1
Options Markets

- Types of Options
  - Stock Options – Options on individual stocks
  - Index Options – SP500 (SPX), SP100, Nasdaq-100, DJIA, R2000… Payoff to in-the-money put is (S_T – K)*multiplier. Usually cash settled; Alternative is options on ETFs.
  - Foreign Currency Options –
  - Interest Rate Options – T-bills, T-bonds, GNMA pass-throughs
  - Futures Options – Options on futures contracts; FX and commodities

- Terminology

- Markets and Payoffs

- Stock Splits, Exotic Options and Embedded options.

- Index options **(see Hull section 13.1)**

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Terminology

- Option - contract giving holder right, but not obligation, to buy (sell) an asset at fixed price (exercise price) at any time on or before given date (expiration date).
  - Call – right to buy.
  - Put – right to sell.
  - American – exercise any time before expiration (most common)
  - European –
- More
  - Intrinsic value –
  - In the Money –
  - Time value – difference between current option price and intrinsic value
  - Option class – all calls or puts on an underlying asset.
  - Option series – all options with same expiration date and strike price.
- Other
  - Closing positions – close position by trading into off-setting position.
  - Many brokers/exchanges auto exercise in-the-money options at expiration.
  - Margin –

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Option Markets and Payoffs

- Markets – Exchanges (CBOE) standardize contracts; increase depth and liquidity
  - Strike prices set at $2.50 or $5 intervals; market makers post bid and ask.
  -

- Option Clearing Corp – Self-regulating intermediary between buyer and seller.
  - Trades cleared by OCC members (brokerages).
  - OCC assigns firms to honor exercise; sets margin requirements.
  - Writer posts margin

- .Quotes – Contracts are for 100 shares, so contract costs *price**100.
  - Expire on 3rd Friday of month; Consider options K=\$80.
  -

Final Stock Price (S_T.)	**Payoff to Long Call**	**Payoff to Long Put**
77		
80		
83		
Payoff at S_T	Max[(S_T–K), 0]	Max[(K–S_T), 0]
Profit	Max[(S_T–K–C), –C]	Max[(K–S_T–P), –P]
Option Written	Min[(– S_T+K +C), +C]	Min[(–K+S_T+P), +P]

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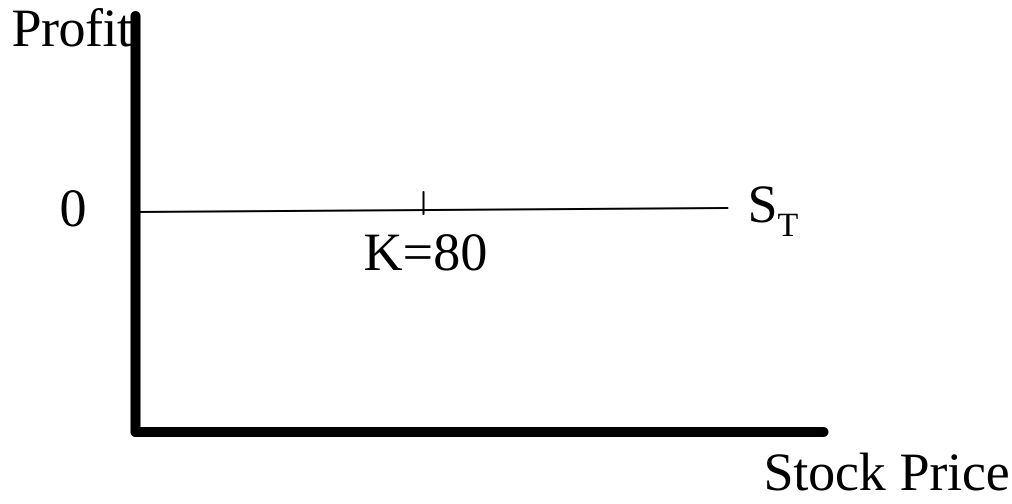
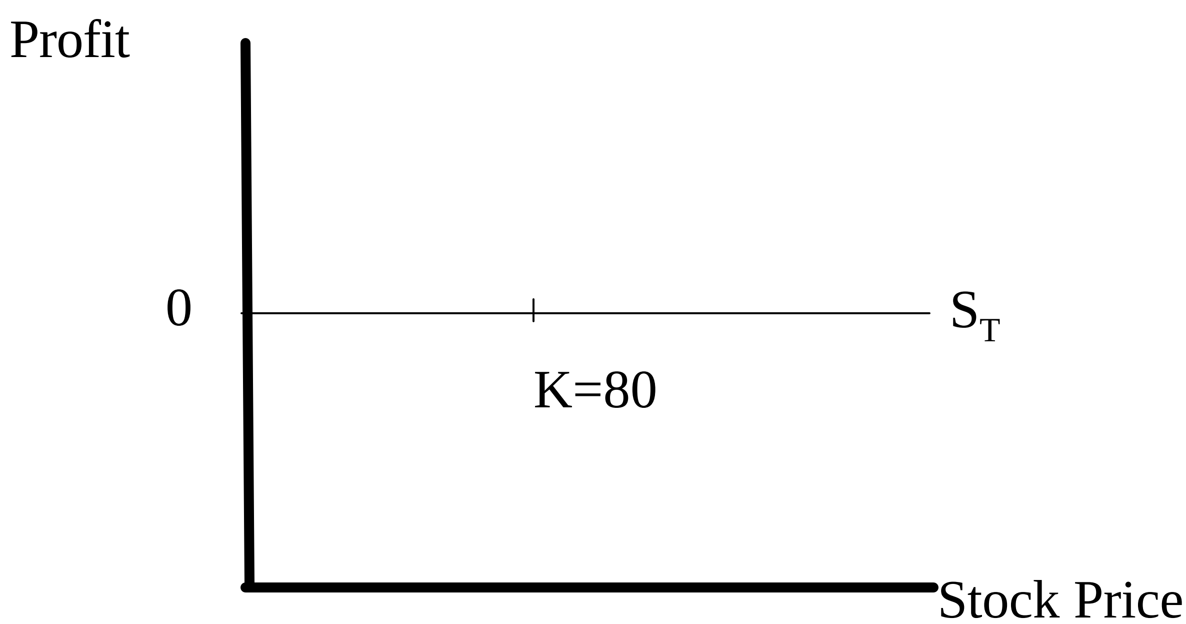
Payoffs/Profits at Expiration





5 # Stock Splits, Exotic Options, Embedded options

- Stock splits and stock dividends – no adjustments for cash dividends.
  - Stock dividends – OCC could adjust # shares, strike price or combination.
  - Stock split *n*-for-*m* – new strike price is Km/n; new contracts is Nn/m
- Q: Consider calls on 100 shares; K= \$20/sh. Adjust terms adjust for 2-for-1 split
- A1:

- Exotic Options –
  - Asian – depend on average price of underlying asset.
  - Barrier – depend on final price and whether barrier penetrated (down and out)
  - Lookback– depend on min or max price of underlying asset.
  - Currency-translated – exercise denominated in FX.
  - Binary – fixed payoffs depending on whether some condition is met.

- Option-like securities –
  - Employee Stock Options - given to employees as part of benefits package. Incentive SO (VP+) vs Non-qualified SO (different tax treatment)
  - Equity in levered firm – call option, with K equal to par value of debt. If assets>debt, stockholders exercise option
  - Bonds –

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Portfolio Insurance (1)

- Portfolio insurance – using options to "insure" value of portfolio.
  - Often use index options, most with multipliers of 100 and cash settled at exp.
  - Insuring portfolio requires choosing # puts and strike price.
  - # Puts = b∗\$Portfolio/\$100S_0. Choose K for level of insurance desired.

- Q: A stock portfolio with b=1.0 is currently worth \$500k and S&P500=1000. The risk-free rate is 12%/yr and div yield on both portfolio and S&P500 is 4%. How can portfolio be insured at \$450k (excluding div) over next 3 months?

- A1: # Puts =
- A2: Choose K=900. .

- Q: Now suppose portfolio has b=2.0 How can the portfolio (including dividends) be insured at \$455k over next 3 months?

- A1: # Puts =
- A2:

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Portfolio Insurance (2)

- A1: # Puts = β*$Portfolio/100$S_0$ = 2*500,000/(100*1,000) = 10
- A2: Choose K associated with target portfolio value (455k equates to 960).
  - Text ignores div rec'd in target portfolio value, so numbers slightly different

	Annual	Periodic				
R_f	12%	3.0%		T_2-T_1(yrs)	0.25	
Div Index	4%	1.0%		Multiplier	100	
Div Port	4%	1.0%		Contracts	10	
S_1	1000			Exercise	960	
Portfolio	$ 500,000					
b_p	2					
S_2	Periodic Return on Index	Return on Index Incl Div R_m	Return on Port Incl Div E(R_p) CAPM	Value of Unhedge Portfolio Incl Div	Cash Flow from Hedge (Puts)	Value of Hedged Portfolio Incl Div
1080	8.0%	9.0%	15.0%	575,000	-	575,000
1040	4.0%	5.0%	7.0%	535,000	-	535,000
1000	0.0%	1.0%	-1.0%	495,000	-	495,000
960	-4.0%	-3.0%	-9.0%	455,000	-	455,000
920	-8.0%	-7.0%	-17.0%	415,000	40,000	455,000
880	-12.0%	-11.0%	-25.0%	375,000	80,000	455,000
800	-20.0%	-19.0%	-41.0%	295,000	160,000	455,000

8 Options: Tips for the Savvy Investor

- Options are traded on many financial assets.

- Options are risky for uninformed investors.
  - Many option traders are informed investors
  - Wrong position may completely wipe your investment, plus cause additional liability (potentially infinite).
  - Writing “naked” options is rare.

- Options can be used to hedge risks or lock-in gains
  - For many investors, options on ETFs may be useful
  - Some contracts can be thinly traded with quoted prices stale.

- Quotes at http://www.finance.yahoo.com and http://biz.yahoo.com/opt/
  - ^SPX for SP500 on finance.yahoo.com ^NDX for Nasdaq 100
  - See also option analyzer.
  - CBOE (index options) - http://www.cboe.com
  - ETF Options - http://www.amex.com