KGI CHINA DEVELOPMENT FINANCIAL

Crude oil

Price war——Optimal strategy under the prisoners' dilemma

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- US shale oil industry will be the biggest loser in the current price war between Saudi Arabia and Russia.
- OPEC hiking oil output is the optimal strategy under the "Nash equilibrium" concept in game theory.
- We expect Brent oil prices to trade at the US$30+ levels until US oil production drops significantly.

Winners and losers amid the oil industry disaster. Once again, the global financial markets bumped into another tail risk event, as the extension of OPEC+ output cut deal failed and resulted in a price war. On 8th March, Saudi Arabia announced plans to ramp up production from the current 9.7mn barrels per day (mbd) to 12.3 mbd starting in April, while simultaneously cutting its selling price by $6/bbl to $8/bbl.

The 26%+ growth in sales volume should fully offset the 15%+ drop in ASP (based on Dubai Crude last closing price of $45.7/bbl on 6th March). Saudi is well-known to be among the lowest cost producer in the world, with its costs averaging around US$15/bbl (all-in cost plus administration and transportation cost). Hence, even after the price cuts, Saudi is guaranteed a c.US$20/bbl profit margin. Saudi Arabia's fiscal income from oil remains intact compared to before the price war.

Russia, the 3rd largest oil producer, does not strictly comply with the output-cut deal and has ramped up production since 2018. As of January 2020, its output was at 11.3 mbd. Russia also plans to fight the price war by boosting another potential 0.5 mbd of production (up 4% from January's volume). However, the drop in oil prices will not be able to offset Russia's volume growth. Russia's production cost averages at c.US$20/bbl, giving the country a US$15/bbl buffer. Russia will eventually suffer but can sustain the price war.

The US, being top oil producer, will have to bite the bullet. More than 70% of the US's production is from shale oil. Though technology advancement has brought down the production costs from the highs of US$80/bbl to the current c.US$40+/bbl levels, the whole industry will still be subjected to widening losses. Not to mention the serious indebtedness of shale oil companies. Therefore, US will be the biggest loser in the price war.

Prisoners' dilemma. We further analyse the rationale behind the price war started by Saudi Arabia through the classic example - the prisoners' dilemma in the economic theory, Nash Equilibrium:

	OPEC hikes output	OPEC cuts output
Russia hikes output	(R+, O+)	(R+, O-)
Russia cuts output	(R-, O+)	(R-, O-)

First, global demand has been growing at a stable annual rate of 1.5% to 2% over the past five years. Therefore, oil supply plays a pivotal role in the price movement. When there is success in coordination (in the "R+, O+" quadrant of the table above) from 2014 to October 2016, oil price nosedived from over US$100/bbl to US$40/bbl (lows of below US$30/bbl). US ramped up output from 8 mbd to the first peak of 9.5mbd in June 2015 regardless of the downturn. The strategy worked when oil price was dragged down substantially below the US production cost, and US production declined by slightly more than 1 mbd (down 11.6%) from the peak. During this period, OPEC+ (OPEC and Russia) ramped up production by 5 mbd (up 12.5%). Hence, the two groups tolerated more than 60% fall in ASP in exchange for gaining another 5%+ of the market share, and the US only lost 1.5%.

In another instance of the success of coordination (R-, O-) from November 2016 to June 2018, oil prices recovered from US$40/bbl to US$80/bbl. OPEC+ cut output by 2mbd (down 4.4%) while US increased production by 2.2mbd (up 25%). The strategy resulted in an almost 100% recovery but resulted in a loss of market share to the US.

The dramatic situation happened in the latest round of output cuts. Since June 2019, there was a failure to coordinate (R+, O-). Russia increased its output by 1.9% to 11.3 mbd while OPEC decreased by 5% to 28.4 mbd as of January 2020. Meanwhile, US grew output to a record high of 13mbd (up 7.4%) during the period. Oil prices plunged by 12.8% during this 7 months period. OPEC has been the honest player complying with the deal. From November 2018 to January 2020, its production dropped by 4.8 mbd while Russia's output only dropped from 11.4 mbd to 11.1mbd and then recovered back to 11.3 mbd. On the other hand, US production grew another 1.3 mbd (up 12%), making it the biggest beneficiary of the output cuts.

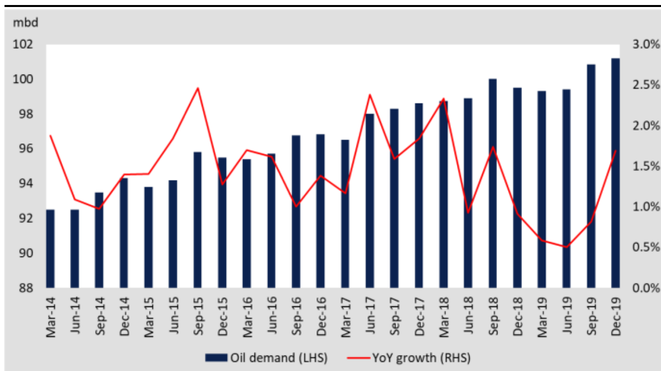
Even while profit margins are thin for US shale oil companies, the gains in market share has consolidated their market position and threatened OPEC+. In conclusion, Saudi Arabia can justify starting the price war given that Russia disagreed with the extension of the output cut, moving from (R+, O-) to (R+, O+), as this was the optimal choice.

The key question to ask is: which type of successful coordination is the optimal choice for OPEC+: (R+, O+) or (R-, O-)? This is about the trade-offs between market share and price. (R-, O-) has proven to be unsustainable given that the supportive oil prices have enabled the US to gradually take over market share from OPEC. Meanwhile, given the increasing oil reliance from China (from 5% in 2014 to 15% in 2019), Russia has managed to maintain its market share. (R+, O+) is an optimal strategy to rebalance the supply chain.

COVID-19 has been declared a global pandemic on 12 March. The barrage of quarantine measures taken in countries and the ban of flights will lead to significantly lower traffic volumes, which will translate to softer oil demand this year. The significant drop in oil demand and the pending surge in supply will definitely widen the supply-demand gap. The current OPEC production capacity surplus is estimated at 3 mbd, which we expect to be fully utilised in the near term.

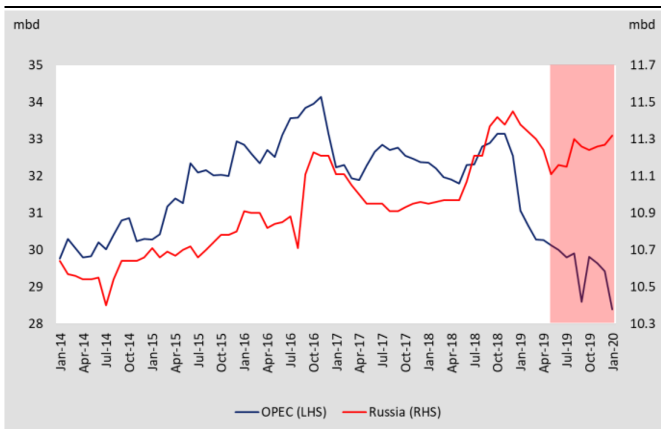
To summarise, we expect the price war to result in the collapse of several US shale companies. But before this happens, we expect Brent oil prices to hover at c.US$30/bbl until to a point when US oil production drops by c.3 mbd. Only then do we expect oil prices to recover.

Figure 1: Global oil demand growth



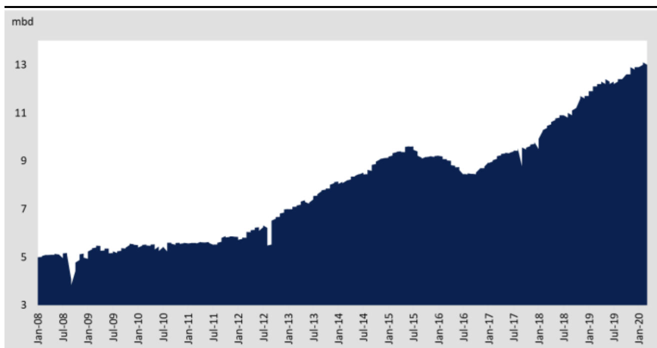
Source: Bloomberg, KGI Research

Figure 2: OPEC and Russia oil output



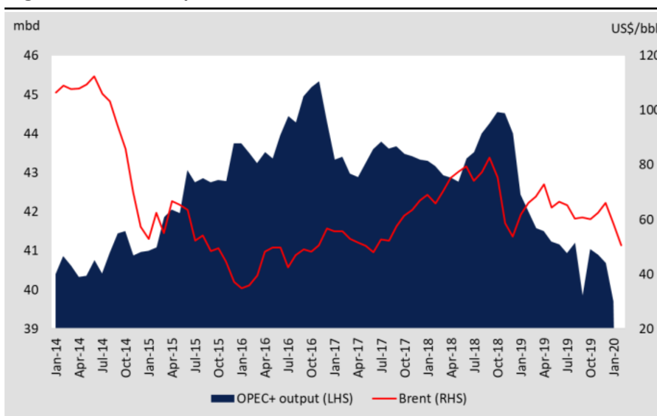
Source: Bloomberg, KGI Research

Figure 3: US oil production remains at record highs



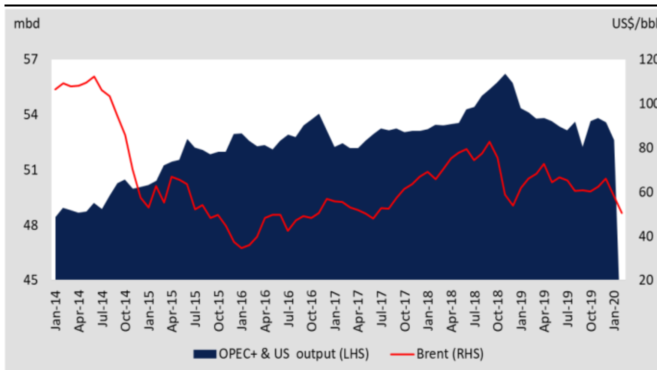
Source: Bloomberg, KGI Research

Figure 4: OPEC+ output



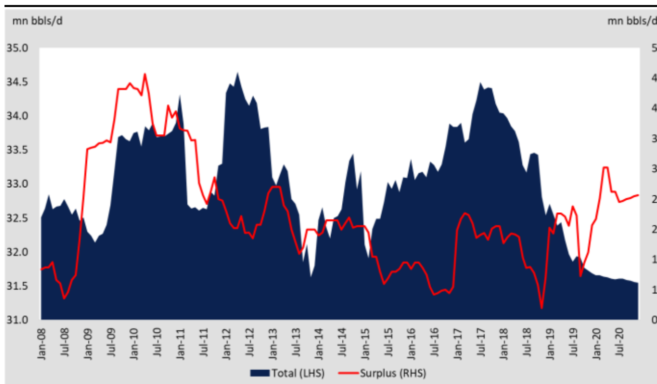
Source: Bloomberg, KGI Research

Figure 5: OPEC+ and US output



Source: Bloomberg, KGI Research

Figure 6: OPEC production capacity and surplus



Source: Bloomberg, KGI Research

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