



Stocks of Oil: Security and Price Effects

In January 2017, almost 1.2 billion barrels of crude oil, or about 60 days of consumption, were held as stocks, or inventories, in the United States. This In Focus examines the ownership and potential uses of these oil stocks while also examining their relationship to important issues of oil security and oil price determination.

Oil stocks in the United States are owned by both the public and the private sectors. The Strategic Petroleum Reserve (SPR) established by the Energy Policy and Conservation Act of 1975 (P.L. 94-163) currently holds about 692 million barrels of crude oil, with an authorized capacity of 1 billion barrels. The key purpose of the SPR is to provide the United States with a measure of oil security in case of supply disruptions, both domestic and international, although it also has linkages to oil price determination.

Private sector crude oil stocks totaled over 500 million barrels in January 2017. These stocks are held by numerous oil industry firms at refineries, bulk terminals, and in pipelines. The purpose of these stocks is to insure the continuous operation of the refining industry which transforms crude oil into petroleum products used by consumers. In recent years, private oil stocks have reflected changing oil prices as well as affecting oil prices and price expectations.

The SPR

The embargo on the sale of oil to the United States by the Organization of the Arab Petroleum Exporting Countries (OAPEC) in 1973-1974 had psychological as well as some physical effects on how the United States viewed oil issues.

Although U.S. crude oil production had peaked in 1970 at about 9.1 million barrels per day (mmb/d), oil consumption had increased to almost 15 mmb/d by that time, resulting in a widening gap to be filled by imported oil. By the time of the embargo, only four years later, U.S. production had fallen to about 8.3 mmb/d and consumption had risen to over 16 mmb/d, suggesting that crude oil import volumes would continue to increase.

The SPR was created to provide security against interruptions in U.S. access to imports from the world oil market. Recognizing that the U.S. refining industry maintained adequate domestic capacity to satisfy demand for petroleum products, the decision was made to hold the reserve in the form of crude oil, rather than petroleum products.

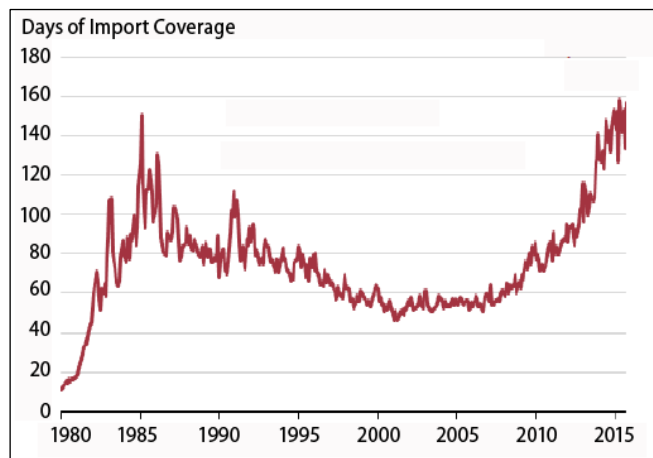
The International Energy Agency (IEA) was also formed in the aftermath of the OAPEC actions. The IEA facilitated an agreement among member countries to hold stocks of oil, or petroleum products, equivalent to 90 days of net imports to provide security against future supply interruptions. Oil

reserves could be held either publicly, as in the United States, or privately, as in most other IEA member countries.

Defining the target quantity of petroleum reserves in terms of net imports meant that the required quantity could change over time as the nation's trade position on the international oil market evolved. By 2006, U.S. net imports had risen to over 10 mmb/d. The trend of increasing petroleum import dependence began to reverse by 2010 as U.S. production of light, tight oil began to increase and consumption stabilized at around 19 mmb/d. By 2016, U.S. oil production reached almost 9 mmb/d and net imports of petroleum decreased to about 4.9 mmb/d.

Figure 1 shows that the net import coverage of SPR has changed over time as the quantity of oil in the SPR, as well as U.S. production, consumption, and net imports have changed.

Figure 1. Import Coverage Provided by SPR 1980-2015



Source: EIA.

Notes: SPR stocks divided by last year's net imports of crude oil and petroleum products.

The current value of SPR net import coverage of over 140 days has raised questions concerning whether the size of the reserve should be reduced. Some view the oil in the SPR as a national security asset, unlikely to be restored if sold off. Others see the SPR as a potential funding source for other high priority programs.

Since 2015, several laws were passed by the 114th Congress which required the sale of oil from the SPR, with the proceeds to be used largely for program funding. The Bipartisan Budget Act of 2015 (P.L. 114-74) authorized the sale of 58 million barrels of oil from the SPR over the period FY2017 through FY2025. In addition to sales revenues to be deposited in the U.S. Treasury, \$2 billion is

to be used to modernize and maintain SPR facilities. The 21st Century Cures Act (P.L. 114-256) authorized the sale of 25 million barrels of SPR oil for health care related expenses. The Fixing American Surface Transportation Act (P.L. 114-94) authorized the sale of 66 million barrels of SPR oil from FY2023 through FY2025.

In total, this legislation will reduce the SPR by 149 million barrels by 2025, a 21% reduction in SPR inventories. While all of this legislation includes restrictions to prevent a fall below the 90 days of net import coverage threshold, it is possible that further reductions could be in the offing.

While providing oil security, the SPR also is related to oil prices. Withdrawals can be ordered by the President when it is determined that economically threatening disruptions in the oil market are taking place, or are likely to occur. As in 2011, when SPR releases provided a calming effect on the oil market after disruption of Libyan supplies, releases from oil reserves can tend to balance shortages in the short term and provide psychological support to the market and stabilize oil prices.

Private Oil Stocks

Private holdings of oil stocks, unlike SPR inventories, are held in widely dispersed facilities across the country by a large number of firms. Although the private sector currently holds about 534 million barrels of crude oil in storage, it does not provide a level of oil security proportional to that of the SPR. A certain amount of oil held in the system is not likely to ever be drawn upon. For example, in the case of oil in pipelines, some quantity may be considered as “pipe fill,” oil required to keep the pipeline system operable.

The level of private oil stocks is closely related to the production of oil as well as changes in the price of oil. Management of these stocks can also affect the price of oil. These effects are limited by the storage capacity of the system as a whole, but that capacity can be augmented or reduced.

The most basic reason for increasing, or decreasing, privately held oil stocks relates to quantities of oil produced. If global production is greater, or less than, current consumption needs, private stocks of oil will either rise, or fall, respectively.

While there are a large number of oil prices depending on the API specific gravity, sulfur content, and location of the oil, the key reference oil price in U.S. markets is that of West Texas Intermediate (WTI). Current prices are measured by the spot price, while future prices are measured by the trading value of futures contracts.

The price of oil reached a recent peak in July 2014, at over \$100 per barrel. Between that time and now, the price has declined to below \$40 per barrel, and currently has risen to about \$50 per barrel. The price of oil fell in 2014 largely as a result of global production running ahead of demand. Oil prices falling and reaching low levels relative to the previous peak are reflected in increasing private stocks. Both reflect an over-production of oil relative to market demand.

Once excess oil has made its way into storage, the management of those oil stocks becomes related to the futures price of oil. Oil futures contracts, and hence prices, are written for one or more months into the future. The basic futures contract obligates the owner of the contract to buy, or sell, a given quantity of oil at a specified price.

Oil stock management depends on the relationship between the current spot price of oil and the futures price. Two possibilities exist. Backwardation refers to a price relationship where the current price of oil is higher than the futures price. This price relationship offers little, or no, incentive to store oil. In addition to storage costs, backwardation suggests that holding oil will result in economic losses on future sales compared to sales in the current period.

Contango, on the other hand, is a situation where the current price of oil is less than that of oil purchased in the future. This means that anyone with access to oil storage facilities can buy oil at the current, spot price; hold the oil in storage; and then sell the oil in the future for a profit. Of course, the carrying cost of holding oil must be smaller than the difference between the current and future price. For example, if the storage cost of oil were \$0.40 per barrel per month, and the contango price spread were \$0.65 per barrel, storing 100,000 barrels of oil for one month could yield a profit of \$25,000. If the cost of oil is taken to be \$40 per barrel, storage could yield a return of 6.25% in a month, given available storage capability and idle cash balances.

Contango can also be thought of as an outcome resulting from excess production relative to market demand. Contango is based on the idea that current surpluses of oil have driven the current price to low levels and that the market will tend to balance, or move toward a zero surplus position in the future.

An oil market with prices in contango encourages near term, current purchases of oil. This behavior can either strengthen or weaken contango. More demand for oil, other things equal, should put upward pressure on current prices, but if that oil is merely put into storage, rising reported inventories might act to reduce the current price. The relative strength of the two effects depends on specific market conditions.

Conclusion

Both public and privately held oil stocks have important roles to play in providing security in times of oil market disruptions. Similarly, both public and private oil stocks have some role in oil price determination and movements. As the world oil market and the U.S. market evolve, it is reasonable to reassess the role of each of these components of the U.S. energy security equation.

Robert Pirog, Specialist in Energy Economics

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