

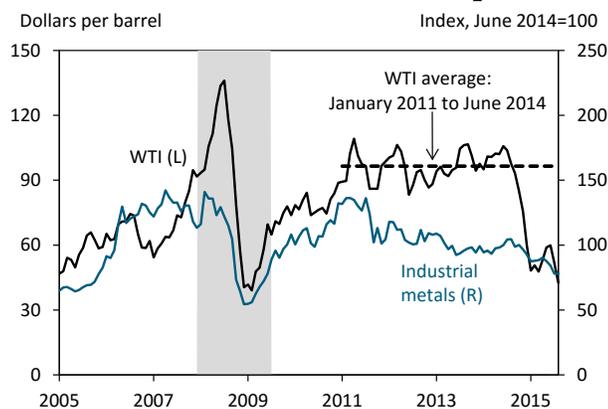
Evaluating a Year of Oil Price Volatility

By Troy Davig, Nida Çakır Melek, Jun Nie, Lee Smith, and Didem Tüzemen

Oil price fluctuations since mid-2014 have not been driven primarily by current demand and supply conditions. Instead, shifts in expectations of future demand and the availability and stability of future supply have played the predominant role.

Fluctuations in oil prices since mid-2014 have been extreme compared with the previous three years, in which prices hovered around \$100 per barrel. For example, oil prices reached a post-recession peak in 2011, remained relatively stable for a few years, and then declined about 50 percent in the second half of 2014. In the first half of 2015, prices were again volatile, reaching a multi-year low in March before rising about 40 percent through mid-June. These gains reversed as prices fell back to multi-year lows by mid-August. Overall, from their peak in mid-2014 to August 2015, oil prices fell by about 60 percent.

Chart 1: Oil versus industrial metals prices

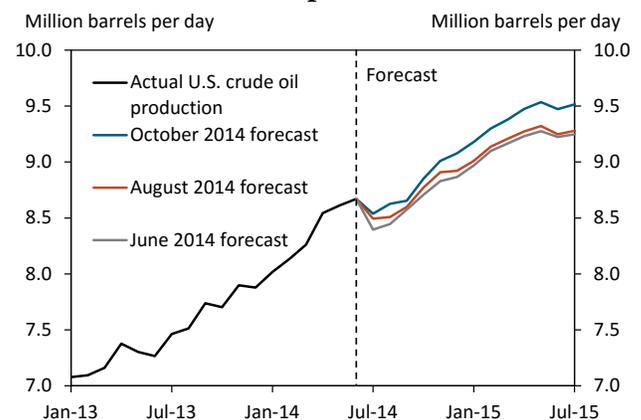


Note: Gray bar denotes NBER-defined recession.
Sources: Chicago Mercantile Exchange, Energy Information Administration, National Bureau of Economic Research, Standard & Poor's and Haver Analytics.

Changing global oil supply conditions are another possible factor. U.S. production increased markedly from 2011 to 2013 and continued to rise unexpectedly throughout 2014, contributing significantly to global production gains. Chart 2 shows the Energy Information Administration (EIA) repeatedly revised up their projections for U.S. production throughout 2014. More broadly, the cumulative increase in U.S. production has lead U.S. output to increase about 70 percent in five years since 2010. The rest of the world also experienced some significant, unexpected supply-side developments since mid-2014. For example, unplanned OPEC

Oil prices fluctuate for a number of reasons. Rising economic activity can increase demand and push prices higher, while rising production rates can cause prices to decline. Changes in current supply and demand are useful in describing oil price movements, but the factors driving such changes are often difficult to identify. For example, if global economic activity was the primary factor, other commodity prices should display similar patterns. Chart 1 compares oil prices with an index of industrial metal prices, which peaked in 2011 and has trended lower over the past few years. In general, commodity prices exhibited some similar recent patterns as oil, but were less dramatic.

Chart 2: U.S. crude oil production



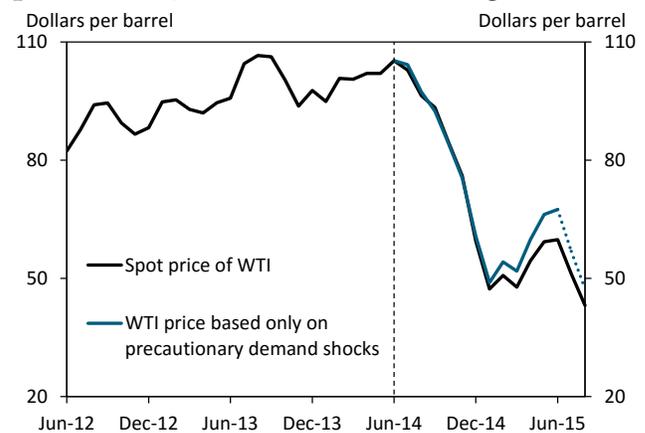
Source: Energy Information Administration.

production outages kept increasing until about mid-2014—largely due to unrest in Libya, Iran, Iraq, and Nigeria—and mostly offset increasing U.S. production. In the second half of 2014, however, such disruptions were less prevalent or did not affect production as would have been expected. For example, production in Libya and Iraq increased. In addition, two announcements regarding expectations of future oil supply also affected energy markets significantly. In late November, OPEC announced a decision to maintain production levels, rather than stem production, which signaled something of a change in its objectives. Oil prices showed signs of stabilizing towards mid-2015, though news in early July of a possible agreement with Iran that would lift oil-related economic sanctions again pushed prices lower.

Along these lines, expectations of future supply and demand conditions, reflected in what might be called “precautionary demand,” can play an important role in oil price movements. Precautionary demand can be driven by sectors of the energy industry that have a direct purpose for crude oil, such as those involved in the refining business. These sectors have to balance expectations of future oil prices with the availability and cost of storage. For example, news that future production will likely continue at a high level can cause precautionary demand for crude oil to fall. As a result, the price of oil may decline, but not due to a contemporaneous slowdown of global economic activity or a sudden increase in current supply.

In general, quantifying the effects of demand and supply shifts in global oil markets on prices requires a model that can properly separate the effect of each factor. Identifying these effects is not always straightforward, though Kilian (2009) provides a framework that can distinguish shifts in current oil production and aggregate demand from changes in expectations about future supply and demand. Using this framework, Chart 3 shows the historical spot price of WTI along with counterfactual time series for the spot price of WTI when conditioning on precautionary demand shocks only. In other words, the counterfactual price removes the effects of current changes in supply and demand on oil prices. From June 2014 to December 2014, precautionary demand shocks explain essentially the entire decline in prices, implying changes in expectations about the oil market primarily influenced the spot price of oil in the second half of 2014. By August 2015, the model suggests oil prices would have averaged \$47 per barrel. Though the actual spot price was somewhat lower at \$43 per barrel, these estimates indicate current supply and demand factors likely played only a small role in shaping oil prices since the middle of 2014.

Chart 3: Counterfactual price of oil based on only precautionary demand shocks (starting June 2014)



Note: Dashed line shows preliminary data for July and August 2015. Sources: Chicago Mercantile Exchange, Energy Information Administration, Thomson Reuters, Wall Street Journal, Haver Analytics and authors' calculations.

Oil price fluctuations since mid-2014 have not been driven primarily by current demand and supply conditions, though these conditions did have more of an effect in 2015. Instead, shifts in expectations

THE MACRO BULLETIN

Macroeconomic research from the FEDERAL RESERVE BANK of KANSAS CITY

SEPTEMBER 8, 2015

regarding future demand and the availability and stability of future supply, which are wrapped up in “precautionary demand” shocks, have played the predominant role.

References

Kilian, Lutz. 2009. “Not All Oil Price Shocks are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market,” *American Economic Review*, vol. 99, no. 3, pp. 1053–1069.

**Troy Davig is senior vice president and director of research at the Federal Reserve Bank of Kansas City. Nida Çakır Melek is an economist, Jun Nie is a senior economist, and Lee Smith and Didem Tüzemen are economists at the bank. For more details, see [“Evaluating a Year of Oil Price Volatility”](#) Federal Reserve Bank of Kansas City, Economic Review, forthcoming. The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Kansas City or the Federal Reserve System.*