

Equalization Model Overview

The equalization model is a multi-variable regression model that is used to calculate the sulphur and density penalty for light and medium Canadian conventional crude streams. The fundamental assumptions underlying the model is that price of Canadian crudes is determined by a world market that is represented by various international reference crudes, by the quality of the crude, and by uniquely Canadian factors like exchange risk and pipeline allocations, extra paperwork, and possibly some perception of supply security risk. It is further assumed that these factors apply equally to all grades of Canadian light and medium conventional crude.

While these factors are well understood philosophically, they are difficult to analyze in the real world where there is normal market fluctuations in price, and where factors that are not considered in the equalization may intrude into the value of any particular crude.

The approach that the Canadian industry has taken has been to collect market data for the price of various crudes (the crude basket) over a 6 month period and using monthly averages of the price, and assumptions of the quality of those crudes, arrive at a calculated sulphur and density penalty using a multi-variable linear regression technique. In this approach it is assumed that sulphur and density are sufficient to characterize the differences in price that result from differences in the quality of the crude.

The basket of crudes that is used is a diverse mix of crude streams from the Canadian market, the US Midwest market, and the US Gulf Coast market. Specifically the basket includes Canadian Light Sweet (MSW) at Edmonton, Central Alberta (CAL) at Edmonton, a Hardisty medium sour stream (MSO), Light Sour Blend (LSB) at Cromer, and Midale (MSM) at Cromer. US Crudes in the basket include West Texas Sour (WTS) at Cushing, Heavy Louisiana Sweet (HLS) at St James, Mars at St James, Poseidon at St James, Eugene Island at St James, and the Argus ASCI Index at St James. The Argus ASCI index is a blend of Mars, Poseidon and Southern Green Canyon crudes but it appears to provide a credible pricing point for USGC crudes. West Texas Intermediate (WTI) and Light Louisiana Sweet (LLS) are also in the basket but they are treated as reference crudes for their various markets – see below.

Since each of the crudes is priced at a location, transportation can be a significant factor in their relative prices. To remove this variable from the analysis, each of the crudes is adjusted to reflect the transportation cost to move it to Chicago. The Chicago market is used as the clearing market for Canadian crude pricing because it is a credible location where USGC coast crudes and Canadian crudes can compete directly.

With the data collected, the model can be set up with the sulphur and density of each crude being variables that can explain some of the price difference between the various crudes at Chicago. To ensure that the Canadian crude pricing is not unduly influenced by the border or issues around the limited pipeline options to exit the Canadian market, a variable is introduced that allows the analysis of any systematic differences between Canadian and US crude.

During the development of the current crude system it was recognized that the world crude price had a tremendous influence on the relative value of various crudes. To account for this, WTI was used as a

variable in the analysis so that the variation in pricing between the various crudes would be the focus of the analysis, not the variations in the actual underlying crude price. This worked well as long as WTI represented the underlying world crude price but recently WTI and the US Gulf Coast pricing has deviated making the differences in the US Gulf Coast crudes and Canadian crudes much more influenced by the WTI problems than by quality differences.

To bring the US Gulf Coast crudes back into a relationship with the Canadian crudes, it was recognized that the US Gulf Coast crudes now behave in a predictable manner against LLS (a light sweet crude that trades in a predictable relationship with Brent, the international reference crude) so it was decided that LLS would provide a more appropriate reference point for USGC crudes than WTI. Using LLS as the reference for the US Gulf Coast crudes, and WTI as the reference for the rest of the basket, resulted in the sulphur and density providing the bulk of the difference in the crude prices for all of the crudes in the basket, and again provided a credible equalization value for the sulphur and density penalty.

Within the basket, WTI has never been a part of the actual basket of regressed crudes. Its role has been as the reference crude and regressing it against itself (treating it as a dependent and an independent variable in the same regression) would bias the results. With the use of LLS as the reference crude for the Gulf Coast crudes, it was concluded that its continued use as a crude in the regressed basket would also not be mathematically appropriate. It was removed from the regressed basket and is now only used as a reference crude.

With the loss of LLS from the basket, the actual crudes in the regression basket were reduced by one. This created some concerns that the basket used for regression had dropped below the minimum threshold for good statistical analysis and that it would lead to less certainty in the calculated result and more volatility in the actual equalization values. To offset this, it was decided to incorporate the Argus ASCI index as another price point for US Gulf Coast crudes. While this index is made up of several crudes that are already in the Equalization basket (plus one crude that is not in the basket), its price behaviour appears to be somewhat different from the price behaviour of the underlying crudes so it was concluded that it does provide a valid price reference point.

In conclusion, the equalization model is a mathematical tool that attempts to allocate the difference in the price of Canadian light and medium conventional crude to the sulphur and density of those crudes. It does not attempt to influence the price of individual crude streams – that is set by market. Its role is merely to provide a mechanism to make the smaller price adjustment for the individual deliveries to those streams.

In an effort to provide a large enough sample to fairly value sulphur and density, selected US crudes that could compete with Canadian crudes, are included in the analysis. A statistical regression technique is used to provide the best values for the sulphur and density penalty.