HoustonBusiness

A Perspective on the Houston Economy

FEDERAL RESERVE BANK OF DALLAS • HOUSTON BRANCH • JUNE 2006

In the Eye of the Storm: Gasoline Markets After the Hurricanes

Discussion of the storms' impact on gasoline markets has focused on the dramatic declines in production. But the hurricanes also affected gasoline inventories, imports and exports, and these sources filled a significant part of the gap left by reduced production.

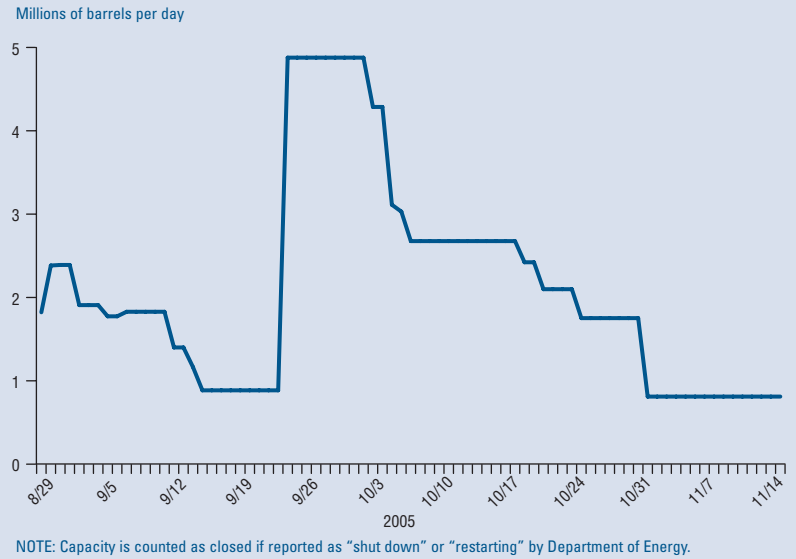
As two of the most powerful hurricanes in history moved into the Gulf of Mexico in 2005, their arrival began a prolonged and significant disruption of Gulf Coast refinery activity. Refineries reduced runs or shut down in preparation for the storms, and a number suffered significant flooding or wind damage when the storms came ashore.

Figure 1 shows the total crude refining capacity (in barrels per day) closed down on the Gulf Coast in the days following Hurricane Katrina's Aug. 29 landfall and through the remainder of 2005.[1] At the peak of the closures, as Hurricane Rita moved through the Gulf of Mexico on Sept. 24, capacity of nearly 5 million barrels per day—about 70 percent of Gulf Coast capacity—was briefly shut down. At the same time, crude capacity of another 500,000–750,000 barrels per day was operating under reduced runs as a precaution, due to damage or because of a lack of feedstock. Entering 2006, two New Orleans refineries and the large BP refinery in Houston were still closed for repairs, representing a combined capacity of 804,000 barrels per day still out of service.

The resulting fall in gasoline production was felt widely in U.S. and global markets. Gasoline prices peaked at $3.12 per gallon nationwide the week after Katrina made landfall. Over the next 10 weeks, U.S. gasoline prices averaged 51 cents per gallon more than during the prior 10 weeks.

Discussion of the storms' impact on gasoline markets has focused on the dramatic declines in production. But the hurricanes also affected gasoline inventories, imports and exports, and these sources filled a significant part of the gap left by reduced production. Imports and the policies that affect them receive close attention in this article due to their role in narrowing the supply gap created by storm-related refinery closures.

Figure 1
Gulf Coast Refining Capacity Closed After 2005 Hurricanes



NOTE: Capacity is counted as closed if reported as "shut down" or "restarting" by Department of Energy.

SOURCE: Office of Electricity Delivery and Energy Reliability.

Gasoline Supplies: Before, During and After

The coastline of Texas, Louisiana, Alabama and Mississippi is home to a large share of the nation's crude oil refining capacity.[2] Gulf Coast refineries accounted for 46.5 percent of crude oil refined in the United States in 2005 and produced 40.6 percent of the nation's gasoline.

To examine the storms' effects on gasoline supplies, we defined three equal periods: the 10 weeks leading up to Katrina (the weeks of June 17 through Aug. 19), the 10-week emergency period (Aug. 26 through Oct. 28) and the post-emergency period (Nov. 4 through Jan. 6). The emergency period is largely defined by the time frame in which the Environmental Protection Agency (EPA) lifted a number of restrictions on the production and use of gasoline and other fuels to increase domestic and foreign supplies. These waivers will be discussed further below.

Table 1 summarizes the hurricanes' effects on gasoline supplies by comparing the emergency period to the 10-week pre- and post-emergency periods. Gasoline supplies are composed of production plus imports, minus exports, plus changes in inventory.[3] First, consider production. On the Gulf Coast, average gasoline output during the emergency was reduced by 442,000 barrels per day, or 12.4 percent below the 10-week averages before and after the storms. In the rest of the U.S., gasoline production rose by an average of 177,000 barrels per day, or 3.7 percent, presumably in response to price incentives and emergency programs.[4]

The hurricanes also affected the nation's gasoline import patterns. In the 10 weeks before and after the storms, over 90 percent of U.S. gasoline imports—composed mostly of conventional gasoline—entered states outside the Gulf Coast, especially through New York Harbor. These imports rose only 2.9 percent in the rest of the U.S. during the emergency.

More dramatic changes were observed on the Gulf Coast, where gasoline imports nearly tripled during the emergency period, with blending components making up the bulk of additional supplies. The Gulf Coast imported an average of only 71,200 barrels per day in the 10 weeks before and after Katrina. Imports were about 25 percent conventional gasoline, and the rest was partially finished gasoline and blending components.

Although gasoline exports represent a relatively small portion of total Gulf Coast production, they make up over 90 percent of U.S. gasoline exports.[5] Most of these exports are conventional gasoline headed for Mexico. During the emergency period, exports from the Gulf Coast fell by 51,600 barrels per day (35.7 percent), adding to Gulf Coast gasoline supplies. Gasoline exports from the rest of the U.S. (mostly California) held steady at about 10,000–12,000 barrels per day.

Before and after the hurricanes, the typical daily change in Gulf Coast inventories was an increase (or a reduction of supplies) of 12,000 barrels per day. During the emergency, inventory fell by a daily average of 23,830 barrels. The rest of the U.S., in contrast, was pulling gasoline out of inventory before and after the storms, but building inventories at a pace of 67,400 barrels per day during the storms. Building inventories during periods of uncertainty—whether the uncertainty stems from weather, mechanical problems or geopolitics—has become a recognized feature of oil markets in the past two years.[6]

Table 2 summarizes our results, comparing changes in

the weekly averages of gasoline supply sources between the emergency and pre- and post-emergency periods. Supply losses during the emergency were led, of course, by an average daily drop in production of 540,200 barrels per day and by less inventory reduction (9,860 barrels per day). Imports were the biggest factor in offsetting this deficit (142,300 barrels per day), and reduced exports added 66,100 barrels per day. As a result, the gasoline deficit on the Gulf Coast due to reduced production was effectively cut 38.2 percent by imports and exports.

In the rest of the U.S., a 217,900 barrel per day increase in gasoline production during the emergency was essentially offset by a nearly equal increase in inventory accumulation. The net increase in gasoline supplies was only 17,100 barrels per day.

After the emergency passed, much of the apparent increase in production on the Gulf Coast was offset by inventory buildups, increased exports and a big drop in imports. The 344,100 barrel-per-day increase in production becomes a net gasoline supply increase of only 68,700 barrels per day.

Gasoline Imports: Filling Supply Gaps

Gasoline imports helped reduce gasoline shortages along the Gulf Coast in the hurricanes' wake, adding 142,000 barrels per day to total supplies. Imports were also linked to two policy measures undertaken during the emergency—the release of petroleum from emergency stockpiles and the suspension of

Table 1
Effect of the Hurricanes on U.S. Gasoline Supplies
(Thousands of barrels per day in each period)

	Gulf Coast		Rest of U.S.	
	Emergency	Before and after	Emergency	Before and after
Production				
Total gasoline	3,121.9	3,564.0	5,008.6	4,832.0
Finished	3,158.2	3,584.1	5,317.7	5,140.9
Reformulated	574.4	645.0	2,306.4	2,279.0
Conventional	2,569.9	2,943.7	2,996.0	2,859.7
Net blending components	−36.3	−18.3	−309.1	−308.8
Imports				
Total gasoline	223.7	71.2	978.1	950.3
Finished	86.7	17.6	601.6	549.0
Reformulated	12.6	6.1	262.1	249.0
Conventional	74.1	11.4	339.5	300.0
Net blending components	137.0	53.6	376.5	401.3
Exports				
Total gasoline	93.0	144.6	10.6	11.7
Finished	85.3	131.7	8.6	9.5
Reformulated	14.4	13.1	1.6	1.5
Conventional	70.9	118.6	6.9	8.0
Net blending components	7.7	12.9	2.1	2.2
Inventories				
Total gasoline	−23.8	12.1	67.4	−78.8
Finished	−37.3	12.4	115.1	−88.3
Reformulated	−26.0	−4.0	−2.5	−17.6
Conventional	−11.0	12.5	117.3	−69.8
Net blending components	13.1	20.8	−48.5	9.5
Gasoline Supplied				
Total gasoline	3,276.4	3,478.5	5,908.7	5,849.4
Finished	3,196.9	3,457.6	5,795.6	5,768.7
Reformulated	598.6	642.0	2,569.4	2,544.1
Conventional	2,584.1	2,824.0	3,211.3	3,221.5
Net blending components	79.9	1.6	113.8	80.8

NOTE: Seasonal adjustment and rounding prevent subtotals from adding exactly to totals.
SOURCES: U.S. Department of Energy; authors' calculations.

Table 2
Contribution of Various Factors to the Change in Gasoline Supplies Before, During and After the Emergency
(Thousands of barrels per day in each period)

	Gulf Coast		Rest of U.S.	
	During	Before and after	During	Before and after
Production	−540.2	344.1	217.9	−135.2
Change in inventory	−9.9	−81.8	−220.0	72.3
Imports	142.3	−167.2	19.5	−36.2
Exports	66.1	−36.5	−.4	−2.5
Total gasoline supplies	−334.1	68.7	17.1	−102.6

NOTE: Parts do not add to total due to seasonal adjustment.
SOURCE: Energy Information Administration.

various environmental restrictions.

U.S. environmental regulators are often criticized for creating balkanized gasoline markets, with widely differing rules on the gasoline formulations sold from one area to another.[7] These environmentally driven formulation differences are often cited as a significant nontariff barrier to gasoline importation because foreign producers are unable or unwilling to produce gasoline for a highly fragmented U.S. market.[8] According to this logic, a removal of these regulations would prompt more gasoline imports into the U.S.

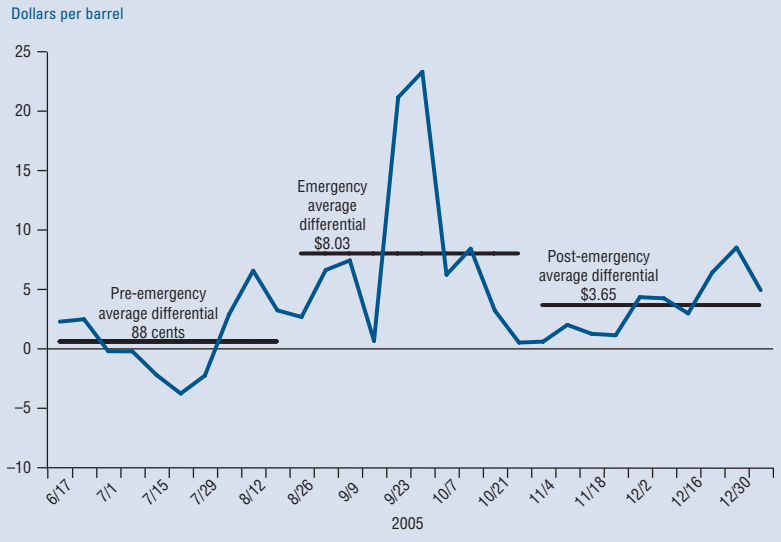
After the storms, the initial waivers offered by the EPA eliminated Reid vapor pressure (RVP) requirements for summertime gasoline. These requirements would have ended on Sept. 1 for all states except Texas, California and Arizona, but the waivers ultimately removed the requirements for these three states as well for the remainder of 2005. Georgia's sulfur requirements, which are more stringent than other states', were lifted from Sept. 1 through Oct. 24. These EPA waivers provided a more uniform gasoline market over broad areas and were particularly important for Texas and Georgia because they are served by Gulf Coast refineries.

Other EPA waivers offered relief to areas not located on the Gulf Coast but served by Gulf Coast refineries through major pipelines. St. Louis, on the Explorer Pipeline, and Virginia, on the Colonial Pipeline, were both offered a set of staggered waivers (from Sept. 2 to Oct. 26 in Virginia and from Sept. 27 to Oct. 27 in Missouri) that allowed conventional gasoline to be sold in areas normally designated for reformulated gasoline sales only. These waivers were not intended to increase gasoline output in these regions but to simplify production and logistics for the Gulf Coast refineries. They also opened major Gulf Coast pipelines for additional import and sale of conventional gasoline via pipeline.

Some waivers were aimed more directly at the Gulf Coast, targeting specific cities and refineries. The Houston and Dallas areas were offered waivers of reformulated gasoline requirements from Sept. 22 to Oct. 30. Also, two Houston-area refineries were targeted to produce defined quantities of relatively high-sulfur gasoline.

Did the easing of environmental restrictions open the Gulf Coast as a freeway for gasoline imports? The relief certainly served to reduce or eliminate many of the gasoline regulations most cited as potential barriers to trade. At the same time, the post-hurricane spike in U.S. gasoline prices offered powerful price incentives to move gasoline into the country. Figure 2 shows the difference in gasoline prices between the Gulf Coast and Rotterdam during the period under examination. The average differential in the 10 weeks before the storm is 88 cents in favor of the Gulf Coast. The average differential rises to $8.03 per barrel during the emergency, then falls back to $3.65 after the emergency.

Figure 2
Gasoline Price Differential Between Gulf Coast and Rotterdam



SOURCES: Energy Information Administration.

Imports: Price Versus Environmental Waivers

To separate the effects of price and environmental waivers, we estimated the parameters of the following equation:

$$y_t = \alpha + \theta E_t + \sum_{i=1}^{L} \beta_i y_{t-i} + \sum_{j=0}^{K} \delta_j d_{t-j} ,$$

where

y_t = imports of gasoline to the Gulf Coast,
d_t = gasoline price differential between the Gulf Coast and Rotterdam, and

Table 3
Impact of Price Differentials and Environmental Waivers on Gasoline Imports During the Emergency Period

	Barrels per dollar increase	Daily barrels due to price	Daily barrels due to waivers
Total gasoline	5,876	47,200	101,750
Reformulated	90	723	7,140
Conventional	2,264	18,179	40,800
Blending components	4,483	35,998	38,860

NOTE: Barrels per day due to the price differential are based on the $8.03 average observed in the emergency period. Parts do not add to total because components were estimated separately.

SOURCE: Authors' calculations.

E_t = dummy variable equal to 1 for the 10 weeks the environmental waivers are in effect, 0 otherwise.

This formidable-looking equation has a simple interpretation. A weighted average of recent gasoline imports to the Gulf Coast is closely related to a weighted average of recently observed differentials in gasoline prices between the U.S. and Rotterdam. A nonprice dummy variable is also included to capture the effect of waiving environmental restrictions during the hurricanes. The emergency period is defined to match the period of the EPA waivers, and the policy impact of public stockpile releases should be captured in the price-related movements.

The equations are estimated based on weekly data from May 2004 to April 2006. Separate equations are estimated for total gasoline imports and for reformulated, conventional and blending components. The results provide a good fit and significant coefficients and prove robust to alternative criteria and specifications.[9]

Table 3 summarizes the results of our estimation.[10] The first column shows the number of barrels per day that would arrive on the Gulf Coast for a $1 increase in the U.S.–Rotterdam price differential, or 5,876 barrels per day for total gasoline. Based on the average $8.03 price differential that prevailed during the emergency, the estimated equation implies an additional 47,200 barrels of imports each day. The environmental waivers turn out to be twice as important as price during the emergency, delivering about 102,000 barrels per day in additional imports. Our nonmarket/waiver variable implies that the additional supplies would be 7,140 barrels per day of reformulated, 40,800 barrels per day of conventional and 38,860 barrels per day of gasoline blending components.

These results support the idea that the environmental waivers were highly effective in promoting imports following the storms. To the extent these results support the idea that U.S. environmental restrictions are a significant barrier to gasoline trade in normal times, they deserve follow-up. Their characterization as barriers to trade, of course, takes no account of the environmental or health benefits derived from these regulations. Imports to the Gulf Coast diminished rapidly after the emergency, as both price incentives and environmental waivers disappeared.

Imports: Gulf Coast Versus the Rest of the U.S.

Our description of the behavior of gasoline supplies during the hurricanes indicates that the Gulf Coast was responding to the emergency very differently from the rest of the U.S. Some of this is not surprising, given the hurricanes' direct impact on production, for example. However, there appear to be wide behavioral differences in the other parts of the supply chain as well—imports, exports and inventory behavior.

One way to determine where significant differences arise is to treat the hurricanes as what economists call a natural experiment. If we look at the Gulf Coast as a part of the U.S. that would normally behave like the rest of the country in its production and delivery of gasoline, the hurricanes' effects (including environmental waivers) can be seen by comparing Gulf Coast behavior with the rest of the country.

For example, Table 4 compares total gasoline production for the Gulf Coast and for the rest of the nation before and after the emergency and during the emergency. The assumption is that before and after the hurricanes, the two regions' production responses are similar, but the storms' impact will make the two regions respond differently during the emergency period.[11]

In fact, we see that Gulf Coast production fell by 442,200 barrels per day, while the rest of the U.S. increased production by 176,600. The hurricanes' impact is measured by the difference in the two regions' responses, or the difference in the differences (–442,200 – 176,600 = –618,700).

Table 4
Difference-in-Differences Analysis for Total Gasoline Production (Thousands of barrels per day)

	Difference Gulf Coast	Difference rest of U.S.	Difference in differences
Before and after the emergency	3,564.1	4,832.1	1,268.0
During the emergency	3,121.9	5,008.6	1,886.7
Difference	−442.2	176.6	−618.7

NOTE: Series may not add due to seasonal adjustments and estimations.
SOURCE: Authors' calculations.

Table 5
Difference-in-Differences Analysis for Gasoline Supply Chain (Thousands of barrels per day)

	Difference Gulf Coast	Difference rest of U.S.	Difference in differences	Significance
Production				
Total gasoline	−442.2	176.6	−618.7	95%+
Finished gasoline	−425.9	176.8	−602.7	95%+
Reformulated	−70.6	27.4	−97.9	95%+
Conventional	−373.8	136.3	−510.1	95%+
Blending components	−16.3	−.3	−16.0	
Inventories				
Total gasoline	−36.0	146.2	−182.1	95%+
Finished	−49.7	203.5	−253.2	95%+
Reformulated	−22.0	15.1	−37.1	
Conventional	−23.6	187.1	−210.7	95%+
Blending components	13.2	−58.0	71.3	
Imports				
Total gasoline	152.5	27.8	124.7	90%+
Finished	69.1	52.6	16.5	
Reformulated	6.4	13.1	−6.7	
Conventional	62.7	39.5	23.1	
Blending components	83.4	−24.8	108.2	95%+
Exports				
Total gasoline	−51.6	−1.1	−50.6	95%+
Finished	−46.4	−.9	−45.6	95%+
Reformulated	1.3	.2	1.1	90%+
Conventional	−47.7	−1.1	−46.6	95%+
Blending components	−5.2	−.1	−5.1	95%+
Gasoline supplied				
Total gasoline	−201.4	59.9	−261.3	90%+
Finished	−260.5	26.8	−287.3	95%+
Reformulated	−43.4	25.2	−68.6	
Conventional	−239.7	−10.3	−229.3	95%+
Blending components	59.1	33.1	26.0	

NOTE: Series may not add due to seasonal adjustments and estimations.
SOURCE: Authors' calculations.

This difference can be tested statistically, and we can be more than 95 percent sure that the hurricanes forced gasoline production onto very different paths in the two regions.

Table 5 summarizes this same analysis for the entire gasoline supply chain, comparing the response of the Gulf Coast to the rest of the U.S. It confirms the significance of the observations made earlier in the article that the storms and their aftermath disrupted the entire Gulf Coast gasoline supply chain. Gulf Coast production, inventories, imports and exports all reacted quite differently from the rest of the U.S. during the storms.[12]

Conclusion

The arrival of Hurricanes Katrina and Rita marked a period of significant turmoil in U.S. and global gasoline markets. The focus of the storms' aftermath is often on the loss of production as refineries closed or were damaged by wind and water. However, our results confirm that the storms forced atypical behavior of inventories, imports and exports during the emergency period, disrupting the entire gasoline supply chain.

On the Gulf Coast, reduced exports and increased imports were the primary vehicle to offset lost production, filling nearly 40 percent of the deficit. Imports added 142,000 barrels per day to gasoline supplies. We estimate that only about one-third of these imports could be attributable to higher U.S. gasoline prices. The rest of the imports were largely the result of environmental waivers, which resulted in a more homogeneous national gasoline market and allowed wider use of conventional gasoline.

Although the rest of the U.S. managed significant production increases after the storms, much of this increase was offset by gasoline hoarding and resulting inventory buildups.

—Adriana Fernandez
Robert W. Gilmer
Jonathan Story

Fernandez is an economist and Story is an analyst at the Houston Branch of the Federal Reserve Bank of Dallas. Gilmer is a vice president at the Bank.

Notes

[1] These statistics were compiled from hurricane situation reports from the Office of Electricity Delivery and Energy Reliability at http://www.oe.netl.doe.gov/emergency_sit_rpt.aspx.

[2] "Concentration of Energy Production and Processing on the Gulf Coast," by Robert W. Gilmer, Carrie Ann Fossum and Iram Siddik, Federal Reserve Bank of Dallas *Houston Business*, December 2005. The data used to describe the Gulf Coast in this article are recorded by the Energy Information Administration as Petroleum Administration for Defense District 3 (PADD 3). PADD 3 contains all the major facilities affected by the storms. It is defined as the sum of the states of Texas, Louisiana, New Mexico, Alabama, Arkansas and Mississippi. However, 93 percent of the refining capacity in these states is located on the Gulf Coast, and for purposes of this article, the terms Gulf Coast and PADD 3 are interchangeable.

[3] A relatively minor adjustment was also made to the data to include net output of blending components in total production. The Department of Energy reports weekly net input of blending components (net output with the opposite sign) for the entire U.S., but these data are not broken out by region, or PADD. The total U.S. figure was allocated to PADDs based on the difference between gross refinery inputs and gross output reported for each PADD.

[4] Weekly production and inventory data cited here are from the Energy Information Administration but have been seasonally adjusted by the authors. Other data series cited here for imports, exports and net blending components are too short to be seasonally adjusted. Because of seasonal adjustment, some totals will not add perfectly in later calculations.

[5] The Energy Information Administration does not report weekly gasoline exports by PADD. It does report monthly exports by PADD and weekly exports of total refined products by PADD. The weekly data on refined products were used to allocate the monthly export data to individual weeks.

[6] One curious result of this hoarding behavior in the face of uncertainty is a correlation between high prices and high inventories of petroleum, the opposite of what should be expected. See "Oil Exploration Booms—Is Houston Next?" by Robert W. Gilmer, Federal Reserve Bank of Dallas *Houston Business*, March 2006, especially Figure 7.

[7] "'Boutique Fuels' and Reformulated Gasoline: Harmonization of Fuel Standards," by Brent D. Yacobucci, Congressional Research Service, updated Dec. 17, 2004.

[8] "Gasoline Supply: The Role of Imports," by Lawrence C. Kumins, Congressional Research Service, Sept. 14, 2004.

[9] The results used the Akaike Information Criterion to determine optimal lag length. Several other criteria were employed to determine optimal lag length, and the results were tested. The results were generally robust to the method used. For details about the Akaike Criterion, see *Econometric Analysis*, by William H. Greene, 2nd ed., New York: McMillan, 1992, p. 245. The results assume that for each category of gasoline imports, only one lagged value of the dependent variable is used, but we used the current and one lagged value of the price differential for total gasoline imports; current and two lagged values of price differential for reformulated and conventional gasoline imports; and five lagged values for blending components.

[10] The coefficients in the equation are related to Table 3 as follows: The first column is the sum of the current and lagged coefficients that related price differentials to imports. The third column is the estimated coefficient on the dummy variable that is equal to 1 for the 10 weeks the environmental waivers were in effect. All results are significant at high levels except those for reformulated gasoline.

[11] In the language of these natural experiments, the hurricanes are a "treatment" applied to the Gulf Coast only, and the difference in the responses of the Gulf Coast and the rest of the U.S. (the "difference in differences," as described in the article) is the treatment effect.

[12] This same difference-in-differences analysis can be carried out by looking at percentage changes in supplies rather than absolute changes in barrels per day. The results provide the same broad perspective of a supply chain that responded very differently on the Gulf Coast during the emergency. However, the percentage change results stand apart to the extent that the differential behavior of Gulf Coast imports comes in much more strongly using percentage differences, with every category of imports except reformulated gasoline showing differences that are significant at the 95 percent level or higher.

Houston BeigeBook May 2006

Houston's economy continues its rapid expansion. Although local job growth has slowed the past couple of months, Houston still is registering 3 percent job gains over the past 12 months—double the national rate. The local unemployment rate has fallen to a seasonally adjusted 5.1 percent, and the Houston Purchasing Managers Index was a very strong 64.2 in April. Beige Book respondents gave no hints at any signs of slowdown ahead.

Retail Sales and Autos

Retail sales in Houston moved at a rapid clip in May, down only slightly from the torrid pace of April. Upper- and middle-range department stores seemed to be doing best, with discount stores lagging.

Houston metropolitan area auto sales were up 5.9 percent through April, compared with the first four months of 2005. High gasoline prices have not deterred Houstonians from buying trucks and SUVs, which made up 56 percent of total sales.

Real Estate

Existing home sales rose 5.1 percent in April compared with a year ago, and prices are matching record levels for median sale value. The inventory of homes on the market continues to shrink. New home sales and traffic through model homes both increased significantly in the first quarter. New home inventories are below last year, and speculative home construction is up 10 percent.

Houston office occupancy is slowly tightening with the city's large employment gains. Most suburban markets are reaching high occupancy levels, but still-slack downtown towers are likely to keep a lid on rents throughout the city—especially for large blocks of space.

Energy Prices

In early April, the price of sweet crude was $66–$67 per barrel, but moved above $70 per barrel at midmonth. Prices were driven upward primarily by tension between the U.S. and Iran and by a series of killings and kidnappings of oil workers in Nigeria. The price of sweet crude has remained near $70 since that time. Crude inventories remain well above historical norms. Shell announced that its large Mars platform in the Gulf of Mexico would return to full production by late May or early June.

Regular gasoline futures prices were near $1.90 in early April, strengthened to $2.25 in midmonth along with the price of crude and fell back to near $2 in late May. Gasoline inventories dropped from recent highs to levels closer to those typical of recent years. Reformulated inventories fell to very low levels with the changeover to ethanol-based oxygenates. The transition appears to be nearing completion without major incident, but a series of refinery outages has kept markets nervous.

Refining and Petrochemicals

Refinery capacity utilization on the Gulf Coast moved back above 90 percent for the first time since the hurricanes, primarily due to the return of three large refineries (two in New Orleans and one in Houston). Refinery margins, which had weakened in February, bounced up to near $20 per barrel of crude refined for much of April and weakened by only a couple of dollars for most of May.

Downward pressure on chemical prices continued through March and into April, as capacity returned from the hurricanes, some imports continued and natural gas feedstock prices fell. However, major plant outages in ethylene turned prices around in May, and polyethylene prices responded to stronger demand and higher feedstock costs. Polypropylene prices rose as propylene prices followed gasoline upward. Polyvinyl chloride prices fell because of the weakening U.S. housing market.

Oil Services and Machinery

The U.S. and Texas rig counts are rising rapidly. However, rigs are exiting the Gulf of Mexico, seeking better day rates elsewhere and escaping the high insurance premiums demanded because of the approaching hurricane season. Otherwise, the story remains the same as in recent months—very strong demand driven by land-based and natural-gas-directed drilling. Although natural gas prices fell below $6 per thousand cubic feet because of high inventories, there were no reports that this deterred producers from further exploration or investment.

For more information or copies of this publication, contact Bill Gilmer at (713) 652-1546 or **bill.gilmer@dal.frb.org**, or write Bill Gilmer, Houston Branch, Federal Reserve Bank of Dallas, P.O. Box 2578, Houston, TX 77252. This publication is also available on the Internet at **www.dallasfed.org**.