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WOULD A RESEARCH TAX CREDIT BE A GOOD INVESTMENT FOR TEXAS?

THE TEXAS LEGISLATURE is considering a new corporate income tax credit for research and development (R&D) spending within the state. Economists generally believe society benefits when government encourages R&D. The federal government and more than one-third of the states currently offer corporate tax credits to subsidize R&D. Is an R&D tax credit a good idea for Texas? And what would be the best way to structure such a credit?

Roughly $221 billion was spent on R&D activities in the United States in 1998, according to the National Science Foundation. As a share of gross domestic product (GDP), R&D investment was approximately 2.6 percent in 1998. Relative to GDP, the United States spends slightly less on R&D than Japan, but more than Germany, the United Kingdom, Canada and Italy.

Of total U.S. R&D spending in 1998, 15 percent funded basic research—original investigations for the advancement of scientific knowledge that generally do not have specific commercial objectives. Twenty-three percent funded applied research—investigations

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directed to new scientific knowledge that have specific commercial objectives. The other 62 percent of R&D spending went to development—the systematic use of the knowledge gained from research directed toward production of useful materials, devices, systems or methods, including design and development of prototypes and processes.

The private sector funds the majority of R&D activity in the United States. In 1998, industry funded $144 billion, the federal government funded $67 billion, and state and local governments, universities and nonprofit institutions funded $10 billion of R&D activity. Federal research funding as a percent of GDP has declined over the last decade because of the sharp cutback in defense-related research.

Motivation for Encouraging Research

Economists generally oppose tax incentives or subsidies limited to specific categories of investment because they believe the free market and a neutral tax system—one that treats all businesses equally—will direct resources to the uses with the highest return. This does not apply, however, to investments that yield spillover benefits—gains to society that the firm making the investment cannot capture. Some forms of research, such as biotechnology, can produce significant spillover benefits.

For example, if a pharmaceutical firm invests in a new factory and produces more medicine, it can capture the resulting social benefit by selling the medicine. But if the firm invests in a research project and discovers a new medicine, its profits may not fully reflect the resulting benefit to society. The firm can capture part of the social benefit by patenting the new medicine and collecting royalties from its users for a limited period, but there are likely to be spillover benefits the firm cannot capture. Others can freely exploit the ideas embedded in the discovery for other purposes and can produce the new medicine after the patent expires. As a result, the firm may find the new factory more profitable than the research project, even though the research project has higher total benefits to society. Thus, society can benefit if government provides a subsidy that induces the firm to undertake the research project.

Studies estimate that research can have extremely high spillover benefits. For example, Charles Jones and John Williams estimate that R&D spending offers a total return for society of 30 percent per year, compared with 7 percent for other investment. They conclude that R&D spending should be increased by at least a factor of four.[1]

Federal Research Incentives

The federal government employs both direct funding and broad tax incentives for private research. Direct funding is generally used to subsidize research that has very low private returns and very high spillover benefits, because firms are reluctant to engage in such research, even with incentives. Basic research often falls into this category. In 1998, the federal government funded roughly 30 percent of the nation's total R&D investment, but 57 percent of basic research.

Tax incentives may be appropriate for research that has a commercial application and a significant private return, but also has a spillover benefit. In these cases, firms will engage in some research without a tax incentive, but less than is socially optimal. The federal government provides two tax benefits for research spending. First, firms may deduct R&D costs when they are incurred (expense them) rather than amortize them over the period in which the firm expects to profit from the research. Second, some costs qualify for a 20-percent research and experimentation (R&E) credit. In fiscal 1998, firms doing research reduced their federal tax liability by $300 million by expensing research costs and by another $2.1 billion by using the R&E credit.

How the Federal Tax Credit Works

Although a wide range of research costs may be expensed, the R&E credit has been limited (since 1986) to "qualified research expenses" that meet sev-

Federal Definition of "Qualified Research Expenses"

Research must consist of a "process of experimentation" in engineering, physics, biology or computer science and must seek "technological" information not commonly known to skilled professionals. The research effort need not be successful. The information sought must be useful in developing a "new or improved" business product or technique and must relate to function, performance, reliability or quality, and not style. The credit does not apply to "reverse engineering," market research, routine quality control or research following commercial production.

The credit applies to the cost of research supplies and wages paid to workers performing, supervising or supporting research, but not to payments for land, structures or equipment (except payments to lease computers). Research must be conducted within the United States and cannot be funded by grants.

SOURCE: Internal Revenue Code and Treasury regulations.

eral criteria specified by Congress. These criteria, summarized in the box, generally exclude development, which Congress felt had little spillover benefit. Since firms do little basic research, the credit largely benefits applied research. Many of the criteria are subjective, and the IRS and firms continue to dispute their interpretation.

The federal R&E credit is a temporary provision, which keeps firms uncertain about its long-term availability. It has been renewed nine times since its enactment in 1981. In four cases, the credit was extended before it expired. In the other five cases, the extension was adopted as long as 417 days after the expiration. In four of those cases, the credit was reinstated retroactively to its expiration date. But in one case, after the credit expired on June 30, 1995, the extension was unexpectedly made retroactive only to July 1, 1996, denying any credit for expenses in the preceding year. The nine extensions have been for periods ranging from six to 36 months. The credit expires again on June 30, 1999.

The R&E credit is an incremental credit, applying only to qualified research expenses in excess of a base amount. During 1981–89, the credit used a rolling base period, in which each firm's base amount in each year depended on its research spending during the preceding three years. The credit now uses a fixed base period. Each firm's base amount equals its average gross receipts during the previous four years multiplied by the 1984–88 ratio of its qualified research expenses to its gross receipts (special rules apply to firms established since 1984).

Manufacturing firms claim approximately three-quarters of the credit, with the largest amounts going to the pharmaceutical, electrical equipment, transportation equipment and machinery industries. Many military and aerospace firms receive little benefit from the credit because their current research spending is below their 1984–88 levels. Large firms claim the bulk of the credit.[2]

How Do States Encourage Research?

Nearly all states provide some tax relief for companies investing in research and development. A quick overview of the bewildering variety of state tax rules provides a vivid reminder of the burden placed on firms complying with multiple state tax codes. Many states provide exemptions or credits against sales or property tax for R&D investment.[3]

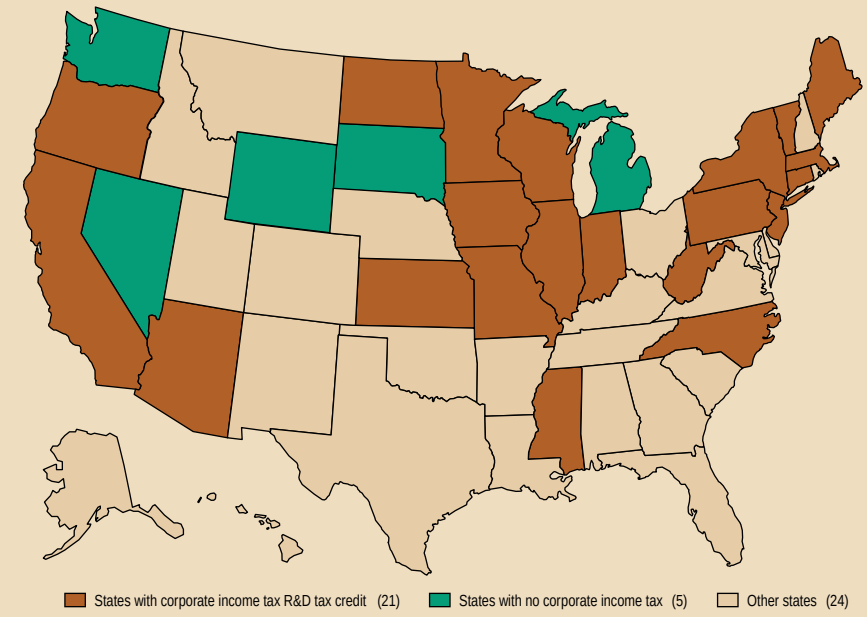
Forty-five states, including Texas, impose a corporate income tax.[4] All of these states allow research costs to be expensed, but, as shown in Chart 1, only 21 of them provide R&D credits. Each state's credit applies only to research conducted within the state. The Mississippi and Vermont credits are linked to R&D employment, and the New York credit is linked to purchases of R&D equipment. The other 18 state credits apply to R&D spending.

As Table 1 details, these 18 state R&D tax credits are nearly all incremental, with substantially different marginal credit rates and base periods. West Virginia uses a nonincremental credit, while Connecticut allows firms to claim both an incremental credit and a nonincremental credit. Five states use rolling base periods, 11 states use a 1984–88 fixed base period (the same as the federal credit), and Maine uses both a roll-

Nearly all states provide some tax relief for companies investing in research and development.

The federal credit and most state credits are designed to subsidize only the incremental increase in R&D spending.

CHART 1
STATES OFFERING R&D TAX CREDITS
(Corporate Income Tax)



SOURCES: Texas State Comptroller; Technology Business Council.

ing and a fixed base period (1995–97). The number of firms claiming the credit and the total amount claimed vary widely among states. Missouri and Pennsylvania impose statewide limits on the amount of credit available, providing the credit to firms on a first-come, first-served basis. The California credit is the largest in absolute terms, with over 1,700 firms claiming $314 million.

The R&D credits are nonrefundable, so firms cannot use the credit in excess of their tax liability. Many states further limit the credit to a fraction of tax liability, which curtails the credit for many firms in states with higher credit rates.

The state credits usually apply to the "qualified research expenses" that receive the federal credit, but Connecticut and Kansas provide credits for any research spending that the federal tax code allows to be expensed. The West Virginia credit includes payments for land, structures and equipment (all excluded from the federal definition), but the credit is only available to firms that produce manufacturing and natural resource products or electric power. The North Carolina credit is also limited to particular industrial sectors, primarily manufacturing and software firms.

The types of industries claiming the credit are generally similar to those claiming the federal credit. Seed companies are important users of the Iowa credit. Large firms generally receive most of the credits.

Advantages and Disadvantages of Incremental Credit

The federal credit and most state credits are designed to subsidize only the incremental increase in R&D spending. The primary advantage of an incremental credit is that it can provide greater marginal incentives with lower revenue losses (more bang for the buck). The ideal incremental credit would set each firm's base amount equal to the amount of research that the firm would have done without any credit. For example, a firm that would spend $100 on R&D without any credit could be offered a 20-percent credit for any R&D spending in excess of $100. This credit offers a 20-percent marginal incentive for R&D spending but at much lower revenue cost than a 20-percent nonincremental credit. If the firm

TABLE 1
STATE CORPORATE INCOME TAX CREDITS FOR R&D SPENDING

State	Took effect	Marginal rate (percent)	Base period	Number of firms	Credit amount (millions of dollars)	Expiration
Arizona	1994	20, 0[1]	1984–1988	81	7	2003
California	1987	11	1984–1988	1,704	314	P
Connecticut	1993	20	Preceding year	236	21	P
"	1993	1, 2, 4, 6[2]	NI	177	9	P
Illinois	1990	6.5	3 preceding years	N/A	35	1999
Indiana	1989	5	1984–1988	37	15	1999
Iowa	1983	6.5	1984–1988	N/A	N/A	P
Kansas	1988	4.33	2 preceding years	47	1	2000
Maine	1996	5	3 preceding years	10	1	P
"	1998	100	1995–1997	N/A	N/A	P
Massachusetts	1991	10	1984–1988	817	62	P
Minnesota	1987	5, 2.5[3]	1984–1988	268	17	P
Missouri	1994	6.5, 0[4]	3 preceding years	67	16[5]	P
New Jersey	1994	10	1984–1988	150	19	P
North Carolina	1996	5	1984–1988	N/A	N/A	2001
North Dakota	1988	8, 4[6]	1984–1988	< 5	< .5	P
Oregon	1989	5, 0[7]	1984–1988	80	8	2001
Pennsylvania	1997	10	4 preceding years	299	15[8]	2004
West Virginia	1986	10	NI	5–10	1–2	P
Wisconsin	1986	5	1984–1988	170	12	P

[1] Arizona credit is 20 percent of creditable spending but cannot exceed $500,000.
[2] Connecticut nonincremental credit is 1 percent of first $50 million of spending plus 2 percent of next $50 million plus 4 percent of next $100 million plus 6 percent of additional spending.
[3] Minnesota credit is 5 percent of first $2 million of creditable spending plus 2.5 percent of additional creditable spending.
[4] Missouri credit is 6.5 percent of creditable spending, but with no additional credit for spending in excess of double the base amount.
[5] Starting in 1999, Missouri limits statewide credits to $10 million.
[6] North Dakota credit is 8 percent of first $1.5 million of creditable spending plus 4 percent of additional creditable spending.
[7] Oregon credit is 5 percent of creditable spending but cannot exceed $500,000.
[8] Pennsylvania limits statewide credits to $15 million.

NOTES: Table does not reflect all details of each state credit. Credit rates refer to 1998; number of firms and credit amount generally refer to 1996 or 1997. Connecticut and Maine each allow firms to claim two credits. NI: Nonincremental credit. P: Permanent credit. N/A: Not available.

SOURCES: Texas State Comptroller; Technology Business Council; state revenue departments; authors' analysis of state statutes and tax forms.

To calculate an incremental credit, each firm's base amount is linked to its past research spending, which can be a poor estimate of the amount it would have spent today without the credit.

increases its research spending to $110, this credit has a revenue loss of $2. A 20-percent nonincremental credit should stimulate the same increase in R&D spending (since the marginal incentive is the same), but the revenue loss would be $22. The incremental credit is cheaper because it does not give the firm $20 to encourage research that it was going to do anyway.

Unfortunately, real-world incremental credits do not work as well as hypothetical examples. To calculate an incremental credit, each firm's base amount is linked to its past research spending, which can be a poor estimate of the amount it would have spent today without the credit. If the firm in the above example were assigned a $70 base amount and spends $110 on R&D, a 20-percent incremental credit would be $8. This amount is much larger than the ideal incremental credit. More disturbingly, if the firm were assigned a $130 base amount, it would continue to spend $100 because it would receive no subsidy for increasing its spending to $110. The lack of marginal incentives for firms with high base amounts reduces the overall stimulus to research and distorts the allocation of research across firms, since research at high-base-amount firms may have large spillover benefits.

Of course, the incremental credit is also more complex than a credit that applies to all qualified research spending, because firms and the IRS must reconstruct baseline R&D spending. Rules must also specify the treatment of

firms' base amounts during mergers and spin-offs.

How Do Tax Credits Affect Firms' R&D Decisions?

Firms look at many factors when making location and investment decisions.

Several studies have attempted to estimate the effect of the federal tax credit on business behavior. In general, the evidence suggests that the credit has increased R&D spending, but the size of the impact is uncertain and the spillover benefits from the additional R&D have not been estimated.

In 1996, the General Accounting Office surveyed eight studies that examined the effects of the federal R&E tax credit.[5] All studies concluded that the credit increased R&D spending, but the estimated magnitude of the increase differed greatly. Four studies estimated that R&D spending induced by the credit exceeded its revenue loss (by a factor as high as two), while the other studies suggested that the increase in R&D was smaller than the revenue loss. None of the studies specifically measured the spillover benefits from the research induced by the credit or determined which types of research had been increased.

There has been virtually no examination of the effectiveness of state R&D credits. If R&D is sensitive to incentives, as suggested by the studies of the federal credit, then state credits may also stimulate R&D, although the credits may just induce firms to relocate R&D from one state to another.

Firms look at many factors when making location and investment decisions. Land and construction costs, the location of suppliers, distribution facilities and labor, as well as natural amenities, such as climate, all contribute to a state's attractiveness for investment. Government regulations, overall tax level and tax structure, and the mix of available public services, such as roads and education quality, also influence corporate decision making. Although it is possible that an R&D tax credit could tip the balance in this process, the value of state R&D tax credits is relatively small compared with the huge investment necessary for most research projects. In fact, each state R&D credit amount is generally about 1 percent or less of total R&D spending in the state. Even in states with credit rates comparable with the 20-percent federal rate, firms are likely to have insufficient tax liabilities to fully use the credits, although they can carry them forward.

In fact, although new R&D tax credits have been adopted recently in some states, there also has been movement in the other direction, in part because of concern that the credits are ineffective. New Hampshire's R&D credit was recently allowed to expire, and the Missouri legislature is considering a proposal to suspend the state's R&D credit.

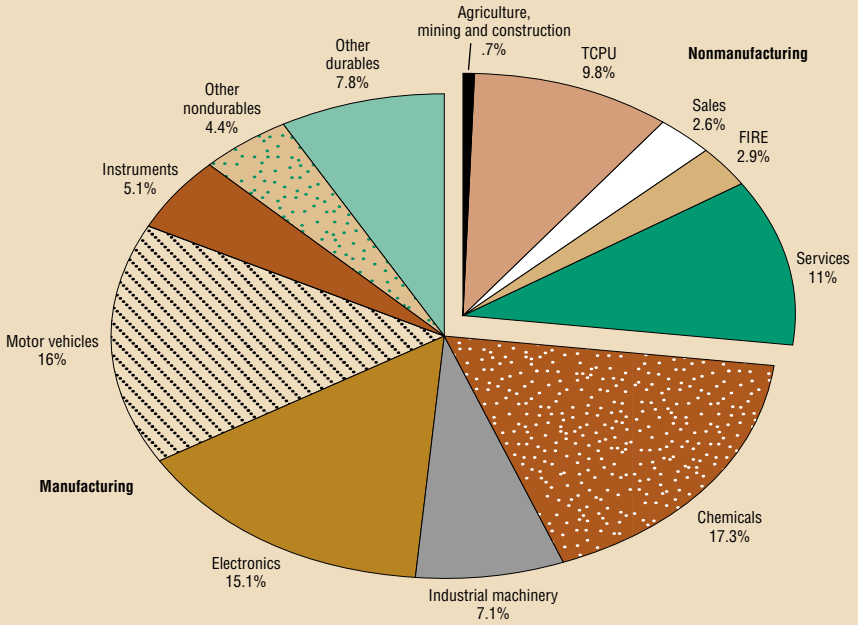
A Texas R&D Credit?

Texas ranks sixth among states in the amount of R&D performed by industry, according to 1995 data gathered by the National Science Foundation. The five states with more R&D—California, Michigan, New York, New Jersey and Massachusetts—either have no corporate income tax or offer an R&D credit.

Can Texas benefit from subsidizing R&D activities within the state? As noted above, most economists believe that the public benefits of R&D are greater than the private benefits, suggesting that it may be appropriate public policy to subsidize these expenditures. But no studies have evaluated the benefits to a state that subsidizes R&D investment. Although a state subsidy might stimulate additional R&D spending and produce spillover benefits, it is not clear that the spillover benefits would accrue in that state. A state might profit from letting other states provide the subsidies and enjoying the spillover benefits from the additional research in those states, without imposing revenue losses on its own firms and residents. If a state R&D credit merely changes the location of R&D activity, there would be no spillover benefits in the form of additional innovation. In this case, there might be little economic rationale for a state R&D credit.

Of course, a state R&D tax credit would create additional jobs and income in industries performing R&D, much as a municipal subsidy for the

CHART 2
INDUSTRIES EXPECTED TO USE TEXAS R&D CREDIT
(Nonincremental Credit)



NOTES: Percentages sum to less than 100 percent because of rounding. TCPU is transportation, communications and public utilities and FIRE is finance, insurance and real estate.

SOURCE: Texas State Comptroller.

construction of a sports stadium would create additional jobs and income in sports-related industries. But such incentives may not stimulate an area's economic growth as effectively as broad-based incentives for job creation.

Some economists have argued that a state should design its incentives to attract well-educated high-wage workers because they may provide greater economic benefits for the state. Clearly, an R&D credit would tend to attract these types of workers. Even so, it may be more efficient to provide incentives for all firms hiring well-educated workers, rather than only firms that conduct research. Adding tax preference for firms engaging in research requires increasing the tax burden on other firms, who may hire equally valuable workers.

If Texas adopts an R&D tax credit, the state should consider a nonincremental credit, which would be more neutral than an incremental credit because it would offer the same percentage marginal subsidy to any firm investing in research and development. A nonincremental credit would also be easier to administer.

As is true for the federal credit, manufacturing firms are expected to be the largest recipients of a Texas R&D credit. As shown in Chart 2, if Texas adopted a nonincremental credit, manufacturing industries—mostly firms producing automobiles and parts, chemicals and telecommunications equipment—would receive over 70 percent of the credit. Service firms, like software developers and research labs, would also benefit.

The allocation of the credit would be slightly different if Texas adopted an incremental R&D credit. The share of the benefits going to manufacturing industries would be still higher, 78.5 percent, and the share accruing to most other firms would be smaller. Service firms would receive 8.5 percent of an incremental credit, while transportation, communications and utilities firms would receive roughly 8 percent.[6]

Summary

Federal incentives for research and development activities may be a good investment because research may produce spillover benefits for society in addition to the private benefits accruing to the firm performing the research. It is less clear whether the same is true for a state subsidizing research within its borders.

Even when state R&D subsidies increase nationwide research, not enough of the spillover benefits may accrue to an individual state to warrant the revenue loss of a credit. When research incentives merely shift the location of research activities, they generate no spillover benefits in the form of additional innovation. A state R&D credit could generate indirect spillover benefits by attracting well-educated or high-wage workers, but this goal might be achieved more efficiently through broad-based incentives for the hiring of such workers in all industries.

If Texas adopts an R&D credit, it should consider using a nonincremental credit because it would be easier to administer and would offer the same percentage subsidy to R&D investment by any firm.

—Fiona Sigalla
Alan D. Viard

Notes

1 Charles I. Jones and John C. Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics*, November 1998, pp. 1119–35.

2 Office of Technology Assessment, "The Effectiveness of Research and Experimentation Tax Credits," Congress of the United States, September 1995, pp. 18–20.

3 The State Science and Technology Institute provided a detailed list of state research and development tax incentives available in 1996.

4 The Texas corporate franchise tax is based partly on capital or net assets and partly on earned surplus or net income.

5 General Accounting Office, *Review of Studies of the Effectiveness of the Research Tax Credit*, GAO-GGD-96-43, May 1996. One of the eight studies actually examined the effects of tax rules related to research by multinational firms rather than the R&E tax credit.

6 The authors thank Craig Doherty of the Texas Comptroller's Office for these estimates.

A Fresh Look at the National Economy

The U.S. economy is in the position of the man who, while standing with one foot on hot coals and the other on a block of ice, said, "On average, I feel fine." We have seen the nation's traded-goods sector go cold while its nontraded sector has heated up. On net, growth has been robust. The divergence between the traded and nontraded sectors makes forecasting the economy unusually difficult. Financial market turbulence is also a concern, although the financial market squeeze that seemed to threaten the expansion during the fall of 1998 now appears more aptly described as a credit "pinch" than a credit "crunch." Our best guess is that we will see further solid output gains in 1999, with inflation rising only a little from 1998's low levels.

A Review of the Economy's Recent Performance

The current expansion is now nearly eight years old, and second in length only to the expansion of the 1960s. (To match the 1960s expansion, we'll have to hold out through January of the year 2000.) More and more, the 1960s are the standard against which this economy must be compared. Both unemployment and inflation are at their lowest levels since the days of bell-bottoms, granny glasses and tie-dyed T-shirts. The big question is whether we can expect this performance to continue in the wake of the Asian crisis and its Russian and Brazilian aftershocks.

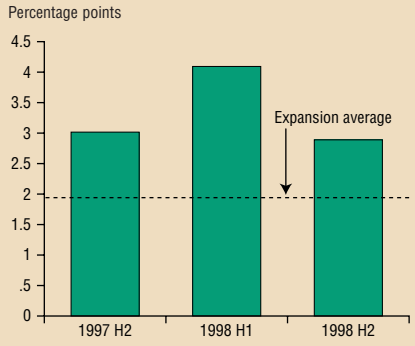
So far, the Asian crisis has been *good* news for U.S. consumers. The collapse of demand in Asia has meant that suddenly workers and equipment that were being used to satisfy the wants of households overseas have been freed up to produce goods for households here in the United States. Given an opportunity to purchase an abundance of goods at low prices, U.S. consumers have gone on a buying binge.

As Chart 1 shows, the contribution that real consumer spending makes to growth in U.S. gross domestic product (GDP) increased sharply as the Asian crisis unfolded, rising from an average of about 2 percentage points during the first six years of this expansion to about 3 percentage points during the second half of 1997 to more than 4 percentage points in the first half of 1998. However, in recent quarters we have seen consumer spending growth begin to decelerate. This shift to slower growth is only natural: households have been given a chance to stock up at what is essentially a fire or going-out-of-business sale. The start of the sale brought a surge of spending, but now the pace of buying is leveling off.

Ordinarily, booming consumer spending would mean good times for U.S. manufacturers. But when domestic consumption is booming partly because of a collapse of overseas demand, U.S. exporters—and those U.S. manufacturers who compete against *foreign* exporters—face tough sledding. As shown in Chart 2, the trade drag on U.S. GDP growth rose from about 0.25 percentage point, on average, during the first six years of this expansion to about 0.5 percentage point in the second half of 1997 and then exploded to 2.5 percentage points in the first half of 1998. In the second half of 1998, the drag from trade showed signs of fading.

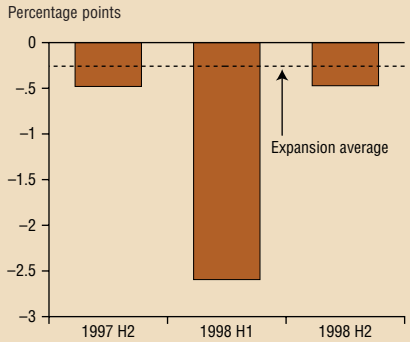
In the labor market, the effects of booming consumer demand have offset the effects of plunging net exports. The

Chart 1
Contribution of Consumption to GDP Growth



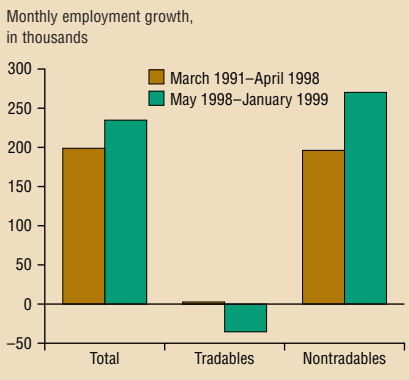
SOURCES: U.S. Department of Commerce (Bureau of Economic Analysis); authors' calculations.

Chart 2
Contribution of Net Exports to GDP Growth



SOURCES: U.S. Department of Commerce (Bureau of Economic Analysis); authors' calculations.

Chart 3
Employment Gains in Nontradables Sector Offset Losses in Tradables Sector



SOURCES: U.S. Department of Labor (Bureau of Labor Statistics); authors' calculations.

pair of bars on the left-hand side of Chart 3 shows that the rate of job growth over the past nine months has slightly exceeded the average pace of growth over the first seven years of the current expansion. But under this placid surface are strong crosscurrents. Employment in the traded-goods-producing sector has begun to decline, whereas employment growth in the nontraded sector (the construction and service-producing industries) has accelerated.

To get a feel for which of these trends will dominate during the remainder of 1999, we can look at the signals being sent by various leading economic indicators.

The Outlook for Output Growth

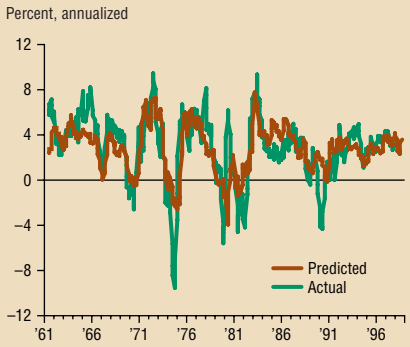
Studies have shown that real (inflation-adjusted) stock prices, the slope of the yield curve (the difference between long-term and short-term interest rates) and the real money supply each have useful information for the strength of the economy one to four quarters into the future. Other indicators are of little or no help at these horizons once stock prices, the slope of the yield curve and the money supply are taken into account.

Stock prices reflect the confidence people feel about the future health of the economy. However, stock prices are often volatile and sometimes signal recessions that don't actually materialize.

Banks find it difficult to make profitable loans when long-term interest rates are low relative to short-term rates. A flat yield curve can signal that policymakers have explicitly tightened credit by raising the federal funds rate, or have implicitly tightened credit by holding short-term rates constant in the face of declines in expected inflation or falling demand for credit.

The real money supply measures the amount of liquid, spendable wealth in people's hands. It also indicates how successful banks and money market mutual funds have been at attracting deposits that can be turned around and loaned to consumers and businesses. The "credit head winds" of the early 1990s were associated with unusually weak money supply growth. Sure enough, output and employment expanded sluggishly, despite rising stock prices and a steep yield curve.

CHART 4
LONG-LEADING INDICATORS PREDICT MODERATE OUTPUT GROWTH IN 1999



SOURCES: The Conference Board; authors' calculations.

The green line in Chart 4 plots output growth over six-month periods, measured by the Conference Board's composite Coincident Index. Growth in this index behaves a lot like GDP growth, but is available monthly. The brown line plots output growth predicted nine months before the fact using stock prices, money growth and the yield curve. The forecasting model misses a few big upward spikes in growth and underestimates the depth of recessions, but it gives several months' advance warning of every recent recession except that of 1990, which was arguably triggered by Iraq's sudden invasion of Kuwait.

Based on data through December 1998, the model predicts 3.6-percent growth in the Coincident Index during the second and third quarters of 1999—little changed from the 3.4-percent average growth during 1998 and substantially above the 2-percent real GDP growth predicted by the average private forecaster for those same two quarters. If the model's past performance is representative, the odds of negative growth during the spring and summer of 1999 are only about 1 in 20.

The Outlook for Inflation

Output growth is only half the economic picture. The other half is infla-

Stock prices reflect the confidence people feel about the future health of the economy.

Moving away from free trade would certainly do the nation harm in the long run and might put upward pressure on inflation in the short run.

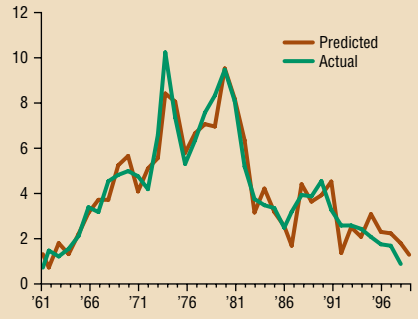
tion. Probably the most important factor affecting inflation is the inflation expectations that are built into labor contracts. Ideally, we would recognize that these expectations depend on past and anticipated future money growth. In practice, economists often approximate inflation expectations by taking an average of past inflation. Other factors affecting inflation include labor market slack (the unemployment rate), supply disruptions originating in the volatile food and energy sectors (as reflected in movements in the relative prices of food and energy) and global competition (as reflected in the price of imports relative to the price of domestically produced output).

Predicting movements in inflation has proven difficult because movements in food, energy and import prices are themselves difficult to predict. For example, much of the downward drift in inflation over the past several years—which has caught most economists by surprise—can be attributed to unexpected declines in the relative price of imports.

Chart 5 shows actual four-quarter changes in the GDP price index along with the forecasts generated by a model that factors in past inflation, labor market slack, food and energy shocks, and import prices. For the reasons just discussed, the model tends to overpredict inflation in recent years, but the errors are not generally large. Our forecast for inflation during 1999 is 1.3 percent—a bit above the 0.9-percent rate of inflation we saw in 1998. Based on historical experience, chances are 50 percent that inflation will lie between 0.75 percent and 1.75 percent, and the odds that inflation will turn into outright *de*flation or that inflation will exceed 2.5 percent are each less than 1 in 20. Again, the average private forecaster is not quite so optimistic, expecting inflation to accelerate to a 1.7-percent annual rate.

CHART 5
INFLATION TO REMAIN LOW IN 1999

Fourth-quarter-over-fourth-quarter percent change, GDP price index



SOURCES: U.S. Department of Commerce (Bureau of Economic Analysis); authors' calculations.

Risks to the Economic Outlook

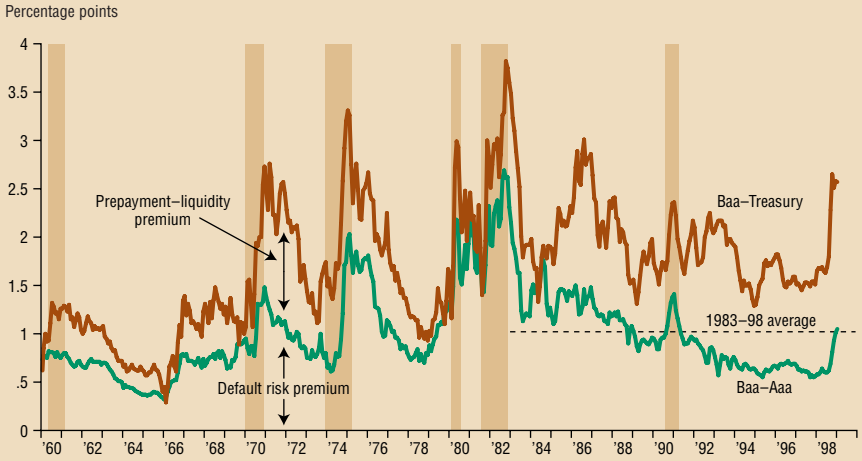
Risks to our forecast are substantial. With other sectors already straining against capacity, further declines in manufacturing and mining may not be fully offset by growth elsewhere in the economy. Additional pressure on U.S. manufacturers might come from further deterioration in Asia, the spread of the Asian and Brazilian troubles to Mexico or a slowdown in Europe.

Even without further contagion, calls for the government to protect domestic firms from foreign competition can be expected to intensify. Moving away from free trade would certainly do the nation harm in the long run and might put upward pressure on inflation in the short run.

Finally, concerns about their own financial health and that of others have led some banks and investors to become more wary in lending and to put an increased premium on liquidity. Such concerns might have been triggered by a deepening economic slowdown overseas or by other signals of a less optimistic outlook for loan quality and profits. They could adversely affect the economic outlook in ways our forecasting models don't fully capture. Specifically, they give rise to two financial risks: a stock market plunge or a credit crunch. Indeed, the Federal Reserve eased monetary policy in late 1998 partly to counter mounting signs that these very risks could cause the economy to slow too much.

A stock market plunge can slow the economy in three ways. First, firms have more difficulty issuing new equity, and managers face pressure to bolster their stock prices by boosting near-term earnings through cutting payroll and in-

CHART 6
NOT EVERY CORPORATE–TREASURY BOND SPREAD IS CLOSELY LINKED TO A RECESSION



NOTE: Shaded bands indicate recessions.

SOURCES: Board of Governors of the Federal Reserve System; authors' calculations.

vestment costs. Second, an associated jump in uncertainty leads firms to postpone or cancel investment and hiring. Third, the decline in wealth and the associated fall in confidence lead people to cut spending. For every sustained dollar drop in equity wealth, annual consumption spending drops by about 4 cents. Indeed, if the stock price decline in the late summer of 1998 had not reversed, it appears that GDP growth would have slowed by 0.5 percentage point in 1999. Sustained stock price changes matter because households typically assess their equity wealth using a one- to three-year horizon to screen out stock price volatility. Looking ahead, the pace of stock market gains and their boost to consumption will likely slow. In addition, high stock price valuation suggests that stock prices are vulnerable and pose a downside risk to our forecast.

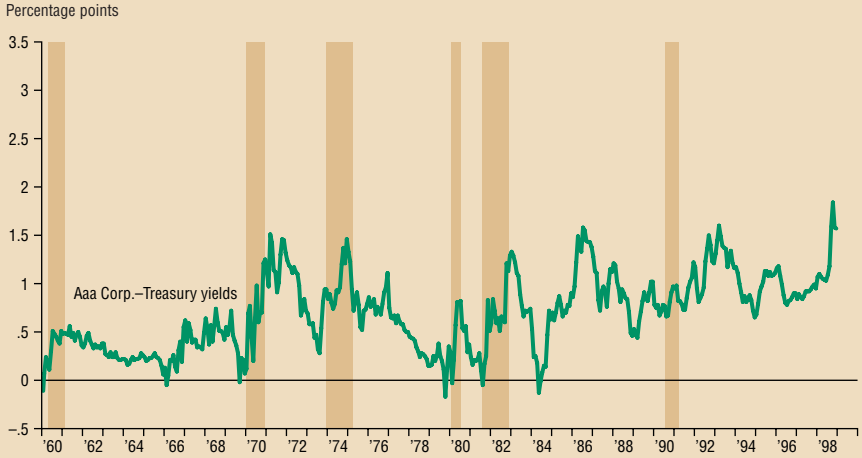
Another risk is that a credit crunch could emerge, in which more borrowers are denied loans or pay higher interest rates. To gauge the availability of bond and equity finance, three types of interest rate spreads are relevant: default, prepayment and liquidity risk indicators. Some analysts noted in late 1998 that spreads between interest rates on lower grade bonds and U.S. Treasuries widened to levels seen in recessions, as shown by the gap between yields on U.S. Treasuries and Baa-rated corporate bonds, the lowest risk category of investment-grade bonds (*Chart 6*). However, this spread has default- and prepayment-risk-premium components that behave differently, implying that the overall spread can give a false recession alarm.

Default risk premiums, measured by the gap between yields on low- and high-grade bonds, compensate investors for the risk that borrowers may not repay. Rising default premiums often imply higher borrowing costs and have been associated with credit crunches and recessions, as shown by the gap between yields on Baa- and Aaa-corporate bonds, the latter being the highest investment-grade bond category (see Chart 6). Recently this spread has risen to its post-1982 average, up from the exceptionally low levels of recent years. Spreads between Aaa-rated corporate and below-investment-grade bonds have widened to above-normal levels, implying that credit conditions have tightened more for less well-established bond-issuing firms.

Investors also demand a prepayment risk premium—measured by the interest rate gap between Aaa-rated corporate bonds that pose little default risk and Treasury bonds—for the possibility that borrowers will refinance their debt if interest rates fall. These bonds differ because when interest rates fall, Aaa bonds tend to be called and refinanced, whereas U.S. Treasuries are not. Prepayment risk premiums reflect interest rate and refinancing uncertainty but are not closely linked to recessions (*Chart 7*). Relative to default risk premiums, there has been a more pronounced rise in the gap between Aaa corporate and Treasury bond yields.

Sometimes this interest rate spread includes a higher liquidity premium to compensate investors for the fact that

CHART 7
HIGHER PREPAYMENT–LIQUIDITY PREMIUMS ARE OFTEN NOT LINKED TO RECESSIONS

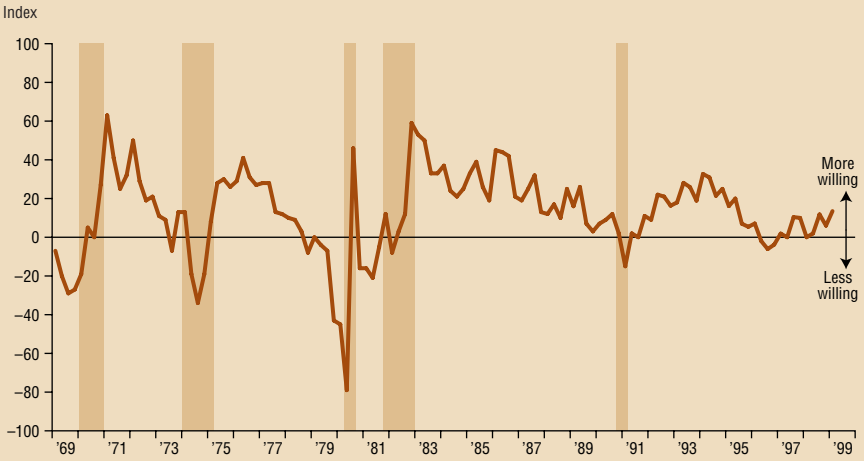


NOTE: Shaded bands indicate recessions.

SOURCES: Board of Governors of the Federal Reserve System; authors' calculations.

Overall, it appears the United States is in a credit pinch rather than a crunch.

CHART 8
BANKS STILL SLIGHTLY MORE WILLING TO LEND TO CONSUMERS



NOTE: Shaded bands indicate recessions.
SOURCE: Board of Governors of the Federal Reserve System.

private instruments are less desirable to hold than U.S. Treasuries when financial markets are turbulent and investors are very risk averse. Some have argued that the recent rises in prepayment spreads reflect a flight to quality in which investors shift from stocks into the most liquid bond instruments—Treasuries—thereby bidding down Treasury yields more than private bond yields and driving spreads up. This may have also widened the spread between interest rates on Treasury bills and prime commercial paper that pose virtually no prepayment or default risk. At one time, the paper–bill spread was correlated with recessions, but since the mid-1980s it has not been closely related to recessions and has given false alarms. Last fall, liquidity premiums surged and many firms could not issue commercial paper, bonds or stock. Partly to ease the liquidity squeeze, the Federal Reserve cut the federal funds rate several times. Since then, the paper–bill spread has returned to normal levels.

With respect to bank lending, Federal Reserve surveys in late 1998 found that after years of easing credit standards, banks slightly tightened credit standards for business loans to large and midsize firms, with smaller changes for loans to small firms. The patterns suggested that credit standards had been tightened more for firms with higher global exposure. Banks reported they were, on net, more willing to make consumer loans than they had been in the earlier survey. Although willingness to lend is not rising as rapidly as in early 1997, it is not falling at a pace associated with previous recessions and credit crunches (*Chart 8*). This pattern continued in the most recent survey of January 1999 but with banks reporting little net change in credit standards for business loans. Overall, it appears the United States is in a credit pinch rather than a crunch. Lending practices are returning to more normal levels of risk-taking.

Conclusion

The U.S. economy will likely grow at a robust pace in 1999, with a modest acceleration in inflation. However, the potential for further deterioration in economies overseas and financial market disruptions poses downside risks to this outlook.

— Evan F. Koenig
John Duca

BEYOND THE BORDER

Brazil: The First Financial Crisis of 1999

IN JANUARY BRAZIL—the eighth largest economy in the world—devalued its currency, initiating the first financial crisis of 1999. To understand Brazil's crisis, it is useful to examine the economic program that preceded it.

In 1994, after years of failed price stabilization plans and resulting high inflation, Brazil initiated a stabilization plan named for its new currency, the real. Despite some problems, the Real Plan was cause for optimism. Brazil took steps to correct a large federal deficit, reducing funds transferred by the federal government to the states and municipalities and increasing federal income taxes. Monetary policy became more restrained. Finally, Brazil pegged its currency to the dollar. Pegging involved using the central bank's dollar reserves to buy reais or using the real to buy dollars, whichever was necessary, to control the number of reais a dollar could buy.[1] In other words, if the free market would not supply as many dollars as real holders wanted at the official exchange rate, then the government would supply dollars out of its reserves.

By pegging its currency, Brazil was sending a signal not only about its currency but also about its monetary policy. To effectively peg its currency to the dollar, a country must follow a monetary policy parallel to that of the United States. If Brazil were to peg to the dollar and run a significantly more inflationary monetary policy than the United States, the difference between its inflation rate and U.S. inflation would ultimately cause intolerable stresses for its currency system; that is, U.S. prices expressed in reais would become cheap to Brazilians, but Brazilian prices expressed in dollars would be expensive to U.S. consumers. Everyone would buy American and no one would buy Brazilian. Brazil suspected it could not match U.S. monetary or inflation policy exactly, so it maintained a crawling peg. This meant the exchange rate would be allowed to slide, but within limits.

The pegged exchange rate plus the other aspects of the Real Plan did send an important message to the world: Brazil was making a persistent effort to control inflation and was achieving its goal. In 1994, the year the Real Plan began, Brazil's annual inflation rate exceeded 900 percent. By the end of 1998, price movements were negative.

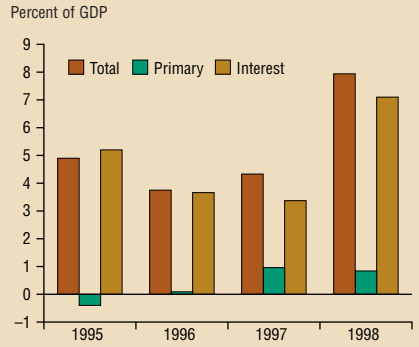
Despite the plan's success, however, the controlled devaluation built into Brazil's crawling peg was not enough to offset the cumulative differences between U.S. and Brazilian inflation rates. This overvaluation of the real made it harder to sell Brazilian products abroad because they were so expensive in dollars, and also motivated more Brazilians to shop abroad.

Financial Contagion

Another event aggravated the fiscal problems the country had hoped to address with programs linked to the Real Plan. Brazil began to suffer from financial contagion, in part because of worries about its overvaluation. Contagion occurs when a financial crisis in one country motivates investors to remove their funds from other—perhaps similar—countries as well. When financial crises swept Asia in 1997 and Russia in 1998, investors who were pulling their investments out of those countries also began to withdraw them from Brazil. To discourage the outflow of dollars, which the central bank would have to supply to maintain the pegged exchange rate, Brazil raised interest rates—a step intended to entice investors to hold their money in Brazil to earn high interest rates. Chart 1 reveals Brazilian interest rate surges, which reflect investor nervousness during the Korean and Russian financial crises.

CHART 1
BRAZILIAN INTEREST RATES

CHART 2
FISCAL DEFICIT WORSENS



The large increases in Brazilian interest rates, however, were not enough to keep foreign currency in the country. To maintain its pegged exchange rate, Brazil also had to devote much of its foreign currency reserves to defend the real. Dollar reserves, which had peaked at more than $70 billion at the beginning of 1998, dropped by half that amount by year's end.

A growing fiscal deficit frightened investors. Chart 2 breaks down the deficit between the portion attributed to interest payments—marked *interest*—and the portion—labeled *primary*—that is the difference between government expenditures on goods and services and the government's income from taxes and fees. The primary deficit is not large on

a year-to-year basis, but the year-in/year-out accumulation of these deficits by a country that has a history of debt moratoriums can worry investors—especially in the context of financial crises in Asia and Russia. Nevertheless, even some usual measures of overall indebtedness, such as the debt–gross domestic product (GDP) ratio, did not suggest an existing crisis.

While the primary deficit was not large, the increases in interest rates made the overall deficit much greater. Last year, the two parts of the deficit—the primary and interest portions—summed to about 8 percent of GDP. That, together with signs that the primary deficit problems might continue, made investors nervous. Increasingly uncomfortable with Brazilian debt in any case, debtholders became particularly more reluctant to hold longer-term Brazilian debt. The ratio of short-term to total Brazilian debt increased markedly.

The Endgame to Devaluation

As problems became more acute in 1998, some well-known economists—but not all of them—began to call openly for a Brazilian devaluation. After the re-election of President Fernando Henrique Cardoso last fall, hopes began to rise that he could effectively address Brazil's budgetary difficulties. He announced a new budget plan to save about $23 billion. Some analysts began to forecast federal primary surpluses for 1999. A $41.5 billion International Monetary Fund (IMF) pre-emptive program was announced to assure currency speculators that attacks on the real would not be warranted.

Then hopes began to fade. In December, a deficit reduction bill was voted down, in part by members of the president's own coalition. A significant pension reform effort failed. Meanwhile, still in December, the rate of capital outflows accelerated rapidly, to as much as $350 million per day.

If a particular event could be said to have triggered Brazil's devaluation, it was the announcement by the new governor of the Brazilian state of Minas Gerais that he would suspend his state's debt payments to Brazil's national government for three months. Capital outflows accelerated even more rapidly. By mid-January, Brazil announced that pegging was over and its exchange rate would be allowed to float.

What Next?

What are the implications of Brazil's crisis for the United States, and for Texas in particular? Although about 20 percent of U.S. trade is with Latin America, Brazil accounts for only about 2 percent of total U.S. exports and 1 percent of total imports. Similarly, Texas sends only 2 percent of its total exports to Brazil. For Texas, direct trade effects of the crisis will be small. Brazil's trade links with Texas' chief trading partners, Canada and Mexico, are also extremely limited.

Does this mean Brazil will have no international impact? Weakness in Brazil will have impacts on its chief trading partners, of which Argentina is a primary example. But a broader concern is that while Brazil had been subject to contagion effects, it might now trigger them. Although such effects were evident in some Latin American markets immediately after the onset of Brazil's crisis, they appear to have subsided. For now, the principal focus with respect to Brazil's problems is Brazil itself, where the economy is already in recession. In the wake of the devaluation and float, Brazil began to approve fiscal reforms, including much-needed pension reforms. Of particular interest will be the new IMF agreement, debt negotiations between state governors and the national government, and further congressional actions to address the central government's fiscal deficit. All these factors will be significant as Brazil attempts to resolve its crisis.

— William C. Gruben
Sherry Kiser

Note

[1] In Portuguese, the national language of Brazil, the plural form of words ending in the letter *l* is typically *is*. Under this rule, because one unit of Brazilian currency is a *real*, we refer to more than one as *reais*.

SWED REGIONAL UPDATE

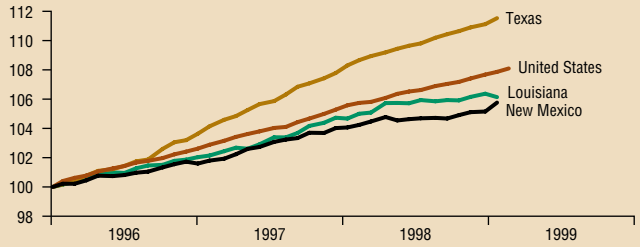
THE REGION'S ECONOMY continues to grow at a very healthy rate. Strong growth in services and construction has countered less robust manufacturing activity and weakening energy-related activity. This growth has kept labor market conditions tight and unemployment rates low. Construction labor, in particular, remains in short supply, but this may change in coming months with slower growth in commercial construction.

During the last part of 1998, a pullback in lending for speculative building caused a drop in Texas construction contract values. However, with many buildings under construction, real estate contacts expect completions of new office buildings to outpace leasing in the coming year, pushing occupancy rates down about 1 to 3 percentage points. Some office rent concessions of up to four free months have already been reported this year in Dallas and Houston. Free apartment rent of one or two months is also becoming quite common in some areas as a means of attracting new renters, but this has not yet caused a slowdown in apartment construction.

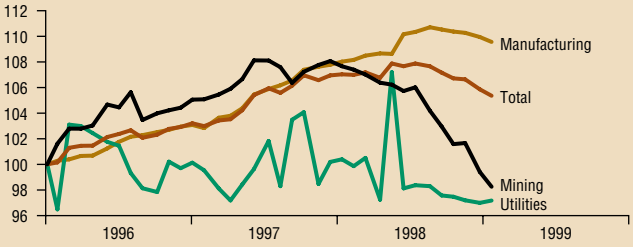
Low oil and natural gas prices continue to take their toll on the energy industry. Unseasonably warm weather and high inventories have pushed natural gas prices about 20 percent lower than last year's levels. Oil prices, which had reached highs above $25 per barrel in 1997, are now at about $12 per barrel, which is below the cost of drilling for many Texas producers. Slower drilling activity has reduced the number of Texas oil rigs by half over the past year. Texas oil and gas extraction jobs have declined 5 percent over the past 12 months as energy firms continue to lay off workers.

—Sheila Dolmas

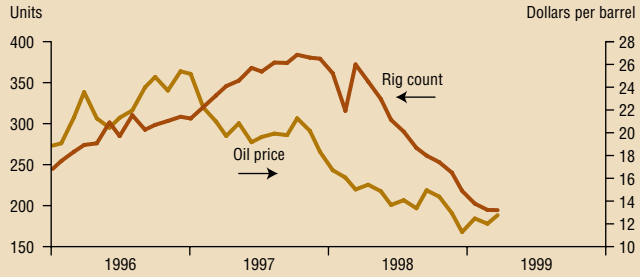
Total Nonfarm Employment



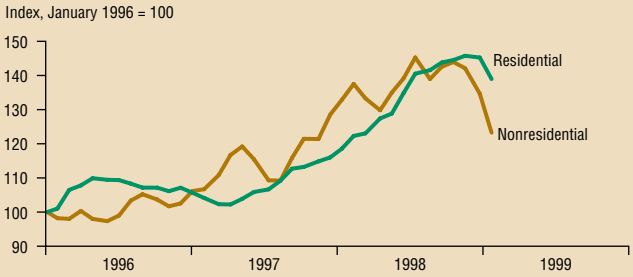
Texas Industrial Production Index



Texas Rig Count and West Texas Intermediate Crude Oil Prices



Texas Residential and Nonresidential Contract Values



Regional Economic Indicators

	Texas Leading Index	TIPI** total	Texas employment*					Total nonfarm employment*		
			Mining	Construction	Manufacturing	Government	Private service-producing	Texas	Louisiana	New Mexico
1/99	—	126.9	161.1	511.9	1,104.5	1,537.3	5,757.7	9,072.5	1,899.3	728.6
12/98	120.7	127.5	162.2	507.1	1,103.9	1,527.2	5,738.8	9,039.2	1,903.5	724.4
11/98	120.1	128.5	162.6	505.8	1,103.8	1,525.7	5,723.4	9,021.3	1,899.6	724.1
10/98	122.0	128.6	164.2	503.4	1,105.4	1,521.5	5,705.8	9,000.3	1,895.3	722.7
9/98	119.9	129.1	165.5	500.4	1,106.0	1,518.4	5,693.1	8,983.4	1,895.7	721.1
8/98	120.6	129.7	166.7	500.5	1,106.2	1,511.8	5,678.5	8,963.7	1,894.2	721.4
7/98	123.1	129.9	167.4	497.4	1,103.8	1,502.5	5,661.1	8,932.2	1,895.7	721.2
6/98	123.4	129.7	168.1	493.4	1,108.0	1,499.6	5,650.2	8,919.3	1,891.8	720.8
5/98	124.6	130.0	168.5	491.9	1,107.3	1,501.4	5,633.4	8,902.5	1,892.2	720.2
4/98	124.6	128.6	168.5	490.4	1,107.3	1,497.1	5,619.1	8,882.4	1,892.0	721.8
3/98	124.4	129.1	170.1	484.4	1,107.1	1,498.8	5,601.2	8,861.6	1,880.4	719.7
2/98	124.9	128.9	170.6	483.0	1,105.3	1,497.3	5,582.9	8,839.1	1,879.0	718.1

* in thousands
** Texas Industrial Production Index

Further Information on the Data

For more information on employment data, see "Reassessing Texas Employment Growth" (*Southwest Economy*, July/August 1993). For TIPI, see "The Texas Industrial Production Index" (Dallas Fed *Economic Review*, November 1989). For the Texas Leading Index and its components, see "The Texas Index of Leading Indicators: A Revision and Further Evaluation" (Dallas Fed *Economic Review*, July 1990).

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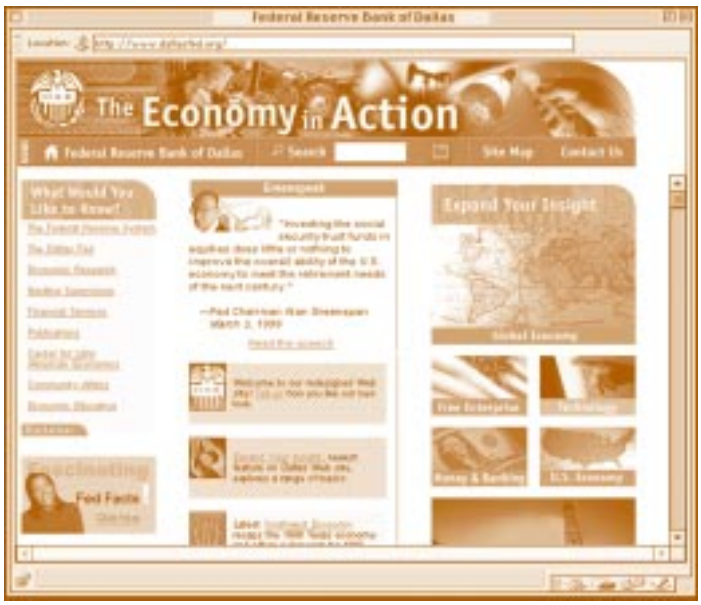

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