Potash Pricing Methodology

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Potash Pricing Methodology Discussion

There is no potash futures or swap market available; however, the price of potash is highly correlated with the values of other fertilizers and energies. As a result, the Margin Coverage Option (MCO) plan of insurance uses a multiple cross hedge to price potash, creating a synthetic price for the fertilizer commodity. Projected and harvest prices are calculated by a linear combination of other correlated fertilizers and energy inputs. The constants within the linear combination are based on historic regression coefficients. These coefficients in turn are used on the price of futures contracts to derive a projected and harvest price for potash. The methodology is similar to that utilized by RMA to for Peanut Pricing which accounts for the leading drivers of both supply and demand.

The price of potash is highly correlated with the values of other fertilizers and energies. As part of the three main macro nutrients N-P-K, demand for potash which contains potassium (K) closely follows the other nutrients, nitrogen (N) and phosphate (P). These are commercially distributed through the fertilizers of urea and DAP, respectively. There are two common variants of Potash, Muriate of Potash (MOP) and Sulphate of Potash (SOP). The latter is produced chemically and at a higher cost. MOP is produced by mining and is the most used form of potash in agriculture. Most of the potash used in the United States is MOP that is imported from mines in the Canadian province of Saskatchewan. The process of mining and refining of potash is very energy dependent with 80 percent of the energy used in Canadian production coming from natural gas and the remaining 20 percent from electricity.[1] As a result, major supply side shocks can be observed in the natural gas futures market, while demand shocks follow the Urea and DAP futures markets.

Data

Four datasets were used that include three futures prices. The futures prices all use the next May contract for a futures price, except when the contract has no open interest, then the price for the next nearest contract with open interest is used. The trading volume of the contract was not taken into account due to the no arbitrage assumption, meaning that if the futures price was mispriced the market would've reacted accordingly.

Price analysis was conducted using the Potash National Average DTN Fertilizer Index, a weekly national average of retail prices collected from around 300 retailers.

[1] https://gensourcepotash.ca/potash-mining/.

The urea prices are the futures value for the nearest contract to May with open interest for granular Urea FOB to the U.S. Gulf as traded on CME with code UFV. Prices are collected and filtered to match potash report dates.

Similar to urea, the DAP prices are the futures value for the nearest contract to May with open interest for DAP FOB to New Orleans, LA (NOLA) as traded on CME with code DFN. Prices are collected and filtered to match potash report dates.

For natural gas, prices represent the value of the next May contract of the Henry Hub Gas Futures as traded on NYMEX with code NG. These futures are closely connected to the spot market and are a heavily utilized energy hedge. Futures prices are filtered to match potash report dates.

All datasets are merged with the report dates for the potash data for time consistency. Because the potash data represents a spot price, indicator variables are also created for the month of observation to capture cost-to-carry and seasonal trends. Any weekly data where at least one of the observations is not available is removed from the dataset.

Model

The price of potash is highly correlated with the values of other fertilizers and energies. As part of the three main macro nutrients N-P-K, demand for potash which contains potassium (K) closely follows the other nutrients, nitrogen (N) and phosphate (P). These are commercially distributed through the fertilizers urea and DAP, respectively. As such, in the following model potash demand is accounted for by including futures values for urea and DAP as regressors. On the supply side of potash, natural gas futures are included as the primary expense in potash production. The regression model is:

$$P_{t,i} = \beta_0 + \beta_1 f_{t,i}^{Urea} + \beta_2 f_{t,i}^{DAP} + \beta_3 f_{t,i}^{NG} + \beta_{4-12} t + \varepsilon_i$$

where

$P_{t,i}$ is the ith AMS announced average spot price for Potash in month t;

$f_{t,i}^{Urea}$ is the ith futures price for Urea in month t;

$f_{t,i}^{DAP}$ is the ith futures price for DAP in month t;

$f_{t,i}^{NG}$ is the ith natural gas futures price in month t.

It is worthwhile to note that implementation of the model for setting a price on potash does not require the seasonal components (β_{4-12}). These terms will cancel out in the difference calculation between the harvest and projected costs.

Published Results

The projected and harvest price of potash will be published during the same time as the other inputs. The published potash price uses the published prices of DAP, urea, and natural gas to compute its final price. This is shown as:

$$P_{Potash} = \beta_0 + \beta_1 P_{Urea} + \beta_2 P_{DAP} + \beta_3 P_{NG}$$

where

P_{Potash} is the published price of potash;

P_{Urea} is the published price of urea;

P_{DAP} is the published price of DAP;

P_{NG} is the published price of natural gas;

β_0 is the intercept coefficient;

β_1 is the slope coefficient associated with urea;

β_2 is the slope coefficient associated with DAP;

β_3 is the slope coefficient associated with natural gas.

Due to potash not having a futures market and therefore having no associated options market there is no meaningful data source to determine the volatility of the price of potash. Potash will not have a published volatility measurement alongside it that the other inputs will have. In the ratemaking process, the volatilities of the other inputs are used in creating potential prices for themselves. This in turn will create volatility within the pricing of potash due to how the price of potash is found.

The specifications for the price discovery periods and contract commodities by commodity can be found in the Margin Coverage Option Price Provisions (MCOPPs) for MCO.