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When Will the United States Grow Out of Its Foreign Debt?
John K. Hill
Economic Review
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The correlation between changes in the nation's total supply of money and subsequent changes in real output has led some people to infer that policymakers, by changing the money supply, can stimulate or moderate the nation's real output.

Scott Freeman argues that this conclusion may be inappropriate. Freeman distinguishes inside money, the money created by banks through their lending, from outside money, the money the Federal Reserve prints. He shows that anticipatory increases in bank lending may account for the rise in the money supply that often precedes an expansion in real output. Under this interpretation, increases in the money supply that are due to Federal Reserve action result in higher prices, with no increase in real output. Thus, the existence of a correlation between money and output does not necessarily imply that Fed-engineered increases in the money supply have real effects.

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Following the failures of depository institutions in the 1980s, many analysts concluded that the rapid growth of lending activity and the deterioration of loan quality were related. Robert T. Clair tests this relationship after separating loan growth by its source: increased lending to new or existing customers, bank mergers, and acquisitions of failed banks. The preliminary evidence suggests that additional lending to new or existing customers beyond what might be normal at a given stage of the business cycle lowers loan quality after a three-year lag. This relationship, based on evidence from Texas banks, was especially strong at banks with below-average capitalization.

Not all loan growth, however, will lead to lower loan quality. Loan growth during an economic expansion is to be expected as loan demand increases. Furthermore, well-capitalized banks were able to grow very rapidly and maintain loan quality.

(Continued on the next page)
One method of increasing loan lending while maintaining loan quality was through the purchase of failed banks with the assistance of the Federal Deposit Insurance Corporation (FDIC). Of course, these purchases increased lending only for the acquiring banks and did not reflect an increase in total lending for the banking industry. Furthermore, it is possible that FDIC resolution procedures have discouraged the acquisition of weak but still solvent banks by stronger banks and are thereby slowing the rate of needed consolidation in the banking industry.

In a 1989 article in this Review, John K. Hill argued that the mere aging of the baby boom generation would cause the United States to become a major capital exporter by the end of the century. To reach that conclusion, he assumed that rising U.S. capital outflows could be absorbed by the rest of the world without a decline in interest rates. In this article, he considers the reasonableness of that assumption and reevaluates the accuracy of his earlier projections.

Hill first examines the demographics of other major countries to see if they could support a rapid turnaround in the U.S. capital account. The results are decidedly negative. An analysis of capital flows based on demographic conditions in the United States, Japan, Germany, and the United Kingdom suggests that the United States could remain a net capital exporter throughout this decade and into the early part of the next century. Despite these findings, Hill continues to support his earlier projections. He argues that new capital demands made by former Communist and developing countries will support interest rates and help to raise the international investment positions of all industrialized countries, including the United States.
Money and Output: Correlation or Causality?

A puzzle

At the center of monetary economics is a puzzling observation: innovations (unexpected surges) in the nation’s total supply of money are historically correlated with innovations in real output. Standard monetary economics can easily explain why an increase in the number of dollars will increase the prices of goods and thus nominal output, the dollar value of the economy’s production.

But why should the number of nearly fictitious items called dollars be linked to the amount of real goods produced by workers and machines? Can dollars make workers more intelligent or reduce the breakdown of machinery?

The question is of interest to policymakers as well as academics. The Federal Reserve System has a great deal of control over the money supply of the United States. If changes in the money supply truly cause changes in real output, the Fed can stimulate (or hold back) the nation’s real production by manipulating the money supply. A moderation of the business cycle might then be within the powers of the Federal Reserve. If, instead, changes in the money supply have no effect on real output, then efforts to stimulate the economy through money supply increases will result only in inflation.

That changes in the money supply cause the changes in real output is only one way to interpret the observed correlation between the two. It might also be that the output changes cause the money supply to change or that both the money supply and output are reacting to innovations in some third factor. This last possibility is the focus of this article.

Friedman and Schwartz in their historical studies (1963a and 1963b) brought the positive correlation between the money supply and real output to the attention of the profession. Positive innovations in the total stock of money were found to occur during expansions in real economic activity and negative innovations during recessions. In addition, Sims (1972) found that the innovations in the money stock preceded the innovations in output. Past innovations in output were of no help in predicting changes in the money stock, but past innovations in the money stock could help predict changes in output. This finding led some in the profession to believe that the money stock innovations caused the output innovations.

However, the usefulness of the money/output correlation as a guide for monetary policy is challenged by the observation that while innovations in the total money stock are strongly correlated with output, innovations in the monetary base—the money distributed by the Federal Reserve—are not. Cagan (1965), Sims (1972), and King and Plosser (1984) all find that innovations in output are more strongly linked to innovations in inside money—that part of the money stock

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1 When interest rates were included in the studies with money and output, it was found by Sims (1960) and by Litterman and Weiss (1985) that their innovations, not those of money, helped predict output. Stock and Watson (1989) find that detrending the money data restores much of the predictive content of monetary data. See Stock and Watson for a summary of recent investigations into the money/output correlation.

2 In opposition to this belief, Tobin (1970) argued that the precedence of the changes in money did not imply that money changes caused the output changes. His reasoning, that the Federal Reserve might be forward-looking, differs from the reasoning to be presented here.
consisting of deposits at banks—than to innovations in the money issued by the Federal Reserve, or outside money. This observation is the key to the explanation of the money/output puzzle that I will now propose.

An explanation

Some definitions. To study the links between money and output, it is essential to identify carefully the components of each. First, a definition of real output is needed. In any period $t+1$, real output ($G_{t+1}$) is an increasing function $F(\ldots)$ of its inputs. For simplicity, I limit the list to the two most obvious, current labor ($L_{t+1}$) and previously created capital ($K_t$). An important but realistic assumption is that new investment in capital cannot produce goods instantly—factories take time to build. I also assume that the productivity of these inputs is subject to random shocks, which I represent with a parameter $\epsilon_{t+1}$. We can now represent real output in the following way:

$$G_{t+1} = x_{t+1} F(L_{t+1}, K_t).$$

Capital may come from two sources, direct investment by individuals ($K$) and investment financed by bank loans ($H_t$), implying

$$G_{t+1} = x_{t+1} F(L_{t+1}, \hat{K} + H_t).$$

The money supply in some period $t (MS_t)$ is defined as the total dollar value of assets readily used in making purchases—currency and liquid (checkable) deposits at banks and similar financial intermediaries,\(^3\) which can be written

$$MS_t = nominal \text{ currency} + nominal \text{ deposits}.\(^4\)$$

Currency consists solely of notes and coins issued by the Federal Reserve. Deposits are more complex; they are not simply held as cash in the vaults of banks. A fraction of deposits is held as noninterest-bearing reserves in bank vaults and at the Federal Reserve; the rest is lent to businesses and home buyers for the interest it generates. In this way, bank deposits are (partially) backed by capital, be it the investments of businesses or housing. Let us therefore call the interest-bearing assets of banks intermediated capital, capital that is invested from funds gathered by banks. This leads to the equation

$$nominal \text{ deposits} = nominal \text{ reserves} + nominal \text{ intermediated capital.}$$

Together, equations 3 and 4 imply that

$$MS_t = nominal \text{ currency} + nominal \text{ reserves} + nominal \text{ intermediated capital.}$$

By law, currency and reserves can only be held in the form of noninterest-bearing fiat money, money created by the Federal Reserve. Therefore, these two terms are combined in equation 3 to get

$$MS_t = nominal \text{ fiat money} + nominal \text{ intermediated capital} = nominal \text{ fiat money} \times (1 + \frac{nominal \text{ intermediated capital}}{nominal \text{ fiat money}}).$$

Equation 6 reveals that the total money supply equals the stock of fiat money times an expression I will refer to as the money multiplier. The money multiplier is 1 plus the ratio of intermediated capital to fiat money.\(^4\) The stock of fiat money, often called the monetary base—or high-powered money—is always known, as it is chosen by the Federal Reserve. The money multiplier then reveals the total money supply for any given value of the monetary base. Consider some examples. Suppose that people hold currency but no deposits. The money multiplier is then simply 1, implying that the total money supply is simply the supply of fiat money, all of it used as currency.
As the use of deposits expands, there is now some money backed by intermediated capital in addition to the money backed by the monetary base, so that for any given level of the monetary base, there is more total money.

Let me introduce some notation to make equation 6 more readable and useful. Let $M_i$ denote the nominal stock of fiat money, the monetary base, and let $Q_i$ denote the real demand for fiat money, the number of goods that people will give up to get the fiat money balances they desire. Recall that $H_i$ denotes the real stock of intermediated capital. A nominal value of a variable is the product of the price level ($p_i$)—an average of the prices of goods—and its real value, the goods that can be purchased by the nominal value. This implies that

$$
(7) \quad \text{nominal intermediated capital} = p_i H_i, \quad \text{and}
$$

$$
(8) \quad \text{nominal fiat money} = M_i = p_i Q_i.
$$

If one substitutes these expressions into equation 6 and divides the top and bottom of the fraction by the price level, the money multiplier is expressed in real terms, which will help link it to real output. This we do in equation 9:

$$
(9) \quad MS_i = M_i(1 + \frac{D_i H_i}{p_i Q_i}) = M_i(1 + \frac{H_i}{Q_i}).
$$

Notice that there are two possible sources of fluctuations in the total money supply—changes in the monetary base and changes in the money multiplier. Changes in the monetary base are caused by actions of the Federal Reserve. Changes in the money multiplier, however, can occur if changes occur in the ratio of intermediated capital to fiat money, a ratio affected by a private decision—how much money to hold in currency and deposits. The more people favor deposits relative to currency, the greater the money multiplier and the total money stock; that is, for each unbacked dollar of the monetary base (fiat money), there are more dollars backed by bank loans and more money in total when the ratio of deposits to currency increases.

What might influence an individual's choice of deposits or currency? It is reasonable to expect that the choice will be influenced by the person's relative costs and rates of return. Currency is generally the more convenient of the two, at least for small transactions; it takes less time and effort to use than checks drawn on bank deposits.

Deposits, however, offer interest and thus a better rate of return. Most of us hold both deposits and currency, balancing their relative costs and returns. It follows that if the costs of one relative to the other increase, less will be held of that form of money. Similarly, if the rate of return of one should rise, more of that form of money will be held.

Banks also face a choice of how to allocate the deposits they receive between interest-bearing assets and reserves. Reserves, whether held as vault cash or as deposits with the Federal Reserve, represent funds that banks can use to make payments at little cost, but they pay no interest. Therefore, the higher the rate of return available to banks, the less banks will want to keep in reserves and the more they will want to invest in interest-bearing assets. In recent decades of high interest rates, banks have tended to hold as reserves only the minimum required by the Federal Reserve. In earlier decades, when interest rates were lower, notably during the Great Depression, banks often held more reserves than required.

**The money/output correlation.** The empirical studies of Cagan and the others listed above found that changes in output are correlated with changes in the money multiplier. Let us examine an example of how this correlation might come about.\(^6\)

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\(^6\) While most of us may not pay much attention to the currency balances we hold, this decision is not trivial for those handling large amounts of currency on which the foregone interest may be substantial.

\(^6\) The explanation of the money/output correlation presented here is taken from Freeman and Huffman (1991), which drew on ideas from Sargent and Wallace (1982) and Freeman (1986). The example presented is only one of many possible causes of a money/output correlation. It is presented as an illustration, not as an assertion that it is the only possible cause. See Tobin (1970) and McCallum (1983) for alternative explanations.
Suppose some random event\(^7\) leads people to believe that capital will be less productive (and thus offer to pay a lower rate of return) in the next period. A likely reaction of investors will be to invest less in the current period. Not only will direct investment \((\hat{K})\) fall, but so will investment financed through bank loans \((H)\). The effect on real output is clear: it will fall in the next period as the result of both the lower productivity of capital and the lower investment. In addition, the flow of savings from investment to other assets will drive down the real interest rate of all assets.

What is the effect on the money supply, \(MS_t = M_t(1 + \frac{H_t}{Q_t})\)? The low return on capital does nothing to change the monetary base, \(M_t\), but what about the money multiplier, \((1 + \frac{H_t}{Q_t})\)? Faced with a reduction in the loans they can make \((H_t)\), banks must either hold more reserves or accept fewer deposits by lowering the rate of return offered on deposits, thereby encouraging people to use more currency. The demand for fiat money \((Q_t)\) is therefore increased through some combination of an increased demand for reserves and for currency. As we saw above, a decrease in the ratio of bank loans to fiat money represents a decrease in the money multiplier, \((1 + \frac{H_t}{Q_t})\) and thus a decrease in the total money supply \((MS_t)\).

Finally, what is the effect on the price level, \(p_t\)? The price level can be determined from equation 8, which tells us that the nominal stock of fiat money must equal its demand in nominal terms:

\[
M_t = p_t Q_t
\]

(10)

or \(p_t = \frac{M_t}{Q_t}\).

The increased demand (increase in \(Q_t\)) for an unchanged stock of fiat money will raise the value of the money; that is, it will lower the price level. These effects are summarized in Figure 1.

The pattern predicted by this analysis fits the data puzzled over in the introduction. Changes in the total nominal money stock are correlated with changes in real output. Moreover, the two move in the same direction, with the change in money preceding the change in output. While I chose only one particular shock to serve as an illustration, the money/output correlation is far more general. Look again at the equations defining output and the money stock:

\[
(2) \quad GNP_{t+1} = x_{t+1} F(L_{t+1}, \hat{K}_t + H_t), \quad \text{and}
\]

\[
(9) \quad MS_t = M_t(1 + \frac{H_t}{Q_t}).
\]

Equations 2 and 9 reveal that both output and the money stock are increasing functions of \(H_t\), which represents bank loans or intermediated capital. Whatever causes bank loans to increase results in an increase in the money supply and, with a delay, in real output (other things being equal).

Active monetary policy. The Federal Reserve has considerable control over the total money supply. Given the observed positive correlation between money and output, can the Federal Reserve stimulate the economy by expanding the stock of money?

Let's try this out. The most direct way to increase the money stock is to print more fiat money. Suppose, therefore, that in some period \(t\), the monetary authority doubles the stock of fiat money, distributing the new money to people in proportion to their holdings of money so that no income is redistributed. Will this bring about a change in real output? No. This is a purely nominal change, a change in units. Prices will double, but no real decision will be affected. People will choose to hold the same real value of deposits, capital, reserves, and currency as before because no rate of return is changed by this one-time expansion of the number of dollars. In particular, the nominal change will not induce any change in real investment plans or real output.

A policy of printing fiat money whenever inside money contracts can stabilize the total money supply and the price level but not real output.

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\(^7\) Examples include such diverse events as political or military threats to oil supplies, summer droughts affecting the fall harvest, technological changes, or even unfounded fears of investors, as emphasized in the Keynesian tradition.
Figure 1
The Model's Chain of Causes and Effects

![Diagram](image)

Green pieces of paper cannot substitute for the real capital that banking provides.  

**Lessons**

The above analysis (or “model”) is of interest not simply because it explains the money/output correlation. Any clever economist can come up with a model to explain some single fact. This particular explanation is especially intriguing because it not only explains the money/output correlation but in so doing explains a phenomenon not generally addressed by traditional models of money—that inside money is more tightly linked to output than is the money distributed by the Federal Reserve.

I cannot claim, however, that this simple model represents absolute truth or captures every complexity of the behavior of money and output. Nevertheless, this model illustrates two ways in which the monetary economists and policymakers may have been misled by the observed money/output correlation. First, the model illustrates why a correlation observed between two variables does not imply that one caused the other. Second, it shows how measures of money may mislead the analysis of monetary policy by lumping together two very different types of money. Let us examine these in turn.

**Correlation or causality?** Although money may be historically correlated with real output, we see from the illustration above that this does not imply that the changes in the money supply cause the changes in output. In the example studied, when money and output both fall, both are reacting to the anticipated decline in the productivity of capital. As investors anticipate a reduction in the return from capital, both direct and intermediated investment fall, which reduces output. The reduction in intermediated investment (bank loans) implies a reduction in the money multiplier and the total money stock. The money stock reacts first because a switch to currency and reserves can be accomplished instantaneously, while a reduction in investment will take a period to reduce output because of the delay between the act of investment and the output it produces.

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An interesting feature of the model in Freeman and Huffman (1991) and the related model of Lacker (1988) is that anticipated future inflation can stimulate output by inducing people to switch from currency to deposits. The effect is a small one, however, since currency holdings are small relative to the nation’s capital stock.
(In many ways this is similar to stock market drops that occur before recessions. The stock market can respond instantly to a drop in anticipated profits, but it takes time for the related drop in investment to show up as a drop in output.)

This example demonstrates a common pitfall in econometric work involving the total money supply. The money supply is an endogenous variable: it reacts to other changes in the economy. Therefore, observed correlations between money and some other endogenous variable (such as output or interest rates) may result from the reactions of both to some economic event. The observed correlation and even precedence of money innovations to output innovations in no way implies that money innovations cause the output innovations.

It is easy to understand that statistical evidence that any two variables move together does not prove that changes in either one cause the changes in the other; a third variable could be the source of both changes. The simple intuition underlying this example is that even evidence that one of the variables changes first does not prove that the first one to change causes the change in the other. It may again be a third factor that causes the other changes, but one variable reacts before the other. Therefore, as Cooley and LeRoy (1985) and Leamer (1985) have argued, the direction of a causal relation cannot be established by the purely statistical device of establishing which variable changes first.

The quantity theory. Finally, the example presented here warns against exclusively focusing on monetary aggregates that treat inside and outside money as if they were entirely the same. Inside money represents deposits invested through banks into capital projects. In this way there is a direct link between inside money and the real economy. In contrast, outside money (the monetary base, or fiat money created by the Federal Reserve) represents merely unbacked pieces of paper with no direct link to real production. It is not surprising, therefore, that these two forms of money have very different links to output in the data.

The quantity theory of money is so named as a statement that the total quantity of money, not its composition, matters. This may be true for the provision of transaction services that money provides. However, both the data and the theory described here indicate that the links of money to real output are very different for inside and outside money. When measures of money fail to distinguish between the two, correlations between inside money and output appear only as correlations between total money and output. Observing the correlation between total money and output, the Federal Reserve quite naturally might hope that the (outside) money the Fed prints will increase output. These hopes will be disappointed if output is only related to inside money. If the money/output correlation is to be studied as a guide to monetary policy, only the links between output and Federal Reserve actions should be examined.
References


Loan Growth and Loan Quality:
Some Preliminary Evidence from Texas Banks

Following the failures of numerous depository institutions in the 1980s, many analysts drew the conclusion that there was a relationship between rapid growth of lending activity and deterioration of loan quality. The relationship between loan growth and loan quality is complex, however, and establishing the relationship between growth and quality requires examining different sources of growth and estimating the actual loan quality with commonly used quality ratios, such as nonperforming loan ratios and charge-off rates.

Preliminary evidence based on data from Texas banks indicates that loan growth through additional lending to new or existing customers (internally generated growth) initially improves measured credit quality but lowers quality after a lag. This result is completely consistent with the charge that some banks grew too quickly and were unable to maintain credit quality. The positive initial effects and the lag in the relationship between loan growth and quality deterioration suggest that early detection of decline in quality is difficult and a challenge to bank managers, directors, and examiners.

The relationship between loan growth and loan quality deterioration appears to depend on a bank's equity position. Rapidly growing banks with high levels of equity did not show evidence of a deterioration in loan quality. This result supports current programs of capital-based supervision of banks.

Loan growth through the acquisition of other banks (externally generated growth) has different effects on loan quality, depending on the type of acquisition. The acquisition of failed banks with assistance from the Federal Deposit Insurance Corporation (FDIC) typically improves credit quality. In contrast, loan growth through mergers and acquisitions of banks without any FDIC assistance typically lowers loan quality. The benefits of FDIC assistance in bank acquisition may be slowing the rate of consolidation of the banking industry by encouraging banks to delay acquisitions of troubled banks until the FDIC provides assistance.

Theoretical link between loan growth and loan quality

Logical arguments can be made relating loan growth to future loan quality. For example, a bank seeking to increase its market share might lower its underwriting standards to attract more loan customers. The underwriting standards are embodied in the nonprice terms of a loan, including collateral requirements, personal guarantees of borrowers, and loan covenants. If a bank lowers nonprice terms to attract new loan customers, then it is increasing the risk exposure of the bank by lowering loan quality.

Even if a bank attempts to maintain the same credit standards, the new borrowers it attracts may be of lower average quality as a result of adverse selection. If a bank is attempting to gain the business of borrowers that have established banking relationships, it is arguable that the lowest-quality customers will be easiest to attract. Banks

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will work hardest to keep their highest-quality borrowers. Lower-quality borrowers, on the other hand, will be bid away from their existing bank more easily. The bank attempting to grow will more likely attract lower-quality borrowers on average and, therefore, experience lower loan quality in the future.

Alternatively, a bank that fails to provide sufficient resources for credit administration during periods of rapid growth may have higher nonperforming loans in the future. If the bank pursues more rapid loan growth but fails to increase resources devoted to credit administration, the new loans may not be properly monitored over time. Close monitoring is needed to spot troubled credits early, before they grow in size. The misallocation of inputs can result in lower loan quality even if the bank has not lowered its underwriting standards.

It has been suggested that the collapse of the Bank of New England is a possible example of these problems. According to a report by the General Accounting Office, the Bank of New England more than quadrupled in size from 1985 to 1989. Bank examiners cited as problems a lack of independent loan review and out-of-date credit documentation (American Banker, September 20, 1991, p. 14). During this period, the bank made many loans that ultimately defaulted. These loan losses might have been significantly reduced if credit administration and monitoring had increased in proportion to lending.

Analyses of thrift failures suggest that some depository institutions consciously adopted high-risk, high-growth strategies after their capital positions had fallen to near or below zero. Some banks have found themselves in a similar position. If bank equity holders have little to lose because their capital has eroded, they may undertake a high-risk strategy in an effort to grow out of their troubles. In the event that the new loans default, the loss will be borne primarily by the FDIC. If these loans are repaid, the bank equity holders may reap sufficient income to recapitalize the bank. This strategy is possible only because federal deposit insurance allows the bank to raise whatever deposits are needed to fund the strategy. This is a classic example of moral hazard—that is, the provision of insurance changes the behavior of the insured (Kane 1985).

It is fully possible, however, for loan growth to have no effect on loan quality or even positive effects. During the recovery and expansion phases of a business cycle, lending increases because of strong loan demand. The strength of the economy also increases loan quality. Consequently, loan growth may be correlated with an improvement in loan quality, as nonperforming loans are likely to decline in a strong economy.

The effect of the economy on loan demand and loan quality is not limited to business cycles. Structural changes in the financial markets could also generate a positive relationship between loan growth and loan quality. For example, removing restrictions from banks that limited their ability to serve the needs of borrowers could increase loan growth at banks. At the same time, it might open access to new customers for banks that are, on average, higher-quality borrowers or that permit greater diversification.

Strong loan demand may not always result in improved loan quality. If the driving force behind strong loan demand is a speculative bubble, then the relationship between loan growth and loan quality is distorted. Stiglitz (1990) casually defines a bubble as occurring when “the reason that the price is high today is only because investors believe that the selling price will be high tomorrow—when fundamental factors do not seem to justify such a price” (p. 13). Shiller (1989) has shown evidence that speculative bubbles may exist for stocks, bonds, and residential real estate. The decade of the 1980s saw an increase in asset-based lending in both real estate and corporate loan transactions. Because repayment of asset-based loans depends primarily on the future selling price of the asset being financed, the collapse of a speculative bubble could lead to deterioration of loan quality, especially among asset-based loans, such as real estate loans and loans for corporate restructuring.

It is unclear if loan growth should be blamed for the decline in loan quality following the bursting of a speculative bubble. Certainly, if the loan growth had been more moderate, the bubble might have been smaller or might never have been formed. On the other hand, the driving force behind the bubble was the expectations of the borrowers. Furthermore, the bursting of a speculative bubble often results in an economic downturn that will
likely cause deterioration in the loan portfolios of all banks, regardless of their growth rates.

From an analytical point of view, it is difficult to separate speculative bubbles from other factors that cause business cycles. Furthermore, some economists argue that bubbles do not exist. They argue that what appears to be the bursting of a bubble is really a market reaction to new information causing the sharp decline in prices. I will not attempt to separate the effects of speculative bubbles from other movements in the business cycle.

The cyclical movements in loan demand and loan quality could result in the erroneous conclusion that loan growth and loan quality are necessarily related. Loan growth could result from strong economic growth, and loan quality could deteriorate from an economic downturn. Consequently, a business-cycle boom followed by a bust will create a pattern of loan growth followed by deteriorating loan quality. Loan growth and loan quality may appear causally related when, in fact, they are both just correlated with the business cycle driven by other forces. A statistical analysis designed to explain the changes in loan quality needs to adjust for business-cycle effects.

Of course, fraud could be a special case of loan growth being correlated with declines in loan quality. Extremely rapid loan growth was observed at many savings and loan associations before their failures. In some of these cases, criminal fraud was the driving force behind the loan growth. Ely (1990) estimated that the Federal Savings and Loan Insurance Corporation incurred losses of $5 billion from criminal fraud at insolvent thrifts, representing a small share of its total losses, estimated to be $147 billion. Low loan quality in these cases is the result of the fraudulent intent of the lenders and, in all likelihood, the borrowers also. The rapid loan growth is a possible symptom of the fraud, but it is not the cause of the poor loan quality.

**Method of loan growth**

The specific method utilized to increase the loan portfolio could have an effect on the relationship between loan growth and future loan quality. Loan growth could be generated by increasing lending to existing customers or to new customers. Alternatively, the loan portfolio could be increased by acquisition or merger. The acquisition might be a healthy bank or a failed bank with the assistance of the FDIC. Again, the impact on loan quality might be quite different, depending on the source of loan growth.

In this article, growth is separated into three categories: growth through acquisition of a failed bank with FDIC assistance, growth through an unassisted acquisition or merger, or internally generated growth. In some cases, the effect of each type of growth on loan quality can be suggested, but in other cases, it is difficult to hypothesize.

Loan growth through the acquisition of a failed bank with the assistance of the FDIC is unlikely to affect loan quality adversely. In most of these transactions, the FDIC removes the low-quality credits from the loan portfolio and agrees to take back loans that decline in quality after the acquisition is executed. In some other cases, the FDIC does not take any of the low-quality loans but, instead, provides the acquiring institution with sufficient resources to charge off the non-performing loans.

Alternatively, a bank could increase its loan portfolio through acquisition of other banks. The acquiring bank can limit its exposure to low-quality loans on the acquired bank’s books. Often, the acquired bank is required to charge off troubled credits before the acquisition is executed. In other cases, the acquired bank establishes a collecting bank to hold the troubled credits. The collecting bank is capitalized by the shareholders of the acquired bank to isolate the effects of the problem credits from the acquiring bank or bank holding company.

Of course, not all bank mergers can be characterized as one bank acquiring another. In

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1 For example, a Ponzi scheme is premised on rapid growth to generate sufficient cash flows to cover up the lack of investment results. Ponzi promised to double investors’ money in a short period. He then used the inflow of new deposits to give initial investors the promised doubling of funds, all the while extracting substantial management fees. Ponzi could keep the scheme going so long as the rapid growth of new investors provided sufficient cash flows to pay off the earlier investors (Kaufman 1986).
the case of a merger between equals, the loan quality of the combined bank will be the average of the loan quality of the two banks, weighted by their relative sizes. In this case, loan quality is less likely to change substantially.

The effect of internal growth on loan quality is the most difficult to predict. If a bank were to restrict itself to loan growth from the growth of existing borrower relationships, it would be limiting its growth potential to that of its borrowers. Its diversity could also be limited. Seeking out new borrowers, however, has the hazards described above, such as adverse selection.

Alternatively, internal loan growth could result from increased lending activity in the loan participation market. A bank might be able to increase loans outstanding without lowering its underwriting standards. Furthermore, the loan participation market could offer a bank the ability to diversify its loan portfolio across geographic regions and across industries in a manner that lowers overall credit risk. If, however, the loan participation market is driven by loans to finance a speculative bubble, then using the vehicle for loan growth could lead to lower loan quality in the future. Many of the highly leveraged transactions of the 1980s that are now in default or are being renegotiated were financed by large pools of banks.

**Measuring loan quality**

The analysis utilizes two standard measures of loan quality: the ratio of charge-offs to total loans and the ratio of nonperforming loans to total loans. These measures are proxies for the actual probability of a loan defaulting. A charge-off is the amount of a loan that a bank determines is unlikely to be repaid and counts as a loss. Nonperforming loans are defined as loans that are 90 days or more past due or have nonaccrual status.

Two measures gauging different stages of loan quality deterioration were used because any single measure may be inadequate in determining loan quality. Banks have some discretion to shift problem loans from the first stage to the second stage. In the first stage of deteriorating loan quality, loans become nonperforming—the borrowers fail to make timely payment of interest and principal. If the loan appears unlikely to be repaid in full, then in a second stage of deterioration, the loan or a portion of the loan is charged off. A bank can lower its nonperforming loan ratio by charging off more of its nonperforming loans. Consequently, both the charge-off rate and the nonperforming loan ratio were used to assess loan quality.

These financial ratios, however, can be distorted by growth if there are lagged relationships between financial variables. As a result, the ratios are imperfect proxies for the actual probability of a loan defaulting. Loans are rarely charged off in their first year. It is far more likely for a loan to default and be charged off long after the loan was first extended. Consequently, there is a lagged relationship between the measure of loan quality and total loans.

These loan quality measures do not adjust for the lag in the relationship between extending loans and loans defaulting. Consider the charge-off rate, for example; it is the ratio of charged-off loans, which are loans extended in previous years that are only now being recognized as a loss, to total current loans, which include loans that were made only recently and, therefore, are unlikely to have defaulted as yet. Essentially, the rate measures yesterday’s mistakes relative to today’s base. Consequently, growth in total loans can distort this ratio. If, as stated above, today’s base is growing, yesterday’s mistakes appear smaller in comparison with the current base. Loan growth would lower the charge-off rate for as long as the growth could be maintained, and the charge-off rate would be lower than the actual probability of default.

A numerical example can illuminate this point and is presented in Table 1. Suppose Bank A starts with $100 of loans and its growth rate is 1 percent per year; the probability of a loan loss is only 0.01. Assume that all loans have a three-year maturity and uncollectible loans are charged off in the third year. In the case of Bank A, its charge-off rate would become stable at 1 percent, exactly equal to the probability of loan loss. Suppose

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This argument is based on the notion that the elasticity of the supply of loans in the participation market is very high and a large amount of loans can be added to the bank’s books without reducing its underwriting standards.

Federal Reserve Bank of Dallas
Bank B is identical to Bank A except it grows at a 10-percent annual rate; then its charge-off rate would stabilize at 0.77 percent. Bank B can maintain this lower charge-off rate as long as it can maintain the 10-percent growth rate.

This article addresses the question of whether the default rate changes in response to rapid loan growth. A comparison of two more simulations shows the distinction of the difference. Suppose both Bank C and Bank D experience a temporary increase in the growth rate of loans from 10-percent growth to 20-percent growth in the eighth period before returning to a steady 10-percent growth rate. In the case of Bank C, assume the probability of a loan defaulting remains constant at 0.01, while in the case of Bank D, assume the probability of default rises from 0.01 to 0.02 for the period of high growth and returns to 0.01 after the high growth. In Bank C's case, the charge-off rate will temporarily fall from 0.77 percent to 0.70 percent and then return to 0.77 percent. In Bank D's case, the charge-off rate declines initially to 0.70 percent, as in the case of Bank C, but then it rises sharply in the third period after the growth to 1.53 percent when the lagged effects of extending credit to riskier borrowers are realized.

Because of this lagged relationship, sustained rapid growth can mask changes in the probability of default by driving the charge-off rate in the opposite direction. For example, more rapid growth could drive the probability of default up only a small percentage relative to the percentage increase in the rate of growth. As a result, total charge-offs would rise in absolute magnitude, but charge-offs relative to total loans would fall.

Of course, maintaining rapid loan growth

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Table 1
Simulation of the Effect of Temporary Increases in Loan Growth Rates on the Measured Charge-off Rate

<table>
<thead>
<tr>
<th>Bank A</th>
<th>Bank B</th>
<th>Bank C</th>
<th>Bank D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>Loans</td>
<td>Charge-off Rate</td>
<td>Loans</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>.98</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>101</td>
<td>1.00</td>
<td>110</td>
</tr>
<tr>
<td>3</td>
<td>102</td>
<td>1.00</td>
<td>121</td>
</tr>
<tr>
<td>4</td>
<td>102</td>
<td>1.00</td>
<td>132</td>
</tr>
<tr>
<td>5</td>
<td>102</td>
<td>1.00</td>
<td>144</td>
</tr>
<tr>
<td>6</td>
<td>102</td>
<td>1.00</td>
<td>157</td>
</tr>
<tr>
<td>7</td>
<td>102</td>
<td>1.00</td>
<td>171</td>
</tr>
<tr>
<td>8</td>
<td>102</td>
<td>1.00</td>
<td>187</td>
</tr>
<tr>
<td>9</td>
<td>102</td>
<td>1.00</td>
<td>204</td>
</tr>
<tr>
<td>10</td>
<td>102</td>
<td>1.00</td>
<td>223</td>
</tr>
<tr>
<td>11</td>
<td>102</td>
<td>1.00</td>
<td>243</td>
</tr>
<tr>
<td>12</td>
<td>102</td>
<td>1.00</td>
<td>265</td>
</tr>
<tr>
<td>13</td>
<td>102</td>
<td>1.00</td>
<td>289</td>
</tr>
<tr>
<td>14</td>
<td>102</td>
<td>1.00</td>
<td>315</td>
</tr>
</tbody>
</table>

Bank A: 1-percent growth of loans and constant probability of default equal to .01.
Bank B: constant loan growth of 10 percent and constant probability of default equal to .01.
Bank C: one-time increase in growth rate from 10 percent to 20 percent in Period 8 and constant probability of default equal to .01.
Bank D: one-time increase in growth rate from 10 percent to 20 percent and one-time increase in probability of default from .01 to .02 in Period 8.
forever is impossible. Eventually, some shock to economic growth limits loan growth. In Texas, for example, these shocks were the decline in oil prices and the collapse of real estate values. When loan growth rates fall, the effects of growth on charge-off rates are reversed and magnified. A slowdown in loan growth causes the charge-off rate to rise temporarily, even though the probability of default may be unchanged.

The model

As the dependent variables, the nonperforming loan ratio and the charge-off rate were regressed on a series of independent variables that measure the effects of loan growth by method of growth, bank financial characteristics, and business conditions. To capture the dynamic relationship between loan quality, as measured by the nonperforming loan ratio and the charge-off rate, and loan growth rates, multiple lags of the loan growth rates were used in the regression to determine the relationship between loan growth and loan quality. The estimation used data from Texas banks for 1976 through 1990.

Loan growth is separated into three categories: growth through FDIC-assisted merger, growth through unassisted merger, and internal growth. Growth through FDIC-assisted merger of a failed bank is defined as the total loans transferred to the surviving bank as a percentage of the total loans at that bank at the end of the previous period. Similarly, growth through unassisted merger is defined as the total loans transferred to the surviving bank as a percentage of the total loans at that bank in the previous period. Internal growth is measured as the residual growth after growth through assisted and unassisted mergers is removed—that is, total loans in time period \( t \) less loans acquired through assisted and unassisted mergers, stated as a percentage increase over total loans in time period \( t - 1 \).

The composition of the loan portfolio may also affect loan quality. During the period under study, oil prices dropped sharply, and the commercial real estate market was devastated by overbuilding and high vacancy rates. Consequently, a bank that was heavily exposed to energy or real estate borrowers would likely have higher nonperforming loan ratios or charge-off rates than a bank whose loan portfolio was better diversified. To account for the effect of differences in loan composition on loan quality, the proportion of commercial and industrial loans to total loans and the proportion of real estate loans to total loans were included.

A bank scale variable (logarithm of total assets) was also included to capture any effects of bank size, such as minimum efficient scales of operations or important reputational effects. It is possible that large banks may be able to achieve efficient scales of workout operations that are not feasible for smaller banks. As a result, large banks may keep nonperforming loans on their books while they work out repayment schedules. Smaller banks may find it more efficient to charge off the loss. Conversely, large banks are more likely to be raising funds in the money markets, and these markets appear to respond more favorably when banks charge off troubled loans rather than carry them as nonperforming assets. Therefore, large banks, if they have sufficient reserves, may have greater incentive to charge off troubled loans to gain more favorable terms in the money markets.

Loan quality will also be a function of the current state of the economy. Business conditions are introduced into the model by including the growth rate of Texas nonagricultural employment in the regressions. Texas employment data are published by the Texas Employment Commission.

The structure of the model is as follows. The dependent variables measuring loan quality—the nonperforming loan ratio and the charge-off rate—are regressed on the following independent variables:

- **GROWTH0**: Internal loan growth
- **GROWTH1**: and three lagged values
- **GROWTH2**: 
- **GROWTH3**: 
- **GRO-MRG**: Loan growth through bank merger

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3 Measures of economic conditions at the county level, including county employment and gross taxable sales in the county, were tested but were dropped from the regressions for lack of significance.
GR1-MRG
GR2-MRG
GR3-MRG

GR0-FL
GR1-FL
GR2-FL
GR3-FL

TA
CMLRAT
RLRAT
EMPGROW
EQUITY

Loan growth through acquisition of failed banks and three lagged values
Log of total bank assets
Business loans as a percentage of total loans
Real estate loans as a percentage of total loans
Rate of Texas nonagricultural employment growth
Total equity capital as a percentage of total assets

A logit-type transformation was performed on the dependent variables because their values were limited in the range of 0 to 1.\(^4\)

It is possible that the negative relationship between loan growth and loan quality may not exist for banks growing at relatively normal rates but only for rapidly growing banks. High-growth banks were identified and tested separately from the rest of the sample to examine this hypothesis. Banks with internal loan growth rates exceeding four times the growth rate of Texas personal income were classified as high-growth banks. Banks with internal loan growth rates less than four times the income rate were classified as normal.\(^5\)

Similarly, to measure the possible effects of moral hazard on bank behavior, the sample of rapid-growth banks was split into high and low capital categories. A bank was classified as a high-capital bank if its equity capital-to-asset ratio exceeded the average for its peer group. The three peer groups used were based on total asset size: banks with less than $100 million in assets, banks with at least $100 million in assets but less than $1 billion, and banks with more than $1 billion in assets.\(^6\)

The regressions were run with annual data from the Reports of Condition and Income filed by Texas banks for 1976 through 1990. Texas personal income data were obtained from the U.S. Bureau of Economic Analysis. The regressions using the nonperforming loan ratio as the dependent variable were estimated for 1984 to 1990, the period for which data were available. The charge-off rate regressions were estimated with data for the entire period.

**Regression results**

The empirical results do provide evidence that rapid loan growth will result in a deterioration of loan quality. As expected, internal loan growth worsened measured loan quality with a lag. These empirical results support the popular notion that rapid loan growth results in low-quality loan portfolios that can lead to bank failure.

All the regressions utilizing nonperforming loan ratios and charge-off rates as the dependent variables were statistically significant. The regression results for the nonperforming loan ratio are presented in Table 2. The adjusted \(R^2\) values indicate that even in the best-fitting equation, less than 20 percent of the total variation is explained. Low \(R^2\) values, however, are common in regressions using cross-section data. The regressions for the charge-off rate are presented in Table 3 and fit the data slightly better than the nonperforming loan ratio regressions.

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\(^4\) If the dependent variable is \(X\), then the logit transformation of that variable is \(\ln(X/(1 - X))\). This procedure monotonically transforms the values of \(X\), constrained to be between 0 and 1, to range from negative to positive infinity.

\(^5\) The relationship may not be symmetric for both loan growth and loan contraction, and some formulations restricting the observations to positive loan growth were estimated. Some versions of the model were estimated with observations limited to positive internal loan growth banks only. The results were essentially the same as the estimate for the full sample.

\(^6\) Examining the moral hazard hypothesis is not the focus of this article. It is important to note that just because a bank has a capital ratio below the peer group average, the bank is not necessarily going to exhibit moral hazard behavior. To examine moral hazard behavior more fully, a sample of banks operating with little if any capital would be needed. It is possible that a sample of savings and loan associations would offer a sufficient number of observations to study the moral hazard problem.
Table 2
Regression Results for Nonperforming Loan Ratio, 1984–90

<table>
<thead>
<tr>
<th></th>
<th>All Texas Banks</th>
<th>High-Growth Banks</th>
<th>Normal-Growth Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>High-Equity</td>
<td>Low-Equity</td>
</tr>
<tr>
<td>GROWTH0</td>
<td>-0.1766***</td>
<td>-0.00574***</td>
<td>-0.00723***</td>
</tr>
<tr>
<td>GROWTH1</td>
<td>-0.00695***</td>
<td>-0.00251***</td>
<td>-0.00360*</td>
</tr>
<tr>
<td>GROWTH2</td>
<td>-0.00086*</td>
<td>-0.00072</td>
<td>-0.00238</td>
</tr>
<tr>
<td>GROWTH3</td>
<td>0.00006</td>
<td>0.00040</td>
<td>0.0045</td>
</tr>
<tr>
<td>GR0-MRG</td>
<td>0.00092</td>
<td>0.00421*</td>
<td>0.00415</td>
</tr>
<tr>
<td>GR1-MRG</td>
<td>0.00155</td>
<td>0.00090</td>
<td>0.00258</td>
</tr>
<tr>
<td>GR2-MRG</td>
<td>0.00342***</td>
<td>0.00288</td>
<td>-</td>
</tr>
<tr>
<td>GR3-MRG</td>
<td>0.00101</td>
<td>-0.00445</td>
<td>-0.00479</td>
</tr>
<tr>
<td>GR0-FL</td>
<td>-0.01383***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR1-FL</td>
<td>-0.00695***</td>
<td>-0.00233</td>
<td>-0.00453</td>
</tr>
<tr>
<td>GR2-FL</td>
<td>-0.00059</td>
<td>-0.00026</td>
<td>-0.00355</td>
</tr>
<tr>
<td>GR3-FL</td>
<td>-0.00290</td>
<td>-0.00686</td>
<td>-0.00627</td>
</tr>
<tr>
<td>TA</td>
<td>0.0592***</td>
<td>0.09393***</td>
<td>0.02410</td>
</tr>
<tr>
<td>CMLRAT</td>
<td>0.00865***</td>
<td>0.00186</td>
<td>0.00777*</td>
</tr>
<tr>
<td>RLRAT</td>
<td>0.00985***</td>
<td>0.00278</td>
<td>0.00837**</td>
</tr>
<tr>
<td>EMPGROW</td>
<td>0.00513</td>
<td>-0.05209***</td>
<td>-0.05562***</td>
</tr>
<tr>
<td>Intercept</td>
<td>-5.08019***</td>
<td>-5.52885***</td>
<td>-5.06423***</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.1610</td>
<td>0.0625</td>
<td>0.0801</td>
</tr>
<tr>
<td>F statistic</td>
<td>143.792***</td>
<td>10.479***</td>
<td>5.750***</td>
</tr>
<tr>
<td>Observations</td>
<td>11,903</td>
<td>2,133</td>
<td>601</td>
</tr>
</tbody>
</table>

1 Banks were classified as high-growth banks if their rate of internally generated loan growth exceeded four times the growth rate of Texas personal income.
* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

As predicted, the initial effects of internal growth improved loan quality when measured by the current nonperforming loan ratio and the charge-off rate. The coefficient on the variable $GROWTH0$ is negative and significant in every regression for both the nonperforming loan ratio and the charge-off rate. The lagged effects of loan growth, however, increase the charge-off rate. In the charge-off rate regression for all Texas banks, the coefficient on $GROWTH3$ is significant and positive, indicating that in this case the lagged effect of loan growth was to raise the charge-off rate. A temporary increase in the growth rate of loans, beginning at time $t$, will cause the charge-off rate to move in the pattern depicted in Figure 1. The regression coefficients indicate the same

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7 The movement in the charge-off rate presented is based on the regression results. Because of the logit transformation, the coefficients indicate the qualitative direction of the effect but cannot be interpreted quantitatively.
Table 3

Regression Results for Loan Charge-off Rate, 1980–90

<table>
<thead>
<tr>
<th></th>
<th>All Texas Banks</th>
<th>High-Growth Banks</th>
<th>Normal-Growth Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>High-Equity</td>
<td>Low-Equity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROWTH0</td>
<td>-.01860***</td>
<td>-.00496***</td>
<td>-.00738***</td>
</tr>
<tr>
<td>GROWTH1</td>
<td>-.00640***</td>
<td>-.00348***</td>
<td>-.00669***</td>
</tr>
<tr>
<td>GROWTH2</td>
<td>.00017*</td>
<td>-.00113</td>
<td>-.00472**</td>
</tr>
<tr>
<td>GROWTH3</td>
<td>.00013**</td>
<td>-.00064**</td>
<td>-.00004</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR0-MRG</td>
<td>.00252***</td>
<td>.00474***</td>
<td>.00464**</td>
</tr>
<tr>
<td>GR1-MRG</td>
<td>.00296***</td>
<td>.00524*</td>
<td>.00421</td>
</tr>
<tr>
<td>GR2-MRG</td>
<td>.00275**</td>
<td>.00138</td>
<td></td>
</tr>
<tr>
<td>GR3-MRG</td>
<td>.00012</td>
<td>-.01563**</td>
<td>-.01540*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR0-FL</td>
<td>-.01469***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR1-FL</td>
<td>-.00504***</td>
<td>-.00251</td>
<td>-.00495**</td>
</tr>
<tr>
<td>GR2-FL</td>
<td>.00158</td>
<td>-.01233</td>
<td>-.01198</td>
</tr>
<tr>
<td>GR3-FL</td>
<td>-.00125</td>
<td>-.01937**</td>
<td>-.01857**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA</td>
<td>-.06761***</td>
<td>-.02123</td>
<td>-.04370</td>
</tr>
<tr>
<td>CMLRAT</td>
<td>.00038</td>
<td>-.00646**</td>
<td>-.00030</td>
</tr>
<tr>
<td>RLRAT</td>
<td>.00019</td>
<td>-.00683**</td>
<td>-.00539*</td>
</tr>
<tr>
<td>EMPGROW</td>
<td>-.04209***</td>
<td>-.05284**</td>
<td>-.04841**</td>
</tr>
<tr>
<td>Intercept</td>
<td>-3.76497***</td>
<td>-4.31454***</td>
<td>-4.07762***</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.1837</td>
<td>.0995</td>
<td>.1197</td>
</tr>
<tr>
<td>F statistic</td>
<td>182.432***</td>
<td>16.634***</td>
<td>8.328***</td>
</tr>
<tr>
<td>Observations</td>
<td>12,902</td>
<td>2,123</td>
<td>594</td>
</tr>
</tbody>
</table>

1. Banks were classified as high-growth banks if their rate of internally generated loan growth exceeded four times the growth rate of Texas personal income.

* Significant at the .10 level.

** Significant at the .05 level.

*** Significant at the .01 level.

The pattern of improvement followed by deterioration that is presented in the simulation of the fictional Bank D.

The empirical results also indicate that a sustained increase in the growth rate of lending could create the appearance that credit quality has improved. If the internal loan growth rate rises and remains at a new higher level, the effect on the charge-off rate would be the sum of the coefficients estimated for the internal growth rate variable and its lagged values. The hypothesis that the sum of the coefficients is equal to zero was tested with an $F$ test and rejected, indicating that a steady-state increase in the growth rate of internal lending would result in a lower measured charge-off rate. The pattern of the movement in the charge-off rate resulting from sustained growth would be much different than occurred with temporary growth. As shown in Figure 2, the charge-off rate would fall beginning at time $t$ and remain below the original charge-off rate for as long as the higher growth rate could be maintained.

There is strong evidence that growth through bank merger lowers asset quality, based on the
effect on the charge-off rate. The initial and the lagged effects of growth through bank mergers were significant and positive, indicating higher charge-off rates. The nonperforming loan ratio, however, was not initially affected by growth through merger. The lagged effect of growth through mergers raised the nonperforming loan ratio in the second year after the merger.

Growth through mergers does not generate the initial improvement effect because the acquiring bank is acquiring loans extended by the acquired bank in previous years. As a result, there is no lag between when these loans are placed on a bank’s books and when the loan might default.

Growth through the acquisition of failed banks appears to be highly successful in improving asset quality only in the short run. The initial and one-year lagged effects of growth through failed-bank acquisition were to lower both the nonperforming loan ratio and the charge-off rate. The longer lagged effects were not significantly different from zero.

Bank size appears to affect loan quality differently, depending on whether quality is measured by the nonperforming loan ratio or the charge-off rate. The positive and significant coefficients on the total assets variable (TA) indicate that larger banks had higher nonperforming loan ratios, and these banks had significantly lower charge-off rates. This result suggests that larger banks may not be as aggressive in charging off nonperforming loans as are small banks. One reason would be that large banks may have a competitive advantage in working out troubled credits and, consequently, carry such loans as nonperforming longer and charge off fewer of these loans.

The effect of loan portfolio concentrations on loan quality suggests that banks concentrated in business and real estate lending were slow to charge off nonperforming loans. Troubled real estate and business loans may be more likely to be successfully rescheduled and ultimately collected. If this is the case, these loans should be reported as nonperforming and need not be charged off.

Credit quality, when measured by the charge-off rate, moved with the business cycle, as expected. Declines in the growth rate of Texas nonagricultural employment correlated with higher charge-off rates. In the nonperforming ratio regression, however, the business-cycle variable was not significant.

The regression results are also consistent with the premise that moral hazard contributes to asset quality problems. If moral hazard were prevalent, then banks with low equity would be more likely to have pursued risky strategies. The sample of high-growth banks was split into two groups: banks with above-average equity-to-assets ratios and banks with below-average ratios. Both high-equity and low-equity banks showed the
Table 4
Regression Results for Moral Hazard Test Using the Charge-off Rate, 1980–90

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROWTH0</td>
<td>-0.01935</td>
<td>***</td>
</tr>
<tr>
<td>GROWTH1</td>
<td>-0.00667</td>
<td>***</td>
</tr>
<tr>
<td>GROWTH2</td>
<td>0.00110</td>
<td></td>
</tr>
<tr>
<td>GROWTH3</td>
<td>0.000813</td>
<td>***</td>
</tr>
<tr>
<td>EQUITY</td>
<td>-1.756713</td>
<td>***</td>
</tr>
<tr>
<td>GROWTH0 x EQUITY</td>
<td>0.04849</td>
<td>***</td>
</tr>
<tr>
<td>GROWTH1 x EQUITY</td>
<td>0.00010</td>
<td></td>
</tr>
<tr>
<td>GROWTH2 x EQUITY</td>
<td>-0.002458</td>
<td>**</td>
</tr>
<tr>
<td>GROWTH3 x EQUITY</td>
<td>-0.000793</td>
<td>***</td>
</tr>
<tr>
<td>GR0-MRG</td>
<td>0.003305</td>
<td>***</td>
</tr>
<tr>
<td>GR1-MRG</td>
<td>0.001811</td>
<td>***</td>
</tr>
<tr>
<td>GR2-MRG</td>
<td>0.002248</td>
<td>***</td>
</tr>
<tr>
<td>GR3-MRG</td>
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<td></td>
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<tr>
<td>GR0-MRG x EQUITY</td>
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</tr>
<tr>
<td>GR1-MRG x EQUITY</td>
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<td></td>
</tr>
<tr>
<td>GR2-MRG x EQUITY</td>
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<td></td>
</tr>
<tr>
<td>GR3-MRG x EQUITY</td>
<td>0.003831</td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

NOTE: EQUITY = 1 for above-average equity banks and 0 for below-average equity banks.

The same initial effect of improvement in the charge-off rate. The charge-off rate at the low-equity banks rose with a lag effect. At the high-equity banks, however, there was no significant effect that raised the charge-off rate.

An additional test of the moral hazard hypothesis also shows evidence of this behavior. A binary variable was defined as equal to 1 for above-average equity banks and 0 for the below-average equity banks for the total sample. In the new regression, the dependent variable—the charge-off rate—was regressed against the independent variables from the previous regressions and the product of the binary variable with the current and lagged values of the growth rate variables. The results of this estimation are presented in Tables 4 and 5. The initial effect significantly lowered the charge-off rate at both the high-equity banks and the low-equity banks. The lagged effect, however, significantly increased the charge-off rate for the low-equity banks. At high-equity banks, the longest lagged effect was insignificant. This result further supports the moral hazard hypothesis. If a bank has a large amount of its own equity exposed to risk, it is careful not to lower its credit standards, even during periods of strong growth.

Policy implications and conclusions

The evidence from Texas banks presented here indicates that a statistically significant relationship exists between loan growth and loan charge-off rates after a lag. These empirical results are in agreement with specific examples of rapidly growing banks that experienced declines in loan quality and eventually failed. Even after allowance for business-cycle effects and bank financial structure, the systematic relationship between loan growth and deteriorating loan quality held among Texas banks during the 1980s.
Table 5
Effect of Loan Growth on Charge-off Rates, 1980–90

<table>
<thead>
<tr>
<th></th>
<th>High-Equity Banks</th>
<th>Low-Equity Banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period 1</td>
<td>- ***</td>
<td>- ***</td>
</tr>
<tr>
<td>Period 2</td>
<td>- ***</td>
<td>- ***</td>
</tr>
<tr>
<td>Period 3</td>
<td>- ***</td>
<td>n.s.</td>
</tr>
<tr>
<td>Period 4</td>
<td>n.s.</td>
<td>+ ***</td>
</tr>
</tbody>
</table>

1 The effect of loan growth on high-equity banks is determined by adding the coefficient from the GROWTH variable and the coefficient from the cross product of GROWTH and EQUITY. An F test is used to determine if the sum is significantly different from zero.

*** Significant at the .01 level.

n.s.—Not significant.

Of course, it would be an overgeneralization to state that any increase in the loan growth rate will lead to higher charge-off rates. Loan growth during an economic expansion is to be expected as loan demand increases. Furthermore, the evidence indicates that this relationship may not hold for banks with above-average equity–asset ratios. Therefore, as stated above, increases in loan growth rates are only a signal of possible declines in loan quality, and such declines will not necessarily occur in every case.

The relationship between growth and quality places an additional burden on bank officers and directors to manage growth carefully. The usual measures of loan quality are distorted when growth rates change. Managers and directors need to adjust for these distortions and explore new methods to measure and control risk. Furthermore, determining the source of the loan growth is especially important in assessing risk. A growing economy, a speculative bubble, a shift in market share, or a perpetuation of fraud can all generate loan growth, but the results are quite different. Finally, the resources devoted to marketing and credit administration need to be carefully balanced to prevent even good loans from becoming troubled assets.

Because the preliminary evidence suggests that loan growth is a determinant of loan quality, bank examiners could use this information to be more effective in the examination process. Growth may be one factor among several to consider when scheduling the frequency of examinations. Furthermore, growth may be a red flag that indicates which areas of a bank’s portfolio are most in need of examination for credit quality issues.

The different approaches to generating loan growth had different effects on loan quality. As shown above, expanding the loan portfolio through increased lending to new or existing customers tends to improve the charge-off rate initially, but eventually it has a negative effect. Growth through the acquisition of failed banks with FDIC assistance tends to improve loan quality, measured by either nonperforming loan ratios or charge-off rates. Growth through mergers with other banks lowers loan quality when measured by the charge-off rate, but its effect on the non-performing ratio is less certain. If a bank wishes to grow and to improve loan quality, growth through the acquisition of failed banks appears to be superior to growth through merger. Of course, this result is based on Texas banking data for a period of rapid bank growth followed by numerous bank failures.

The cause of this difference between bank merger and failed-bank acquisition is likely to be the assistance given by the FDIC to the acquirer of a failed bank. Typically, the FDIC is liberal in removing low-quality assets from the books of failed banks or in allowing the acquiring bank to return low-quality assets to the FDIC after the
acquisition. If bankers are averse to risk, the credit quality certainty provided by the FDIC would be considered highly valuable.

These results suggest that there may be a bias toward banking consolidation to take place through the acquisition of failed banks, rather than through mergers of solvent banks. Even after an acquiring bank has decided on an acquisition target, it may delay the acquisition if, in its assessment, the target bank is likely to fail and can be acquired with the FDIC removing the troubled loans from the current loan portfolio. The acquiring bank will trade off the benefits of current acquisition with the benefit of greater credit quality certainty in the future with an FDIC assistance package. Of course, the acquiring bank also takes the risk of possibly not submitting the winning bid to the FDIC.

Such a bias could slow the rate of much-needed consolidation in the banking industry. The U.S. banking industry needs banking consolidation, because it offers one of the best approaches to increasing the diversity of bank portfolios and increasing the efficiency in the provision of banking services (Clair, Tucker, and Siems 1991). It is possible that the rate of consolidation may be slowed by the rate at which the FDIC can close failed banks. If FDIC resolution procedures for failed banks are slowing the rate of consolidation, these procedures need to be reexamined. The nation's interests are unlikely to be served by drawing out the process of consolidation.
References


When Will the United States Grow Out of Its Foreign Debt?

One of the most provocative developments in the U.S. economy during the 1980s was the rapid increase in net foreign claims on U.S. assets, with its counterpart in a large domestic trade deficit. To some observers, the heightened pace of foreign acquisition of U.S. assets was clear evidence of an improved investment climate and so should be regarded as a sign of strength. To others, however, the foreign capital inflows were the result of a broad-based consumption binge. By drawing down wealth to support present spending levels, U.S. residents were compromising their future living standards.

In an article in the September 1989 issue of *Economic Review*, I argued that a substantial portion of the foreign capital inflows could be explained by U.S. demographics. During the 1980s, the baby boom generation created large investment demands, yet offered little saving to finance them. This behavior was normal, given the age of the cohort, however, and so the resulting foreign capital inflows held little significance for future U.S. living standards, one way or the other. As members of the baby boom aged, saving would rise, domestic investment would drop, and the United States would switch from being an importer to a net exporter of capital. My calculations showed that projected shifts in the age distribution of U.S. households were significant enough to raise net capital outflows to 3 percent of gross national product (GNP) by the year 2010.

A principal assumption in my earlier analysis was that rising U.S. capital outflows could be absorbed by the rest of the world without a decline in interest rates. In this article, I consider the reasonableness of this assumption and re-evaluate the accuracy of my earlier projections. First, I look at the other major industrialized countries to see if their demographics would support a rapid turnaround in the U.S. capital account. The results are decidedly negative. Although the U.S. population will age significantly over the next several decades, so will the populations of other major trading nations. This coincidence in aging serves to postpone the date of improvement in the U.S. foreign investment position. A simulation of patterns of capital flow based on demographic conditions in the United States, Japan, Germany, and the United Kingdom suggests that the U.S. could remain a net importer of capital throughout the 1990s and into the early part of the next century.

This analysis probably represents an extreme among possible outcomes since other factors affecting the world capital market over the next few decades are likely to support rather than depress interest rates. I believe two to be especially important: (1) a more complete integration of developing countries into the world capital market and (2) the transformation of centrally planned economies into market economies. The United States is a young nation by the standards of the major industrialized countries, but it is old...
relative to the less-developed world. If, through internal reforms, countries such as Mexico and Argentina can gain broader participation in the world capital market, their demographics will lead them to draw capital from the United States and other developed countries.

A second factor that may significantly raise world investment demand over the next few decades is the economic liberalization of Eastern Europe and the former Soviet Union. Because of technological isolation and distorted incentive structures, a huge fraction of the capital stock in these countries is outmoded and will have to be modernized or replaced. The effects could be dramatic. In a simulated reconstruction of Eastern Europe, where the domestic capital stock is effectively doubled over the next ten years, I find that U.S. capital flows rise from −1 percent of GNP at the end of the 1980s to 1 percent of GNP by the end of the century. The consequences of a recapitalization of the former Soviet Union could be far greater.

After weighing these alternative considerations, I remain in general agreement with my earlier conclusion: with the aging of the baby boom generation, the United States is likely to become a major capital exporter by the end of this decade and throughout the early part of the next century. This course of events is not a given, however. Indeed, it is incompatible with the economic environment of the 1980s, where international capital flows were confined largely to major Organization of Economic Cooperation and Development (OECD) countries. But the capital market of the future is likely to contain many new players, especially a number of developing and newly liberalized countries. The new participants will be net borrowers of capital and so will support the turnaround in the U.S. capital account that is called for by the aging of the U.S. population.

Demographics and capital flows within OECD countries

A limitation of the analysis in my earlier paper is that the effects of U.S. demographics on U.S. capital outflows were evaluated in a vacuum, without reference to demographic conditions in other trading countries. In this section, I look simultaneously at the demography of four major industrialized countries: the United States, Japan, Germany, and the United Kingdom. These are among the largest of the developed countries, and their demographic characteristics are varied enough to be representative of all OECD countries.

The analysis here is based on numerical solutions of an overlapping generations model similar to the one I used in my earlier paper. The model is briefly described in the box titled "The Simulation Model." The simulations evaluate the effect of comparative demographics on the net external asset position of each country for each year from 1970 to 2010. Demographic differences highlighted in the model relate to historical variations in the size of successive birth cohorts. The analysis ignores any variation in life expectancy or patterns of household formation.

The results for the decade of the 1980s are very similar to those I found in my earlier work. When demographic conditions in the four countries are considered together, the United States remains a net capital importer, with a current account deficit averaging 1 percent of GNP each year throughout the decade. The dominant capital-exporting country is Japan, with annual outflows averaging 3 percent of its GNP. The United States is a net recipient of foreign capital not because its savings rate is low by international standards, but because its investment rate is relatively high. The high rate of domestic investment over this period reflects the entry of the baby boom generation into the U.S. workforce.6

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2 The data for this article refer to West Germany before unification with East Germany.

3 Interestingly, the simulations indicate that U.S. capital inflows should have been as large during the 1970s as they were during the 1980s. Official estimates, on the other hand, date the decline in U.S. net foreign assets to the early 1980s. This disparity between the simulated and measured series adds a new perspective to the debate on the origin of U.S. foreign indebtedness. Traditional analysis has emphasized the emergence of factors during the 1980s, such as the U.S. federal budget deficit, that drew foreign capital into the United States. It may be equally important, however, to look for a cessation of factors that had restrained capital inflows during the 1970s. Most important in this regard may be the dismantling of capital controls by Japan and other major countries.

Federal Reserve Bank of Dallas
The Simulation Model

The model is designed not to replicate history or to forecast, but to evaluate the partial effect of demographic conditions on world capital flows. Households have identical preferences for consumption over time and identical life-cycle patterns of labor supply. Countries produce a single good using a common technology. Simulated movements in the external asset position of a country are entirely the result of relative shifts in population age mix.

**Wealth accumulation.** Households are formed by two adults of age 21. Each member has a fixed and known life expectancy. Households accumulate wealth according to the life-cycle theory. Each maximizes a lifetime utility function containing two parameters: an elasticity of intertemporal substitution and a pure rate of time preference. Following recent literature, I set the elasticity of substitution at a low value. The utility function also contains periodic weights reflecting family needs. These weights are defined by combining age-specific consumption weights with an assumed life-cycle pattern of family size and age composition.

Households begin their lives with no wealth, and they leave no bequests. They borrow and lend at a single rate of interest on the basis of their current and future labor income. Household labor supply is exogenous but is defined to reflect age-related variations in labor force participation and worker productivity.

Figure A shows an optimal wealth profile for a given wage and interest rate. The profile has the traditional hump shape, reflecting a pattern of accumulation during the working years followed by a reduction in wealth during retirement. The principal limitation of the life-cycle model is that it overstates the rate at which households draw down their wealth late in life. For some countries, the share of the elderly in the domestic population changes significantly over the period of our analysis. As I will note later, however, the direction of the bias is clear, and it reinforces the conclusions of the analysis.

**Capital formation.** Each country produces a single, nondepreciating good using labor and the good itself (capital). There are no adjustment costs in capital formation. The capital stock in a country depends on its labor supply and current factor prices.

(Continued on the next page)
The Simulation Model—Continued

All types of labor are perfect substitutes, but the efficiency of an individual's labor varies with age. The assumed effects of age on male productivity are based on studies of age-earnings profiles of U.S. men with college experience. Earnings for female workers are assumed to be independent of age and 1.3 times the earnings of an entry-level male worker.

Each household generates a demand for capital that is proportional to its labor supply. Figure A shows the relationship between age and required capital for a given wage and interest rate. The shape of the profile during the first half of the life cycle reflects gains in the productivity of the male worker and changes in the rate of female labor force participation associated with child rearing. Effective household labor supply peaks when adults are in their early forties. After that, labor supply begins to decline—slowly at first, tracking the decline in worker productivity, and then more rapidly as labor force participation falls.

**Equilibrium.** The real interest rate adjusts to ensure that aggregate wealth at the beginning of a year is just sufficient to finance aggregate capital requirements for that year. The net foreign asset position of a country is determined by the relative age mix of its population. Individual household wealth, \( w \), depends on age, \( a \), and the interest rate, \( r \), but not on country of origin. The implied capital requirement of a household, \( k \), is also independent of its country of origin, varying only with age and the rate of interest. In equilibrium, therefore, net foreign assets per household in a given country can be written as

\[
NFA = \sum_a [p(a) - p^*(a)][w(a,r) - k(a,r)],
\]

where \( p(a) \) is the fraction of the country's household population of age \( a \) and \( p^*(a) \) is the corresponding fraction for the world. Differences in age mix provide the only basis for international exchange. The net external asset position of an individual household rises monotonically with age. Thus, countries with young populations become net international debtors. Their net foreign asset positions increase as they age relative to the rest of the world.

**Demographic data.** The model requires information on the number of households living in each country during the period 1970–2010. To measure the households formed in a given country in year \( t \), I divide by 2 the number of individuals who were of age 37 (the median age of the statistical age bracket 35–39) and residing in the country during year \( (t+1) \). Individuals are counted in their late thirties as a crude adjustment for immigration. Population projections are drawn from official sources. Because the period of analysis ends with the year 2010, relevant birth rates are known, leaving immigration as the major source of uncertainty in the projections.
Table 1

<table>
<thead>
<tr>
<th>Macroeconomic Aggregate</th>
<th>Average of Annual Rates (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant World Interest Ratea</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>(3.9)</td>
</tr>
<tr>
<td>Saving/GNP</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>(2.5)</td>
</tr>
<tr>
<td>Capital Outflow/GNP</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(1.4)</td>
</tr>
<tr>
<td>Declining World Interest Rateb</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>(3.9)</td>
</tr>
<tr>
<td>Saving/GNP</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>(3.9)</td>
</tr>
<tr>
<td>Capital Outflow/GNP</td>
<td>-1.4</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
</tr>
</tbody>
</table>

NOTE: Figures in parentheses are macro aggregates for a collective group consisting of the United States, Japan, the former West Germany, and the United Kingdom.

aInterest rate held constant at its market-clearing value in 1989.
bInterest rate adjusted each year so that capital flows among the four major countries net to zero.

Projected capital flows for the next two decades differ greatly, depending on whether interest rates are assumed constant or are adjusted until flows among the four major countries net to zero. The two cases are contrasted in Table 1 and Figures 1A and 1B. With a constant interest rate, demographic shifts within the U.S. population produce over the period 1990–2009 a 2-percentage-point rise in the savings rate and a 2-percentage-point decline in the rate of investment, as shown in Table 1. Accordingly, U.S. capital outflows rise by 4 percentage points of GNP. This is a repetition of the dramatic projections contained in my earlier article.

At a constant interest rate, the United States would seek to reduce its external debt. But the other major countries would wish to remain capital exporters, as indicated in Figure 1B. The result is a capital glut, with aggregate wealth exceeding aggregate capital demand by more than 10 percent by 2010. Interest rates must fall to equalize capital flows among the countries. Investment spending is substantially more interest elastic than saving, so the bulk of the disequilibrium adjustment falls on investment. For the United States, the positive effect on investment from a falling interest rate offsets the negative effect of slower labor force growth. Any reduction in the rate of capital inflow

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The size of the surplus is probably understated. For Japan and Germany, the share of the population age 65 and over is projected to rise significantly throughout the 1990s and 2000s. Given that the life-cycle model overstates the rate of dissaving among the elderly, the savings overhang is likely to be even larger than my analysis suggests.
occurs because of an increase in the savings rate. U.S. net foreign assets continue to decline throughout the 1990s and on into the next century.

The basic reason for these results is as follows. The U.S. population will age significantly over the next two decades, reflecting the aging of the large baby boom cohort. By itself, this aging would produce a substantial rise in the U.S. foreign investment position. However, the populations of other major industrialized countries will also age over this period. On balance, the U.S.–world median age differential will rise only moderately. The implication is that any increase in U.S. net foreign assets will be much smaller than a partial analysis of U.S. demographic trends would suggest. The demographic forces behind this analysis are clear and decisive, so the conclusions are robust with respect to both alternative parameter values in my own analysis and alternative modeling approaches (Cutler et al., 1990, and Masson and Tryon, 1990).

**Demographics in developing countries**

One of the salient trends in the international economy in the past fifteen years has been a move toward greater integration of national capital markets, especially among OECD countries. If this trend continues, the analysis of the previous section may itself be flawed by its omission of new participants in the world capital market. Figure 2 indicates how the results of the previous analysis would change. Relative to other developed countries, the United States is a young nation. If capital flows are largely confined to developed countries, the United States will tend to be a net debtor nation. The median age of the U.S. population is high, however, in relation to the less-developed world. The difference is moderate but significant when comparing the United States with the fast-growing East Asian countries, such as Hong Kong and Singapore. The age differential is dramatic, however, in the case of Mexico and other Latin American countries. The message, then, is clear. If
the process of capital market integration continues so as to include many of the developing countries, demographic forces will serve to support interest rates and raise the international investment positions of the major industrialized countries, including the United States.

Capital demands from newly liberalized countries

Demography is not, of course, the only factor that will affect world capital flows in coming decades. Of particular recent interest are historic economic reforms in Eastern Europe. To gauge the potential significance of these reforms, I used the model to simulate the effect of an economic reconstruction of Eastern Europe. For purposes of simulation, I created a country group that, relative to the collective population of the four major industrialized countries, has an identical age mix but is only one fourth the size to reflect the relative size of the six newly liberalized countries of Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Rumania. To simulate reconstruction, I assume that the capital stock of the country group at the beginning of 1990 is only one-half as large as would be optimal, given the size of its labor force and the prevailing world interest rate. Reconstruction consists of a capital deepening that takes place at a uniform rate over a ten-year period until the year 2000, when capital-labor ratios are equalized.

The effects of the reconstruction are shown in Figure 3. A net demand for capital by East European countries serves to limit the decline in world interest rates. U.S. capital flows move from a deficit in excess of 1 percent of GNP at the end of the 1980s to a surplus of nearly 1 percent of GNP by the end of the century. Without additional stimulus, the U.S. current account then falls back into deficit. By that time, however, the former Soviet Union may be in a position to host foreign investment, with potentially greater consequences for world capital flows.

Does it matter?

A principal lesson of the analysis in my earlier paper was that demographic shifts can
produce large changes in capital flows and other macroeconomic aggregates that have very little consequence for living standards. So long as households plan over their life cycle, does it really matter whether the U.S. international investment position begins to improve this year or in ten years' time? There are at least two reasons for believing that it does.

First, a world capital glut would make it more difficult for members of the U.S. baby boom to prepare for retirement, adding to whatever burden recent fiscal policy may have left them. Even more threatening, however, is the possibility of rising protectionist pressures should the U.S. trade balance remain in deficit for another ten years. In this light, recent economic reforms in Communist nations and in some Latin American nations, such as Mexico and Chile, take on added significance. Through their effect on world capital markets, these reforms may promote equity across generations of U.S. citizens and help to preserve free international commerce and exchange.
References


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Additional Information

The 1992 Southwest Conference will be in the Dallas Fed's new headquarters, just north of Woodall Rodgers Freeway at 2200 N. Pearl St. in downtown Dallas. The registration fee is $150 until October 1, 1992, and $200 after October 1, 1992. Registration materials will be mailed later this summer. To request registration materials or more information, call the Dallas Fed at (214) 922-5259.

Economic Review — Third Quarter 1992
New Dallas Fed Headquarters

In July, the Federal Reserve Bank of Dallas completed its move into a new headquarters building at 2200 N. Pearl St., Dallas, Texas. The mailing address, Station K, Dallas TX 75222, has not changed.

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