

Economic Analysis

Oil Prices: Black Gold or a Black Hole?

Nathaniel Karp / Marcial Nava / Amanda Augustine

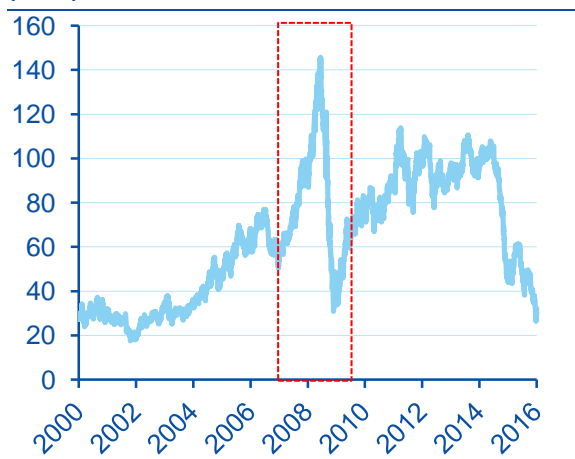
- **Current market conditions still suggest further oil price declines**
- **As oversupply shrinks, a rebound in prices is likely**
- **High uncertainty from economic slowdown, financial volatility and policy responses**
- **Structural trends point to a lower oil price equilibrium**

The Eagle and the Dragon: the End of an Era

Between the early 2000s and the second half of 2014, oil prices exhibited a period of sustained gains interrupted momentarily by the Great Recession. In this commodity super-cycle, oil market conditions were characterized by robust growth in both non-OECD demand and non-OPEC supply, supported by loose monetary policy, unprecedented technological advancements and search-for-yield investment strategies. As a result, a massive amount of resources was allocated throughout the oil and gas (O&G) value chain.

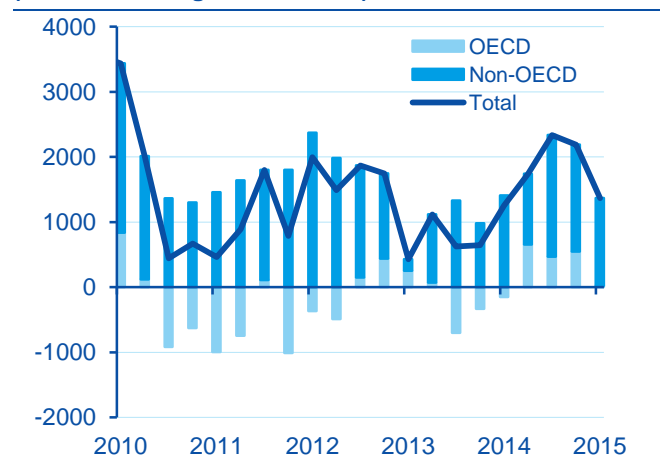
Global demand was largely driven by the formidable economic expansion of emerging markets. Between 2000 and 2015, emerging markets contributed 70 cents for each additional dollar, PPP adjusted, of world GDP. In the same period, the increase of global demand for petroleum products was entirely driven by emerging markets. Moreover, China's staggering 9.5% average GDP growth in this period and its large spillover effects on other emerging markets explain 63% of the net increase in petroleum products demand in the last 15 years.

Chart 1
WTI Spot Price (\$/bbl)



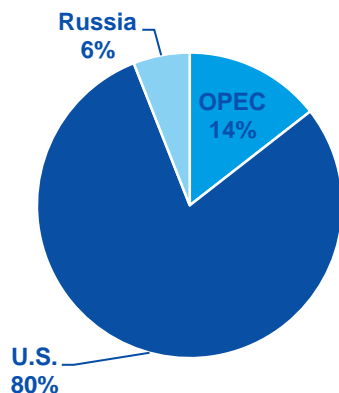
Source: BBVA Research & Haver Analytics

Chart 2
Oil Product Demand (12-month change, thous bbl/d)



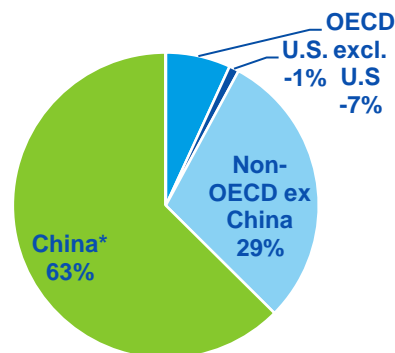
Source: BBVA Research & Haver Analytics

Chart 3
World Crude Oil Production
(Contribution to total net increase, 2011-2015)



Source: BBVA Research & Haver Analytics

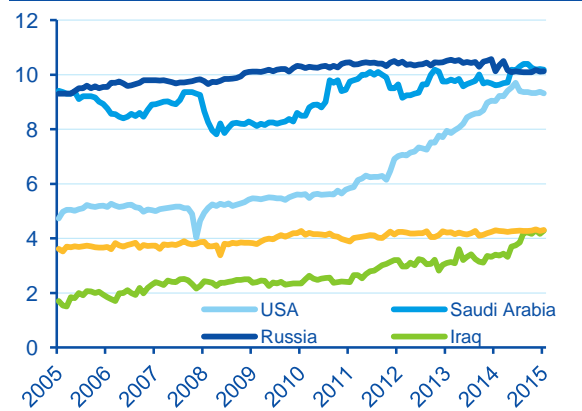
Chart 4
World Oil Product Demand
(Contribution to total net increase, 2000-2015)



Includes direct and indirect effects on other emerging markets.
Source: BBVA Research & Haver Analytics

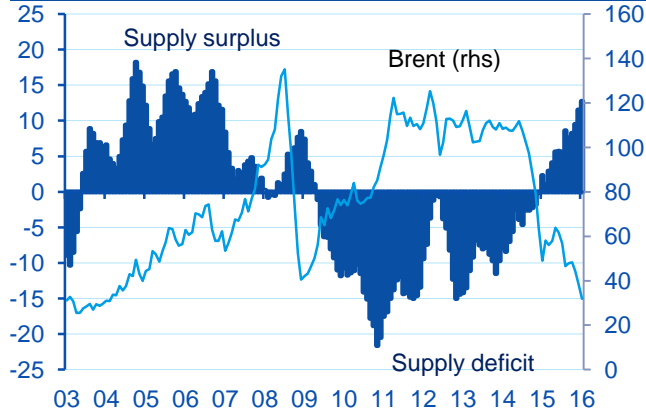
The non-OPEC supply surge was driven by the U.S., where a combination of high oil prices, hydraulic fracturing, horizontal drilling, deep-water technologies and historically low interest rates encouraged a significant amount of investments in the O&G industry. Shale projects became financially attractive as they enjoyed the highest IRRs among onshore and offshore projects as well as the lowest payback time.¹ In fact, the ratio of total O&G capital expenditures to GDP increased from 0.4% in 2000 to 2.1% in 2014, accumulating \$2.8tn in 15 years. As a result, U.S. crude oil production increased from 5.7 million bbl/d in 2011 to 9.7 million bbl/d in April 2015. In this period, the U.S. accounted for 83% of the cumulative net increase in global crude oil supply.

Chart 5
Crude Oil Production (Million bbl/d)



Source: BBVA Research & Haver Analytics

Chart 6
Global Oil Supply/Demand Balance and Brent
(Million bbl/d 6-month moving average & \$/bbl)



Source: BBVA Research & Haver Analytics

¹ Assuming a \$90 bbl and based on the 30 largest projects expected to start up in the period 2014-2020, the IRR for shale/tight oil projects was estimated at 45% with a payback period of 2 years. Source: Rystad Energy

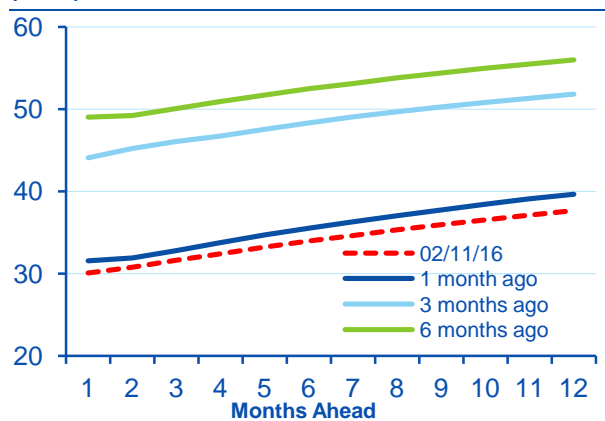
Throughout much of this period, crude oil prices increased consistently, suggesting that demand-side factors dominated market expectations. Beginning in 2011, when U.S. supply began to surge, oil prices stabilized as expectations discounted a more balanced market, but by 2014, demand was unable to absorb supply, leading to a decline in prices that continues today.

In previous episodes of price downturns, OPEC would have reacted by cutting production as it did during 2001 and 2008; however, in November 2014, the cartel surprised markets by deciding to keep its production quota unchanged, which was interpreted as an attempt to protect market share. The reluctance to cut production and the decision to revamp it when prices continued declining in 2015, was seen by some experts as an attempt to force higher-cost producers to exit the market.

At the same time, in mid-2014, China's economic deceleration became more evident, and this trend has persisted ever since. For example, the manufacturing PMI² has decelerated consistently since July 2014, after it reached a peak of 51.7. The spillover effects into emerging markets have been significant. For instance, growth of industrial production in emerging markets and the volume of foreign trade from and to these regions have slowed to their lowest levels in six years.

Our econometric analysis confirms that the drop in oil prices has been primarily driven by fundamentals, particularly resilient non-OPEC oil supply and weaker non-OECD demand. In addition, the reassessment of global growth expectations in favor of developed economies relative to emerging markets, along with monetary policy divergence in developed economies, have strengthened the relative value of the U.S. dollar and generated further downward price pressures. Price volatility has also reflected geopolitical developments, such as the lifting of sanctions on Iran and military conflicts in the Middle East. Our baseline scenario projects a downward adjustment in 1H16 followed by a mild recovery thereafter. By the end of 2018, prices are expected to stabilize around \$60/bbl.

Chart 7
Brent Crude Futures
(\$/bbl)



Source: BBVA Research & Haver Analytics

Table 1
Crude Oil Price Scenarios
(Brent, \$/bbl, annual average)

	Baseline	Upside	Downside
2015	52.6	52.6	52.6
2016	30.3	45.0	20.3
2017	45.7	63.7	26.4
2018	55.7	75.7	26.8
2019	59.6	83.5	23.7
2020	59.6	87.7	21.4

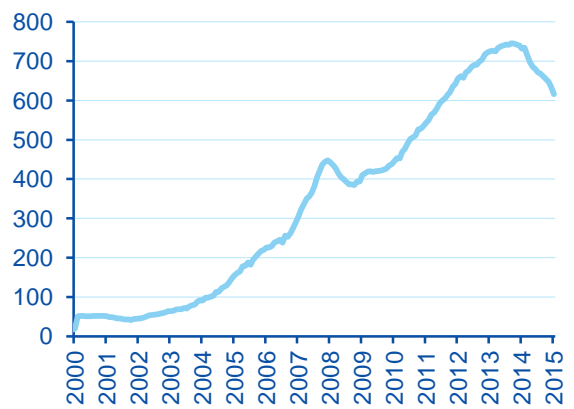
Source: BBVA Research & Haver Analytics

² Purchasing Managers Index

Scraping the Bottom of the Barrel: Further Adjustment in 1H16

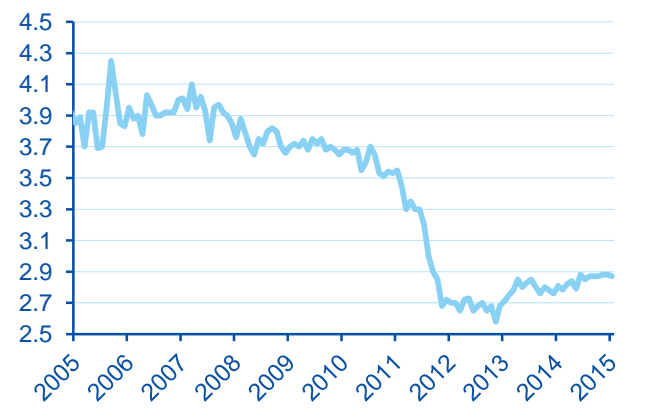
Since prices began to fall, futures contracts have persistently reassessed expectations to the downside amid higher-than-average price volatility, suggesting elevated uncertainty on when prices will reach bottom and turnaround. These trends reflect concerns about oversupply as OPEC has not shown any convincing sign of a potential cut in production. This could be explained by two factors. On the one hand, the marginal cost per barrel for Saudi Arabia and other OPEC members remains well below \$20/bbl. On the other hand, Saudi Arabia, the biggest producer and holder of the second-largest proven reserves, has been able to absorb the impact of low prices on its economy through a combination of austerity measures and the selling of foreign reserves. Considering that foreign reserves are still high at \$616bn (100% of GDP) and that public debt is low (6.7% of GDP), the country has ample room to withstand a longer period of low oil prices.

Chart 8
Saudi Arabia: Foreign Reserves
(Total minus gold, EOP, billion US\$)



Source: BBVA Research & Haver Analytics

Chart 9
Iran: Crude Oil Production
(Million bbl/d)



Source: BBVA Research & Haver Analytics

Divisions within OPEC obscure the possibility of agreement among members. The cartel is split in two groups. The first includes countries like Venezuela, Nigeria, Iran, Iraq and Libya, whose troubled economies desperately need higher prices and would like to see production cuts from members with stronger economic conditions. The second group is comprised by Saudi Arabia and other Gulf states who believe that any cut in production should be shared not only by all OPEC members, but also by some non-OPEC producers as well—a necessary condition to maintain market shares unchanged. However, non-OPEC countries like Russia—the second world’s largest producer—and Brazil may find it difficult to cut production voluntarily as their economies are contracting and oil revenues are critical to support countercyclical fiscal policy. Not surprisingly, recent efforts to persuade Russia to join OPEC in cutting production have been unsuccessful.

Another source of downward pressures has to do with Iran’s ability to export crude oil after the lifting of sanctions resulting from the nuclear deal with the P5+1 group.³ The Iranian government aims at returning to full production capacity –estimated at nearly 4 million bbl/d– by increasing production 0.5 million bbl/d in 2016 and another 0.5 million thereafter. However, a large expansion in production will take time, as the significant amounts of

³ The UN Security Council’s five permanent members: China, France, Russia, United States, United Kingdom; plus Germany.

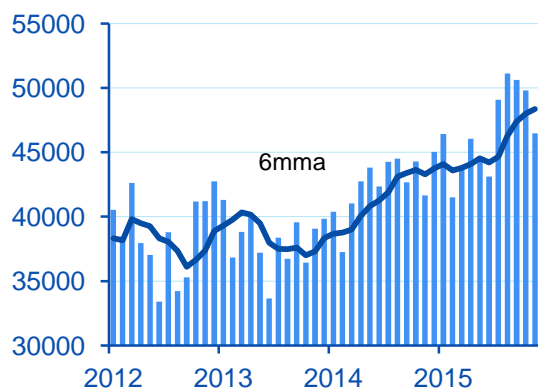
investments that are needed to modernize a deteriorated infrastructure are constrained by tighter credit conditions and diminished risk appetite in the industry. Therefore, a more reasonable estimation suggests that the amount of additional oil that the country can inject into the global market in the short-term is between 0.2 million bbl/d and 0.4 million bbl/d.

Given OPEC and Russia's impasse, together with Iran's reintegration to the global market, the attention has turned to the U.S., where production has shown a significant degree of resiliency. Since its last peak of 9.6 million bbl/d in June 2015, U.S. crude oil field production went down gradually to 9.1 million in September and has stabilized at 9.2 million bbl/d ever since.

This resiliency can be explained by the decline of break-even prices in a highly competitive private market, supported by a solid institutional framework. In some cases, highly-leveraged operators continue producing and selling crude in order to service debt, while others cut dividends or increase reliance on equity rather than debt.

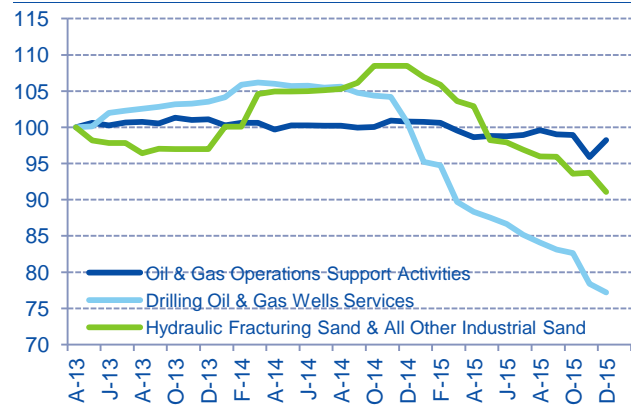
Hedging has also played an important role in sustaining production levels. Companies hedge production in order to protect themselves against price fluctuations. In 2015, a significant portion of U.S. production was hedged, allowing highly-indebted companies to shield their revenues and continue servicing debt. Soon after prices began to fall, many companies were able to hedge at \$90 or \$80/bbl; however, as prices continued to fall, hedging became more difficult. A recent study by IHS suggests that small producers and exploration companies have 47% of their oil production hedged at \$71/bbl, while mid-size companies have hedged 43% of production at \$60/bbl. Larger companies, with stronger balance sheets, have hedged 6% of crude oil production at \$54/bbl.⁴

Chart 10
U.S. Federal Offshore Oil Production
(Million bbl/d, PADD3)



Source: BBVA Research & Haver Analytics

Chart 11
U.S. Producer Price Index
(NSA, January 2013 = 100)



Source: BBVA Research & Haver Analytics

In addition, several operators maintain production to hold acreage, and companies are using advanced technologies like 3D seismic imaging, pad drilling and zipper frac to enhance drilling and completion. As a result, initial production rates have edged up; however, it is not clear if enhanced completions increase estimated ultimate recovery or not. Likewise, some producers are implementing high-grading to maximize well productivity.

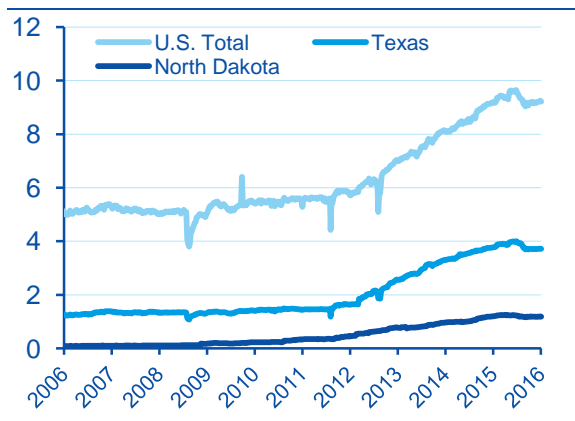
⁴ IHS (2016). "North American Oil and Gas Companies Face Difficult Year in 2016 as Strong Hedging Protections Roll Off, IHS Says." News Release. January 29. Available at <http://goo.gl/AKivPE>

In fact, across major U.S. shale plays, new-well production per rig has increased between 12% in Haynesville and 83% in Utica in the last 12 months.

Variable costs have also adjusted faster than expected. Companies are switching from horizontal to vertical wells and taking advantage of large discounts from service companies; as a result, the number of wells waiting on completion has increased. The combination of operational efficiency and cost compression has helped to lower drilling and completion costs by nearly 30%.⁵

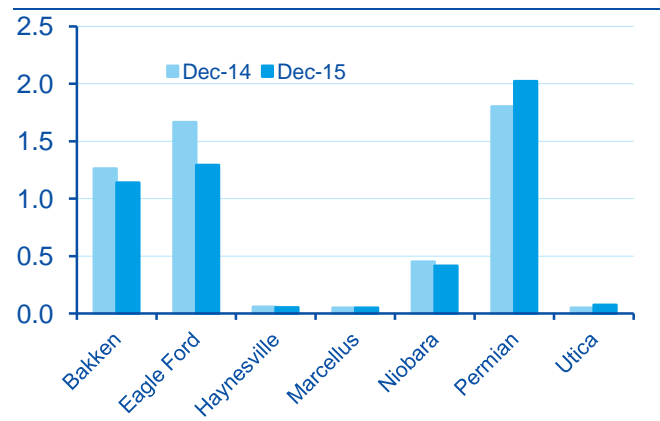
Meanwhile, in December 2015, production expanded in the Permian and Utica plays relative to a year earlier, but contracted in the Bakken and the Eagle Ford plays. Production in the Permian may take longer to adjust as it still requires further development and companies deploy capital to this region where acreage is not fully held by production. In addition, since July 2015, offshore production in the Gulf of Mexico has been running around 200 thousand bbl/d higher than a year earlier and will increase further as projects come online. In any case, break-evens vary significantly across shale plays and companies, implying a highly heterogeneous outcome.

Chart 12
U.S. Crude Oil Production (Million bbl/d)



Source: BBVA Research & Haver Analytics

Chart 13
U.S. Total Oil Production by Shale Play (Million bbl/d)



Source: BBVA Research & EIA

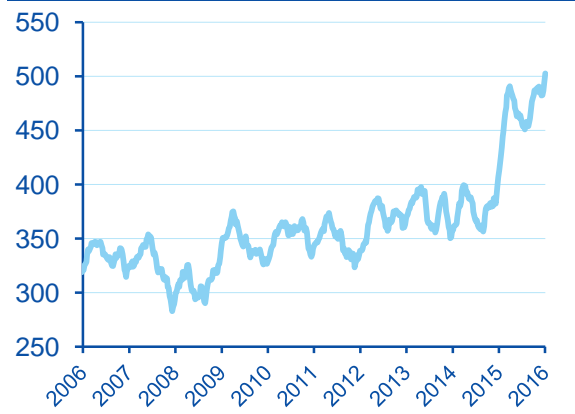
From the demand side, prospects for global growth have diminished due to weakness in emerging markets and modest growth in developed economies. In particular, China’s economic growth is expected to slow from 6.9% in 2015 to 6.2% in 2016 and 5.8% in 2017. Our baseline scenario assumes a “soft landing”; however, uncertainties about the magnitude and quality of the slowdown, and the government’s ability to manage the cycle through fiscal and monetary policy, are likely to exert downward pressures on crude prices. Since slower growth in China restrains output in emerging markets, demand growth for crude from developing economies is also likely to soften.

The combined effect of an upsurge in production and average growth in demand led to substantial inventory accumulation. In fact, both world inventories and the inventory-to-sales ratio stand at record high levels. The increase in global stocks over the past 12 months has been driven by non-OECD countries and the U.S. which

⁵ The Oxford Institute for Energy Studies (2015). “US Shale Oil Dynamics in a Low Price Environment.” November. Available at: <http://goo.gl/U8g4SX>

contributed with almost 50% and 26% of the gain, respectively. If excess supply continues, downward price pressures will remain. These forces could be significant as storage capacity, which grew briskly during the super-cycle, is still far from reaching its limit.

Chart 14
U.S. Stocks of Crude Oil Excluding SPR
(EOP, million barrels)



Source: BBVA Research & Haver Analytics

Table 2
Real GDP Growth
(YoY % change)

	Estimates		Projections	
	2015	2016	2017	
Russia	-3.7	-1.0	1.0	
China	6.9	6.2	5.8	
India	7.4	7.6	8.0	
Brazil	-3.8	-3.0	1.3	
South Africa	1.3	0.7	1.8	

Source: BBVA Research, IMF, & Haver Analytics

A Not So Crude Awakening: Higher Prices in 2H16 and 2017?

Although we expect prices to decline further in 1H16, a rebound is likely in 2H16 and throughout 2017. This view assumes that U.S. production will decline further. The rapid reduction of active rigs suggests that U.S. crude oil production could decline by around \$1 million bbl/d over the next 12 months. This would trim a substantial portion of excess supply in the market, currently estimated to be between 1.5 and 1.8 million bbl/d. In 2015, U.S. real private fixed investment in mining exploration, shafts and wells contracted 35%—\$47.3 billion less than in 2014. This trend is likely to continue in 2016 as O&G companies make further CapEx reductions in response to pressures on profitability. As a share of GDP, CapEx in the U.S. O&G industry declined to 1.5% in 2015—the lowest since 2008.

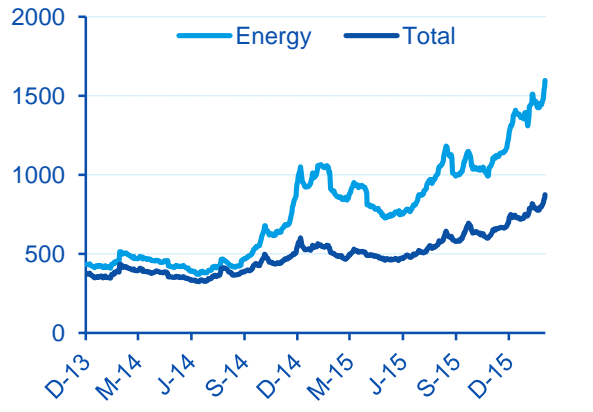
U.S. production will also be affected by an increasing number of bankruptcies from small and mid-sized highly-leveraged independent companies with low quality assets. In 2015, 41 firms declared bankruptcy with an estimated total debt of \$16.7bn.⁶ Moreover, a more risk-averse environment reflected by tighter credit standards for O&G financing will hit larger players. According to the Senior Loan Officer Opinion Survey, 85% of respondents considered that tightening underwriting policies on new loans or lines of credit made to O&G was somewhat to very important.⁷ The Shared National Credit Program revealed that approximately \$34.2bn of O&G commitments (syndicated loans of at least \$20 million) were considered “classified” (meaning assets that were rated substandard, doubtful or loss), that is 15% of total classified commitments.⁸

⁶ Oil&Gas360 (2015). “Oil and Gas Bankruptcy Climbs to More than \$16 Billion in 2015.” December 23. Available at <http://goo.gl/u2wqX5>

⁷ Federal Reserve (2015). Senior Loan Officer Opinion Survey on Bank Lending Practices. April. Available at <http://goo.gl/E4GT75>

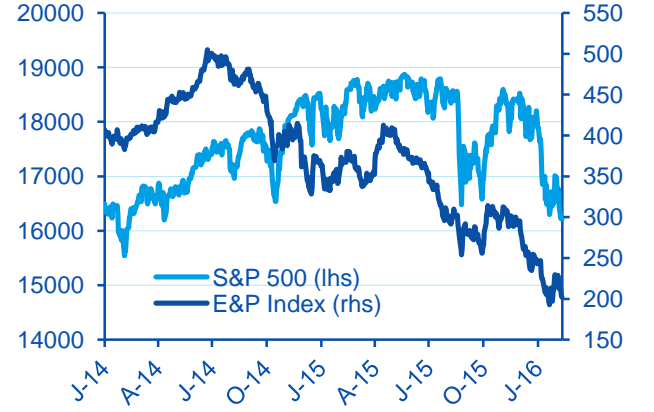
⁸ Federal Reserve (2015). Shared National Credits Program Review. November. Available at <http://goo.gl/Odli4Y>

Chart 15
High Yield Bonds
(Option adjusted spreads relative to 10YTN)



Source: BBVA Research & Haver Analytics

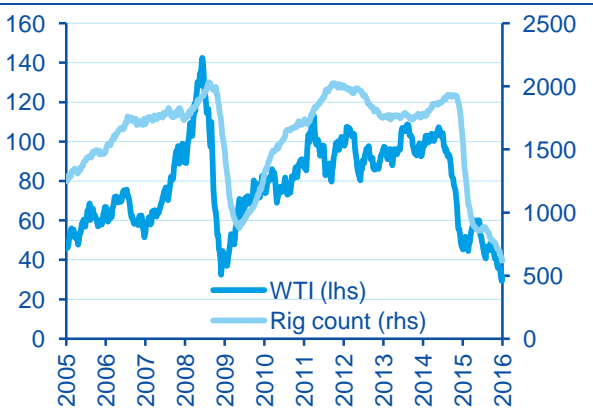
Chart 16
S&P 500 Composite
(Market Cap \$bn)



Source: BBVA Research & Haver Analytics

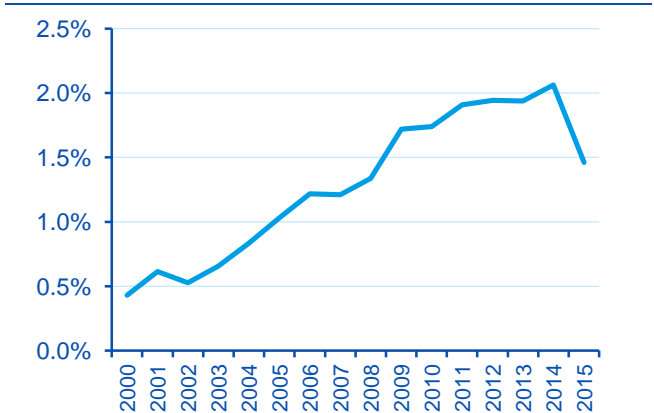
Recent call reports suggest that some large banks are increasing provisions and reducing credit facilities as reserve replacement declines and future prices fall below borrowing bases. In addition, rating agencies have continued to downgrade O&G companies at a fast pace, fueling concerns at a time when it is uncertain if syndicates will be able to meet working capital needs and a large amount of hedges are set to roll off in 1H16. Estimates for the U.S. suggest that only 14% and 2% of production is protected for 2016 and 2017, respectively.⁹ However, the share of production protection tends to be higher for smaller players than for more diversified companies, and so far there is no evidence of large independent firms collapsing. In other words, while current data suggests a manageable impact from tighter financial conditions, concerns about a large-scale effect and contagion beyond O&G continue rising.

Chart 17
U.S. Active Rig Count and WTI
(Units and \$/bbl)



Source: BBVA Research & Haver Analytics

Chart 18
U.S. Capital Expenditures in O&G
(Share of GDP)



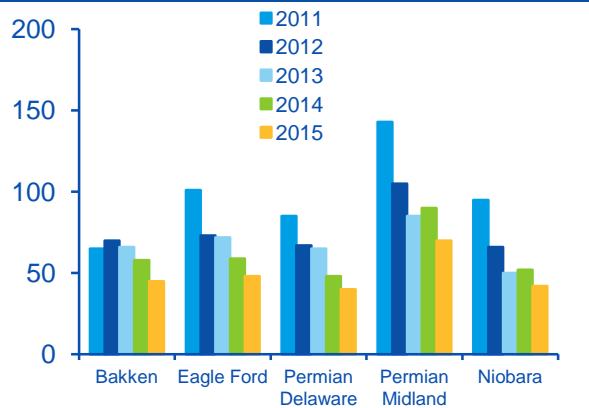
Source: BBVA Research & Haver Analytics

⁹ IHS, *Op. Cit.*

Global production could also decline if OPEC cuts production or if it manages to convince Russia to do the same; however, as of date, there is no evidence that this will happen. In addition, it is unlikely that smaller producers will also cut production on their own or as part of a broader deal, if they do not see an improvement in their economic performance.

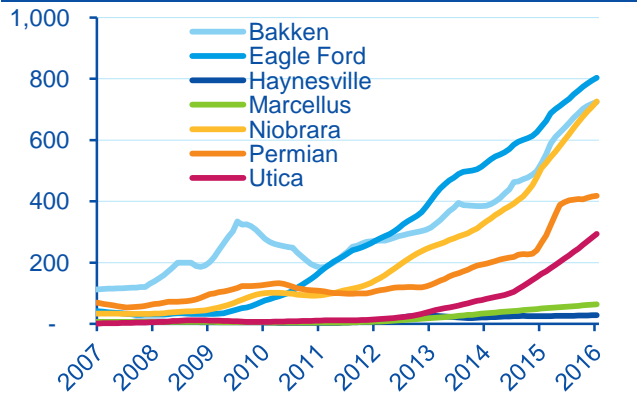
However, even if we assume a deeper adjustment in U.S. production or a sharp cut in OPEC output, the upside will be limited. First, if Saudi Arabia and its partners want to maintain or gain market share, they need to keep prices at or below high-cost producers' break-even prices. This would have to happen for a prolonged period in order to avoid having high-cost producers return to the market as soon as prices recover. Second, given the high number of wells waiting on completion and the level of sophistication achieved by the U.S. shale industry during the past 15 years, firms could revamp production quickly, thereby containing upward price pressures. Higher prices will also increase the financial appeal of tight oil projects, which combined with their higher rates of return and shorter payback times, could trigger a significant inflow of investments. Third, prospects for slower economic growth could counterbalance any upside coming from a supply-side adjustment.

Chart 19
U.S. Break-Even Prices for Main Shale Plays (\$/bbl)



Source: NASWellData & Rystad Energy

Chart 20
New-Well Production per Rig (bbl/d)

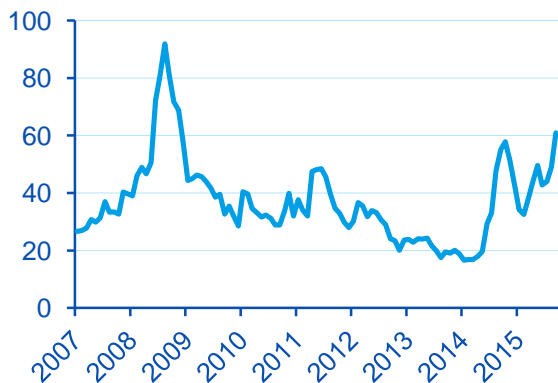


Source: BBVA Research & EIA

A Fractured Future: High Uncertainty

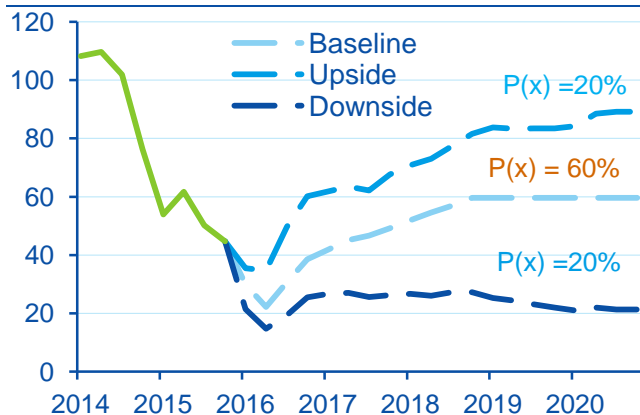
Notwithstanding recent trends, the outlook remains highly uncertain. For example, the crude oil volatility index, which measures the market's expectation of 30-day volatility of crude oil prices, stands at its highest level in seven years. Meanwhile, the 95% confidence interval for December 2016 oil price futures ranges from \$19/bbl to \$85/bbl, and widens to \$18/bbl to \$105/bbl for December 2017. Likewise, our scenarios reflect elevated uncertainty. Prices could resurge rapidly if OPEC decides to drastically cut production, U.S. production plummets, the industry cannot recover and suffers a massive wave of defaults, and the deceleration of the global economy turns out to be milder than expected. In contrast, prices could decline further if a "hard-landing" of the Chinese economy materializes, OPEC increases production, and U.S. producers boost production to new record high levels. These scenarios exclude geopolitical shocks and natural disasters as these events are unpredictable and complex to incorporate in standard models; moreover, their impact tends to fade away after a short period of time.

Chart 21
CBOE Crude Oil Volatility Index



Source: BBVA Research & Haver Analytics

Chart 22
Crude Oil Price Scenarios (Brent, \$/bbl)



Source: BBVA Research & Haver Analytics

Drilling for a New Equilibrium

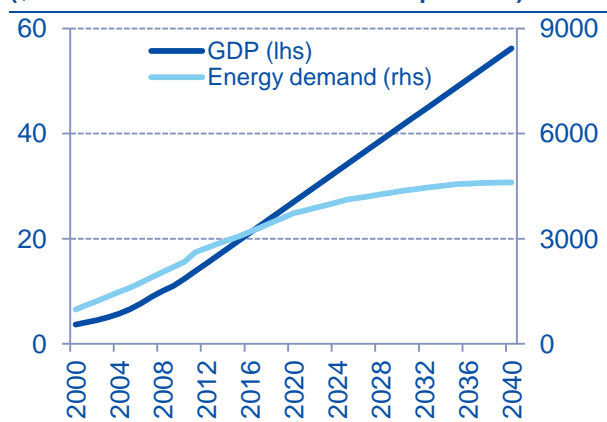
According to our analysis, the new cycle will be characterized by a new lower equilibrium price level. From the supply side, increasing competition from non-OPEC producers will continue to weaken the role of OPEC as a price stabilizer. More competition will foster innovation that could bring break-even prices down, making high-cost producers more competitive in the future. In the last 35 years, the average time between field discovery and production has declined from 10 to 3 years, while new-well production per rig has increased more than tenfold in the last eight years. At the same time, producers have managed to lift extraction to levels that were unthinkable just a few years ago. One example of a productivity enhancer is plasma-pulse, a technology that maximizes oil recovery by using a high-energy plasma arc, rather than by injecting fluids at high pressure to stimulate the reservoir. Plasma-pulse is a more efficient and more environmentally-friendly option than traditional techniques. The usage of small-scale accelerometers, Resbots, logging-while-drilling techniques, gamma rays and resistivity meters are all helping to reduce drilling costs by interpreting collected data and making seismic exploration redundant. In addition, technologies like low salinity water injection allow older wells to remain economically viable for a longer period of time, while carbon capture and storage innovations, bubble curtains, and ESEIEH¹⁰ help reduce CO2 emissions, economic costs, noise pollution and environmental impact. Finally, submersible helicopter models, flexible pipes and new insulation techniques have helped to prevent fractures, metal fatigue and improve overall safety.

Technological advancements have rendered the notion of “peak oil,” the hypothetical point in time when production reaches its maximum and declines thereafter to depletion, less relevant in a world where reserves continue to be discovered and extraction is increasingly feasible. New technologies have allowed drilling 250 miles offshore to depths exceeding 10,000 feet, albeit at very high costs; however, as these technologies become economically feasible, the amount of potential oil production will grow significantly. In the U.S. alone, reserves of crude and lease condensate have risen for six consecutive years and exceed 39 billion barrels—the highest level since 1972. In addition, the U.S. shale revolution proved that a more competitive environment encourages innovation that boosts productivity and grants access to once unavailable resources. As these

¹⁰ Enhanced Solvent Extraction Incorporating Electromagnetic Heating

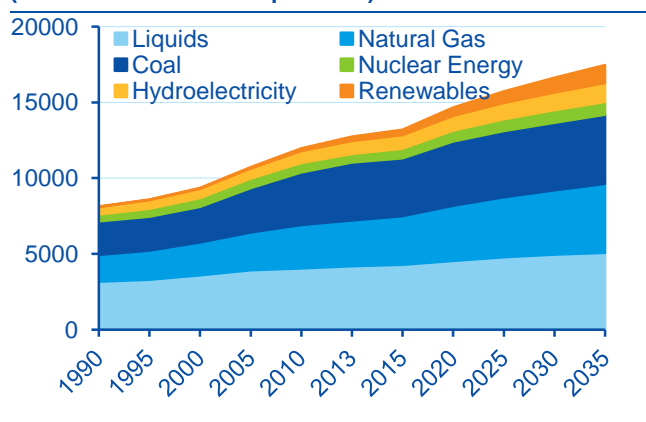
technologies are exported to other countries and ignite new shale booms, global production will become more resilient and elastic.

Chart 23
China: GDP and Energy Demand
(\$tn PPP and million tonnes of oil equivalent)



Source: BBVA Research, IMF & IEA

Chart 24
World Energy Consumption by Fuel
(Million tonnes of oil equivalent)



Source: BP Energy Outlook 2035

From the demand side, emerging markets will continue to drive demand for oil. However, as China transitions from an investment- to a consumption-driven economy and becomes more developed, energy efficiency in transportation, commercial and industrial activity will increase, as has been the case in developed countries. According to the International Energy Agency, Chinese energy demand will start decoupling from GDP by the end of this decade and stabilize near 4,000 million tons of oil equivalent by 2040.¹¹ This divergence will bring the energy-to-GDP ratio downward, implying higher energy efficiency as each additional percentage point of economic growth will require significantly less energy than before. Other developing countries in transition will go through the same process, although at a different time and pace. In contrast, economic growth in the developed world will remain below average, amid ongoing energy efficiency gains and other structural transformations, which will limit the pace of oil consumption. Ultimately, global oil demand will be more easily met and unlikely to generate significant imbalances as seen during the super-cycle.

Finally, oil prices face downward pressure from two key fronts: policies aimed at curbing climate change and technological changes that lower the cost of alternative sources of energy. Commitments to reduce CO2 emissions to the atmosphere, epitomized by the unprecedented agreement at the 2015 UN Climate Change Conference, are expected to encourage significant amounts of investments in order to increase the share of renewables in the global energy mix. These investments, together with fiscal incentives and stiffer environmental regulations across the globe, promise to increase the cost-competitiveness of clean energy relative to fossil fuels. As technology adopters, emerging markets could make a relatively quick transition to energy efficiency and renewable sources even if oil prices remain low for a prolonged period of time. Although the uncertainty is high, these trends would imply a new lower equilibrium price for crude oil.

¹¹ International Energy Agency (2015). "World Energy Outlook." November. Available at: <http://goo.gl/H1B6Ht>

Energy Beyond the Barrel

Our baseline scenario assumes that the low oil price environment will continue for some time, followed by a moderate increase as production levels adjust. Over a longer horizon, prices are likely to be higher than current levels. However, the new equilibrium has shifted to the downside relative to the super-cycle, as the dynamics of slower expected demand growth and lower break-even prices come into play. This is a new paradigm, whereby hydrocarbons supply is abundant and accessible, but demand shifts towards multiple sources; nevertheless, as has always been the case, uncertainty remains elevated.

The world's energy needs are not only massive, but also complex. On the one hand, vast amounts of cheap energy are needed to support economic growth in developing countries where population is expected to grow the most. However, as the impact of climate change becomes more acute and governments and private agents take it more seriously, the need for "clean and cheap" energy will no longer be an option but an imperative. Hydrocarbons fit only in the "cheap" side of the equation. Renewables, on the other hand, are clean, but not yet a cost-effective alternative for economic development, more so if oil prices remain low. In this new paradigm, oil will still be needed, but will make up a smaller share of the total energy mix.

DISCLAIMER

This document was prepared by Banco Bilbao Vizcaya Argentaria's (BBVA) BBVA Research U.S. on behalf of itself and its affiliated companies (each BBVA Group Company) for distribution in the United States and the rest of the world and is provided for information purposes only. Within the US, BBVA operates primarily through its subsidiary Compass Bank. The information, opinions, estimates and forecasts contained herein refer to the specific date and are subject to changes without notice due to market fluctuations. The information, opinions, estimates and forecasts contained in this document have been gathered or obtained from public sources, believed to be correct by the Company concerning their accuracy, completeness, and/or correctness. This document is not an offer to sell or a solicitation to acquire or dispose of an interest in securities.