

ECO Explanatory Notes

Bubble Runs

ECO Forecast Report		
Item	Description	Details and Use
Expected Return	<i>Expected return of bubble process</i>	Expected return on the bubble process considering the return on the normal price, the correction (crash or rally), and the return when there is no correction.
State	<i>Is the bubble positive or negative</i>	A positive bubble will eventually crash and a negative bubble will eventually rally.
Action (Buy/sell/hold)	<i>Recommended action based on probability and size of correction</i>	“Expected Return” and “Lambda Coefficient Ratio” should have the same sign. If they do not, then the results should be considered inconclusive.
Hedge	<i>This is the optimal fractional amount to invest in the asset</i>	The optimal hedge obtained by the optimal Kelly is the hedge times the asset. Values greater than one suggests using leverage. Values less than zero means short the asset by the specified amount.
Correction Prob	<i>Probability of bubble bursting</i>	Probability of the correction. This value times the bubble size gives an expectation of the correction and is useful in evaluating one’s risk tolerance.
Correction Size	<i>Expected return if bubble bursts</i>	Useful to calibrate with one’s risk profile, i.e., how much risk one can tolerate. It can be different from the mispricing because the expected correction will be a percentage of the mispricing.
Prob Trend	<i>How much the bubble probability has been changing</i>	The probability of a correction may be increasing or decreasing depending on this value’s sign and it may or may not reinforce the other metrics’ results.
Mispricing	<i>Is asset over/underpriced</i>	The percentage amount that the price is from the neutral price (assumed here to be the normal price).
Return No Correction	<i>Expected return if the bubble doesn’t burst</i>	Expected return if no correction happens. Take this into consideration if the probability of a correction is relatively small.
Normal Return	<i>Return of the normal price that the actual price oscillates about</i>	The normal price return is a long-term price that the actual price oscillates about. It is a return that one should expect over the long-term.

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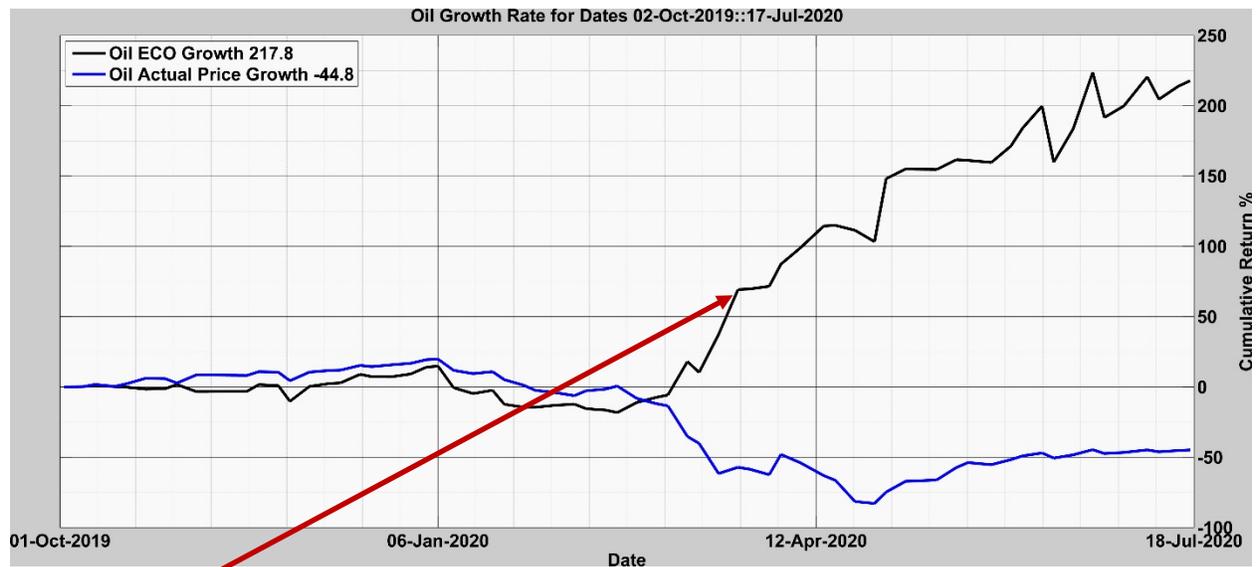
Using ECO scores

1. Determine the asset mispricing and whether it is in a state of pending crash or rally.
2. Digest the buy/sell action.
3. Confirm the action.
 - a. Do the lambda and the expected return values have the same sign? If they do not, then the model output does not warrant a buy or sell and the action should be neutral or 'hold.'
4. How much risk is there?
 - a. Ascertained in part from the mispricing. The expected correction back to the normal price may be more or less than the mispricing which is determined by the bubble size.
5. How likely is the bubble to burst?
 - a. Higher bubble probabilities indicate a higher likelihood of the bubble bursting.
6. Check the acceleration of the bubble probability for determining if the probability is increasing or decreasing.
7. What happens if the bubble does not burst?
 - a. We already have an expected return. With the 'expected return no correction' value, we also have a return expectation if the bubble does or does not correct. A risk manager can therefore assess how much risk to take in buying or selling an asset using the 'expected return no correction' values.
 - b. Of course expectations will not correspond exactly with actual returns. Ranking assets with higher expected returns however typically corresponds with actual higher returns.
8. Finally, one can compare the amount of volatility contributed by jumps to the total volatility of the asset price.

ECO example

The ECO process entails calibrating three model parameters to obtain optimal values. The model is run for a few periods (3 to 6 months) over different values of the parameters. These parameters are expected to hold for some months as the price process goes through a rather stable regime. A regime is stable if the price stochastics do not change considerably. ‘Stable’ does not imply that the price process goes through time without volatility.

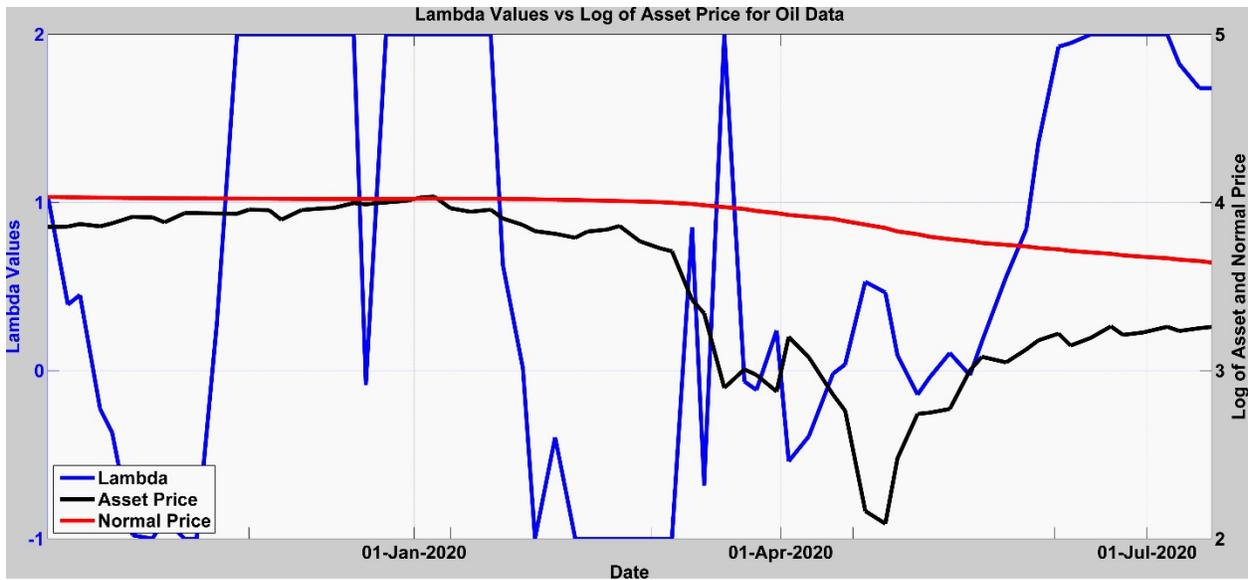
Using ECO output, we see substantial outperformance for timing exposure to West Texas intermediate oil from October 2019 through July 2020 in the chart below. We use ECO values as given in the ECO Forecast Report to project what will happen in the future (Bubble crash, rally, returns, etc. as in table).



Portfolio constructed from the oil asset plus cash = $\lambda \cdot \text{oil} + (1 - \lambda) \cdot \text{return_on_cash}$.

We are using a return on cash of zero.

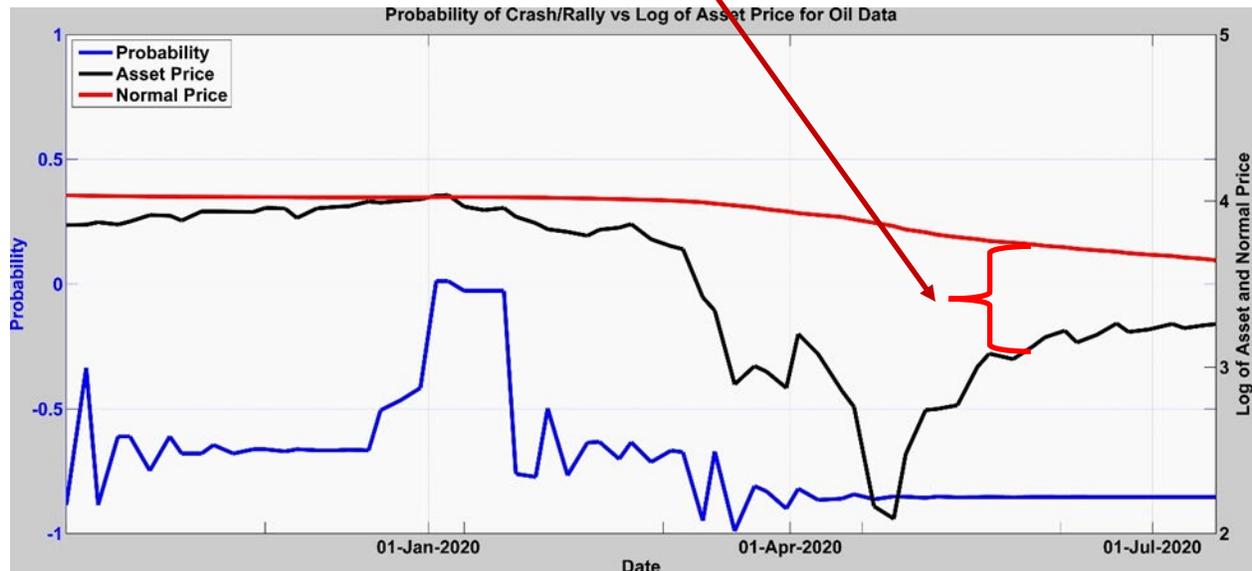
Lambda values are shown in the next figure. A value of -1 means the asset price is likely declining and that one should be invested in cash and not in oil. A value of -1 also means that it is a good time to sell oil.



Correction probabilities are given in the next figure. A crash is a positive probability. A rally probability is recorded as negative to distinguish it from a crash probability.

Note that a rally probability near 1 (illustrated as a negative) can coincide with a lambda near 2. This can occur because a rally has occurred and is expected to continue because the asset is increasing. Since it is increasing, it can be worthwhile to leverage that asset, i.e. have a value of 2.

The next figure illustrates the crash probability. The distance between the asset price and the normal price is the mispricing.



You can see when the crash probability decreases toward -1 (where rally probabilities are illustrated with a minus sign to distinguish them from crash probabilities) in relation to a declining asset price.

The bubble size is the expected percentage jump back towards the normal price.

The value of the probability and lambda are obtained assuming the rational expectation condition holds:

$$E_t \left[\ln \left(\frac{p_{t+1}}{p_t} \right) \right] = (1 - \bar{\rho}) \bar{r}_t + \bar{\rho} \bar{K} \ln \left(\frac{N_t}{p_t} \right) + \bar{\rho} r_D = r_D$$

The lambda value is obtained by maximizing the expected growth rate of wealth assuming you have a portfolio consisting of the asset and cash. The result gives the optimal combination of the asset and cash but it also gives the indicators on whether or not you should buy the asset, sell it, or just hold constant.



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