

# **FUEL PRICE FORECAST**

## **METHODOLOGY**

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## OVERVIEW

The method has four steps. First, use time series on fuel prices, crude oil prices, and exchange rates to determine - based on history - what is the level of fuel prices for a given level of crude oil prices. The estimations are best performed with weekly data for maximum precision and no less than three years of data to capture periods of high and low oil prices. The statistical approach is multiple regression estimated on the individual country level. One can use STATA, R, Excel or any other statistical tool. Look at the R-squared of the regression to see if these variables can be used to predict fuel prices with a reasonable degree of confidence. A value greater than about 0.85 would be ok. That is generally the case in liberalized fuel markets.

Second, obtain the most recent predictions of crude oil prices as explained below.

Third, use the estimated parameters from your regression model to estimate what the level of fuel prices would be if the crude oil price predictions come true. Play around with scenarios of higher and lower crude oil prices and higher and lower exchange rates.

Fourth, complicate the analysis. Reestimate your model and predictions by using the logarithm of the key variables or by lagging the right-hand-side variables. Try eliminating outliers. Check if aggregating the weekly data into monthly observations makes a difference. Calculate out-of-sample predictions to evaluate the predictive power of the model. Check how the model performs during periods of high and low crude oil prices. Add a time trend variable to capture time patterns with respect to taxation and the rising cost of marketing and distribution of fuels. Create and include seasonal dummy variables to capture seasonal patterns.

## FORECAST HORIZONS

There are abundant one-year crude oil price forecasts from most multilateral organizations and the big investment banks. That makes it possible to derive a "consensus" forecast as well as a range into which most forecasts fall. Using these parameters, one can generate fuel price forecasts.

The U.S. International Energy Agency, the World Bank and a few of the investment banks also produce five and ten year forecasts of crude oil prices that can be used for longer-term predictions. In that case the range around the "consensus" oil price forecast is wider as the uncertainty is greater and one needs to run more conservative scenario estimations. Also, at longer time horizons, one has to account for the trends in taxes and other policies as well as the general increase in the cost of marketing and distribution observed in many countries. In other words, it is essential to include a time trend in the model and to do a bit of research on the country to see if any major policy changes are being discussed.

## OIL PRICE SCENARIOS

Oil prices are subject to various economic and geopolitical shocks and are highly volatile. Therefore, adding a range of high and low prices in the forecasts paints a more complete picture of the future fuel prices.

One can use the crude oil price forecasts from the U.S. Energy Information Administration, the World Bank and multiple investment banks including Bank of America Securities, Citigroup, Goldman Sachs, and JPMorgan Chase. Most of them are available through a simple google search. One can also use the forward crude oil prices from the New York Mercantile Exchange and the oil demand and supply forecasts from the International Energy Agency and OPEC, also available through a google search. The forward prices might reflect the expected future crude oil prices by the market but there are important caveats to that assumption discussed [here](#).

## REGULATED VS LIBERALIZED MARKETS

About half of the 160 countries that we track have liberalized fuel markets in the sense that fuel prices are driven by market supply and demand conditions. In the other half, the government either sets a price ceiling of the fuel prices or fixes the prices. In some countries, the governments revisit the fixed price or the ceiling once per week or a month, or once per year with the passage of the annual government budget. Yet in other countries, the fixed price/ceiling is not revisited on a regular basis but is changed when either crude oil prices change significantly or the government decides to achieve some social or budgetary objectives.

The point is that the relationship between crude oil prices and fuel prices is not very tight in many countries. A forecast of fuel prices in that case requires a broader context that goes beyond data analytics. One has to spend some time reading about the country and its mechanism for setting fuel prices.

## POLITICAL ECONOMY

People are very sensitive to the level and changes in fuel prices. Hence, the authorities in every country are very careful with these prices as sudden large increases can create social unrest. They try to balance between the objective to collect revenue from fuel taxes and to fight pollution on the one hand and the objective to ensure that transportation costs do not hamper businesses and households on the other hand.

Governments in countries with large income inequality or high poverty rates try to keep fuel prices low and stable. The same applies to countries with large territories where transport is very important and to countries with large agricultural sectors as fuel is a major cost component.

The situation in most oil producing countries is a prime example. They subsidize domestic fuel prices as an important benefit to their populations. At the same time, their government budgets are heavily dependent on oil sales. A decrease in the price of oil can jeopardize their ability to provide cheap fuel and to tie up the government budget. In that situation, the country may be forced to raise fuel prices to compensate for the decline in budget revenue – a situation where fuel prices are increasing while crude oil prices are declining. It is important to keep such political economy considerations in mind when generating forecasts.

## MARKETING AND DISTRIBUTION COST

The marketing and distribution costs can range from less than 10 percent of the final retail fuel price to well over 20 percent. The relative share of these costs depends on the market structure, the level of fuel taxes, and the cost of doing business in a country including the cost of land and labor. Also, those costs tend to rise over time with inflation which explains why

countries have rising fuel prices over time even if crude oil prices and taxes are the same. A longer-term forecast has to account for the speed with which these costs rise in a country.

## SEASONALITY

Seasonality is relevant mostly for short-term forecasts but should be mentioned because its effect could be substantial. The seasonal variations can sometimes exceed 10 percent of the average cost of fuel. In the Northern Hemisphere, diesel prices are typically higher during harvest time in the fall and during winter when diesel and diesel substitutes are used for heating. Gasoline prices are typically higher in the summer during the holiday travel months.

## EXCHANGE RATES

Oil is traded in U.S. dollars. When the currency of a country depreciates, this makes oil imports more expensive even if crude oil prices are unchanged. The reverse happens when the local currency appreciates: imported oil products become cheaper and fuel prices decrease. In fact, the effect on fuel prices of changes in crude oil prices and changes in exchange rates is the same. Whether Brent prices are 10 percent higher or the dollar is 10 percent more expensive is the same for countries that do not use the U.S. dollar as their currency. However, there is an important caveat. Exchange rates are much less volatile than crude oil prices and, in practical terms, the effect of oil prices is more important.

One more note should be made about oil exporting countries. When oil prices decline, their exports decrease and, unless they have a fixed exchange rate to the U.S. dollar, their currency depreciates. The depreciating currency puts upward pressure on all prices, including on fuel prices. Moreover, the government budget comes under pressure from the reduced oil revenue which limits the ability of the government to subsidize domestic fuel prices. As a result, we may have the curious situation where fuel prices are increasing while crude oil prices are declining.

## PERMANENT VS TRANSITORY SHOCKS

In countries with liberalized fuel markets, it takes about three to four weeks for fuel prices to

adjust to a new level of crude oil prices as market participants continue to operate under the old contractual agreements for some time. The greatest impact is in week two.

Given that sluggish adjustment, if oil prices move in one direction and soon thereafter move in the other direction, we will see only oil price volatility and no change to fuel prices. The stability of fuel prices is even greater in countries with regulated fuel prices. Authorities typically wait for a few weeks to be sure that oil prices have experienced a relatively permanent shift before adjusting the fuel price levels. They are right to do so as oil prices often overshoot and the initial large movement is soon reversed either fully or partially. Therefore, a very short term forecast of fuel prices over a few days probably does not make much sense.

## CRUDE OIL PRICE INCREASES VS DECREASES

“Rise like rockets and drop like feathers.” A widely shared belief is that fuel prices rapidly increase when oil prices increase but decline very slowly, if at all, when oil prices decline. That is not supported by the data. Changes in oil prices have a very symmetric effect on the upside and on the downside. That holds for both gasoline and diesel fuel. Their prices behave very similarly with respect to changes in crude oil prices. However, while that is true in general, individual countries may have different circumstances. For example, in countries where diesel and gasoline taxes are different, the change in the prices of the two fuels will be different when crude oil prices or exchange rates change.

## ABOUT GLOBALPETROLPRICES.COM

We track retail fuel, electricity, and natural gas prices using data from companies, government institutions, regulatory agencies, statistical institutes, and major media outlets. The fuel price data are collected weekly for over 160 countries. The electricity and natural gas prices are collected for most of these countries on a quarterly basis.

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