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Cheaper Gasoline: Causes, Impacts and Expectations

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Cheaper Gasoline: Causes, Impacts and Expectations

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1. Introduction

By the end of 2014 everyone in the U.S. knew at least the following three things:

- What is ebola?
- Who is Charlie Hebdo?
- Gasoline prices crashed.

Of these three, the one that will have the biggest and most immediate impact on the U.S. and Tennessee is cheaper gasoline. Between June 2014 and January 2015 the average price of a gallon of gasoline sold in the U.S. fell by $1.65 per gallon. That may not sound like much – about the cost of a cup of coffee – but Americans, and Tennesseans in particular, buy a lot of gas. Yearly sales of gasoline and diesel fuel in Tennessee exceed 600 gallons per capita, above the national average of 550 gallons. At that rate, saving a $1.65 per gallon adds up to $1,000 per Tennessean and $6.5 billion statewide. Nationally, saving $1.65 on each of the 170 billion gallons of gasoline and diesel fuel Americans burn each year will save more than a quarter of a trillion dollars. Even in an economy of over $17 trillion, that's real money. While consumers are better off, the lower prices have put pressure on producers. The nation’s mining and petroleum sector will see double-digit contraction in investment this year, along with the loss of a significant number of jobs.

2. It’s the Crude Oil

Why did the price of gasoline fall so far so fast? And how long is it likely to stay near $2/gallon? To answer the first question, we need to break down the cost of a gallon of gasoline into its main components:

- crude oil
- petroleum refining
- distribution and marketing
- federal and state motor fuel taxes

The cost of crude oil, including transportation from oilfield to refinery by supertanker or pipeline, is typically included in the delivered cost of crude oil. The proposed Keystone XL pipeline, for example, is intended to bring crude oil derived from Canadian tar sands south across the U.S. to refineries on the Gulf of Mexico. At the refinery crude oil is processed, upgraded, blended and made into refined products: gasoline, diesel, kerosene, jet fuel and more. From the refinery, finished products are shipped via product pipelines to regional...
storage terminals from which they are distributed by tanker truck to retail refueling stations. One of the largest pipelines in the U.S., the Colonial, passes through Knoxville, Tennessee carrying refined product from the Gulf of Mexico northward. Knoxville's location on that pipeline is one reason East Tennessee has among the lowest gasoline prices in the nation.

Petroleum transportation and processing is amazingly efficient. The cost of refining petroleum into motor fuels accounts for only about $0.25 in the price of a gallon of gasoline (Figure 1). Motor fuel taxes, which pay for about half the cost of building and maintaining our roads, bridges and tunnels add, on average, about $0.42 cents to each gallon. Of that, $0.184 is federal tax (unchanged since 1994). In Tennessee, state taxes add $0.214/gallon (also unchanged for two decades). Low state motor fuel taxes are another reason gasoline is cheaper in Tennessee.\(^1\) Distribution and marketing, including the costs of refueling stations, add about $0.25 per gallon. The total cost of everything but the oil delivered to the refinery comes to about $1.10 per gallon.

This leaves the cost of crude oil. A barrel of crude oil contains 42 gallons. A very good rule of thumb is that the cost of crude oil in a gallon of gasoline is equal to the price of crude per barrel divide by 42. In 2012 when the cost of oil to U.S. refiners was $101 per barrel, crude oil accounted for $2.40 in the price of a gallon of gasoline. Today, with crude at $40-50 per barrel, the cost of crude contributes only a little more than $1 to the price of a gallon of gasoline.

![What do we pay for in a gallon of regular grade gasoline?](image)

Figure 1. What We Pay for in a $2.54 Gallon of Regular Gasoline (12/2014)

\(^1\) As of January 1, 2015, 17 states had lower gasoline tax rates than Tennessee. Tennessee's diesel tax rate is $.184 and the federal rate is $.244. See [http://www.taxadmin.org/fta/rate/mf.pdf](http://www.taxadmin.org/fta/rate/mf.pdf).
Although there is some variation from year to year, all the “other” costs of a gallon of gasoline have remained remarkably close to $1.10 to $1.20 per gallon (in constant or inflation-adjusted dollars) for about 40 years, as shown in Figure 2. When it comes to explaining big changes in the price of gasoline, it’s the crude oil.

Figure 2. Crude Oil’s Share of the Cost of a Gallon of Gasoline in the U.S., 1970-2014
Source: U.S. Energy Information Administration

3. Supply, Demand and OPEC

Why did the price of oil fall? Of course, when you boil it all down the answer is supply and demand. At $100/barrel, producers found ways to bring more oil to market, consumers decided to use less. But to understand why oil prices fell so far so fast and what might happen next, one needs to know a little more about the world oil market. An appropriate place to start is the founding of the Organization of the Petroleum Exporting Countries (OPEC) in September of 1960 in Baghdad, Iraq. The founding members were Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. At the time, oil was selling for about $2/barrel in dollars of the time, or about $15/barrel in today’s dollars. OPEC describes its purpose as follows:

“OPEC’s objective is to co-ordinate and unify petroleum policies among Member Countries, in order to secure fair and stable prices for petroleum producers; an efficient, economic and regular supply of petroleum to consuming nations; and a fair return on capital to those investing in the industry.” (OPEC, 2015)
In other words, their objective is to influence world oil prices.\(^2\) In 1968, OPEC issued a declaration asserting the right of every country to own and control its natural resources in the interest of national development. OPEC describes its members’ actions during the early 1970s as follows:

“OPEC rose to international prominence during this decade, as its Member Countries took control of their domestic petroleum industries and acquired a major say in the pricing of crude oil on world markets.” (OPEC, 2015)

Late in 1973, Arab members of OPEC declared an oil embargo against nations that had supported Israel in the October War of that year. As a consequence, oil prices tripled and, as Figure 3 illustrates, the world oil market has not been the same since. A market with low and relatively stable prices was transformed into one with much higher and much more volatile prices. Since 1973, oil prices have risen quickly and fallen quickly, but why?

![World Crude Oil Prices Since 1940](https://www.bp.com/-/media/bp shaped world/energy-economics/statistical-review-of-world-energy/figures/figure-3-world-crude-oil-prices-since-1940.png)

Figure 3. World Crude Oil Prices Since 1940.

The market power of a cartel that controls a large fraction of a market but not the entire market depends on three things:

1) its market share
2) the price elasticity of world oil demand

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\(^2\) The New Palgrave Dictionary of Economics defines a cartel as follows: “Cartels are associations of firms that restrict output or set prices.” In the case of OPEC the firms are state-owned. [http://www.dictionaryofeconomics.com/article?id=pde2008_C000552&edition=all&field=content&q=cartel&topicid=&result_number=2](http://www.dictionaryofeconomics.com/article?id=pde2008_C000552&edition=all&field=content&q=cartel&topicid=&result_number=2).
3) the price elasticity of supply by non-cartel producers

Numerous studies of the world oil market have demonstrated that short-run world oil supply and demand are “inelastic”. This means that relatively small changes in quantities supplied or demanded cause relatively large changes in the price of oil. This is the key to understanding the volatility of world oil prices: over a short period of time (a few months or a year), the price elasticities of world oil supply and demand are approximately one-tenth as great as they are over a much longer period (e.g., 5-10 years). In the short-run, a change in supply or demand of even a few percent can double world oil prices or cut them in half.

The history of the world oil market since the founding of OPEC is illustrated in Figure 4. One of the key determinants of OPEC’s market power, its market share, is the x-axis. The world average price of crude oil in 2013 dollars is the y-axis. From the founding of OPEC until the Arab-OPEC oil embargo of 1973, the price of oil varied between $10 and $15 per barrel (2013 $). The embargo tripled that price. Prices doubled again when the war between Iran and Iraq shut down much of those countries’ oil production. The price of oil rose to over $100/barrel. But world demand and non-OPEC supply began to respond to the unprecedentedly high price. In an attempt to defend the high price of oil, OPEC members made additional production cuts. From 1980 to 1985, OPEC members reduced their oil production from 26 million barrels per day to just under 16 million barrels per day. Saudi Arabia alone reduced its oil output from 10.3 million barrels per day to 3.6 (BP, 2014). Cutting production in the face of record high prices is definitely not the behavior of a competitive firm. By 1985 it was clear that cutting production could not go on forever. OPEC members abandoned the defense of high oil prices and began increasing production and regaining lost market share in a growing world market.

The recent experience with $100/barrel prices differs from that of 1979-85 in one very important respect: with the exception of the Great Recession in 2009, prices have remained near $100/barrel for five years without any cuts in OPEC supply. This almost certainly indicates a fundamental change in world oil markets.
Two fundamental factors triggered the price collapse of late 2014. Oil production outside of OPEC (which had been approximately 52 million barrels per day since 2009) increased by 4.2 million barrels per day between September 2012 and September 2014 (Figure 5). Of the 4.2 million barrels per day increase, 2.7 million barrels per day came from increased U.S. production. In 2014, world economic growth faltered. Oil demand in OECD countries had been gradually declining due to high prices and sluggish economic growth. Fuel economy and greenhouse gas emissions standards in the U.S. and EU also played a role in constraining world demand. Late in 2014 it appears that growth in the developing world slowed as well.
A change of only a few percent in the balance of supply and demand may not seem large enough to cause oil prices to fall by 50%. But it is. Price elasticities are not known with certainty. However, there is a reasonable consensus that the price elasticity of world oil demand given many years for markets to adjust is about -0.5 +/- 0.1. But for a single year, the price elasticity of oil demand is only about -0.05 (Greene, Liu and Leiby, 2014). Oil supply outside of OPEC is similarly inelastic. With elasticities that low, a sudden surge in demand or reduction of supply of only about 4% would cause oil prices to double. Likewise, a sudden increase in supply or reduction in demand of similar magnitude would cut the price of oil in half. Given a decade or so to adjust to a 4% decrease in demand, the price of oil would be only about 7% lower. Small changes in supply or demand can cause big price changes in the short run that cannot be sustained in the long run.

The surge in U.S. oil production from the “fracking” of tight oil formations was an important factor in the fall of world oil prices. What the future holds for U.S. (and world) tight oil supply is highly uncertain. Three alternative scenarios constructed by the U.S. Energy Information Administration are shown in Figure 6, with the Reference Case representing their best estimate. If the Reference Case turns out to be more accurate, U.S. production will begin to decline after 2020. In the High Resource Case U.S. production continues growing up to an additional 4 million barrels per day in 2040. Uncertainty about how much oil is available at what cost adds to the uncertainty about future oil prices.

![U.S. Crude Oil Production: History and Three Tight Oil Scenarios](image)

Figure 6. U.S. Crude Oil Production: History and Three Tight Oil Scenarios

4. What do low oil prices mean for our economy?

Lower oil prices and gasoline prices are good news for the economy in general but they are not good news for everyone. There are winners and losers. Owners and producers of petroleum lose. Anyone who drives a motor vehicle saves money on fuel. The prices of airline tickets should eventually come down as well, since about one fourth of the cost of
airline operations is fuel. American Airlines, which doesn’t hedge its bets on future fuel costs saved an estimated $600 million in fuel costs in 2014 alone (Martin, 2015). Airlines that did hedge on fuel costs lost money on hedging but saved more in reduced fuel costs. The trucking industry likes to say that “Everything in your home has been on a truck.” It’s almost true. As recently as last summer, fuel made up about 40% of the cost of operating a long-haul 18-wheeler. Fuel is also a major component of rail and waterborne freight costs, and so lower fuel prices will, eventually, make almost everything you buy less expensive.

Motorists will save the most. About 9% of U.S. households own no motor vehicle. Thirty-four percent own one vehicle, 37% two and about 20% own three or more. Based on the miles driven per vehicle for these ownership groups and assuming 25 miles per gallon for all vehicles (about the national average), Figure 7 shows estimated annual fuel savings at $2.00/gallon versus $3.65. The majority of U.S. households save more than $1,500 annually.

Drivers in rural areas will save more than drivers in urban areas because they drive 25% more miles than suburbanites and 40% more than central city residents (Davis, et al., p. 8-17). Wealthier households will save more than middle-income households because they spend more but they’ll save a smaller percentage of their income. Households with incomes below $70,000 per year spend from 5% to 6.5% of their income on gasoline (Davis et al., 2014, table 8.3). Households with annual incomes of $70,000 and above spend an average of 4.7% of their income on gasoline. Tennessee is expected to be among the top ten states in terms of economic benefits from lower oil prices (Brown, 2014). Early estimates suggest that consumers have chosen to save a considerable portion of their reduced gasoline expenditures.

![Figure 7. Estimated Annual Gasoline Savings by Household Car Ownership. Source: Davis, et al., 2014, table 8.15.](image-url)
Lower oil prices help our balance of trade. Expenditures on imported oil in 2014 were $200 million less than just three years ago. Most of the reduction, however, was due to increased domestic supply rather than lower oil prices since prices remained high until the end of the 2014. Even if the price of oil stays in the $40-50/barrel range, savings on imported oil will not be as large as they would have been five years ago when the U.S. was importing half of its oil supply. Increased domestic production from shale oil or more precisely tight oil formations reduced the oil import share to just 27% last year (Figure 8). On the other hand, domestic oil producers are seeing a dramatic drop in revenue with oil priced between $40-50/barrel.

Figure 8. U.S. Oil Supply and Expenditures on Domestic and Imported Oil
Source: U.S. Energy Information Administration, 2015, Petroleum and Other Liquids Data

The news is bad for those who own oil resources, work in the petroleum industry or own stock in energy companies. (The news is especially bad for countries that rely heavily on the oil sector for foreign exchange and government finances, including Russia.) Eight states whose economies are closely tied to the energy industry will suffer losses in jobs and income: Alaska, Louisiana, New Mexico, North Dakota, Texas, West Virginia and Wyoming (Brown, 2014). Frackers and wildcatters who may have been producing oil at a cost of $30-40/barrel and selling it for $100/bbl will see profits of $60-70/barrel nearly evaporate. New resource development will slow or stop. Thousands of workers in formerly booming oil producing areas will lose their jobs as oil firms cut back on drilling operations (e.g., Doan and Penty, 2015). Additional jobs will be created elsewhere in the economy by increased consumer spending freed up by lower gasoline prices, but the dislocations will be painful and costly. Owners of energy company stocks will lose also. Since the summer of 2014, ExxonMobil shares have declined by about 10% and Chevron Corporation shares are down aby about 20%. Over the same period the major market indices (Dow, S&P 500, NASDAQ) rose by 2-5%.
Fortunately, in the U.S. winners will far outnumber losers. The net effect of oil industry losses and consumer gains will average out to approximately $1,000 in additional income per household. The resulting boost in spending is expected to increase US Gross Domestic Product by 0.7% to 1% (Brown, 2014).

5. What next?

“It’s difficult to make predictions, especially about the future.”

Those words of wisdom have been attributed to many people, from quantum physicist Niels Bohr to New York Yankee catcher Yogi Berra. Statistical analyses of world oil prices since 1970 have shown that the pattern is indistinguishable from a random walk with no trend (e.g., Hamilton, 2009). In plain English, that means that historical prices alone tell us nothing about future prices. We know more than just past oil prices, however. We know something about market fundamentals, world oil resources, monopoly power, price elasticities and economic theory. That helps somewhat but still leaves the future of oil prices highly uncertain. To accurately predict future oil prices we’d need to know how fast the world economy will grow, how much oil there really is in tight oil and other undeveloped formations in the U.S. and elsewhere, whether OPEC will change its mind and cut back its oil production, how the politics and conflicts of the Middle East will affect production in the region, whether the U.S., the EU and China will tighten or loosen their fuel economy standards, and probably more. One thing we can be sure of is that prices will change.

We know that low oil prices encourage increased consumption and discourage additional supply. U.S. producers have already begun cutting back on exploration and development. Whether the global economy rebounds in 2015 remains to be seen but an eventual rebound seems certain. The evidence is not conclusive but it appears that the price elasticities of oil supply and demand are even smaller today than they were back in the 1980s (Greene and Liu, 2015). In addition, it is likely that the cost of producing oil outside of OPEC has increased, perhaps to twice what it was 25 years ago. These factors could explain OPEC’s decision not to reduce production to support higher oil prices. If this line of reasoning is correct, oil prices are likely to rebound to the vicinity of $100/barrel relatively soon, perhaps next year or the year after. But don’t forget Niels Bohr and Yogi Berra.
References

14. U.S. Energy Information Administration (EIA), 2015. EIA petroleum price and quantity data used in this report were extracted from tables that can be found at: http://www.eia.gov/petroleum/data.cfm.