

# MRI Explained

July 15, 2020

## MRI Inputs

**Historical Settles** - the average daily spot price from past years.

The logic for using Historical Settles goes something like this. The forward market price is a forecast of where the daily markets will average. Take August 2019 as an example. The market is trading at \$75.00/mwh so you can assume the market expects the dailies in August to average \$75 or higher.

Our current algorithm compares the market to the forecast and uses those deltas (plus other inputs) to drive rank. V 2.00 will also continue to use a **modified** version Market vs Forecast deltas but we'll incorporate two new metrics for determining BIAS:

### **Market Range**

The market can swing up and down over the Historical Period. Where that market sits relative to the historical range can influence BIAS. If a market is at an all-time high it is more of a short candidate than long (don't buy the top, don't sell the bottom). APT2 incorporates the Market Range by assigning Long and Short Points for each traded product.

### **Market vs Historical Settle**

If the market is trading higher than where prices have historically settled (average spot price for a derivative) it becomes more of a short candidate than long. The opposite is equally true, if the market is trading at the low range of historical settles, or beneath, it is a long candidate. Long and Short points are assigned based upon where the current market prices are relative to the Historical Settle.

### **Market vs Forecast**

A BUY signal is generated if the forecast is higher than the market and, likewise, a SELL signal arises whenever the Market is greater than the forecast. The degree of buying and selling is determined by the relative distance of the two prices. If the Delta (Market-Forecast) is at an

all-time high a stronger Sell signal is sent than if it is barely over. Market vs Forecast will also incorporate a “Forecast Validity” component.

### **Forecast Validity**

This is a sub-process that is applied during the Market vs Forecast calculations and tests the Forecast Validity. A “valid” forecast is one that falls within the Historical Settle Range; the forecast becomes less valid if it is outside of the range. It is a bold prediction to forecast something that has never occurred, hence it is less valid.

## TradeRank Output

1. Deriv - identifies the derivative type
  - a. O - Outright
  - b. S - Spread
  - c. R - Roll
  - d. H - HourType
2. Agg - identifies the aggregation level
  - a. M - monthly
  - b. Q - quarterly
  - c. Y - annual (yearly)
3. Hub - two-digit hubcode identifying the location
4. HT - HourType, two letter code
  - a. HL - Heavy Load (Markettype = 1)
  - b. LL - Light Load (Markettype = 2)
5. Period - the forward period
6. Date - the date the forward period traded
7. Metric - the measurement basis
  - a. Power Price
  - b. Heat Rate
  - c.
8. Forecast - the forecast value compiled by APT
9. Market - the market value compiled by APT
10. Spot Min - the lowest Spot value
11. Spot Avg - the average Spot Value
12. Spot Max - The Maximum Spot Value

# Computing MRI Points

APT2 will generate two point types for each sub-group plus the overall rank.

**Short Rank** - this computes the desirability of shorting (selling) a derivative

**Long Rank** - this computes the desirability of buying a derivative

## Four Sources of Points

There are three sources of points plus an aggregate of all three-four in total. All will be displayed in the Summary Table with their own Ranks and Metrics.

### Market Range (MR)

This measurement compares the current forecast to where it has traded within the Historical Period. The Historical Period is the number of historical forecast dates used in APT2. The logic is a current market price that is at an all-time high is a better short candidate than one that is at an all-time low. Market Range is the most important of the three Ranks.

**Step 1** - Compute the Market Price Min, Max, Average, and Market Range for all derivatives.

**Market Range** = Max-Min; this is the range of traded values in the Historical Period

**Step 2** - Distance From Min (DFN)

Current Market Price - Min

**Step 3** - PFX - this is the % distance from the Min; a 1.00 would mean the current price is the highest ever

DFN / Range

**Step 4** - Lookup the Market Range Points. Using apt\_points\_market, find the correct Lpts and Spts based upon PFX

From	To	Lpts	Spts
0	0.01	80	10
0.01	0.02	100	1
0.02	0.03	99	2
0.03	0.04	98	3
0.04	0.05	97	4
0.05	0.06	96	5
0.06	0.07	95	6
0.07	0.08	94	7

Find the factor by using the FROM and TO range against PFX

All returned values will be between 0 and 100. Return the Long and Short points into two columns:

MRL - Market Range Long

MRS - Market Range Short

## Market vs Spot (MVS)

Market Range compares the market to market by computing how far the current price is from Market highs and lows. Market vs Spot does just that, compares the current market price to the historical spot price. The theory goes that if the market ever trades outside of the historical spot range its anomalous and should be faded. For example, if the highest the spot ever reached in May was \$72.00 and the market is trading \$96, there better be a good and obvious reason; if not it should be sold short.

**Step 1 - Compute Spot Metrics** - Compute the Min, Max, Average, and Range for all spot products. Save this data to a table as it will be used again in the Forecast ranks. All products should be aggregated on Period (M, Q, or Y) by Hub and Hour Type (HL or LL). Do not aggregate by year, merge all years into the Spot Metrics. For example, the May SP HL Spot would include the years 2009-2018. That would be the set of metrics for all May SP HL products.

**Step 2 - Match Spot to Market** - Match Spot and Market on hub, hour type, period (Month, Quarter, or Year), and market type (PP or HR).

**Step 3 - Compute Deltas** - Compute deltas between Market Price and Spot Min (DFN) and Spot Max (DFX).

DFN - Delta From Minimum = Market Price - Spot Minimum

DFX - Delta from Maximum = Spot Maximum - Market Price

NOTE: observe the two formulas, this ensures the result will usually be positive. It will be negative only if the Market is outside of the Spot Range (where Spot Range = Spot Max - Spot Min)

**Step 4 - Compute Percentage Deltas** - Determine the % deviation from the Min (PFN) or Max spot price (PFX)

PFN - Percent From Minimum =  $DFN / \text{Spot Range}$

PFX - Percent From Maximum =  $DFX / \text{Spot Range}$

**Step 5 - Lookup Spot Points** - use the input table - apt\_points\_marketspot to assign the Long and Short Points.

ID	From	To	Points
1	-99999	0	0
2	0	0.05	5
3	0.05	0.1	10
4	0.1	0.15	13
5	0.15	0.2	16
6	0.2	0.25	19
7	0.25	0.3	22
8	0.3	0.35	25

Apply the lookup to both PFN and PFX and return the appropriate Points into two columns:

MSL - Market Spot Long points

MSS - Market Spot Short points

## Market vs Forecast(MVF)

This measurement is similar to what APT1 performed, but with a few twists to be explained below. The objective is to find the relative forecast bias with respect to the market price. Is the forecast over the market? What does that mean? APT2 will generally suggest shorting if the market > forecast and buying if its < market. Generally, because APT2 incorporates Forecast Validity checks. These are done against the Spot Range. If the forecast > Spot Max or < Spot Min the confidence around the forecast is reduced.

**Step One - Compute the MF** - Compute the Market - Forecast Delta (MF) for all products and all dates.

MF = Market - Forecast

**Step Two - Compute a Min, Max, and Average MF** against all dates for that product.

MFx = Maximum (Market - Forecast)

MFn = Minimum (Market - Forecast)

MFa = Average (Market - Forecast)

MFr = MFx - MFn = (Market - Forecast) range; in other words, the highest and lowest deltas

**Step Three - Compute Bias** - If Forecast > Market, Bias = Long; if Forecast < Market, Bias = Short. In other words, if the forecast was perfect you'd always sell when the market was over and buy when it's under.

**Step Four - Compute Bias** - If Forecast > Market, Bias = Long; if Forecast < Market, Bias = Short.

Short Bias = -1; assign a -1 to Short Bias

Long Bias = +1, assign a +1 to Long Bias

~~**Step Five - Compute DFX** -  $DFX = \text{Distance From Max} = MFx - MF$~~

**Step Six - Assign the Long MF Points (MFL)** - If Bias = +1 (long),  $MFL = (MF / MF_n) * 100$ . Place these points in a separate column, they will be used later. For the MFL column, if Bias = -1, assign a zero, not NULL.

**Step Seven - Assign the Short MF Points (MFS)** - If Bias = -1 (short),  $MFS = (MF / MF_x) * 100$ . Place these points in a separate column, they will be used later. For the MFS column, if Bias = +1, assign a zero, not NULL.

## Forecast Confidence Factor (FCF)

We define our confidence in the forecast around where it sits relative to where historical spot prices settled. If we're forecasting May 2019 at \$40 and the highest spot price we say for May was \$25 we'd be out of the Spot Range and our confidence in the forecast would be diminished. If we were at \$25.50 we'd have more confidence in the forecast than at those \$40s, so confidence is relative.

**Step One - Merge Spot and Forecast** - Match on Hub, HT, Month, and Market

**Step Two - Compute Deltas** - Compute distance from Spot Max (DFx) and Spot Min (DFn)

$DFx = \text{Distance of Forecast from Max Spot Price} = \text{Max Spot Price (SPx)} - \text{Forecast (F)}$

$DFn = \text{Distance of Forecast from Min Spot Price} = \text{Forecast (F)} - \text{Min Spot Price (SPn)}$

**Step Three - Select Which Delta (DFn or DFx = UsedDelta)** - Pick the lowest absolute value

IF (ABS ( DFn ) > ABS ( DFx ), DFn, DFx )

**Step Four - Compute RangeFactor** - This will provide the lookup value to be used in setting the Confidence Factor

Range Factor = UsedDelta / SpotRange

Spot Range = Spot Max - Spot Min

**Step Five - Lookup the Confidence Factor** - Use input file apt\_points\_confidence

From	To	ConfFactor
.9999	0.005	0.8
0.005	0.1	0.7
0.1	0.25	0.6
0.25	0.5	0.4
0.5	0.75	0.3
0.75	1	0.2
1	99999	0

Return the ConfFactor for the given RangeFactor. For example, if the RangeFactor = .37, return 0.4; if it's 1.9, return 0.00.

**Step Six - Modify (override) the Confidence Factor** - If the forecast is within Spot Range, set ConfFactor to 1

For Forecasts where .... Spot Min <= Forecast <= Max, set ConfFactor to 1.00

**Step Seven - Compute Final Forecast Points using ConfFactor** - Multiply MFS and MFL by the Confidence Factor from Step Six (these are the final values computed from Market vs Forecast process.

MFS final = MFS \* ConfFactor

MFL final = MFL \* ConfFactor

Combine All Points (long and short)

Take the point results from the three process and combine into Total Short Points and Total Long Points

Total Short Points = MRS + MSS + MFS (final, after step seven)

Total Long Points = MRL + MSL + MFL (final, after step seven)

**MRI=Long Points - Short Points**