

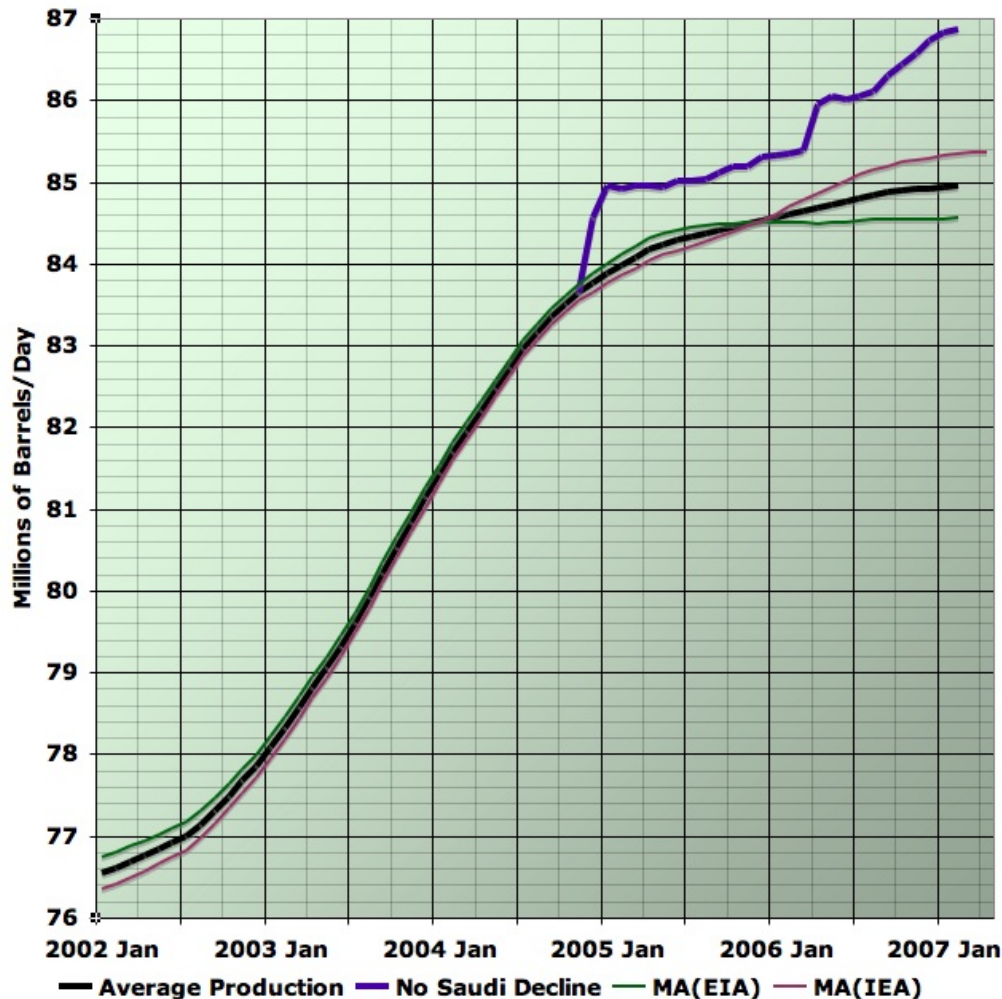


## Saudi Arabia and Gas Prices

Posted by [Stuart Staniford](#) on May 24, 2007 - 7:47am

Topic: [Economics/Finance](#)

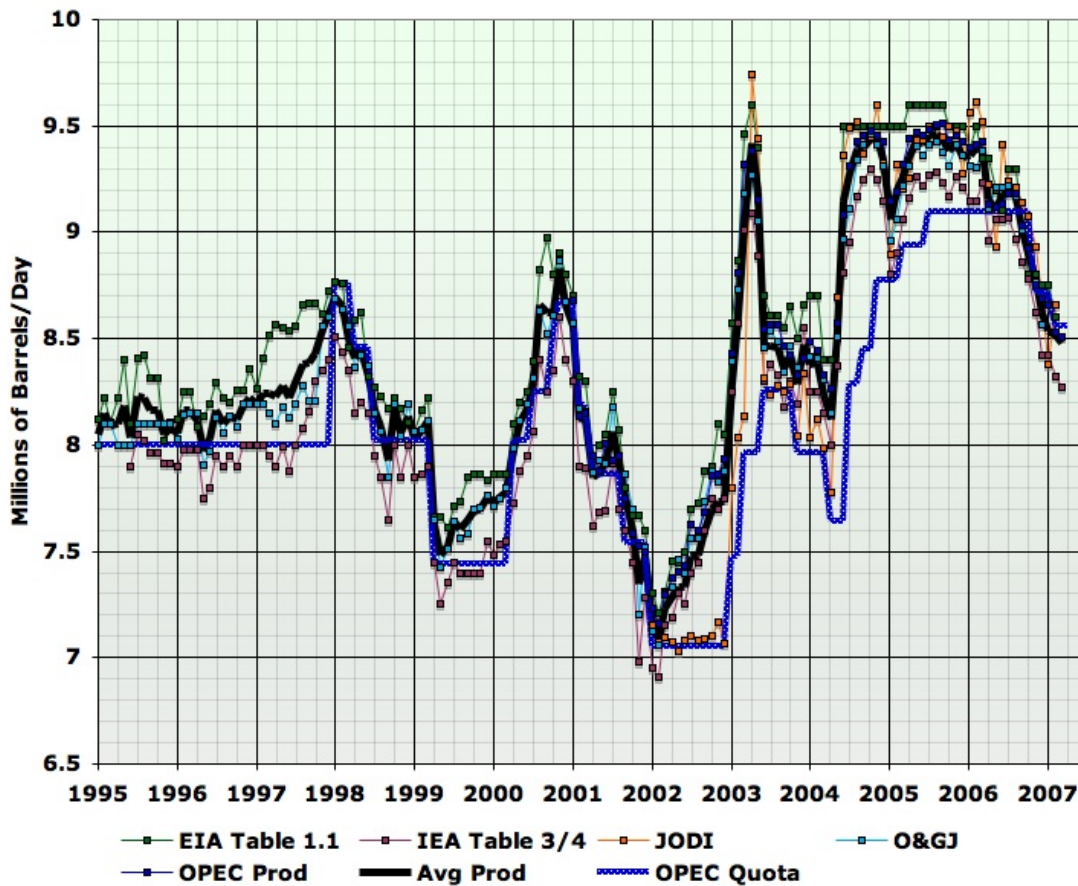
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Two estimates of total global liquid fuel supply (13 month centered moving averages recursed once). Also, average of the two curves, together with hypothetical scenario with no Saudi declines occurred and where 690kbd of production were added from Qatif/Abu Safah, and 300kbd were added from Haradh III) Jan 2002-most recent month. Graph is not zero-scaled to better show changes. Click to enlarge. Source: EIA data is from [International Petroleum Monthly Table 1.4](#). IEA data are from [IEA Oil Market Report Table 3](#).

Following on from recent discussions on [Saudi Arabian production declines](#), and the somewhat uncertain degree to which we might [attribute them to declines in North Ghawar](#), I'd now like to take up the question of what have been the consequences of these declines for global oil supply, and for US gasoline prices in particular. We can discuss this impact regardless of the degree to which the declines have been deliberate or due to unavoidable declines in the output of some

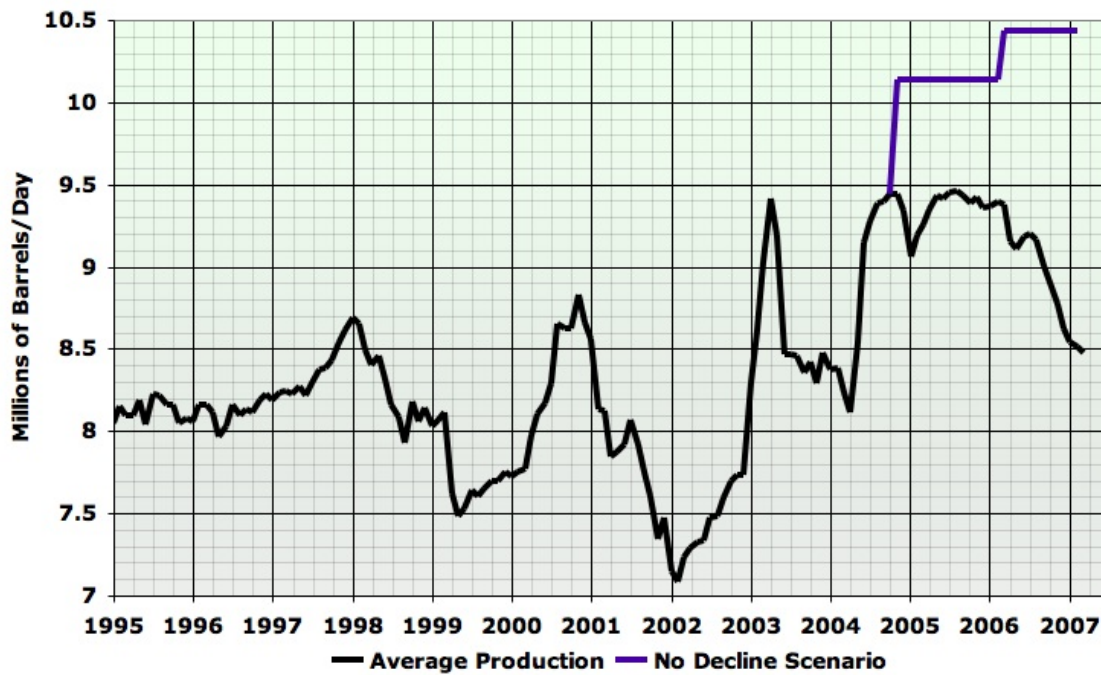
Let me start by providing the latest available data on Saudi oil production:



Five estimates of Saudi Arabian oil production, Jan 1995 - Mar 2007, together with average and OPEC quota at the time. Click to enlarge. Source: [US EIA International Petroleum Monthly Table 1.1](#), [IEA Oil Market Report Table 3](#), [Joint Oil Data Initiative](#), [OPEC Monthly Oil Market Report, Table 17 \(or similar\) on OPEC Supply](#), [Oil and Gas Journal](#), and [OPEC for quotas](#).

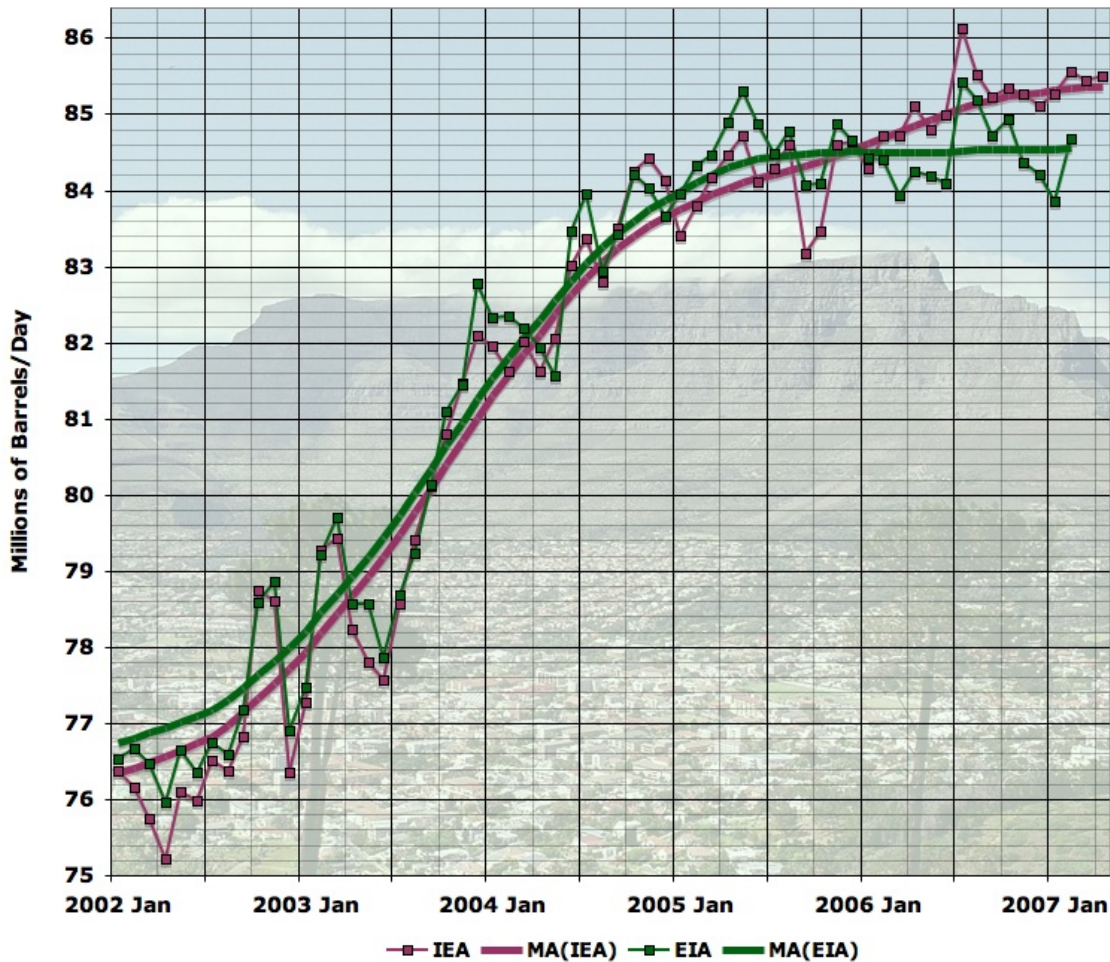
The core issue under discussion is that production is off by about 1 million barrels per day since Q3 of 2004, despite the addition of new projects with a rated capacity of about 1 million barrels per day (the Qatif/Abu Safah redevelopment which was supposed to create 690k b/d of additional crude+condensate capacity, and the Haradh III development which should have added 300k b/d of crude production capacity).

If we imagine that all fields had been on the same plateau as in Q3 2004 to the present day, and we further add in the new projects (dating approximate), we would have had a picture like the purple curve in this next graph:



*Average of five estimates of Saudi Arabian oil production, Jan 1995-Mar 2007, together with hypothetical scenario with no declines and where 690kbd of production were added from Qatif/Abu Safah, and 300kbd were added from Haradh III. Graph is not zero-scaled to better show changes. Click to enlarge. Source: see previous figure.*

This situation is one factor playing into the global production curve. Total global oil supply during the economic recovery following the 2000 tech crash recession looks like this:

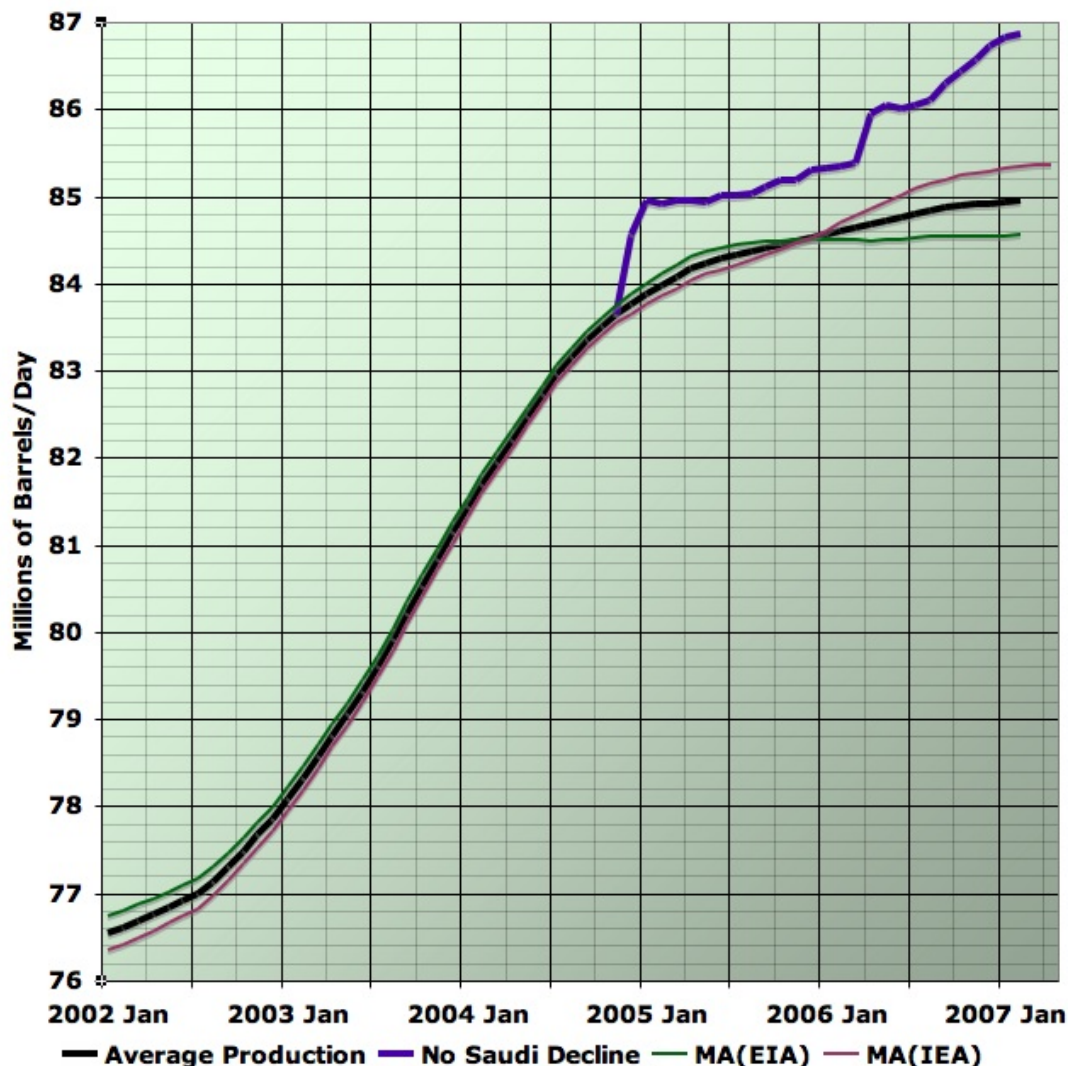


Two estimates of total global liquid fuel supply, with 13 month centered moving averages recurred once. Jan 2002-most recent month. Click to enlarge. Source: EIA data is from [International Petroleum Monthly Table 1.4](#). IEA data are from [IEA Oil Market Report Table 3](#).

(These are "total liquids" figures - ie they include natural gas liquids, coal-to-liquids, biofuels, refinery gains, etc, in addition to crude and condensate). If you believe the EIA, total global oil supply has been essentially flat for the last couple of years, despite rising prices. If you prefer the IEA's figures, then production has been growing but in an anomalously slow way compared to historical growth rates.

If we add onto the average of the two moving average curves above the difference between actual Saudi production and the hypothetical "no decline" scenario, we get this picture:

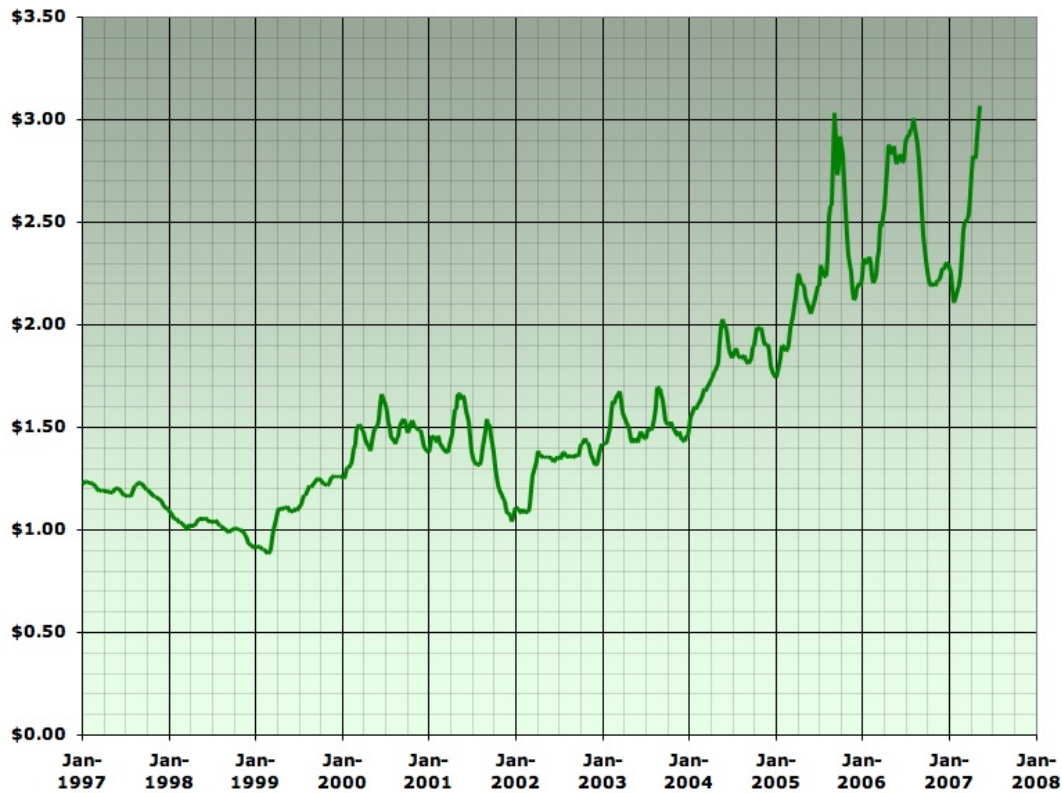




Two estimates of total global liquid fuel supply (13 month centered moving averages recursed once). Also, average of the two curves, together with hypothetical scenario with no Saudi declines occurred and where 690kbd of production were added from Qatif/Abu Safah, and 300kbd were added from Haradh III) Jan 2002-most recent month. Click to enlarge. Source: EIA data is from [International Petroleum Monthly Table 1.4](#). IEA data are from [IEA Oil Market Report Table 3](#).

Clearly, that would have been a rather different last few years in the global oil markets. But how much of the run up of gas prices can we attribute to this cause?

Firstly, just how much has the price of gas gone up since 2004?

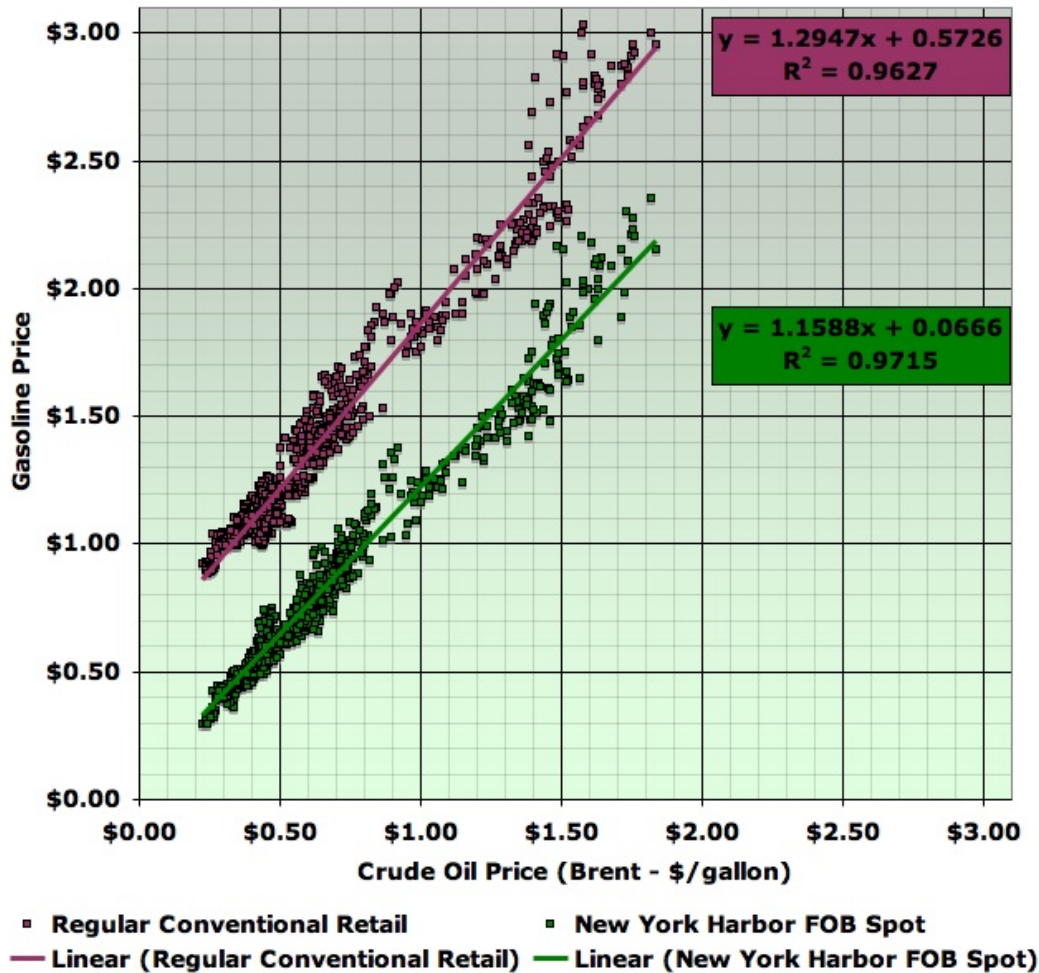


*Evolution of US average price for regular conventional gasoline, Jan 1997-May 12th, 2007. [Click to enlarge.](#)*

*Source: EIA [retail prices](#).*

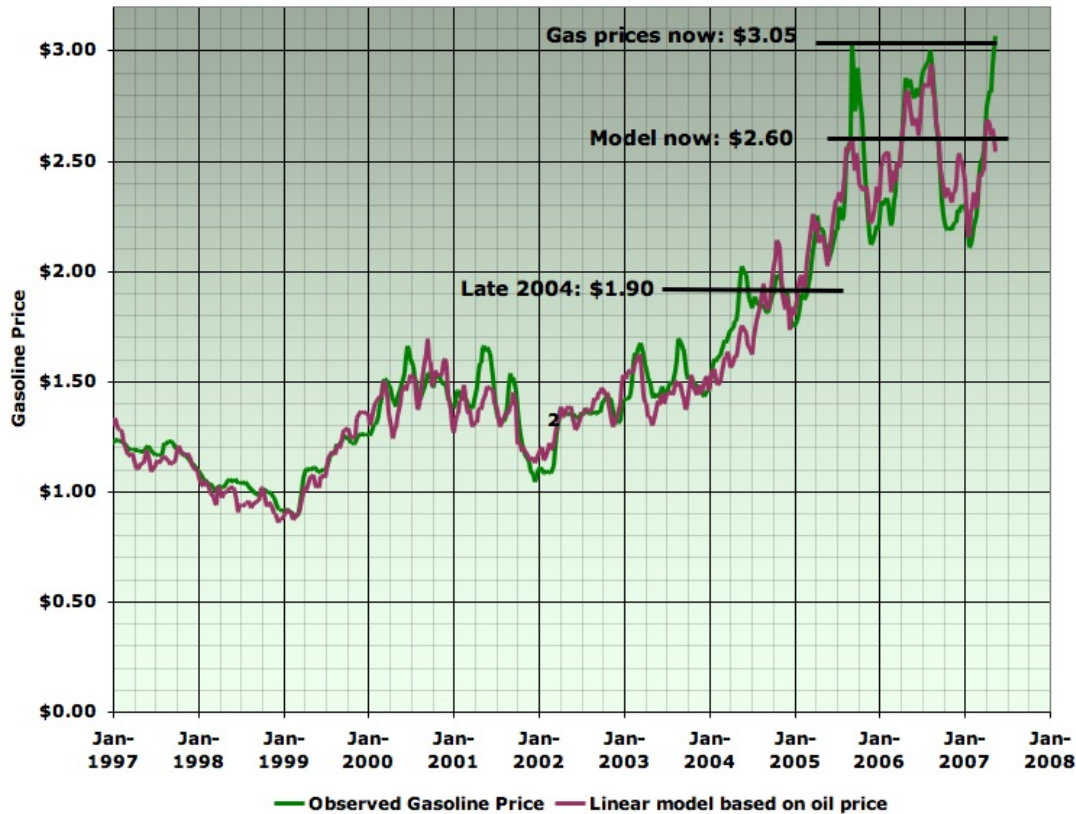
Well, in late 2004 it was around \$1.90, and now it's about \$3.05. So we have around \$1.15 of increase to explain or about a 60% increase in the price.

The next thing to understand is that there is generally an extremely strong relationship between the price of gasoline and the price of oil:



Scattergrams of weekly gasoline prices versus oil prices from February 1991 - May 5th week, 2007. Oil price is Brent spot price, purple curves show gas retail price for conventional regular, green is spot price for gasoline imported to New York Harbor (ie a wholesale price). Gas prices are not inflation adjusted so  $R^2$  may be slightly overstated for weekly data ( $R^2$  on monthly inflation adjusted series is also 95%+ however). Click to [enlarge](#). Source: EIA [retail prices](#), and [spot prices](#).

The  $R^2$  of 96% at the retail level says that 96% of the variance of gas prices (since 1991) is explained by this simple straight line model applied to oil prices. This makes sense - refiners have to include the cost of crude in the price they charge their customers, and both they are the distributors and retailers probably begin their pricing model by tacking a fixed percentage onto whatever crude costs them. While there is some residual effect that we can attribute to varying refinery/distributor/retailer margins - which are erratically seasonal - clearly if you know the oil price, you usually know most of what you need to know to get close to the current price of gas. Let's look at the time series of gas prices together with the results of the linear model above (which just knows about the oil price, and nothing else):



*Weekly gasoline prices (regular conventional) versus predicted price from linear model based on Brent oil prices from February 1991 - May 5th week, 2007. Data is not inflation adjusted. Click to enlarge. Source: [EIA retail prices](#), and [spot prices](#).*

As you can see, although generally this model does pretty well, right now we are in an anomalous period where gas prices have gone significantly higher than oil prices alone would suggest. Likely this is due to the refining tightness [discussed elsewhere](#). So on the graph above, we can attribute about \$0.45 of the rise since late 2004 to downstream margins (most of which is very recent and probably fairly transient till BP [finishes repairs](#)), but about \$0.70 is due just to crude costs.

So then the question is whether 2mbpd in missing Saudi oil production is enough to account for the \$0.70 increase that can reasonably be attributed to crude, rather than refinery tightness. Well, that's a  $\$0.70/\$1.90 \sim 35\%$  increase. Given [a gasoline price elasticity of -0.05](#) during the period of interest, it would only take a  $35/20 = 1.75\%$  reduction in global gasoline supplies to do the job. Since the missing Saudi production is  $2/84 = 2.4\%$  of global oil supply, it would appear that, had this not happened, we would have had little or none of the 35% crude-based increase in gasoline prices since 2004.

(Note that I'm not arguing this is the only thing going on in world oil markets. However, I'm suggesting the thought experiment of keeping everything else exactly as it occurred, and just adding back in the missing 2mbd of Saudi production. It appears in that hypothetical world, we wouldn't have had the crude oil increases that led to most of the recent gas price increases).

One might argue that the world couldn't have refined the extra oil, had Saudi Aramco produced it (thereby causing much larger violations of the historical relationship between oil and gasoline prices). Global refinery utilization data is poor enough to make this a difficult argument to evaluate. However, since they keep reducing their [deliveries below contracted volumes to their customers](#), this doesn't seem the likeliest explanation:



May 14 (Bloomberg) -- Saudi Aramco, the world's largest state oil company, will cut Arab Light crude oil exports to Asia for the first time in at least three months as part of an overall supply reduction to the region.

The Dhahran, Saudi Arabia-based oil producer will lower shipments starting in June, said three refinery officials who received notices and asked not to be identified because of confidentiality agreements. The producer has been reducing Arab Medium and Arab Heavy sales by between 9 percent and 10 percent of total contracted volumes.

Saudi Aramco's supply cuts in the past few months were focused on its Arab Heavy grade that mostly yields fuel oil during processing. Saudi Arabia is lowering exports to comply with 1.7 million-barrel-a-day production cuts agreed last year by the Organization of Petroleum Exporting Countries.

The company has trimmed shipments below contract levels since November. Saudi Aramco lowered exports to Asian refiners in April by an average 9 percent, and the cuts this month and in June are more than the 7 percent reduction in March shipments.

It's the eighth month that Saudi Aramco has reduced exports to Asia.

(Note that the production declines actually began at least 12 months before the OPEC quota cut, and earlier than that if one counts the failure of the Qatif megaproject to increase top line production).

Finally, for the record, I don't want to suggest that gasoline price increases are all bad. I personally am in favor of high gas prices to promote conservation of precious remaining oil, moves to make the vehicle fleet more efficient and reduced carbon emissions. But if you feel differently about high gas prices, you might want to pay close attention to what Saudi Arabia is doing.

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