DoNiNaKa Oil:
Hedging Strategies for Refined Oil Delivery Contract

Dorly Hazan-Amir, Nikhil Mehta, Nan Suwankornsakul, Karoline Vinsrygg

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Summary

- **Contract**
  DoNiNaKa has entered into a short contract of 1 million barrels of crude oil to be delivered on June 1, 2006 at spot price.
  Long Contract for June 1st at a price of $73.70 / barrel
  Total exposure is $73,700,000, with a loss limit of 5% and with a 90% probability

- **Hedging Method**
  We propose a Long Straddle to hedge the market view of neutral and volatile
Significance of Industry

- The world’s largest oil producer is Saudi Arabia
  - Other leading oil producers are Russia, Norway, Kuwait, Iran

- OPEC (The Organization of Oil Producing Countries) is the dominant player in the industry. For all practical purposes, OPEC control the world’s oil production level – and is thereby also a powerful source of influence to the oil price level
  - Non-OPEC countries still represent about 60% of the total oil production, but these countries are not as tightly organized and thereby not as influential. Moreover, it is more difficult to control production in non-OPEC countries, as more companies are privately held (not state owned)
  - 10 of the 14 largest oil exporting countries were OPEC members in 2004*

- The world’s largest oil consumer is USA

- More than 2/3 of the world’s oil consumption is at some point transported at sea

*http://www.eia.doe.gov/emeu/cabs/nonopec.html
What Influences Crude Oil Prices - and what drives volatility?

- World production of oil
  - And where it is produced

- World demand for oil
  - And where it is demanded
    - China = current engine

- Inventory Management of Oil Reserves

High volatility, general economic factors, “high politics”, states of the world (wars, threats etc), climate (cold or mild winters), seasonality, market inefficiencies
Demand vs. Supply

- Oil Demand a **Function of GDP Growth**
  - …but quite **unpredictable**

### Table 2: GDP Growth vs. Oil Demand Growth, 2002-2006E

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005E</th>
<th>2006E</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. GDP Growth</td>
<td>1.6%</td>
<td>2.7%</td>
<td>4.2%</td>
<td>3.6%</td>
<td>3.3%</td>
</tr>
<tr>
<td>U.S. Oil Demand Growth</td>
<td>0.6%</td>
<td>1.4%</td>
<td>3.5%</td>
<td>0.6%</td>
<td>1.5%</td>
</tr>
<tr>
<td>U.S. GDP Growth/U.S. Oil Demand Growth</td>
<td>0.3x</td>
<td>0.5x</td>
<td>0.8x</td>
<td>0.2x</td>
<td>0.5x</td>
</tr>
<tr>
<td>China GDP Growth</td>
<td>8.0%</td>
<td>9.1%</td>
<td>9.5%</td>
<td>9.2%</td>
<td>8.5%</td>
</tr>
<tr>
<td>China Oil Demand Growth</td>
<td>6.4%</td>
<td>11.0%</td>
<td>15.4%</td>
<td>3.2%</td>
<td>7.0%</td>
</tr>
<tr>
<td>China GDP Growth/China Oil Demand Growth</td>
<td>0.8x</td>
<td>1.2x</td>
<td>1.6x</td>
<td>0.3x</td>
<td>0.8x</td>
</tr>
<tr>
<td>Global GDP Growth</td>
<td>3.0%</td>
<td>4.0%</td>
<td>5.1%</td>
<td>4.3%</td>
<td>4.3%</td>
</tr>
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<td>0.5x</td>
<td>0.7x</td>
<td>0.3x</td>
<td>0.5x</td>
</tr>
</tbody>
</table>

Risk Assessment

- The oil market is one of the most volatile markets in the world
  - The last year, oil prices have fluctuated between $46 and $76 per barrel
- Futures prices are at historical peak level
- Political pressure as a result of high gasoline prices:
  - oil companies are being investigated in the USA to assess whether there is sufficient evidence of unfair competition practices
- Force Majeure: Iraq war and possible Iranian tension escalation
- Weather extremes
Historical Oil Prices
Gives Evidence of Extraordinary 2006 Level

Average price 1945 - 2004: $17.18/barrel*

May 1st 2006 CL futures level

How long will the peak peak???

*2004 adjusted prices
Analysts’ Opinions:

Trends in Oil Demand

- Two major trends support strong oil demand predictions in 2006 and 2007:
  - The rising middle class in developing countries is boosting car sales
  - World trade is growing strongly, boosting diesel consumption for both trucks, trains and ships
- Factors hurting demand have been fuel switching by Asian power plants to coal and Europe’s diesel switch in cars

1 Handelsbanken Capital Market, Report from April 5, 2006
2 CIBC World Markets, Equity Research Industry Update, April 26, 2006
Analysts’ Opinions:

Trends in Oil Production

• A key factor in tightening the oil market has been weak oil production in the U.S., U.K., Norway, Venezuela and Indonesia*

• The surge in oil production in Russia, as well as the rest of OPEC from 2002-2005 offset the above decline

* JP Morgan, Analyst Report from May 3, 2006
Analysts’ Opinions:

Demand Will Surpass Gains in Supply

- The observed trend in the market leads Morgan Stanley Research (and a majority of other analysts) to conclude that global demand for refined oil products will significantly surpass gains in supply during the 2006-2007 period*

*April 28, 2006
Analysts’ Opinions:

Further Increases in Oil Prices

• Handelsbanken Capital Markets increased its 2006 and 2007 oil price forecast to $70 bbl based on decreasing supply and increasing geopolitical risk in the Middle East

• Increased demand for alternative energy sources and exploration & production related capex are driving investment in LNG carriers and offshore equipment

1 Handelsbanken Capital Market, Report from April 19, 2006

2 Credit Suisse First Boston – North America, research report from April 25, 2006

Source: Bloomberg
Analyst Consensus

- Prices to remain high \(^1\)
- Geopolitical issues and tight supply \(^2\)
- Prices will be volatile

1. Woori Investment and Securities
2. Alaron Trading Corporation
Business Strategy

DoNiNaKa© Oil Corporation

- Refining and supply of petroleum products
- Marketing of fuels under the DoNiNaKa brands.

Goal

To mitigate the business risk of the price of crude oil (CL)

Industry leader in all core business activities.
Superior hedging techniques.
Long Contract to purchase 1 million barrels of oil

- Contract size: 1 million barrels of crude oil
- Delivery time: June 1, 2006
- Price: $73.70/barrel
- The total exposure value: $73,700,000
- Percentage loss limit: 5%
- Dollar loss limit: $3,685,000
- 10% chance of losing more than $3,685,000 and 5%

If the price of oil drops between now and June 1, DoNiNaKa would lose money on the contracts signed on May 1, 2006 on account of having locked in a higher price than the future market price.
Short Contract with Teekay Shipping

- Contract size: 1 million barrels of crude oil
- Delivery time: June 1, 2006
- Price: Spot price on June 1, 2006

On May 1, 2006, DoNiNaKa Oil agreed to deliver 1 million barrels of crude oil to Teekay Shipping Corporation, a Canadian oil and gas shipping company, at the spot price on June 1, 2006.
## Market View

<table>
<thead>
<tr>
<th>Market View</th>
<th>Volatility View</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
</tr>
<tr>
<td><strong>Up</strong></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Long Call</td>
</tr>
<tr>
<td><strong>Neutral</strong></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Long Straddle/Strangle</td>
</tr>
<tr>
<td><strong>Down</strong></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Long Put</td>
</tr>
</tbody>
</table>

**Overview**

**Recommendations**

**Hedging Strategies**
# VaR for the June Contract

The future contracts we must sell at least 714 contracts to meet our risk targets.

## Hedging Strategies

### Recommendation

- **Notes Quick & Dirty Check**
  - **Target Loss**: -5.00%
  - **Loss %**: -17.48% - 19.21%
  - **Keep**: 28.6% - 25.0%
  - **Hedge**: -71.4% - 74.0%

Set no hedge & To Match “Keep” probability 1 out of with

- **for 1.00 s.d.** 15.67%  6  10.9% loss
- **for 1.28 s.d.** 10.63%  10  13.8% loss
- **for 1.44 s.d.** 7.43%  13  15.3% loss
- **for 1.65 s.d.** 4.95%  20  17.3% loss
- **for 2.00 s.d.** 2.28%  44  20.5% loss
- **for 2.33 s.d.** 1.03%  100  23.3% loss
- **for 3.09 s.d.** 0.10%  1000  29.3% loss

\[
\text{Check # s.d.: } 1.3
\]

<table>
<thead>
<tr>
<th>Risk Value at Risk (V@R)</th>
<th>Underlying:</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Today/5/2/2006</strong> Futures price:</td>
<td>$73.70</td>
<td>Monthly price volatility (stdev) :</td>
</tr>
<tr>
<td><strong>Risk Limit</strong></td>
<td>-3.685,000</td>
<td># of contract underlying</td>
</tr>
<tr>
<td><strong># s.d. V@R (e.g. 1.00)</strong></td>
<td>1.25</td>
<td>Exposure (+/-Contracts)</td>
</tr>
<tr>
<td><strong>Exposure (maturity) Date</strong></td>
<td>6/1/2006</td>
<td>$ underlying</td>
</tr>
<tr>
<td><strong>For risk premium-adjusted V@R</strong></td>
<td></td>
<td><strong>Adjustment (+/-Contracts)</strong></td>
</tr>
<tr>
<td><strong>Funding Rate</strong></td>
<td>5.00%</td>
<td>Monthly Estimates</td>
</tr>
<tr>
<td><strong>Risk Premium Estimate</strong></td>
<td>2.50%</td>
<td>Riskmetrics (optional)</td>
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<tr>
<td></td>
<td></td>
<td>Weight lost 50% obs.</td>
</tr>
<tr>
<td><strong>Standard deviations (e.g. % as 10)</strong></td>
<td>15,1700</td>
<td>15,1700</td>
</tr>
<tr>
<td><strong>Long V@R @ price exp(# s.d)</strong></td>
<td>60,8171</td>
<td>60,8171</td>
</tr>
<tr>
<td><strong>Long upside @ price exp(# s.d)</strong></td>
<td>89,6778</td>
<td>89,6778</td>
</tr>
<tr>
<td><strong>$ Profit</strong></td>
<td>4,569,647</td>
<td>4,569,647</td>
</tr>
</tbody>
</table>

## Analysis

### Probability of doing worse than -1.28 standard deviation (or 60.8171) is 10.03%

### Overview

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- **Analysis**
## Market Data

<table>
<thead>
<tr>
<th>In-at-out of money</th>
<th>Calls</th>
<th></th>
<th>Puts</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Strike Price</td>
<td>Price Quote</td>
<td>Strike Price</td>
<td>Price Quote</td>
</tr>
<tr>
<td>OTM</td>
<td>75</td>
<td>1.58</td>
<td>72</td>
<td>0.75</td>
</tr>
<tr>
<td>ATM</td>
<td>74</td>
<td>2.25</td>
<td>74</td>
<td>1.35</td>
</tr>
<tr>
<td>ITM</td>
<td>72</td>
<td>3.36</td>
<td>75</td>
<td>1.97</td>
</tr>
</tbody>
</table>

**Futures Price: Maturity 06/01: $73.70**
Recommended: Synthetic Long Straddle

Main view: Very volatile and no direction

Long Straddle fits our main view. Our risk limit is $3.68 MM and this hedging strategy will cost us a maximum of $2.1 MM which is less than our risk limit. This strategy will allow DoNiNaKa to profit from high volatility (both increase and decrease in price).
Option 1: Synthetic Long Strangle

Alternate view: Very volatile (but less confident) and no direction

Long Strangle fits our alternate view. Our risk limit is $3.68 MM and this hedging strategy will cost us a maximum of $1.4 MM which is less than our risk limit. This strategy will allow DoNiNaKa to profit from high volatility in price and also minimize the loss if prices remain stable.
Option 2: Synthetic Long Call itm

Alternate view: Up and Unsure (more bullish so ITM)

Synthetic long call fits our alternate view. Our risk limit is $3.68 MM and this hedging strategy will cost us a maximum of $2.5 MM which is less than our risk limit. This strategy will allow DoNiNaKa to profit when prices go up and also limit the loss if prices go down.

<table>
<thead>
<tr>
<th>Price at Contract Maturity</th>
<th>Synthetic Call ITM</th>
<th>Up and Unsure</th>
<th>Already +F, Buy One Put OTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>67.7</td>
<td>(6.0)</td>
<td>3.6</td>
<td>(2.5)</td>
</tr>
<tr>
<td>68.7</td>
<td>(5.0)</td>
<td>2.6</td>
<td>(2.5)</td>
</tr>
<tr>
<td>69.7</td>
<td>(4.0)</td>
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<tr>
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<td>0.3</td>
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<tr>
<td>77.7</td>
<td>4.0</td>
<td>(0.8)</td>
<td>3.3</td>
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<tr>
<td>78.7</td>
<td>5.0</td>
<td>(0.8)</td>
<td>4.3</td>
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<tr>
<td>79.7</td>
<td>6.0</td>
<td>(0.8)</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Overview

Analysis

Hedging Strategies

Recommendations
Option 3: Synthetic Long Put itm

Alternate view: Down and Unsure (more bearish than ITM)

Synthetic long put fits our alternate view. Our risk limit is $3.68 MM and this hedging strategy will cost us a maximum of $2.0 MM which is less than our risk limit. This strategy will allow DoNiNaKa to profit when prices go down and also limit the loss if prices go up.
Option 4: Synthetic Bull Spread

**Alternate view:**

**Limited up, worry big down**

Synthetic Bull Spread fits our alternate view. Our risk limit is $3.68 MM and this hedging strategy will cost us a maximum of $0.9 MM which is less than our risk limit. This strategy will allow DoNiNaKa to profit when prices go up but the upside gain is limited. This strategy will also limit the downside.

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**Overview**

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**Synthetic Bull Spread**

**Limited Up, Worry Big Down**

Already +F, Buy One Put ITM, Sell One Call OTM
We have analyzed all positions consistent with the four most likely market conditions against our basic futures hedge positions:

- Long Straddle
- Long Strangle
- Long Call
- Long Put
- Bull Spread

Consistent with our market view of volatility and no specified direction, Long Straddle seems to be the best fit. Moreover, the attractive price structure limits the downside of this position below our loss limit threshold of $3.68 MM.