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Economic and Financial Review

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Economic and Financial Review

Beginning with this issue, two Federal Reserve Bank of Dallas publications—Economic Review *and* Financial Industry Studies—*are being merged into a single publication. Like its predecessors,* Economic and Financial Review *will take a policy-oriented approach to thought-provoking economic, banking, and financial issues. Contributors will continue to be economists and associates of the Dallas Fed's Economic Research and Financial Industry Studies departments.*

Contents

The New Budget Outlook: Policymakers Respond to the Surplus

Alan D. Viard

A variety of proposals would reduce the projected surpluses by cutting taxes or increasing federal spending.

The federal budget landscape has changed dramatically during the last six years. After a steady decline in the deficit from 1993 to 1996, a budget "surprise" unexpectedly brought the budget close to balance in 1997 and moved it into surplus in 1998 for the first time in twenty-nine years. The deficit decline and the move into surplus resulted from a combination of factors, including a surge in individual income tax receipts, slower growth of medical costs, lower interest rates, economic growth, and the 1990 and 1993 deficit-reduction laws.

These events, combined with legislation adopted in 1997, have produced a new budget outlook. If current policies are maintained, surpluses are expected to continue for twenty years, completely retiring the outstanding federal debt. However, deficits are expected to reappear after 2020 due to rising Social Security and medical spending. Of course, the magnitudes of the surpluses and subsequent deficits are subject to substantial uncertainty.

After decades of struggling to reduce deficits, policymakers now face the unfamiliar issue of how to respond to surpluses. A variety of proposals would reduce the projected surpluses by cutting taxes or increasing federal spending. President Clinton has proposed reducing the projected surpluses by 32 percent through spending increases for defense, education, and other programs, and tax cuts to fund individual savings accounts. Congress has adopted a budget resolution that envisions reducing the projected surpluses by a similar amount, primarily through tax cuts.

Reducing the surpluses would lower government saving and would require tax increases or spending cuts in the future. Under plausible assumptions, most of the proposed tax cuts and spending increases would reduce national saving because private saving would not rise to fully offset the decline in government saving. As a result, the proposals would increase current consumption but would reduce future output and consumption. In particular, the proposals are likely to increase consumption by current generations and reduce consumption by future generations. An evaluation of the desirability of this shift depends on value judgments about the needs, rights, and obligations of the different generations.

Different considerations are relevant for some proposed tax cuts and spending increases. Proposals to reduce the tax burden on saving or to create tax-funded individual savings accounts might stimulate private saving, although the increase would probably still not be sufficient to

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Figure 1

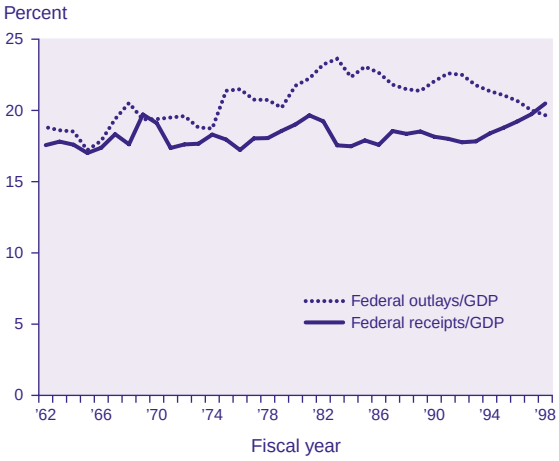
Federal Debt Burden Peaks in 1993

(Federal debt held by public/GDP)

SOURCE: Office of Management and Budget (1999, pp. 110–111).

Figure 2

Receipts Exceed Outlays in 1998



SOURCE: Office of Management and Budget (1999, pp. 21–22).

offset the decline in government saving. Compared with preserving the projected surpluses, individual accounts would have distinctive implications for personal freedom, risk allocation, administrative costs, and political viability. Increases in government investments, such as education and infrastructure, would be desirable if they corrected market failures in ways that offered higher returns than private investment.

BACKGROUND

Although this article does not offer a detailed description of historical budget policy, it is useful to review a few major trends. Figure 1 indicates that the ratio of publicly held federal debt to gross domestic product (GDP) declined from fiscal 1962 to 1974,[1] except during recessions, because deficits were sufficiently small that the debt grew more slowly than GDP. As shown in Figure 2, outlays rose sharply as a share of GDP in 1966–68, but receipts also increased due to the income surtax. The decline of the debt-to-GDP ratio was halted in 1974, and the ratio remained relatively stable until 1981. Outlays rose during this period, but receipts also increased as high inflation pushed taxpayers into higher individual income tax brackets. The ratio of debt to GDP nearly doubled from 1981 to 1993, an unprecedented rise during a peacetime expansion. By 1993 the debt equaled 50 percent of annual GDP, the highest level since 1956. Receipts declined as a share of GDP, as a result of the 1981 across-the-board income-tax-rate reduction, while outlays grew.

The debt-to-GDP ratio declined after 1993, falling to 44 percent in 1998. Figure 2 reveals that this decline was achieved by both increasing receipts and reducing outlays, as shares of GDP. In 1998, the ratio of receipts to GDP was at its highest level since 1944, and the ratio of outlays to GDP was at its lowest level since 1974.

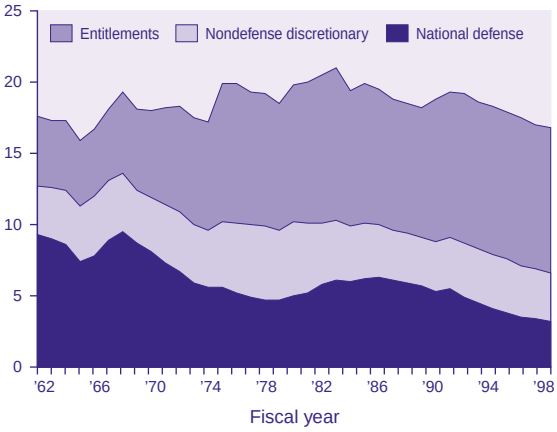
The composition of outlays has also changed dramatically. The budget laws divide noninterest spending into two categories: discretionary and entitlement programs. Discretionary programs may continue to operate only if Congress and the president approve their funding through annual appropriation bills. Half of all discretionary spending currently goes to national defense, with the rest funding a wide range of programs such as highways, law enforcement, and national parks. Entitlement programs do not require annual appropriations because Congress and the president have permanently authorized them to pay benefits to eligible individuals based on formulas set by law. These programs may operate indefinitely, unless Congress and the president change the underlying laws. Three-quarters of entitlement spending goes to Social Security, Medicare, and the federal share of Medicaid. The other quarter is devoted to a range of smaller programs, including veterans' benefits, unemployment compensation, farm subsidies, and welfare.

As shown in Figure 3, defense spending, nondefense discretionary spending, and entitlement spending have followed sharply different patterns (as shares of GDP) over the 1962–98 period. Defense spending followed a strong downward trend, from 9.3 percent to 3.2 percent of

Figure 3

Entitlement Spending Crowds Out Discretionary Spending

Percent of GDP

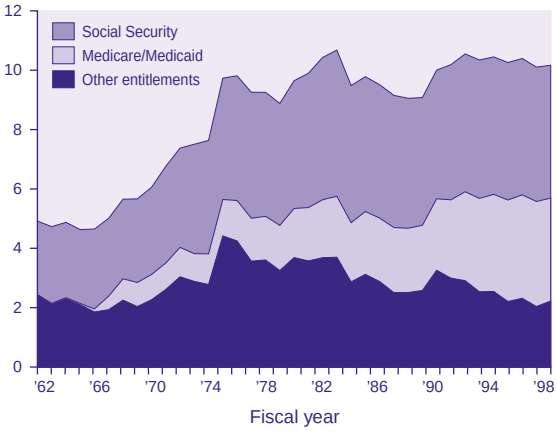


SOURCE: Office of Management and Budget (1999, p. 120).

Figure 4

Social Security and Medical Programs Dominate Entitlement Spending

Percent of GDP



SOURCE: Office of Management and Budget (1999, pp. 121–25, 169–70).

GDP, interrupted in 1966–68 during the Vietnam conflict and during the 1980–86 defense buildup; its 1998 share of GDP was the lowest since 1940. Representing 3.4 percent of GDP, nondefense discretionary spending generally rose before 1981 and fell thereafter, with little net change. As discussed below, recent deficit reduction efforts have focused on cutting defense and nondefense discretionary spending. In contrast, entitlement spending has followed a strong upward trend, from 4.9 percent to 10.2 percent of GDP.[2] As indicated in Figure 4, most of this growth has been in Social Security, Medicare, and the federal share of Medicaid.

RECENT BUDGET DEVELOPMENTS

Steady Deficit Decline, 1993–96

The unexpected move into surplus was preceded by a steady reduction in the deficit from 1993 to 1996. After peaking at $290 billion in fiscal 1992, the deficit declined to $107 billion in fiscal 1996.

A combination of economic events and policy changes precipitated this deficit decline. The continued economic expansion boosted receipts, and lower nominal interest rates reduced the government's interest expense. The conclusion of the costly savings and loan bailout also reduced outlays. One important trend, shown in Figure 5, was the slower growth of medical costs, which restrained Medicare and Medicaid spending. However, a major portion of the decline was the result of policy changes made by the 1990 and 1993 deficit-reduction laws. These laws tightened Medicare reimbursements to health care providers, increased income and excise taxes, and locked in fiscal discipline through the Budget Enforcement Act (BEA).

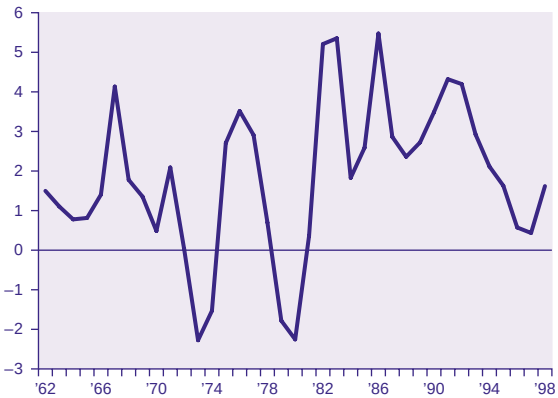
The BEA, adopted for fiscal years 1991–95 by the 1990 law and extended to 1998 by the 1993 law, imposed two important restrictions on budget policy. First, it capped nominal discretionary spending at approximately $550 billion throughout this period, reducing defense and nondefense discretionary spending as shares of GDP, as shown in Figure 3. Second, the BEA imposed a pay-as-you-go rule that prohibited changing the laws to reduce taxes without reducing entitlement spending or to increase entitlement spending without increasing taxes, although it did not require any action to offset

Figure 5

Slower Growth of Medical Costs

(Annual change, relative CPI for medical care)

Percent



SOURCE: Bureau of Labor Statistics.

the entitlement growth built into current law. The discretionary cap and the pay-as-you-go rule could be waived if Congress and the president designated a measure as an emergency.[3]

Budget Surplus Surprise, 1997–98

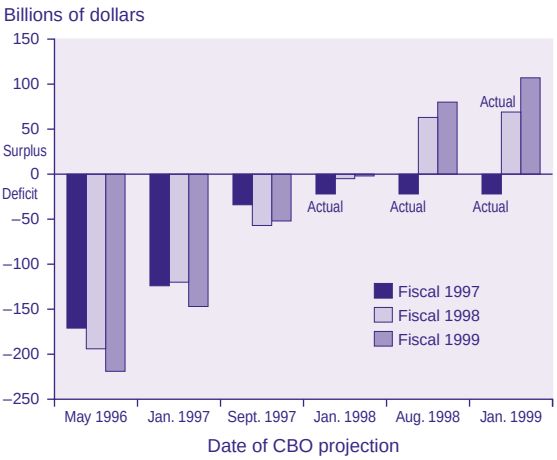
The steady deficit decline from 1993 to 1996 was followed by a surprise that moved the budget close to balance in 1997 and into surplus in 1998. To appreciate the magnitude of this budget surplus surprise, it is necessary to understand what forecasters expected in 1996.

Although the deficit had declined for four consecutive years, forecasters expected it to begin rising again. Figure 6 charts budget projections for fiscal years 1997–99 made at various dates by the Congressional Budget Office (CBO). (The projections assumed there would be no changes in tax and entitlement laws and that discretionary spending would equal the BEA cap until it expired.) In May 1996, CBO projected deficits of about $200 billion for 1997–99. Although there were no major relevant policy changes, persistent good news repeatedly forced CBO to alter its forecasts. Fiscal 1997 ended with a deficit of only $22 billion and 1998 with a surplus of $69 billion; CBO now projects a $107 billion surplus in 1999. The magnitude of these forecast deviations is unprecedented.

Analysts are still trying to fully explain the budget surplus surprise, but several factors emerge from a comparison of the actual fiscal 1998 budget outcome with the May 1996 CBO projection (*Table 1*). One-third of the forecast deviation was caused by an overestimate of outlays. Almost half of the outlay overestimate was in Medicare and Medicaid, reflecting the continued slower growth of medical costs. Interest outlays also were lower than predicted, reflecting both lower debt and lower nominal interest rates.

Two-thirds of the deviation was caused by an underestimate of receipts, primarily reflecting an unexpected surge in individual income tax receipts. Income tax receipts were boosted by strong economic growth and by several other factors, as discussed by CBO (1999b). Income from partnerships and S corporations rose sharply, and wages and salaries grew most rapidly in the highest tax brackets. One important factor was the rapid rise of net capital gains realizations, as shown in Figure 7, which largely reflected the recent stock market boom.[4] The stock market's continued strength suggests that realizations remained high in 1998, boosting fiscal 1999 receipts.

Figure 6
CBO Revises Its Budget Projections Upward

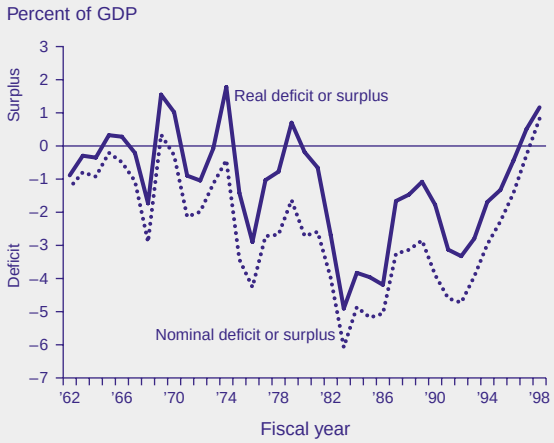


SOURCE: CBO (1996, 1997a, 1997b, 1998b, 1998c, 1999b).

Adjusting the Deficit For Inflation

The deficits and surpluses reported in this article are measured in nominal terms. Although simple, these nominal figures are inaccurate during periods of inflation. While the nominal deficit measures the change in the dollar value of government debt during the year, it is more meaningful to measure the change in the real value of government debt. For example, suppose the government has $100 debt outstanding at the beginning of the year, with a 4-percent annual interest rate. If the government collects $30 of revenue and spends $33 ($29 for programs and $4 for interest), the nominal deficit during the year is $3 and the debt is $103 at the end of the year. However, if the inflation rate during the year is 2 percent, the debt at the end of the year has about the same real value as $101 of debt at the beginning of the year. The real deficit is the increase in the real value of the debt, which is about $1.

Figure B.1
Budget Trends Largely Unchanged by Inflation Correction



SOURCES: Office of Management and Budget (1999, pp. 20, 110–11); Bureau of Economic Analysis, *National Income and Product Accounts*; author's calculations.

This real deficit can be obtained by correctly measuring the government's real interest expense. Although holders of the government debt receive 4-percent interest payments, the real value of their principal (the government's obligation) declines by 2 percent. The real return paid by the government to the bondholders is only 2 percent and the real interest payment is only $2. Recalculating spending and the deficit with this $2 interest expense yields the real deficit of $1.

Figure B.1 compares nominal deficits to real deficits for the 1962–98 period. (The inflation rate is measured by the change in the personal consumption expenditures implicit price deflator during the fiscal year, taking the deflator at the end of each fiscal year to be the geometric mean of the values for the last quarter of the fiscal year and the following quarter.) Although the levels were different, the nominal and real deficits generally followed similar patterns. The budget moved into real surplus in fiscal 1997, one year before it moved into nominal surplus. Since the trends are similar, I use the nominal figures, which are emphasized by policymakers, throughout this article.

Table 1
Fiscal 1998 Receipts, Outlays, and Surplus
(Comparison of May 1996 CBO projection and actual outcome)

	May 1996 projection	Actual outcome	Forecast deviation*
Total receipts	1,544	1,722	179
Individual income tax	694	829	135
Social insurance taxes	553	572	19
Corporate income tax	172	189	17
Other receipts	125	133	8
– Total outlays	1,737	1,653	84
Social Security	383	376	7
Medicare and Medicaid	351	312	39
Interest	257	243	14
Other outlays	746	722	24
= Budget balance	–194	69	263

* Forecast deviations that increase the surplus are listed as positive numbers.

NOTES: All numbers are billions of dollars. Details may not add to totals because of rounding. Medicare spending is gross of beneficiary premiums.

SOURCE: CBO (1996, 1999b).

THE NEW BUDGET OUTLOOK

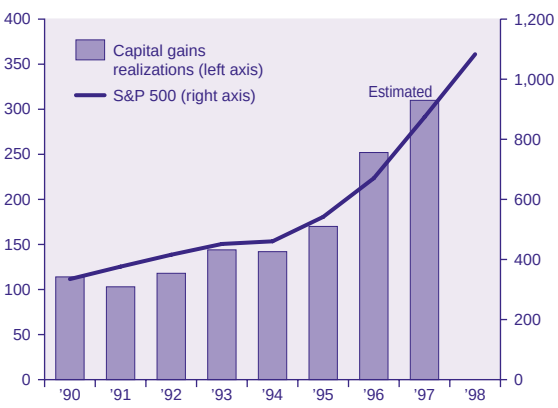
The budget surplus surprise, combined with new legislation adopted on August 5, 1997, has profoundly altered the budget outlook. In 1996, CBO's ten-year forecast projected large and growing deficits. Now, the ten-year forecast predicts large and growing surpluses, if current policies are maintained. CBO's longer term projections predict that surpluses will continue for an additional decade after 2009 but that deficits will reemerge after 2020.

As shown in Figure 8, CBO steadily altered its forecasts for fiscal 2002 and 2006, as it did for 1997–99. (The projections assumed discretionary spending would grow with inflation after the BEA cap expired.) CBO now projects a $306 billion surplus for 2006 if current policies are maintained, a stunning $709 billion change from the $403 billion deficit projected in May 1996. The predicted surplus grows to $381 billion in 2009, with the publicly held federal debt (which is reduced by each year's surplus[5]) declining from $3.77 trillion on September 30, 1997, to $1.21 trillion on September 30, 2009.

Most of the revision in the 2006 forecast reflects the continued effects of the budget surprise, but part of it reflects the August 1997 legislation. Unlike the 1998 forecast deviation, most of the change takes the form of lower outlays rather than increased receipts (*Table 2*).

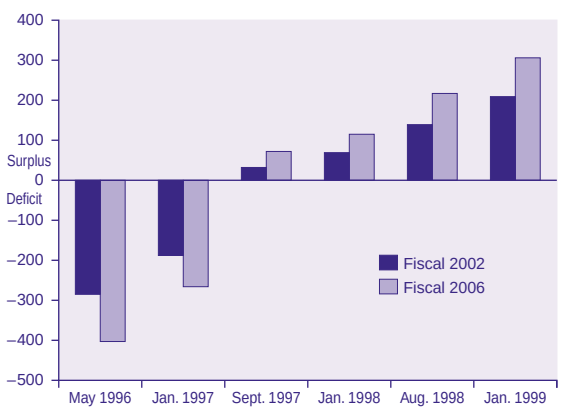
One-third of the improvement is attributable to lower interest expense, primarily reflecting the dramatically lower path of federal debt (the September 30, 2006, debt is now projected to be $2.53 trillion rather than the $6.75 trillion projected in 1996). One-sixth of the improvement is due to the 1997 legislation. This legislation extended the BEA (both the $550 billion discretionary cap and the pay-as-you-go rule) through 2002, tightened Medicare reimbursements and increased beneficiary premiums, and increased tobacco and airline taxes, although it reduced income taxes for parents, investors, and students. CBO (1997b) credits the legislation with reducing the 2006 deficit by $118 billion: $60 billion in savings from the discretionary cap extension, $72 billion in Medicare savings, and $20 billion in interest savings, offset by a $34 billion net revenue loss. Medicare and Medicaid

Figure 7
Capital Gains Realizations Surge During Stock Market Boom



SOURCES: Internal Revenue Service, *Statistics of Income*; author's calculations.

Figure 8
CBO Dramatically Revises Future Budget Projections



SOURCE: CBO (1996, 1997a, 1997b, 1998b, 1998c, 1999b).

spending has been revised downward and income tax receipts have been revised upward because CBO (1999b) assumes that part, but not all, of the slower growth of medical costs and the surge in individual income tax receipts will continue.

As with any ten-year forecast, the projection of a $381 billion surplus in 2009 is subject to substantial uncertainty. CBO (1999b) estimates that a reduction of 0.1 percent in each year's real GDP growth throughout the next decade would reduce the 2009 surplus by $40 billion, whereas a permanent increase of one percentage point (100 basis points) in nominal interest rates would reduce it by $20 billion. Other sources of uncertainty include the growth of medical costs and the level of individual income tax receipts.

Although its detailed forecast extends only through fiscal 2009, CBO (1999b) presents a summary projection through 2060. (The projection assumes entitlement laws do not change and discretionary spending and revenues rise with GDP after 2009). According to this forecast, surpluses will continue through 2020, and the entire publicly held federal debt will be retired around 2012.

However, entitlement spending is expected to rise sharply after 2010, first reducing the surpluses and then moving the budget back into deficit after 2020. The anticipated increase in spending results from two long-term trends. First, the dependency ratio (the ratio of the population aged 65 and over to those aged 20 to 64) will rise as the baby boomers begin turning 65 in 2011 and as life spans are extended. Figure 9 plots the future dependency ratio from the Social Security trustees' intermediate projections. Second, despite recent slow growth, medical costs are expected to resume their rapid increase. Figure 10 graphs predicted Social Security and Medicare spending (gross of beneficiary premiums) from the intermediate projections of the Social Security and Medicare trustees. Federal Medicaid spending (not shown) is also expected to rise sharply.

Because of the rise in entitlement costs, tax increases or spending cuts will be needed to restore long-term fiscal balance. CBO (1999b) estimates that a permanent tax increase or

Table 2
Projected Fiscal 2006 Receipts, Outlays, and Surplus
(Comparison of May 1996 and January 1999 CBO projections)

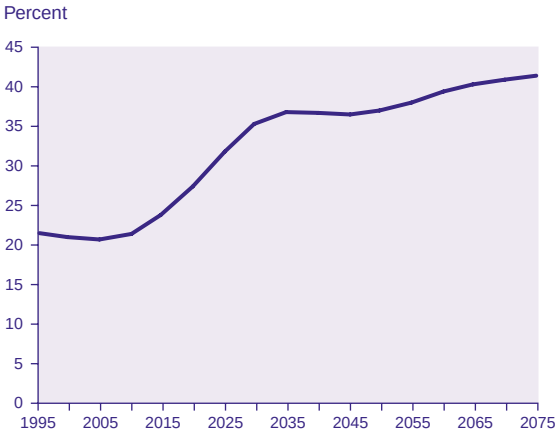
	May 1996 projection	January 1999 projection	Forecast revision*
Total receipts	2,232	2,393	161
Individual income tax	1,051	1,138	87
Social insurance taxes	800	816	16
Corporate income tax	214	250	36
Other receipts	167	189	22
– Total outlays	2,636	2,086	550
Social Security	567	538	29
Medicare and Medicaid	706	537	169
Interest	385	140	245
Other outlays	978	871	107
= Budget balance	–403	306	709

* Forecast revisions that increase the surplus are listed as positive numbers.

NOTES: All numbers are billions of dollars. Details may not add to totals because of rounding. Medicare spending is gross of beneficiary premiums.

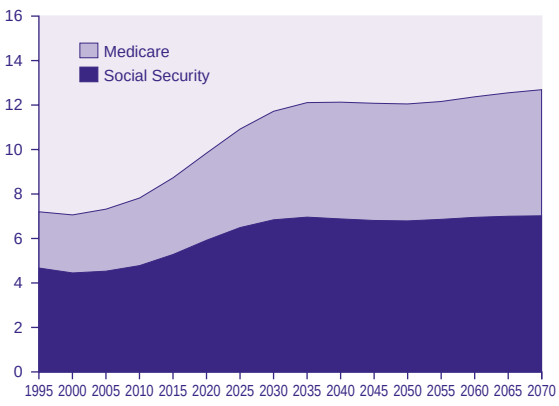
SOURCE: CBO (1996, 1999b).

Figure 9
Dependency Ratio Projected to Rise Sharply After 2010
(Population aged 65 and over / population aged 20–64)



SOURCE: Board of Trustees (1999a, p. 145).

Figure 10
Social Security and Medicare Costs Expected to Soar



SOURCE: Board of Trustees (1999a, p. 187; 1999b, p. 57).

Social Security and the Budget

Throughout this article, I use the unified-budget numbers that appear in CBO and Office of Management and Budget reports rather than the "on-budget" numbers that also appear in the reports. The on-budget numbers exclude the Social Security trust fund, which was placed "off-budget" in 1985.

The payroll and self-employment taxes earmarked for Social Security (and some income taxes paid on Social Security benefits) are credited to a separate trust fund in the budget accounts. Social Security benefits and administrative costs are charged against the fund. When Social Security taxes exceed Social Security spending (as in each of the last fourteen years), this excess reduces the amount the U.S. Treasury borrows from the public and its future interest payments to the public. To ensure that the budget accounts attribute these effects to the Social Security program, the bonds the Treasury avoids selling to the public are "bought" by the trust fund with its excess revenues. Each year, the Treasury "pays" interest on these bonds to the trust fund, thereby crediting the trust fund with the interest that it avoids paying to the public. In any year in which Social Security spending exceeds taxes and the trust fund's interest income, the trust fund finances its deficit by "selling" bonds back to the Treasury.

In fiscal 1998, the trust fund was credited with $478 billion of income, consisting of $416 billion in payroll and self-employment taxes, $9 billion in income tax on benefits, $7 billion in employer payroll tax "paid" by the federal government for its own employees, and $46 billion in interest "paid" by the Treasury. Since Social Security benefits and administrative costs were only $379 billion, the trust fund posted a $99 billion surplus. On September 30, 1998, the trust fund held $730 billion of bonds, indicating that if the past Social Security surpluses had not occurred the Treasury would owe the public $4.45 trillion rather than $3.72 trillion.

The on-budget numbers for fiscal 1998 differed significantly from the unified-budget numbers. The on-budget accounts recorded only $1,306 billion in receipts, rather than $1,722 billion, because they ignored the $416 billion payroll and self-employment taxes. They recorded only $1,046 billion of noninterest outlays, rather than $1,409 billion, because they ignored $370 billion of Social Security spending[1] but included the $7 billion of employer payroll taxes "paid" to the trust fund. Finally, they recorded $290 billion of interest expense rather than $244 billion because they included the $46 billion in interest "paid" to the trust fund. With total outlays of $1,336 billion and receipts of $1,306 billion, the on-budget accounts recorded a $30 billion deficit. This number differed from the $69 billion unified-budget surplus by $99 billion, the amount of the trust fund surplus.

If current policies are maintained, the difference will rise over the next two decades as the trust fund runs larger surpluses. For fiscal 2009, for example, CBO (1999b, p. 33) projects an on-budget surplus of $164 billion, a trust fund surplus of $217 billion, and a unified-budget surplus of $381 billion. However, the trust fund will run deficits after 2020, causing the on-budget deficit to be smaller than the unified-budget deficit.

Economists rarely use the on-budget numbers, which distort federal activity by ignoring important components of receipts and outlays and treating an internal payment as an interest expense. For example, the 1998 on-budget numbers would not have changed if Social Security payroll and self-employment taxes had been abolished, even though the $416 billion revenue loss would have greatly weakened the federal government's financial position. Economists usually use the unified-budget numbers, which include Social Security outlays and revenues and correctly measure the government's interest payment to the public.[2]

[1] The other $9 billion of Social Security spending was included in on-budget outlays to balance the inclusion of the $9 billion income tax on benefits in on-budget receipts.

[2] Although private firms' accounting methods do not ignore pension operations in the way the on-budget accounts ignore Social Security, they also do not include pension obligations on a cash basis in the way the unified accounts do. Instead, they record pension obligations as they accrue. Analysis of this issue lies outside the scope of this article.

spending cut equal to 0.6 percent of GDP would restore long-term balance, if it were adopted immediately. The necessary tax increase or spending cut will be larger if it is delayed.

Of course, these long-term projections are subject to even greater uncertainty than the ten-year forecasts because economic growth, the relative price of medical care, fertility, and life expectancy are difficult to predict over an extended horizon. Some analysts are particularly skeptical of the projection by the Social Security trustees and CBO that life expectancy at birth will rise by only five years from now to 2075. As discussed by Lee and Skinner (1999), time series analysis of the mortality rate suggests that the increase might be twice as great, which would further increase Social Security and Medicare costs and the size of the long-term fiscal imbalance.

PROPOSALS TO REDUCE THE PROJECTED SURPLUSES

As described by Stein (1998), the arrival of the surpluses has left policymakers adrift. For the last two decades, there was widespread agreement in principle that the appropriate goal was to balance the budget. After 1981, proposals for large tax cuts or spending increases were consistently rejected because they would impede this goal. Some economists and policymakers continue to oppose tax cuts and spending increases, arguing that the projected surpluses should be preserved. But others support tax cuts or spending increases, which are now consistent with budget balance, although these measures would reduce the projected surpluses. Because the BEA remains in effect through fiscal 2002, tax cuts or spending increases would require altering the discretionary cap or pay-as-you-go rule or invoking their emergency exceptions.

The projected surpluses are already lower than they could have been, because of tax reductions and spending increases adopted during the last two years. The August 1997 legislation provided tax credits for children and higher education costs, expanded the capital gains preference and tax-deferred savings opportunities, and created a new Children's Health Insurance Program. June 1998 legislation modified the BEA to permit $20 billion to $30 billion of annual transportation spending outside the discretionary cap, and October 1998 legislation invoked the BEA's emergency exception to increase defense and nondefense discretionary spending by $17 billion in fiscal 1999 and $5 billion in fiscal 2000.

Many tax cuts and spending increases that would reduce the projected surpluses have been proposed. In his fiscal 2000 budget proposal, President Clinton proposes spending increases and tax cuts that would reduce by about 32 percent the cumulative surpluses projected during the next ten years. His proposal would reduce the surpluses by 24 percent

through spending increases for education, national defense, and other programs and by another 13 percent through tax cuts to fund individual savings accounts, as described below. However, it would increase the surpluses by 5 percent by raising tobacco and other taxes. President Clinton proposes that most of the spending increases and tax cuts be adopted only after a Social Security reform plan is enacted.[6]

On April 15, Congress adopted a fiscal 2000 budget resolution that envisions reducing the projected surpluses by 27 percent, with a 35 percent reduction from unspecified tax cuts offset by an 8 percent increase from spending cuts. Some members of Congress suggest reducing individual income tax rates, while others call for tax cuts for two-income married couples, reform or abolition of the alternative minimum individual income tax, and further expansion of the capital gains preference.

In view of the variation in these proposals, no single analysis can accurately describe their effects. To draw out the major implications, I classify the proposals into three categories. First, I consider transfer payments or tax cuts in which the amount received by each individual does not depend upon the amount he or she saves. Second, I consider tax cuts that increase the reward to saving, including tax cuts to fund individual savings accounts. Third, I consider increases in the government's purchases of goods or services.

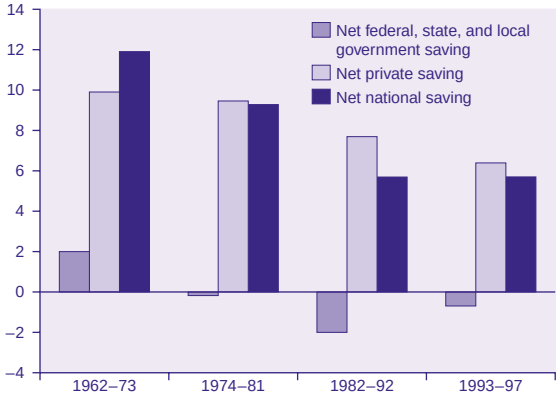
Tax Cuts and Transfer Payments With No Reward for Saving

Surplus reductions through higher transfer payments or lower taxes would place the federal debt on a higher path. The government budget constraint would then require that taxes be increased or spending be reduced in the future to service the additional debt.

While it might seem that the tax cuts or transfer payments would increase living standards today and that the necessary future tax increases or spending cuts would reduce living standards when they are implemented, the effects actually depend upon how these policies affect national saving. National saving, which measures the portion of national income withheld from current consumption and invested to increase future consumption, equals the private saving by individuals and businesses plus government saving. Surpluses constitute government saving, and deficits constitute negative government saving. Since reducing the surpluses would reduce government saving, national saving would decline if private saving did not change. However, if private saving rose by an offsetting amount, national saving would be unchanged.

Figure 11
National Saving Rate Is Below Historical Levels

Percent of net national product



SOURCE: Bureau of Economic Analysis, *National Income and Products Accounts*.

Figure 11 displays the past behavior of net private saving and net government (federal, state, and local) saving, measured as percentages of net national product. As government saving declined during the 1962–92 period, private saving also declined, causing a sharp drop in national saving. As government saving increased after 1992, private saving continued to decline, leaving national saving essentially unchanged.

One leading view of the relationship between private and government saving is the Ricardian equivalence theory, which is the subject of an extensive literature survey by Elmendorf and Mankiw (1998). According to this theory, taxpayers realize the transfer payments or tax cuts they receive today will require tax increases or spending cuts in the future. To prepare for this burden, they increase their private saving by the full amount of the tax cut or transfer payment, leaving national saving unchanged. The key assumption is that individuals rationally plan their consumption based on their expected lifetime income.

Under the Ricardian theory, the initial tax cuts or transfer payments do not increase consumption, because individuals save the money they receive. Conversely, the future tax increases or spending cuts do not reduce consumption when they occur, because individuals draw upon their additional savings. Reduction of the surpluses through tax cuts or increased transfer payments, therefore, has no profound economic implications.

However, as Elmendorf and Mankiw (1998) note, a majority of economists reject the Ricardian equivalence theory. Although direct empirical tests have been inconclusive, these economists reject the theory because they doubt the plausibility of its assumptions. If these economists are correct, private saving would not rise to fully offset the reduction of the surpluses, and national saving would decline.

This reduction in national saving would increase current consumption but would reduce future national income and consumption. National saving is invested in various forms of capital in the United States, including corporate and noncorporate business investment, owner-occupied housing, consumer durables, and human capital such as education or training, and is also used to purchase foreign assets. A reduced supply of saving would increase interest rates and reduce these investments. With less capital, future income and consumption would be lower. Workers would suffer part of the loss, because the reduction in the capital stock would lower labor productivity and real wages.

The amount of future consumption that would be lost depends on the real pretax rate of return to investment. This return is uncertain because it is affected by a variety of shocks to the economy. Its expected value can be estimated from the historical average of the ratio of pretax real net-of-depreciation capital income to the value of the capital stock.[7] The expected real return is 6 percent to 7 percent per year, according to estimates by Elmendorf and Mankiw (1998), Bosworth (1997), Cooley and Prescott (1995), Fullerton and Rogers (1993), and Summers (1990).[8] The relatively high return implies that a reduction in national saving significantly decreases future consumption. For example, consuming one dollar more (saving one dollar less) today would reduce consumption by four dollars (adjusted for inflation) twenty-five years in the future.

However, a reduction in national saving might be desirable even if the amount of consumption lost in the future was greater than the amount gained in the present. The relevant issue is how the changes in consumption at each date affect human well-being. To examine this issue, it is important to distinguish two ways in which national saving might decline. First, members of each generation might consume more when they are young and less when they are elderly. Second, current generations might consume more throughout their lifetimes, and future generations might consume less. Under certain circumstances, tax cuts or transfer payments could reduce national saving in either manner.

Tax cuts and transfer payments could cause people to consume earlier in their lifetimes if they are subject to incomplete information or myopia. Individuals might not know whether their tax cut or transfer payment was financed by a reduction in the surplus that will trigger future tax increases or spending cuts or by an increase in someone else's taxes. The benefit of having this information might not justify the substantial costs of learning the relevant economic concepts and reviewing published budget materials. Surveys by Allers, de Haan, and de Kam (1998) and Gruen (1991) find widespread unawareness and misinformation about the level of and changes in government debt. Alternatively, as Elmendorf and Mankiw (1998) discuss, even if individuals understood the future tax implications, they might not fully use this information in formulating a rational lifetime consumption plan. The complexity of intertemporal decision making may lead them to rely on rules of thumb to plan their consumption.

The assumption that individuals do not allocate consumption over their lifetimes in a perfectly rational, far-sighted manner is supported by empirical evidence. Campbell and Mankiw (1991) find that consumption rises when income rises, even when the income increase was predictable in advance, which contradicts the assumption that individuals prepare for predictable income changes by adjusting their consumption when they learn about the increases. Campbell and Mankiw's results are consistent with approximately half of aggregate consumption being done by individuals who consume a constant fraction of their current disposable income, without regard to their future income. If these individuals receive tax cuts and transfer payments in the present, financed by tax increases and spending cuts in the future, they will increase their current consumption and reduce their future consumption.

Would this change in consumption patterns be desirable? Since neither the original consumption decisions nor the new ones are optimal, no definitive general conclusion is possible.[9] Many individuals are likely to experience significant tax increases or benefit reductions when the federal government confronts the post-2020 budget challenge. Individuals who are unaware of this prospect or have not incorporated it into their saving behavior may be consuming too much now and will be forced to consume too little later in life because of their

inadequate saving. Tax cuts and transfer payments could further lower their well-being. Conversely, individuals who overestimate the stringency of future tax increases or spending cuts[10] may be saving too much, needlessly sacrificing current consumption to acquire excessive future consumption. Tax cuts and transfer payments could increase their well-being.

One complication is that saving is taxed by individual and corporate income taxes and property taxes, which prevents savers from earning the full 6 percent to 7 percent expected annual real return that their saving generates. The tax penalty on saving induces people to consume earlier in their lives than they would under a neutral tax system. If, for some reason, the taxation of saving cannot be changed, then tricking people into saving more would help offset the distortion caused by the tax system. This is an imperfect solution, however; it would be preferable to directly eliminate the distortion by reforming the tax system.

In any case, many economists believe that the most important effects of tax cuts and transfer payments are not changes in when each generation consumes, but changes in how much consumption is enjoyed by each generation. They believe that tax cuts and transfer payments would increase the consumption of earlier generations at the expense of later generations because later generations would bear part of the necessary future tax increases and spending cuts.[11] Gokhale, Kotlikoff, and Sabelhaus (1996) argue that the recent decline in national saving was largely the result of fiscal policies that transferred resources from later generations to earlier generations.

Under this assumption, the desirability of tax cuts and transfer payments depends on value judgments about the needs, rights, and obligations of different generations. Eisner (1998) argues that there is little reason to increase national saving because future generations will be wealthier than current generations. However, Feldstein (1998) and Romer (1988) present mathematical calculations suggesting the utility gained by future generations would be greater than the utility sacrificed by current generations, because of the high rate of return from saving. But Elmendorf and Mankiw (1998) point out that such analyses are inconclusive because they depend on the weights given to utility at different levels of wealth. Furthermore, many philosophers object to the utilitarian approach underlying these analyses, stressing instead the rights and obligations of different individuals and generations. Some analysts contend these rights and obligations cannot be determined in any conclusive manner.[12]

Greenspan (1999), Passell (1998), Stein (1998), and Steurle (1997) oppose reducing the projected surpluses to any significant extent, arguing that additional saving is desirable to ease the burden current and future generations will face from the post-2020 budget challenge. Greenspan and Steurle emphasize the possibility that these burdens will be greater than expected if part of the projected surpluses does not materialize because of slow economic growth or other deviations from forecast assumptions.

Tax Cuts That Reward Private Saving

Although a majority of economists believe tax cuts and transfer payments generally reduce national saving, this conclusion may not hold for tax cuts that increase the reward for private saving (or reduce the penalty the current tax system imposes on saving). These proposals would probably boost private saving, which could offset the decline in government saving.

Many tax-cut proposals, such as reducing income tax rates, would slightly increase the after-tax return to saving. Other proposals would do this to a greater extent. Some proposals would reduce the surplus by replacing the income tax with a consumption tax, setting the consumption tax rate below the level that would replace current revenues. Although a revenue-losing switch to a consumption tax could increase private saving by enough to keep national saving unaffected, such an outcome is unlikely. Engen and Gale (1996) survey the potential effects on saving of switching to a consumption tax and suggest caution in estimating the magnitude of any increase. An increase in national saving would be more likely if such reforms were implemented on a revenue-neutral basis.

A different approach is to give individuals a tax cut, with the condition that they place the funds in an individual retirement saving account. In his fiscal 2000 budget, President Clinton proposes that tax cuts of this type be used to fund a system of Universal Savings Accounts. Workers with incomes below $40,000 would be given $300 for their accounts and would receive dollar-for-dollar government matching for up to $700 of additional contributions, with smaller benefits for those with higher incomes. An alternative proposal by Feldstein and Samwick (1998) would give each worker an amount equal to 2 percent of earnings subject to Social Security tax for his or her account.

President Clinton's proposed accounts would not be integrated with the Social Security system, but the Feldstein-Samwick proposal would reduce Social Security benefits by seventy-five cents for each dollar withdrawn from the accounts during retirement.

Reducing the surpluses through tax cuts that fund individual savings accounts would probably reduce national saving to some extent. Current workers would receive the tax cuts, while future generations might bear part of the future tax increases and spending cuts necessitated by the reduction in the surpluses. Also, acting on incomplete information, workers who might not have reduced their saving to offset government budget surpluses might reduce their other saving to offset the highly visible wealth in their accounts. However, the saving reduction would be smaller under the Feldstein-Samwick plan because lower future Social Security benefits would offset up to 75 percent of the wealth.

CBO (1998a) analyzes the relative merits of private saving in individual accounts and government saving through budget surpluses. Individual accounts would offer greater personal freedom because individuals could make their own portfolio choices. But not all individuals will necessarily be prepared to make these choices. In surveys cited by Levitt (1998) and Diamond (1997), many Americans express unfamiliarity with the benefits of diversification, the relationship of bond prices to interest rates, and the differences between stocks and bonds. To reduce the problems posed by limited knowledge, individual portfolio choice would probably be restricted to some extent, although neither the president nor Feldstein and Samwick specify the restrictions they would impose. Supporters also argue that the introduction of individual accounts would spur individuals to learn more about portfolio choice.

Although the aggregate return on additional investment and its total uncertainty would be the same whether the investment was financed from savings in individual accounts or from budget surpluses, the allocation of risk would be different. With surpluses, the government could diversify risk, particularly across generations. With individual accounts, the extent of diversification would depend on workers' portfolio decisions. Budget surpluses might pose greater political risk because the allocation of the future tax reductions or spending increases permitted by the surpluses would depend on political decisions that could not be predicted. Since individual accounts would be private property, workers would have some assurance they could retain the wealth in their accounts regardless of political developments.

Unlike budget surpluses, individual accounts would have significant administrative costs. Mitchell (1998) and Diamond (1997) observe that administrative costs consume 10 percent of returns for many private saving vehicles. Costs might be reduced to some extent if individuals were limited to a few standardized portfolio options.

Feldstein and Samwick (1998) also argue that Congress and the president will inevitably yield to temptation and reduce the surpluses by adopting some form of tax cuts or spending increases. They warn that rejecting individual accounts and attempting to preserve the surpluses would actually result in lower national saving because Congress and the president would eventually backslide and reduce the surpluses through spending increases or tax cuts that did not reward saving. However, it might be possible to prevent this outcome by imposing constitutional or other institutional restrictions that preclude future backsliding.

Increases in Government Purchases

Another way to reduce the surpluses would be to increase the government's purchases of goods and services. Many forms of government purchases, such as Medicare spending, are essentially current consumption. Increases in government consumption raise issues similar to those posed by transfer payments or tax cuts that increase private consumption. The choice between private and government consumption should depend upon how effectively each type of consumption satisfies the preferences of individuals.

Other forms of government purchases, such as education, public infrastructure, and health care for workers, can increase future output. Public investment of this type is desirable if it corrects market failure in a way that provides a higher return than private investment. Of course, these returns are often difficult to measure and may vary greatly across different types of government purchases.

CONCLUSION

A combination of economic events and policy changes reduced the federal budget deficit for five years in a row and unexpectedly moved the budget into surplus last year. If current policies are maintained, surpluses are expected to continue for twenty years, com-

pletely retiring the outstanding federal debt, although deficits are expected to return after 2020. Congress and President Clinton are considering proposals to reduce the projected surpluses through tax cuts or spending increases.

Under plausible assumptions, many of the proposed tax cuts and spending increases would reduce national saving and lower future output because they are likely to increase the consumption of current generations and reduce the consumption of future generations. Evaluation of the desirability of this outcome requires a value judgment about the needs, rights, and obligations of the different generations. Different considerations are relevant for some proposed tax cuts and spending increases. Tax cuts that reward saving or fund individual savings accounts might increase private saving but probably not enough to offset the reduction in government saving. Increases in government investments, such as education and infrastructure, would be desirable if they corrected market failures in ways that offered higher returns than private investment.

The decision on whether and how to reduce the projected surpluses will have important effects on the well-being of current and future Americans.

NOTES

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1 Fiscal years 1976 and earlier began on July 1 of the preceding year, while fiscal years 1977 and later begin on October 1 of the preceding year. The period July 1 to September 30, 1976, which was a transitional quarter not included in any fiscal year, is not shown in the figures.

2 The entitlement spending plotted in the figure is mandatory spending (other than interest) minus offsetting receipts. Collender (1999) provides more detail on these budget categories.

3 Collender (1999) provides a thorough description of the BEA.

4 The reduction in the top tax rate on long-term capital gains from 28 percent to 20 percent, which took effect on May 7, 1997, also probably increased 1997 realizations. Moreover, mutual funds, which generally realize gains to a greater extent than do individual investors, now own a larger portion of stocks. Barclay, Pearson, and Weisbach (1998) document and analyze mutual funds' willingness to realize capital gains.

5 Although policymakers and journalists sometimes discuss "using" the surpluses to reduce the debt, this terminology is somewhat misleading. Unless the government increases its cash balances or holdings of financial assets, surpluses necessarily reduce the debt. By the same token, deficits necessarily increase the debt, unless the government reduces its cash balances or its holdings of financial assets.

6 The reductions in the surplus are calculated from CBO (1999a, pp. xiii, 2, 3, 22). I treat the proposed stock purchases and associated interest costs as not reducing the surplus.

7 As discussed by Summers (1990), this method is subject to several potential problems. Both capital income and the capital stock may be mismeasured, particularly because consumer durables, human capital, and government capital are excluded. The average return obtained by this method may differ from the marginal return if the production function does not exhibit constant returns to scale. Moreover, the private return earned by capital may differ from the social return because of monopoly power, externalities, and the marginal cost of public services (such as police and fire protection) provided to capital.

8 Some authors, such as Feldstein (1998), use values of 9 percent or more, based on the pretax return to corporate capital. But, as CBO (1998a), Elmendorf and Mankiw (1998, p. 23 n.9), Bosworth (1997, p. 163), Diamond (1997, p. 21 n.24), and Summers (1990, p. 117) observe, corporate capital has higher pretax returns than other investments because it is taxed more heavily and because after-tax (risk-adjusted) returns on different investments should be equal.

9 As Elmendorf and Mankiw (1998, pp. 50–52) discuss, some individuals who wish to borrow to consume earlier in their lifetimes may be unable to do so because bankruptcy risk causes private lenders to restrict the amount they will lend to these consumers. If it can, the government should help individuals sidestep these restrictions by borrowing on their behalf (giving them a tax cut or transfer payment, financed by a future tax increase). However, if the government's ability to collect taxes is the same as private lenders' ability to collect loan repayments, then it cannot accomplish this objective. For each dollar of additional government borrowing, private lenders would reduce their loans by one dollar.

10 In surveys cited by Burtless (1997, p. 400), 70 percent of voters under age 50 state that they expect to receive no Social Security benefits at all, suggesting that many people have unfounded beliefs about the magnitude of the necessary adjustments.

11 Even if future generations bear the tax increases or spending cuts, Ricardian equivalence could still be valid and national saving still might not decline. Current generations might increase their private saving to leave larger gifts and bequests to their heirs, compensating them for the burden they will face. Elmendorf and Mankiw (1998, pp. 45–50) survey the literature on

this issue. However, empirical evidence suggests that households do not systematically alter their gifts and bequests to offset changes in their heirs' circumstances (Hayashi, Altonji, and Kotlikoff 1996).

[12] Legal scholar Richard Epstein (1992, p. 85) comments, "I confess that my moral intuitions are not as well developed…on this grand scale. Hard as I try I cannot determine precisely what it is that my parents owed me, or what their generation owed my generation or those yet to come. I am also somewhat overwhelmed by a similar inability to speak about what I owe my children, as distinguished from what I hope to provide for them." Kinsley (1994) expresses similar views.

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Oil Prices and U.S. Aggregate Economic Activity: A Question of Neutrality

Stephen P. A. Brown and Mine K. Yücel

Research suggests rising oil prices reduced output and increased inflation in the 1970s and early 1980s and falling oil prices boosted output and lowered inflation in the mid- to late 1980s.

Considerable research finds that oil price shocks have affected U.S. output and inflation (Hamilton 1983, 1988, 1996; Tatom 1988; Mork 1989, 1994; Kahn and Hampton 1990; Huntington 1998). Research also supports the view that these shocks have been an important source of economic fluctuation in the United States over the past three decades (Miller, Supel, and Turner 1980; Finn 1991; Kim and Loungani 1992). This research suggests rising oil prices reduced output and increased inflation in the 1970s and early 1980s and falling oil prices boosted output and lowered inflation in the mid- to late 1980s. Nevertheless, other studies argue it was not the oil price shocks themselves but monetary policy's response to them that caused the fluctuations in aggregate economic activity (Bohi 1989; Bernanke, Gertler, and Watson 1997).

Bernanke, Gertler, and Watson (BGW) show that the U.S. economy responds differently to an oil price shock when the federal funds rate is held constant than it does when the rate is unconstrained. In the unconstrained case, a positive oil price shock leads to a rise in the federal funds rate and a decline in real gross domestic product. With the federal funds rate held constant, BGW find a positive oil price shock leads to an increase in real GDP. Defining neutral monetary policy as one in which the federal funds rate is constant, BGW argue that monetary policy has not been neutral in response to oil price shocks. They contend the difference in real GDP's behavior shows it is monetary policy's response to oil price shocks that causes aggregate economic activity to fluctuate.

A constant federal funds rate is not necessarily the only definition of monetary neutrality in the face of a supply shock. Friedman (1959) suggests a constant monetary aggregate; Gordon (1998) suggests that neutrality occurs when the monetary authority adjusts policy to hold nominal GDP constant.[1]

For this article, we construct a vector autoregressive (VAR) model of the U.S. economy similar to the BGW model to examine whether the definition of monetary neutrality affects the conclusion that monetary policy's response to oil price shocks accounts for the fluctuations in aggregate economic activity. We find that with the BGW definition of neutral monetary policy—a constant federal funds rate—oil price shocks have prompted a tightening of monetary policy. However, under a different definition of neutrality—constant nominal GDP—it could be argued that the Federal Reserve has taken a neutral course.

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MODEL, INTERPRETATION, AND ESTIMATION

Our model is a variant of BGW's VAR model. Both consist of seven variables and equations representing real GDP, the GDP deflator, a commodity price index, the price of oil, the federal funds rate, and short- and long-term interest rates. Both versions of the model can be used to represent money demand, as well as the relationships between oil prices, aggregate economic activity, financial variables, and inflation.

For oil prices, the BGW model uses the "net oil price" proposed by Hamilton (1996), constructed by calculating the difference between the current price and the maximum price seen in the past twelve months (in logs). Hamilton's net oil price is equal to the difference or zero, whichever is greater. In addition, the federal funds rate does not enter the BGW model directly but, rather, works through the term structure of interest rates. The short- and long-term market rates are decomposed into two parts—an expectations of future funds rate component and a term premium component.

Our version of the model has two oil price variables: the Hamilton net oil price and the price of oil. Following Balke, Brown, and Yücel (1999), we include an additional oil price variable to allow for the differential effects of rising and falling oil prices. The net oil price captures only rising oil prices. Unlike BGW, we do not impose a structure on the model and include the federal funds rate directly in the VAR.

Simple theory can help predict how an oil price shock will affect the variables in either model. Higher energy prices resulting from an oil price shock cause a temporary shift in the production function, leading to lower output. The reduction in output, ceteris paribus, results in an excess demand for goods and an increase in the interest rate. The fall in output and increase in the interest rate, in turn, reduce the demand for real cash balances, and given a nominal quantity of money, the price level rises. Therefore, we would expect an oil price shock to lower GDP and increase both interest rates and the price level.[2]

According to Gordon (1998), the Federal Reserve maintains neutrality in the face of a supply shock by acting to hold nominal spending constant. Hence, under this circumstance a decline in GDP, an increase in interest rates, and an increase in the price level can be consistent with a neutral monetary policy—as long as nominal GDP remains constant. In contrast, BGW define a neutral monetary policy as one in which the Federal Reserve holds the federal funds rate constant in the face of a supply shock regardless of the consequences for the price level and nominal GDP. Because a supply shock might boost short-term interest rates, however, holding the federal funds rate constant could be interpreted as accommodative if it results in gains in nominal GDP.

Data

To examine the neutrality issues, we use data similar to BGW's. We use monthly data for January 1965 through December 1997.[3] The real oil price variable is the producers price index of crude oil, with the Hamilton net oil price calculated from the same series. GDP is in constant 1987 dollars. We use the Chow–Lin procedure to obtain a monthly GDP series from the quarterly data, with personal consumption expenditures, industrial production, and total nonagricultural employment as reference series. We also use the Chow–Lin procedure to obtain a monthly GDP deflator series from the quarterly data, with the producer price indexes for capital equipment, finished goods, intermediate materials, and crude materials as the reference series. The commodity price index is the spot market index for all commodities from the Commodity Research Bureau. The short-term interest rate is the three-month Treasury bill. The long-term interest rate is the ten-year Treasury bond. All three interest rate variables are from Citibase.

Following BGW, we use log levels of real GDP, the price deflator, and the commodity price. The federal funds rate and the long-term interest rate are kept in levels. We use log first differences of the real oil price to make it comparable to the Hamilton oil price variable. Because it can be generated by an identity from the oil price series, the net oil price is included as a regressor in each equation, along with the real oil price, but is not a left-hand variable itself.

Variance Decomposition and Impulse Responses

We use both a variance decomposition and impulse responses to assess the relationship between oil price shocks and aggregate economic activity. A variance decomposition apportions the variance of forecast errors in a given variable to its own shocks and those of the other variables in the VAR. It allows us to assess the relative importance of oil price shocks to the volatility of the other variables.

Impulse response functions allow us to examine the dynamic effects of oil price shocks on U.S. economic activity and inflation. The impulse response function traces over time the

Table 1
Variance Decomposition

	RGDP	Deflator	Pcom	Oil	FF	Short rate	Long rate
RGDP	29.7	1.2	6.5	1.4	43.9	15.3	2.0
Deflator	8.4	21.6	64.2	.2	3.8	.8	.9
Pcom	5.8	3.4	76.9	.3	9.5	2.8	1.1
Oil	3.8	2.2	10.3	75.4	3.9	2.7	1.7
FF	22.7	5.2	38.7	1.1	20.7	10.8	.7
Short rate	20.8	5.7	40.8	.7	15.6	15.8	.8
Long rate	13.7	10.7	51.7	.6	6.4	8.0	8.8

NOTE: The variable on the left is being decomposed by the right-hand-side variables shown at the top.

effects on a variable of an exogenous shock to another variable. The persistence of a shock tells us how fast the system adjusts back to equilibrium. The faster a shock dampens, the faster the adjustment. We analyze the effects of a one-time oil price shock and trace its effect on each of the variables.

We use a Choleski decomposition to construct the variance decompositions and impulse responses. This technique decomposes the residual (μ_i) from each equation in the VAR system into a linear combination of the residuals from the other equations (μ_j) and an orthogonal element (ν_i). The structure is as follows:[4]

$$(1)\quad \mu_{gdp} = \nu_{gdp}$$

$$(2)\quad \mu_{defl} = c_{21}\mu_{gdp} + \nu_{defl}$$

$$(3)\quad \mu_{pcom} = c_{31}\mu_{gdp} + c_{32}\mu_{defl} + \nu_{pcom}$$

$$(4)\quad \mu_{poil} = c_{41}\mu_{gdp} + c_{42}\mu_{defl} + c_{43}\mu_{pcom} + \nu_{poil}$$

$$(5)\quad \mu_{ff} = c_{51}\mu_{gdp} + c_{52}\mu_{defl} + c_{53}\mu_{pcom} + c_{54}\mu_{poil} + \nu_{ff}$$

$$(6)\quad \mu_{rs} = c_{61}\mu_{gdp} + c_{62}\mu_{defl} + c_{63}\mu_{pcom} + c_{64}\mu_{poil} + c_{65}\mu_{ff} + \nu_{rs}$$

$$(7)\quad \mu_{rl} = c_{71}\mu_{gdp} + c_{72}\mu_{defl} + c_{73}\mu_{pcom} + c_{74}\mu_{poil} + c_{75}\mu_{ff} + c_{76}\mu_{rs} + \nu_{rl},$$

where μ_{gdp} is the residual from the real GDP equation, μ_{defl} is the residual from the GDP deflator equation, μ_{pcom} is the residual from the commodity price equation, μ_{poil} is the residual from the oil price equation, μ_{ff} is the residual from the federal funds rate equation, μ_{rs} is the residual from the short-term interest rate equation, and μ_{rl} is the residual from the long-term interest rate equation.

The decomposition structure implies that unexpected changes in real GDP (μ_{gdp}) arise from any of the specified variables only with a lag. Unexpected changes in the deflator (μ_{defl}) can arise contemporaneously from innovations in real GDP but can arise from other variables only with a lag. Similarly, as we move down the equations, unexpected changes in one of the left-hand-side variables can arise contemporaneously from innovations in variables on the left-hand side of the equations preceding it, but can arise from the variables on the left-hand side of the equations succeeding it only with a lag.[5]

In addition to the standard impulse responses, we also calculate impulse responses under a counterfactual case in which the federal funds rate is held constant, which is akin to the Sims–Zha case in BGW.[6] In the Sims–Zha case, the federal funds rate response is shut down by setting the rate at its baseline level—that is, its value in the absence of an oil price shock.

OIL PRICE SHOCKS AND AGGREGATE ECONOMIC BEHAVIOR

Using the model and procedures described above, we examine the sources of variation in each variable and the estimated responses of aggregate economic activity to an oil price shock with the federal funds rate free to respond and with the rate constant. We find that innovations in the oil price itself—except possibly through a manifestation in commodity prices—have little effect on monetary policy during the estimation period.[7] We also find that holding the federal funds rate constant prevents a decline in real GDP, but at the cost of higher inflation.

Variance Decomposition

The variance decomposition suggests that oil price shocks are not a major source of volatility for most of the variables in the model. As Table 1 shows, for many of the variables the largest source of shock other than the variable itself is the commodity price; changes in oil prices are a minimal source of disturbance to these variables.[8] The commodity price is the source of 65 percent of the volatility in the price deflator, about 40 percent of the volatility in the federal funds rate and short-term interest rates, and 50 percent of the volatility in long-term interest rates.

For real GDP, the largest source of shocks is changes in the federal funds rate, which contributes nearly 44 percent of the volatility. The GDP variable itself accounts for about 30 percent of its own volatility, and the commodity price accounts for 6.5 percent of the volatility. Oil prices contribute only 1.4 percent of GDP volatility.

Although the federal funds rate is the largest source of volatility for real GDP, the rate's movements do not arise from changes in oil prices. The oil price contributes only about 1 percent of the volatility in the federal funds rate. Commodity prices are the largest source of volatility for the rate, while GDP accounts for almost 23 percent of the volatility. The funds rate itself is the third-largest source of its own volatility, contributing nearly 21 percent. Table 1 shows that the variance decomposition for all three interest rates is very similar, particularly for the federal funds and short-term rates.

These findings suggest it is not the oil price itself but perhaps its manifestation in commodity prices that affects the volatility of economic activity. The commodity price is the largest source of fluctuation for all variables except GDP and oil prices. The main sources of GDP volatility are GDP itself and changes in the federal funds rate. A change in commodity prices is the source of nearly half the volatility for all interest rates in the model. The fed funds rate seems to be responding to changes in general commodity prices, not necessarily just the oil price, because changes in oil prices are the smallest source of volatility for the fed funds rate.

Impulse Responses

Figure 1 shows the impulse responses to an oil price shock in the base case (solid line). As is shown, a positive oil price shock leads to a decline in real GDP, a rise in the price level, and increases in short- and long-term interest rates.[9]

GDP and Inflation Response. We find that a one-standard-deviation shock to the real oil price leads to a transitory decline in real GDP. The maximum decline in real GDP is about 0.005 percent and is realized in the thirteenth month.

Our findings are similar to those of Hamilton (1983), Tatom (1988), Mork (1989, 1994), and Huntington (1998), who find decreases in real gross domestic product (or gross national product) follow an oil price shock. If the maximum decline in real GDP is normalized by the maximum increase in the price of oil, we estimate the resulting oil price elasticity of GDP is −0.008.[10] Our estimate shows a smaller effect than the −0.02 to −0.076 range reported in a 1987 Energy Modeling Forum study (Hickman, Huntington, and Sweeney 1987), perhaps because the model contains commodity prices. Brown and Yücel (1995) also suggest that the elasticity of real GDP to changes in oil prices may have declined with the energy intensity of the economy since the 1980s and that inclusion of data for more recent periods could result in a smaller elasticity estimate.

A shock to oil prices leads to a response in the price level similar in magnitude to the response in real GDP. The one-standard-deviation increase in oil prices leads to a 0.006 percent increase in the price level that is 90 percent complete in the first year. The maximum response is reached in eighteen months. Estimated at the peak of the response, the elasticity of the price level with respect to the real price of oil is 0.011 percent.

The impulse responses of real GDP and the deflator show that the responses for both GDP and the deflator are similar in magnitude. This similarity can be seen in the impulse response of nominal GDP, which is calculated from real GDP and the price level. After the initial period, the impulse is relatively constant throughout the time horizon and the magnitude is very small.[11] Such a finding is roughly consistent with Gordon's definition of neutral monetary policy. It also suggests the response of real GDP and the price level are consistent with a supply-side response to an oil price shock in which the shift in aggregate supply lowers output and raises prices.

Interest Rates and Monetary Responses. On the financial side, the oil price shock leads to increases in all the variables. An increase in oil prices leads to a rise in the federal funds rate, a smaller rise in the short-term rate, and an even smaller rise in the long-term rate. The spread between long- and short-term interest rates narrows because the long rate rises less than the short rate.

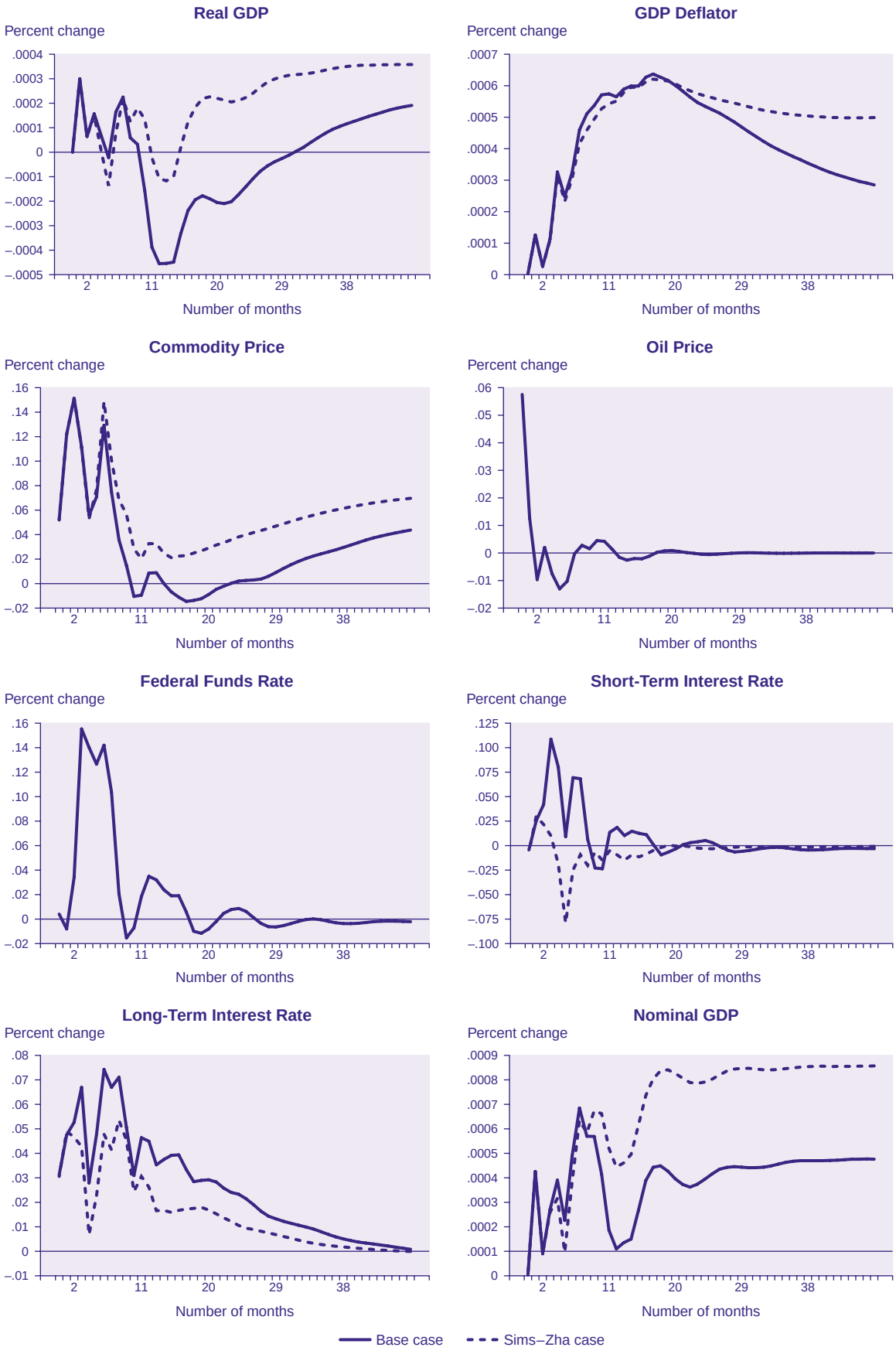
The federal funds rate rises 0.16 percent above its preshock value by the fourth month and then declines until the end of the time horizon. The oil price shock leads the short-term interest rate to increase 0.1 percent, also by the fourth month. The maximum increase in the long rate is 0.07 percent, which occurs at seven months.

BGW interpret a rising federal funds rate as tightening by the Federal Reserve, but other interpretations are possible. If interest rates rise in response to an oil price shock, a higher federal funds rate may be needed to hold nominal GDP constant.

Constant Federal Funds Rate Case. BGW interpret a constant federal funds rate as a neutral monetary response. However, if an oil price shock pushes nominal interest rates upward, holding the federal funds rate constant could mean an easing of monetary policy. To

Figure 1

Response to One-Standard-Deviation Oil Price Shock



examine this issue, we consider the impulse responses of aggregate economic activity to oil price shocks under a counterfactual case in which the federal funds rate is held constant. This approach follows the Sims–Zha experiment in the BGW study.

The dotted line in Figure 1 shows the Sims–Zha case in which the federal funds rate is held constant. As is shown, the GDP responses under the Sims–Zha and base cases are identical for the first three months and very similar for the next several months. At the ninth month, real GDP is higher under Sims–Zha than in the base case and continues to increase throughout the time horizon.

Similarly, the commodity price responses in the Sims–Zha and base cases are nearly identical for the first seven months. Commodity prices in the Sims–Zha case then rise above the base case response and remain higher until the end of the time horizon.

The Sims–Zha case also leads to a higher price level, but it takes some time for the price level to rise above the base case values. As with real GDP and commodity prices, the price level responds very similarly in the first seven months under both cases. The price level for the Sims–Zha case remains lower than the base case level until the twenty-third month, after which it surpasses the base level. Hence, the effect of holding the federal funds rate constant shows up quickly in real activity and commodity prices but is slower to appear in the general price level.

The responses of nominal GDP in the Sims–Zha and base cases are similar for the first nine months. After that, nominal GDP increases and remains at least twice its base-case value until the end of the estimated time horizon. Using Gordon's classifications of monetary policy, the gains in nominal GDP that arise under the Sims–Zha case suggest that holding the federal funds rate constant in the face of an oil price shock represents an accommodative monetary policy.[12] Monetary policymakers can offset the real losses arising from an oil price shock, but only at the cost of higher inflation.

SUMMARY AND CONCLUSION

We use impulse responses from a VAR model economy to assess how oil price shocks move through major channels of the U.S. economy to affect aggregate economic activity and the price level. The model represents the interactions between seven variables: real GDP, commodity prices, the GDP deflator, oil prices, the federal funds rate, and short- and long-term interest rates.

The impulse responses to an oil price shock show that the model responds to a temporary oil price shock with a decline in real GDP, increases in the federal funds rate and other interest rates, and an increase in the price level. The decline in real GDP and the rise in the deflator are similar in magnitude, and, consequently, nominal GDP remains relatively constant. Under Gordon's definition of monetary neutrality—holding nominal GDP constant—a rise in the federal funds rate can represent a neutral monetary policy response to an oil price shock.

When the federal funds rate is held constant under the Sims–Zha counterfactual case, we obtain impulse responses that could be seen as contrary to BGW's assertion that a constant federal funds rate represents a neutral monetary policy. When the rate is held constant in the face of an oil price shock, nominal GDP is higher, as are real GDP, commodity prices, and the price level—all of which are consistent with accommodative monetary policy. In addition, we find the response to oil price shocks appears more quickly in real GDP and commodity prices than it does in the overall price level.

The magnitude of the responses may provide a glimpse of how monetary policy responded to past oil price shocks. In particular, a constant nominal GDP suggests that the Federal Reserve maintained a generally neutral monetary policy. As Koenig (1995) remarks, "That a large fraction of the business cycle can be attributed to supply shocks may mean not that monetary policy is ineffective, but that the Federal Reserve has been doing its job."

NOTES

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1 The different definitions of neutrality need not be mutually exclusive. Koenig (1995) shows that when utility is logarithmic in consumption, the optimal policy would be for the monetary authority to target a geometric weighted average of output and the price level. Such a policy encompasses rules proposed by Hall (1984) and Taylor (1985). In the realistic special case where the market-clearing level of employment is independent of productivity, it is optimal for the monetary authority to target nominal spending.

[2] See Barro (1984) and Gordon (1998).

[3] Some have argued that Federal Reserve policy has changed over this estimation period. See Balke and Emery (1994). We follow BGW and allow for no structural changes in policy. Estimates using post-1982 data yield substantially similar results.

[4] Our ordering follows BGW. We also experimented with an ordering where oil prices were placed first in the model. The results were almost identical.

[5] Because we couldn't calculate variance decompositions with both oil price variables in the model, we calculated two sets of variance decompositions, one with the Hamilton net oil price and one with first differences of the log of oil prices. The two sets were almost identical. Table 1 presents the results with the Hamilton net oil price in the model.

[6] To estimate the impulse responses to a change in oil prices, we need to simultaneously generate impulses in both the oil price and the Hamilton net oil price. To accomplish this task, we use an identity equation that creates impulses in the Hamilton net oil price from impulses in oil prices.

[7] Oil prices are included in the commodity price index.

[8] This result led us to run a model without commodity prices to see if oil prices became a larger source of shock. We do not report any results here because the model was very unstable.

[9] Use of an identity equation to generate impulses in the Hamilton oil price from impulses in oil prices prevents the estimation of confidence bands.

[10] The reported value is calculated on a constant-elasticity basis.

[11] In a test of sensitivity, we ran an unrestricted version of the BGW model and calculated significance bands around the impulses in the base case. The results were substantially similar to those shown here, and the impulse response of nominal GDP to an oil price shock was insignificant in the base case.

[12] We found substantially similar results with an unrestricted version of the BGW model.

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Industry Mix and Lending Environment Variability: What Does the Average Bank Face?

Jeffery W. Gunther and Kenneth J. Robinson

The industrial restructuring of regional economies has resulted in a widespread and substantial reduction in the environmental risk faced by banks.

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Behind that old proverb "don't put all your eggs in one basket" lie the potential benefits of diversification. However, the idea that diversification is always enhanced by using more baskets can be misleading. In the world of equity investing, for example, the introduction of an additional stock to a portfolio can either increase or reduce the variability, or risk, of the portfolio's return. The new stock is more likely to reduce portfolio variability if changes in its return over time are not closely associated with changes in the return of the original portfolio.

In the same way individuals can hold portfolios of stocks, banks can be said to own a portfolio of earning assets. The most important collection of assets for most banks is their loan portfolio. And diversification in banks' loan portfolios is just as important as diversification in individuals' portfolios. A well-diversified loan portfolio does not eliminate all the risks banks face. But diversification can substantially limit banks' exposure to economic shocks and help reduce the variability of bank earnings.

Many banks in Texas experienced financial difficulties in the last half of the 1980s because their loan portfolios were concentrated in oil and real estate, industries that suffered severe shocks at that time. If the Texas banks had also been lending heavily in states with a significantly different industry mix, lending profits in those states may have helped offset the severe losses on loans extended in Texas. On the other hand, having additional lending operations in another heavily oil-dependent state, such as Oklahoma, would not have done much to help reduce the earnings variability of Texas banks.

If the benefits of diversification are well known, why might banks not have pursued a more diversified loan portfolio? One explanation might lie in legal restrictions the U.S. banking industry faced that limited diversification opportunities. Chief among these are the longstanding restrictions on interstate banking and branching that U.S. banks operated under until fairly recently. Individual states controlled the degree of branching allowed within their own borders, as well as the degree of interstate banking allowed across their borders. Although several methods were used to partially overcome these obstacles, geographic restrictions nevertheless made it difficult for banks to spread their operations across several regions.

In the late 1970s, restrictions on banks' geographic expansion began to ease. States increasingly allowed out-of-state banking organizations to acquire in-state banks, and intrastate branching restrictions were eliminated. This pro-

cess culminated with the passage of the Riegle–Neal Interstate Banking and Branching Efficiency Act of 1994, which authorized interstate banking and branching.

Given the breakdown of geographic banking restrictions, banks' diversification opportunities may have improved. In addition, recent structural changes within regional economies in many cases have left relatively volatile industries with a diminished role. These changes also may have improved diversification opportunities for banks by making the regional economies themselves more diversified.

We look for evidence on the potential risk-reducing effects of these changes by concentrating on the implications of a bank's location for the nature of its lending landscape. Our representation of a bank's lending environment is obtained by forming industry portfolios for U.S. banking organizations based on the extent of their presence in different states and the mix of economic activity found in those states. We generate these "environmental portfolios" using data from 1985, just prior to the oil-price-induced regional recessions that occurred in the latter 1980s, and 1996, the latest year for which data on state gross domestic product are available.

If the stability of the bank lending environment has improved, we would expect that the variability underlying banks' environmental portfolios declined over this period, which is indeed what we find. We then investigate whether this reduction in risk stems from a geographic restructuring of the banking system, or whether the states now have a more diverse mix of economic activity, or both. Our evidence indicates both of these effects are at work, with the industrial diversification of state economies providing the most benefits.

EVIDENCE ON BANK DIVERSIFICATION

Diversification benefits are often possible when the cash flows or earnings potentials from different stocks, loans, or any type of economic activity or asset do not move in tandem. By choosing new markets or new products whose earnings move differently from those generated by existing lines of business, the variability of overall firm earnings often can be reduced. On the other hand, if the returns generated by individual markets tend to move together while the new markets are significantly riskier than existing markets, geographic expansion might actually increase risk.[1]

Using stock market data, Demsetz and Strahan (1997) find a negative relationship between banking organization size and measures of firm-specific risk, indicating that diversification and bank size are linked. However, these authors also find that larger banking organizations tend to operate with higher amounts of leverage and greater commercial loans and that these riskier portfolio components can offset the risk-reducing benefits of diversification.

Economic researchers have studied bank diversification mostly from a geographic perspective.[2] Geographic diversification would allow losses incurred in one region of the country to be offset with profits made in another. In this regard, Benston, Hunter, and Wall (1995) find that a desire for greater earnings diversification played a significant role in motivating bank mergers and acquisitions in the early to mid-1980s.

Neely and Wheelock (1997) find evidence that U.S. banks are not very geographically diversified. In their analysis, state-level bank earnings are affected by state-level per capita income growth. As these authors point out, "If the investment and deposit bases of banks were extensively diversified across states, we would not expect to find this systematic relationship between a bank's earnings and the per capita income of the state in which it is headquartered" (Neely and Wheelock, 1997, p. 31).

Liang and Rhoades (1988) find a negative relationship between geographic expansion and different measures of risk. However, these authors also find lower levels of earnings and capital for banks with more geographic coverage. Rose (1995) finds some evidence that at sufficiently high levels of geographic expansion, earnings are more stable and risks reduced. Fraser et al. (1997) use stock price data to estimate the effects of the Office of Thrift Supervision's decision to allow interstate branching for federally chartered savings and loan associations. These authors find significant positive wealth effects associated with this decision for both large banks and thrifts.

Finally, for some evidence that removal of intrastate branching restrictions improves bank efficiency and contributes to economic growth, see Jayaratne and Strahan (1997).

ASSESSING A BANK'S ENVIRONMENTAL PORTFOLIO

Previous studies have used different variables to measure the extent of a bank's geographic coverage. Some examples are the percentage of consolidated assets booked by affiliate out-of-state banks and the number of states

Table 1
Components of State Gross Domestic Product

- Agriculture, forestry, and fishing
- Mining (less oil and gas extraction)
- Oil and gas extraction
- Construction
- Durable goods manufacturing
- Nondurable goods manufacturing
- Transportation and public utilities
- Wholesale trade
- Retail trade
- Finance, insurance, and real estate
- Services
- Government

in which an interstate banking organization has a full-service office.[3]

Our starting point is that a bank's lending activity can be expected to be heavily influenced by economic activity within the bank's operating environment.[4] As a result, in the context of diversification, the most relevant aspect of a bank's geographic location may be the industry mix of the region or regions in which the bank operates.

With these considerations in mind, we take a novel approach by constructing environmental portfolios of industries for banking organizations based on the extent of the banks' presence in individual states and the mix of economic activity found in those states. For example, a bank operating only in Texas will likely find its earnings sensitive to the mix of economic activity in that state. But a banking organization with operations in both Texas and California would be affected by the economic structure of both these states, most likely in proportion to the magnitude of its presence in each state.

To measure the mix of economic activity within individual states, we use data from the Bureau of Economic Analysis on state gross domestic product and its major components (*Table 1*). For each state, we calculate the relative importance of each major component in 1985 and 1996. For example, in Texas the oil industry accounted for almost 14 percent of state gross domestic product in the mid-1980s, whereas by the mid-1990s oil's share had slipped to about 7 percent. These economic components are used as weights or measures of the relative importance of different industries in determining the lending environment banking organizations face in a given state.

We also need a measure of the relative importance of a banking organization's presence in each state. For this measure, we use the share of the organization's total deposits in every state in which it operates. A bank with 80 percent of its deposits in Texas is assumed to be highly exposed to the ups and downs of the state's prominent industries. These state deposit shares are calculated for 1985 and 1996 using branch-level deposit data from the FDIC's Summary of Deposits.

For our environmental portfolios, the industries listed in Table 1 represent the counterparts to portfolio assets, and annual industry growth rates represent the counterparts to asset returns. To arrive at the overall return for a bank's environmental portfolio, each industry growth rate, or return, must be weighted by both the relative importance of the industry in each state and the share of the banking organization's total deposits in each state (see the box titled "Constructing Environmental Portfolios").

MEASURING PORTFOLIO RISK

Improvements in diversification are measured by how much risk is reduced. For our purposes, we want to estimate whether the overall risk of banks' operating environments has declined from the mid-1980s to the mid-1990s.

One component of our measure of the overall risk underlying environmental portfolios is known as portfolio variance, which represents the variability of the portfolio's return. If the industry growth rates were all independent of each other, calculation of the overall variance of each bank's environmental portfolio would be simple. In this case, the variance of an environmental portfolio would simply be the sum of the industry growth variances, with each industry variance weighted by a measure of the importance of that industry in the portfolio.

However, because the growth rates of the various industries are correlated, or move together, the variance of a given bank's portfolio also must take account of the *covariance* of the industries that make up the portfolio. The covariance is a measure of how the industries move together (or covary). If the industry growth rates move in the same direction, their covariance is positive; if they move in opposite directions, their covariance is negative. If the growth rates are totally unrelated, their covariance is zero.

The underlying variability, or variance, of each bank's environmental portfolio turns out

to be a weighted sum of both the underlying industry growth variances and the covariances of the different industries that make up the portfolio. Lower values of this portfolio variance measure indicate more stable lending environments.

In the analysis that follows, we gauge the risk of environmental portfolios in terms of a related measure known as the coefficient of variation. This measure is equal to the square root of the variance of an environmental portfolio, or its standard deviation, divided by—or scaled by—the portfolio's average growth rate.[5] For more on the calculation of portfolio variance and the coefficient of variation, see the box titled "Constructing Environmental Portfolios."

A CHECK ON OUR RISK MEASURE

Before examining trends in the risk of bank lending environments, we provide some evidence on our methodology's appropriateness. To support our use of environmental portfolios' coefficients of variation as an indicator of risk in bank lending environments, we estimate a bank failure model for the latter 1980s, when many states experienced severe economic and banking difficulties. If our risk measure is accurate, bank failures should have been more likely in regions with the potential for high variability, as indicated by the coefficient of variation. While the reverse may have sometimes occurred, the general tendency should have been for regions with a relatively volatile industry mix to be more susceptible to episodes of economic and banking difficulties.

In the other parts of this paper, we analyze diversification issues at the organization level rather than the bank level because important connections exist among subsidiary banks operated by the same holding company. We do not want to ignore these connections totally by treating affiliated banks as separate organizations. However, because our only purpose at this point is to provide evidence on the relevance of our measure of environmental variability in identifying risk, we maintain direct comparability with the existing literature on bank failure by examining failure at the bank rather than the organization level. Hence, only the state in which the bank is located needs to be considered in constructing its environmental portfolio.[6]

We use five financial indicators, each measured as a percentage of gross assets, to characterize the financial posture of individual banks as of year-end 1985, just before the wave of U.S. bank failures in the late 1980s. Equity capital, which serves as a buffer protecting a bank's solvency against financial losses, is our measure of capital adequacy; more capital is expected to reduce the chance of failure. Troubled assets—

Constructing Environmental Portfolios

A portfolio typically is a collection of earning assets such as stocks, bonds, or, in the case of banks, loans and securities, among other assets. For the purposes of our analysis, we define a bank's environmental portfolio as the mix of industries to which the bank is directly exposed by virtue of the geographic location of its offices.

To construct a given bank's environmental portfolio, we use the composition of economic activity or gross domestic product (*GDP*) in the state or states in which the bank has operations. The industries we use to describe a state's economy are identified in Table 1.

We measure the returns for each industry by calculating the growth rate at the national level of each of the individual components of *GDP*:

$$(1) \qquad g_{i,t} = \frac{GDP_{i,t}}{GDP_{i,t-1}} - 1.$$

From Equation 1, we have, for each period, the returns $g_1, g_2, \ldots g_n$ for the $n = 12$ different components of *GDP* identified in Table 1.

Each bank's environmental portfolio consists of shares (α_i) in each of these industries. The industry shares account for two important factors that potentially affect a bank's returns. The first is how important a bank's presence is in each state, and the second is how important a particular component of *GDP* is in each state:

$$(2) \qquad \alpha_{b,i,t} = \sum_s \left[\frac{DEPOSITS_{b,s,t}}{\sum_s DEPOSITS_{b,s,t}} \right] \left[\frac{GDP_{i,s,t}}{\sum_i GDP_{i,s,t}} \right].$$

In Equation 2, $DEPOSITS_{b,s,t}$ measures the level of banking organization *b*'s deposits in state *s* at time *t*, and $GDP_{i,s,t}$ is component *i* of *GDP* for state *s* in time *t*. The first part of Equation 2 represents the proportion of a bank's total deposits in each state. The second part represents the proportion of each state's *GDP* accounted for by industry *i*.

Since we are ultimately concerned with identifying whether banks' environmental portfolios have become more diversified, we need to calculate the variance of the returns on these environmental portfolios. Assuming normality, the variance formula is given as:

$$(3) \qquad V_{b,t} = \sum_{i=1} \sum_{j=1} \alpha_{b,i,t} \, \alpha_{b,j,t} \, \sigma_{i,j} \, .$$

In Equation 3, $\sigma_{i,j}$ is the covariance of industry *i* with industry *j*. When *i* equals *j*, this term is the variance of growth in industry *i*. There are *n* variance terms and $n(n-1)$ covariance terms.[1]

The variability statistics reported in the paper are based on the coefficient of variation, which is equal to the square root of the variance of an environmental portfolio, or its standard deviation, divided by—or scaled by—the portfolio's average growth rate. The average growth rate of a portfolio characterized by the industry shares α_i is calculated as:

$$(4) \qquad G_{b,t} = \sum_{i=1} \alpha_{b,i,t} \, \bar{g}_i \, .$$

In Equation 4, $\bar{g}_i$ represents the average rate of growth for industry *i*. Hence, our measure of risk is given as:

$$(5) \qquad R_{b,t} = \frac{\sqrt{V_{b,t}}}{G_{b,t}}.$$

We construct environmental portfolios for each banking organization in both 1985 and 1996. The variances and covariances of the g_i, which are needed to calculate the portfolio variances, are calculated using national data from 1947 through 1996. These data were obtained from the Bureau of Economic Analysis.

[1] For more on the calculation of portfolio variances, see Fama and Miller (1972, pp. 234–35).

Table 2
Estimated Influences on the Probability of Bank Failure, 1986–89

Variable	Parameter estimate
Constant	–2.705 (.123)
Equity capital	–5.149 (.906)
Troubled assets	10.708 (.751)
Net income	–5.846 (1.240)
Investment securities	–2.554 (.228)
Large certificates of deposit	2.831 (.202)
Coefficient of variation	2.523 (.198)

NOTES: Standard errors are in parentheses. Each variable is significant at the 1-percent level. The estimates were obtained using the probit model. For more on this statistical procedure, see Maddala (1983, pp. 22–27). Of the 13,988 banks used in the analysis, 684 failed during 1986–89.

including loans past due ninety days or more and still accruing interest, nonaccrual loans, and other real estate owned (which, for the most part, consists of foreclosed real estate)—serve as our measure of asset quality. More troubled assets should increase the probability of failure. We use net income to measure the strength of earnings. Higher income would be expected to reduce the likelihood of failure. Liquid assets, such as investment securities, enable a bank to respond quickly to unexpected demands for cash and typically reflect relatively conservative financial strategies. As such, large holdings of investment securities might reduce the chance of failure. On the other hand, volatile liabilities, such as large certificates of deposit, often reflect relatively aggressive financial strategies, impose high interest expenses, and are subject to quick withdrawal. As a result, a high funding dependence on large certificates of deposit might increase the probability of failure.

In addition to these financial indicators, we include in the failure model the coefficient of variation for each bank's environmental portfolio in 1985. A finding that banks in states with a relatively high coefficient of variation tended to fail at a higher rate during 1986–89 would support our use of the coefficient of variation as an indicator of environmental risk.

The estimation results for the bank failure model are shown in Table 2. Each of the financial indicators is statistically significant and has the expected effect on the likelihood of failure. In addition, a high coefficient of variation for a bank's environmental portfolio raises the bank's probability of failure. This finding indicates our methodology is useful in identifying risk in bank lending environments.

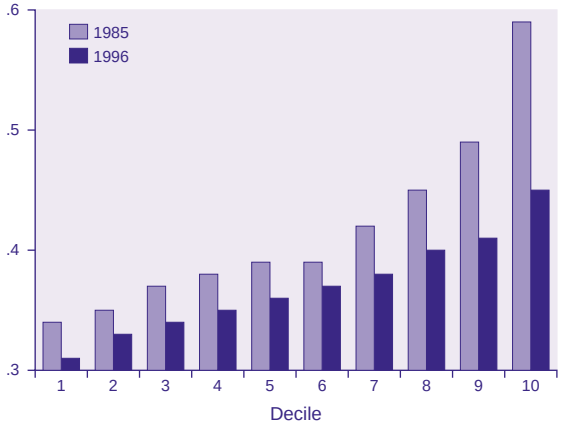
PORTFOLIO RISK: 1985 VERSUS 1996

What, then, has happened to the risk of bank lending environments in recent years? We calculated the average variability of banks' environmental portfolios for both 1985 and 1996. In calculating these averages, we weighted each bank's coefficient of variation by the bank's share of total industry deposits. Weighting by deposit size allows large banks to have a greater influence on the results of our analysis, reflecting their greater presence in the industry as measured by their market share. For 1985, we were able to collect data on 11,331 U.S. banking organizations. Reflecting the consolidation trends in the U.S. banking industry, only 6,700 banking organizations reported the branch deposit data necessary to construct the 1996 portfolios. In 1985, the average coefficient of variation for banks' environmental portfolios was 0.416. By contrast, in 1996, average environmental variability was 0.369, a reduction of 11 percent.

In an effort to look behind these aggregate results, we ranked the banks by their environmental variability and divided them into ten groups, both for 1985 and 1996. Each of the ten groups represents approximately 10 percent of total industry deposits. We then calculated the deposit-weighted average coefficient of variation for each group. The result is shown in Figure 1. The average coefficient of variation for each group of banks is markedly lower in 1996 than in 1985. The average coefficient of variation for the low-variability group (group 1) was 0.337 in 1985 versus 0.313 in 1996, a reduction of 7 percent. The average coefficient of variation for the high-variability group (group 10) was 0.593 in 1985 versus 0.447 in 1996, a reduction of 25 percent.

From these results, U.S. banks have experienced a substantial reduction in the underlying variability of their operating environment. What remains unanswered, though, is whether this

Figure 1
Banking System Diversification
Coefficient of variation, deposit-weighted average



NOTES: Rank based on coefficient of variation, defined as the standard deviation of the portfolio divided by the average return on the portfolio. Each of the ten groups represents approximately 10 percent of total banking industry deposits.

SOURCES: FDIC Summary of Deposits; Bureau of Economic Analysis.

result is due to a geographic restructuring of the banking system, an industrial restructuring of regional economies, or some combination of these two possibilities.

IS IT THE BANKS OR THE ECONOMY?

To discover the possible sources of the observed reduction in environmental variability, we conducted some simulations by changing the nature of the weights used in forming the banks' environmental portfolios for 1996. In the first experiment, we calculated the banks' portfolios using the deposit shares as they existed in 1996 but represented the industry mix of state economies using the industry shares that had prevailed in 1985. This simulation represented the combination of 1996 banking structure and 1985 economic structure. We then compared the environmental variability associated with this simulated 1996 environment to underlying economic variability in 1985. The difference between the two provides an estimate of the effect of bank structure changes on the underlying risk of bank operating environments.

Similarly, in the second experiment, we calculated the banks' portfolios using the state industry shares as they existed in 1996 but represented the geographic location of banking offices using the deposit shares that had prevailed in 1985. This simulation represented the combination of 1996 economic structure and 1985 banking structure. We then compared the environmental variability associated with this simulated 1996 environment to underlying economic variability in 1985. The difference between the two provides an estimate of the effect of structural changes in state economies on the underlying risk of bank operating environments.

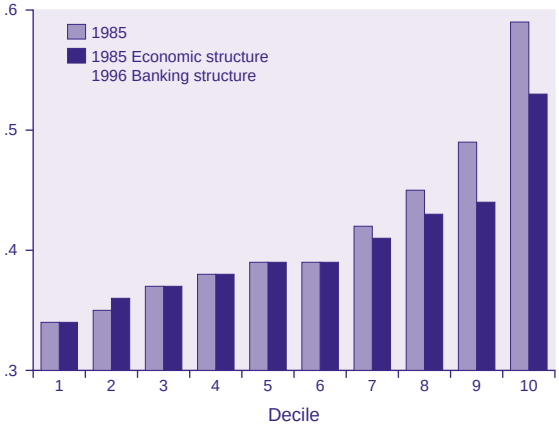
These experiments can provide only a qualitative assessment of the relative importance of the types of effects—bank structure changes and economic structure changes. The assessments are only qualitative because they do not succeed in decomposing the total effect into two parts; that is, the sum of the two simulated effects is not necessarily equal to the observed overall change in environmental variability.

Effect of Bank Structure Changes

Figure 2 shows the results from simulating portfolio variances in 1996 using actual banking structure in that year combined with the industrial structure from 1985. The banks were again ranked based on their coefficient of variation and segmented into ten groups. While the industrywide reduction in variability from 1985 to the simulated 1996 environment is only about 3 percent, portfolio variance fell appreciably for the high-variance groups of banks. For the group with the highest variability (group 10), the results indicate a 10-percent reduction in environmental portfolio variance, from 0.593 in 1985 to 0.534 in 1996.

This finding indicates geographic restructuring has played an important role in reducing

Figure 2
Effect of Bank Structure Changes on Diversification
Coefficient of variation, deposit-weighted average



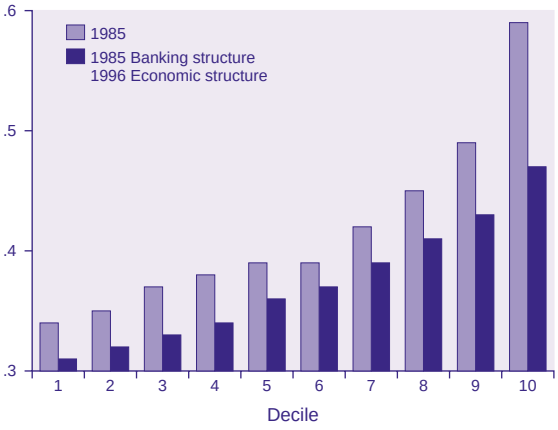
NOTES: Rank based on coefficient of variation, defined as the standard deviation of the portfolio divided by the average return on the portfolio. Each of the ten groups represents approximately 10 percent of total banking industry deposits.

SOURCES: FDIC Summary of Deposits; Bureau of Economic Analysis.

Figure 3

Effect of Economic Structure Changes on Diversification

Coefficient of variation, deposit-weighted average



NOTES: Rank based on coefficient of variation, defined as the standard deviation of the portfolio divided by the average return on the portfolio. Each of the ten groups represents approximately 10 percent of total banking industry deposits.

SOURCES: FDIC Summary of Deposits; Bureau of Economic Analysis.

the environmental variability banks face. Figure 2 shows a tendency for risk-reducing structural change to affect mostly the high-variance components of the banking industry, as the observed declines in variance did not occur across the board. This trend is consistent with the view that consolidation through bank failures, mergers, and acquisitions has whittled down the segments of the industry exposed to the greatest environmental variability.

Effect of Economic Structure Changes

In response to economic shocks experienced during 1985–96, the industrial mix of some states has undergone significant change. A good example is the oil bust of the mid-1980s. Regional economies with a high dependence on oil and gas production initially suffered severe recessions in response to the fall in energy prices. However, many of these economies have since transformed themselves by boosting the importance of other sectors—so much so that when oil prices plummeted more recently, the ill effects were much more limited. As this example shows, painful shocks often result in readjustments that diversify regional economies away from a heavy dependence on relatively volatile industries.

Our purpose in this section is to gauge the importance of these changes in reducing the environmental variability faced by banks. Figure 3 shows the results from simulating portfolio variances in 1996 using the actual economic structure in that year combined with the banking structure from 1985. Overall, average variability fell 10 percent from 1985 to the simulated environment in 1996. The group with the highest variability (group 10) shows a 21-percent reduction in environmental variability, from 0.593 in 1985 to 0.467 in 1996. Hence, we can conclude that industry diversification at the state level has led to a much more stable lending environment for banking organizations.

CONCLUSION

Diversification opportunities have increased for the U.S. banking system. Our results indicate geographic restructuring of the banking industry has helped reduce the variability underlying bank loan markets, and the risk-reducing effects have been concentrated in the high-variance components of the banking industry. In addition, the industrial restructuring of regional economies has resulted in a widespread and substantial reduction in the environmental risk faced by banks.

And these results actually understate the potential for diversification that has emerged in recent years. In our analysis, a bank's lending environment is defined according to the geographic location of its deposit base. Such a regional definition is rapidly losing its relevance as new information technologies enable banks to lend increasingly to individuals and businesses outside the scope of traditional, geographically defined loan markets.

NOTES

[1] As Rose (1995) points out, geographic expansion also might raise operating costs and risks for a banking organization, potentially offsetting any gains from a more diversified portfolio.

[2] For some evidence of diversification opportunities associated with banks' products, see Boyd and Graham (1988); Rosen, Lloyd-Davies, and Humphrey (1989); Templeton and Severiens (1992); and Wall, Reichert, and Mohanty (1993).

[3] See Rose (1995, pp. 304–5) for a number of possible measures of geographic coverage.

[4] Unless otherwise mentioned, we use the term "bank" as a synonym for "banking organization." That is, in most cases, our analysis is conducted using data at the organization level rather than the individual bank level.

[5] The coefficient of variation is a commonly used measure of risk in diversification studies. While we report results in terms of the coefficient of variation, our findings are qualitatively identical when the standard deviation of portfolio growth is used to measure risk.

Scaling the standard deviation by average growth provides a measure of the magnitude of economic variability relative to trend performance.

[6] This was true in 1985 but is not today, given the prevalence of interstate branching.

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Between a Rock and a Hard Place: The CRA–Safety and Soundness Pinch

Jeffery W. Gunther

Banking entails risk, but can regulators decide how much risk is appropriate?

The rising costs of complying with supervisory demands have brought the issue of regulatory burden to the attention of both lawmakers and bank regulators. But one relatively underappreciated aspect of regulatory burden is the potential for the supervisory process to impose conflicting demands on banks.

In October 1977, Congress passed the Community Reinvestment Act (CRA) as Title VIII of the Housing and Community Development Act. The legislation was designed to encourage commercial banks and thrifts to help meet the credit needs of their communities, including low- and moderate-income neighborhoods, in a manner consistent with safe and sound banking practices. In 1989, the Financial Institutions Reform, Recovery, and Enforcement Act established four possible composite CRA ratings: 1—outstanding; 2—satisfactory; 3—needs to improve; and 4—substantial noncompliance. Federal agencies historically considered twelve factors in deciding how well financial institutions were meeting the goals of the CRA (see Garwood and Smith 1993). Revised regulations announced in April 1995 replaced these factors with three tests—of lending, investment, and service—with the lending test receiving the most weight.[1]

Examiners have always focused on lending activity in determining a bank's CRA rating. The revised CRA rules reflect this focus, as it is difficult for a bank to receive an overall satisfactory rating unless its lending performance is satisfactory. In rating CRA compliance, regulators assess such factors as a bank's overall lending activity in its market area and the degree to which the bank provides credit throughout its market, with particular emphasis on low- and moderate-income neighborhoods and individuals as well as small businesses and farms.

But regulators use very different criteria in assigning safety and soundness ratings to banks. In 1979, federal agencies adopted the Uniform Financial Institutions Rating System. Under this system, ratings originally were derived from on-site evaluations of five factors—capital adequacy (*C*), asset quality (*A*), management (*M*), earnings (*E*), and liquidity (*L*). This CAMEL rating system was revised on January 1, 1997, to include a sixth component.[2] The new *S* component focuses on sensitivity to market risk, such as the risk arising from changes in interest rates. Like the earlier CAMEL ratings, the CAMELS ratings have five levels: 1—basically sound in every respect; 2—fundamentally sound but with modest weaknesses; 3—financial, operational, or compliance weaknesses that cause supervisory concern; 4—serious financial weaknesses

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that could impair future viability; and 5—critical financial weaknesses that render the probability of near-term failure extremely high. (For simplicity, this article applies the term *CAMEL* to both CAMEL and CAMELS ratings.)

Even this brief description of CRA and safety and soundness ratings reveals the potential for conflict. Although safety and soundness is a factor in CRA ratings, banks are encouraged to boost the availability of credit throughout the communities they serve. In contrast, the primary focus of the safety and soundness exam process is the containment of risk in general and credit risk in particular. Lacker (1994) points out some of the potential implications of requiring banks to lend in certain areas or to certain borrowers, including the possibility that regulators might be culpable in the event of large-scale losses on CRA-related loans.

This article formulates and tests hypotheses about the way the potential conflict between CRA objectives and safety and soundness considerations may actually play out in the day-to-day operations of the supervisory process. The next section discusses two types of events involving potential conflict. A framework is then developed for empirically identifying the determinants of CAMEL and CRA ratings, with the goal of testing for conflict between the demands placed on banks by CRA exams, on one side, and safety and soundness exams, on the other. For smaller sized banks in particular, the findings of this exploratory study point to a supervisory process in pursuit of conflicting goals and suggest more thought may be needed regarding the appropriateness of CRA regulations. The article concludes with ideas for further research in this area.

TWO FACES OF BANK REGULATION

One type of potential conflict between CRA objectives and safety and soundness concerns revolves around risks associated with the act's attempt to boost the supply of credit. The second potential conflict discussed in this article involves the resource constraints that arise when a bank has financial problems and is struggling to cope with them.

Aggressive Strategies Hypothesis

To the extent that the CRA exam process rewards aggressive banking strategies, a potential conflict arises with the primary goal of the safety and soundness exam process, which is to contain risk. Increases in lending could tend to help CRA ratings but could hurt CAMEL ratings by triggering asset quality problems. Similarly, if CRA examiners credit banks for pursuing generally aggressive strategies that support high levels of lending but might detract from safety and soundness, the implementation of such strategies could push CAMEL and CRA ratings in opposite directions.

A good example involves the tendency for growth- and lending-oriented banks to manage their equity positions at lower levels than do more conservative banks. As a result, relatively low capitalization may be a common feature of the strategies that closely conform to the credit-enhancing objectives of the CRA. However, banks that manage their capital in this manner leave themselves with a comparatively small cushion between financial loss and insolvency and so may be viewed less favorably from a safety and soundness perspective. This type of conflict and its various implications can be referred to as the *aggressive strategies hypothesis.*

Necessary Retrenchment Hypothesis

The second hypothesis involves the possibility that financial losses might necessitate a redirection of resources, away from CRA objectives and to the process of financial recovery. When a bank encounters financial problems, current legislation and regulations governing the safety and soundness exam process dictate financial retrenchment and corrective action to avoid possible speculative or fraudulent endgames by bank owners and managers, while, at the same time, facilitating either the bank's financial recovery or, if necessary, its prompt closure. The possibility then arises that the CRA exam process may not take into full account the slowdown in CRA-related activities that the situation requires. If this occurs, the CRA exam process may tend to assign inferior ratings to banks struggling with financial difficulties. In this case, the CRA exam process would conflict with safety and soundness considerations. This type of conflict and its various implications can be referred to as the *necessary retrenchment hypothesis.*

A Clarification

It is important to note that both the aggressive strategies and necessary retrenchment hypotheses can operate on two levels. The first concerns whether examiners rate banks in a manner consistent with the hypotheses. The empirical work that follows addresses this issue.

A second question then arises regarding the extent to which bank behavior can be attributed to the rating schemes examiners use. Even if the CRA exam process does reward aggressive

growth and lending strategies, it cannot be inferred from this alone that aggressively managed banks adopt such strategies in order to attain superior CRA ratings. Other motivations may be at work. Similar reasoning applies to safety and soundness exams.

As a result, the scope of this article is limited to the goals of the supervisory process, leaving the task of assessing the success of supervision in motivating bank behavior to other studies.

EMPIRICAL APPROACH

The statistical model used to test the hypotheses under consideration accommodates a distinguishing feature of CRA and CAMEL ratings. The ratings themselves are not continuous variables. In addition, an unsatisfactory safety and soundness rating corresponds to a CAMEL rating of 3, 4, or 5. The unsatisfactory CRA ratings are 3 and 4. Hence, if the purpose is to identify factors that contribute to unsatisfactory ratings, the variables to be explained are of the either–or type; that is, banks are either satisfactory or unsatisfactory from safety and soundness and CRA perspectives.

Because the ratings are in this way limited to certain categories or levels, as opposed to varying continuously over an unlimited range, the statistical estimation uses so-called limited dependent-variable techniques. More specifically, the probit model is used to assess various factors' influences on CRA and CAMEL ratings. For a description of the probit model, see Greene (1993).

As discussed in the next section, another key element in the approach involves the choice of appropriate variables for inclusion in the model as potential determinants of CRA and CAMEL ratings. To include banks of all sizes and locations in the analysis, data availability considerations necessitate a focus on key financial variables that characterize a bank's overall strategy and condition. Variables that address more specific aspects of bank behavior in relation to CRA objectives are not universally reported. The general or summary nature of the variables used here may make the model most relevant for smaller sized banks, where the types of information available to CRA examiners tend to be relatively limited.

DATA

This section describes the variables the analysis uses and their predicted effects on CRA and CAMEL ratings based on the hypotheses developed above. Sample design is also considered.

Variables

To estimate the model, it is necessary to identify sets of variables upon which the results of safety and soundness and CRA exams may depend. Numerous factors are undoubtedly considered in assigning both types of ratings. However, data availability issues, coupled with the need for a parsimonious specification, suggest the best approach is to focus on key variables capable of neatly summarizing a bank's strategy and condition.[3]

Examiners looking at CRA compliance have always maintained a strong focus on lending activity. If in valuing lending activity CRA examiners knowingly or unknowingly reward aggressive banking strategies, financial characteristics typically associated with such strategies might help predict how well a bank does on its CRA exam.

The model has three proxies for aggressive banking strategies to help explain CRA ratings. The first is the ratio of equity capital to total assets (*CAR*). As discussed earlier, it is natural for growth- and lending-oriented banks to manage their equity positions at lower levels than relatively conservative banks. As a result, relatively low capitalization may be a common feature of the strategies that closely conform to the credit-enhancing objectives of the CRA. High *CAR* values are expected to enhance the chances of receiving a substandard CRA rating. On the other hand, because capital is a buffer protecting a bank's solvency from financial loss, a low capital-to-asset ratio may detract from safety and soundness, so that high values of *CAR* should reduce the likelihood of a substandard CAMEL rating. The hypothesized opposing effects of this variable are implied by the aggressive strategies hypothesis.

The model's second proxy for aggressive banking strategies is the ratio of investment securities to total assets (*SEC*). As with low capital, relatively low holdings of securities, which provide a bank with liquidity, may be a common feature of the strategies that closely conform to the credit-enhancing objectives of the CRA. However, as a measure of liquidity, investment securities should reduce the chances of receiving a substandard CAMEL rating. The hypothesized opposing effects of this variable are implied by the aggressive strategies hypothesis.

The model's final proxy for aggressive banking strategies is the loan-to-asset ratio (*LAR*), which provides a direct measure of the

Table 1
Expected Effects of Explanatory Variables

Variable	Definition	Hypothesis	Effect on likelihood of a substandard: CAMEL rating	Effect on likelihood of a substandard: CRA rating
CAR	Ratio of equity capital to assets	*Aggressive strategies*	Reduce	Increase
SEC	Ratio of investment securities to assets	*Aggressive strategies*	Reduce	Increase
LAR	Ratio of total loans to assets	*Aggressive strategies*	Increase	Reduce
TAR	Ratio of past-due loans, nonaccrual loans, and other real estate owned to total loans and other real estate owned	*Necessary retrenchment*	Increase	Increase
ROA	Ratio of net income to average assets	*Necessary retrenchment*	Reduce	Reduce
SIZE	Log of total assets	*Market resources*	Reduce	Reduce
MSA	Equal to 1 if the head office is located in a metropolitan statistical area	*Urban location*	Increase	Increase
ECON	Prior year's logarithmic growth in nominal state gross domestic product	*Economic conditions*	Reduce	Reduce

scale of lending activity. High values for this ratio should reduce the chances of receiving a substandard CRA rating. The aggressive strategies hypothesis would predict that while helping a bank's CRA rating, a high loan-to-asset ratio also might trigger asset quality problems and thereby detract from safety and soundness. The credit risk associated with bank lending has been the primary contributor to financial problems in recent banking downturns.

Measures of bank performance are obvious candidates for inclusion in the model as explanatory variables for CAMEL ratings. As a bank's financial condition deteriorates, its chances of receiving an unsatisfactory CAMEL rating should increase. The model includes two measures of financial condition. The troubled-asset ratio (*TAR*) measures bad outcomes on lending decisions and is expected to increase the likelihood of a substandard CAMEL rating. Troubled assets are defined as loans past due ninety days or more that are still accruing interest, nonaccrual loans, and other real estate owned, which consists primarily of foreclosed real estate. The troubled-asset ratio is troubled assets divided by the sum of total loans and other real estate owned. As such, the ratio primarily reflects the quality of the loan portfolio, but not the scale of bad loan outcomes relative to assets.[4] In addition, the return on assets (*ROA*) indicates the strength of current earnings and so should reduce the chances of a substandard safety and soundness rating. The necessary retrenchment hypothesis would predict that, in hurting a bank's CAMEL rating, deteriorating financial conditions might also necessitate a retrenchment from CRA objectives and result in a substandard CRA rating.

In addition to the variables serving as proxies for financial condition and aggressive banking strategies, the model has three other types of indicators. Bank size is measured by the natural logarithm of total assets (*SIZE*). Large banks may have more financial flexibility than small banks because of greater diversification potential and closer access to financial markets. These types of considerations, which can be called the *market resources hypothesis*, suggest relatively large banks may have less difficulty maintaining satisfactory CAMEL and CRA ratings.

An urban location may subject banks to especially strong competitive pressures, thereby increasing the difficulty of maintaining good ratings. In addition, because such banks may be closer to low-income neighborhoods given priority by the CRA, an urban location may result in greater challenges with respect to CRA compliance, thereby further increasing the difficulty of maintaining a satisfactory rating. The model has an indicator variable (*MSA*) for location in a metropolitan statistical area to control for these potential effects, which can be called the *urban location hypothesis*.

And finally, the prior year's logarithmic growth in nominal state gross domestic product (*ECON*) is included in both equations to control for potential economic effects. By contributing to a favorable operating environment, a strong economy might, under the *economic conditions*

hypothesis, help reduce the chances of receiving a substandard CAMEL or CRA rating. Table 1 summarizes the model's variables and their expected effects on the likelihood of a substandard CAMEL or CRA rating.

Sample Design

Several considerations help shape the sample of regulatory ratings the analysis uses. First, an effort is made to ensure the CAMEL and CRA ratings used were assigned at times as close as possible to the date of the financial variables. Cole and Gunther (1998) show CAMEL ratings can become stale quickly, and the same may be true for CRA ratings. To match up the two types of ratings, the analysis considers only the first safety and soundness or CRA exam opened in a given year. Moreover, if a safety and soundness exam was conducted in a given year but a CRA exam was not, the corresponding CAMEL rating is discarded. Similarly, CRA ratings without companion CAMEL ratings are excluded from the analysis. Financial data are from regulatory reports as of the end of the previous year. Matching up the two types of ratings in this manner provides an opportunity to examine the extent to which CRA and safety and soundness problems coincide.

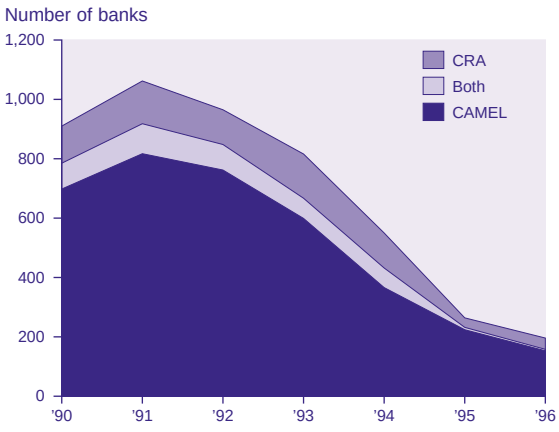
In addition, each bank included in the analysis is required to have been active for at least four years. This restriction is necessary to avoid the atypical financial characteristics of young banks. Also, banks reporting no loans at all are excluded. For consistency, the analysis is limited to banks; savings and loan institutions examined by the Office of Thrift Supervision are not considered. Finally, the limited availability of CRA ratings prevents the analysis from extending prior to 1990, while a paucity of problem CRA ratings precludes meaningful estimation subsequent to 1996. The resulting sample contains 25,424 pairs of CAMEL and CRA ratings.[5] Banks are included in the sample more than once if they received a pair of ratings in more than one year. The 25,424 pairs of CAMEL and CRA ratings used in the analysis represent observations on 10,910 individual banks.

Figure 1 shows the number of problem CAMEL and CRA banks in the sample. The relatively large number of problem banks in the early years of the sample reflects the energy and real estate downturns that adversely affected the banking industry in several regions during that period. There is a noticeable tendency for CAMEL and CRA problems to grow and decline in tandem, suggesting the existence of a direct relationship or common cause. On the other hand, a sizable number of banks with safety and soundness problems avoided substandard CRA ratings. Similarly, many banks with CRA shortcomings nevertheless received favorable CAMEL ratings. The substantial degree of independence in the ratings is consistent with the view that factors exist that either affect only one of the ratings or actually drive the ratings in opposite directions.

Before turning to the estimation results, it is instructive to examine the means of the explanatory variables. Based on the variable means, banks with safety and soundness problems tend to have lower capital and liquidity, more loans, worse asset quality, and lower income than banks with favorable CAMEL and CRA ratings, as shown in the first and second columns of Table 2. Many of these relationships are reversed, though, for banks with CRA problems (column 3). These banks tend to have more capital, more liquidity, and fewer loans than banks with no problem ratings. This is especially true for the banks with substandard CRA ratings but favorable CAMEL ratings, as shown in the fourth column. The banks with both CAMEL and CRA problems (column 5) appear similar in many respects to all banks with CAMEL problems. Finally, banks with substandard CAMEL or CRA ratings tend to be smaller and less rural than problem-free banks, and the problem banks tend to be located in relatively slow-growing states.

This characterization of the relationships between the explanatory variables and problem

Figure 1
Sample of Problem Banks



NOTES: Banks with a CAMEL rating of 3, 4, or 5 are considered safety and soundness problems. Banks with a CRA rating of 3 or 4 are considered CRA problems. The sample is based on data restrictions described in the text.

SOURCES: Board of Governors; Federal Financial Institutions Examination Council.

ratings does not take into account the substantial degree of correlation that exists between the various explanatory variables. The statistical analysis that follows overcomes this shortcoming.

RESULTS

Table 3 shows the estimation results for the probit model of CAMEL and CRA ratings. The model is run separately for each of the seven years considered and for all seven years combined. The CAMEL rating equation is in the upper panel, and the CRA rating equation is in the lower panel.

The bank capital results strongly support the aggressive strategies hypothesis. Higher capital reduces the likelihood of a substandard safety and soundness rating in each of the seven years and in the combined sample, reflecting capital's role as a buffer against financial loss. In contrast, high capital ratios also raise the probability of a substandard CRA rating in five of the seven years and in the combined sample, consistent with the view that relatively low capitalization is common in aggressive strategies that closely conform to the credit-enhancing objectives of the CRA. The opposing signs for *CAR* in the CAMEL and CRA equations highlight the conflict between CRA objectives and safety and soundness standards.

Investment securities, however, do not support the aggressive strategies hypothesis. Securities holdings reduce the likelihood of a substandard CAMEL rating in four of the seven years and in the combined sample, consistent with their liquidity role. However, the variable *SEC* significantly affects CRA ratings in only one of the seven years and with a negative sign. In the combined sample, *SEC* is significant at the 1-percent level, but again with the wrong sign. The insignificance of *SEC* in six of the seven years suggests its effect on CRA ratings is relatively weak.

The loan-to-asset ratio results support the aggressive strategies hypothesis. For six of the seven years and in the combined sample, the ratio of loans to total assets, *LAR*, has the expected negative influence on the chances of a substandard CRA rating. This result supports the view that favorable CRA ratings are associated with high loan concentrations. In addition, *LAR* is significant in the CAMEL rating equation in five separate years and in the combined sample. Its sign is positive for each of the seven years and the combined sample, consistent with the aggressive strategies hypothesis, which implies that high lending activity, and therefore a strong CRA rating, can lead to substandard financial performance.

Table 2
Means of Explanatory Variables

	Type of problem				
	None	Safety and soundness	CRA	CRA only	Both
CAR	9.49	7.35	10.06	11.46	7.66
SEC	32.52	22.74	33.39	40.39	21.37
LAR	52.71	57.81	47.41	41.60	57.39
TAR	1.77	6.67	4.56	2.55	7.99
ROA	1.14	.05	.52	1.03	–.35
SIZE	11.03	10.86	10.80	10.84	10.73
MSA	39.96	55.97	64.86	59.61	73.87
ECON	5.50	5.10	5.01	5.06	4.92
Observations	20,661	4,040	1,144	723	421

NOTE: All the variables except *SIZE* are multiplied by 100. See notes to Figure 1.

SOURCES: Board of Governors; Federal Financial Institutions Examination Council.

The empirical results also strongly support the necessary retrenchment hypothesis. The troubled-asset ratio, *TAR*, and the return on assets, *ROA*, have the expected effects in the CAMEL rating equation in each of the seven periods and in the combined sample. High levels of *TAR* and low levels of *ROA* are associated with substandard CAMEL ratings. Moreover, *TAR* has the expected effect in the CRA rating equation in five of the seven years and in the combined sample. *ROA* significantly affects CRA ratings in four separate years and in the combined sample. The positive effect of financial problems on both the likelihood of receiving a substandard CAMEL rating and the chances of a substandard CRA rating is consistent with the necessary retrenchment hypothesis.

An alternative explanation for the positive association between financial problems and substandard CRA ratings is bad management. According to this view, if its management is bad, a bank is likely to perform poorly in all dimensions, including CRA compliance. If this view is correct, financial problems do not lead to substandard CRA performance; rather, financial and CRA problems reflect a common factor—bad management.

One way to test the role of management is to analyze the timing of CRA and safety and soundness problems. If both types of problems simply reflect bad management, then they would tend to occur at the same time. On the other hand, if the necessary retrenchment hypothesis is correct, then safety and soundness problems might occur first, followed by problems with CRA compliance.

Table 3

Estimation Results for a Probit Model of CAMEL and CRA Ratings

Index for Probability of Safety and Soundness Problems (CAMEL rating of 3, 4, or 5)

Year	*Constant*	*CAR*	*SEC*	*LAR*	*TAR*	*ROA*	*SIZE*	*MSA*	*ECON*
1990	.125	–13.910*	–.926†	2.240*	21.368*	–65.139*	–.079*	–.131	1.122
	(.460)	(1.574)	(.415)	(.418)	(1.213)	(5.526)	(.031)	(.077)	(2.086)
1991	.096	–11.801*	–1.401*	1.549*	21.747*	–70.175*	–.064†	–.030	4.769*
	(.435)	(1.408)	(.379)	(.388)	(1.157)	(5.020)	(.026)	(.069)	(1.517)
1992	.301	–14.573*	–.952*	2.594*	20.753*	–52.388*	–.140*	.003	2.601
	(.425)	(1.516)	(.367)	(.383)	(1.040)	(4.343)	(.026)	(.066)	(1.681)
1993	.616	–10.344*	–.648	1.918*	20.235*	–61.753*	–.157*	–.067	–1.259
	(.415)	(1.303)	(.405)	(.413)	(1.013)	(4.664)	(.026)	(.066)	(1.524)
1994	1.414*	–9.609*	–1.031†	.848	21.322*	–61.747*	–.201*	.182†	–.101
	(.522)	(1.669)	(.477)	(.499)	(1.296)	(5.070)	(.032)	(.078)	(1.902)
1995	1.290	–6.750*	–.817	.994	23.974*	–44.975*	–.235*	.183	–3.569
	(.715)	(1.697)	(.654)	(.664)	(1.701)	(5.185)	(.042)	(.096)	(2.313)
1996	.544	–4.700*	–1.426	1.480†	19.486*	–80.652*	–.199*	.027	4.752
	(.794)	(1.754)	(.752)	(.755)	(1.898)	(8.033)	(.049)	(.110)	(4.172)
All years, all banks	1.122*	–12.208*	–1.354*	1.291*	21.779*	–61.524*	–.150*	–.011	.170
	(.176)	(.568)	(.163)	(.165)	(.455)	(1.917)	(.011)	(.028)	(.607)
All years, small banks	1.041*	–11.663*	–1.295*	1.293*	21.105*	–62.765*	–.146*	–.007	.428
	(.208)	(.580)	(.176)	(.180)	(.473)	(2.063)	(.017)	(.029)	(.635)
All years, large banks	1.090	–24.797*	–1.748*	2.055*	31.371*	–47.265*	–.148*	.074	–.784
	(.797)	(2.754)	(.553)	(.502)	(1.830)	(5.595)	(.040)	(.168)	(2.184)

Index for Probability of CRA Shortcomings (CRA rating of 3 or 4)

Year	*Constant*	*CAR*	*SEC*	*LAR*	*TAR*	*ROA*	*SIZE*	*MSA*	*ECON*
1990	–.358	2.742†	–.436	–1.217*	.992	–9.997*	–.091†	.580*	2.669
	(.490)	(1.075)	(.409)	(.421)	(.949)	(3.865)	(.037)	(.083)	(2.305)
1991	–1.197*	3.484*	–.177	–1.045*	2.297†	–12.006*	–.009	.481*	–2.002
	(.459)	(.917)	(.382)	(.404)	(.894)	(3.630)	(.029)	(.076)	(1.658)
1992	–1.177†	4.496*	–.195	–.720	2.285†	–14.695*	–.053	.653*	–4.613
	(.489)	(.989)	(.406)	(.423)	(.931)	(3.757)	(.033)	(.082)	(2.370)
1993	–.712	5.479*	–.127	–1.008†	2.767*	–16.245*	–.086*	.588*	–5.086*
	(.454)	(.894)	(.415)	(.433)	(.897)	(3.862)	(.031)	(.079)	(1.638)
1994	.145	2.557*	–.771	–2.193*	4.592*	–5.630	–.090*	.584*	–3.017
	(.506)	(.938)	(.424)	(.458)	(.987)	(3.444)	(.032)	(.085)	(2.036)
1995	.284	2.180	–1.459†	–3.724*	5.444*	–5.948	–.087	.501*	2.371
	(.919)	(1.412)	(.675)	(.726)	(1.869)	(5.150)	(.060)	(.157)	(3.779)
1996	1.523	1.230	.010	–4.427*	2.912	–10.311	–.129	.580*	–13.143†
	(1.021)	(1.248)	(.738)	(.854)	(2.318)	(7.308)	(.067)	(.179)	(5.995)
All years, all banks	–.057	2.807*	–.604*	–1.738*	3.197*	–11.080*	–.084*	.537*	–3.733*
	(.191)	(.368)	(.164)	(.171)	(.379)	(1.474)	(.013)	(.033)	(.711)
All years, small banks	.185	2.712*	–.786*	–1.954*	2.837*	–12.401*	–.089*	.532*	–3.519*
	(.232)	(.383)	(.179)	(.189)	(.401)	(1.561)	(.019)	(.034)	(.752)
All years, large banks	–1.503	2.821	.725	–.342	6.238*	2.277	–.072	.577†	–5.900*
	(.826)	(1.447)	(.501)	(.488)	(1.215)	(4.909)	(.045)	(.227)	(2.274)

NOTES: Standard errors are in parentheses. Small banks have total assets of less than $250 million. Significance levels: † 5 percent, * 1 percent.

For the banks in the sample that experienced both CAMEL and CRA problems simultaneously, which type of problem occurred first, or did they begin at the same time? There are 421 observations, representing 355 individual banks, in the combined sample for which both the CAMEL rating and the CRA rating are substandard. Taking the first year in which these banks experienced both types of problems as the base year, 104 of these 355 banks are represented in the combined sample at some earlier point in time. For each of these 104 banks, then, it is possible to examine a pair of ratings received prior to the development of joint CAMEL–CRA problems.

Looking at the first preceding pair of ratings available, 66 of the 104 banks, or 63 percent, had CAMEL problems prior to developing both CAMEL and CRA problems. In contrast, only 13 of the 104 banks, or about 12 percent, had CRA problems prior to developing both types of problems. Based on these data, safety and soundness problems, but not CRA compliance problems, tend to precede the development of simultaneous CAMEL–CRA problems. This finding gives further support to the necessary retrenchment hypothesis.

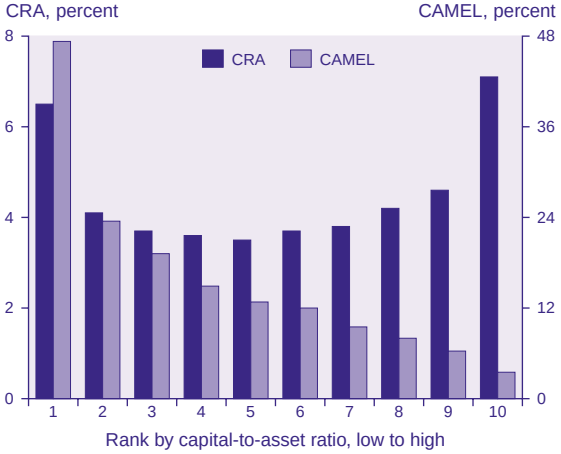
Two other variables included in the model—*SIZE* and *MSA*—also generate some interesting findings. In each of the seven years and in the combined sample, *SIZE* reduces the chances of receiving a substandard CAMEL rating, as the market resources hypothesis predicts. *SIZE* also significantly reduces the chances of receiving a substandard CRA rating in three of the years and in the combined sample. Moreover, while *SIZE* is significant in only three periods, its sign is negative for each of the seven years. *MSA* is significant and positive in the CAMEL rating equation for only one period. However, an urban location consistently raises the likelihood of receiving a substandard CRA rating, as the urban location hypothesis suggests.

The variable measuring economic conditions, *ECON*, is significant in the CAMEL rating equation for only one period, and contrary to expectations, its sign is positive. In the CRA rating equation, *ECON* is significant for two of the seven years and for the combined sample, with a negative sign, consistent with the economic conditions hypothesis.

The last two rows in the upper and lower panels of Table 3 show the results of estimating the CAMEL and CRA rating equations for small banks and large banks separately. Small banks are defined as having total assets under $250 million.[6] For both the CAMEL and CRA rating equations, the small bank results are qualitatively identical to the results for all banks. There are disparities, however, in the results for the large banks. While the estimated CAMEL rating equation for the large banks is very similar to the estimated CAMEL rating equation for all banks, the CRA rating equation does not appear well specified for the large banks. In particular, only *TAR*, *MSA*, and *ECON* are significant in the CRA rating equation for large banks. *LAR*, which is a key variable in the CRA rating equation for small banks, is insignificant in the CRA rating equation for large banks. These disparities suggest the results of the analysis for all banks are driven primarily by smaller banks. Because detailed data on lending to particular neighborhoods and borrowers tend to be more readily available at large banks, CRA examiners may place less weight on a large bank's overall level of lending and focus more on the distribution of lending across neighborhoods and borrowers of different income levels.

To help understand the implications of the estimation results reported in Table 3, it is useful to examine the predicted probabilities of substandard CAMEL and CRA ratings for different groups of banks. Figure 2 uses the estimation results for the entire combined sample to show these probabilities for ten equally sized groups of banks sorted by the capital-to-asset ratio. The first group contains the most thinly capitalized banks; that is, it contains the first 10 percent of the observations based on the banks'

Figure 2
Average Probability of Problem Status, by Capital-to-Asset Ratio

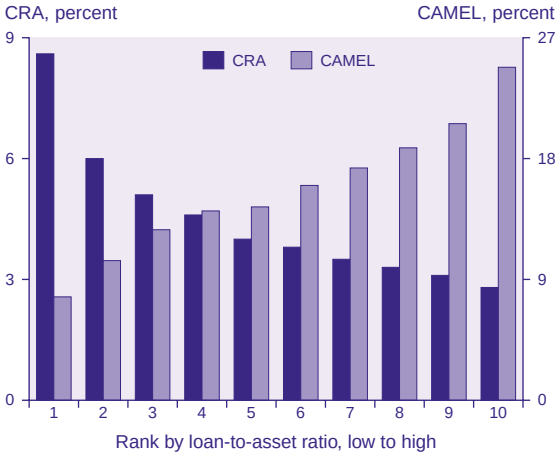


NOTES: See notes to Figure 1.

SOURCES: Board of Governors; Federal Financial Institutions Examination Council.

Figure 3

Average Probability of Problem Status, by Loan-to-Asset Ratio



NOTES: See notes to Figure 1.

SOURCES: Board of Governors; Federal Financial Institutions Examination Council.

capital-to-asset ratios. The tenth group contains the top 10 percent of the observations based on the capital-to-asset ratio. Capitalization is chosen as the measure by which to sort the observations in appreciation of the fundamental role of capital, both in the characterization of bank risk and in the structuring of supervisory actions. As discussed earlier, low capital typically reflects relatively high risk, while high capital usually is part of an overall conservative banking strategy.

As shown in Figure 2, banks with very low capital tend to have relatively high probabilities of receiving substandard CAMEL and CRA ratings. Many of these banks have severe financial problems, which, as predicted by the necessary retrenchment hypothesis, tend to spill over into the area of CRA compliance. The chances of receiving substandard ratings subsequently fall with increases in capital, but only up through the fifth group of banks. After that point, further increases in capitalization actually increase the likelihood of a substandard CRA rating, even while the chances of a substandard CAMEL rating continue to fall. The divergence in the paths of the two probabilities as capital moves from its median to higher values portrays the aggressive strategies hypothesis at work. The results in Figure 2 indicate that banks with the best CRA ratings tend to fall in the middle of the risk spectrum. While the majority of banks in each of the ten capital groups are likely to avoid problem status, the probability of CRA problems is nevertheless distributed away from the sample median.

Figure 3 is constructed in a manner similar to Figure 2, except the observations are now ranked according to the loan-to-asset ratio rather than the capital-to-asset ratio. The average probability of a substandard CRA rating declines as the loan-to-asset ratio increases, whereas the probability of a substandard CAMEL rating rises along with the loan-to-asset ratio. The opposing paths of the two probabilities again show the aggressive strategies hypothesis at work.

CONCLUSION

The empirical analysis presented here provides evidence of conflict for small banks between the enforcement of safety and soundness standards and CRA compliance. High loan concentrations tend to help CRA ratings while hurting CAMEL ratings. Bank capital, the centerpiece of safety and soundness supervision and regulation, is associated with favorable CAMEL ratings but increases the likelihood of a substandard CRA rating. Finally, banks with financial problems are more likely to be downgraded by the CRA exam process, even though a shift away from CRA objectives may be necessary to facilitate financial recovery.

Several important areas of research remain. The revised CRA regulations announced in April 1995 were not fully implemented for small banks until the beginning of 1996 and for large banks until July 1997. Relationships under the earlier regulations may not fully carry over to the new regulatory regime. A full assessment of this issue would, unfortunately, require a new round of financial problems, with the revised regulations in place. In addition, it would be useful to introduce where possible more detailed data on lending to various income classes of neighborhoods and borrowers. This effort may yield additional insights on the determinants of CRA ratings, particularly for large banks.

Nevertheless, the findings of this study, which provide a first look at CAMEL–CRA rating pairs, point to a supervisory process in pursuit of conflicting goals, particularly at smaller sized banks. Banking entails risk, but can regulators decide how much risk is appropriate? From the safety and soundness perspective, regulators are concerned with the potential for excessive risk. From the CRA perspective, it appears that the exam process rewards aggressive banking strategies. These opposing supervisory forces represent a pinch for banks seeking to establish relatively conservative risk postures, in that the chances of receiving a substandard CRA rating increase as risk is reduced. Similarly, it also appears that the CRA exam process does not

take into full account the resource constraints associated with financial problems. This tension between CRA objectives and safety and soundness standards has been an underappreciated cost of the CRA and suggests further thought is necessary regarding the appropriateness of CRA regulations.

NOTES

The author would like to thank, without implicating, Bob Avery, Raphael Bostic, Glenn Canner, Tom Saving, and Nancy Vickrey for helpful discussions and comments.

1 For an overview of the revised regulations, see Federal Reserve Board (1995).

2 For an overview of the revised rating system, see *Federal Register* (1996).

3 With respect to CRA ratings, a detailed approach to specification, as opposed to the summary approach used here, requires knowledge of the geographic areas constituting the CRA assessment communities for individual banks, as well as data on community development loans, lending to low- and moderate-income neighborhoods and individuals, and lending to small businesses and farms. Such data are not generally available for the banks and periods this analysis uses. See Bostic and Canner (1998) for a description of the detailed CRA data large banks began reporting in 1996.

4 The safety and soundness effect of loan quality, as measured by *TAR*, generally depends on the scale of lending activity. The loan-to-asset ratio, *LAR*, is included in the model to capture this scale effect. The nonlinearity inherent in the probit model allows for an influence of *LAR* on the safety and soundness effect of *TAR*.

5 The data for 1990 include 2,796 observations, with 785 CAMEL problem banks and 212 CRA problem banks. The corresponding data for 1991 are 3,267, 918, and 245; 1992—3,804, 848, and 203; 1993—4,656, 667, and 217; 1994—4,299, 432, and 184; 1995—3,624, 232, and 40; and 1996—2,978, 158, and 43.

6 The combined sample includes 22,733 small-bank observations, with 3,642 CAMEL problems and 1,036 CRA problems. There are 2,691 large-bank observations, with 398 CAMEL problems and 108 CRA problems.

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