risky than the other major category of assets held by banks—securities	Lower
Securities/Total Assets Higher ratio at high-performance banks indicating lower credit risk	Higher
Municipal Securities/Total Securities High-performance banks had more income to shelter so they made greater use of the tax advantage of municipals	Higher
Earning Assets/Total Assets	Higher
Interest Expense/Total Assets High-performance banks funded themselves at lower cost by emphasizing a traditional liability structure and a conservative capital structure	Lower
Demand Deposit/Total Liabilities High-performance banks made greater use of the most traditional of funding sources	Higher
Interest Expense/Interest-Bearing Liabilities High-performance banks made greater use of low-cost retail deposits to gather funds	Lower
Capital/Total Assets High-performance banks had a stronger or more conservative capital structure	Higher
Noninterest Expense/Total Assets High-performance banks held these expenses to a lower level indicating a more efficient use of resources	Lower
Assets/Employees High-performance banks required fewer employees per million dollars in assets	Higher
Salaries/Employees High-performance banks' employees were better paid	Higher
Loan Loss Provisions/Total Assets High-performance banks limited their lending and only lent to high-quality borrowers—restraining their credit risk	Lower
Loan Charge-Offs/Total Loans Lending to high-quality borrowers meant fewer loan charge-offs at high-performance banks	Lower
Nonperforming Loans/Total Loans Lending to high-quality borrowers meant high-performance banks carried fewer bad loans on their books	Lower

FACTORS NOT SHOWING SIGNIFICANT DIFFERENCES BETWEEN HIGH-PERFORMANCE SMALL BANKS AND ALL SMALL BANKS:

Location in a Metropolitan Area
Bank Holding Company Affiliation
Loan Income/Total Loans
Securities Income/Total Securities
Loan Portfolio Composition
Loan Maturity
Noninterest Income/Total Assets
High-performance small banks placed no more emphasis on these less traditional sources of income than the average small bank
Fee Income/Total Assets
Gains or Losses on Securities/Total Assets

Table II

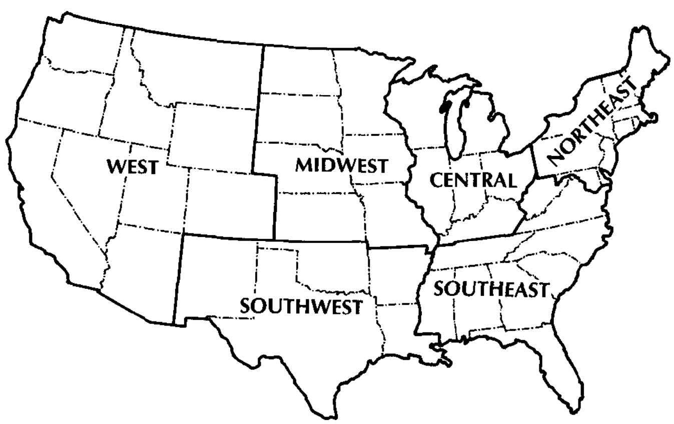
SMALL BANKS BY GEOGRAPHIC REGION, 1987[a]

	All Banks	High-Performance Banks[b]		
Region[c]	Number	Number	As a Percent of All Small Banks	As a Percent of All High-Performance Banks
Northeast	377	25	6.6	12.1
Southeast	1,196	54	4.5	26.2
Central	2,290	44	1.9	21.4
Midwest	2,841	34	1.2	16.5
Southwest	1,909	33	1.7	16.0
West	880	16	1.8	7.8
Total	9,493	206		100.0
Average			2.2	

[a] Small banks are those with end-of-year assets of $100 million or less that were opened on or before December 31, 1982.

[b] High-performance small banks have ROAs of 1.5 percent or more for all years, 1982-87.

[c] For regions, see map below.



Unique Qualities These include leadership in the market, provision of services other firms cannot duplicate, having the dominant market share, or being first to arrive in the market. Perhaps one or more of these apply to the high-performance banks.

Stochastic Process Persistent profits may result from historical chance. The basic idea of the stochastic process, as explained by Alchian, is that "where there is uncertainty, people's judgments and opinions, even when based on the best available evidence, will differ; no one of them may be making his choice by tossing coins; yet the aggregate set of actions of the entire group of participants may be indistinguishable from a set of individual actions, each selected at random."[2] According to this theory the high-performance banks in this study may have selected, by chance, the management, investment, and lending policies that turned out to be very profitable during the 1980s. To test if this was so, the average ROA for the 206 high-performance small banks and all small banks were calculated for each year between 1970 and 1981. The average for the high-performers was considerably above the average for all small banks for each of the twelve years, indicating that the high performers of the 1980s produced supernormal profits during the 1970s as well. Chance alone is an unlikely explanation of almost two decades of persistently high profits.

Prior Empirical Research

Several other analysts have attempted to pinpoint factors associated with bank profitability. A study of bank profitability in the 1970s by Kwast and Rose (1982) included large banks from throughout the nation. The authors determined that neither pricing, operating costs, market concentration, or macroeconomic effects were responsible for the higher earnings of some banks. They hypothesized, instead, that differences in regional factors, portfolio make-up, or managerial abilities must explain the better earnings of high-performance banks. Wall (1985) examined small and mid-sized banks over the period 1972 to 1981 to identify factors important to bank profits. Wall found that consistently profitable banks had lower interest and noninterest expenses than did their less profitable counterparts because of more capital, more demand deposits, slightly lower rates paid on liabilities overall, greater holdings of securities, and more efficient management. Wall concluded that interest and noninterest income at consistently profitable banks was no higher than at less profitable banks, and that asset size, number of branches, and market concentration did not explain higher earnings. Wall's findings on the factors associated with small and mid-sized bank profits in the 1972 through 1981 period differ little from our findings for small banks in the 1980s.

Methodology

Data for our study came from the Reports of Condition and Income (call report), a detailed financial

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[2] Alchian (1950), p. 216. Alchian is an excellent background source for understanding the issues involved in stochastic growth. Also see Nelson and Winter (1982) and Steindl (1965).

statement filed quarterly by banks with their regulators. A set of income, expense, and portfolio ratios were calculated for all small U.S. banks established in 1982 or before. Ratios were then averaged across all small banks and all high-performance small banks throughout the nation for each year from 1982 through 1987.

Because economic conditions varied from region to region, ratios for both groups of banks were also computed on a regional basis. For each of the six years, the average ratios, regional and national, for high-performance small banks and all small banks were compared using a standard t test to determine statistically significant differences (see Table III). A difference between the ratios of high-performance small banks and all small banks is considered to be due to factors other than chance if the t statistic is significant at the 5 percent level. Regional patterns in the ratios are identified and discussed.

The same banks are included in the high-performance group for each year of the study while the number of banks in the all-small-banks category varies. The all-small-banks category, for any given year, includes all banks throughout the nation that had assets less than $100 million at the end of that year and had been established in 1982 or before.[3] The number of banks in this category declined each year, from 12,353 in 1982 to 9,493 in 1987 as the banks grew in asset size, merged, or failed. To be included in the high-performance subset a bank must have had no more than $100 million in assets and must have produced a return on assets (ROA) greater than 1.5 percent for each of the six years from 1982 through 1987. Banks with ROAs greater than 1.5 percent have very strong profits. Banks established after 1982 could not have had high ROA in that year, so are excluded from the high-performance group by our convention that requires high ROA in every year. There are 206 high-performance banks. They are listed in Table IA in the appendix.

The period 1982-87 is used in this study for two reasons. First, it offers the most recent extended period since the passage of DIDMCA and the Garn-St. Germain Act. Second, it provides an interval long enough to be sure that luck or accounting choices alone did not influence the selection of the high-performance small banks.

[3] Unless otherwise stated, the phrase *all small banks* or *average small bank* should be assumed to include only those banks meeting these two requirements.

Table III

COMPARISON OF SELECTED RATIOS: HIGH-PERFORMANCE BANKS VERSUS ALL SMALL BANKS

	1982							1983							1984								
	NE	SE	CN	MW	SW	W	U.S.	NE	SE	CN	MW	SW	W	U.S.	NE	SE	CN	MW	SW	W	U.S.		
1		**P**	**P**		**P**	P	**P**	P	**P**	**P**	**P**	**P**		**P**	na	na	na	na	na	na	na	1	Interest Income/Assets
2	**N**	**N**	**N**	**N**			**N**	**N**	**N**	**N**	**N**	**N**	N	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	2	Interest Expense/Assets
3	N							N														3	Noninterest Income/Assets
4	**N**		N		**N**	N	N	**N**		**N**		**N**	**N**		**N**		**N**		**N**	**N**	N	4	Noninterest Expense/Assets
5	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	5	Loan Loss Provision/Assets
6						**N**																6	Securities Gains/Assets
7	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	7	Return on Assets
8		**N**	**N**	**N**	**N**	**N**	**N**		**N**	**N**	**N**	**N**	**N**	**N**		**N**	**N**	**N**	**N**	N	**N**	8	Loans/Assets
9	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	9	Securities/Assets
10	**P**	**P**	**P**	**P**	**P**		**P**	**P**	**P**	**P**	**P**	**P**		**P**	**P**	**P**	**P**	**P**	**P**		**P**	10	Equity/Assets
11	**N**	**N**	**N**	N	**N**		**N**		N	N		N		**N**					N			11	Total Assets

na indicates that data were not available.

P indicates that the mean for the ratio for the high-performance small banks (h.p.s.b.) exceeded that for all small banks and was statistically significantly different at the 1 percent level.

P indicates that the mean for the ratio for the h.p.s.b. exceeded that for all small banks and was statistically significantly different at the 5 percent level.

Blank space indicates that there was no significant difference between h.p.s.b. and all small banks for the ratio.

N indicates that the mean for the ratio for all small banks exceeded that for the h.p.s.b. and was statistically significantly different at the 1 percent level.

N indicates that the mean for the ratio for all small banks exceeded that for the h.p.s.b. and was statistically significantly different at the 5 percent level.

SEE TABLE IIA IN APPENDIX FOR RATIO AND T STATISTIC VALUES.

Characteristics of High-Performance Small Banks

Table II shows that high-performance small banks were not distributed proportionately throughout the country. The Northeast had the highest, and the Midwest the lowest, proportion of high-performance small banks relative to all small banks. During the 1982 through 1987 period, there were substantial differences in regional economic performance which likely caused some of the corresponding regional differences in the proportion of high-performance small banks. Slumping prices for energy, real estate, and farm commodities had adverse effects on the Southwest, Midwest, and Central regions, while strong economic growth was occurring in the Northeast and Southeast through the period.

Although not shown in Table II, approximately 30 percent of high-performance small banks were headquartered in or near large population centers, represented here by metropolitan statistical areas (MSAs), while the figure averaged a slightly higher 33 percent for all small banks. Only in 1982 and 1983 were the differences statistically significant when small banks, high-performance versus total, were compared for the nation. When tested by region and across years, only in the Southwest were high-performance small banks significantly less likely to be located in MSAs.

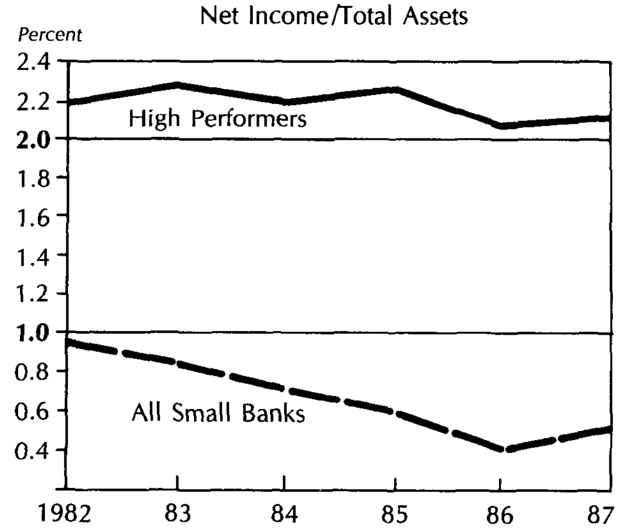
The asset size of the average high-performance small bank was $40.8 million in 1987 compared with $37.5 million for all small banks. Asset size of the average high-performance small bank increased by 56 percent from 1982 through 1987, while the asset size of the average small bank increased by only 20 percent. The percentage of high-performance and all small banks that were subsidiaries of bank holding companies (BHCs) increased through the period. In 1987, 46 percent of high-performance and 66 percent of all small banks were subsidiaries of BHCs. A test was performed to determine if the difference in BHC affiliation between the two groups of banks was statistically significant across the years. For the nation as a whole the difference was significant, but statistically significant regional differences were not found except in the Northeast and Southwest regions. Firm conclusions about the relationship between BHC ownership and profits based on these data are difficult to draw.

	1985							1986							1987							
	NE	SE	CN	MW	SW	W	U.S.	NE	SE	CN	MW	SW	W	U.S.	NE	SE	CN	MW	SW	W	U.S.	
1	**P**	**P**	**P**		**P**		**P**	**P**	**P**	**P**	P	**P**	P	**P**	**P**	**P**	**P**	P	**P**		**P**	1
2	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	N	**N**	**N**	**N**	**N**	**N**	**N**	N	**N**	2
3																						3
4	**N**		**N**		**N**	**N**	N	N		**N**		**N**	**N**	**N**	N		**N**		**N**	N		4
5	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	5
6		**N**					**N**		**N**			**N**	**N**	**N**								6
7	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	7
8		**N**	**N**	**N**	**N**	N	**N**	N	**N**	**N**	**N**	**N**		**N**	N	**N**	**N**	**N**	**N**		**N**	8
9	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	9
10	**P**	**P**	**P**	**P**	**P**		**P**	**P**	**P**	**P**	**P**	**P**	P	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	10
11																						11

How The High Performers Did It

The high-performance small banks identified in this study differed from the average small bank in several ways. They depended more on low-cost demand deposits, invested more in securities (especially long-term and municipal securities), made more high-quality loans, and were more highly capitalized. As a result, the high-performance small banks produced higher interest income, lower interest expense, lower noninterest expenses, and lower provision for loan losses than did the average small bank. The high-performance small banks did not differ significantly from the average small bank in interest income from loans and securities, in loan portfolio makeup, in noninterest income, or in income from securities gains. There was little variation among regions in how the high-performance small banks operated. As shown in the chart, average ROA for the 206 high performers exceeded 2 percent in every year and was fairly stable, while average ROA for all small banks declined in every year except 1987 and ended the period at .51 percent.

ROA OF SMALL BANKS
Net Income/Total Assets



Interest Income Except for one or two years' observations for three regions, high-performance small banks produced significantly more tax-equivalent interest income relative to assets than the average for all small banks (see Table III, line 1).[4] Among the major categories of income and expense, higher interest income was second only to lower interest expense as a contributor to the earnings differential of the high-performance banks across the years and regions of the study. Averaged for the six years of the study, high-performance small banks' interest income relative to assets was 58 basis points higher than the average small bank's. Wall (1985) found that higher interest income was not associated with higher profits for small and medium-sized banks between 1972 and 1981. Greater pressure on interest expense resulting from deregulation in the early 1980s of rates paid on deposits may have made interest income more important to profitability for our study period. Interest income relative to assets depends on the earnings per dollar of the various types of interest-earning assets, their proportions in the asset portfolio, and the proportion of nonearning assets to all assets.

LOANS The difference between loan income relative to total loans at the high-performance small banks and at the average small bank was not significant for most regions across years or for the national average except in 1982 and 1983. As shown on line 8 of Table III, the ratio of total loans to total assets was significantly lower for high performers than for all small banks. In the Southwest and Midwest where agriculture and oil industry problems were prevalent, the high performers eschewed lending, especially in the later years of the study. While at the national level the high-performance small banks differed statistically from the average of all small banks in terms of loan composition, the regional data do not corroborate this finding. The high performers in the West and Midwest made fewer commercial and industrial loans than average for small banks in those regions and high-performance small banks in the Southeast made more loans to individuals than average for small banks in that region. Other regions show no consistent differences in portfolio makeup. There was no difference in the maturities of loans made by high performers and all small banks.

SECURITIES High-performance small banks had a much higher ratio of securities to total assets than did all small banks (Table III, line 9). The difference was statistically significant across all regions and all years in the study. High-performance banks also had more municipal securities than their counterparts, accounting for most, but not all, of the higher

[4] The interest income on most securities issued by local and state governments is exempt from federal income taxes. These securities, therefore, pay lower rates of interest than taxable securities of equivalent risk and maturity. To put the tax-exempt income on a basis comparable to the pretax return on taxable securities, or on a tax-equivalent basis, an adjustment is made to income from state and local securities. For banks with positive profits before taxes, income from state and local securities is increased by $t/(1-t)$ times the lesser of profits before taxes or interest earned on state and local securities, where t is the bank's marginal federal tax rate.

securities-to-assets ratios of high-performance banks. Municipal securities are generally tax-exempt and pay tax-adjusted rates comparable to other securities only for those holders with high marginal tax rates. As a bank's net income increases, its ability to make use of the tax-free income these securities generate increases. Accordingly, high-income banks would be expected to hold more municipal securities than less profitable banks.

At the national level the ratio of taxable securities to total assets was higher at the high-performance small banks than at the average small bank for the years 1982 through 1984 only. On a regional basis, the difference was consistently significant only for the Southwest, probably because of the lack of good lending opportunities in depressed oil industry areas of the region.

On average the high-performance banks generally had more securities with maturities greater than one year than did their counterparts. The difference was significant for the nation across all years but only consistently different for three of the regions in all the years.

High-performance small banks did not consistently earn more on securities than did all small banks. Securities income relative to total securities was significantly greater at the high-performance small banks than at the average small bank in some years but not in others at the national level and varied from region to region across the years. In addition, there was no significant difference between securities gains and losses relative to assets between high-performance small banks and all small banks (Table III, line 6). Securities gains or losses are realized when a bank sells a security, prior to the maturity of the security, for a price different than that paid to purchase it.[5]

EARNING ASSETS-TO-TOTAL ASSETS The national average proportion of earning assets-to-total assets at high-performance small banks was 91.4 percent in 1987 compared with 90.4 percent at the average small bank. High-performance small banks' earning assets-to-total assets ratio exceeded the average small banks' ratio significantly in every year from 1982 through 1987 at the national level and for most regions across the years. This accounts for some of the higher interest income relative to assets of the high performers. Examples of nonearning assets are buildings, equipment, cash, and foreclosed real estate.

[5] For additional information on the relationship between market rates of interest and securities prices see Gup, Fraser, and Kolari (1989), Chapters 2 and 5.

Interest Expense Interest expense relative to assets in 1987 was 3.9 percent for the average of all high-performance small banks in the nation and 4.6 percent for the average of all small banks. The difference was significant across all regions and years with the exception of the Southwest and West regions in 1982 (Table III, line 2). Among the major income and expense categories, interest expense was the largest contributor to higher ROA at the high-performance banks. Interest expense relative to assets depends on the proportion of liabilities that are interest-paying, the rates paid on the interest-paying liabilities, and the level of the capital-to-assets ratio.

DEMAND DEPOSITS TO TOTAL LIABILITIES The major liability not paying interest is demand deposits. The high-performance small banks had a lower level of interest expense relative to assets than the average small bank, in part because they had more demand deposits. The difference between the ratio of demand deposits to total liabilities for high-performance small banks and that of the average small bank was significant in all years for the nation and for varying regions across the years.

RATES PAID ON INTEREST-BEARING LIABILITIES Interest expense relative to interest-paying liabilities was lower at the high-performance small banks than at the average small bank. The difference was significant across most regions and at the national level for all six years and accounted for one-third to one-fourth of the total difference in interest expense relative to assets. For the national average, the high-performance banks were able to gather a higher proportion of their liabilities from passbook and statement savings, normally the least costly of the interest-bearing liabilities, and were less dependent on expensive large certificates of deposit (CDs) than average for all small banks throughout the nation. Again, the regional data are not consistent in their support of this finding. High performers made greater use of savings only in the Northeast and Central regions and lower use of large CDs in only the Southwest and West regions. Other regions show no consistent patterns.

CAPITAL-TO-ASSETS RATIO The average high-performance small bank had a significantly greater equity-to-assets ratio than the average for all small banks (Table III, line 10). That is, the high-performance banks had more capital than did their counterparts. The difference was significant across all regions in all years except for the West and was significant at the national level for all years. Since equity funds do not pay interest, they do not add to interest expenses, so that higher ratios of equity-to-assets tended to lower interest expense-to-assets ratios. Because one method of increasing equity is to retain earnings, banks that maintain consistently high-earnings can be expected to have more capital than the average bank.

Noninterest Income and Expense With the exception of the Northeast region in 1982 and 1983, noninterest income from fees and other sources was never, in the period under study, significantly different at the high performers than at small banks in general (Table III, line 3). High-performance small banks apparently did not make fee income a priority.

The high-performance banks had lower noninterest expense relative to assets than did their counterparts except in the Southeast and Midwest regions (Table III, line 4). Relative to assets, the difference averaged 37 basis points for the 1982-87 period. Noninterest expense includes salaries expense, bank premises and fixed asset expenses, and a category reported on the call report as "other noninterest expense," including legal fees, deposit insurance fees, advertising expenses, management fees paid to parent BHCs, and other expenses. Bank premises and fixed assets expenses and other noninterest expenses were significantly lower at high-performance small banks, though salaries expense was not. Assets per employee also were higher at high-performance banks. However, higher average salaries at those banks made salaries relative to assets about the same as at the typical small bank. A lower noninterest expense-to-assets ratio could indicate more efficient management. But it is difficult to tell simply from call report data what, if anything, was being managed more efficiently.

As mentioned previously, a smaller percentage of high-performance small banks were BHC subsidiaries than was the case for all small banks. Since management fees paid to parent BHCs are an expense faced only by BHC subsidiaries, banks not owned by BHCs might tend to show up more frequently in the high-performance group. Management fees are included in other noninterest expenses on the call report. Small BHC subsidiary banks had only a five basis points higher other noninterest expense in 1987 than did small banks without a holding company affiliation. This difference is so small it is not likely to have biased the selection of high-performance small banks in favor of non-BHC banks.

Provision for Loan Losses For every region in every year and for the national averages for every year, provision for loan losses relative to assets was significantly lower at high-performance small banks than at the average small bank (Table III, line 5). Provision for loan losses relative to assets was, on average for the six years of the study, 49 basis points lower at the high-performance banks. By substituting investments in securities for lending, that is, by holding fewer loans relative to assets, the high-performance banks decreased the proportion of the asset portfolio subject to credit risk and therefore lowered their level of loan losses relative to assets. In addition, the high-performance banks made higher quality loans. They had significantly fewer charge-offs and nonperforming loans relative to total loans than other banks, suggesting that the high performers lent to low-risk borrowers. While many small banks in depressed regions were having serious problems with their loan portfolios, some banks in those same regions were able to prosper. For example, 20 of the 206 high-performance small banks were located in Texas, where many banks were having trouble producing profits. As of 1987, there were 1,066 small banks in Texas, so that 1.9 percent were high-performance, close to the national average.

Conclusion

While the average small bank's profits were fairly low and falling for most of the 1982 through 1987 period, there were 206 banks, out of 9,493 small banks (assets of $100 million or less) operating in 1987, that had a return on assets of 1.5 percent or more in each of those six years. Although there were fewer high-performance small banks in geographic regions that had economic difficulties, high-performance banks were found in all regions. High-performance small banks seemed to choose similar strategies in all regions.

The high-performance banks did not engage in exotic financial activities. Instead, they did a very good job of basic banking—acquiring funds at low cost and making high-quality, profitable investments. Wall (1985) found much the same for the 1972 through 1981 period. Our study provides evidence that the deregulation of the early 1980s did not change the methods for producing profits at small banks.

The high-performance small banks earned abnormally high returns for long periods. On the contrary, economic theory suggests that abnormally high profits should be short-lived. Other banks, seeking higher returns, will engage in similar activities and drive down returns to the industry norms. The high-performance banks we studied were able to maintain persistent profits in the face of competition. Importantly, the high-performance banks were able to acquire funds at lower cost than their competition through demand and other low-cost deposits. How they were able to attract these deposits in the face of competition is a subject that deserves further research.

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APPENDIX

Table IA

HIGH-PERFORMANCE SMALL BANKS

Bank	City	State
Brunswick Bank & Trust Co.	Manalapan TWP	NJ
Community Bank of Bergen City	Maywood	NJ
Putnam County National Bank of Carmel	Carmel	NY
National Bank of Coxsackie	Coxsackie	NY
First National Bank of Dryden	Dryden	NY
National Bank of Florida	Florida	NY
First National Bank of Hermon	Hermon	NY
Bank of Millbrook	Millbrook	NY
National Bank of Stamford	Stamford	NY
First National Bank of Wyoming	Wyoming	DE
First National Bank of Tuckahoe	Tuckahoe	NJ
Citizens National Bank of Ashland	Ashland	PA
East Prospect State Bank	East Prospect	PA
Citizens National Bank of Lansford	Lansford	PA
New Tripoli National Bank	New Tripoli	PA
Union Bank & Trust Co.	Pottsville	PA
Summit Hill Trust Co.	Summit Hill	PA
Guaranty Deposit Bank	Cumberland	KY
Harlan National Bank	Harlan	KY
Jackson County Bank	McKee	KY
First State Bank	Manchester	KY
Farmers & Trades Bank	Mt. Olivet	KY
Baltic State Bank	Baltic	OH
Custar State Bank Co.	Custar	OH
Corn City State Bank	Deshler	OH
Junction City Banking Co.	Junction City	OH
Farmers National Bank of Plain City	Plain City	OH
Farmers Bank	West Union	OH
Valley National Bank	Freeport	PA
Peoples National Bank of Rural Valley	Rural Valley	PA
National Capital Bank of Washington	Washington	DC
Centreville National Bank of Maryland	Centreville	MD
Caroline County Bank	Greensboro	MD
Bank of Southern Maryland	La Plata	MD
New Windsor State Bank	New Windsor	MD
Bank of Ocean City	Ocean City	MD
Bank of Currituck	Moyock	NC
Avery County Bank	Newland	NC
Bank of Heath Springs	Heath Springs	SC
Latta Bank & Trust Co.	Latta	SC
Dorn Banking Co.	McCormick	SC
Bank of Ridgeway	Ridgeway	SC
Bank of York	York	SC
Middleburg National Bank	Middleburg	VA
First & Citizens Bank	Monterey	VA
Tazewell National Bank	Tazewell	VA
Bank of Waverly	Waverly	VA
Farmers Bank	Windsor	VA
Lincoln National Bank of Hamlin	Hamlin	WV
First Clark National Bank of Northfork	Northfork	WV
First State Bank & Trust Co.	Rainelle	WV
Western Greenbrier National Bank	Rainelle	WV
Bank of War	War	WV
Citizens Bank	Fayette	AL
First National Bank of Fayette	Fayette	AL
Peoples Bank of Greensboro	Greensboro	AL
Peoples Bank	Red Level	AL
First National Bank in Sylacauga	Sylacauga	AL
National Trust Co. of Ft. Myers	Ft. Myers	FL
Peoples Bank of Graceville	Graceville	FL
Peoples State Bank	Groveland	FL
Springfield Commercial Bank	Springfield	FL
Capital City Second National Bank	Tallahassee	FL
Wilcox County State Bank	Abbeville	GA
Braselton Banking Co.	Braselton	GA
Bank of Camilla	Camilla	GA
First National Bank of Polk County	Cedartown	GA
Merchants & Farmers Bank	Comer	GA
Commercial Bank	Crawford	GA
Bank of Danielsville	Danielsville	GA
Darien Bank	Darien	GA
Fairburn Banking Co.	Fairburn	GA
Citizens Bank	Folkston	GA
Bank of Hazlehurst	Hazlehurst	GA
Hinesville Bank	Hinesville	GA
Wilkinson County Bank	Irwinton	GA
Bank of La Fayette	La Fayette	GA
Farmers & Merchants Bank	Lakeland	GA
Security State Bank	McRae	GA
Pembroke State Bank	Pembroke	GA
First State Bank	Stockbridge	GA
Farmers & Merchants Bank	Summerville	GA
Bank of Thomson	Thomson	GA
Darby Bank & Trust Co.	Vidalia	GA
First National Bank of West Point	West Point	GA
First National Bank in Deridder	Deridder	LA
Bank of Sunset & Trust Co.	Sunset	LA
Citizens Bank & Trust Co. of Grainger Co.	Rutledge	TN
Abingdon Bank & Trust Co.	Abingdon	IL
First Trust & Savings Bank	Albany	IL
Algonquin State Bank	Algonquin	IL
District National Bank of Chicago	Chicago	IL
Irving Bank	Chicago	IL
National Bank of N. Evanston	Evanston	IL
First National Bank of Fairmount	Fairmount	IL
First Bank & Trust Co.	Palatine	IL
Reynolds State Bank	Reynolds	IL
First National Bank of Schiller Park	Schiller Park	IL
Tiskilwa State Bank	Tiskilwa	IL
Vermont State Bank	Vermont	IL
Auburn State Bank	Auburn	IN
Rockville National Bank	Rockville	IN
Iowa State Bank	Calmar	IA
Ossian State Bank	Ossian	IA
Palmer State Bank	Palmer	IA
Home State Bank	Royal	IA
Solon State Bank	Solon	IA
State Bank of Hesperia	Hesperia	MI
Cleveland State Bank	Cleveland	WI
Citizens Bank	Delavan	WI
Kilbourn State Bank	Milwaukee	WI
Palmyra State Bank	Palmyra	WI
Sharon State Bank	Sharon	WI
Bank of South Wayne	South Wayne	WI

Bank	City	State
Stoughton State Bank	Stoughton	WI
First National Bank of Altheimer	Altheimer	AR
Farmers & Merchants Bank	Des Arc	AR
Leachville State Bank	Leachville	AR
Smackover State Bank	Smackover	AR
Egyptian State Bank	Carriers Mills	IL
Bank of Christopher	Christopher	IL
State Bank of Farina	Farina	IL
First National Bank of Staunton	*Staunton*	IL
Fort Knox National Bank	Fort Knox	KY
Fredonia Valley Bank	Fredonia	KY
Poole Deposit Bank	Poole	KY
Sacramento Deposit Bank	Sacramento	KY
Peoples Bank	Shepherdsville	KY
Iuka Guaranty Bank	Iuka	MS
Bank of Okolona	Okolona	MS
First National Bank of Pontotoc	Pontotoc	MS
Mechanics Savings Bank	Water Valley	MS
Citizens Bank	Dexter	MO
Bank of Wellsville	Wellsville	MO
First Bank of Coon Rapids	Coon Rapids	MN
Farmers State Bank	Lester Prairie	MN
Town & Country Bank—Maplewood	Maplewood	MN
Farmers State Bank	Rothsay	MN
First WE Savings Bank of St. Louis Park	St. Louis Park	MN
Northern State Bank	Thief River Falls	MN
Peoples State Bank	Warren	MN
Farmers State Bank	Conrad	MT
Sargent County Bank	Forman	ND
Stock Growers Bank	Napoleon	ND
First Western Bank	Wall	SD
Security National Bank of Durand	Durand	WI
Security State Bank	Ladysmith	WI
Firstbank of Gunbarrel NA	Boulder County	CO
Metropolitan State Bank	Commerce City	CO
Century Bank & Trust Co.	Denver	CO
Omnibank Southeast	Denver	CO
Haxtun Community Bank	Haxtun	CO
State Bank of Wiley	Wiley	CO
Fort Riley National Bank	Fort Riley	KS
Miners State Bank	Frontenac	KS
Gypsum Valley Bank	*Gypsum*	KS
First National Bank of Howard	Howard	KS
Citizens State Bank	Moundridge	KS
Farmers State Bank	Winona	KS
Bank of Leeton	Leeton	MO
Citizens Bank & Trust Co.	Smithville	MO
Ashton State Bank	Ashton	NE
State Bank of Du Bois	Du Bois	NE
First National Bank of Friend	Friend	NE
First National Bank of Hooper	Hooper	NE
First State Bank	Randolph	NE
State Bank of Riverdale	Riverdale	NE
State Bank of Table Rock	Table Rock	NE
Bank of Talmage	*Talmage*	NE
First National Bank of West Point	West Point	NE
American Exchange Bank	Lindsay	OK
Bank of Locust Grove	Locust Grove	OK
Park State Bank	Nicoma Park	OK
First National Bank of Pryor	Pryor	OK
Vian State Bank	Vian	OK
Farmers State Bank	Pine Bluffs	WY
Western Commerce Bank	Carlsbad	NM
Citizens Bank	Tucumcari	NM
First National Bank of Albany	Albany	TX
Farmers State Bank	*Bertram*	TX
First State Bank	Big Sandy	TX
First State Bank	Columbus	TX
Medina Valley State Bank	Devine	TX
Dilley State Bank	Dilley	TX
First National Bank in Falfurrias	Falfurrias	TX
First State Bank	Frankston	TX
First National Bank of Hebronville	Hebronville	TX
Border Bank	Hidalgo	TX
Citizens National Bank of Hillsboro	Hillsboro	TX
Industry State Bank	Industry	TX
Muenster State Bank	Muenster	TX
First National Bank of Odonnell	Odonnell	TX
First State Bank	Premont	TX
Peoples State Bank	Rocksprings	TX
Citizens Bank	Rusk	TX
First State Bank	Rusk	TX
Eisenhower National Bank	San Antonio	TX
First State Bank	Three Rivers	TX
First National Bank in Coachella	Coachella	CA
Bank of Montreal California	San Francisco	CA
First Bank of San Luis Obispo	San Luis Obispo	CA
Torrance National Bank	Torrance	CA
First National Bank of Ely	Ely	NV
Pioneer Trust Co.	Salem	OR
Barnes Banking Co.	Kaysville	UT
First National Bank of Morgan	Morgan	UT

Table IIA

1982	NORTHEAST High[a]	NORTHEAST All[b]	NORTHEAST T Stat[c]	SOUTHEAST High	SOUTHEAST All	SOUTHEAST T Stat	CENTRAL High	CENTRAL All	CENTRAL T Stat
INTEREST INCOME/ASSETS[d]	11.22	11.14	(.29)	12.20	11.68	(3.91)***	11.87	11.39	(2.77)***
INTEREST EXPENSE/ASSETS	5.25	6.18	(−2.92)***	5.92	6.82	(−4.36)***	6.18	7.13	(−4.05)***
NONINTEREST INCOME/ASSETS	0.36	0.70	(−2.37)**	1.52	0.78	(1.01)	0.55	0.50	(.36)
NONINTEREST EXPENSES/ASSETS	2.64	3.59	(−4.69)***	3.63	3.53	(.18)	2.55	2.95	(−2.16)**
LOAN LOSS PROV/ASSETS	0.14	0.28	(−3.57)***	0.18	0.45	(−7.93)***	0.10	0.35	(−8.55)***
SEC. GAINS/ASSETS	−0.09	−0.01	(−1.08)	−0.05	−0.02	(−1.30)	−0.07	0.00	(−1.36)
RETURN ON ASSETS	1.94	1.00	(14.85)***	2.26	0.93	(8.59)***	2.06	0.85	(15.45)***
LOANS/ASSETS	48.01	50.58	(−1.04)	36.76	47.48	(−6.27)***	37.22	48.17	(−6.12)***
SECURITIES/ASSETS	36.45	27.92	(3.42)***	43.85	31.00	(6.99)***	45.91	32.17	(6.99)***
EQUITY/ASSET	12.96	9.11	(5.34)***	12.97	9.48	(5.00)***	12.50	8.79	(6.27)***
TOTAL ASSETS (000)	$31,892	$41,903	(−2.79)***	$27,044	$33,149	(−3.01)***	$26,250	$33,173	(−2.77)***
1983									
INTEREST INCOME/ASSETS[d]	10.71	10.30	(2.02)**	11.38	10.62	(7.16)***	11.05	10.45	(3.56)***
INTEREST EXPENSE/ASSETS	4.63	5.48	(−3.45)***	5.05	5.85	(−5.03)***	5.26	6.19	(−4.70)***
NONINTEREST INCOME/ASSETS	0.39	0.51	(−2.44)**	1.57	0.77	(.99)	0.57	0.51	(.48)
NONINTEREST EXPENSES/ASSETS	2.63	3.25	(−3.88)***	3.70	3.43	(.38)	2.46	2.91	(−2.85)***
LOAN LOSS PROV/ASSETS	0.09	0.23	(−4.66)***	0.24	0.52	(−5.83)***	0.11	0.40	(−10.54)***
SEC. GAINS/ASSETS	0.00	0.01	(−.36)	0.02	0.00	(.99)	0.00	0.01	(−.16)
RETURN ON ASSETS	2.06	1.04	(10.80)***	2.22	0.88	(10.53)***	2.15	0.84	(20.55)***
LOANS/ASSETS	46.63	49.78	(−1.26)	36.01	47.03	(−6.24)***	36.60	48.02	(−6.16)***
SECURITIES/ASSETS	38.02	31.08	(2.66)***	45.40	33.57	(6.26)***	46.60	34.66	(6.04)***
EQUITY/ASSET	13.26	8.85	(5.95)***	13.47	9.02	(7.23)***	12.98	8.69	(6.73)***
TOTAL ASSETS (000)	$35,496	$45,107	(−1.91)	$29,973	$35,578	(−2.50)**	$29,298	$35,035	(−2.04)**
1984									
INTEREST INCOME/ASSETS	NA	NA		NA	NA		NA	NA	
INTEREST EXPENSE/ASSETS	5.01	5.87	(−3.59)***	5.37	6.18	(−5.31)***	5.59	6.55	(−5.07)***
NONINTEREST INCOME/ASSETS	0.42	0.87	(−1.73)	1.56	1.09	(.62)	0.62	0.55	(.41)
NONINTEREST EXPENSES/ASSETS	2.59	3.54	(−3.14)***	3.54	3.70	(−.26)	2.48	2.92	(−2.71)***
LOAN LOSS PROV/ASSETS	0.13	0.22	(−3.41)***	0.24	0.48	(−5.44)***	0.14	0.43	(−7.14)***
SEC. GAINS/ASSETS	0.03	−0.02	(.97)	−0.02	−0.01	(−.38)	0.01	−0.01	(.72)
RETURN ON ASSETS	2.06	1.04	(10.76)***	2.15	0.89	(11.79)***	2.06	0.80	(18.31)***
LOANS/ASSETS	48.34	52.53	(−1.53)	38.40	48.87	(−5.41)***	39.51	50.05	(−5.50)***
SECURITIES/ASSETS	36.49	28.70	(2.96)***	44.16	32.10	(6.02)***	43.10	32.42	(5.32)***
EQUITY/ASSET	13.60	8.96	(6.83)***	13.80	9.60	(6.16)***	12.88	8.68	(7.11)***
TOTAL ASSETS (000)	$39,067	$47,037	(−1.54)	$33,599	$37,349	(−1.47)	$32,231	$36,457	(−1.21)
1985									
INTEREST INCOME/ASSETS[d]	10.84	10.21	(3.65)***	11.21	10.61	(5.59)***	10.72	10.25	(2.88)***
INTEREST EXPENSE/ASSETS	4.66	5.33	(−3.00)***	4.94	5.64	(−5.18)***	5.07	5.92	(−4.86)***
NONINTEREST INCOME/ASSETS	0.40	1.11	(−1.87)	1.71	1.18	(.57)	0.63	0.55	(.51)
NONINTEREST EXPENSES/ASSETS	2.46	3.74	(−3.24)***	3.74	3.86	(−.15)	2.41	2.94	(−3.49)***
LOAN LOSS PROV/ASSETS	0.12	0.28	(−3.93)***	0.26	0.54	(−6.61)***	0.15	0.62	(−13.25)***
SEC. GAINS/ASSETS	0.05	0.07	(−.34)	0.01	0.06	(−4.39)***	0.07	0.07	(.11)
RETURN ON ASSETS	2.19	1.14	(9.43)***	2.22	1.02	(9.17)***	2.14	0.79	(21.41)***
LOANS/ASSETS	47.15	52.33	(−1.77)	40.17	49.88	(−4.95)***	40.34	48.87	(−4.32)***
SECURITIES/ASSETS	38.23	29.32	(3.19)***	43.64	31.36	(5.94)***	41.91	32.57	(3.67)***
EQUITY/ASSET	13.98	9.18	(7.04)***	14.12	9.89	(4.98)***	13.34	8.69	(7.84)***
TOTAL ASSETS (000)	$43,197	$49,477	(−1.22)	$36,820	$38,624	(−.56)	$35,181	$38,171	(−.83)
1986									
INTEREST INCOME/ASSETS	10.03	9.34	(3.46)***	10.32	9.69	(4.43)***	10.03	9.42	(4.31)***
INTEREST EXPENSE/ASSETS	4.10	4.65	(−2.79)***	4.30	4.91	(−5.09)***	4.50	5.23	(−4.54)***
NONINTEREST INCOME/ASSETS	0.38	1.22	(−1.37)	1.54	1.32	(.28)	0.60	0.54	(.37)
NONINTEREST EXPENSES/ASSETS	2.35	3.77	(−2.28)**	3.52	3.97	(−.68)	2.37	2.93	(−3.42)***
LOAN LOSS PROV/ASSETS	0.10	0.24	(−5.26)***	0.29	0.50	(−5.40)***	0.21	0.54	(−8.72)***
SEC. GAINS/ASSETS	0.12	0.10	(.27)	0.04	0.11	(−6.02)***	0.12	0.12	(.14)
RETURN ON ASSETS	2.10	1.08	(9.48)***	2.08	0.99	(9.63)***	2.05	0.77	(24.30)***
LOANS/ASSETS	45.77	53.09	(−2.48)**	41.48	50.00	(−4.35)***	40.45	48.06	(−3.84)***
SECURITIES/ASSETS	35.84	26.74	(3.15)***	38.76	30.04	(4.25)***	39.78	32.38	(3.43)***
EQUITY/ASSET	13.77	9.27	(6.34)***	13.77	9.92	(6.25)***	13.61	8.68	(7.92)***
TOTAL ASSETS (000)	$49,113	$50,730	(−.32)	$41,093	$40,797	(.09)	$37,820	$39,696	(−.52)
1987									
INTEREST INCOME/ASSETS[d]	9.43	8.94	(2.99)***	9.60	9.07	(3.95)***	9.16	8.77	(3.03)***
INTEREST EXPENSE/ASSETS	3.81	4.35	(−3.31)***	3.93	4.47	(−5.28)***	4.06	4.71	(−4.26)***
NONINTEREST INCOME/ASSETS	0.39	1.46	(−1.32)	4.46	1.33	(.85)	0.60	0.54	(.41)
NONINTEREST EXPENSES/ASSETS	2.43	4.06	(−2.02)**	5.67	3.86	(.65)	2.41	2.93	(−2.96)***
LOAN LOSS PROV/ASSETS	0.09	0.21	(−4.20)***	0.26	0.46	(−4.36)***	0.18	0.37	(−5.60)***
SEC. GAINS/ASSETS	0.07	0.04	(.62)	0.04	0.02	(1.07)	0.05	0.03	(.66)
RETURN ON ASSETS	2.02	1.07	(10.84)***	2.49	0.96	(2.97)***	1.89	0.81	(19.77)***
LOANS/ASSETS	50.41	58.04	(−2.72)**	44.28	52.18	(−3.87)***	42.25	49.83	(−3.24)***
SECURITIES/ASSETS	35.33	25.42	(3.32)***	37.38	29.89	(3.72)***	39.52	32.86	(3.08)***
EQUITY/ASSET	14.37	9.67	(6.89)***	15.46	10.00	(3.60)***	14.00	8.88	(7.86)***
TOTAL ASSETS (000)	$52,300	$53,223	(−.17)	$43,519	$41,679	(.57)	$40,679	$40,631	(.01)

[a] Mean for *all* high performance banks, in percent terms unless otherwise stated.

[b] Mean for all small banks, in percent terms unless otherwise stated.

[c] *** indicates high performance and all banks are statistically significantly different at the 1 percent level.
** indicates high performance and all banks are statistically significantly different at the 5 percent level.

[d] INTEREST INCOME/ASSETS is stated on a taxable-equivalent basis.

MIDWEST			SOUTHWEST			WEST			U.S.		
High	All	T Stat	High	All	T Stat	High	All	T Stat	High	All	T Stat
12.36	12.00	(1.61)	12.20	11.64	(2.77)***	12.09	11.15	(2.84)**	12.03	11.61	(5.24)***
5.74	7.32	(-3.69)***	6.00	6.54	(-1.84)	4.80	5.78	(-1.91)	5.79	6.84	(-8.50)***
0.48	0.51	(-.21)	0.75	0.78	(-.24)	0.91	0.90	(.03)	0.83	0.65	(.94)
2.62	2.92	(-1.22)	2.74	3.41	(-4.45)***	3.55	4.84	(-2.41)**	2.97	3.33	(-2.16)**
0.19	0.38	(-3.85)***	0.20	0.49	(-5.17)***	0.15	0.60	(-6.72)***	0.16	0.42	(-14.78)***
-0.08	-0.02	(-1.61)	-0.03	-0.01	(-.92)	-0.12	0.01	(-1.67)	-0.07	-0.01	(-3.36)***
2.39	1.10	(8.93)***	2.22	1.13	(14.11)***	2.36	0.36	(10.74)***	2.20	0.95	(22.72)***
40.60	50.57	(-4.80)**	38.45	49.57	(-4.87)***	45.25	55.69	(-3.28)***	39.79	49.83	(-11.44)***
43.32	32.48	(4.92)***	42.94	26.82	(7.20)***	31.25	18.83	(3.12)***	42.18	29.56	(13.37)***
14.81	9.06	(5.09)***	12.68	9.67	(4.94)***	15.44	12.21	(1.33)	13.31	9.47	(10.18)***
$18,851	$25,193	(-2.59)**	$25,633	$34,003	(-3.38)***	$31,017	$27,156	(.71)	$26,193	$31,131	(-4.44)***
11.61	10.92	(2.76)***	11.50	10.52	(3.43)***	11.06	10.41	(1.87)	11.26	10.61	(8.35)***
5.02	6.42	(-3.84)***	5.14	5.72	(-3.06)***	4.11	5.23	(-2.81)**	4.98	5.98	(-9.98)***
0.53	0.52	(.08)	0.80	0.82	(-.13)	1.09	1.02	(.31)	0.88	0.66	(1.03)
2.69	2.91	(-.82)	2.63	3.39	(-3.82)***	3.31	4.63	(-4.12)***	2.94	3.26	(-1.67)
0.22	0.54	(-3.50)***	0.32	0.72	(-4.26)***	0.18	0.63	(-6.57)***	0.20	0.53	(-12.60)***
-0.02	0.01	(-1.97)	-0.01	0.02	(-1.06)	-0.04	0.01	(-1.10)	0.00	0.01	(-1.42)
2.42	0.91	(14.17)***	2.45	0.85	(14.73)***	2.50	0.48	(5.42)***	2.28	0.84	(28.69)***
39.91	50.84	(-5.16)***	37.44	50.66	(-5.43)***	45.43	57.98	(-3.11)***	39.03	50.20	(-12.22)***
45.14	34.36	(4.90)***	44.59	28.00	(7.02)***	32.73	20.01	(3.99)***	43.60	31.55	(12.31)***
16.20	9.03	(5.15)***	13.38	8.94	(8.67)***	16.22	9.50	(2.01)	13.99	8.97	(11.83)***
$20,759	$26,394	(-1.61)	$29,313	$36,836	(-2.62)**	$34,796	$31,218	(.63)	$29,247	$33,257	(-3.21)***
NA	NA		NA	NA		NA	NA		NA	NA	
5.33	6.81	(-3.93)***	5.57	6.45	(-5.02)***	4.45	5.90	(-3.42)***	5.33	6.45	(-11.15)***
0.79	0.60	(.91)	0.79	0.87	(-.63)	1.15	1.12	(.17)	0.94	0.77	(.78)
2.69	2.91	(-.92)	2.68	3.42	(-3.62)***	3.38	4.63	(-2.78)***	2.91	3.32	(-2.34)**
0.24	0.91	(-10.38)***	0.29	0.87	(-9.61)***	0.02	0.80	(-4.99)***	0.20	0.68	(-19.64)***
-0.02	0.00	(-1.02)	-0.01	0.00	(-.19)	-0.03	0.00	(-1.09)	0.00	-0.01	(.15)
2.35	0.62	(11.11)***	2.13	0.64	(19.30)***	2.68	0.44	(5.77)***	2.19	0.71	(28.91)***
40.00	51.64	(-5.33)***	38.10	53.30	(-6.14)***	46.52	59.60	(-2.40)**	40.69	52.01	(-11.93)***
44.30	32.75	(4.98)***	44.47	25.40	(7.88)***	31.89	18.91	(3.05)***	42.12	29.61	(12.50)***
16.77	8.99	(5.20)***	14.28	8.63	(7.11)***	18.64	8.79	(1.80)	14.52	8.91	(10.06)***
$22,585	$27,188	(-1.30)	$32,190	$38,749	(-2.08)**	$37,433	$33,669	(.65)	$32,224	$34,693	(-1.78)
10.72	10.46	(1.29)	11.34	10.57	(4.17)***	11.49	10.47	(1.77)	11.02	10.44	(7.02)***
4.66	6.13	(-4.41)***	5.13	5.92	(-4.78)***	3.91	5.40	(-3.80)***	4.84	5.87	(-11.19)***
0.75	0.60	(.67)	0.78	0.92	(-1.19)	1.03	1.20	(-.96)	0.96	0.81	(.61)
2.63	2.97	(-1.42)	2.64	3.59	(-5.44)***	3.34	4.75	(-4.67)***	2.91	3.41	(-2.36)**
0.30	1.31	(-18.82)***	0.48	1.18	(-8.98)***	0.31	1.08	(-9.55)***	0.26	0.95	(-27.99)***
0.09	0.11	(-.81)	0.02	0.09	(-1.62)	0.09	0.08	(.32)	0.05	0.08	(-3.06)***
2.27	0.41	(18.45)***	2.17	0.40	(23.77)***	2.80	0.08	(5.39)***	2.24	0.60	(29.36)***
37.54	48.69	(-3.93)***	38.36	53.43	(-5.87)***	44.84	58.56	(-2.45)**	40.69	50.94	(-9.56)***
44.27	33.36	(4.38)***	43.30	24.28	(7.45)***	34.52	18.64	(3.59)***	41.95	29.51	(11.75)***
16.94	8.91	(5.24)***	14.28	8.53	(10.42)***	18.24	8.39	(2.04)	14.75	8.88	(11.05)***
$24,331	$27,804	(-.98)	$35,030	$39,644	(-1.10)	$39,851	$34,294	(.98)	$35,131	$35,715	(-.35)
9.80	9.33	(2.16)**	10.56	9.50	(5.39)***	9.97	9.34	(2.45)**	10.10	9.44	(9.83)***
4.06	5.31	(-4.45)***	4.51	5.22	(-7.18)***	3.53	4.57	(-3.06)***	4.25	5.12	(-12.38)***
0.71	0.60	(.45)	0.79	0.90	(-1.04)	1.04	1.35	(-1.18)	0.90	0.84	(.31)
2.66	3.01	(-1.50)	2.62	3.68	(-6.53)***	3.45	4.77	(-3.09)***	2.84	3.45	(-3.32)***
0.37	1.23	(-12.11)***	0.52	1.56	(-12.23)***	0.24	1.17	(-11.61)***	0.29	1.00	(-26.49)***
0.14	0.19	(-.87)	0.08	0.21	(-3.81)***	0.05	0.15	(-3.29)***	0.09	0.16	(-4.09)***
1.99	0.25	(23.75)***	2.12	-0.13	(25.28)***	2.08	0.03	(14.62)***	2.07	0.40	(40.60)***
35.76	45.11	(-3.27)***	37.27	50.95	(-5.24)***	43.92	45.46	(-2.09)	40.35	48.94	(-7.88)***
44.81	35.35	(3.65)***	42.87	23.78	(7.21)***	34.34	19.35	(3.10)***	39.94	29.73	(9.27)***
16.89	8.57	(5.54)***	14.78	8.11	(9.88)***	18.31	8.12	(2.16)**	14.77	8.66	(12.12)***
$26,345	$28,981	(-.72)	$36,847	$39,930	(-.74)	$42,840	$36,337	(1.09)	$38,388	$36,888	(.90)
9.03	8.61	(2.23)**	9.47	8.81	(4.23)***	9.35	8.87	(1.82)	9.35	8.78	(8.60)***
3.65	4.66	(-4.17)***	4.04	4.70	(-7.11)***	3.25	4.09	(-2.89)**	3.86	4.59	(-11.24)***
0.70	0.62	(.40)	0.72	0.90	(-1.61)	1.20	1.21	(-.05)	1.67	0.83	(.86)
2.63	2.97	(-1.36)	2.52	3.63	(-7.30)***	3.51	4.72	(-2.52)**	3.41	3.41	(0.00)
0.28	0.64	(-4.87)***	0.41	1.29	(-12.05)***	0.30	0.91	(-6.30)***	0.25	0.69	(-17.70)***
0.00	0.02	(-1.80)	0.04	0.04	(-.03)	0.03	0.03	(.29)	0.04	0.03	(.85)
1.95	0.56	(20.12)***	1.96	-0.14	(26.94)***	2.05	0.11	(13.84)***	2.10	0.51	(11.56)***
36.61	45.25	(-2.77)***	35.52	49.56	(-5.22)***	45.60	55.49	(-1.70)	42.02	49.55	(-6.27)***
44.34	37.67	(2.11)**	45.45	27.79	(6.21)***	35.91	22.78	(3.33)***	39.92	31.68	(7.39)***
17.61	8.81	(5.69)***	14.61	8.04	(10.01)***	19.24	8.35	(2.13)**	15.53	8.81	(10.45)***
$27,038	$29,767	(-.73)	$39,661	$39,823	(-.04)	$45,566	$36,664	(1.48)	$40,799	$37,482	(1.81)