Financial Derivatives

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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

232.50	TSLA140404C00232500	11.05	↓0.86	11.15	11.45	20	77
232.50	TSLA140411C00232500	14.62	↓2.12	13.35	13.70	2	55
232.50	TSLA140425C00232500	16.10	↓0.90	16.20	17.05	4	13
235.00	TSLA140404C00235000	9.71	↓0.44	9.90	10.20	50	145
235.00	TSLA140411C00235000	13.00	↑0.15	12.10	12.40	5	70
235.00	TSLA140419C00235000	13.85	↓0.83	13.70	13.90	162	717

Options - Call

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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

232.50	TSLA140411P00232500	10.50	0.00	11.10	11.50	2	46
232.50	TSLA140425P00232500	15.00	↑0.86	14.35	14.95	3	30
235.00	TSLA140404P00235000	10.95	↑0.58	10.10	10.40	25	116
235.00	TSLA140411P00235000	12.85	↓0.65	12.35	12.75	13	56

- 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

McD's:	Price	Farmer
20kM	Mar 2k	20kM

Futures - Cattle Hedging

McD's:	Price	Farmer
$20kM	Mar 2k	$20kM
	←----------$5k	
$25kM	Aprl 2.5k	$15kM

Futures - Cattle Hedging

McD's:	Price	Farmer
$25kM	Aprl 2.5k	$15kM
	←----------$5k	
$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

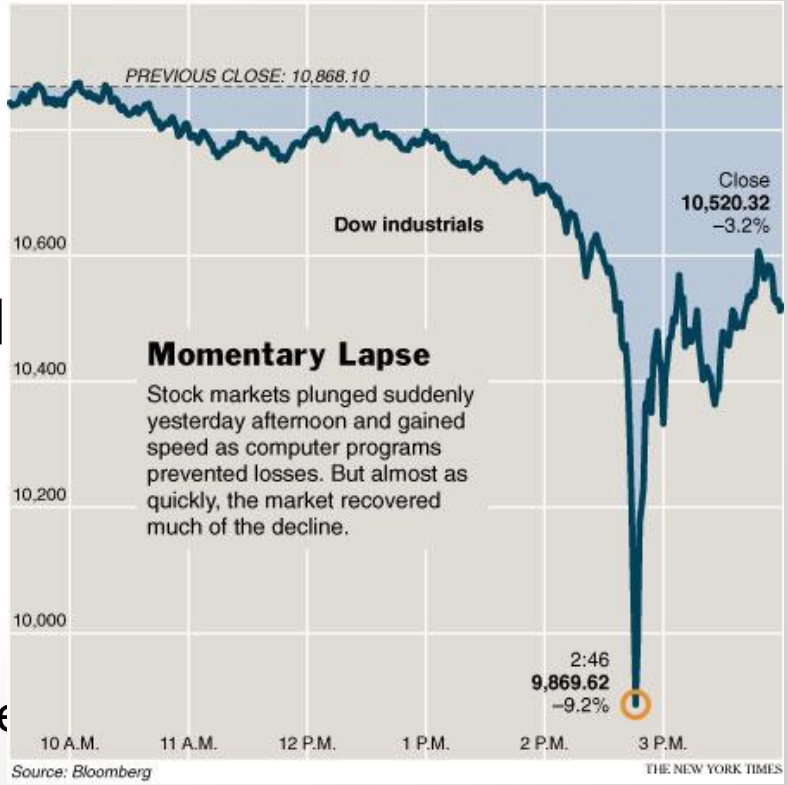
- S&P 500 E-Mini’s
  - Index tracking
    - no underlying asset
- Buyer/Seller
- Future is $50 * price of S&P 500
  - 50 * 1,872.01 = $93,600.50
- But you only have to put up the margin cost
  - $4,758 - 5% capital

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 immediate



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

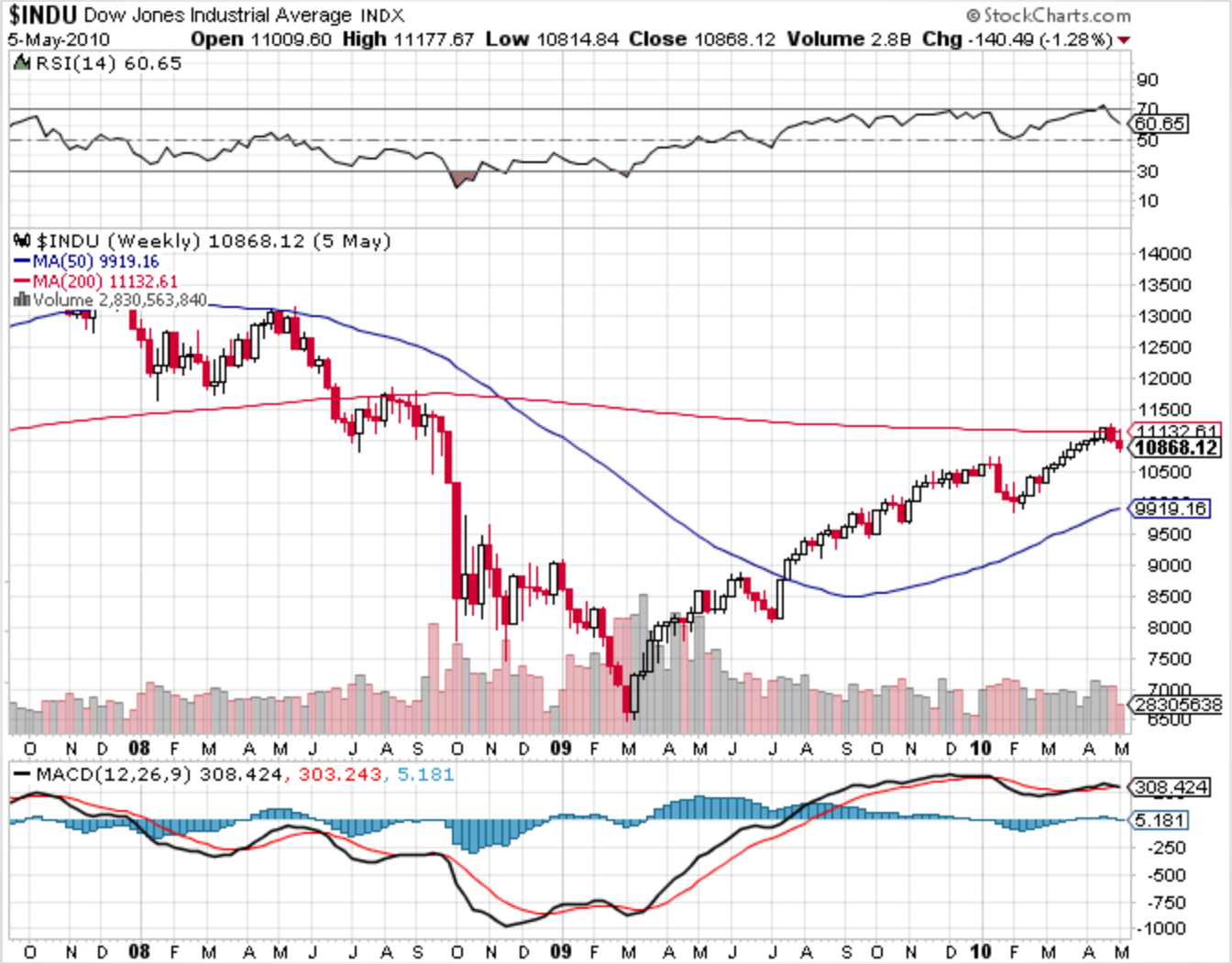
- Special Purpose entity (whole new company)
  - Now holds the mortgages IB purchased
- Investment Bank sells shares of SPE
  - IB bought mortgages for $1B
  - Sells all shares for $1.1B
    - $100 M profit
- Holders of SPE shares get dividends
  - Interest payments from home owners

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


$INDU Dow Jones Industrial Average INDX
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5-May-2010 Open 11009.60 High 11177.67 Low 10814.84 Close 10868.12 Volume 2.8B Chg -140.49 (-1.28%)
RSI(14) 60.65
$INDU (Weekly) 10868.12 (5 May)
MA(50) 9919.16
MA(200) 11132.61
Volume 2,830,563,840
MACD(12,26,9) 308.424, 303.243, 5.181
O N D 08 F M A M J J A S O N D 09 F M A M J J A S O N D 10 F M A M

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?