Weather Derivatives and not Carbon Trading (Sorry)

Cornelius Sheridan
and
Nipun Tulshian

NASDAQ

1

What is a Weather Derivative?

- Any contract that derives its value from a meteorological event
  - Temperature
    - Heating(HDD)
    - Cooling(CDD)
  - Hurricanes
  - Snowfall
  - Frost

NASDAQ

2

Weather Derivatives Market

- First trade occurred in Over-the-Counter (OTC) market in 1997
- Occurred between power producer and power distributor
- Since 1999 contracts trade on the Chicago Mercantile Exchange (CME)
- Early pioneer-Enron Online
  - They weren't all bad after all

NASDAQ® 3

Weather Derivatives Market (Continued)

- Typical open interest-200,000 contracts
- Peak open interest-400,000 contracts
- Average daily volume-5,000 contracts
- Busiest months- March, September
- Slowest months-April, October

NASDAQ® 4

Temperature Derivatives

- Available for US, Canada, EU, Japan, and Australia
- United States
  - 20 Cities
  - Heating Monthly
  - Heating Seasonally
  - Cooling Monthly
  - Cooling Seasonally

Temperature Derivatives (Continued)

- Europe
  - 10 Cities
- Canada
  - 6 Cities
- Japan
  - 2 Cities
- Australia
  - 3 Cities

Temperature Derivatives (Continued)

- Contracts are based on multiples of $20
- Maximum position- 10,000 contracts
- Cash settlement at the contracts expiry
- Trades like typical futures contract
- Options on futures are available

NASDAQ 7

How temperature derivatives work?

- Value of contract based on Heating Degree Days(HDD) or Cooling Degree Days(CDD)
- Degree days are based on the days average temperature minus 65 degrees
- The daily number is summed over entire period to equal contract total

NASDAQ 8

How temperature derivatives work? (Continued)

- Example: HDD
  - Average Temperature: 50 F
  - Base Temperature: 65 F
  - HDD: 15
  - Contract Value: $20 per unit
  - Value: 15X$20=300
  - Repeat for all days in month or season
  - Sum all values

NASDAQ 9

Temperature Derivative-Participants

- Hedgers
  - Electricity Producers/Consumers
  - Natural Gas Suppliers/Consumers
  - Heating Oil Suppliers/Consumers
  - Farmers
  - Weather Sensitive Businesses
- Speculators

NASDAQ 10

Hurricane Derivatives

- Available for US Hurricane Season
  - Season runs from Jan 1 to December 31
  - Landfall = Texas to Maine
- Contracts available
  - Events
  - Seasonal
  - Seasonal Maximum
- Hurricane futures are binary contracts

NASDAQ® 11

What are Binary Contracts?

- Binary contracts are contracts with only two outcomes
  - $Big Money$
  - Zero
- If contract crosses threshold it pays out, otherwise it pays nothing
- Contract price = (expected likelihood of event) X (payout if event occurs)

NASDAQ® 12

Hurricane Derivatives (Continued)

- Events
  - Number of hurricanes that occur during the season
- Seasonal
  - Number X Strength of hurricanes that occur in specific region
- Seasonal Maximum
  - Strongest hurricane that occurs in region

NASDAQ® 13

Hurricane Derivatives (Continued)

- Regions include
  - Gulf Coast
  - Florida
  - South Atlantic Coast
  - Northern Atlantic Coast
  - Cat-In-A-Box (Oil Fields)
- Contracts-$1,000
- Settlement-CME Hurricane Index

NASDAQ® 14

Hurricane Derivatives-Participants

- Hedgers
  - Insurance Companies
  - Oil Companies
  - Tourist Destinations
  - Commercial Property Owners
- Speculators

Hurricane Derivatives-Example

- Problem: Oil Co needs to protect Gulf of Mexico (GOM) oil rigs
- Risk: Hurricane damage to oil rigs
- Solution:
  - Purchase Seasonal Maximum contract
  - Number of contracts (Value of Rig/1K)
  - Contract index number based on vulnerability of oil rig

Hurricane Derivatives-Example

- Index Number
  - Ranges from 1-30
  - Katrina was a 20.4
- Oil Co buys index number that corresponded to destruction of rig
- Outcome(s):
  - Hurricane destroys rig = binary payday
  - No hurricane = rig is still intact

NASDAQ® 17

Snowfall Derivatives

- Available for Boston and NYC snowfall
- Contracts for individual months or entire season
- Monthly contracts run from October through April
- Contracts- $200 per inch
- Settlement- CME Snowfall Index

NASDAQ® 18

Snowfall Derivatives (Continued)

- All contracts are settled in cash
- Trades throughout the year like a typical futures contract
- Maximum position is 10,000 contracts
- Options are also available

NASDAQ

19

Snowfall Derivatives-Participants

- Hedgers
  - City Governments
  - Ski Resorts
  - Rock Salt Companies
  - Airlines?
- Speculators

NASDAQ

20

Frost Derivatives

- Available for one city in Europe
  - Amsterdam
- Contract is priced based on the accumulation of Frost Index Points
- Contracts are priced at 10,000 Euros per Frost Index Point
- Maximum Position is 10,000 contracts

NASDAQ 21

Frost Derivatives (Continued)

- Frost Index Point
  - Temperature at 700 is less than -3.5 C
  - Temperature at 1000 is less than -1.5 C
  - Temperature at 700 and 1000 is less than -.5 C
- One point is awarded if anyone of these events occurs

NASDAQ 22

Frost Derivatives (Continued)

- Available for individual month or entire season
- Months- November through March
- Contracts are settled in cash at expiry
- Options are available on the futures

NASDAQ 23

Frost Derivatives-Participants

- Crazy Europeans
- Hedgers
- Speculators

NASDAQ 24

Additional Resources

- CME online
  - http://www.cmegroup.com/trading/weather/index.html
- Books
  - Weather Derivative Valuation
  - Climate Risk and Weather Markets
  - Insurance and Weather Derivatives
  - Weather Risk Management

NASDAQ 25

Additional Resources (Continued)

- Research
  - http://www.altevoresearch.com/HF_Weather_deriv_Feb06.pdf
  - http://fic.wharton.upenn.edu/fic/papers/02/0242.pdf
  - http://www.people.cornell.edu/pages/ats33/DerivativesReport.pdf
- Investopedia
  - http://www.investopedia.com/articles/optioninvestor/05/052505.asp

NASDAQ 26