Calculating Prices for Heating Oil, Gasoline and Crude Oil Calendar Swaps
A Primer for Beginning Energy Hedgers

Most energy swaps are based on the NYMEX futures contracts or on NYMEX ClearPort prices and are of 18 months duration or less. Also, very few swaps are matched between producers and consumers. Most hedgers on the sell side want to hedge when prices are high or beginning to fall most buyers want to hedge when prices are low or beginning to rise. Thus almost all deals, which are said to be “matched” or back-to-back ultimately, end with a market maker who sooner or later hedges in the futures market or over-the-counter.

Anyone who hedges with a swap provided by a third party may have to pay a margin to cover the market maker’s overhead, and credit and execution risk. The minimum cost for hedging this way can be five cents per barrel and can run as high as 20 cents depending on how far out one wants to hedge.

If you are thinking of hedging your product or crude exposure with a swap of about two years duration or less and have the means to put up the margin required and you have, or can open an account with a futures broker, you could synthesize the swap yourself without going through a dealer. Or if you do decide to use a dealer or market-maker, it is important to at least cross check them against the price that hypothetically is trading on the exchange so you can see what the margins are. If you end up consistently paying a high differential between the calculated price and the prices you are quoted, you might want to rethink doing you own execution. Placing the hedge yourself either in futures or in a ClearPort issue may allow you to save the swap dealer’s profit, which can be substantial, and give you greater control over your own business.

First let’s review the difference between a contract month swap and a calendar month swap. A contract month swap is easy to calculate because it is just an average of a string of futures contracts. Contract month swaps are typically used in the natural gas market for example if one wanted to calculate a contract month swap for the year 2006 a simple arithmetic average of the January through December 2006 contracts would suffice. If the volume per month was the same for each month for example 1 BCF then approximately 100 contracts per month could be bought or sold to effect to hedge. Volume weighting could also be down based on these contracts. So for example if for January through June 1 BCF per month was to be hedged and for July through December 2 BCF per month was the hedge amount approximately 100 contracts per month would be bought or sold for the first half of the year and 200 contracts per month for the latter half.

Calculating Calendar Swaps on Heating Oil, Gasoline and Propane

A calendar month swap is somewhat more complicated as it involves calculating which particular contract is being traded during a certain time frame such as the calendar year 2006. For heating oil, gasoline and propane calculating a calendar swap price is easy because each individual contract expires on the last business day of a given month. So for equal volumes per month a simple arithmetic average similar to the contract month swap but offset by a month is sufficient. For example for calendar year 2006 a simple arithmetic average of the February 2006 contract, which trades during the month of January 2006 through the January 2007 contract which trades during the month of December 2006 would be calculated. If volumes were based on a volume per day then a simple volume weighting based on the days of each month will yield the appropriate value.

Calendar	Designation	HO
Jan-06	HOG06	178.73
Feb-06	HOH06	182.20
Mar-06	HOJ06	183.00
Apr-06	HOK06	180.00
May-06	HOM06	176.20
Jun-06	HON06	174.95
Jul-06	HOQ06	175.75
Aug-06	HOU06	177.05
Sep-06	HOV06	179.15
Oct-06	HOX06	181.60
Nov-06	HOZ06	184.05
Dec-06	HOF06	186.65
Average	Cal 06	179.94

Next, the table to the right shows the prices February 2005 through January 2007 contracts which would apply for a 2006 calendar heating oil swap. Based on these closing prices for December 15 the price for a calendar 2006 swap for heating oil would be $1.7994. This assumes a “shaped” swap where in each month has a different price associated with it and the settled separately.

Estimating Approximate Calendar Swaps on Crude Oil

For crude oil the situation is more complex the reason is that the rule for crude oil expiration is three business days prior to the 25th of any given month. So each month two different contracts trade example in any given calendar month of January both the February contract for about two thirds of month and the March for about one third of months contract trade. Using this simplification to calculate a price quickly is usually sufficient.

Contract Month	Contract	CL	Weighting
February	CLG06	59.99	0.67
March	CLH06	61.10	0.33
Cal January	-	60.36	1.00

For any given month, then, like January 2006, two-thirds of the first month trading, in this case the February 2006 contract, CLG06 and one-third of the second month, here March 2006, CLH06 yield an approximate swap price of $60.36.

Calculating a whole year is not much more difficult because all but the first and last contracts that trade during a calendar year trade for a full month. So, the entire calendar year of 2006 can be estimated by taking two-thirds of the February 2006 contract that starts off the year, the full March 2006 to January 2007 contracts and then one-third of the February 2007 contract that ends the year. This is reflected in the next table shown below that yields an average swap price of $62.67 for the 12 calendar months in 2006.

Contract Month	Contract	CL	Weighting
February	CLG06	59.99	0.67
March	CLH06	61.10	1.00
April	CLJ06	61.78	1.00
May	CLK06	62.21	1.00
June	CLM06	62.54	1.00
July	CLN06	62.81	1.00
August	CLQ06	63.03	1.00
September	CLU06	63.22	1.00
October	CLV06	63.38	1.00
November	CLX06	63.50	1.00
December	CLZ06	63.59	1.00
January	CLF07	63.66	1.00
February	CLG07	63.68	0.33
Cal 2006	-	62.67	12

Calculating Precise Calendar Swaps on Crude Oil

Calculating a swap price precisely first requires that the calendar be reviewed to determine exactly which days each contract trades, taking into consideration not only the difference in calendar days per month, but also any holidays and the shift in the expiration date that could be caused by the specific way in which the weekends and holidays fall.

You will need a NYMEX calendar, which can be obtained from their official website, covering the duration of the hedge period, the expiration dates for the contracts in question, dates the exchange will be closed for holidays. For this simple example, lets assume the same volume each month of 100,000 barrels for the calendar year 2006.

1) The first step is to determine how many trading days during the calendar year each contract trades. In order to illustrate exactly how this is done, an example is given below for the calendar month of January 2006.

January 2006 Trading Day Calendar

M	T	W	Th	F
H	3	4	5	6
9	10	11	12	13
H	17	18	19	20
23	24	25	26	27
30	31			

Legend
CLG06
CLH06

2) Identify the number of days that each contract, February 2006 (CLG06) and March 2006 (CLH06) trades, and day-weight the prices. The calendar table above shows that February 2006 traded for 12 days and March 2006 for eight days. So the calculated calendar strip price for January 2006 is calculated to be $60.43 as shown below:

Contract	Days During Jan-06	Weight	Price	Price* Wt
Feb-06	12	12/20	59.99	35.99
Mar-06	8	8/20	61.1	24.44
Cal Jan 06	20	20/20		60.43

Now, in order to calculate the swap price for an entire year, a similar methodology is used.

1) First the number of trading days for each contract that trades during the year is determined, as shown in the second column below.

Contract	Days in 2006	Weight	Price	Price* Wt
Feb-06	13	0.052	59.99	3.13
Mar-06	21	0.084	61.1	5.15
Apr-06	20	0.080	61.78	4.96
May-06	21	0.084	62.21	5.25
Jun-06	22	0.088	62.54	5.53
Jul-06	20	0.080	62.81	5.04
Aug-06	20	0.080	63.03	5.06
Sep-06	23	0.092	63.22	5.84
Oct-06	20	0.080	63.38	5.09
Nov-06	22	0.088	63.5	5.61
Dec-06	20	0.080	63.59	5.11
Jan-07	20	0.080	63.66	5.11
Feb-07	7	0.028	63.68	1.79
Cal-06	249	1.0	-	62.68

2) Next the weighting for each month is determined by dividing the days per contract by the number of days in the year, for 2006 a total of 249 days.

3) Then the prices is multiplied by the weighting and then a sum of all the months is taken, yielding a year swap price of $62.68 compared with the "quickie" calculation of $62.67 above.

For help with any energy hedging, trading or forecasting issues please call us at (505) 237-1600 or contact kase@kaseco.com.