



Why isn't the price of gasoline even higher?

Posted by [Gail the Actuary](#) on July 9, 2008 - 10:00am

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In the last year, the price of gasoline has risen by 38%. The prices of other fuels have risen much more--diesel has risen by 64% and jet fuel has risen by 91%, and the price of West Texas Intermediate (WTI) crude oil has risen by 100%. Why aren't gasoline prices rising more than they are? Some will recognize this as the "crack spread" issue.

I see several possible explanations, including a long term shift in prices valuing diesel (or "distillate") more highly than gasoline; political pressure to keep gasoline prices low; and integrated oil companies not really needing a high gasoline pricing margin to keep overall profits at an acceptable level. I do not see ethanol as playing a significant role at this time. Regardless of the explanation, refineries and gasoline stations that are not part of oil conglomerates may find this a difficult storm to weather.

Figure 1 shows that the differential between the retail price of gasoline and the per-gallon cost of crude oil has recently dropped dramatically, leaving a much smaller margin to cover expenses and profit. It is this shift that I am discussing in this article.

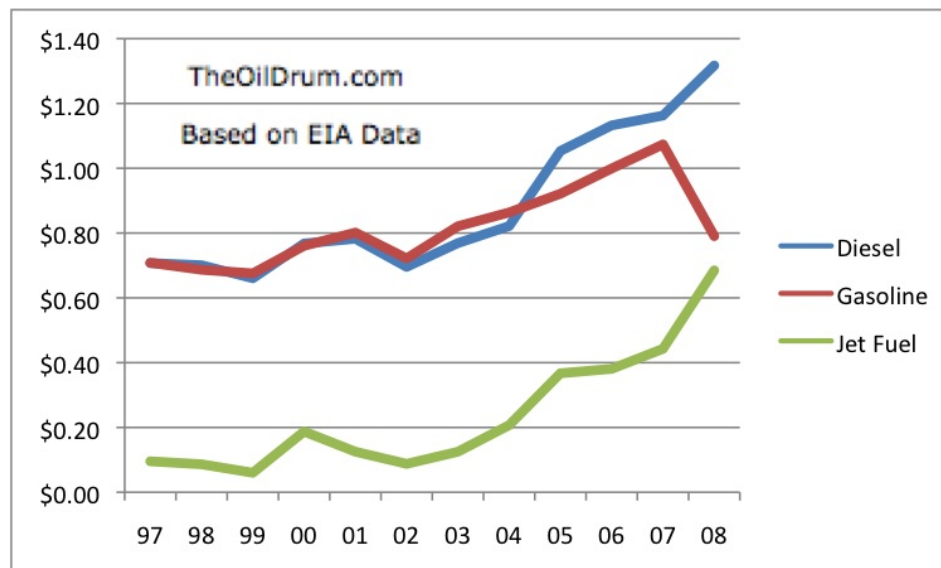


Figure 1. Average gasoline price minus WTI crude price; average diesel price minus WTI crude price; and average jet fuel price minus WTI crude price. (Averages are for full years, except 2008 which is for 6 months; crude prices have been converted to a per gallon basis.)

In this post, I divide my observations into four sections:

1. General observations and background
2. Changes in world product demand and recent US consumption
3. Who are the market players, and why this matters
4. What might be ahead?

In this post, I have not tried to address the question of how the futures market fits in with this situation. If prices in the futures market align with what buyers and sellers of the physical products would pay, futures markets shouldn't be an issue. If the futures market is tending to raise the price of some products and leave others artificially low, this could be contributing to unusual differentials that seem to be occurring now. For example, if speculation is playing a role in the high price of crude oil, but is having a lesser impact on gasoline ("RBOB"), it would seem like this could be causing dislocations of the type we are seeing.

Section 1. General Observations and Background

There are several problems with trying to analyze very precisely how much margin refineries need to be profitable. One problem is that refineries make a mixture of products. Another is that one really needs to break out costs more finely than I am doing in this analysis, to analyze very precisely what is happening. A third problem is that many of the costs, including refinery operation costs and some taxes, will vary with the price of crude oil. Thus, one would expect an upward drift in pricing margins over time, as we are seeing for diesel and jet fuel in Figure 1.

Clearly, the particular comparison figures make a difference also. In Figure 1, I am using average retail prices for regular gasoline, for diesel (all types combined) and spot prices for kerosine-type jet fuel at New York Harbor. Gasoline, distillate (which includes both diesel and home heating oil), and jet fuel are the three biggest categories of US petroleum products.

If we look at the output of all US refineries (Figure 2), we find that recent years, the distribution of the production of the various petroleum products has remained relatively constant.

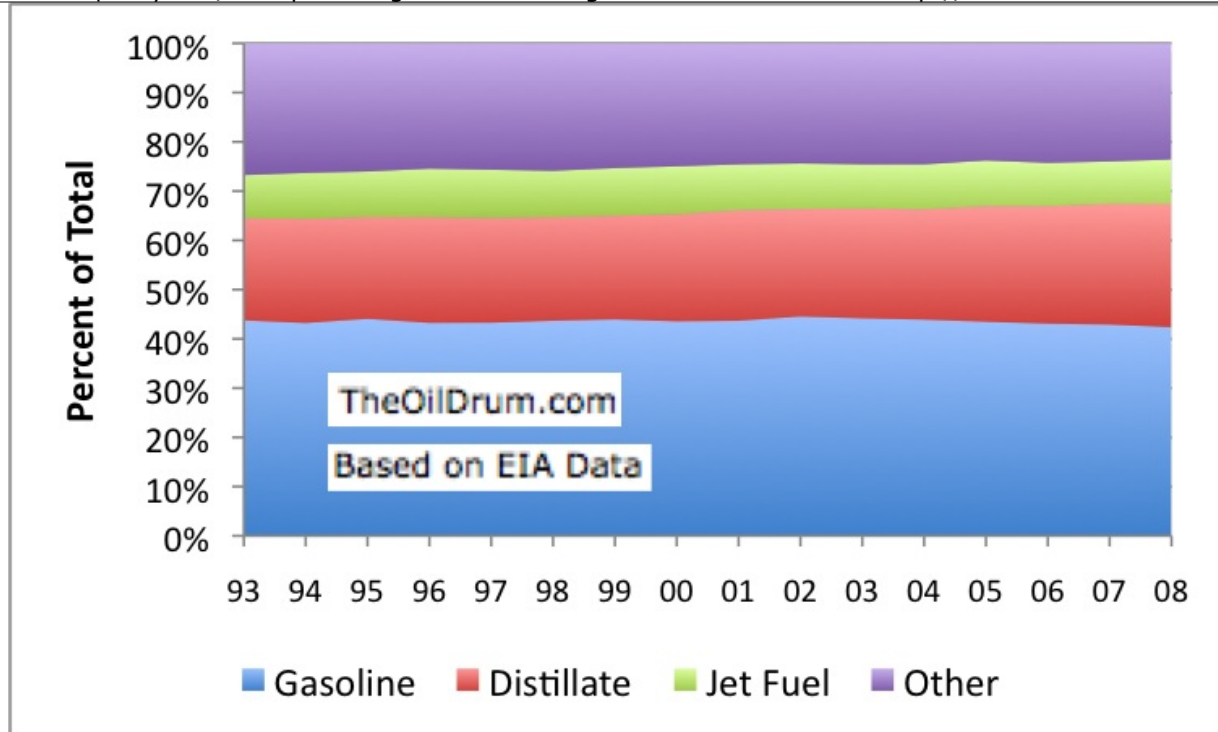


Figure 2. Breakdown of Production from US Refineries, 1993-2008

Figure 2 shows that gasoline production has remained in a tight band at 42% to 44% of US refinery output. Distillate, which is used for both diesel fuel and heating oil, has gradually climbed from about 21% of output in 1993 to 25% of output in 2008. Jet fuel has been fairly constant at about 9% of total production. The "all other" category has declined from 24% to 21%, as distillate production has grown.

It seems to me that there are several reasons why shifts in production don't happen very quickly. For one, the mix of oil fields feeding our refineries changes only very slowly over time, and the particular oil going into a refinery is a significant determining factor of the mix of products coming out of the refinery. For another, even if a refinery has "cracking" or "coking" capability so that it can change the mixture of products it produces, it is expensive to use, and only a part of the refinery output will use it. Also, our built infrastructure uses a particular mix of products. This mixture can change over time, but only fairly slowly.

What does this pricing shift mean for refineries?

I think there are really two issues. One is that margin for gasoline refining is dropping. In fact, since we are looking at the difference between the retail price and the cost of crude, it is the whole top-to-bottom margin that is dropping, so there is less available not only for refineries, but for other operations such as gasoline stations. There have been many [reports](#) in the news recently about gasoline stations closing because of financial problems.

The second issue is that margins for diesel and jet fuel do not seem to be rising enough to make up for the drop in the gasoline margin. It is difficult to tell for certain, without knowing how much of the costs are fixed costs and how much are variable costs. I would expect that costs of refining would be quite closely tied to the price of crude, because refining is very energy intensive. If companies are looking at only the dollar spread, they may be underestimating how much their costs really will rise with higher crude prices, and think that the pricing margins for distillate and jet fuel are more adequate than they really are.

Because of the differences in margins by product, refineries may be able to improve their financial results if they can change their mix to generate more distillate and jet fuel, and less gasoline. Overall, they may still come out behind in terms of profitability, if pricing margins for distillate and jet fuel have not risen enough to offset the decline in the gasoline margin. Refineries that are producing a lot of gasoline now and lack the capability to change their mix will almost certainly suffer a loss of profitability with the current pricing margins.

Section 2: Changes in world product demand and recent US consumption

Recent US consumption trends

If we compare US consumption of various oil products in the first four months of 2008 with the corresponding amounts for the first four months of 2007, we find that US gasoline consumption dropped less than any other product.

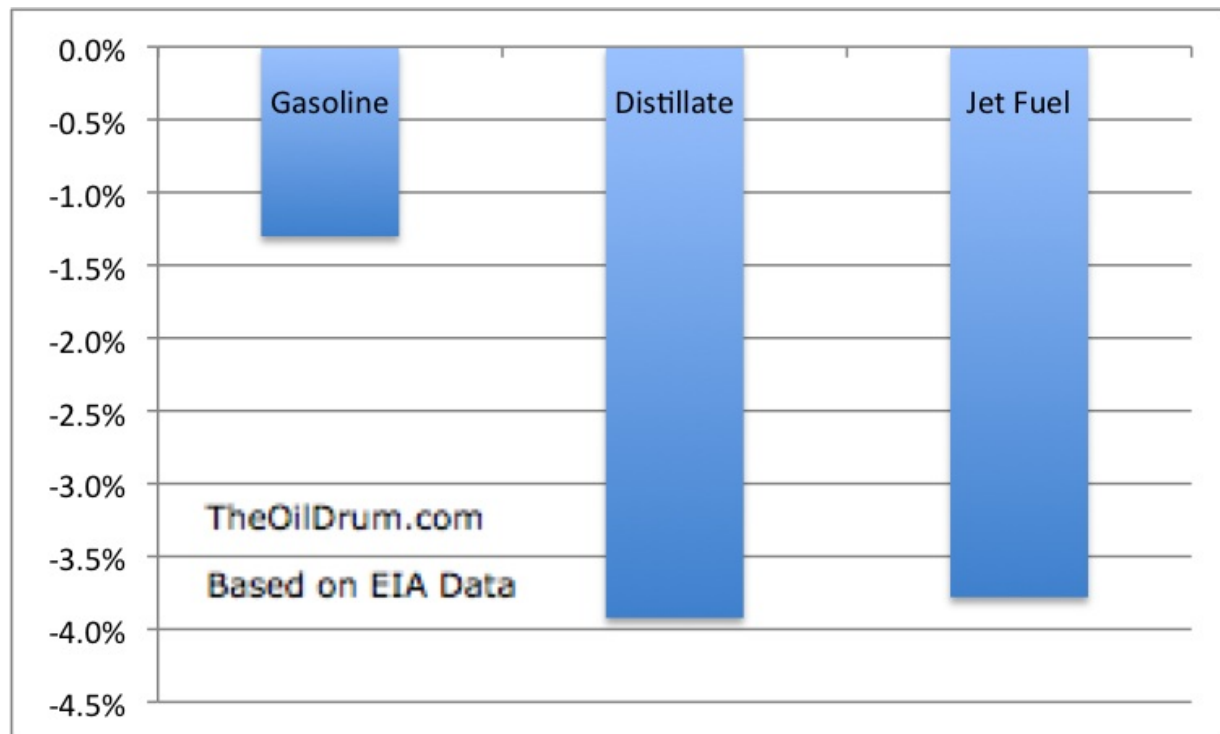


Figure 3. Decreases in US consumption by product, January-April 2008 compared to January - April 2007.

Figure 3 indicates that consumption during the first four months of the year dropped by -1.3% for gasoline, -3.9% for distillate, and -3.8% for jet fuels. Other products, not shown on Figure 3 include residual fuel oil, -21.6%; asphalt, -13.1%; and natural gas liquids, -5.8%. Overall consumption of petroleum products decreased -4.2%, which is a huge change. These amounts are calculated on an average daily basis, and reflect the fact that 2008 is a leap year.

Thus, what we are seeing is that gasoline, with a disproportionately low price increase, is holding up better in consumption than other products, with larger price increases. Part of this is the fact that with the lower price increase, Americans have had less need to cut back on their demand. Part of it, too, is that it has been possible to continue to get imports, even with this relatively low price increase, indicating that overseas demand for gasoline is not high, compared to other products.

Part of what is happening is that US exports of petroleum products are increasing. In the case of distillate, we have shifted from being a net importer to a net exporter (Figure 4).

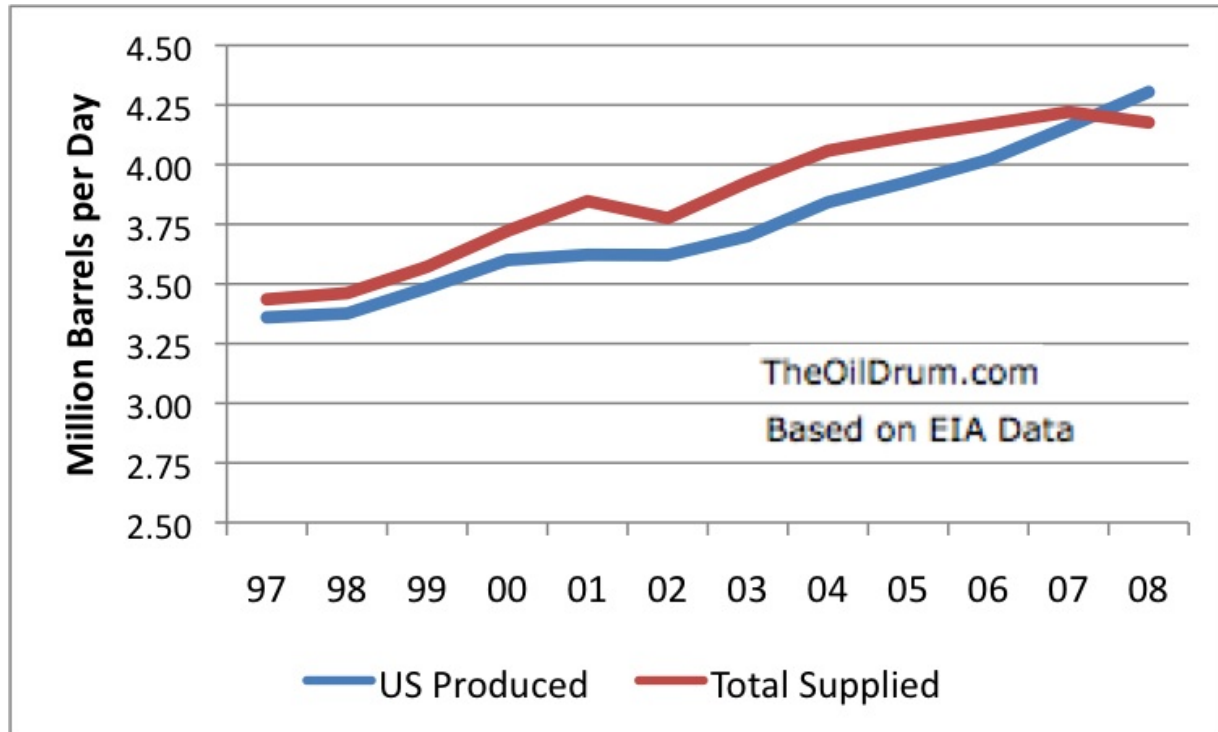


Figure 4. US Distillate Products Supplied (Consumed), US Produced and Imports. Years 1997 to 2007 are full years; 2008 represents January-April 2008 average.

Four months is a fairly short time period, and I am not certain that shifts in consumption among the various petroleum products during this period are necessarily indicative of longer-term trends. There is considerable seasonality in American's automobile driving and in the use of heating oil, and this may be affecting the numbers. It is interesting that gasoline prices have continued to stay disproportionately low, even after the summer driving season would normally have begun.

The world market is perhaps beginning to value distillate more highly, relative to gasoline, because of its greater energy content.

I think part of what may be happening, on a worldwide basis, is a change in the relative value of distillate and gasoline. Gasoline started as the higher valued fuel, but is now becoming the lower valued fuel.

As I understand it, when the United States first began refining petroleum, gasoline was viewed as the premier product. It was cleaner burning than diesel, and cars that ran on petroleum had quieter engines. The majority of petroleum produced in the US was light sweet crude oil. With such crude oil, it was easy to produce a high proportion of gasoline, with little refining effort.

With these considerations in mind, the US auto fleet was built using gasoline as its primary fuel. Refineries were optimized for producing the maximum amount of gasoline. The price of gasoline was set as high, or higher, than that for diesel. Diesel was viewed as almost as a byproduct that could be sold at a lower price to support gasoline sales.

When petroleum was cheap and plentiful, this approach may have made sense. The catch is that

diesel is really the better value, in terms of the number of miles per gallon that vehicles are able to drive. Part of this difference is because of the higher energy content of diesel relative to gasoline, and part of this is because diesel engines tend to be more efficient. Another problem of the past--the bad odor of diesel emissions--has also been eliminated by removal sulphur from the diesel during the refining process.

Now that the price of petroleum is increasing, the consumers are becoming increasingly aware of the value of distillate fuel. We see this in several areas:

- European countries many years ago recognized the greater inherent value of diesel compared to gasoline, and taxed the use of gasoline so as to discourage its use. In recent years, there has been more and more shift toward diesel powered cars, as the lower cost and higher mileage of diesel cars becomes more important to consumers.
- India and China have also have [adopted](#) tax structures that favor the use of diesel cars over gasoline vehicles.
- Diesel is becoming the fuel of choice in a wide variety of applications around the world. These include electric power generation; backup power where power interruptions are a problem, and many industrial applications. Recent cold weather also increased the demand for heating oil around the world, further adding to demand of distillates.

With these shifts, world demand for distillate is rising more rapidly than demand for gasoline. Europe in particular tends to have left-over gasoline to export. I would expect the amount of left-over gasoline from around the world to grow, or decline less, as it continues to be the less-favored product.

At his point, biofuels are not really an issue for distillates. Costs are proving to be very high using palm oil or rape seed. Thus, there is no possibility of increasing distillate availability using biofuels, unless there is a scientific breakthrough.

Ethanol impact

[Other authors](#) assume ethanol production is increasing gasoline supply, and that this may be helping to hold down gasoline prices. While this is theoretically possible in the future, to date ethanol added to the gasoline mostly offsets MTBE taken out of the gasoline supply.

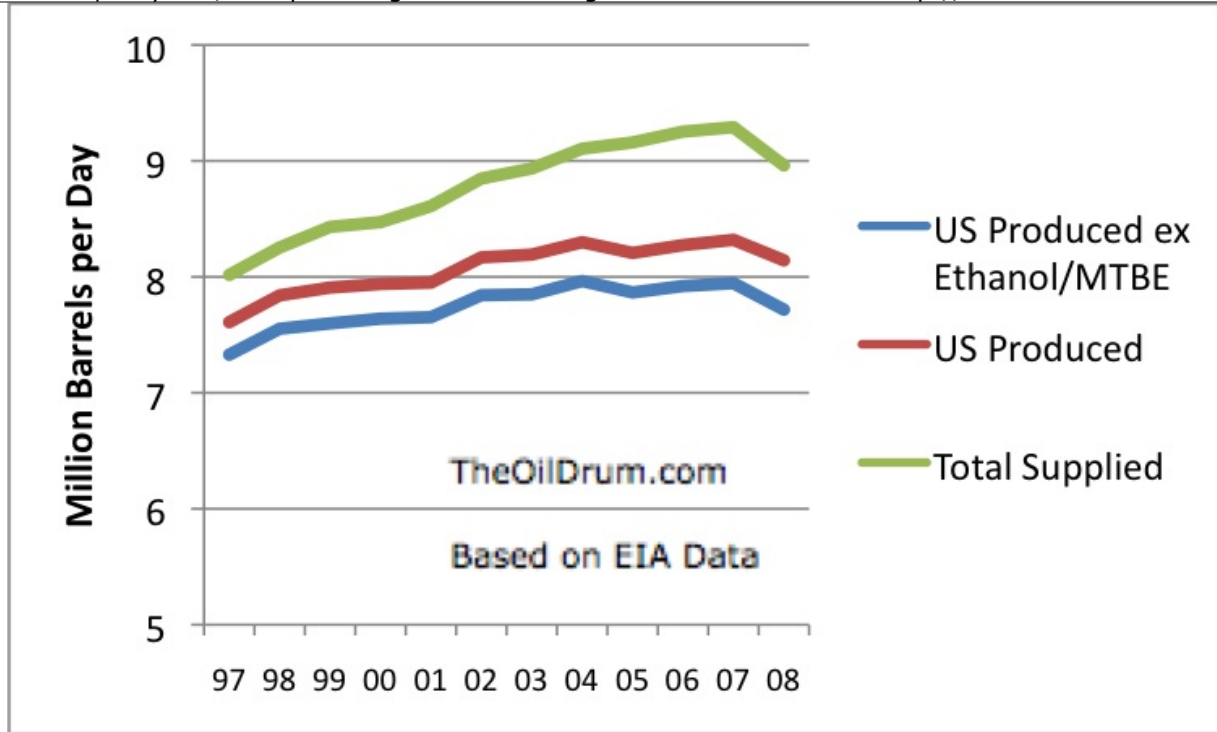


Figure 5. US Gasoline Consumption (Product Supplied), divided into US produced excluding Ethanol/MTBE, Ethanol/MTBE, and net imports. Years 1997 to 2007 are full years; 2008 represents January-April 2008 average.

When ethanol production was ramped up in the 2004 to 2006 period, one of the major purposes of ethanol was to act as a replacement for MTBE. MTBE is an oxygenate that many states banned because it contributes to groundwater pollution. MTBE is made from natural gas and had the side-benefit of extending the oil supply fairly cheaply.

The EIA [provides data](#) showing the total amount of oxygenates (MTBE + ethanol) added to the gasoline supply. Between 2003 and 2007 these increased from 343,000 barrels a day to 374,000 barrels a day, an increase of 31,000 barrels a day. This is hardly significant.

Of course, if one ignores the prior MTBE use, ethanol is adding to the fuel supply today. In the future, ethanol is expected to further increase the gasoline supply. Even if the amount is small, the higher supply may help hold down gasoline prices, and further exaggerate the shift in prices between gasoline and distillate that we are seeing. Longer term, the effect of this will be to encourage refiners to produce more distillates and less gasoline.

Section 3: Who are the market players, and why this matters

Refiners are the real buyers of crude oil

If one stops to think about it, the most direct factor determining crude oil demand is the number of refineries bidding for the crude. In general, refineries would prefer to be at full production, except when they are off-line for maintenance.

If refineries believe that they cannot sell all of the product they are making at a satisfactory price, they might also choose to limit production. One example of this would be refineries in China, where retail prices have been capped, but refineries must still buy crude oil at the market price. China recently raised retail prices. One might expect this to *increase* crude oil demand from

refineries there, since they will now be able to sell their products at a better price.

Another example of refineries that would choose to limit their purchases is refineries that expect to lose money on the product mix that their refinery can produce, given current pricing margins. An example of this would be almost any US refinery that makes mostly gasoline using sweet light crude such as WTI, and is not set up to change its product mix significantly.

If a refinery is part of a vertically integrated oil company, it may be willing to live with very low refining margins, because even with these low refining margins, the profitability of the company as a whole is adequate compared to non-petroleum companies. In fact, vertically integrated petroleum companies may actually prefer these low refining margins, because with "normal" refining margins, there would be great hue and cry for excess profits taxes on these companies. If margins are low, vertically integrated companies may be using refining losses to offset part of the profits generated by, say, producing oil at \$50 a barrel and selling the refined products at current prices.

I doubt that any politician would challenge artificially low refining margins for gasoline, since it means lower gas prices for constituents. In fact, pressure from politicians may contribute to the relatively low gasoline prices we see.

When it comes to buying gasoline overseas, these lower prices may not a huge problem, because the gasoline that is on the market is surplus gasoline, produced as part of the refining mix. Producers of the gasoline may be willing to take any reasonable price, if other buyers are not available.

The problem, of course, is that if gasoline prices are depressed for any reason, non-vertically integrated refineries are at a huge disadvantage. They are forced to buy crude oil at a high price and sell gasoline at a low price, because they have no other choice, and have no other companies in the group to share the poor results with.

Some non-integrated refiners can change their product mix to optimize profitability. These refiners may do better, although there is no guarantee that they will be profitable. If integrated petroleum companies are able to live with low enough margins, it is possible that it will be virtually impossible for non-integrated companies to produce a product mix that will provide an acceptable profit level.

Local service stations are intermediate buyers of gasoline.

It seems to me that the situation with service stations is not all that different from the situation with refiners. The gasoline produced by various refineries is placed in the pipeline, and service stations purchase it. The service stations that are owned as part of vertically integrated operations may be willing to live with a very low margin between the retail price of gasoline and the wholesale price of gasoline, because the loss can be offset against profits elsewhere.

Non-vertically integrated gas stations are put in a difficult spot, because they have to compete for customers with the vertically integrated gasoline stations. Quite often, there are two gas stations on a single corner. If one station sells regular gasoline for \$4.09 a gallon, it is difficult for a nearby station to sell gas at \$4.29 a gallon. Even \$4.19 is a stretch.

Section 4: What might be ahead?

It is not clear how long the very low refining margin for gasoline might last. If underlying issue is a

shift to greater demand for distillate and jet fuel, relative to gasoline, it could take years to completely resolve. If political influences are involved, it is possible that the situation could resolve after the next election.

If refining margins continue at their current levels, I would expect many bankruptcies among refiners that are not integrated with companies that also produce crude oil. This could happen around the world, since the issue is not particularly a US only issue. The refiners at greatest risk of financial difficulty are those that currently make primarily gasoline and lack the capability of switching to other products.

EIA data indicates that utilization rates in the United States have been drifting downward, as shown in Figure 6. This might indicate overcapacity of certain types of refineries.

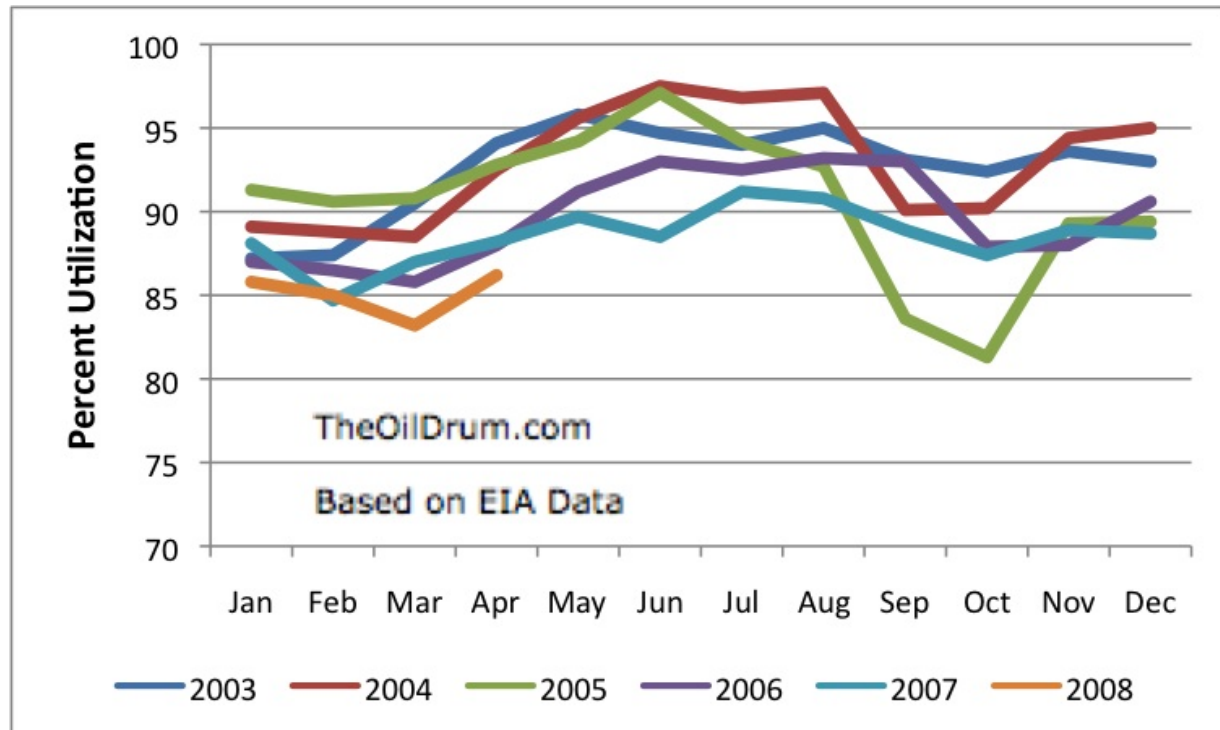


Figure 6. US Refinery Utilization

It is possible that the failure of a few refineries making primarily gasoline (and lack the capability of switching their product mix) would help get refinery supply back in line demand, at least with respect to refinery capacity for light crude. The smaller number of refineries for light crude would reduce the number of companies bidding for light crude, and would therefore cause its price to drift lower. Profit margins for remaining refineries would tend to rebound if there is less competition, and would help get the situation back to more normal pricing margins.

A problem might occur if there are too many refinery failures. It is theoretically possible that the world could be left with inadequate refining capacity if an excessive number of refineries fail. I expect that at least some governments would step in before they allowed a local refinery to fail, since output of a local refinery is often the source of local petroleum products. If governments get involved, pricing margins could remain distorted for a long period.

I expect that quite a few service stations are likely to fail also, especially ones that are not part of integrated companies. The failure of a few service stations is likely to have little impact, except in rural areas where service stations are rare. In these rural areas, some people may find it

necessary to drive long distances to find a service station.

If diesel is gaining in demand relative to gasoline, I would expect the price for sweet medium grades of crude to rise closer to the price of sweet light crude oils, since medium crude yields a higher proportion of distillates and jet fuel. This shift in crude oil prices will tend to help get refining margins back to a more normal level.

If there are failures of non-integrated refiners and service stations, these are likely to start fairly soon, if refining margins remain low. Refineries and service stations are likely to find it difficult to maintain adequate credit facilities to borrow the funds they need to buy crude or gasoline. Once they lose their lines of credit, they are likely to go out of business quickly.

These are ideas of mine. I would be interested in hearing readers' ideas as well. Some of you have a lot more hands on knowledge of the situation than I do.



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