15.407 Recitation

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MIT Sloan School of Management

Things to cover today:

Basics of Options:

1. Introducing Options

2. AOB

Definitions:

Options: The owner of an option has the right to buy (or sell) a specified asset on (or before) a given date, at a given price.
The right to buy is a **call option**, the right to sell is a **put option**. The specified price is the **exercise price**, and the last date you can exercise the option is the **expiration date**

Option is a class of derivatives. Derivatives are things of which payoffs are directly related to the prices of (underlying) asset(s). As we will see next week, the no-arbitrage argument is very powerful for this class of assets.

Options are extensively traded, from stock to bond, commodity, credit, even on other derivatives. Financial Engineering is a field that study derivatives.

Payoff of an option:
Suppose you bought a call option on IBM with strike price of $90, expiring in 1 month. Currently IBM trades at $94.33. How much will you get if IBM trades at (i) $100, or (ii) $88 one month from now? How much do you think the option is worth?

If price IBM goes to $100 and the option allows you to buy it at $90, you will exercise the option, buy at $90 and immediately sell at $100. This will give you a payoff of $10. If the price is $88, you will not exercise the option. Why would you buy at $90 when you can buy at the spot market at a lower price?

Let S be the stock price and K be the strike price, then the value of exercising an option is just max(S-K,0).

Can we guess the price of the option?
If the option is American, we can buy the option and exercise it now, so the price must be larger than $4.33. But in general it holds also (for stocks) with European options. The American call that expires on Nov 21, 2003 has a price of $5.70.

Payoff of an option:
How are option used in the market?
(i) Hedging
Suppose you hold 20 shares of GM stock, you want to hold it for its dividend and possible long term growth, but you are worried about a market downfall in the next 6 months. What do you do?

You don't want to sell the stock, and shorting a futures is not possible because the size is too small. However, you can easily buy 20 units of put option. Now you are immune to any downside.

However, this is not free: shoring a futures is costless, but you're paying a price to buy the put option.

(ii) Speculation:
Lucent technology is trading at $2.35 per share. I want to bet on it going up, however, I only have $2000 of capital available. I can buy 851 shares of lucent and pocket $553.15 if the stock goes up to $3, and lose $297.87 if the stock goes to $2.

Suppose I now buy call options on Lucent. The Jan 2004 option with strike price of $2.5 trades at .25. Now I can by 8000 of the options. I will gain $8000 * 0.5 = \$4000$ if the stock price goes to $3 at the end of January!! **However**, I will lose all my money if the stock price goes below $2.5

Idea: Option could be thought as a highly leveraged position in stock.