

Measuring the Quality of the Crude Oil Supply and its Impact on Basis Differentials

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Overview

There are several qualitative indications of declining quality of the crude oil supply over the last decade. Production decline rates in mature basins producing light, sweet crude oils are known to be substantial. New conventional sources appear to be heavier and of higher sulfur content. Production growth to meet forecast demand will come from these new sources suggesting a decline in refinery feedstock quality. The contribution from unconventional resources, such as oil sands, is expected to grow further contributing to overall quality erosion. Further to this observation, we observe a growing quality-driven basis differential between heavier, sour crude oils and light, sweet crude oils suggesting increasing competition by refiners for easier to refine feedstock.

Methods

This article describes a global reserves and production model coupling production forecasting with quality metrics for the largest fields and traded blends. New sources with peak rates and oil quality metrics are incrementally added to the global production stream based on announced start-up timing to project the availability of oil and oil quality for the near future. The model is back-tested against historical crude quality and production data to insure its accuracy. A forecast of crude oil supply quality as a function of API gravity is presented.

Historical price differentials are correlated with quality metrics for actively traded crude oils. The differentials are then cross-correlated with a measure of the global industry's refining complexity, a measure of industry's capacity to refine poorer quality feedstock into high value products.

Results

We show how the quality-driven basis differential has grown as the quality of the crude supply has declined, relative to the industry's complexity.

Conclusions

The basis differential for selected crude oil blends relative to benchmark crude oils for a refining industry is growing. While the refining industry capacity is growing to meet rising demand, refining complexity remains relatively low. This disconnect in supply quality relative to refining capability is driving an increase in quality-driven basis differential.

References