OIL HEDGING INSTRUMENTS

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CAFRAL Seminar on Hedging of Oil requirements
by Oil Marketing Companies
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Outline

- Major participants of oil market
- What's hedging?
- Exchange traded contracts – futures
- OTC contracts – swaps and options
- Term structure of oil market
- Commodity index investors

Participants

- Producers
- Consumers
- Traders
- Investors

What's hedging?

- Definition: A hedge is a financial instrument that reduces risk.
- *Example: a company buying a crude oil (March 2015) contract at $89.00 for hedging*

	Settlement price = $95.00			
Date	**Financial Transaction**		**Cash Transaction**	
	Buy	Receive	Buy	Receive
Nov 1, 2014	CLH5 $89.00			
Feb 2, 2015		$95 square CLH5	Pays $95 for oil	
Result		$6 profit		
	Net cost = $95 - $6 = $89			

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	Settlement price = $78.00			
Date	**Financial Transaction**		**Cash Transaction**	
	Buy	Receive	Buy	Receive
Nov 1, 2014	CLH5 $89			
Feb 2, 2015		$78 square CLH5	Pays $78 for oil	
Result		$11 loss		
	Net cost = $78 + $11 = $89			

Basis risk

- Hedging may not remove all risk.
- Location of delivery, quality of commodity, date mismatch contribute to the imperfection of a hedge.

Exchange-traded futures contract

- Futures contracts trading in an exchange has long history
- Concept of clearing and clearing house
- Transparency
- Concentration of activity in one contract (front month)
- Electronic market place fast overtaking a physical “open outcry” market place
- Round the clock, global market

Futures characteristics

- Standardized contracts
  - Contract size
  - Delivery month
  - Daily resettlement
- Performance bond
- Maintenance margin
- Daily marked-to-market
- Settlement
- Clearing

Physical settlement vs financial settlement

- Some futures contract are physically settled, others are financially (cash) settled.
- Financially settled means contracts which are “losing” vs final settlement price pays the difference (i.e. loss amount) and the “winning” ones receive these. Example is WTI Crude traded on ICE
- Physical settlement means goods exchange hands for payment
- Most participants prefer to square off position before last trading date

Pro's and con's of using futures

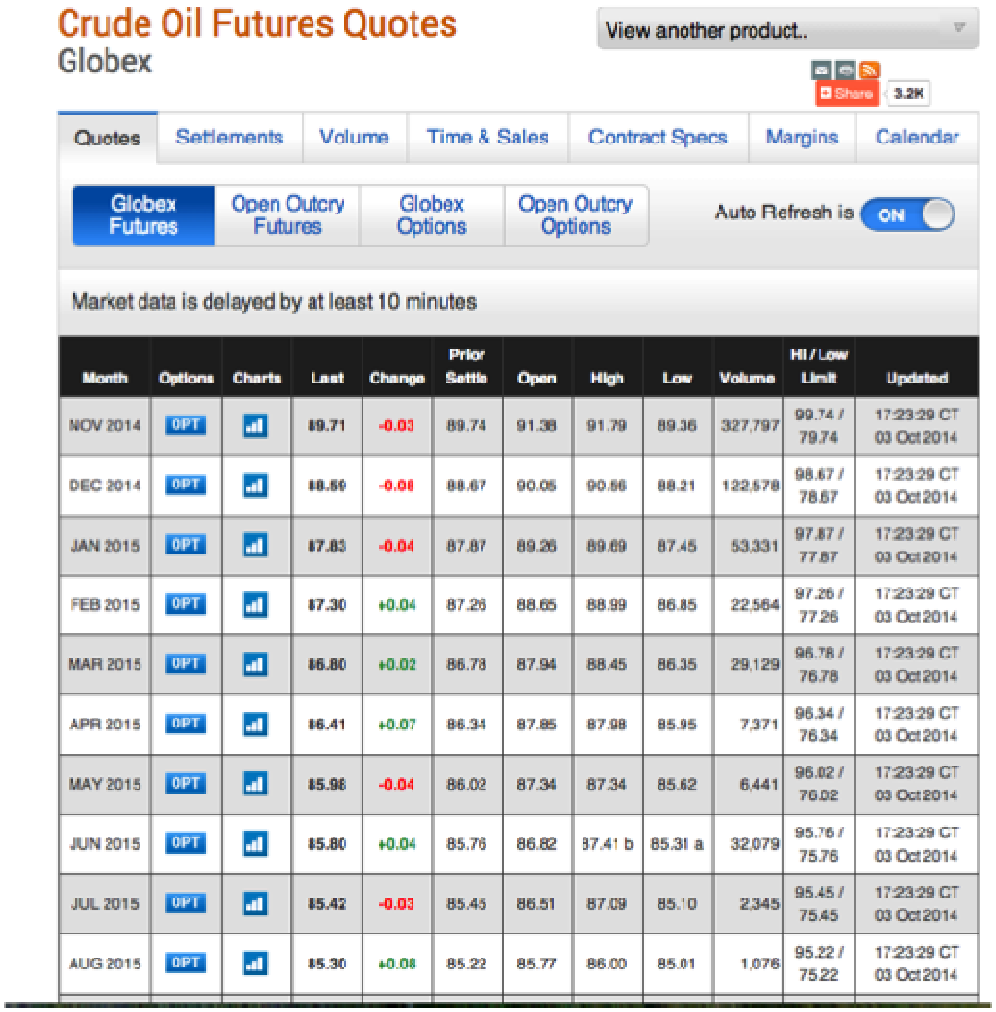
Pro	Con
Price transparency	Not customized
Market data availability	May be unable to do sizeable trades
P&L discipline	Need margin management
Clearing house credit	Need to roll contract

Rolling a hedge : an example

- An airline hedges against rising fuel price by buying a December 2014 Brent crude oil contract (LCOZ4) at $94.50.
- Before the expiry of LCOZ4 sometime in November 2014, (as trading volume in LCOZ4 fades and the next front contract rises), the airline rolls the contract
- This, by selling LCOZ4 and buying January 2015 Brent crude oil contract (LCOF5) at $96.20 and $96.70 respectively
- It realizes a profit of $(96.20-94.50)=$1.70 per barrel. This is $1,700 as each contract amount is for 1,000 barrels.

And the company remains with a new long position of 1 LCOF5 contract at $96.70.

A page from WTI Crude Oil futures from Globex



Crude Oil Futures Quotes
Globex

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Quotes | Settlements | Volume | Time & Sales | Contract Specs | Margins | Calendar

Globex Futures | Open Outcry Futures | Globex Options | Open Outcry Options

Auto Refresh is ON

Market data is delayed by at least 10 minutes

Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	HI / Low Limit	Updated
NOV 2014	OPT		89.71	-0.03	89.74	91.38	91.79	89.36	327,797	99.74 / 79.74	17:23:29 CT 03 Oct 2014
DEC 2014	OPT		88.59	-0.08	88.67	90.05	90.56	88.21	122,578	98.67 / 78.67	17:23:29 CT 03 Oct 2014
JAN 2015	OPT		87.83	-0.04	87.87	89.26	89.69	87.45	53,331	97.87 / 77.87	17:23:29 CT 03 Oct 2014
FEB 2015	OPT		87.30	+0.04	87.26	88.65	88.99	86.85	22,564	97.26 / 77.26	17:23:29 CT 03 Oct 2014
MAR 2015	OPT		86.80	+0.02	86.78	87.94	88.45	86.35	29,129	96.78 / 76.78	17:23:29 CT 03 Oct 2014
APR 2015	OPT		86.41	+0.07	86.34	87.85	87.98	85.95	7,371	96.34 / 76.34	17:23:29 CT 03 Oct 2014
MAY 2015	OPT		85.98	-0.04	86.02	87.34	87.34	85.62	6,441	96.02 / 76.02	17:23:29 CT 03 Oct 2014
JUN 2015	OPT		85.80	+0.04	85.76	86.82	87.41 b	85.31 a	32,079	95.76 / 75.76	17:23:29 CT 03 Oct 2014
JUL 2015	OPT		85.42	-0.03	85.45	86.51	87.09	85.10	2,345	95.45 / 75.45	17:23:29 CT 03 Oct 2014
AUG 2015	OPT		85.30	+0.08	85.22	85.77	86.00	85.01	1,076	95.22 / 75.22	17:23:29 CT 03 Oct 2014

A typical daily report of ICE Brent crude oil contract

03-Oct-2014

COMMODITY NAME	CONTRACT MONTH	DAILY PRICE RANGE				SETTLE		VOLUME AND OI TOTALS						
		OPEN#	HIGH	LOW	CLOSE#	PRICE	CHANGE	TOTAL VOLUME	OI	CHANGE	EFP	EFS	BLOCK VOLUME	SPREAD VOLUME
B-Brent Crude Future														
B	Nov14	93.75	94.06	91.48	92.25	92.31	-1.11	260,479			3,353	0	5,307	93,353
B	Dec14	94.25	94.61	92.04	92.82	92.88	-1.12	203,315			3,691	0	4,202	136,810
B	Jan15	94.80	95.03	92.53	93.23	93.38	-1.12	68,362			0	0	1,317	60,041
B	Feb15	95.22	95.45	93.01	93.72	93.82	-1.12	32,929			0	0	1,181	30,871
B	Mar15	95.57	95.78	93.38	94.10	94.20	-1.11	38,663			0	0	4,398	33,760
B	Apr15	95.78	96.02	93.77	94.43	94.51	-1.09	16,031			0	0	0	15,929
B	May15	95.97	96.27	94.01	94.65	94.71	-1.08	12,206			0	0	0	12,154
B	Jun15	96.13	96.41	94.20	94.74	94.84	-1.08	50,828			0	0	2,977	44,241
B	Jul15	96.06	96.06	94.50	94.92	94.99	-1.08	4,310			0	0	0	4,290
B	Aug15	95.45	95.48	94.86	95.01	95.14	-1.07	3,054			0	0	200	2,841
B	Sep15	95.72	95.72	94.70	94.70	95.23	-1.05	5,579			0	0	100	5,404
B	Oct15	95.48	95.75	95.14	95.21	95.27	-1.04	1,647			0	0	100	1,531
B	Nov15	95.49	95.49	95.07	95.17	95.31	-1.01	2,158			0	0	0	2,141
B	Dec15	96.37	96.74	94.75	95.27	95.27	-0.99	49,377			0	0	3,024	39,671
B	Jan16					95.22	-0.97	1,242			0	0	0	1,242
B	Feb16					95.16	-0.95	349			0	0	0	349
B	Mar16					95.12	-0.93	586			0	0	0	586
B	Apr16					95.08	-0.92	49			0	0	0	49
B	May16					94.99	-0.91	202			0	0	0	202
B	Jun16	96.07	96.24	94.49	94.84	94.91	-0.90	7,028			0	0	600	6,373
B	Jul16					94.85	-0.88	306			0	0	0	306
B	Aug16					94.76	-0.86	76			0	0	0	76
B	Sep16					94.60	-0.84	742			0	0	300	442

OTC contracts

- Party to party contract, can be customized
- Can be benchmarked to an exchange contract, e.g. a ‘bullet’ swap
- Swap is often the basic instrument
- Options is also a popular instrument

Swaps

- A swap is an exchange of fixed for floating obligation between 2 parties,
  - e.g. Party A buys from Bank B a March 2015 contract at $95 (fixed price). The settlement price is the average of the daily closing prices of the first-nearby futures during the period 1 Mar 2015-31 Mar 2015 (floating price).
  - If fixed price > floating price, Party A pays difference to Bank B.
  - If fixed price < floating price, Party A receives difference from Bank B.

Swaps

- It can also be a “bullet” swap, where the underlying is a futures contract that is traded on an exchange.

- The underlying can also be unlisted on any exchange. In this situation, a commonly used benchmark for calculation of settlement price is Platt pricing.

(Platt is a leading global provider of energy information)

Options

- Option is the right to buy or sell, i.e. enter into a transaction at a certain date. This right, but not an obligation, normally comes with the payment of a premium.
- (Physical, forwards and futures represent an obligation to do a transaction at a certain date).
- Call option owner has the right to buy the commodity at a certain date.
- Put option owner has the right to sell the commodity at a certain date.
- Exchange traded options have underlying which are exchange traded futures contracts.
- OTC options have wider varieties.

Be familiar with option terms

- Strike price: The pre-determined price for the future transaction.
- Premium: this is the price the option buyer pays to the option seller.
- Obligation: the option seller has an obligation to transact at the strike price at a specified date; the buyer, having paid a premium does not.
- Exercise: the act of effecting the transaction at the strike price.
- Expiry date: every option has an expiry time and date.
- Time to maturity: Time from now until option expiration.
- At-the-money (ATM): An option is ATM if Strike = Forward Price of the pricing period.

An example of using call option

- A petroleum company wants to buy crude oil for delivery in July 2015. It buys a June 2015 average rate call option in Brent crude. This gives the company the right to own Brent crude at the average observation of prices for June 2015 contracts during the life of the option.
- The company pays a premium for this right, but not obligation should the average price turned out to be more expensive than the cash price in July.

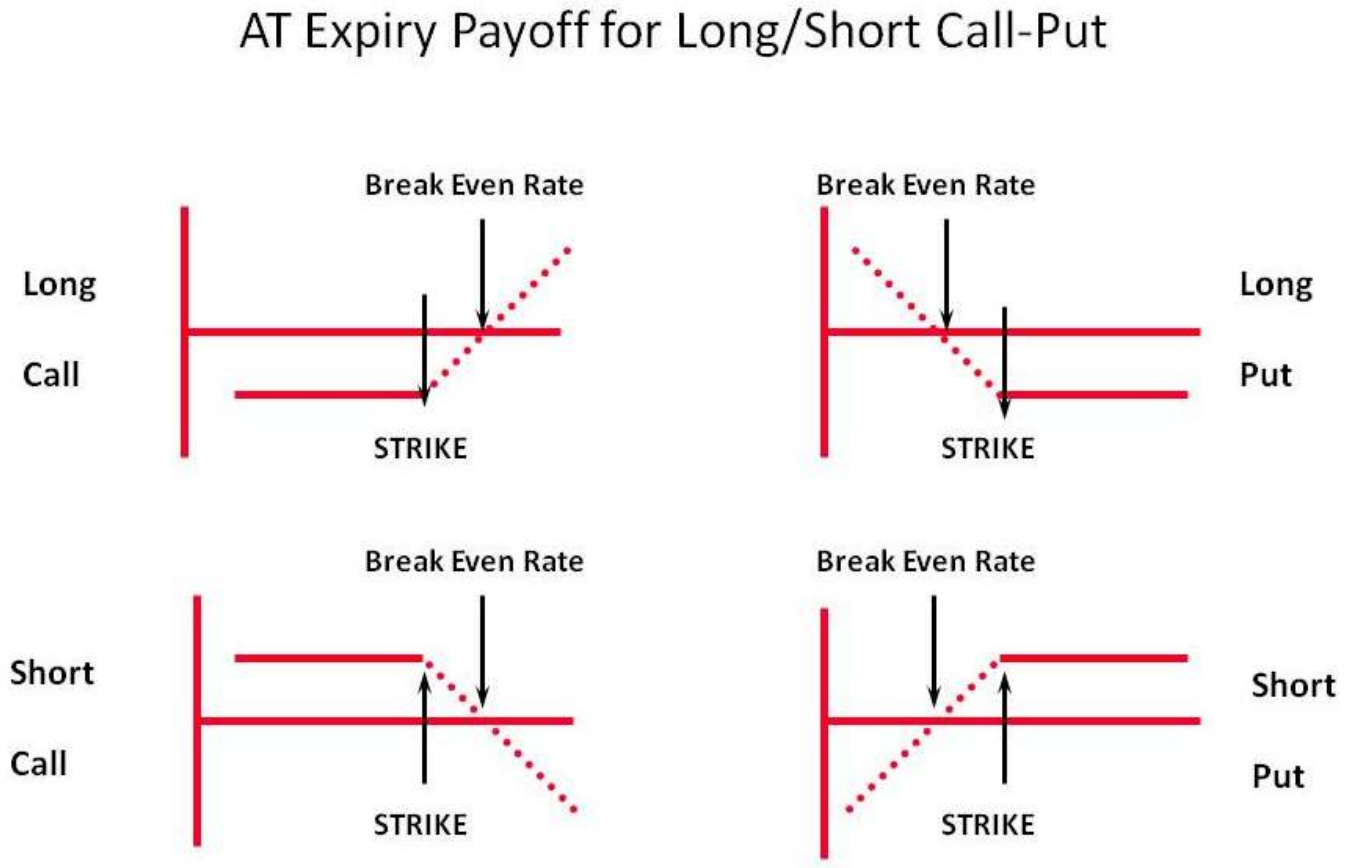
An example of a covered call option

- An oil producer wants to protect against falling oil price. Current spot price is $89.50.
- It sells a March 2015 WTI crude call option at $93, receiving a premium of $0.95.
- If WTI price falls to $86 in March, its effective sales price is $(86+0.95) = $86.95.
- If WTI price is above $93, it is obliged to sell at $93. However it has received $0.95 premium.
- If WTI price is at $93 and there is no exercise, it is now able to sell physical oil at $93 (better than original spot price) and still keep premium.
- Covered call writing is a good way to sell at a target price.

Selling a put option

- This is a good way to buy at a target price
- Example: an airline sells a March 2015 WTI put option with strike price $85, receiving a premium of $1.80. Current spot is $86.
- If WTI falls below $85 at expiry, it is obliged to buy WTI oil at $85. Its effective cost is lowered by the premium received.

Graphically showing buying (long) and selling (short) of calls and puts



Easy way to remember how to draw these diagrams is to think of a diamond:
Left side is call, right side is put.

Combination of buying and selling calls and puts

- Example: a bullish strategy
  - Buy a March'15 WTI call at $93
  - Sell a March'15 WTI put at $85
  - Net premium = zero
  - This is a zero cost collar

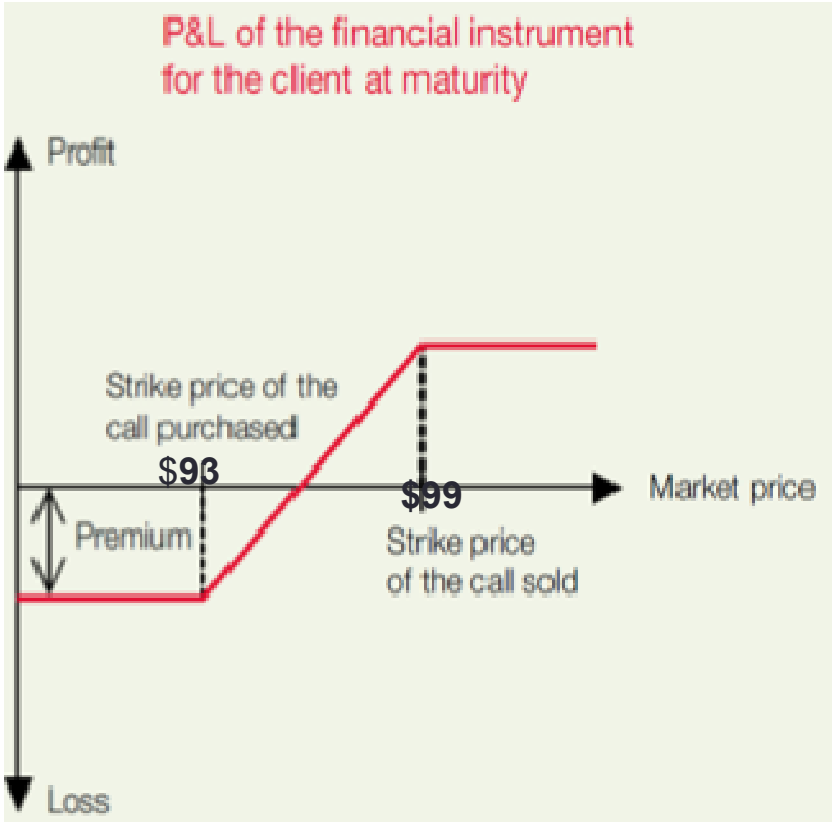
  - Hence a consumer who needs to own WTI may use this strategy

  - Consumer can choose preferred strike prices that will yield preferred net premiums.

  - Can also do unequal number of contracts or amount of put and call.

Example of reducing cost of protection: buying a call spread

- Consumer can lessen the cost of protection by buying a March'15 WTI call at $93 and selling a March'15 WTI call at $99.
- i.e. he loses protection of rising price above $99



Current climate favors buyers

- Which means producers should be hedging?
- Buyers can maximise via selling puts?

Term structure of oil

- Contango
- Backwardation

Brent futures: backwardation a year ago have turned to contango

Brent crude prices, 8 Oct 2014

WTI crude: forward prices have flattened

Natural gas futures showing contango and seasonality

Investors in commodity index

- Two major commodity indices – S&PGSCI and DJ-UBSCI that financial investors use.
- Oil and energy contracts form the biggest components.
- Between 2003-2008, institutional investors in these indices grew from $15bio to more than $200bio.
- Current estimate $130bio. Dampened by global economic slowdown.
- Loss of backwardation = negative carry

Summary

- Myriad of oil products for hedging.
- Financial market expertise being utilized in commodities.
- Futures market model is sound.
- Hedging reduces risk and uncertainty.
- Basis risks exist.
- Selection of suitable hedging instrument that meets management objectives.

Appendix: Major energy contracts & exchanges

Top 20 Energy Futures & Options Contracts

Rank	Contract	Contract Size	Jan-Dec 2012	Jan-Dec 2013	% Change
1	Brent Crude Futures, ICE Futures Europe	1,000 barrels	147,385,858	159,093,303	7.9%
2	Light, Sweet Crude Oil Futures, Nymex	1,000 barrels	140,531,588	147,690,593	5.1%
3	Henry Hub Natural Gas Futures, Nymex	10,000 MMBTU	94,799,542	84,282,495	-11.1%
4	Gasoil Futures, ICE Futures Europe	100 tonnes	63,503,591	63,964,827	0.7%
5	Crude Oil Futures, MCX	100 barrels	57,790,229	39,558,169	-31.5%
6	WTI Crude Futures, ICE Futures Europe	1,000 barrels	33,142,089	36,106,788	8.9%
7	NY Harbor RBOB Gasoline Futures, Nymex	42,000 U.S. gallons	36,603,841	34,470,288	-5.8%
8	No. 2 Heating Oil Futures, Nymex	42,000 U.S. gallons	36,087,707	32,749,553	-9.3%
9	Crude Oil (LO) Options, Nymex	1,000 barrels	32,525,624	31,478,060	-3.2%
10	Natural Gas Futures, MCX	1,250 MMBTU	27,886,670	23,828,800	-14.6%
11	Natural Gas European-Style Options, Nymex	10,000 MMBTU	24,260,726	21,053,064	-13.2%
12	Brent Oil Futures, Moscow Exchange	10 barrels	11,952,101	18,170,809	52.0%
13	U.S. Oil Fund ETF Options *	N/A	21,348,808	16,557,758	-22.4%
14	Henry Hub Swap (NN) Futures, Nymex	2,500 MMBTU	18,156,113	11,459,837	-36.9%
15	Brent Crude Oil Options, ICE Futures Europe	1,000 barrels	8,908,862	9,675,876	8.6%
16	Brent Crude Oil Last Day Futures, Nymex	1,000 barrels	1,161,113	9,214,951	693.6%
17	U.S. Natural Gas Fund ETF Options *	N/A	12,369,729	7,988,602	-35.4%
18	EUA Futures, ICE Futures Europe	1,000 EUAs	6,465,262	7,260,390	12.3%
19	Natural Gas Penultimate Swap Futures, Nymex	2,500 MMBTU	7,945,695	6,418,797	-19.2%
20	Thermal Coal Futures, ZCE **	200 tonnes	N/A	4,357,384	N/A

** Traded on multiple U.S. options exchanges ** Began trading in September 2013*

Source: FIA Annual Volume Survey