DecisionNext

Modeling Methodology

Cutout Model

DecisionNext provides multiple forecasts for each data series. For beef cuts they are: Machine Learning, CME, Fundamentals, and Cutout.
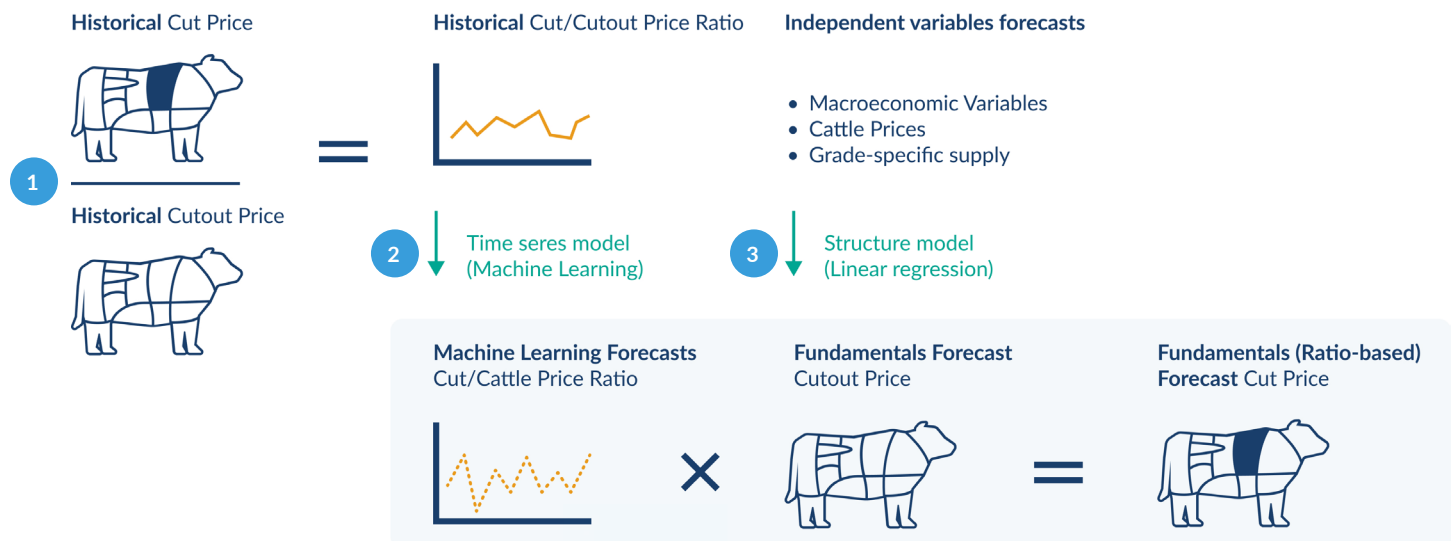
The Cutout Model is only available for Beef. The Cutout Model is a ratio based model that takes the historical graded beef prices divided by historical graded cutout prices to get a historical ratio of the two items. We then forecast the ratio, create a forecast of graded cutout prices influenced by macroeconomic variables, and multiply those to get a forecasted beef price.

This document explains the methods and factors driving the Cutout beef price forecasts. The approach combines an understanding of the demand and supply for beef with cut specific demand factors.

DecisionNext has developed this technique with a similar intent to standard cattle and beef ratio models, which link cattle and beef prices. However, the performance gained in predicting beef prices through cutout values is highlighted by the underperformance of cattle-centric models during volatile periods of changing herd dynamics and macroeconomic conditions. This modeling technique moves beyond the idea of livestock markets driving prices toward a greater recognition of what drives beef prices today.

The Cutout Model is built as follows:

- **Step 1:** Measure the ratio between the historical graded beef cut prices and the historical graded cutout prices to get a historical ratio of the two items.

- **Step 2:** Forecast the ratio of the beef cut to cutout prices using Machine Learning (ML) techniques.

- **Step 3:** Generate a Fundamentals forecast of graded cutout prices using macroeconomic variables.

- **Step 4:** Multiply the forecasts generated in step 2 and step 3 to generate the Cutout forecast for beef cut prices.

Historical Cut Price

Historical Cut/Cutout Price Ratio

Independent variables forecasts

- Macroeconomic Variables
- Cattle Prices
- Grade-specific supply

Historical Cutout Price

2 — Time seres model (Machine Learning)

3 — Structure model (Linear regression)

Machine Learning Forecasts Cut/Cattle Price Ratio

× **Fundamentals Forecast** Cutout Price

= **Fundamentals (Ratio-based) Forecast** Cut Price

Further defining steps 2 & 3:

Step 2: "Forecast the ratio of the beef cut to cutout prices using Machine Learning (ML) techniques"

What is the Machine Learning forecast of the beef cut to cutout ratio ?

It is a forecast generated using the latest variable selection tools that select the optimal number of historical lags and seasonality components to generate a forecast. It is really good at picking up patterns that change over time. Note this forecast of the ratio is slightly different from the ML forecast for cut and cutout value itself as those also include the option to select other price series. The ratio forecasts only select historical values of itself and seasonality because we found it to be a more reliable predictor for the ratio values.

Step 3: "Generate a Fundamentals forecast of graded cutout prices using macroeconomic and cattle variables"

What is a Fundamentals forecast, why is it different from other techniques?

The technique, called Structure, is used to generate the Fundamentals forecast. A Structure forecast can be considered a two-part pooled forecast. The first step for building the forecast model is to manually or statistically select the appropriate variables to explain the historical graded cutout values. Then estimate the "weights" or coefficients for those series. Next generate or select forecasts for each of the Structure model input variables. The final step is to multiply the forecasts of the input series by the weights to result in a final forecast for the series of interest, which here is the cutout value.

A DecisionNext Fundamentals forecast uses the Structure technique which differs from other standard techniques because it can combine information from users' opinions of input variables, as well as include forecasts from publicly traded futures markets, such as the live cattle futures market. Futures markets are typically pretty smart and by incorporating that information and adding to it with our own models we can improve upon it by focusing it toward beef prices as opposed to just cattle values. The technique can take the best of both worlds, using historical realized outcomes and the market's perception of where related prices are headed.

What are the input variables and forecast sources for the graded cutout?

Input variables	Forecast sources
Cattle price	CME live cattle futures curve
% Cattle graded choice/select/prime Grades included vary by Cutout grades	ML forecast
Personal disposable income	ML forecast

FAQ:

Q: Why use the live cattle futures curve to forecast the beef cutout value and not just use cattle values?
A: We have a beef price forecast using just the cattle price (actually we have two), see the CME and Fundamentals forecast.

Q: Why use the live cattle futures curve to forecast beef cutout value and not Machine Learning?
A: Futures market is pretty good at seeing structural shifts (shifts herd size) better than just historical data alone. Using the futures forecast as an input to a forecast allows for combining the information contained in futures markets and mapping it to how beef and cattle correlate (and do not correlate) over time.

Q: Why not just use Machine Learning to forecast beef cutout values?
A: We do have that, see the ML forecast. But the reason is why not do both? ML forecasts tend to be really good at picking predictive correlations over time as well as seasonality. But they are not as good when the market is about to or just went through large supply shifts, such as those related to changes in the herd size. By having access to both ML and a Fundamentals (Structure) graded-Cutout beef forecast we can observe where supply might be driving prices and where demand might be pushing or holding back prices.