Lessons of an Oil Market Analyst (and the value of an IAEE membership)

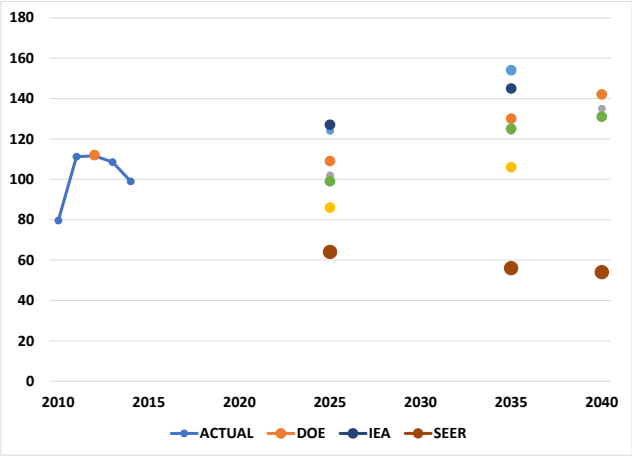
BY MICHAEL C. LYNCH

Two decades ago, at a strategy meeting for the USAEE, someone remarked apologetically that he wasn't an actual economist, which brought forth the realization that most of the people in the room were not Ph.D. economists, but historians, political scientists (like me), and other professionals. One result was the decision to change the group's name to "for energy economics" from "of energy economists".

I am reminded of this when an academic economist remarks disparagingly that a colleague is more of a historian than an economist, meaning his work was not reliant on higher-level mathematics. While I value much of the complex academic economics, including math that is beyond my comprehension, there is also a significant value to being aware of history and frankly to having lived through a lot of it.

This was quite evident a decade ago when supply disruptions in Iraq, Venezuela, later Nigeria, Libya and others caused prices to rise just as they had in the late 1970s during the Iranian Revolution. Morry Adelman, one of the IAEE's founders and my mentor, laughed about how people persisted in thinking that every price increase was going to be permanent "this time". Few seemed to remember that the vast majority of experts thought in 1980 that oil prices would never decline. Indeed, at Energy Modeling Forum 6 at Stanford, the ten computer models predicted, on average, that the price in 2000 would be $160/bbl (2015$).

Yet right up to the point that oil prices collapsed in 2015, the consensus was that oil prices would continue rising. Figure 1 shows the 2014 survey DOE made of forecasts, and when mine was far below the others, I was told that people jokingly asked if I was drunk. This despite the fact that my forecast was for prices to be roughly twice the historical mean price—and no nonrenewable resource has experienced sustained long-term prices above historical means. The same point that Adelman made, and which was widely ignored, in the early 1980s.



DOE Oil Price Survey 2014 (2012$/bbl)
Source: Annual Energy Outlook, 2014.

The very blatant reality is that, just as short-term supply problems drove prices up in the 1970s, so they did in the 2000s, yet very few experienced déjà vu. Instead, cliché's like "the easy oil is gone," "the industry is running faster just to stay in place," and "oil is finite" were all trotted out to explain that higher prices had a geological basis, rooted in below-ground physical realities not above ground, transient events. When prices returned part of the way towards the historical mean in 2015, the industry was shocked and many companies sustained major losses. Promoters of competing energy sources also found the market competition from oil much tougher than they expected.

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See footnotes at end ot text.

Historical Context

The lack of experience shows in both the manner in which so many seem unaware of the fact that arguments such as "oil is finite" and the industry must offset depletion refer not to new developments but factors that are eternal, and also in the degree to which current events and arguments echo past ones. Those arguing recently that depletion meant high prices were sustainable regularly pointed out that "Steep falls in oil production means the world now needed an amount of oil equivalent to Saudi Arabia's oil production every two years."[1]

Not only did those statements not explain how this differed from past industry needs, few seemed aware that in 1977, President Carter had made a near identical argument, stating, "that just to stay even, we need the production of a new Texas every year, an Alaskan North Slope every nine months, or a new Saudi Arabia every three years. Obviously, this cannot continue."[2]

Of course, it can and has continued, as the industry has always replaced depletion and managed to raise production at the same time. Numerous analysts published a graph showing future capacity needs including the amount required to offset depletion, but without showing how depletion was offset in the past, or even its historical existence.

Status not the Same as Expertise

Quite a number of senior industry people have spoken at IAEE conferences, including OPEC-Secretary-Generals, energy ministers and secretaries and numerous industry CEOs. But in my experience, all walked in, spoke, took a few questions, and left, with the exception of then-OPEC Secretary-General Dr. Subroto who attended some panels at the 1993 Bali meeting. (One young academic was embarrassed to deliver a paper on the possibility of a market without OPEC with the Secretary-General in the front row, but he laughed and assured her he was open-minded.) One wonders what other officials might have learned if they had listened to some of the research.

And actually, one of the best lessons I've learned came from ad-libbed comments from Richard Gordon at the Bali IAEE Conference in 1993, where he received the IAEE award for Outstanding Contribution to the Profession. After hearing various other speakers complain that oil prices, tanker rates, and LNG prices were too all low to allow sufficient investment to keep the market balanced, he said, as memory serves me, "If we've learned anything as energy economists it's that markets always clear and they usually clear faster and at lower prices than anyone expects."

Yet decision-makers have tended to treat episodes of tight markets and high prices as the new norm, or more recently a "new paradigm," that will not be reversed, generally demonstrating a level of knowledge that could be gleaned from cable TV. The common claim that $100 was the new oil price floor because that was the marginal cost of production was a serious misinterpretation of microeconomics, but it seems unlikely that many executives or top-level decision-makers ever questioned it, apparently thinking their status implied expertise.

The reason important people often have minimal expertise and/or knowledge can be found in the work of Herbert Simon, who talked about bounded rationality, the concept that individuals did not have the capacity to seek perfect information.[3] Senior executives are obviously even more constrained and have to rely on subordinates with expertise or a superficial review of media comments. It would be nice to think that the latter was why so many in the industry believed that $100 was the new floor price. Turning again to Adelman, in his 1986 article in *The Energy Journal*, "The Competitive Floor to World Oil Prices," he explained that operating costs constituted the short-term marginal cost, a basic concept of microeconomics.

Superficial Analysis

The problem is worsened by the fact that he media is dominated by comments from people who are not actually expert on petroleum economics. The problem is worsened by the cyclical nature of academic and expert interest in oil which rises sharply when prices go up and there is more funding for petroleum economics research but also a greater willingness to publish articles on the subject. As Anas AlHajji once noted, in 1972 only one American economist had published refereed articles on petroleum economics, but after the 1973 Oil Crisis, a dozen newcomers entered the field. (The same appears true of climate change economics and other "hot" topics.)

This becomes clear when considering two theories that have been embraced by many, the Hotelling Principle and the Hubbert Curve. The Hotelling Principle is based on a 1931 article by Harold Hotelling and reinterpreted by Robert Solow to suggest that prices of nonrenewable resources should rise exponentially.[4] Later authors refined this to indicate the oil prices should rise at the rate of interest. The Hubbert Curve is a bell-shaped curve applied to regional oil production trends by geologist M. King Hubbert. Both have been used to forecast prices and oil production, respectively, by numerous authors.

Unfortunately, both are counter-historical and clearly so. While neither Solow nor Hubbert had the easy access to price and production data that modern analysts do, these days a few minutes study would show that neither approach is consistent with actual behavior, except in rare cases. And as early as 1963, Barnett and Morse published data showing that mineral prices did not have a natural tendency to rise.[5]

Further, the Hotelling Principle has been shown to be an invalid interpretation by no less than three economists in the pages of *The Energy Journal*.[6] And yet, some economists continue to insist it only needs modification: "The oft-cited fact that the Hotelling model is frequently rejected by the data...must be interpreted with caution." [7] In reality, it should be discarded as having any predictive power for mineral prices.

The Hubbert curve is a more egregious case because its use led to the rise of the "peak oil" movement, advocates who claimed that scientific research proved that the ultimate and irreversible peak global oil production was imminent, causing economic collapse and the possible extinction of mankind. The bell curve was used both to predict oil supply trends and estimate recoverable resources in any given area.

Unfortunately, it consisted of nothing more than curve-fitting with no scientific foundation whatsoever, as Hubbert himself originally admitted. However, when it proved relatively prescient in forecasting the 1970 U.S. oil production peak, it became codified to some as being scientific. This is roughly the same as making a good prediction of the stock market and then insisting the method would always work.

By the time of the 1998 publication of "The End of Cheap Oil," there was ample data available to show that oil and gas supply rarely followed a bell curve. The lack of independent variables was made glaringly obvious by Hubbert's own assessment of U.S. natural gas production, when he extrapolated the production decline after the 1970s to imply cessation of production by about 2000, when it actually represented demand weakness due to high prices.

This is often seen in other supply forecasts, where the drop in British production after the 1988 Alpha Piper disaster and the collapse in the Soviet Union's production were both extrapolated by Colin Campbell with disastrous results. And the role of overlooked independent variables, like fiscal regimes, meant that country after country has surpassed previous peaks despite the supposed impossibility.

The fact that peak oil arguments were never mathematically valid is apparently unknown to most who concentrate on the surprise growth of U.S. shale oil production, again ignoring not just the production shut in by OPEC and other producers in support of the prices, but the political disruptions of supply from Iran, Libya, Nigeria, Venezuela and others. Conventional oil production has proved weak in the past decade, but has grown despite these problems.

Supply

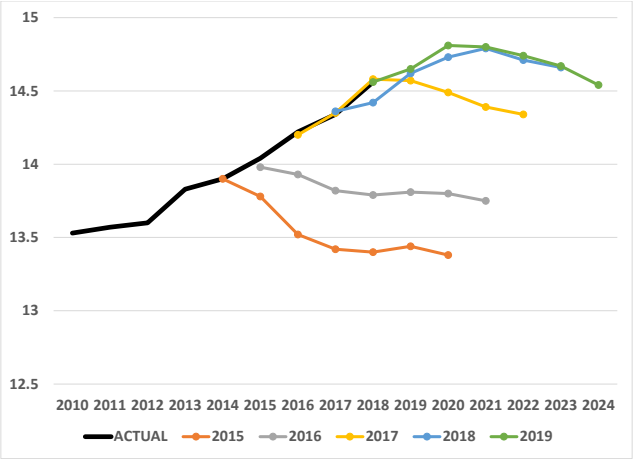
Predicting oil supply has always bedeviled forecasters because of the huge impact of both geology and politics. Geological uncertainty can be reduced somewhat through aggregation, but clearly a dollar spent drilling for a well in the Persian Gulf yields much more supply than a dollar spent in New Mexico, which helps explain the sustained higher prices in the 1970s.

After the first price spike in 1973, forecasters used the simple method of applying a price elasticity, which suggested soaring prices would lead to much higher supply. Unfortunately, three complicating factors rendered this invalid: taxes absorbed much of the higher revenue from higher prices, a rise in resource nationalism led to a shift in capital from high-yield resource to low-yield resources (from the Middle East to the U.S., especially). Additionally, the upstream investment boom caused costs to rise cyclically.

But knowledge that resource depletion raises costs over the long term has been a major factor in both bullish oil price forecasts and bearish oil supply forecasts, reflecting the simplicity of the analysis or, to put it in more formal terms, omitted variables. As Adelman pointed out in 1986, "Diminishing returns are opposed by increasing knowledge, both of the earth's crust and of methods of extraction and use. The price of oil, like that of any mineral, is the uncertain fluctuating result of the conflict."[8]

Unfortunately, most seemed to ignore this effect, with technological improvements widely remarked on only with the revolutionary development of hydraulic fracturing of shales. For conventional oil, the dominant tendency has been to produce pessimistic oil supply forecasts for all but the most resource-rich countries. Figure 2 actually shows the IEA's recent medium term forecasts for production from the Former Soviet Union, with the typical pattern of a brief increase, peak and decline, when actual production rose consistently.

Since 1982, most official long-term forecasts have projected flat or declining production in nearly every country and region, regardless of how mature the resource base. In a 1990 paper delivered to the Calgary IAEE conference, I noted that the non-OPEC Third World, which had experienced steady production growth and had experienced minimal drilling, was repeatedly and incorrectly to be facing a near-term peak and lengthy decline.[9] Any number of individual countries, from Colombia to Oman to Venezuela, have gone through unexpected production booms—following fiscal reforms and yet it remains rare to find projections of increasing conventional oil production outside of the Middle East.



IEA Forecasts By Year Of FSU Oil Production (mb/d)

Basics

It is somehow extremely hard for people to recognize that oil markets are complex and that forecasters, formal or informal, are human. Not only is it hard to predict oil supply, demand and prices, but forecasters are prone not just to errors but bias. And bias is easy to satisfy when an issue is complex such that this is an enormous amount of information that can confirm nearly any viewpoint.

But the history of forecasting has been one of avoidable errors, specifically, believing theories that are not well-founded and actually contradict real world behavior, whether the Hubbert curve or the so-called Hotelling theory.

And it is somewhat bizarre that so many can ignore short-term problems such as the Arab Spring that take supply off the market rapidly and drive prices higher, instead insisting that long-term trends militate for higher prices. Similarly, the fact that forecasts have shown a repeated bias towards rising-price and declining non-OPEC supply projections has failed to impress all too many, in the industry and without.

There is no doubt that the long-term oil market development will depend not just on uncertain political developments and technological advances, rendering significant uncertainties, but recognizing and correcting past errors is a first step. The industry and market's repeated ability to do what many consider impossible should be the first lesson learned.

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