



HoustonBusiness

A Perspective on the Houston Economy

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The Houston Business Cycle Since the Oil Bust

Using Houston employment as our primary guide, we look at total employment, build a diffusion index based on changes in employment by sector and search out unusual concentrations of local jobs to define local export activity. We also use other economic series to define an index of coincident economic activity.

Nearly 16 years have elapsed since Houston's oil bust ended in early 1987. Since that time several important events have shaped the local business cycle: the 1990–91 U.S. economic recession, the U.S. economic boom of the late 1990s, the Asian financial crisis and the 2001 U.S. recession. Intertwoven with these larger events is a related cycle in oil and other commodities that was particularly important to Houston.

Since 1987 Houston's business cycle has been marked by rapid growth interspersed with three distinct periods of no growth or slow growth. The most recent no-growth period began in early 2001 and probably marks the city's first recession since 1987.

The richest and most timely set of data on the Houston economy is 53 series of monthly employment data by industrial sector, and we use employment

as our primary guide to economic activity since 1987. In this article we look at total employment, build a diffusion index based on changes in employment by sector and search out unusual concentrations of local jobs to define local export activity. We also use other economic series—real retail sales, real wages and the unemployment rate—to define an index of coincident economic activity. It is this index that points to an ongoing mild recession in Houston that began in early 2001.

The 1991–93 Slowdown

The U.S. recession of the early 1990s lasted from July 1990 to March 1991, but a prolonged period of weak expansion and limited job growth followed. The jobless recovery was not clearly over until mid-1993, when the United States entered an extended period of rapid growth in both output and employment. Even in the early stages of this rapid growth period—in 1993–94—the pattern was set for 3 million new jobs per year and 4 percent annual GDP growth.

Figure 1
Working Rigs in the United States, 1988–2002



SOURCES: Baker Hughes; authors' calculations.

Accompanying the U.S. growth story was an important cycle in oil and natural gas exploration.¹ Two important oil shocks preceded the national recession. Crude oil prices increased 50 percent as the Iran–Iraq war ended in 1989 and OPEC found renewed discipline in world oil markets. Then prices jumped another 59 percent as Iraq invaded Kuwait in 1990.

Local oil producers recognized the transient nature of the Gulf War oil spike but saw the increased revenues and cash flows as an opportunity to beef up staff and plant for a coming boom in natural gas-directed drilling. Conventional wisdom held that the gas bubble—the surplus of natural gas generated by energy deregulation in the late 1980s—was finally at an end and that gas prices would soon rise sharply. However, this expectation was denied by a warm winter in 1990–91, when natural gas prices plunged to near \$1 per thousand cubic feet. Domestic drilling collapsed along with gas prices, sending the number of working rigs to the lowest levels in the 50-year history of the Baker Hughes rig count (Figure 1).

Further blocking economic

than doubled the tax on oil and natural gas relative to other energy forms, a potential blow to refining and petrochemical activity along the Ship Channel. Proposed health care reform, which introduced the term *primary care physician*, would have struck hard at the specialized care offered by the Texas Medical Center. Finally, a presidential review of the need for a space station project froze investment in the Clear Lake area.

Employment continued to grow in Houston through much of the 1990–91 U.S. recession; oil revenues carried the local economy, and job growth did not flatten out until late 1990. Even as the bad news mounted—jobless recovery in the United States, a collapse in drilling and the Clinton proposals—job growth did not decline; it remained flat through all of 1991 and much of 1992. Figure 2 clearly shows this period, in which the number of jobs neither grew nor declined significantly.

progress in Houston in 1992 was the newly elected Clinton administration, which advanced a series of public policy proposals that seemed aimed at the basic pillars of the Houston economy. A proposed Btu tax would have more

A Diffusion Index. Another measure of employment strength or weakness emphasizes the breadth of change in employment as opposed to the total number of workers with jobs. The Texas Workforce Commission reports 53 separate employment series for Houston each month, and a diffusion index focuses on the number of series increasing versus those decreasing. Periods of strong growth should see more sectors increasing, and weak growth would be accompanied by a growing number of declining sectors.

The diffusion index (I_t) for time period t is calculated as follows:

$$I_t = 37.75 + (N_t - D_t)$$

where N_t is the number of seasonally adjusted sectors increasing from one month to the next, D_t is the number decreasing and 12.25 is the average value of $N_t - D_t$ from 1988 to 2002. Thus, the index is set in such a way that its average value from 1988 to 2002 is 50. If the index is greater than 50, the economy is performing above average; if the index is below 50, economic performance is subpar.

Figure 2
Total Employment in Houston, 1988–2002



SOURCES: Texas Workforce Commission; authors' calculations.

Figure 3 plots a centered seven-month moving average of the index. It indicates the same general periods of below-average performance as total employment, with values below 50 during 1991–93, 1998–99 and the current slowdown. During the 1991–93 slowdown, the index peaked in April 1990 at 61.3 and hit its low point in October 1991 at 39.6.

Diffusion indexes often play the role of leading indicators, and this index played that role well by turning before both the slowing and the reacceleration of job growth. Although total employment began to grow slowly in late 1992, this diffusion index points up the slowness of overall growth, indicating that the breadth of job growth across sectors remained below average through March 1995. It took strong U.S. economic growth, which began in mid-1993, combined with a 1995 turnaround in oil and natural gas extraction to get Houston's employment growth back on the fast track.

Defining Houston's Export Base. Another simple measure of economic activity, also based on employment data, is the export base of a locality. The calculation begins with the concept of excess employment and the identification of unusual concentrations of workers in the local economy. Such concentrations may indicate export activity. Table 1, for example, shows the location quotients for a series of key sectors in Houston.

$$LQ_i = \frac{\text{percent share of total employment found in industry } i \text{ in Houston}}{\text{percent share of total employment found in industry } i \text{ in the United States}}$$

If Houston is a typical place in the United States, its location quotient is equal to 1; if it has a higher than normal con-

centration, the location quotient is greater than 1; and if it has a below average concentration, the location quotient is less than 1.

A location quotient greater than 1 can be interpreted as indicating potential specialization in production and export activity from the community to the rest of the nation and the world. In Table 1, it is assumed that 100 percent of oil producers, oil services and manufacturing is export-oriented. For other sectors with a location quotient greater than 1, the excess share of employment—the share above what would normally be found in the community—is calculated as percent export jobs in sector $i = (LQ_i - 1)/LQ_i \times 100$.

Using these definitions, Figure 4 plots Houston's export base from 1988 to 2002. Oil producers, oil services, durable manufacturing, pipelines, heavy construction and engineering services still dominate the industries highlighted in Table 1. While it remains a good

measure of Houston's traditional economic base, one could question whether the measure has kept up with job diversification trends in Houston, especially in the service sector. Maybe the best way to interpret these calculations is as a timely measure of how Houston's traditional strengths in oil, chemicals, engineering and heavy construction are performing. Again, focusing on the 1992–93 period, Figure 4 clearly shows the serious distress felt by oil production, drilling and related manufacturing as the price of natural gas collapsed.

What kept total employment flat in Houston from 1991 to 1993, with so much downward pressure on basic exports from

Table 1
Location Quotients and Sector Share of Basic Employment in Houston, 2001

Sector	Location quotient	Percent basic
Oil producers	9.28	100
Oil services	6.54	100
Special trade contractors	1.21	17.4
Other construction	1.97	49.2
Manufacturing	.76	100
Electricity, gas, sanitary services	2.38	26.2
Durable wholesale	1.31	23.8
Personal services	1.09	8.6
Business services	1.18	15.1
Auto repair	1.13	11.5
Legal services	1.17	14.2
Engineering, management services	1.6	37.5

NOTE: Oil producers, oil services and manufacturing sectors are 100 percent basic by assumption; other sectors follow formula in text.

SOURCE: Authors' calculations.

Figure 3
Diffusion Index for Houston Employment

Index, 7-month average



SOURCES: Texas Workforce Commission; authors' calculations.

Figure 4
Export Base in Houston, 1988–2002

Thousands of jobs



SOURCE: Authors' calculations.

the oil sector? Basic exports are important because they pay for imports; Houston trades oil services for financial services from New York, autos from Detroit and software from Silicon Valley. Exports also support inherently local, nonexport activities such as dry cleaners, video rental stores, grocery stores, drugstores and neighborhood restaurants. After a solid recovery and expansion following the oil bust (total employment grew 3.4 percent per year from January 1987 to January 1992), nonexport activities also grew rapidly, lagging the basic industries and trying to catch up with the earlier rapid export growth. This continued momentum from non-basic growth, plus additional help from the U.S. economy after 1991, provided just enough strength to keep job growth out of a significant decline in 1992–93.

The 1998–99 Slowdown

During 1996 and 1997, Houston's economy hit on all cylinders and ran at peak capacity.² The national economy was booming, along with drilling activity and oil services, and there was strong capital spending downstream by refiners and

petrochemical companies. By early 1998, however, storm warnings were being issued for all the economies up and down the Gulf Coast.³ The Asian financial crisis began in Thailand in May 1997 and quickly spread to Malaysia, Indonesia, the Philippines and South Korea. The roots of the crisis lay in too much capital seeking too few deals in the fastest growing part of the world, a loss of confidence in these countries' banking systems and a collapse of local currencies as foreign capital fled the region. Eventually, countries throughout Asia, Latin America and Eastern Europe felt the destabilizing effects of the crisis, and the world saw the worst collapse of commodity prices—for cotton, soybeans, copper, gold and especially oil—since the Great Depression.

Oil markets in 1998 were already headed for a difficult year. A warm winter and spring, ongoing humanitarian sales of Iraqi crude oil, and OPEC's decision to increase quotas and ratify cheating by its members all added crude oil to world markets. Then the Asian crisis added another 400,000 barrels per day, and the price collapsed to \$10–\$12 per barrel at mid-year. Cheap Middle Eastern chemicals that would have been sold to Asia were diverted to Europe and other U.S. export markets. Planned engineering and industrial construction projects were canceled around the globe.

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Crude oil prices fell to \$12 per barrel in June 1998, and domestic drilling followed to a seasonally adjusted 525 rigs in April 1999, yet another all-time low. Foreign drilling was similarly depressed. Oil prices did not improve until OPEC and several non-OPEC producers forged an agreement in March 1999 to remove 2 million barrels of crude from world markets. By May 1999, West Texas Intermediate had improved from \$12 to \$19 per barrel, and natural gas had risen from \$1.64 to \$2.20 per thousand cubic feet.

Throughout the crisis, U.S. growth was shaped by two conflicting trends. One was the slowdown in world growth and the collapse of commodity prices. The other was a sharp decline in short- and long-term interest rates, as the 30-year bond fell from 6.5 percent in July 1997 to dip briefly under 5 percent in October 1998. Lower rates, rising incomes and stock market gains fueled demand for autos, housing and durable goods. By the second half of 1998, the United States seemed to have shrugged off any global problems and returned to its fast-growth track of the late 1990s.

The mix of good news and bad—depressed commodity markets versus strong U.S. growth—shows up clearly in our charts for the 1998–1999 period. Each shows a different part of the story. Figure 2 shows no prolonged decline in employment, for example, as job growth simply flattens out for the first six months of 1999. In contrast, Figure 3 shows a prolonged period of weakness. The breadth of employment growth peaks in December 1997 at 61.3 and falls under

50 in July 1998. It would not be until April 2000 that the diffusion index would move above 50 and stay there. With both commodity markets and the U.S. economy struggling, fewer and fewer local sectors were left growing.

The depth of the problems in oil and other commodity markets is best illustrated by the number of jobs in Houston's export base (*Figure 4*). Basic export employment fell 4.9 percent between December 1998 and October 1999. The peak in base employment came late—18 months after the Asian financial crisis began and 10 months after domestic drilling peaked.

How did Houston avoid losing jobs in 1998–99? The answer again lies in a combination of strong continued U.S. growth and past momentum. Figure 5 contrasts the behavior of basic and nonbasic Houston employment, measured monthly by average annual growth rates. The rapid growth in 1996–98 created a need for continued growth in local businesses such as dry cleaners and retail stores, local construction, housing and such, providing momentum that carried over into 1998–99 even as Houston's traditional export base was collapsing. The result was nonbasic employment growth that stayed well above 2 percent annually, while oil and chemical jobs collapsed.

The Current Slowdown

The primary force affecting the U.S. economy since early 2001 has been the recession and the jobless recovery.⁴ Rapid U.S. expansion ended in 2000 as rising interest rates began to choke off housing, auto and consumer durable sales and as

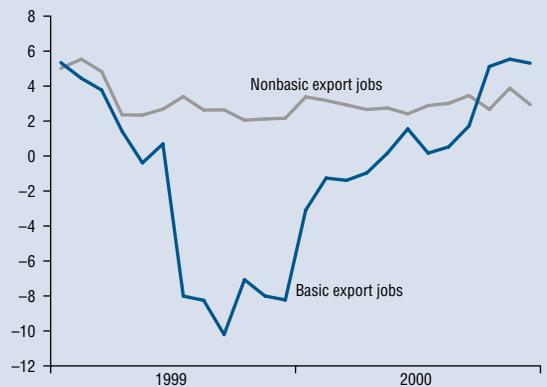
investment in the New Economy collapsed along with computers, semiconductors, telecommunications and the Internet. The recession was mild and brief, beginning in March 2001 and probably ending the following November. Moderate rates of recovery, continued weakness in the New Economy, and concerns about war and terrorism have combined to prevent any significant job growth in either Houston or the United States in 2002.

Crude oil and natural gas prices have been surprisingly strong since 2000. Oil prices moved over \$30 per barrel in the spring of 2000 on the heels of an agreement among OPEC and non-OPEC producers, including Russia, Norway and Mexico. A target band of \$22–\$28 was set for a basket of OPEC crude oils, and OPEC discipline has since kept crude prices mostly within the price band. Natural gas prices have also provided positive surprises, generally staying above \$2 per thousand cubic feet since 1996. Despite warm winters in 1998–99 and 2001–02, falling industrial demand throughout the 2001 recession and record-high natural gas inventories, gas prices have typically defied gravity and remained above \$2—often far above.

Given strong energy prices, the mystery is why oil field activity has remained subdued. Domestic drilling began to decline from a seasonally adjusted peak of 1,281 rigs in

Figure 5
Growth Rate of Basic and Nonbasic Employment in Houston, 1999–2000

3-month average (percent)*



* Annualized rate.

SOURCES: Texas Workforce Commission; authors' calculations.

April 2001 and fell by 39.8 percent to 771 by the following March. The rig count climbed to 850 by May and stayed near that level through the rest of 2002. Driven by oil instead of natural gas, international drilling never collapsed like domestic exploration and has remained relatively healthy. Oil field conditions have not been nearly as bad as in previous oil cycles of the 1990s, but oil service companies are frustrated that energy prices have been so high and drilling activity so weak. Producers seem to have focused more intently on the fundamentals of recession, warm weather and high inventories than on price alone.

Total employment in Houston peaked at 2,125,000 jobs in April 2001 and declined by 15,000 jobs, or 0.7 percent, by year-end. 2002 saw very little change in total employment. The diffusion index (*Figure 3*) peaked in August 2000 and slipped under 50 in March 2001. Since that time, the index has remained in the low 40s, thus far providing no indication of coming recovery.

The export-base employment (*Figure 4*) shows that Houston's traditional industries

Figure 6
Coincident Economic Activity Index for Houston, 1988–2002

Index, July 1992 = 100



SOURCE: Authors' calculations.

peaked again in May 2001 at a level that exceeded the prior December 1998 peak by less than 1 percent. The number of export base jobs has since declined by a relatively mild 2 percent. Nonbasic activity has been affected by the prolonged period of no significant growth in basic jobs and by the continued lack of stimulus from the U.S. economy. Nonbasic employment has averaged annual growth rates of only 0.1 percent in 2001–02. There has been no source of positive stimulus in Houston throughout 2002.

Was It a Recession?

Throughout the previous discussion and analysis, we have been careful to describe job growth over the last 16 years as slowing, turning flat or declining slightly. The emphasis on a single variable—employment—makes it difficult to talk about recession or a broad decline in the macro economy. Different variables—unemployment, personal income or retail sales, for example—might lead to different conclusions about the direction, timing or depth of a particular cyclical event. On the other hand, as the cyclical event occurs, there should be some correlation

among the variables over time that provides information on a larger, unobserved variable called the business cycle.

The Conference Board measures U.S. economic activity by a simple weighted average of several broad meas-

ures of macroeconomic activity, giving them equal weight after adjusting for volatility: personal income (less transfer payments), nonfarm employment, industrial production, and sales by trade and manufacturing. In recent years, a new and very different approach has emerged to measure the business cycle, a dynamic single-factor model of coincident economic activity created by Stock and Watson.⁵

The Stock and Watson approach uses broad measures of economic activity to estimate a single unobserved, underlying variable consistent with the general notion of a business cycle. The underlying variables chosen for Houston are nonfarm employment, the unemployment rate, real wages and real retail sales. Based on their correlation over time, we define a coincident index as a measure of the business cycle.⁶

All four of the selected variables are statistically significant factors in defining the Houston business cycle and carry the expected signs. Employment is restricted to entering the equation with no lags, but other variables can enter with lags if statistically significant. Employment, real wages and real retail sales enter the equation simultaneously, while the unemploy-

ment rate enters simultaneously and with a single lag.

We first estimated the model from January 1980 through March 2002, the period for which all variables are available. We then updated it through October 2002 using data only on employment and the unemployment rate. The model is highly stable, and the size of the Houston economy provides a smooth series.

The weights selected by the model emphasize nonfarm employment (.48) and real wages (.33) as the key variables, while smaller but significant information comes from the unemployment rate (.11) and retail sales (.08). The coincident index for Houston, based on July 1992 = 100, is shown in Figure 6. The index looks very much like a smoothed version of total employment in Figure 2, but it now contains much more information about the Houston business cycle. Timing and duration of cyclical events differ slightly between the two series.

Was there a recession in the 1990s? The index in the 1991–93 period is flat, indicating that Houston skirted recession for a prolonged period but never suffered a significant reverse. The business cycle does not show a decline that could be labeled a recession. The story is similar for 1998–99; again employment was flat with no significant decline, but for a much shorter period than 1991–93.

The current slowdown, however, does show a decline beginning in May 2001, although it amounted to only 1 percent by December of that year. There was no significant improvement throughout 2002 that would indicate recovery.

Thus, after twice avoiding the label, the current downturn marks Houston's first recession since the 1980s. *Houston Business* will revisit the question of whether economic recovery may be under way later this spring, after the employment data for 2002 are rebenchmarked.

Is the recession mild? Compare the 1 percent decline in 2001 with Houston's double-dip, oil-bust recession of the 1980s—a recession built on massive speculation in oil and real estate. The same coincident index tells us that between March 1982 and November 1983 the Houston economy declined by 12 percent; between November 1984 and January 1987 it fell another 10.1 percent. Houston may have found speculative excesses in 2001 in energy trading and downtown office space, for example, but the impact so far on the overall economy has been relatively mild.

Conclusion

Strong growth in Houston in the 1990s required more than oil; it needed both a growing U.S. economy and strong oil markets. When both factors were working, the Houston economy performed in stellar fashion. But weakness from either side quickly showed up in both the rate and breadth of total employment growth. Weakness in both the U.S. economy and oil markets essentially stopped the Houston economy in its tracks in 1991–93 and 1998–99, and in 2001 it led Houston into its first minor recession since the oil bust.

This 1990s pattern of no growth or very mild recession contrasts sharply with the huge economic setbacks that followed

oil and real estate overspeculation in the 1980s. Although still a commodity-driven economy with roughly half of its jobs directly or indirectly dependent on oil, natural gas and petrochemicals, Houston's business cycle has been substantially tamed since the 1980s.

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Notes

- ¹ For a description of Houston's economy during this period, see the following issues of *Houston Business*: "Houston in 1993," February 1993; "Houston's Slowdown: National Recession or Oil Patch Slump?" August 1993; and "Houston's Economy: Still Slow in 1994?" December 1993.
- ² See the following issues of *Houston Business*: "Houston Again Shares State's Economic Growth," August 1995; "Houston Economy Shows Endurance and Renewed Strength," October 1996; and "Houston Economy Heats Up," August 1997.
- ³ See these issues of *Houston Business*: "Asian Flu and Oil Glut Weaken Outlook for Houston," March 1998; and "Weak Commodity Prices Take Toll on Gulf Coast Economy," March 1999.
- ⁴ For details on this period, see the following issues of *Houston Business*: "The Wheel Turns Again: Lessons from the Latest Oil Cycle," June 2000; "Gulf Coast Expansion Waits for Upstream, Downstream Energy," April 2002; and "Houston's Near-Term Outlook: Slow Growth, Downward Risk," October 2002.
- ⁵ James H. Stock and Mark W. Watson (1989), "New Indexes of Coincident and Leading Economic Indicators," *NBER Macroeconomic Annual*, ed. Olivier J. Blanchard and Stanley Fischer (Cambridge, Mass.: MIT Press for National Bureau of Economic Research), 351–94.
- ⁶ Alan Clayton-Matthews and James H. Stock (1998–99) build an index for the state of Massachusetts based on the income tax base, sales tax base and unemployment rate in "An Application of the Stock/Watson Index Methodology to the Massachusetts Economy," *Journal of Economic and Social Meas-*

urement 25: 183–233. The variables chosen for this index are the same as those used in an unpublished paper, by Keith Phillips and Jesus Cañas of the Federal Reserve Bank of Dallas, that examines the business cycle of Texas border cities. The authors would like to thank Phillips for suggesting the model for Houston and Cañas for estimating it.

Houston shows few signs of emerging from the mild recession it entered early in 2001. Employment remains flat; the seasonally adjusted unemployment rate has continued to rise all year and now stands near 6 percent; and the local Purchasing Managers Index shows no forward momentum in energy or manufacturing. A sluggish U.S. economy and lackluster drilling have conspired to keep the Houston economy in the doldrums.

Retail and Auto Sales

For retailers, the holiday problem was not a shortage of customers. It was deep discounting, widespread promotions and fierce competition. Shoppers responded by filling the stores and walking away with retailers' profits, making the consumer the holiday winner. Fortunately, retailers entered the holiday season with light inventories and had little trouble clearing out seasonal goods.

Auto sales continue weak despite ongoing dealer incentives and promotions. November sales for Harris County were off 3 percent from 2001 and are down 8 percent year-to-date.

Energy Prices and Drilling

Oil and natural gas prices have risen sharply in recent weeks. Crude oil prices have been driven by a variety of factors: cold weather, OPEC's decision to rein in production, the threat of war in Iraq and a general strike in Venezuela. The price of West Texas Intermediate rose from \$25 per barrel in mid-November to \$32 by late December.

Responding primarily to cold weather in the Midwest and Northeast, natural gas prices climbed from \$3.80 per thousand cubic feet to more than \$5 by mid-December. A record surplus quickly evaporated, pulling inventories to 17 percent below last year and 5 percent below the five-year average. Gas supplies remain adequate for a normal winter, but continued arctic weather could push prices even higher.

Improved energy market fundamentals have not translated into increased domestic drilling; a rise in workover activity (a quick route to a production boost) and a jump in Texas drilling (mostly inexpensive gas projects) were the only responses. Total U.S. activity remained near 850 working rigs, the same level observed since last May. International activity has improved over the past two months, led by the North Sea and Latin America, but the general strike in Venezuela could reverse these recent gains.

Petrochemicals and Refining

Growth in petrochemical demand decelerated sharply at midyear, matching the slowdown in the rest of the industrial sector. Through year-end, there is still no indication of improved demand, prices are stable or declining, and the higher oil and gas feedstock prices are coming out of profit

margins. Overcapacity remains a significant problem in key areas such as ethylene.

Refining margins improved through mid-December as cold weather drove heating oil prices up faster than the price of crude. Since mid-December, the Venezuelan general strike has pushed prices up sharply, and several important Gulf Coast refineries could find themselves out of crude by early January if shipments don't resume. High levels of oil product imports from Europe delayed a price response to potential gasoline and heating oil shortages, but gasoline pump prices were rising quickly by late December.

Residential Real Estate

November new home sales were up 2 percent compared with a year earlier, traffic was up 14 percent and housing starts rose 29 percent. Inventory is rebuilding from last year's lows and now stands 41 percent higher than a year ago. November sales of existing homes, propelled by low interest rates, matched last year's high levels. Apartment leasing activity is sluggish; low interest rates and strong single-family sales are pulling people out of apartments, and slow job growth is providing few replacement tenants. Rents are flat across all classes of units, with occupancy strong at the bottom of the market and weak at the top.



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