

## The futures markets



### Introduction and Mechanics

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## Web sites

Intercontinental Exchange (owns NYME): <http://www.theice.com>

**CMEGroup** (CME and CBOT): <http://www.cmegroup.com>

Ino (good free site for checking prices): <http://www.ino.com>

Kitco (metals): <http://www.kitco.com>

OpenECry (online futures broker): <http://www.openecry.com>

Peruse the CMEGroup site before the next lecture and see what information they provide. **Look at the list of commodities they trade and look at their contract specifications and prices.**

## Key terms

- **Spot price:** Today's cash price.
- **Futures price:** Today's price of a specified futures contract, like Feb 2012 CMEGroup Henry Hub nat gas contract.
- **Expected future spot price:** Exactly what the name implies. There is a theory that says that this price will not be the same as the futures price (normal backwardation).
- **Volume (futures):** The number of contracts traded today (or in any period of time)
- **Open interest (futures):** The number of contracts that are "open," that exist right now, that have a long and short position.
- **e-Mini contract:** A smaller contract in some commodity, usually about half the size, electronically traded.

## Example: CMEGroup Henry Hub Natural Gas Futures (HH)



Contract size: 10,000 mmBTU (current value about \$25,000)  
 Initial margin: \$2,835 [January 23, 2012]  
 Maintenance margin: \$2,100  
 Contract price sensitivity: \$100 per penny move  
 Delivery allowed?: Yes, complicated, only trading companies can do it.

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### Homework assignment that you must do this week – right now!!

We are going to use Nat Gas as a prototype example at lot on this class, beginning with this lecture.

Natural gas is at a low spot historically, at less than \$2.50 per mmBTU.

Your assignment: During market hours go the the CMEGroup website (do it now if you have a laptop in class) and find the full futures chain for **Henry Hub Natural Gas (NG)**.

1. Pull up the chart (use weekly data) for the Feb 2012 contract. What has happened to this price?
2. Going back to the main page, look at the full chain. Look at Feb 2013. That is what you call an extreme **Contango**.
3. If you think that spot **NG** will rise, can you trade futures to make that bet?
4. Shale gas – the new panacea! How is that affected by this?
5. If spot NG rises, will UNG follow the price up and show capital gains like it is supposed to? Shall we watch? [Yes]

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**But maybe the ETF-tracking theory is wrong! Look! UNG tracked HH futures down faithfully, like it is supposed to!**



Hmmm. Was the HH futures chain in backwardation in September 2011? Feb 2012 was at \$5.40. Feb 2013 was at \$5.80. So no. But **now** it is in Contango. Get the difference?

## Performance Bonds

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Unlike when you buy an option, when you enter into a futures contract you are not buying anything and you don't pay for anything. You have entered a contract that either (1) gives you the **right** to buy something in the future (traditional futures contract) or (2) or gives you a capital gain or capital loss as though you have the right to buy something in the future (modern futures contract with no delivery allowed).

The trader has a cash account that is used to meet **performance bonds**, also called margin requirements, on all futures contracts. It is identical to a cash account in a stock trading account.

Each futures contract held by the trader, long or short, has an **initial margin** and a **maintenance margin** (also called a **day margin**).

The initial margin defines the minimum amount of cash that must be remaining in the account when a new futures contract is undertaken.

The cash balance in the account may not drop below **the sum total of all maintenance margins**, otherwise there is a **margin call**.

## Settlement

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At the end of each trading day (5:15 PM NYT) the cash account referred to in the previous slide is adjusted in the process called **settlement**.

For futures contract in which the trader is **long [short]**, if the price rose during the day, a capital **gain [loss]** is added to the account and if the price fell during the day, a capital **loss [gain]** is subtracted.

This process is calculated for each futures contract at market close by taking the closing price (called the **settle**) and calculating the difference between that and the closing price the previous day (called the **prior settle**).

For example, a single HH Nat Gas futures contract has a **contract price sensitivity** of \$100 per penny. If the trader is long in an HH futures contract that rose \$0.12, then \$1,200 is added to her cash account during settlement.

**An example of cash account adjustment**

March Natural Gas futures contract, long 10,000 ,mmBTUs

Nat Gas (HH) daily settlement				
Date	Price	Position	Gain	Cash
0	2.47	24,700	0	40,000
1	2.49	24,900	200	40,200
2	2.36	23,600	-1,300	38,900
3	2.32	23,200	-400	38,500
4	2.48	24,800	1,600	40,100
5	2.51	25,100	300	40,400
6	2.62	26,200	1,100	41,500

For a short contract, the signs in the **Gain** would simply reverse.

Contract price sensitivity: \$100 per penny.

**Example**

- In January, you buy a April HH natural gas futures contract for \$2.66 per mmBTU (nominal value \$26,600). You are long. You want to take delivery.
- Spot price in on the day you enter this contract is \$2.46 (not relevant to settlement nor to this contract).
- When April delivery arrives, spot price has risen to \$3.04.
- Question: What are the settlement terms?
  - You take delivery of the nat gas in Apr at the new spot (\$3.04), *not* \$2.66, so you pay \$30,400.
  - You have gained \$3,800 in your cash (margin) account.
  - The **total cost** of this contract to you is (\$30,400 – 3,800) which equals \$26,600, exactly as you intended.
- Therefore, **the only asset you have is the cash balance of your margin account!**

## **Exiting the contract (offset)**

Less than 1% of all futures contracts end with delivery of the commodity!  
Nearly all traders reverse their trades (called "offset") before the contract expiration date.

Remember that the futures price must converge to the spot price as the expiration date approaches. Open interest declines until it is zero.

Generally long positions exit at about the same pace as short positions, so open interest is gradually cleared off by the exchange.

Remember, you did not "buy" or pay for anything when you opened the contract. You agreed to daily settlement terms, which have been satisfied daily. When you offset you do not sell anything or get paid. *You just inform your broker that you are closing out your trade and the exchange says goodbye.*

Most ICE contracts allow either futures swaps (EFP) or cash settlement instead of delivery even if you do not offset. Many contracts are cash settlement only.

Many non-commodity contracts do not have deliverables so offset is automatic.

## **Questions and answers about pricing**

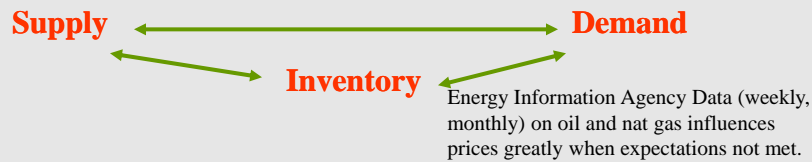
Question: Spot and futures prices are sometimes very volatile. What, generally, is causing these price fluctuations.

Answer: These markets wouldn't exist if prices weren't volatile. There is no general answer about why prices rise and fall .. that depends upon the commodity. Coffee doesn't follow the same cycle as crude oil (why would it)? Of course, at the root is **basic supply and demand**, including long term and short term. Generally, the many variables affecting production or supply on one side and the market for the product on the other will impact price, whether that is due to the weather, changes in consumer taste. Many commodity prices are affected by storage capacity, distribution capacity, interest rates, and other costs.

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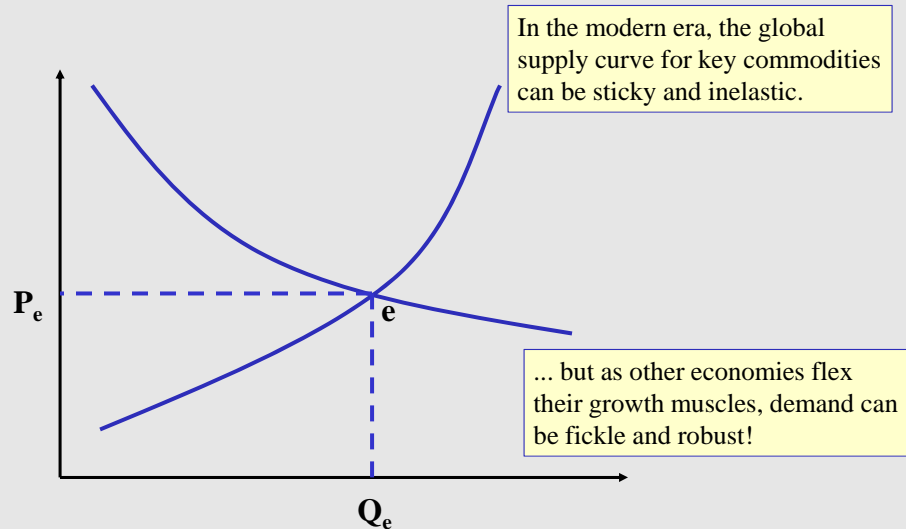
### Pricing fundamentals of tangible, storable commodities (like oil and nat gas)

The prices of tangible, storable commodities like crude oil, natural gas, wheat, copper, and so forth are fundamentally determined by global trends in **supply** (production), **demand** (consumption), and stored **inventory**, which acts as a buffer between supply and demand. Often futures prices, which have a short-run orientation (although they are influenced by long-run expectations) are strongly affected by unexpected inventory fluctuations.



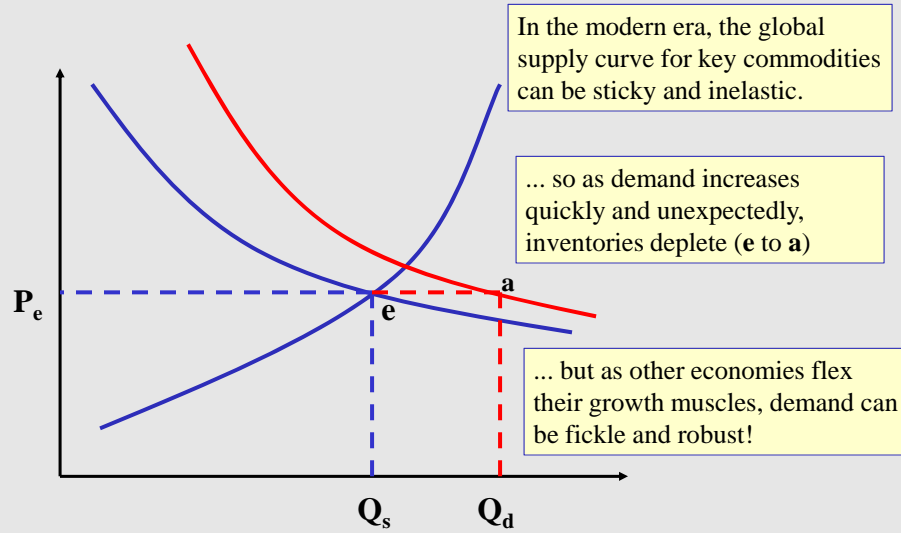
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### Key Storable Commodity Supply and Demand



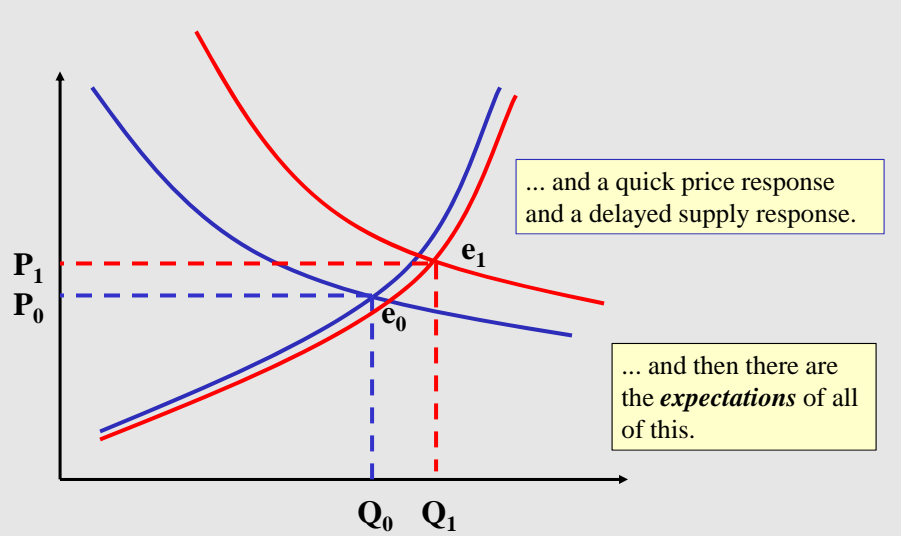
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### Key Storable Commodity Supply and Demand



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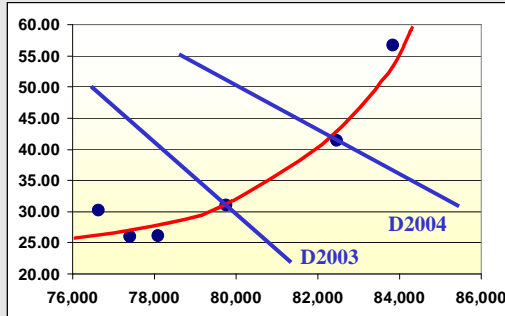
### Key Storable Commodity Supply and Demand



### Severe Supply Inelasticity of Oil

Global Oil Market		
	Demand	Price
2000	76,619	30.26
2001	77,406	25.95
2002	78,082	26.15
2003	79,742	30.99
2004	82,452	41.47
2005	83,837	56.70

Daily millions barrels  
Source: EIA



WEFA study commissioned by the American Petroleum Institute in 1990 concluded that the supply elasticity of oil was only 0.13! (controversial)

Data source: Energy Information Agency.

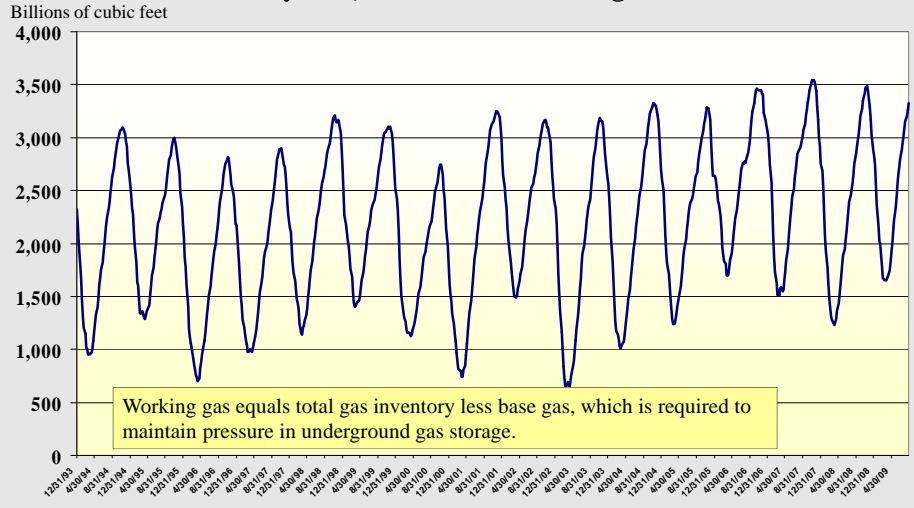
### What should matter for a commodity like Natural Gas?

- What matters on the supply side (production) in the short run?
- What matters on the supply side (exploration and development) in the long run?
- What matters on the demand side?
- Does inventory matter on this commodity?
- Is this market at all news-event driven? Data driven?
- Is this a sympathy market (to, say, crude)?

An example where inventory matters ...

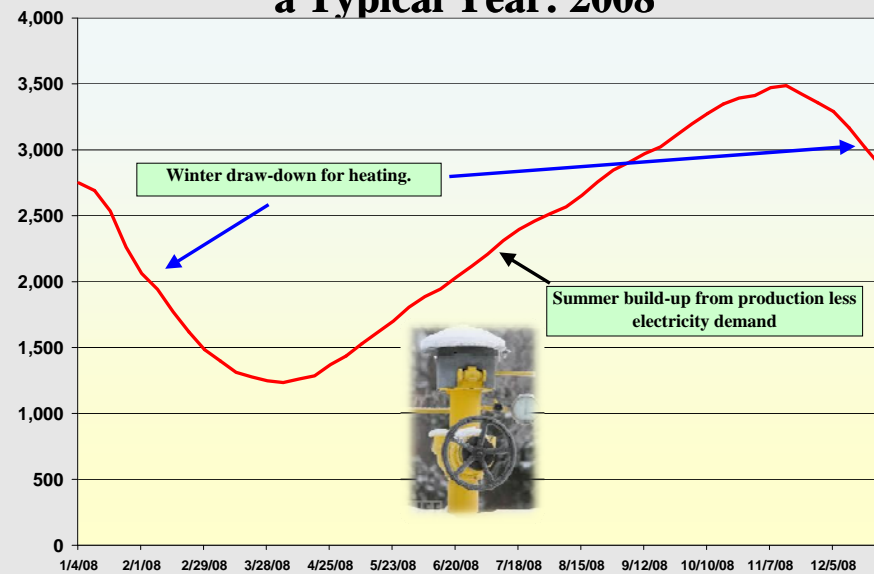
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### Natural Gas Underground Working Gas Inventories Weekly data, December 1993 to August 2009



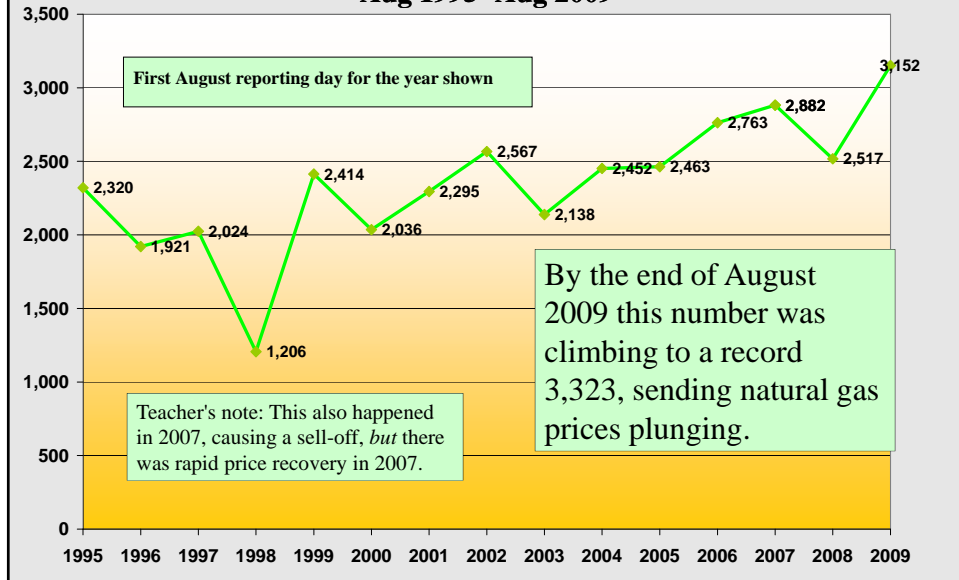
Source: Energy Information Administration

### Working Underground Gas Inventories for a Typical Year: 2008



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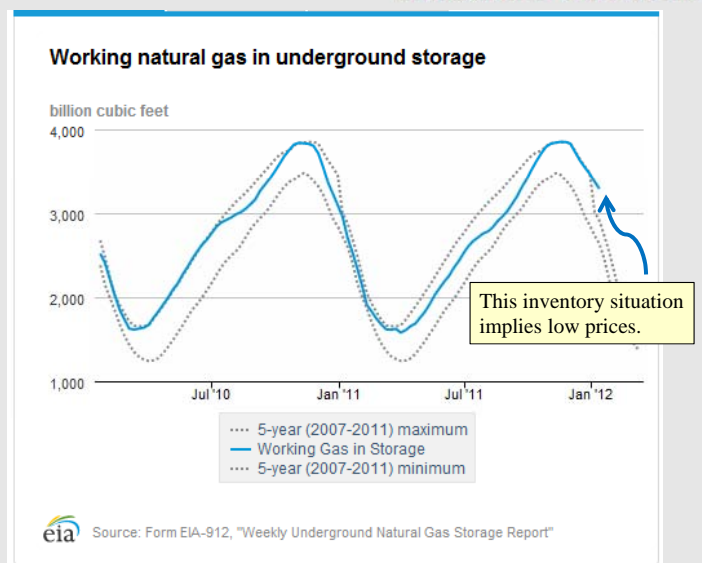
### Comparing equivalent dates for different years: working gas Aug 1995- Aug 2009



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### Related data that I watch ...

An example of the *Weekly Natural Gas Storage Report* issued each Thursday by the Energy Information Administration.



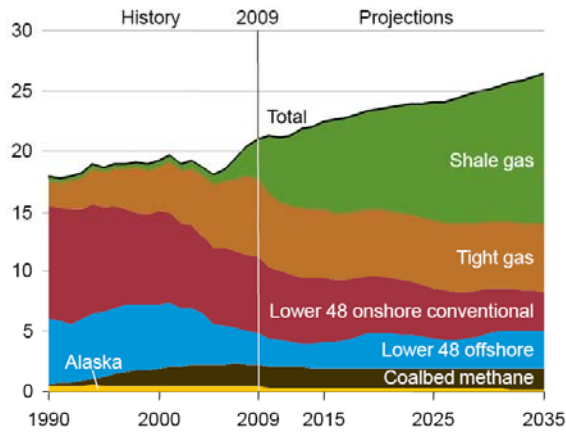
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**Long-term supply:  
Is this really going  
to happen if Nat  
Gas prices remain  
well below \$5?**

Source: *Annual Energy Outlook 2011 with Projections to 2034*, Energy Information Administration

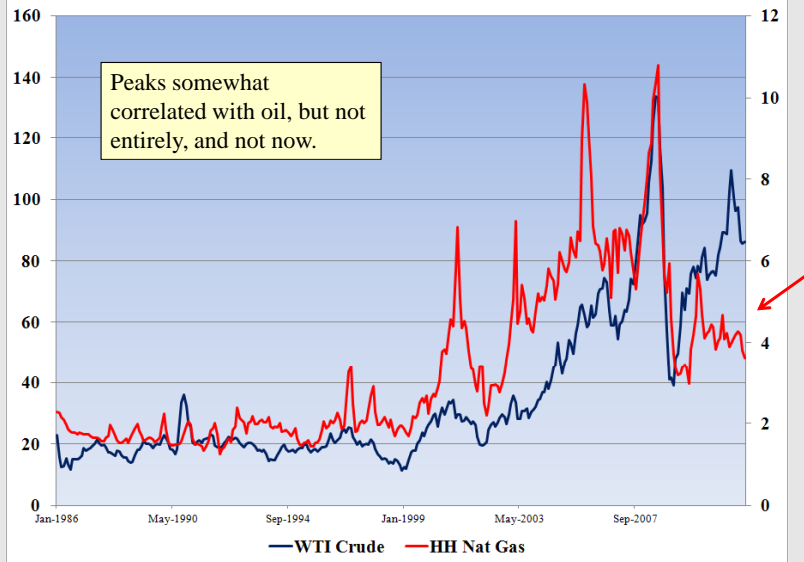
Shale gas provides largest source of growth in U.S. natural gas supply

Figure 89. Natural gas production by source, 1990-2035 (trillion cubic feet)



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**Are Nat Gas and WTI Crude Sympathetic?**



Source: Energy Information Administration