Energy Beet based Ethanol Investment Analysis Using Real Option Value Approach

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Background
- Energy beet is a potential feedstock candidate to qualify for advanced biofuels and meet the Renewable Fuel Standard (RFS2) mandate.
- Progress to build an integrated energy beet-ethanol biorefineries that is capable of producing sugar juice as marketable intermediate, ethanol and coproducts in a single product facility in the Northern Plain and California.
- Plant Sensory System (PSS) has developed Nitrogen Use Efficient and Stress Tolerant Crops (NUEST) technology in energy beets that maximize total sugar per acre.

Objective
- analyze the economic feasibility and implied profitability of such investment
- quantify the real option value (ROV) of flexibility and the optimal decision to switching between producing sugar juice and ethanol in ethanol plant

Methodology
- Net Present Value
- Real Option Value

Mean reverting (MR) stochastic price processes for ethanol and sugar:

\[ dY_t = \eta(Y_t)dt + \sigma(Y_t)dz \]

Stochastic process parameters: 2006-2014

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sugar</th>
<th>Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drift</td>
<td>0.023</td>
<td>0.053</td>
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<tr>
<td>Volatility (%)</td>
<td>9.3</td>
<td>4.6</td>
</tr>
<tr>
<td>MR coefficient</td>
<td>0.12</td>
<td>0.01</td>
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<tr>
<td>Correlation</td>
<td>0.18</td>
<td>0.18</td>
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</tbody>
</table>

Price

<table>
<thead>
<tr>
<th></th>
<th>Cent /lb raw sugar</th>
<th>$/gal ethanol</th>
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<tbody>
<tr>
<td>Current price</td>
<td>27.25</td>
<td>2.49</td>
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<tr>
<td>Mean price</td>
<td>38.15</td>
<td>2.32</td>
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<tr>
<td>Longterm mean</td>
<td>35.72</td>
<td>2.44</td>
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<td>Risk adjusted price</td>
<td>30.73</td>
<td>2.02</td>
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</tbody>
</table>

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