Financial Derivatives

Scotty Bauer
Overview

- What is a financial derivative?
- Types of financial derivatives
- How you make money with financial derivatives
- How financial derivatives played a role in the financial meltdown
Financial derivative

- Contract between two or more parties
- Value of contract derived from performance of underlying asset
- Used to hedge positions
- Easier access to some markets
  - Buy oil contracts instead of true barrels
- Trading -- speculation
Options

● Call option
  ○ For stocks
  ○ Two party transaction
    ■ write (seller)
    ■ buyer
  ○ Seller (short)
    ■ Thinks stock price will go down
  ○ Buyer (long)
    ■ Thinks stock price will go up
Options - Call

● Buyer
  ○ purchase 100 shares at strike price

● Strike price
  ○ Some arbitrary price of the stock

● Seller
  ○ is contractually obligated to purchase 100 shares
    ■ at strike price (if executed)
Options - Call

- **Premium**
  - Seller collects at time of writing

<table>
<thead>
<tr>
<th>Premium</th>
<th>Strike</th>
<th>Premium</th>
<th>Option</th>
<th>Expiration</th>
<th>Quantity</th>
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### Options - Call

<table>
<thead>
<tr>
<th>Strike</th>
<th>Symbol</th>
<th>Last</th>
<th>Change</th>
<th>Volatility</th>
<th>Open Interest</th>
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- **TSLA 232.50 April 25 Exp.**
  - $16.10 per contract
  - 100 shares per contract
  - $1610 you pay to the writer of the contract
Options - Call

● Writer
  ○ Collects $1610
    ■ legally obligated to purchase 100 shares
    ■ $232.50 * 100 = $23,500
    ■ If exercised
  ○ Margin account level 3
Options - Call

- Tesla stock goes to $255
  - Call tracks price of stock
  - Call contract you own is now worth $22.50
  - Sell it back to writer for $22.50
  - $2250 - $1610 = $640 ~39% gain
  - Writer loses $640 dollars
Options - Put

● Inverse of call
  ○ 2 party
  ○ Writer thinks stock will go up
    ■ obligated to purchase shares at strike price
  ○ Buyer thinks stock will go down
    ■ wants to lock in gains
    ■ has the right to sell 100 shares at strike
Options - Put

- Buyer purchases put @ 235.00 strike
  - stock goes down to $200
  - buyer of put can sell stock @ $235
  - writer of put has to buy stock @ $235
    - or buy back option at higher price
    - lose money
Futures

- Very old derivative
  - Forward contract
    - Farmers hedge against changes in the prices of their crops between planting and when they could be harvested and brought to market.

- Hides market volatility
- Leverage
- Specifies amount and delivery time
- Evaluated at close every night.
Futures with underlying assets

- Cattle - hedging
  - McDonalds wants, for accounting purposes, cattle cost to be fairly static
  - Buy a futures contract for 10 Cattle @ $2k per cattle for delivery in May 2014.
  - If price of cattle goes up or down they still purchase at $2k

- Both parties put up margin
  - explain on next pages
# Futures - Cattle Hedging

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<tr>
<th>McD’s:</th>
<th>Price</th>
<th>Farmer</th>
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<td>20kM</td>
<td>Mar 2k</td>
<td>20kM</td>
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Futures - Cattle Hedging

McD’s: $20kM  Price: Mar 2k  Farmer: $20kM

$5k

$25kM  Price: Apr 2.5k  Farmer: $15kM
Futures - Cattle Hedging

McD’s: $25kM Price Aprl 2.5k Farmer $15kM

$30kM May 3k $10kM
Futures- Cattle Hedging

- May
  - McD’s wants its 10 cattle
  - Pays the spot price of the underlying asset
    - In May 3k per cattle
    - has to pay 30k per cattle
    - They wanted to pay only 2k per cattle
  - Over the course of 3 months
    - 10k was taken from farmers margin acct
    - true cost only 20k or 2k per cattle
Futures - Cattle Hedging

- Coked up trader in NY
  - Can’t fit 10 cows in penthouse
  - Only want to trade speculatively

- Novate the contract
  - Another contract
  - You buy cows back at spot price

- Previous scenario
  - Trader on the right side loses 10k
  - Trader on the right side gains 10k
  - no cows in penthouse
Futures - Leverage

● S&P 500 E-Mini’s
  ○ Index tracking
    ■ no underlying asset
● Buyer/Seller
● Future is $50 * price of S&P 500
  ○ 50 * 1,872.01 = $93,600.50
● But you only have to put up the margin cost
  ○ $4,758 - 5% capital
Futures - Leverage

- April
- S&P is now at $2012
  - Contract is now 50 * 2012 = 100,600
  - 5% of 100,600 is $5030
  - Margin account reads $4785 + $5030 = $9815
    - 105% gain
    - Leverage turned 7% S&P gain into 105% gain
    - Works opposite way -7% S&P means -5030
S&P Minis Flash Crash

- Sold 75k contracts
  - Sold through all the buyers
  - HFT started trading b/f
    - 23k contracts exchanged
    - 30 seconds
  - 3% decline in s&p mini
- Computers started to pull out of market
- Stop losses hit -- more selling
- CME stop logic stopped S&P mini trading
  - 5 sec -- fixed market almost immediately
Swaps
Swaps - Formal Definition

- Derivative in which two counterparties exchange cash flows of one party’s financial instrument
- Traded OTC - High risk
- Banks only
  - huge swaths of money
- Outstanding swaps in 2010 $348 Trillion
Interest rate swap example

- LIBOR
  - London Interbank Offered Rate
  - Libor rates are calculated for ten currencies and fifteen borrowing periods ranging from overnight to one year and are published daily at 11:30 am
  - But really banks just sit down and make up some number
- Really
The financial Crisis of 2007

- **Credit Default Swaps**
  - Insurance policy on Bonds/Loans/etc
  - “Credit Event” -- Default, restructuring
    - **CDS Seller**
      - Contractually obligated to purchase your loan/bond
      - Nominal value
      - Good for you as the loan/bond is worthless
    - **Buyer stuck with these worthless bonds/loans**
The financial Crisis of 2007

- Mortgage-backed Securities
- Buy a house get a $1m mortgage
  - commercial bank, DFS, Zion, Wells fargo
- Commercial banks package mortgage
  - sell to BoA, GS, Leehman bros, JPM
- Investment Banks then
  - create Special Purpose Entity
FC 2007 MBS

- Special Purpose entity (whole new company)
  - Now holds the mortgages IB purchased
- Investment Bank sells shares of SPE
  - IB bought mortgages for $1B
  - Sells all shares for $1.1B
    - $100 M profit
- Holders of SPE shares get dividends
  - Interest payments from home owners
Getting Owned 2007 Investment Bank Style

- IB makes SPE with mortgages
  - They know these mortgages are worthless
  - Credit agencies give them AA ratings anyway
  - Sell SPE shares to investors
    - Make profit
  - Buy Naked CDS on those mortgages
  - Mortgages fail
    - investors out
  - Banks++
CDS MBS and the crash

- So many toxic MBS
- Banks wrote so many CDS to each other and AIG wrote a majority
  - Free money right?
  - Housing prices only go up
- Mortgages default
  - CDS get called
    - No one set money aside for possible default
- Naked CDS
  - Banks wrote CDS for people betting against other peoples loans
    - 1B loan 16Billion in CDS insurance
- Chain reaction
Exotic Derivatives

● Weather derivatives
  ○ ENRON
  ○ Mostly used for farmers/ski resorts
    ■ Anyone who can be hurt by weather
  ○ PCMR gets terrible snow fall
    ■ Less tickets sold
    ■ Okay because hedged with weather derivative
  ○ Farmer gets no rain
    ■ No crops
    ■ Ok because weather derivatives
Exotic Derivatives

● Energy derivative
  ○ ENRON!!
  ○ Natural gas, oil, electricity
  ○ Turn power off in California
    ■ Electricity is scarcer--cost more
    ■ Electricity derivative cost more
    ■ Enron makes
Questions?