the Southwest ECONOMY

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Oil Extraction in The Southwest:

Smaller, Profitable And at Home In the City

Since the oil price collapse of the 1980s, volatility in the oil market has forced the industry to cut payrolls and consolidate to stay competitive.[1] These trends have reshaped the geographic distribution and nature of oil extraction, turning it into an urban and technology-based industry concentrated in Texas and Louisiana.

Oil extraction employment has continued to fall in the United States, and the significance of the industry to the oil-based Southwest economy has diminished steadily.[2] However, the reasons for declining employment have changed, reflecting a stronger, more profitable industry. Recent job losses have resulted from strategic realignment and from cost pressure generated by new exploration technology and gains in productivity.

This article examines growth trends in oil extraction, the industry's consolidation into a few large oil cities and the implications for economic growth in the Southwest. We find that the same trends that have reduced jobs overall—an international focus on exploration, new technology and competitive cost pressure—have worked to move jobs into the city. Although few Southwest cities have seen any net gain in oil-related employment since 1987, recent economic performance has been hurt less than might be expected as oil cities have found other avenues to grow. From 1987 to 1993, cities with large numbers of oil extraction jobs were at the forefront of the Southwest's recovery from the oil bust.

Recent Trends in Oil Extraction

Oil extraction employment since 1987 in the United States has been shaped by several factors. Low oil and natural gas prices still play a key role; the Organization of Petroleum Exporting Countries still engages in cartel pricing, but now recognizes oil-on-oil competition from basins around the world. OPEC prices continue to reflect monopoly revenues but are presumably set low enough to discourage exploration and production from non-OPEC basins, including those in the United States.

Volatile oil markets also play a role in restraining job growth. For decades before the oil bust, oil prices were very stable and controlled by the Texas Railroad Commission or by OPEC. Stability was the norm, and when an occasional oil price spike occurred, it stood out from long-term trends and a specific event could explain it—a refinery strike, war in the Middle East, an OPEC meeting and so forth. Since the late 1980s, volatility has increased and, despite OPEC's best efforts, prices have fluctuated widely and often.

Price volatility may restrain activity if producers are adverse to price risk, or if it raises the cost of doing business as producers hedge against price risk. More importantly, however, price volatility now shapes every oil company by forcing it to reduce fixed costs. It is important to be able to quickly *expand or contract activity* in response to changing market prices. One way to accomplish

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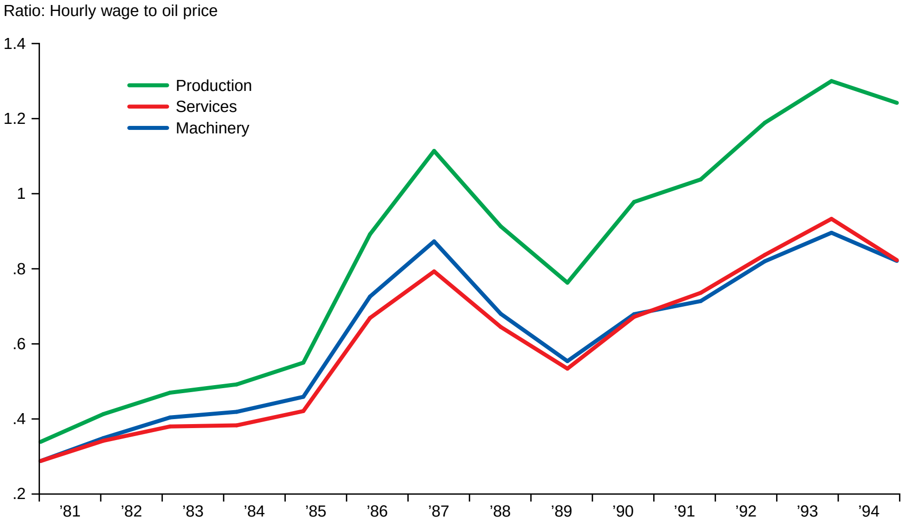
Chart 1
Implied Productivity in Oil and Gas Mining



SOURCE: Bureau of Labor Statistics, Department of Energy and author's calculations.

this is by shifting oil market risk to temporary employees, outside suppliers, contractors and consultants, and by hiring fewer workers for the permanent payroll. Much work once done by the oil industry is now performed in other industries. This reduces direct oil employment, but opens new opportunities for local businesses in support industries.

Another important trend in the 1990s has been that many of America's largest oil producers shifted their emphasis from domestic to foreign exploration and production. The U.S. onshore fields are perceived as drilled out, and offshore opportunities are mostly confined to the western Gulf of Mexico. Among large, integrated producers in particular, restructuring and downsizing of staff assigned to domestic operations became the hallmark of the early 1990s.

Improved management and technology also is reshaping the industry. Important new tools, such as three-dimensional seismic, coiled tubing, and measurement while drilling, have lowered drilling costs, reduced risk and widened the range of economic prospects available to the industry. The recent strong interest in the Gulf of Mexico, both in deep water and in the subsalt regions, is largely a product of advancing technology. Chart 1 shows the ratio of industry wages relative to the price of oil, an implicit measure of industry productivity that shows strong gains since 1985.

Finally, oil industry employment in the United States has steadily declined over the past 15 years. The total number of jobs rose by 491,000 from 1973 to 1981, or by 256 percent. Many of these gains were quickly erased after the oil bubble burst in 1981, and the industry lost 374,000 jobs the following six years. The boom and bust in the industry is described in Table 1, which shows changes in industry employment since 1973.

An Urban Oil Industry

Oil industry trends are shaping not just the level of U.S. oil employment but also its geographic distribution. In particular, an urban and technology-based oil industry has emerged that operates equally well at home and around the world. This urban industry is headquartered in the southwestern United States. As the oil industry has shrunk, it has shifted a bigger share of its jobs and payrolls into Texas and Louisiana, and especially into the region's largest cities.

Chart 2 shows the share of U.S. oil industry wages, salaries and benefits paid in Texas and Louisiana. These two states received 46.7 percent of the U.S. total as the oil bust began in 1981, 58.6 percent in 1987 and 62.2 percent in 1993. The share of U.S oil income paid in Houston, Dallas and New Orleans also is tracked in Chart 2, and the growing share in the two states results almost completely from gains in the large cities. In Texas, for example, 83 percent of the wages, salaries and benefits paid by oil producers and oil services in 1993 were paid out in metropolitan areas.

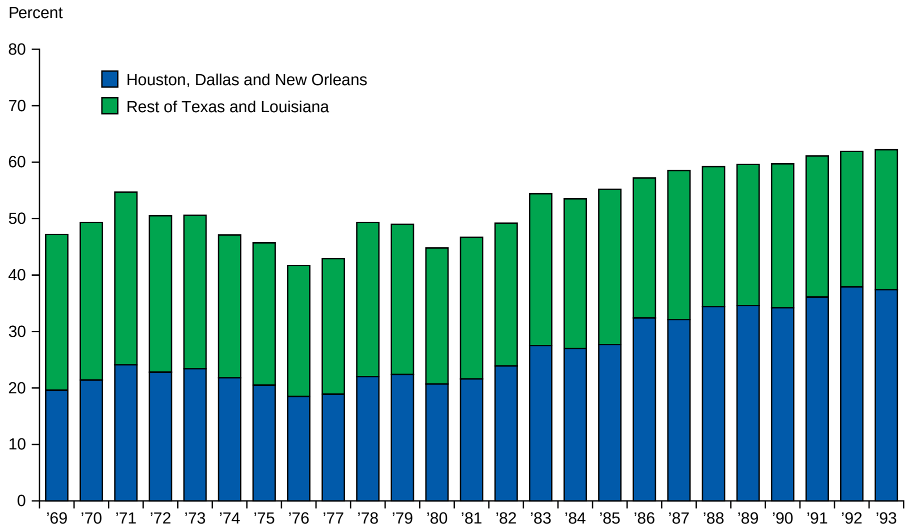
The shift to the cities has been a steady trend since the early 1980s. If this trend is surprising, it is only because we think of oil extraction as a resource-based industry. Yet there is a growing urban component that is becoming footloose—no longer tied to one field or a single oil basin, perhaps working in several U.S. oil basins, perhaps operating overseas, and perhaps both. For example, a producer or service company that in past years operated profitably in a single U.S. oil basin may now find fewer local opportunities. To keep the company viable or make it grow, work must be found elsewhere, and opportunities within the industry spread out geographically. To capitalize

Table 1
Employment in Oil and Gas Production, Services and Machinery
(Thousands of jobs)

Year	Producers	Services	Machinery	Total
1973	135.6	134.6	45.4	315.6
1981	254.3	430.2	122.3	806.8
1987	199.4	197.0	36.4	432.8
1993	171.2	173.5	37.9	382.6

SOURCE: Bureau of Labor Statistics, Employment and Earnings.

Chart 2
Oil Industry Wages, Salaries and Benefits Paid in Texas and Louisiana
(Percent of U.S. Total 1969 to 1993)



SOURCE: Bureau of Economic Analysis, Regional Economic Information System.

on new opportunities, a bigger oil center—a Houston, Dallas or New Orleans with strong ties to producers and services already operating in many regions—may offer a better central point from which to organize work in multiple basins. The large, integrated oil companies have been footloose for a very long time in the sense of seeking exploration and production opportunities on a global scale. Increasingly, we see large independent producers now operate throughout the United States or overseas.

To better see how the consolidation of oil extraction worked in the United States, we found 29 cities that have (or recently had) a number of oil extraction jobs. The candidate cities were located with the help of the *Oil and Gas Journal*'s annual listing of publicly traded producers, Standard & Poor's *Register of Corporations* and various databases that contain information on county or metropolitan area jobs and income. *County Business Patterns* then provided specific detail for the 29 metropolitan areas. Together, the 29 cities represent almost half of U.S. oil employment with headquarters, exploration services and machinery most concentrated in the cities (*Table 2*). The post-1987 consolidation of the industry is led by producers, headquarters and exploration services.

Table 3 shows total oil extraction employment for 16 of the 29 cities, all located in Texas and Louisiana, and each city's percentage of the 29-city total in 1987 and 1993. Houston clearly stands apart, making up over one-third of the 29-city total, followed by the Metroplex (Dallas, No. 2, Fort Worth, No. 5), and Midland–Odessa, New Orleans and Lafayette. Houston, Dallas and New Orleans are the cities with the largest concentration of headquarters facilities. Midland–Odessa and Lafayette, in contrast, are primarily service centers for the

Table 2
Twenty-Nine Oil Cities as a Share
Of the U.S. Oil Industry
(Percent of Employment in Oil
Extraction, 1987 and 1993)

	1987	**1993**
All oil extraction	45.2	47.4
Producers	28.5	41.2
Headquarters	67.6	68.3
Services	36.1	35.2
Drilling	37.1	38.7
Exploration	49.2	56.0
N.E.C.	33.9	31.1
Machinery	73.2	69.7

SOURCE: *County Business Patterns.*

"Oil industry trends are shaping not just the level of U.S. oil employment but also its geographic distribution."

"The opportunity to be close to a large number of potential clients is an irresistible attraction for suppliers."

Permian Basin and Gulf of Mexico, respectively.

The growing footloose part of the industry, operating at home and abroad, has created not just a split between metropolitan and nonmetropolitan areas but also a division between large and small oil cities. Industry consolidation has generally favored those cities that are home to the largest clusters of oil industry activity, especially Houston. Such clustering is not unique to the oil industry. Throughout the U.S. economy we find industry-specific activity such as entertainment in Hollywood, autos in Detroit and financial services in New York.

Three reasons can be given for the formation of large industrial clusters. First, there is the need to be plugged into cutting-edge activity, to be part of the industry's knowledge loop. Economists call this "informational spillovers"—insights gleaned from professional groups and meetings, from technical small talk and gossip or by keeping an eye on competitors. Second, large clusters allow a specialized labor force to form. A wide choice of employees with industry-specific skills and experience is attractive to employers; the cluster is similarly attractive to employees because of the range of job alternatives offered them. Finally, just as labor specializes, so do suppliers and financial providers. The opportunity to be close to a large number of potential clients is an irresistible attraction for suppliers.

Note the strong cumulative effects of success. The bigger the city, the more attractive it is; the more attractive it is, the bigger it gets. A city's advantages are partly built on critical knowledge needed for survival, and partly built on potential cost savings from labor and suppliers. The process works in reverse as well. As a cluster unravels, past success can quickly spiral into failure.

Implications for Regional Growth

For Texas and Louisiana, this is bittersweet economic news. The oil extraction industry is healthy and profitable, exhibiting strong productivity, and skill levels and wages

Table 3
A Comparison of Total Oil Employment in 16 Southwestern Cities

City name	1993 total oil jobs	1993 percent of 29-city total	1987 total oil jobs	1987 percent of 29-city total
Houston	57,628	33.8	55,160	28.1
Dallas	16,979	10.0	18,626	9.5
Midland – Odessa	9,590	5.6	12,876	6.6
New Orleans	9,136	5.4	12,103	6.2
Lafayette	7,008	4.1	6,541	3.3
Fort Worth	5,106	3.0	5,721	2.9
Houma	2,623	1.5	4,257	2.2
Longview – Marshall	1,876	1.1	3,162	1.6
Shreveport	1,796	1.1	2,661	1.4
Corpus Christi	1,719	1.0	2,566	1.3
San Antonio	1,584	.9	2,582	1.3
Wichita Falls	1,429	.8	3,218	1.6
Abilene	1,301	.8	1,939	1.0
Tyler	1,019	.6	627	.3
Amarillo	550	.3	851	.4
Laredo	446	.3	369	.2
16 southwestern cities	119,790	70.3	133,259	67.9
Remaining 13 cities	50,593	29.7	63,096	32.1
All 29 oil cities	170,383	100.0	196,355	100.0

SOURCE: *County Business Patterns.*

Table 4
Diversification Indexes for 16 Oil Cities in Texas and Louisiana

City name	Index	Made different by
Midland – Odessa	1,274	Oil and gas extraction
Houma	980	Oil and gas extraction
Lafayette	650	Oil and gas extraction
Laredo	232	Oil and gas extraction
Longview – Marshall	188	Oil and gas extraction
Abilene	185	Military
Corpus Christi	170	Oil refining
Amarillo	163	Oil and gas extraction
New Orleans	144	Oil and gas extraction
Wichita Falls	141	Military
Houston	119	Oil and gas extraction
Tyler	75	Oil and gas extraction
San Antonio	59	Federal military
Fort Worth	58	Transportation equipment, excluding automobiles
Shreveport	39	Oil and gas extraction
Dallas	29	Oil and gas extraction
16 southwestern oil cities	282	
13 other oil cities	117	
29 oil cities	208	

SOURCE: Bureau of Economic Analysis, Regional Economic Information System and author's calculations.

are rising. However, the industry still is not creating jobs, and continued job losses are concentrated among smaller oil centers. What does this mean for cities with large numbers of oil jobs? Or for broader regional growth trends? Our conclusion is that these Southwest oil cities *were* hurt by the massive industry correction of the oil bust, but they are now coping well with current job trends.

There is no question that oil shapes the industrial structure of these southwestern cities.[3] As seen in Table 4, oil is a large factor pulling the 16 Southwest oil cities away from a "typical" U.S. industrial structure. It is a mistake to conclude all these cities are simply built on oil, however. In each city, there is typically an industry other than oil extraction that can serve as a fallback when oil is hurt. Examples are transportation services in Laredo, chemicals in Houston and New Orleans, and the military in Abilene and Wichita Falls.

During the oil downturn, it was widely predicted that successful entrepreneurship would play a key role in the economic recovery of the Southwest. A forest-fire analogy was often used; in other words, the layoffs of skilled technical people from oil and other industries were the seeds from which the next generation of companies and jobs would grow. The number of self-employed in the 16 oil cities in Texas and Louisiana grew twice as fast as it did in the United States from 1982 to 1987, while the income of the self-employed grew at half the rate it did in the United States. This turned around after 1987. From 1987 to 1993, the growth in the number of self-employed in the 16 cities slowed to a rate well below that of the United States, while entrepreneurial income grew at 80.5 percent versus 42.3 percent in the United States.

Now that the extensive adjustments required by the oil bust are well behind them, the regional oil cities have demonstrated they can grow without significant help from oil extraction. Despite continued dependence on oil, and oil's inability to create larger numbers of jobs, these cities collectively have shared in the Southwest's economic recovery. Taken together, their income and employment growth has exceeded that of the United States since 1987. As was often predicted during the oil downturn, entrepreneurial income has become a powerful source of growth in virtually every oil city in Texas and Louisiana.

—Robert W. Gilmer

Notes

1 The oil extraction industry consists of oil production, exploration, drilling and other services performed for producers, and the manufacture of specialized oil machinery.

2 For further detail on the source of the data and the actual figures, see "The Oil Industry and the Cities: Consolidation in the Oil Extraction Industry," *Houston Business*, Federal Reserve Bank of Dallas, April 1996.

3 One way to illustrate how oil shapes industrial structure is to compute the following simple index that compares each city, industry-by-industry, to the United States. The United States, as a mix of all cities, provides a standard for a highly diversified place. The measure is zero if the city is highly diversified and matches the U.S. share in every industry; the index is large if the city has an industry mix that diverges far from the U.S. norm. A local concentration in any industry that is much larger than the U.S. will increase the index very quickly. The measure is

$$I = \sum_{i=1}^{n} \frac{(s_i - s_i^*)^2}{s_i^*} * 100,$$

where s_i is the share of wages, salaries and benefits paid in industry i, s_i^* is the U.S. share of earnings in industry i and n is the number of industries. Table 4 shows the list of 16 southwestern oil cities, ranked from top to bottom according to their index value in 1987, or according to how different they are from the U.S. norm. Values and ranking in 1993 are very similar. Table 4 also shows the industry that contributed most to making each city different from the United States. Where oil and natural gas extraction is not the industry that makes a city most different, it ranks No. 2. As seen at the bottom of Table 4, the indexes for these 16 cities have an average value twice as big as the other 13 of 29 oil cities. For more details on this index and its application to 29 oil cities, see "Industrial Structure in Oil Cities," *Houston Business*, Federal Reserve Bank of Dallas, May 1996.

Should High Gold Prices Be A Source of Concern?

"A rise in the price of gold is the best signal that we have to indicate that there is diminished confidence about the future purchasing power of money."

—Wayne Angell

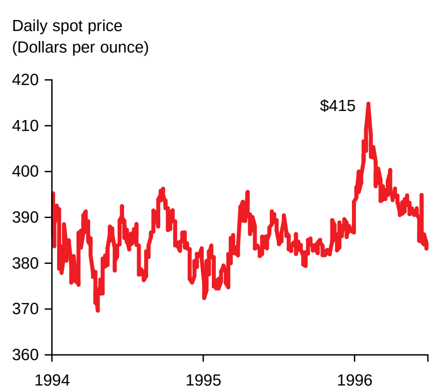
"Gold has racked up a notoriously poor record as a leading indicator of U.S. inflation, especially in the '80s and '90s."

—Citibank economists

One of the primary responsibilities of the Federal Reserve is to facilitate mutually beneficial, private exchange by maintaining the value of the nation's currency. If the future purchasing power of the dollar is uncertain, the operation of our free enterprise economy is disrupted: people will forgo transactions that they would otherwise have undertaken and be forced to negotiate complicated and costly contingent contracts that they otherwise would have been able to avoid. To protect themselves from loss, people will eschew dollar-denominated assets in favor of alternative stores of value.

In the view of some economists, gold plays a special role as an alternative store of value. When, after two years of comparative quiet, the price of gold surged this winter (*Chart 1*), these economists warned of an impending increase in inflation. For example, in a *Wall Street Journal* editorial, former Federal Reserve Governor Wayne Angell asserted that "A rise in the price of gold is the best signal that we have to indicate that there is diminished confidence about the future purchasing power of money." Other analysts were skeptical about the significance of the gold-price run-up and, more generally, about the usefulness of gold as an inflation indicator. Citibank economists, writing in the newsletter *Economic Week*, asserted that "Gold has racked up a notoriously poor record as a leading indicator of U.S. inflation, especially in the '80s and '90s."

Chart 1
Gold's Sharp Winter Price Hike



SOURCE: London Bullion Fixing.

In research presented here, I show that Wayne Angell and Citibank are *both* right. Consistent with Wayne Angell's view, there is evidence that the price of gold has been one of our more useful inflation indicators during the 1980s and 1990s. However, consistent with Citibank's skepticism, the predictive performance of gold has been less than stellar.

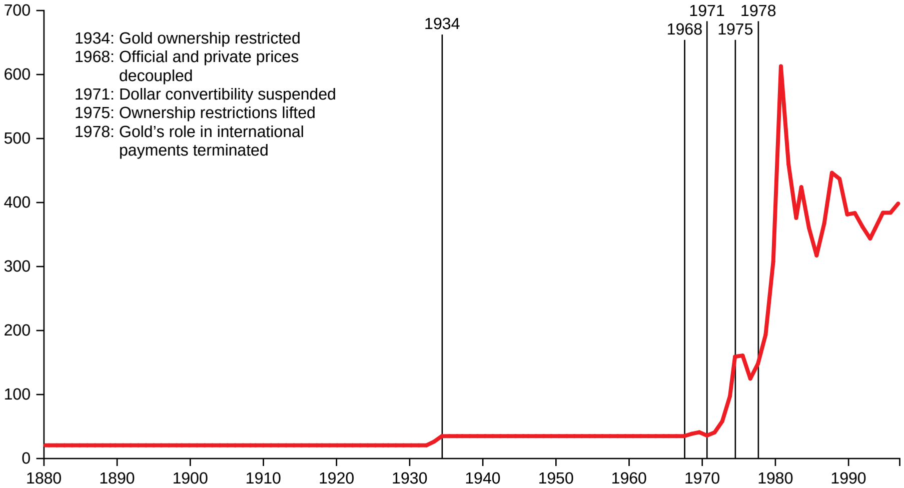
Historical Background

Why might gold be regarded as a particularly attractive store of value in times of inflation and inflation uncertainty? Compared with other commodities, gold is unusually durable: it doesn't decay, rust or tarnish. Gold's attractive appearance and malleability mean that it can be enjoyed as jewelry or other ornamentation and yet is easily convertible into coin or bullion. Moreover, because gold is durable and malleable, nearly all the gold that has ever been mined is still available. Consequently, the available stock of gold is large relative to the influx of newly mined gold, and the total supply of gold does not fluctuate much from year to year. Finally, gold is sufficiently rare that only small quantities are needed to purchase large amounts of other goods and services.

Chart 2 provides some historical perspective on the price of gold. It shows that for over 50 years, from 1879 through 1932, the price of gold was fixed at just under $21 per ounce. In 1934, the price was reset at $35 per ounce, and U.S. citizens were prohibited from owning gold coins or bullion. No further changes occurred until 1968, when the metal's private price was decoupled from its official price. But it was not until 1971, when the convertibility of the dollar was suspended, that the market price of an ounce of gold rose appreciably. In 1975, private U.S. citizens were again allowed to hold gold coins

Chart 2
The Price of Gold

Annual averages
(Dollars per ounce)



SOURCE: U. S. Congress.

and bullion, and in 1978 the International Monetary Fund's official gold prices and gold convertibility requirements were finally terminated. The average annual price of gold peaked a few years later, in 1980, at more than $600 per ounce. (The peak daily closing price—achieved early in 1980—was $850 per ounce.) Since 1982, average annual gold prices have stayed between $300 and $450 per ounce.

The focus of this article is on the gold–inflation relationship since 1981. The 1980s and 1990s have been marked by comparative stability in the international financial system and the laws pertaining to gold ownership. Moreover, there have been no substantial changes in the conduct of monetary policy, and it is over this period that its critics say gold has performed poorly as an inflation indicator.

Gold as an Inflation Indicator

To get a clear picture of the relationship between the price of gold and inflation, we must smooth out some of their short-term fluctuations. To this end, Chart 3 plots a six-month moving average of the annualized rate of change in the consumer price index (CPI) and a 12-month moving average of the price of gold. The gold-price plot is shifted relative to the inflation plot to show the level of gold prices six months earlier. For example, the chart indicates that inflation during the six months ending in July 1986 was very low: consumer prices actually *fell* at an annual rate of almost 1 percent. The gold-price plot attains its minimum ($317 per ounce) at very nearly the same position on the chart—indicating that the low inflation in the first half of 1986 was preceded by low gold prices during 1985. More generally, Chart 3 suggests that sustained movements in inflation have often been preceded by similar movements in the price of gold. The most glaring exception occurs in late 1990, when the Persian Gulf crisis triggered a sharp uptick in inflation that was not foreshadowed by a rise in gold prices.

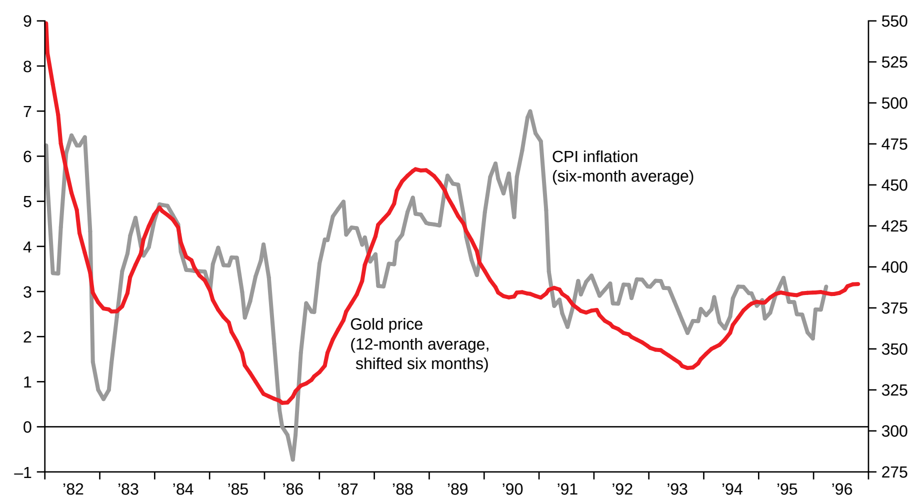
Exactly how much power to predict future inflation do gold prices have? To get an answer, I regressed six-month inflation rates first simply on past inflation rates, and second on both past inflation rates and past gold prices. I found that past rates of consumer price inflation are of absolutely no use in predicting current consumer price inflation: the adjusted R^2 when lagged inflation rates are the only explanatory variables is actually negative.[1] In contrast, when gold is introduced into the forecasting equation, the equation's predictive power rises to 21 percent.

Moreover, the impact of gold is quantitatively significant. Roughly speaking, each $10 increase in the price of gold, sustained for six months, implies a 20-basis-point-higher inflation rate over the following six months.[2] For example, the $30 increase in the price of gold

Chart 3
Gold as an Inflation Indicator

Annualized percentage
(Change in CPI)

Gold price
(Dollars per ounce)



SOURCE: Department of Labor, author's calculations.

“An upward blip in gold prices says little about future inflation. However, a consistently high gold price is one of the symptoms of an irresponsible monetary policy.”

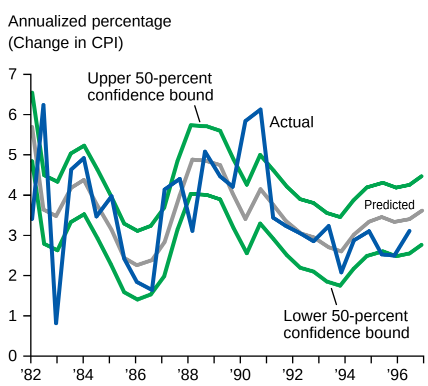
that occurred this winter, *had it been sustained*, would have raised forecasted inflation in the second half of 1996 by over half a percentage point.

Gold Prices Are Predicting Higher Inflation

Chart 4 plots actual and predicted six-month changes in the consumer price index, where predictions are based on lagged gold prices and lagged inflation rates. The most recent inflation prediction—3.6 percent—covers the six-month period between March and September of 1996. In the previous six-month period, the predicted inflation rate was 3.3 percent and the actual inflation rate was 3.1 percent.

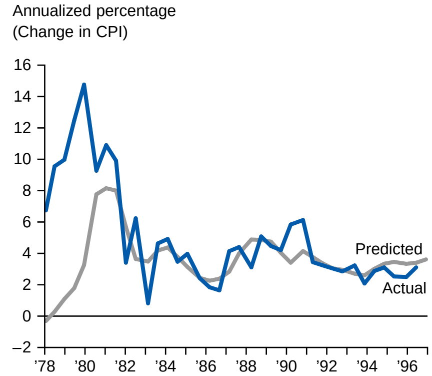
How much confidence should one place in the current 3.6-percent inflation prediction? Not a lot. On either side of the predicted-inflation plot, Chart 4 displays upper and lower 50-percent confidence bounds. Chances that the actual inflation rate will lie within these bounds are 50–50. For inflation from March to September of 1996, the upper and lower bounds are 4.5 percent and 2.75 percent, respectively. That’s a pretty wide range. Indeed, despite its 3.6-percent inflation prediction, the forecasting equation says that there is a one-in-three chance that inflation will be lower over the next six months than the 3.1-percent rate recorded

Chart 4
Gold’s Prediction: Higher Inflation



SOURCE: Department of Labor, author’s calculations.

Chart 5
Signs of Instability



SOURCE: Department of Labor, author’s calculations.

over the past six months. Even with gold’s help, inflation predictions aren’t very accurate.

More Caveats

Just because gold is helpful for predicting inflation doesn’t mean that it is the *best* inflation indicator, or that other indicators aren’t helpful, too. I looked at nine indicators other than the price of gold, including measures of labor market and output market slack, survey measures of inflation expectations, the slope of the yield curve, and measures of money growth and commodity prices. Among these alternative indicators, I found that the slope of the yield curve has had more predictive power for consumer price inflation during the 1980s and early 1990s than has the price of gold: the yield curve explains 25 percent of the variation in CPI inflation over this period, as compared with 21 percent for gold. One does even better using both variables together: predictive power jumps up to 38 percent.

The clear message is that gold may not be the only—or even the most valuable—indicator of future inflation. Moreover, just because gold has historically been helpful for predicting inflation doesn’t mean that it will remain so in the future. Some evidence on this score is illustrated in Chart 5, which extends our earlier plots of actual inflation and predicted inflation back into the late 1970s. A sharp deterioration in the performance of the forecasting model is evident as one moves backward in time: inflation is much, much higher prior to 1981 than the model would have predicted. Indeed, the model says that the chances of seeing such high inflation rates were less than one in 100.

What accounts for this breakdown in the predictive performance of gold? One possibility is that gold sales by the world's central banks following elimination of convertibility requirements kept gold prices below what they otherwise would have been. In any case, the forecasting breakdown raises fears that the relationship between gold and inflation may shift again. Such a shift might occur as a result of renewed gold sales by central banks (who still hold a third of the world's total mined gold). Alternatively, it might occur in response to increased real or policy uncertainty in the United States or overseas.

A second reason for skepticism concerning the reliability of the gold–inflation relationship has to do with gold's more recent forecasting performance. As shown in both Chart 4 and Chart 5, since 1993 actual inflation has fallen short of the rate one would have predicted using past inflation and gold prices. While this string of overpredictions may very well be only a chance occurrence, it bears watching.

Conclusion: Gold's Predictive Power Is Neither a Mirage Nor a Panacea

Federal Reserve Chairman Alan Greenspan has said that the price of gold is a useful but not perfect indicator of inflationary expectations. In other words, as an indicator of future inflation, the price of gold is neither a mirage nor a panacea. Consistent with Greenspan's view, there is evidence that sustained movements in the price of gold convey valuable information about future inflation trends.

Currently, the price of gold is signaling that inflation is likely to rise. However, the confidence bands around this prediction are quite wide. If we want to narrow these bands, we must look beyond gold to the information contained in other economic and financial indicators. The need to look beyond gold is heightened by the realization that the gold–inflation relationship has not always been stable.

Should high gold prices be a source of concern? Yes, but not a source of panic. An upward blip in gold prices like that observed this winter says little about future inflation. However, a consistently high gold price is one of the symptoms of an irresponsible monetary policy.

—Evan F. Koenig

Notes

1 The *un*adjusted R^2 is the fraction of the variation in the dependent variable that is explained by the regression equation. The adjusted R^2 exacts a penalty for each additional explanatory variable to offset the tendency for even an irrelevant regressor to increase the unadjusted R^2. (In the extreme case where there are as many independent regressors as observations, the R^2 would always be 1.0 in the absence of adjustment.) The exact relationship between the two measures of explanatory power is $R^2_A = R^2_U - k(1 - R^2_U)/(n - k - 1)$, where R^2_A is the adjusted R^2, R^2_U is the unadjusted R^2, k is the number of regressors (excluding the constant) and n is the number of observations.

2 The estimated regression takes the form:

$$\pi_t = \underset{(2.472)}{-3.754} + \underset{(0.180)}{0.158}\pi_{t-1} + \underset{(0.146)}{0.000}\pi_{t-2} + \underset{(0.0065)}{0.0175}g_{t-1}$$

$$R^2_A = .213,\ \text{S.E.} = 1.262,$$

where π is the annualized percentage rate of consumer price inflation over a six-month period, g is the average monthly gold price over a six-month period and standard errors are in parentheses. The equation was estimated using semiannual data, from 1982:H1–95:H2.

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Beyond the Border

Chile: The Big Saver

Chile's persistently high economic growth has helped make the country a model of success for Latin America. A high savings rate seems to be one of Chile's most important distinguishing characteristics. Because high savings rates often lead to high rates of investment and growth, other Latin American countries want to emulate Chile's savings-inducing government programs.

Developing countries need investment to grow, and they can acquire the necessary funds from either international capital markets or domestic savings. But much research suggests that the international mobility of financial capital is somewhat limited, and that capital that is internationally mobile can be volatile. In other words, money tends to stay in its native country, and the funds that do circulate in international capital markets are subject to capital flight. Volatility apparently occurs for reasons that have as much to do with world capital markets as with anything a particular country can do to promote stability. To the extent that domestic savings are less footloose than international capital, it is not surprising that many Latin American countries have been pursuing increased domestic savings.

Table 1
Chile: The Biggest Latin American Saver
(Savings as a percentage of GDP)

	1988–94 average
Argentina*	19.02
Mexico	19.84
Brazil	22.49
Chile	28.70
Colombia	21.57
Venezuela**	22.68

*1988–93. **1988–95.

SOURCE: Board of Governors, International Monetary Fund.

As Table 1 illustrates, Chile's savings as a percentage of gross domestic product (GDP) have consistently exceeded those of other Latin American countries by 5 to 6 percent. What Chile has been putting away provides a stable source of funding for investment.

In the search for causes of Chile's high savings, the country's private pension system has emerged as the leading candidate. Chilean law requires workers to put 10 percent of their pretax income into one of 18 private pension funds. The growth and development of this system in the 1980s coincided with the steep rise in Chilean savings; hence, the pension program appears to have had an important impact on savings. Argentina, Colombia, Peru and Mexico all have implemented some type of Chilean-style private pension scheme, although these schemes are not always as ambitious as Chile's.

The conventional wisdom views the pension system as a powerful force driving Chilean savings. Research by University of Chile professor Manuel Agosin, although not reversing this notion, raises questions about its strength. Agosin estimates that although total Chilean savings are high, the rate of household savings is about 0 percent. The forced saving induced by the pension system may have raised the rate of household savings, confirming prior beliefs, but from levels that had been negative (2 to 3 percent) for quite some time.

Agosin identifies the two major sources of Chile's savings as the public sector and private firms, which contrasts with the findings of other analysts who have focused on the individual. The public-sector contribution to savings is the smaller of the two but is still important. The fiscal surplus in 1994 was 1.6 percent of GDP; Chile has been running substantial fiscal surpluses throughout the 1990s. Chilean law prohibits the government from running a fiscal deficit, and the Banco Central de Chile cannot finance government spending by printing money. While the Banco Central has been losing money recently, state-owned companies have been making large positive contributions to national savings. The state-owned copper mining company, Codelco, has saved quite a bit over the past few years. The wild fluctuations in the price of copper in recent weeks may hurt Codelco's profitability; nonetheless, the company has been a major force driving Chilean savings. On average, state-owned corporations have set aside about 5 percent of GDP annually, according to Agosin.

Public-sector savings are significant, but private savings are more important, having risen from 2.3 percent of GDP in 1980 to 22.1 percent in 1994. Savings by firms account for most of the increase. The creation of a private pension scheme has played important roles in Chile's economy—including the development of an efficient capital market. But Chilean firms generate most of their savings from within and invest those savings internally.

The basis for firms' savings is, of course, their profits. Chilean government policies, policies that have very little to do with the country's pension scheme, have greatly affected profits. The massive devaluation of the Chilean peso in 1982 triggered a surge in Chile's exports, which ultimately led to an overall economic expansion. Having continued for 14 consecutive years, this expansion has resulted in massive profits that companies have kept for internal investment. Chile's abundant natural resources—copper, fruits and vegetables, fish, and forest products—and government policies that permit their efficient exploitation have offered ample investment opportunities.

Agosin's analysis suggests that other Latin American countries will not be able to duplicate Chile's savings rates by simply aping its private pension system, but most Latin American countries have gone far afield in their reforms in any case. While a private pension system is important, rational fiscal and monetary policies that generate long-term growth are probably much more significant.

—Jeremy Nalewaik

Regional Update

Despite a drought and a slump in semiconductor demand, the Eleventh District economy accelerated in April after a relatively slow first quarter. Anecdotal reports from business contacts suggest that economic activity remained healthy in May and early June, and contacts were generally upbeat about the outlook for the rest of the year.

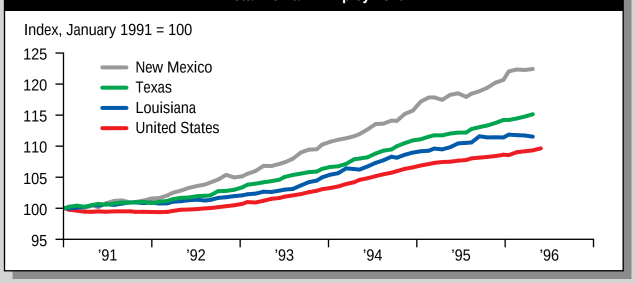
District job growth improved in April after sluggish growth in the first part of the year. Employment rose almost 3 percent in April, following first-quarter growth of about 2 percent. Much of the April increase resulted from a pickup in manufacturing, which was boosted by hiring in construction-related industries. Electronics employment also accelerated in April, despite reports of lower demand for semiconductors. Other manufacturing indicators, such as the manufacturing component of TIPI and weekly hours worked, rose in April, suggesting further expansion in this sector.

An improving Mexican economy has also helped bolster the Eleventh District economy. Texas exports to Mexico rose strongly in the first quarter after falling overall in 1995, and retail sales along the Mexico–Texas border continue to improve. In addition, the energy sector has strengthened, boosted in part by strong natural gas drilling in the Gulf of Mexico. Nevertheless, drought continues to hurt Eleventh District farmers and ranchers. Crop insurance and federal aid should help mitigate the negative effects, however.

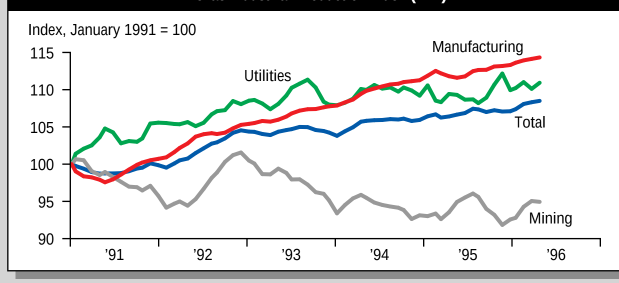
The Texas Leading Index increased for the fourth consecutive month in April. Recent strength in the index and anecdotal reports suggest the Texas economy should continue on its current course of healthy expansion in coming months.

—D'Ann M. Petersen

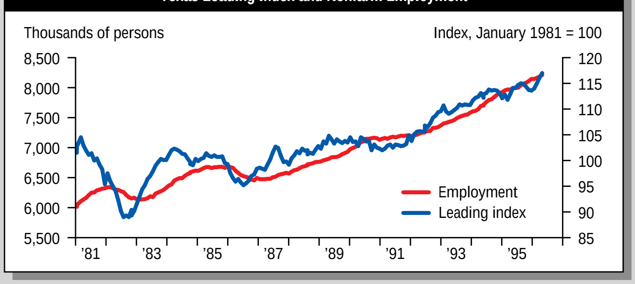
Total Nonfarm Employment



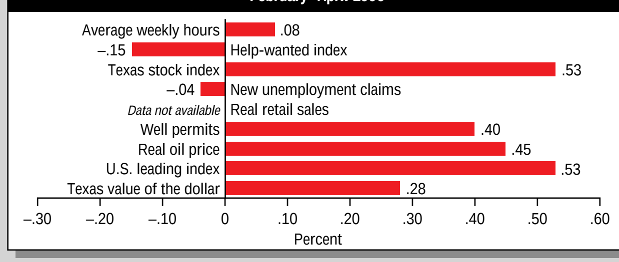
Texas Industrial Production Index (TIPI)



Texas Leading Index and Nonfarm Employment



Net Contributions of Components to Change in Leading Index, February–April 1996



REGIONAL ECONOMIC INDICATORS

	Texas Leading Index	TIPI total	Texas Employment: Mining	Texas Employment: Construction	Texas Employment: Manufacturing	Texas Employment: Government	Texas Employment: Private service-producing	Total Nonfarm Employment: Texas	Total Nonfarm Employment: Louisiana	Total Nonfarm Employment: New Mexico
4/96	117.0	121.2	153.1	427.1	1,038.6	1,469.3	5,123.2	8,211.3	1,790.1	712.3
3/96	116.1	121.0	153.6	425.5	1,036.2	1,466.7	5,102.1	8,184.1	1,793.1	711.4
2/96	115.0	120.7	154.5	425.6	1,037.3	1,464.9	5,080.3	8,162.6	1,794.0	711.8
1/96	114.0	119.9	152.6	425.5	1,040.2	1,462.0	5,064.6	8,144.9	1,795.3	710.1
12/95	113.6	119.6	154.5	421.4	1,035.3	1,461.9	5,072.0	8,145.1	1,788.1	702.1
11/95	113.7	119.6	154.4	418.4	1,032.4	1,459.6	5,046.0	8,110.8	1,788.4	699.5
10/95	114.3	119.8	154.8	415.8	1,030.7	1,455.3	5,025.9	8,082.5	1,788.2	694.8
9/95	114.9	119.5	155.3	411.7	1,031.3	1,453.0	5,011.7	8,063.0	1,791.1	691.5
8/95	115.0	119.9	155.4	408.0	1,029.3	1,458.9	4,989.5	8,041.1	1,775.1	689.1
7/95	114.7	120.0	155.1	405.0	1,026.2	1,449.4	4,965.3	8,001.0	1,774.1	686.2
6/95	114.1	119.3	156.7	407.3	1,028.0	1,445.1	4,962.6	7,999.7	1,772.7	689.5
5/95	114.1	119.1	156.9	406.1	1,027.2	1,441.8	4,957.5	7,989.5	1,762.8	688.1

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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