

# TWO SIDES OF THE COIN

## THE IMPACT OF LOW OIL PRICES ON DOWNSTREAM OIL

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**T**ODAY'S LOW-OIL-PRICE ENVIRONMENT CONSTITUTES a sizable headwind for much of the energy value chain, especially exploration and production companies.<sup>1</sup> For much of the downstream sector, though, times are relatively good. Indeed, for many downstream companies, the current environment offers attractive opportunities for revenue and profit growth. Prospects are far from uniform across the sector, however. For European petrochemical companies, today's low oil prices are clearly advantageous; for U.S. refiners, in contrast, they present a hurdle. Downstream companies thus need to understand the dynamics of their particular markets and choose their strategies carefully if they hope to fully capture the upside that today's low oil prices might afford. They will also need to act quickly, as the current window of opportunity will not stay open indefinitely.

### The Effects of Low Oil Prices Vary by Segment

For many companies in the downstream sector, the current low-oil-price environ-

ment has been a blessing. With the plunge in oil prices, their feedstock costs have fallen materially. Simultaneously, demand for their products has risen, propelled by a pickup in economic growth triggered by the decline in oil prices. These companies' margins have widened proportionately.

However, the effects of low oil prices on downstream companies vary by segment and, within some segments, by region. Below we examine the dynamics of three critical segments of the downstream sector: refining, petrochemicals, and specialty products.

### Refining: A Stronger Recovery?

To date, refiners have reaped sizable rewards from cheaper oil. Their margins have swelled as prices of refined products have fallen more slowly than the price of crude oil.<sup>2</sup>

If oil prices remain relatively low for the next 12 to 18 months, the economic back-drop for these companies should remain

supportive. There are unknowns, however. On balance, low oil prices will accelerate global economic growth and, with it, demand for oil products. But there will be noticeable differences by region. Financial analysts expect low oil prices to trigger a 0.4 to 1.0 percent increase in European economic growth, for example, and the oil shocks in 1986 and 1998 suggest that European demand for oil products will accelerate by a similar amount. In the U.S., low oil prices are expected to lead to a one-time 0.7 to 1.0 percent increase in GDP. In the short term, though, this may spur only a modest rise in demand for a particularly critical oil product in the country—fuel—as a combination of higher energy efficiency and the growing substitution of biofuels and natural gas for traditional fuels weakens the relationship between economic growth and fuel demand.<sup>3</sup>

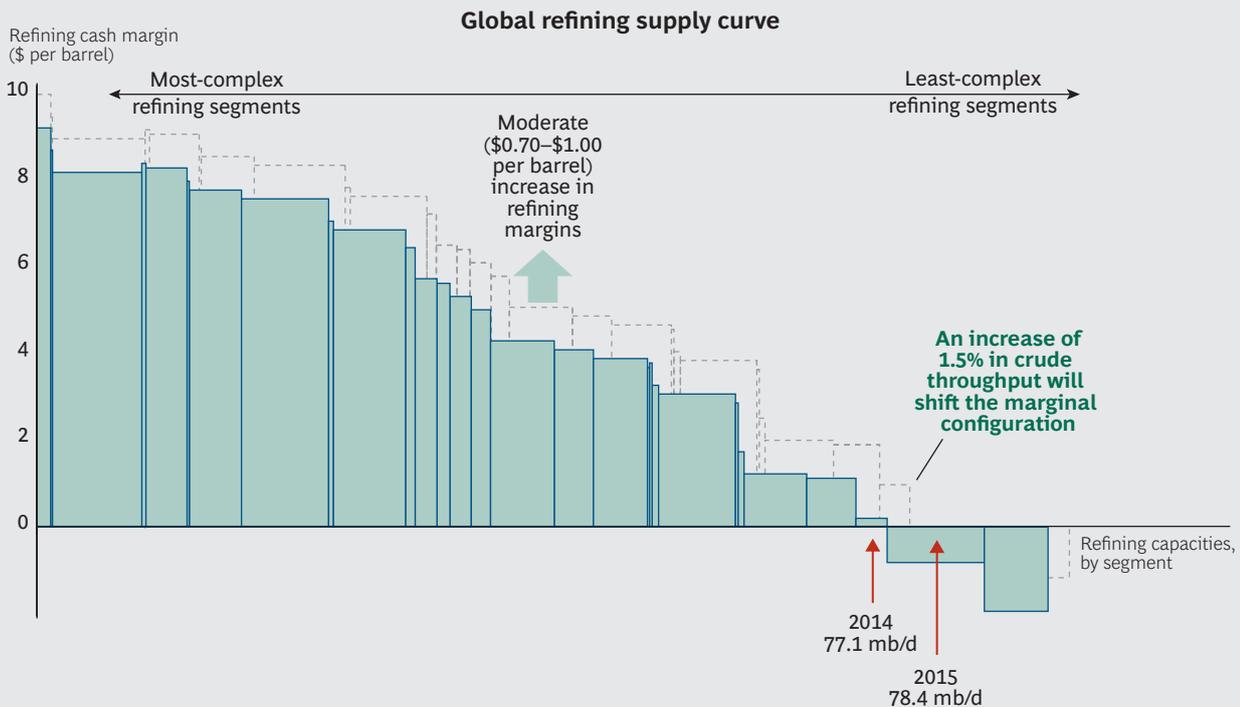
oil products there than in other regions. This is due partially to the fact that more than half of Asian demand comes from countries such as China, India, and Indonesia, where consumer prices are regulated.

Differences in regional outlook aside, stronger demand—particularly for middle distillates, including kerosene and diesel fuel—is good news for the refining industry. In the short term, it will lead to an increase in crude throughput, allowing less-complex refining segments to become cash positive and pushing up margins for the industry as a whole. Exhibit 1 illustrates how higher throughput increases margins by shifting the marginal configuration, defined as the least-complex cash-positive refining segment. The lower the configuration’s complexity, the higher the margins are for the entire refining industry.<sup>4</sup>

Prospects for demand growth in Asia are less clear, as previous oil shocks have had less impact on economic growth and demand for

Higher demand and increased crude throughput also affect another very important driver of refining margins: the price dif-

### EXHIBIT 1 | Higher Throughput Will Shift the Marginal Configuration, Leading to Higher Margins for Refiners



Source: BCG Global Refining Model.

Note: mb/d = millions of barrels per day. Each tranche represents a different level of complexity. This graph offers a simplified view of a global refining-curve configuration, with refining margins being driven by marginal configurations at international hubs. The marginal configuration is the least-complex cash-positive refining segment.

ferential between light and heavy refined products. (The greater the differential, the higher the refiners' margins.) The differential depends on the absolute level of crude-oil prices and also on whether fuel oil is priced as a conversion feedstock or as an alternative fuel for power generation: when it is priced as a conversion feedstock, its price is higher than when it is priced as a substitute fuel.<sup>5</sup> Since 2009, the price differential between light and heavy products has been generally small despite high crude-oil prices: fuel oil has been priced as a conversion feedstock owing to a relative shortage of heavy products, or material. This is one of the reasons why refining margins have been under pressure.

But when the global refining system processes more crude oil, the production of heavy products increases faster than the production of light products, since less-complex refining segments that have higher fuel yields are in operation. If the difference in production is sufficient to lead to a surplus of heavy material, then pricing mechanisms for fuel oil shift to substitution, and the price differential between heavy and light products surges, boosting refining margins significantly. This is what happened from 2004 through 2007.

It is highly unlikely that this scenario will repeat in the near term, however. The Boston Consulting Group's Global Refining Model indicates that for there to be a surplus of heavy material in 2016, annual demand for middle distillates would need to grow by 2.7 percent in 2015 and 2016.<sup>6</sup> But for this to happen, economic growth would need to accelerate by 1.2 percent in both years, which is well beyond the International Monetary Fund's projection of 0.5 to 0.7 percent. And even if this scenario were to materialize, the rise in price differentials between heavy and light products would likely remain moderate—that is, in the \$20 to \$25 per barrel range versus \$18 to \$22 before the oil price crash—assuming that oil prices stay low.

The profitability outlook for refiners over the next 12 to 18 months is also region specific. U.S. refiners will see the supply ad-

vantage that they have enjoyed in recent years shrink in 2015 and 2016, for several reasons. One is slowing production growth of U.S. shale oil. Another is the gradual opening of infrastructure bottlenecks that have given U.S. refiners ready access to stranded U.S.-produced oil that is priced materially lower than imported oil.

U.S. refiners will also wrestle with the effects of a stronger dollar, which will reduce the competitive advantage these companies have enjoyed over their European counterparts by \$0.20 to \$0.30 per barrel. U.S. refiners will continue to hold a competitive advantage, particularly given their gas and energy costs, which are lower than those in the rest of the world.<sup>7</sup> But this advantage has eroded, providing temporary relief to European and Asian refiners. (See Exhibit 2.)

In sum, if low oil prices persist for 12 to 18 months, further improvements in refining margins will likely be moderate, with the change in the marginal configuration pushing margins higher by an average of \$0.70 to \$1 per barrel. For margins to improve much beyond that, economic growth would have to be significantly stronger than most analysts anticipate.

How will refiners fare if crude-oil prices stay low for more than 12 to 18 months? On the supply front, some refining projects will be postponed, as the fall in oil prices poses a financial burden for most national oil companies in Asia and the Middle East, likely forcing some to reduce downstream capital expenditures. Kuwait Petroleum International, the international downstream arm of Kuwait Petroleum Corporation, for example, announced in October 2014 that it would cancel its planned investment in its refinery in Rotterdam. In the U.S., low oil prices have already led Marathon Petroleum to defer a final investment decision on the planned expansion of its residual-oil upgrader at the company's 522,000-barrel-per-day refinery in Garyville, Louisiana. In China, Sinopec recently announced that it would cut capital expenditures by 12 percent as a result of cash constraints and declining growth in domestic demand for oil. PetroChina has can-

## EXHIBIT 2 | Refining Margins for Non-U.S. Refiners Have Increased

Refining margins at international hubs



Sources: International Energy Agency; KBC Bank; BCG analysis.

Note: Rotterdam, Brent crude cracking; U.S. Gulf Coast, 50-50 Maya-Mars coking; Singapore, Dubai hydrocracking.

celebrated two grassroots refinery projects that represent a total of 400,000 barrels per day of production capacity. If a sufficient number of the industry's investments are canceled or delayed, there could be a surplus of heavy material sooner than many analysts have been expecting—as early as 2018, in an optimistic scenario.

Demand for refiners' products over the longer term will be affected by several factors. One is the likely slowdown of growth in the adoption of electric mobility and in the substitution of ethanol for gasoline. Electric mobility currently represents 1 percent of total energy demand from the transportation sector and many analysts have projected that the demand will rise to 2 percent by 2020. From 2005 through 2012, ethanol demand increased by 15 percent per year, reducing annual growth in gasoline demand by 0.5 percent. If the current low-oil-price environment persists, the adoption rates of both electric mobility and ethanol will be slower, potentially increasing annual demand for oil products by 0.4 to 0.5 percent. At the same time, some countries that currently subsidize fuel—an estimated 30 percent of global fuel demand is supported by price subsidies—may use the drop in oil prices as an opportunity to at least partially phase out subsidization.

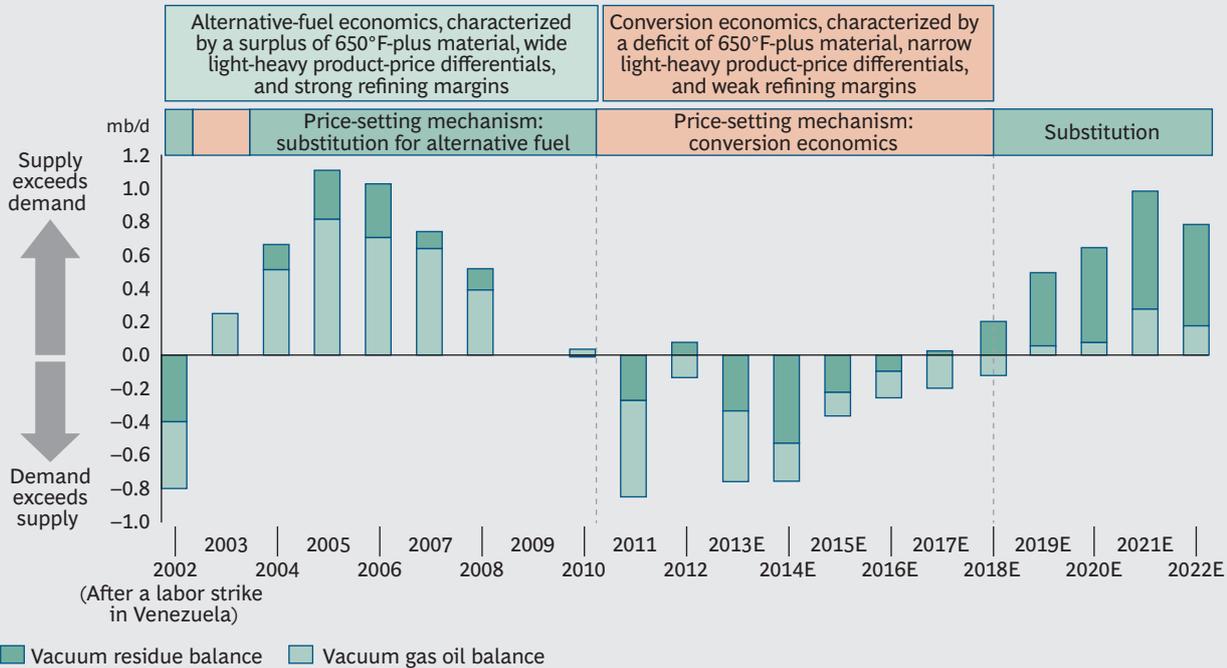
(India's government, for example, took advantage of the fall in crude prices to announce the full deregulation of diesel prices in October 2014.) This could reduce demand growth for fuel when prices eventually rise again.

We expect that refining margins will remain under pressure for the medium and longer term, largely due to overcapacity and relatively slow demand growth. There is, however, the potential for a stronger-than-expected rebound in refining margins in 2018 or 2019. (See Exhibit 3.) But for this rebound to materialize, four conditions would need to hold—a possibility analysts consider unlikely:

- Low oil prices would need to endure beyond 2016 and generate a substantial boost in economic activity and demand for oil products.
- Fuel-oil pricing mechanisms would need to return to substitution.
- A minimum of 15 percent of planned conversion-capacity projects would need to be canceled or delayed.
- Crude-oil prices would need to rebound in 2017 or 2018.

### EXHIBIT 3 | Refining Margins Could See a Stronger-Than-Expected Rebound

Global heavy-material balance



Source: BCG Global Refining Model.

Note: mb/d = millions of barrels per day. Heavy-light balance estimates are based on the assumption that middle-distillate demand will accelerate by 0.5 to 2.1 percent per year until 2018 and that 15 percent of conversion additions will be canceled or delayed. Heavy material includes all 650°F-plus material.

### Petrochemicals: Prospects Vary by Region

Petrochemical companies have suffered recently, with a sharp increase in inventories squeezing their margins. But with lower oil prices, the general outlook for these companies has improved. In 2015 and 2016, the companies should benefit from stronger demand spurred by rising economic activity: history shows that a 1 percent rise in economic activity generates an increase of 0.8 to 1.1 percent in the demand for petrochemical products.

Once again, though, prospects vary significantly by region. U.S. and Middle Eastern petrochemical company plants, or steam crackers, are primarily gas fed. As a result, the companies will see a decrease in the competitive edge they have enjoyed over their European and Asian rivals—whose crackers are mostly naphtha fed (naphtha is typically derived from crude oil)—for the past several years. The BCG Global Petrochemicals Model shows that in mid-2014, before oil prices began to slide, the average

cost of producing a ton of ethylene was \$1,032 in Europe and \$528 in the U.S.; by May 2015, those costs had fallen to \$561 and \$394, respectively, materially narrowing U.S. companies' cost advantage.<sup>8</sup> U.S. companies' feedstock-cost advantage could slide even further if U.S. gas prices rebound owing to slower growth in the production of shale gas.

The current oil-price environment thus brings relief to European petrochemical companies, even though these companies remain at a disadvantage relative to competitors in feedstock-advantaged regions. The current environment also reduces the price competitiveness of Middle Eastern exports to Asia.

### Specialty Products: A Supportive Backdrop Across Categories

For makers of specialty products, such as aviation fuel, lubricants, and marine fuel, 2015 stands to be a good year. Results should be relatively strong across product categories.

Aviation fuel sales are likely to rebound, with air travel rising in concert with economic activity. According to the International Air Transport Association, total global air travel was nearly 6 percent higher in 2014 than in 2013, the biggest increase in ten years, and growth has accelerated since the decline in oil prices. Specifically, demand for kerosene could grow considerably in parallel with rising demand for other middle distillates, such as diesel, potentially improving margins for kerosene in the medium term. Growing demand for middle distillates would, of course, be most beneficial to refineries that have strong middle-distillate yields. A number of U.S. refineries, including Motiva and Valero, recently announced that they would be reducing fluid-catalytic-cracking capacity while ramping up hydrocracking capacity in an effort to ride this aviation-related growth in demand for middle distillates.

In the lubricants business, base-oil producers should see a significant lift in profits, since prices of base-oil products are likely to decline less than feedstock prices. When prices of vacuum gas oil, a feedstock for manufacturing lubricants, fell by 46 percent from July 2014 through December 2014, for example, prices of Group I base oils fell by only 22 percent.<sup>9</sup> The same dynamic holds for lubricants: in general, product prices should fall more moderately—and more slowly—than the costs of base oils and additives, pushing the profits of lubricant makers higher. Demand for lubricants, meanwhile, should increase. This is especially true in the industrial and commercial-transportation categories, as growth rates for the two are closely correlated with growth rates in economic activity.

The marine fuel outlook is similarly positive. Demand fell in 2012 and 2013, despite a continued rise in seaborne trade. This decline was driven largely by the growing prevalence of slow steaming, the practice of operating ships well below their maximum speed in order to reduce fuel expenditures.<sup>10</sup> In the short term, lower fuel prices will make slow steaming less attractive, particularly for those classes of ships (including tankers, especially very large crude carriers)

that have benefited from a rebound in freight rates. This means that demand for marine fuel will likely increase, even though shipping companies will keep trying to contain fuel costs until they have a better gauge on the evolution of freight rates.

Another factor that will have a positive influence on demand for marine fuel is the introduction in early 2015 of new emission standards for ships trading in designated emission-control areas. The standards, which came into effect under the International Convention for the Prevention of Pollution from Ships (MARPOL), will accelerate demand for marine gas oil and create new supply and blending opportunities for refiners and traders. Markets for marine fuel will continue to be heavily influenced by MARPOL regulation, which will continue to evolve.<sup>11</sup> Currently, shipping companies appear to be taking a wait-and-see approach, holding back on making major capital expenditures (such as transitioning to liquefied natural gas as a fuel or adopting scrubber technologies) until there is less regulatory and technological uncertainty.

All told, we expect that demand for marine fuel will rise between 4 and 6 percent in 2015, depending on the strength of the global economy and developments in freight rates.

## Four Actions for Downstream Players

Downstream players have several levers at their disposal to ensure that they maximize value in the current oil-price environment.

**Increase operational flexibility.** Against a backdrop of low and volatile oil prices, refiners, in particular, will have more opportunity to engage in crude-quality arbitrage, as it will take a while for market prices to adjust to the new environment. Refiners should examine their crude mix to take advantage of temporary price discrepancies. When the price of Brent crude fell by 41.7 percent, on average, from July 2014 through December 2014, for example, the price of Western Canada Select fell by 46 percent.

The current environment, with an abundant oil supply relative to demand, will also offer refiners and other downstream players opportunities to save on feedstock costs by capitalizing on distressed cargoes. Countries that are struggling to maintain oil export revenues—including Iran, Nigeria, and Libya—could offer particularly attractive opportunities.

**Prepare for significant trading opportunities.** Low oil prices have triggered higher market volatility, leading to potentially lucrative trading opportunities. These include so-called contango situations, in which prices for future delivery are higher than those for immediate delivery, creating a time arbitrage opportunity. (In February 2015, for example, West Texas Intermediate crude for March 2015 delivery settled at \$51.69 a barrel, while the price for delivery in March 2016 was \$61.63.) There will also be arbitrage opportunities based on crude quality and on location. (Geographic arbitrage can be based on the processing of two crudes of the same quality that are produced in different regions, for example, or on the export or blending of products in different locations.)

Indeed, 2015 and 2016 are expected to be record years for trading activity, and companies with spare storage capacity, in particular, might use this to their advantage. The environment will give downstream companies with strong trading capabilities a significant competitive edge and force others to consider forming strategic alliances with trading companies.

**Accelerate transformation and operational-improvement programs and revisit the prioritization of initiatives.** Companies should identify and implement programs that can deliver quick wins in the current environment. In our experience leading lean refining programs, we have found that operational-improvement initiatives can result in additional profits of \$1 to \$3 per barrel.<sup>12</sup> Companies should also reprioritize existing initiatives to achieve the greatest financial value—for example, emphasizing margin-optimization and storage-debottlenecking efforts over energy-efficient

initiatives. Downstream players should also renegotiate contracts with suppliers and reassess inventory targets. In a low-oil-price environment, companies may find it profitable to increase stock levels in order to secure additional sales.

**Reconsider M&A opportunities.** With wider margins, downstream companies may now be positioned to go ahead with transactions that might not have been viable previously. Rather than building new capacity, some national oil companies are, for example, considering the acquisition of refining assets in order to secure outlets for the crude that they produce. Refiners might now find the terms of these deals sufficiently compelling to warrant serious consideration. The challenges low oil prices pose to upstream companies could also spur increased industry consolidation, further raising the allure of downstream assets as acquisition targets.

**T**HE CURRENT LOW-OIL-PRICE environment presents a unique opportunity for many downstream companies—but the window, which will eventually close, could close rapidly. Companies must thus quickly identify their highest-value opportunities and seize the moment. Those that successfully do so could improve their resilience and competitive position—and, simultaneously, leave themselves far better prepared for an eventual rebound in oil prices.

#### NOTES

1. See “Lower, and More Volatile, Oil Prices: What They Mean and How to Respond,” BCG article, January 2015; and “Killing the Complexity Monster in E&P: Eight Critical Actions for Upstream Oil and Gas Companies,” BCG article, January 2015.
2. Until oil prices rebound, however, refiners will suffer the financial effects of a general depreciation in the value of their oil and product inventories.
3. Data for 2014 and early 2015, however, shows an acceleration in demand for oil for the production of gasoline and middle distillates.
4. The simplified supply curve shown in Exhibit 1 represents the global refining system. In reality, price equilibrium is reached at the same time for the three major international hubs—the U.S. Gulf Coast, Rotterdam, and Singapore—but each has a different marginal-configuration curve.
5. Of the 43.2 million barrels per day (mb/d) of heavy material that the global refining industry produces

through atmospheric distillation, 33.9 mb/d, considerably more than two-thirds, is used as conversion feedstock for further transformation into lighter, higher-value products.

6. The BCG Global Refining Model provides data on regional supply-and-demand balances and marginal configurations as well as on the global balance of heavy material. The model also establishes a rigorous linkage between capacity and demand data and product price mechanisms, allowing for the creation of margin scenarios globally and by region.

7. Currently, U.S. refiners have a very high level of inventory, which also gives them a temporary advantage.

8. The BCG Global Petrochemicals Model provides past, current, and forward-looking supply curves for ethylene and propylene by region.

9. Group I, or GI, base oils are the least refined of the five base-oil categories defined by the American

Petroleum Institute. They are generally used in relatively undemanding applications.

10. According to the United Nations Conference on Trade and Development, seaborne trade grew by 5.7 percent and 3.8 percent in 2012 and 2013, respectively. Demand for marine fuel fell by 4 percent in 2012 and an estimated 4 percent in 2013, according to the International Energy Agency.

11. MARPOL VI legislation, enforced by local regulation, stipulates the use of fuel whose sulfur content does not exceed 0.1 percent in emission-control areas. Further tightening of fuel specifications for marine fuel beyond 2020 are being negotiated.

12. BCG has applied its Lean Refining methodology to more than 30 refineries in Europe, the Americas, the Middle East, Africa, and Asia.

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*This is the fourth in a series of articles exploring issues associated with changing oil prices. The previous articles are “Lower, and More Volatile, Oil Prices: What They Mean and How to Respond” (January 2015), “Killing the Complexity Monster in E&P: Eight Critical Actions for Upstream Oil and Gas Companies” (January 2015), and “Low Oil Prices Are Challenging Natural-Gas Markets” (March 2015).*

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