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Oil-price shocks and the chemical industry: Preparing for a volatile environment

The outlook for oil prices is highly unstable. To assure they have the agility to navigate this, chemical companies need to build new organizational capabilities.

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The oil-price decline since mid-2014 has been a major shock to the global chemical industry. Many producers were underprepared for both the magnitude and speed of the impact on their businesses. The changing nature of oil supply and demand is expected to exacerbate volatility and increase the likelihood of oil-price shocks. Chemical companies need to develop the organizational agility to prepare for impending shocks and take rapid action when they occur, to capture value and minimize threats.

Oil-price outlook and volatility

Many chemical producers were caught off guard by the unexpected and substantial decline in oil prices starting in the latter half of 2014. After four years of relatively stable prices, some chemical companies appear to have forgotten the inherent volatility in the oil market. These so-called return-to-normal lower oil prices are expected to prevail in the market for the medium term and are driven by fundamental changes in the supply and demand dynamics of the oil industry. In

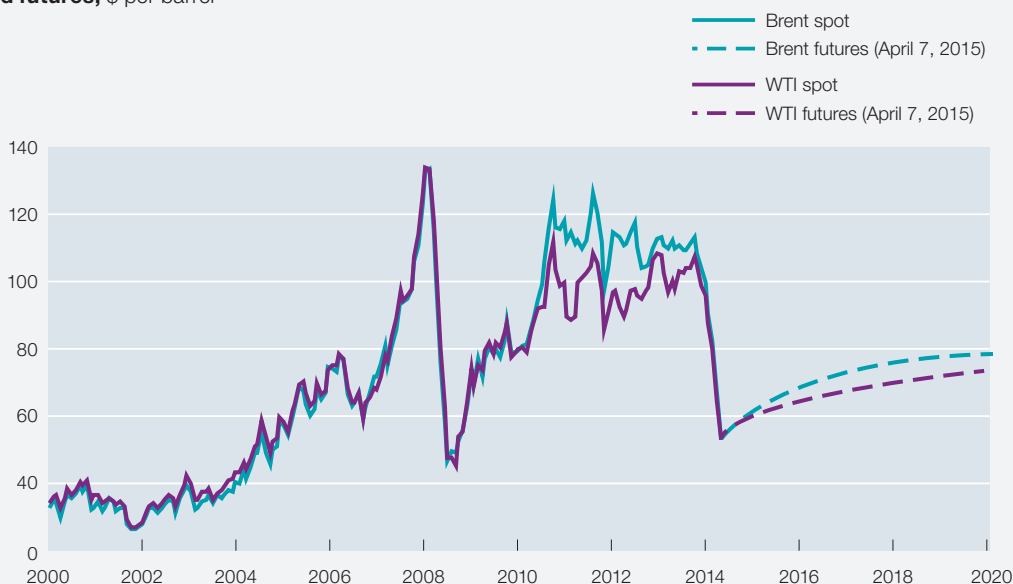
particular, oil supply has grown larger in recent years, with the addition of new production—including unconventional sources such as US light tight oil (LTO), which is produced by horizontal drilling and hydraulic fracturing of shale rock; new offshore sources in Angola, Brazil, Nigeria, and other regions; and rebounding supply from countries that have experienced political or social unrest (for example, Iraq and Libya). The impact of this supply has been compounded by the inaction of the Organization of the Petroleum Exporting Countries (OPEC) to curtail production since crude-oil prices started falling last year. On the demand side, growth has slowed as a result of lower global economic growth and increased energy

efficiency driven by historically high oil prices and carbon dioxide reduction initiatives (Exhibit 1).

More concerning for the chemical industry is the increased likelihood of supply-side shocks over the medium term. US LTO and certain other growing oil sources tend to have high production-decline rates, with a typical falloff from peak production of 50 to 80 percent within a year. This can create significant volatility in supply from these sources, as production needs to be continually replaced. Since LTO production can be launched relatively quickly, producers tend to hold off investing if oil prices are too low, and then rush in together as oil prices rise and economics improve, resulting

Exhibit 1 Oil prices are experiencing a ‘return to normal’ due to increased supply and reduced demand.

Brent and West Texas Intermediate (WTI) monthly prices and futures, \$ per barrel

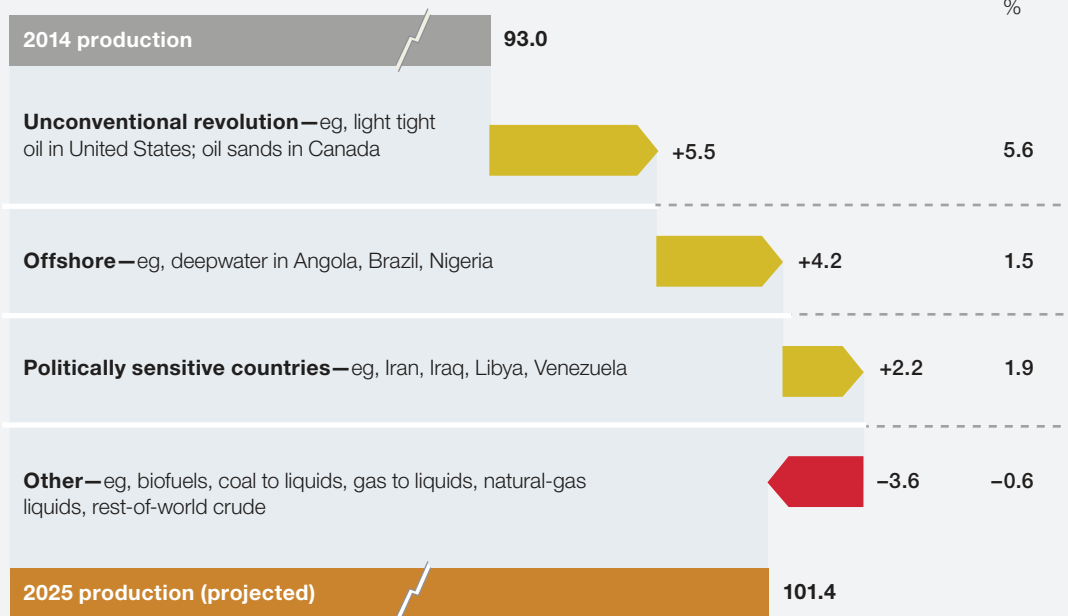


Source: Energy Information Administration; Intercontinental Exchange; NYMEX (CME Group)

Exhibit 2 The likelihood of oil-price shocks has increased due to greater volatility in sources of supply.

Oil-production change,¹ million barrels a day

CAGR,²
2014–25,
%



¹Figures do not sum to total, because of rounding.

²Compound annual growth rate, projected.

Source: Energy Insights (a McKinsey Solution); Rystad Energy

in a rapid supply ramp-up. Production from some countries also tends to be volatile, driven by short-term disruptions related to political and social unrest. Finally, OPEC's decision not to curtail production in the face of the 2014 oil-price decline so as to retain market share may indicate a shift away from its historical role as the global oil-supply and price moderator (Exhibit 2).

The combined impact of this increase in supply volatility and of OPEC's reluctance to act has been an increased likelihood of short-term supply-

demand shocks on the global oil market, resulting in both rapid price spikes and price declines.

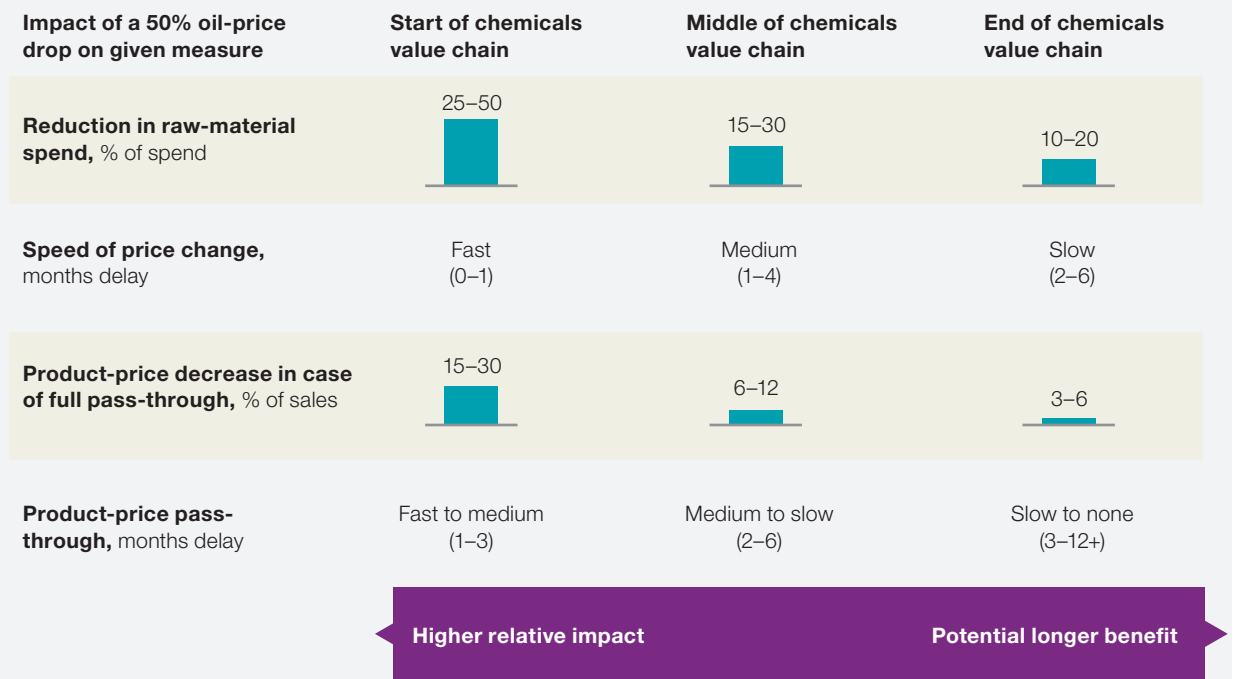
Impacts of oil-price shocks on the chemical industry

Oil-price shocks are much more than just another management issue that chemical executives have to contend with. Crude oil and petrochemicals are inextricably linked, with oil-price shocks resulting in generally three effects on the chemical industry.

■ **Cost structure.** Crude oil is a major cost driver in the petrochemical industry, because many of the key chemical building blocks (for example, aromatics, ethylene, and propylene) for the industry's products are directly produced from oil or its derivatives (for instance, naphtha and liquefied petroleum gas). In addition, some chemicals, such as chlorine, are produced through highly energy-intensive manufacturing routes and have a strong link to oil prices. Changes in oil prices have an immediate and significant impact on the cost structures of these chemicals.

■ **Price-setting mechanisms.** For most commodity chemicals, the production costs of the marginal producer are the principal drivers of market prices. Oil-price shocks affect marginal producers' production economics and, therefore, commodity-chemical price levels. These price changes, in turn, impact specialty-chemical producers downstream, which typically use commodity chemicals as inputs, though the extent of the impact is less and with a significant time lag (Exhibit 3). In addition, the price changes can enable some downstream chemical producers to find substitution opportunities as the relative

Exhibit 3 The impact of the oil-price drop is differentiated along the chemicals value chain.



Source: McKinsey analysis

prices of certain chemical intermediates change (for example, the price of polypropylene could fall below high-density polyethylene during an oil-price decline).

- **Demand patterns.** Abrupt changes in oil prices may change spending patterns for individual consumers, who see their disposable incomes expand or contract. In the medium term, the new oil-price environment begins to inform consumers' and companies' investment decisions (such as buying a house or building a plant). As oil prices decline, initial spending focuses on consumables (for example, food). If lower oil prices persist, investment in durables and then fixed assets ramps up, along with associated spending on chemicals used to make the durables and fixed assets. Of course, if oil prices go back up, the opposite occurs.

It is important to recognize that demand shifts are typically more gradual and have a more muted impact on the industry as a whole than the cost- and price-related impacts of oil shocks described above.

Rapid shifts in producer economics

The intersection of changing cost structures and price mechanisms due to oil shocks has a significant impact on chemical producers' economics and reshapes value creation and competitive dynamics. A full understanding of the impact of oil shocks requires an in-depth analysis of cost, price, and competitive structure for individual product chains by region.

However, a categorization into three general cost and price categories, each of which has different margin implications, can be helpful to gain a broad understanding. The first is chain–region combinations with strong price and cost linkages to oil. The second is combinations where price and cost changes are asymmetric in relation

to oil price. The third is chain–region combinations with minimal price and cost ties to oil.

Leaders in the industry can use this simple framework to segment their portfolio across the categories and prepare a differentiated response by segment.

Chain–region combinations with strong price and cost linkages to oil

With prices and costs linked to the same underlying commodity, oil shocks will have a minimal impact on margins, because prices and costs change by roughly the same amount. Before prices reach equilibrium, however, a chemical producer that has exceptional commercial and sourcing capabilities can expand margin in a falling-oil-price environment by realizing sourcing savings faster than its selling prices decline. Conversely, in a rising-oil-price environment, it can boost margins by raising prices faster than its costs rise. Benzene, a true commodity chemical produced as a refinery by-product, and its simple derivatives (such as styrene and polystyrene) are an example of a chain in this category, because global prices and costs move in conjunction with oil-price fluctuations. Producers in these chains could see margins change briefly during oil-price shocks, because of the time lag in passing on cost increases or decreases to customers, but should expect most of the oil cost to pass through and for margins to remain relatively independent of oil prices over the medium to long term.

Chain–region combinations in which price and cost changes are asymmetric in relation to oil price

There are some product chains in which oil prices will have a significant effect on the costs and prices in some regions but not in others. Chain–region combinations that fall into this category tend to see the largest margin impact from oil shocks—either compression or windfall. In addition, sudden changes in producer margins often cause

producers to delay or accelerate in-progress capital projects, changing the medium-term supply-demand balance.

One example of this situation during 2014 and 2015 is polyvinyl chloride (PVC). Because PVC prices across regions are connected by exports, they tend to be set by the global marginal player, which, in the recent past, has often been Asian naphtha-based producers. Because of this, North American players with access to low-cost shale-gas-based ethylene have enjoyed strong margins for the past few years. As Asian naphtha prices have fallen, the global PVC price has fallen. However, while North American gas prices have also fallen, they are down less than naphtha prices, with the net effect of some margin compression for North American integrated players. Interestingly, as naphtha prices have fallen, the Asian coal-based acetylene route has emerged as the marginal PVC producer. This is preventing PVC prices from falling further and may ultimately benefit all other players.

Many specialty chemicals, for which prices are set by value in use while costs are set by oil-based inputs, enjoy asymmetric benefits from lower oil prices (but correspondingly see margin compression when oil prices rise).

Chain–region combinations with minimal price and cost ties to oil

Chemicals whose prices and costs are both delinked from oil will likely see minimal margin impact from an oil shock. For example, some specialized-lubricant additives are generally priced based on value in use or substitute arbitrage, and they have very few oil-related cost components. The margins for these chemicals seem to be relatively impervious to changes in oil prices. Some biobased chemicals follow the same path; indeed, consistency of pricing as compared to more

volatile competing materials is a major selling point for many of them.

A word of caution: although this framework provides a foundation for gauging the margin impact on most chains and regions, exceptions can complicate the analysis. Price and cost changes may not happen immediately, and pricing mechanisms sometimes shift from oil related to not oil related within a particular chain–region combination, as the PVC example shows.

Many senior chemical-company managers are not fully aware of how their portfolio is exposed to oil-price swings across the three categories. They can alleviate this by developing and maintaining an understanding of the influence of oil on each of the chains in their portfolio. This understanding—typically embodied in microeconomic models—provides a fact base for rational decision making in the face of oil-price shocks.

Building organizational capability and agility to prepare for future shocks

While important, microeconomic models of oil-price impact by themselves are insufficient. The 2014 shock has shown that many chemical companies are incapable of changing direction quickly enough to respond appropriately to oil-price shocks. The stable-oil-price environment from 2010 onward allowed many chemical-company leaders to focus their attention away from volatility management. However, with the recent oil-price decline, leaders are realizing they no longer possess the organizational agility that is required.

To ensure that their businesses are prepared to deal with further shocks, leaders must strengthen their agility in three areas—strategic, managerial, and functional—to enable their organizations to respond quickly to an oil shock.

Strategic foresight and insight

A chemical company's ability to quickly determine the right direction to take in the face of a rapidly changing environment is built on four pillars:

- **Monitor oil-price shocks.** Companies must monitor oil-price indicators and embrace exceptional analytical capabilities to be alert to impending oil shocks as soon as possible.
- **Analyze portfolio exposure.** Chemical-industry leaders need to know how various oil-price scenarios will impact their portfolio. This requires a periodic microeconomic review of the cost structures and price mechanisms for their products on a chain-by-chain and region-by-region basis, establishing both the magnitude and timing of impact from oil-price movements.
- **Optimize risk.** Producers should take decisive action to understand what is the “right” amount of risk for their business, and then eliminate undesirable risks by shifting them through contracting, financial hedging, and internal operational choices (for example, sourcing alternative feedstocks).
- **Create playbooks.** Producers need to invest in creating comprehensive business playbooks to guide actions under different oil-price scenarios, including learnings from the most recent shock. The best playbooks set out three to five clear priorities or expectations (for instance, hold prices in North America) that can be easily translated into tactical actions during an oil shock.

Managerial agility

Managerial agility refers to the pace at which leaders can rapidly shift the focus of their organizations

and align on new priorities. The best companies have installed mechanisms:

- **Assemble a senior, cross-functional decision-making team.** In highly volatile environments, decisions must be made much more quickly and at higher levels than in business-as-usual periods. Quickly convening and empowering these teams is critical, as they are at the heart of driving the required communication, feedback, and accountability during shocks.
- **Reallocate resources to critical functions.** Producers need flexibility to support overstretched functions and businesses with resources from other, less critical areas. Ultimately, this comes down to incentives and culture. Are managers acting in the best interests of the organization as a whole or focused solely on their domains?

Functional agility

In our experience, functional capabilities are put to the test during major shocks, since standard processes designed for steady market developments no longer work. Typically, we see that significant pressure is placed on the commercial and sourcing functions, which must rapidly execute actions to capture value and minimize threats. Strong functional agility requires companies to do the following:

- **Identify value and develop action plans.** Companies must rapidly translate priorities into concrete actions by identifying pockets of value at stake (for example, customers at risk of switching to other suppliers) and developing clear and specific action plans (for instance, by customer) for frontline teams to implement.
- **Communicate actions to the front line.** To reduce missteps and set expectations, functions need

to rapidly communicate new priorities to the front line. Speed is of the essence in providing guidance to all legitimate stakeholders and managing immediate moves.

- **Implement rigorous tactical execution.** The key to successful execution is to shift decision making from autopilot to manual and drive day-to-day performance tracking. We often see this executed best through a war-room approach, bringing together market data, decision makers, and tracking of financial performance.
- **Never lose sight of operational excellence.** In the new lower-oil-price environment that prevails for now, excellence in operations and capital efficiency is more important than ever, to more players than ever. Producers that previously benefited from highly advantaged feedstocks have seen their margins fall steeply, and so need to work on operations and capital-expenditure excellence to recapture at least part of their former profitability. Naphtha-based producers are less disadvantaged but remain the marginal producers: for them, operations excellence remains a no-regrets move.



Chemical companies need not necessarily fear oil-price volatility; in fact, the best ones will savor the opportunities it presents. With disciplined investment in organizational capabilities and agility, producers can effectively plan for, respond to, and benefit from oil-price shocks. ■

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