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Shifts in resid markets provide potential margin uplift for refiners

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In the second half of 2015, the price of residual fuel oil (resid) declined markedly relative to crude. If sustained, it could result in growing margins for complex refiners.

Why and how the price of residual fuel oil shifts

Residual fuel oil is a byproduct of the refining process, and typically prices at one of two levels according to its value in marginal uses: a lower substitution value, where it displaces natural gas in power plants that can switch, and a higher conversion value that it achieves when complex refiners are using it as a feedstock for other products.

Global resid pricing is affected by both supply and demand. Changes in supply primarily come from changes in the global crude slate, and in overall refinery utilization. Heavier crudes and higher utilization result in more resid production. Changes in demand come from two main areas: changes in overall refining conversion capacity, such as coking and cracking which consume resid as a feedstock, and changes in end-use segments, such as marine fuel, asphalt, and oil-fueled power generation.

Before 2009, the resid market was over-supplied, as high refinery utilization and a heavy global crude slate produced more resid than refinery converters and end-users could absorb. As a result, resid priced at its lower substitution value. That results in wide price differentials between light and heavy products, and creates margin opportunity for refiners who can convert the resid to lighter components.

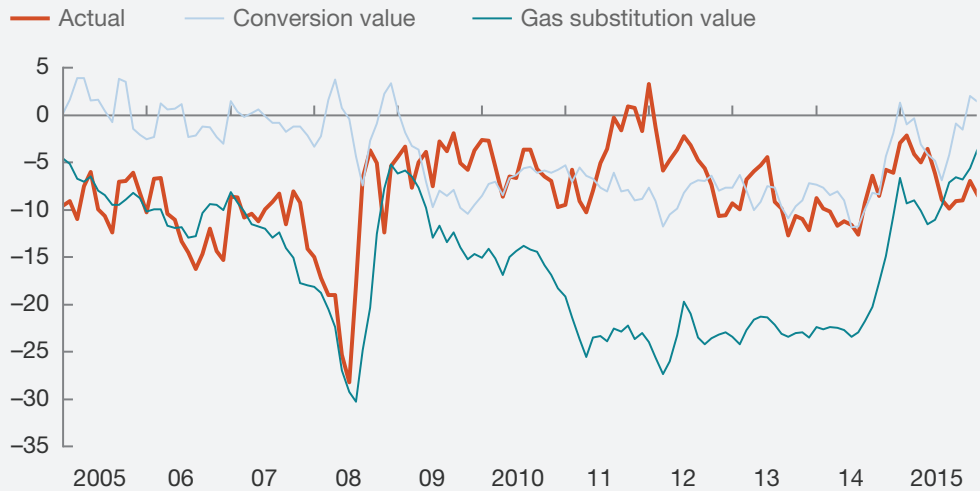
Since 2009, the global resid market has been tight and resid priced at its value as a conversion feedstock. This tightness was caused by a lightening global crude slate, high investment in new refinery conversion capacity, and high fuel oil demand in Japan for power generation post-Fukushima. This higher conversion pricing results in narrow light/heavy differentials and low margins for complex refiners using it as a feedstock.

In late 2015, the price of resid appeared to revert to the lower substitution level. For the last four months of 2015, resid prices were more than \$5 a barrel lower than would be expected if the market were still tight (Exhibit 1). This switch was partly obscured by very low crude prices, which somewhat masked the light/heavy differentials.

Exhibit 1

Global residual fuel pricing mechanism has shifted in late 2015

Residual fuel oil price,¹ \$/barrel (differential to Dubai crude in Singapore)



¹2% Sulfur fuel oil Singapore-Dubai crude delivered to Singapore.

McKinsey&Company | Source: Energy Insights; Platts

The switch to substitution price caused by depressed demand

Recent trends in the balance between global supply and demand for resid suggest that the primary cause of the shift back to the substitution price level was a change in demand.

Demand for resid has fallen in some key markets. The introduction of tighter marine residual fuel oil quality specifications in January 2015 caused a shift to marine gasoil. This has added to the regional oversupply of residual fuel oil in Europe, and has caused exports (primarily to Asian markets) to rise by around 150,000 barrels a day.

At the same time, demand in Asia contracted. China's industrial slowdown and the greater availability of natural gas contributed to a 10% overall reduction in fuel oil use. Also, looser crude import restrictions on China's non-state refiners since July 2015 have allowed many of these smaller, independent refineries to switch from resid as their primary feedstock (Exhibit 2). Demand in Japan has also fallen as some nuclear capacity returned and displaced fuel oil-powered generation.

The growing surplus in Asia translated into higher stocks of fuel oil and falling prices, although by the end of 2015 we observed some migration to residual fuel oil, especially in the Korean power sector.

Outlook and implications

If the price of resid stays at its substitution level for a sustained period, that will be very advantageous for more complex refiners. In this scenario, resid prices will remain about \$5 a barrel lower than they would otherwise be with crude at around \$30 a barrel. This will add several dollars per barrel in contribution margin to refiners that can run convert heavy crude.

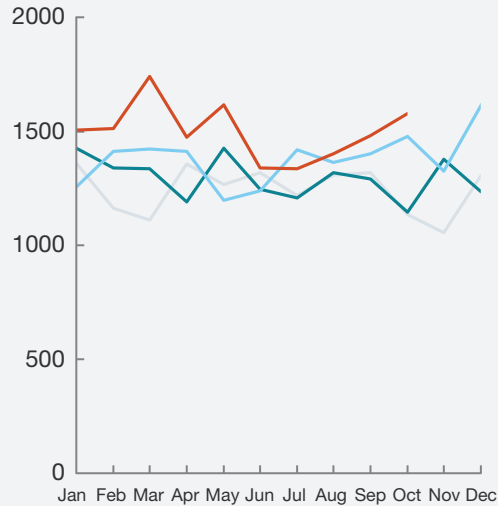
At higher crude prices, the advantage to refiners could be much more pronounced, as the absolute value of crude prices has a strong magnifying effect on the light/heavy differential.

Exhibit 2

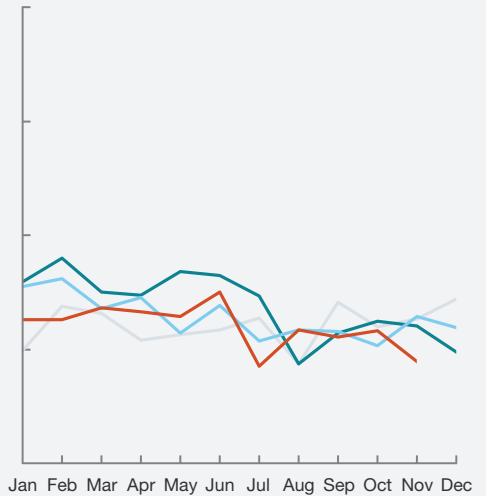
Europe is exporting more fuel oil and China is using less.

— 2012 — 2013 — 2014 — 2015

OECD Europe residual fuel oil exports,
thousand barrels/day



Chinese residual fuel oil demand,
thousand barrels/day



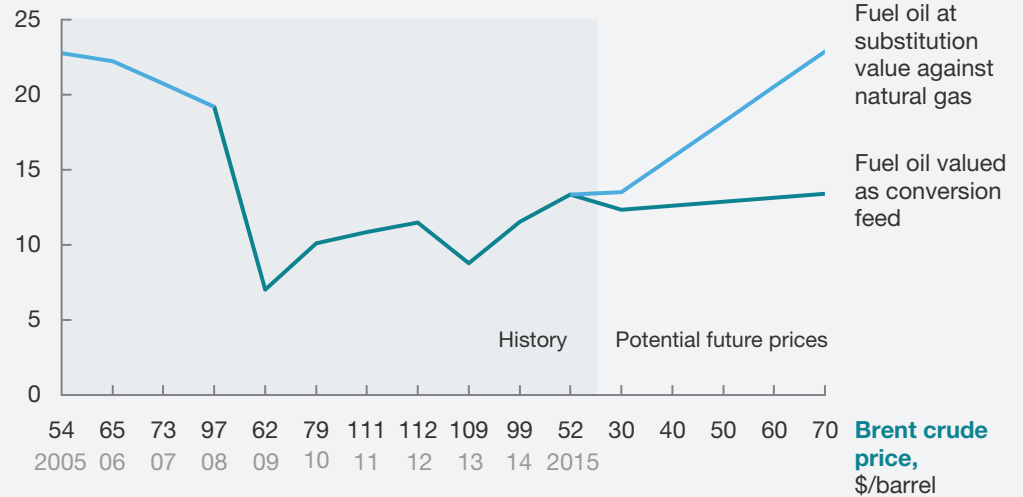
Source: International Energy Agency Monthly Oil Data Service, 2015; analysis of data provided by Energy Insights (a McKinsey Solution)

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Exhibit 3

A modest increase in crude oil prices could lead to higher refiner margins.

Maya coking margin in US Gulf Coast, \$/barrel



McKinsey&Company | Source: Energy Insights; Platts

If global crude prices were to recover to the \$60/barrel range, coking margins could improve by over \$10/barrel (Exhibit 3). This would add significantly to overall refining profitability,

and likely more than offset any deterioration of margins from growing oversupply and lower capacity utilization.

It is too early to assess if the current state of resid pricing will sustain. There are several factors could push resid back to conversion-based pricing in the near- to medium-term. These include a return to higher industrial growth in China, a stalled return of nuclear plant operations in Japan, and new refinery conversion capacity coming on line. All of these bear close observation over the coming months.

Also, given the short time that prices have been at the lower price mechanism, it is likely that the market remains close to the tipping point between the two mechanisms. Small changes in the resid balance could cause the pricing basis to switch again. □

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