Commodities 4

The Commodities Trading 4 Case will introduce students to the risks and opportunities associated with the concept of "production arbitrage". Students will be allowed to buy crude oil and refine it into two products, Heating Oil and RBOB Gasoline.

Description

The Commodities Trading 4 case consists of a simulation of 10 minutes that represents 1 month of calendar time (20 trading days).

Parameter	Value
Simulation time	600 seconds (10 minutes)
Calendar time per simulation	1 month (20 trading days)
Max order size	30 contracts

Market Dynamics

There are 3 tradable securities and 3 assets. The tradable securities are:

Securities	Description	Contract Size	Shortable
CL	Crude Oil Spot	1,000 Barrels	No
HO	Heating Oil	42,000 Gallons	No
RB	RBOB Gasoline	42,000 Gallons	No

Students must lease storage (CL-STORAGE) before buying crude oil (CL) in the spot market. A storage tank holds up to 10,000 barrels of crude oil and costs $500 per day (charged every 30 seconds). Each storage tank must be leased in its entirety (i.e. students cannot lease half a tank). Students are allowed to lease up to 10 storage tanks at the same time.

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Storage Assets	Description	Capacity	Cost
CL-STORAGE	Storage for Crude Oil Spot in Cushing	10K Barrels	$500/day

Students are able to refine crude oil to produce RBOB gasoline and heating oil. The Crude Oil Refinery (3:2:1) converts 3 contracts (3000 barrels) of crude oil in Cushing into 2 contracts (84,000 gallons) of RBOB gasoline and 1 contract (42,000 gallons) of heating oil, hence the (3:2:1) specification.

There are two refineries available for leasing. Both of them have a lease period of 55 seconds (almost two days). Once the refinery process is complete, students must "release" the refinery otherwise they will be charged for another lease period of 55 seconds.
The lease cost covers the cost of production, additives, and the facility. NEW-REFINERY has a lower leasing cost compared to the OLD-REFINERY because it uses a new technology that requires fewer additives and has lower production costs.

Assets	Description	Capacity	Transport or Conversion Period	Cost
NEW-REFINERY	Crude Oil Refinery (3:2:1)	30K Barrels	1.5 Days (45 seconds)	$280,000 per 55 seconds
OLD-REFINERY	Crude Oil Refinery (3:2:1)	30K Barrels	1.5 Days (45 seconds)	$300,000 per 55 seconds

*Note: There are no storage requirements for the physical products: RBOB Gasoline and Heating Oil. Automatic storage at no cost can be assumed for these products.

Each student can use only one NEW-REFINERY and one OLD-REFINERY. However, they can lease both refineries at the same time if it is profitable to do so.

The CL daily market returns are normally distributed with the mean equal to zero and an annualized volatility of 40%. This case represents 1 month of calendar time (20 trading days) therefore it assumes that there are 240 (=12 x 20) trading days in 1 year.

Trading Limits, Transaction Costs and Position close-out

Participants will be subject to gross and net trading limits of 500 contracts and 100 contracts respectively. The gross trading limit reflects the sum of the absolute values of the long and short positions across all securities and cannot exceed 500 contracts. The net trading limit reflects the sum of long and short positions such that short positions negate any long positions and has an upper bound of 100 contracts of crude equivalent products. Trading limits will be strictly enforced and students will not be able to exceed them.

The maximum trade size will be 30 contracts, restricting the volume of contracts transacted per trade to 30. Transaction fees will be set at $1 per contract traded.

Any outstanding position in Crude Oil (CL), Heating Oil (HO) and RBOB (RB) Gasoline will be closed at their last traded price at the end of the period (month).

Follow up questions

1) How would you calculate the risk of implementing a "product arbitrage strategy" (buy CL, refine it and sell HO and RB)?

2) How much riskier is refining Crude Oil using the OLD-REFINERY as compared to the NEW-REFINERY?