Chapter 2 - An Introduction to Forwards and Options

Finance 6470: Derivatives Markets

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Introduction

- Basic derivatives contracts
  - Forward contracts (long & short)
  - Call options
  - Put options
- Types of positions
  - Long position (buyer)
  - Short position (seller)
- Graphical representation
  - Payoff diagrams (does not take into account upfront costs)
  - Profit diagrams

Forward Contracts

- Definition: a binding agreement (obligation) to buy or sell an underlying asset in the future, at a price set today
- Futures contracts are the same as forwards in principle except for some institutional and pricing differences
  - (futures are traded on an exchange and are marked-to-market daily)
- A forward contract specifies
  - The features and quantity of the asset to be delivered
  - The delivery logistics, such as time, date, and place
  - The price the buyer will pay at the time of delivery

The Payoff on a Forward Contract

- Payoff for a contract is its value at expiration
- Payoff for
  - Long forward: $S_T - F_{0,T}$
  - Short forward: $F_{0,T} - S_T$
- Example 2.1 S&R (special and rich) index

Payoff Diagrams for Forwards

Forward Versus Outright Purchase

$$
\begin{aligned}
\text{Forward} + \text{bond} &= \text{Spot price at expiration} - \$1,020 + \$1,020 \\
&= \text{Spot price at expiration}
\end{aligned}
$$

Additional Considerations

- Type of settlement
  - Cash settlement: less costly and more practical
  - Physical delivery: often avoided due to significant costs
- Credit risk of the counter pary
  - Major issue for over-the-counter contracts
    - Credit check, collateral, bank letter of credit
  - Less severe for exchange-traded contracts
    - Exchange guarantees transactions, requires collateral

Call Options

- A non-binding agreement (right but not an obligation) to buy an asset in the future, at a price set today
- Preserves the upside potential, while at the same time eliminating the unpleasant downside (for the buyer)
- The seller of a call option is obligated to deliver if asked (the long position of the option holds the optionality)

Examples

Definition and Terminology

- A call option gives the owner the right but not the obligation to buy the underlying asset at a predetermined price during a predetermined time period
- Strike (or exercise) price: the amount paid by the option buyer for the asset if she decides to exercise
- Exercise: the act of paying the strike price to buy the asset
- Expiration (expiry): the date by which the option must be exercised
  - European: can be exercised only at expiration date
  - American: can be exercised at any time before expiration
  - Burmudan: can be exercised during specified periods

Payoff/Profit of a Long Call Position (Purchased)

- Long call payoff $= \max\{0, S_T - K\}$
- Profit $=$ Payoff - future value of option premium
- Examples

Diagrams for Purchased Call

Payoff & Profit of a Short Call Position (Written)

- Short call payoff $= -\max\{0, S_T - K\}$
- Profit $=$ Payoff $+$ future value of option premium
- Example 2.7

Put Options

- A put option gives the owner the right but now the obligation to sell the underlying asset at a predetermined price during a predetermined time period
- The seller of a put option is obligated to buy if asked
- Payoff/profit of a long put (purchased)
    - Long put payoff $= \max\{0, K - S_T\}$
    - Profit = Payoff - future value of option premium
- Payoff/profit of a short put (written)
    - Short put payoff $= -\max\{0, K - S_T\}$
    - Profit = Payoff + future value of option premium

Put Option Examples

Profit for a Long Put Position

A Few Items to Note

- A call option becomes more profitable when the underlying asset appreciates in value
- A put option becomes more profitable when the underlying asset depreciates in value
- Moneyness:
  - In-the-money (ITM): positive payoff if exercised immediately
  - At-the-money (ATM): zero payoff if exercised immediately
  - Out-of-the-money: (OTM): negative payoff if exercised immediately

Option and Forward Positions: A Summary