Energy Beet based Ethanol Investment Analysis Using Real Option Value Approach

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Background

- Energy beet is a potential feedstock candidates 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

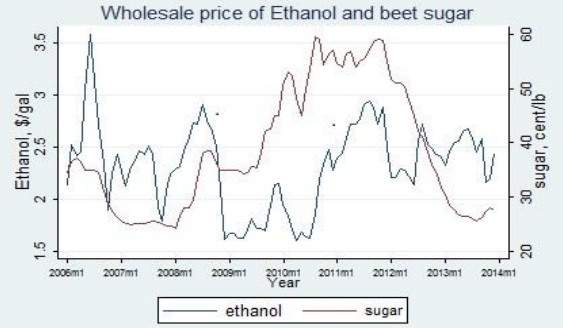
- analyze the economic feasibility and implied profitability of such investment
- quantify the real option value (ROV) of flexibility and the optimal decision to switching between producing sugar juice and ethanol in ethanol plant

Methodology

- Net Present Value
- Real Option Value

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

$$dY_t = \eta(Y,t)dt + \sigma(Y,t)dz$$



Source: Nebraska Energy Office and USDA-ERS 2014

Deterministic bases case operating cash flow		
Cost	Cent /lb sugar juice	$/gallon Ethanol
Feedstock	10.42	1.39
Processing	4.58	0.79
Capital	1.82	0.24
Total cost	16.83	2.42
Pulp credit	0.67	0.42
Supply cost	16.15	2.00

Y: vector Price of ethanol ($/gal) & beet sugar (cent/lb);
η: drifts in prices σ:Volatilities
dz: Wiener processes
t:time in a year

Stochastic process parameters: 2006-2014		
Parameter	Sugar	Ethanol
Drift	0.023	0.053
Volatility (%)	9.3	4.6
MR coefficient	0.12	0.01
Corrolation	0.18	0.18
Price	Cent /lb raw sugar	$/gal ethanol
Current price	27.25	2.49
Mean price	38.15	2.32
longterm mean	35.72	2.44
Risk adjuted price	30.73	2.02

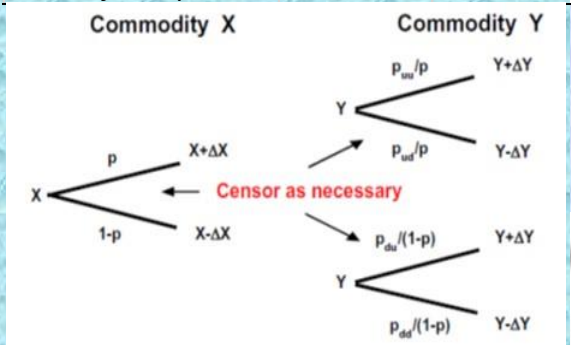


Fig. 1. Splitting the four-branch node into marginal and conditional steps.

- The option value increase when ethanol and sugar prices moved independently and continue to increase if they became negatively correlated.
- The flexibility of producing marketable intermediate sugar may provide ethanol plants multiple market outlets and allowing the option to overcome market volatility

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Plant Sensory Systems