Chapter 11: Derivatives

Introduction

1. Derivatives: contracts that derive their value from the performance of an underlying asset, event, or outcome. Derivatives help investors reduce risk and uncertainty.

Uses of Derivatives Contracts

1. Derivatives can be created on any asset, event, or outcome, which is called the underlying. Derivatives can be used to manage risks associated with the underlying, but they can also increase risk exposure for the other party to the contract.
2. Hedge: an action that reduces uncertainty or risk.
3. Derivatives allow companies and investors to manage future risks related to raw material prices, product prices, interest rates, exchange rates, and even some uncontrollable factors. Derivatives also allow investors to gain exposure to underlying assets while committing much less capital and incurring lower transaction costs than if they had invested directly in the assets.

Key Terms of Derivative Contracts

1. There are four main types of derivatives contracts:
    a. Forward Contracts (forwards)
    b. Futures Contracts (futures)
    c. Option Contracts (options)
    d. Swap Contracts (swaps)
2. Each of these four kinds of derivatives specify four elements:
    a. Underlying
        i. Derivatives were originally only made on tangible assets, but now some are based on outcomes. Examples of underlyings include agricultural products, livestock, currencies, interest rates, individual shares and equity indices, bond indices, economic factors, natural resources, weather-related outcomes, and other products.
        ii. The specific underlying asset, in addition to its general nature, must be specified, as these can vary.
    b. Size and Price
        i. Size: the amount of the underlying to be exchanges.
        ii. Price: the price at which the underlying will be purchased or sold under the terms of the contract. This price is referred to as the Exercise Price or Strike Price. Note that this is not the current/spot price.
    c. Expiration Date
        i. All derivatives had a finite life; each contract specifies a date on which the contract ends, called the expiration date.

d. Settlement
    i. Settlement describes how a contract is satisfied at expiration.

Forwards and Futures

1. Introduction
    a. Forwards and futures both involve obligations in the future on the part of both parties of the contract. They are both sometimes referred to as forward commitments or bilateral commitments. Bilateral contracts expose each party to the risk that the other party will not fulfill the contractual obligations.

2. Forwads
    a. Forward Contract: an agreement between two parties in which one party agrees to buy from the seller an underlying at a predetermined date and price. The date can be any time in the future. Investors primarily use futures to lock in the price of an underlying and to gain certainty about future financial outcomes. Forward contracts are made in the over-the-counter market, meaning that the agreement is made directly between the two parties, sometimes with the arrangement of a dealer.
    b. Counterparty Risk: the risk that a party faces that the other party will not fulfill their contractual obligations. In order to reduce this risk, parties will analyze one anothers' creditworthiness and default risk.
    c. Performance Bond: a guarantee, usually by a third party (such as an insurance company), to ensure payment in case a party fails to fulfill its contractual obligations.
    d. An alternative to a performance bond may be collateral, which refers to pledged assets.
    e. Unless the strike price happens to be the spot price at the time of settlement, it is inevitable that one party will gain and the other will sustain loss at the strike price.

3. Futures
    a. Future Contract: a contract between two parties in which one is obligated to sell an underlying at a specified size and price to the other. Unlike forwards, however, these contracts are sold on formal exchanges, so the two parties may not know the other. Because these contracts are sold on exchanges and are liquid, it is possible for the buyer or the seller to close out their position by taking the opposite.
    b. The presence of an exchange as an intermediary between buyers and sellers help reduce counterparty risk. However, counterparty risk can not be eliminated altogether, as there is always risk of failure on the part of one party to fulfill their contractual obligations. In order to reduce this, exchanges typically require that parties deposit funds as collateral. The depositing of funds is called Posting Margin, and the amount itself that is deposited is called the Initial Margin. The Initial Margin should be sufficient to protect the exchange against movements in the underlying's price, the greater the volatility, the greater the margin.
    c. Marking to Market Daily: is another way of reducing counterparty risk, and involves settling profits and losses on futures contracts every day. This has the effect of resetting the contract price and cash flows to buyers and sellers.

4. Distinctions Between Forwards and Futures
    a. Trading and Flexibility of Terms
        i. Forward contracts transact in the over the counter market and terms are customized according to the needs of the parties involved, whereas futures are traded on exchanges. Typically, exchanges will set the terms of the contracts for which they facilitate trading, regardless of the buyers' and sellers' needs.
        ii. For hedgers that are attempting to eliminate or reduce risk, standardisation makes it difficult to precisely hedge a position, whereas for non-hedgers, standardisation is not a problem.
    b. Liquidity
        i. Because forward contracts are sold in over the counter markets, they are illiquid. Future contracts, however, because they are traded on exchanges, are liquid and can be sold at times other than initiation. It is relatively simple for an investor to close out a position that they hold on a future contract.
    c. Counterparty Risk
        i. Counterparty risk inevitably exists in both forward and future contracts. However, because future contracts are sold on exchanges, there is typically lower counterparty risk due to the presence of exchanges, clearing houses, and other intermediaries.
    d. Transaction Costs
        i. Transaction costs in forward contracts are typically high and harder to determine due to the fact that they are embedded in the terms of the contract. Future contracts, however, have lower transaction costs and they are more visible. This is because exchanges will show transaction costs, brokers fees, and the broker typically earns the spread between the ask and bid, as well as some form of commission.
    e. Timing of Cash Flows
        i. If forward and future contracts are held until maturity, there is no difference between them in terms of the timing of cash flows. However, the effect of price changes is taken into account on an ongoing basis for future contracts, whereas they are only considered at maturity for forward contracts.
    f. Settlement
        i. Forward contracts settle with physical delivery or cash settlement, and future contracts typically settle with cash.

Option Contracts

1. Introduction
    a. Options give one party (buyer) the right to demand an action from the other party (seller) in the future. In an option contract, the buyer of the option has the right, but not the obligation, to buy or sell the underlying. Options are considered to be unilateral contracts because only one party (seller) has a future commitment. Unilateral contracts expose only the buyer to the risk that the seller will not fulfill their contractual obligations.

b. The buyer of an option contract will exercise their right to buy or sell the underlying if conditions are favorable or if specific conditions are met. For this reason, options are also known as contingent claims.
c. Options are traded on both exchanges and over the counter markets, and they are more customizable in over the counter markets.
d. Option Contracts Include:
    i. The underlying security
    ii. The size
    iii. Exercise/Strike Price (the price at which the underlying is bought/sold)
    iv. Expiration date (option contracts typically expire in March, June, September, or December.
e. The buyer of an option contract chooses to exercise an option based on the underlying's price relative to its exercise price. The buyer of an option contract will exercise an option only when and if the strike price is such that it is advantageous to buy/sell given its market price.
f. Because of the unilateral nature of option contracts, the sellers of options contracts command an option premium at the start of the contract. The option premium is the maximum benefit that the seller can attain (unless the buyer makes a financially irrational decision.) The seller of an option contract hopes that the option will not be exercised.
g. Note that aside from the option premium, an option buyer's payoff is never negative. Option buyers pay option sellers the premium to compensate them for the risk they take on by selling the contract. But, if an option seller underestimates the risk associated with the option, the premiums paid may be far less than the losses they incur on exercise.

2. Call Options and Put Options
    a. Call Options: give the buyer the right (but not the obligation) to buy the underlying from the seller at the exercise price until the option expires.
        i. A call option is said to be "in the money" if the market price is greater than the exercise price. In this case, the option would be exercised.
        ii. A call option is said to be "out of the money" if the market price is less than the exercise price. In this case, the option would not be exercised.
        iii. A call option is said to be "at the money" if the market price is equal to the exercise price. In this case, the option may or may not be exercised.
    b. Put Options: give the buyer the right (but not the obligation) to sell the underlying to the seller at the exercise price until the option expires.
        i. A put option is said to be "in the money" if the market price is less than the exercise price. In this case, the option would be exercised.
        ii. A put option is said to be "out of the money" if the market price is greater than the exercise price. In this case, the option would not be exercised.
        iii. A put option is said to be "at the money" if the market price is equal to the exercise price. In this case, the option may or may not be exercised.
    c. These designations are referred to as the "moneyness of an option, and they are used to refer to profitability of the option if it were to be exercised by the buyer.

3. Factors That Affect Option Premiums
    a. Option premiums are expected to compensate the sellers for their risk, and it is the maximum profit that the option seller can make. If an option seller underestimates the risk associated with the option, the premiums may be far less than the losses incurred if the option is exercised.
    b. The lower the exercise price for a call option relative to the current spot price, the higher the premium because the likelihood that it will be exercised is greater.
    c. The higher the exercise price for a put option relative to the current spot price, the higher the premium because the likelihood that it will be exercised is greater.
    d. The longer the duration of an option contract, the higher the premium because the likelihood that the underlying's price will change in favor of the option buyer increases. Similarly, the greater the volatility of the underlying, the higher the option premiums because the probability that the underlying's price will change in favor of the option buyer increases.
    e. The premium of an option contract is dependent upon the current spot price of the underlying, the exercise price, time until expiration, and volatility of the underlying.

Swap Contracts

1. Swap Contracts are typically derivatives in which two parties exchange cash flows or other financial instruments over multiple periods for mutual benefit, usually to manage risk. Swaps are bilateral contracts and the contract's net initial value to each party should be equal to zero.
2. Interest rate swaps are the most common type of swap and they allow companies to swap their interest rate obligations (usually a fixed rate for a floating rate) to manage interest rate risk, in order to better match their streams of cash inflows/outflows or to lower borrowing costs.
3. Currency swaps enable borrowers to exchange debt service obligations denominated in one currency for equivalent debt service obligations denominated in another currency.
4. Credit default swaps are not truly swaps. Similar to options, they are contingent and unilateral claims. Through CDSs, the buyer of the contract attempts to protect themselves against the loss of value in a debt security or index of debt securities, the loss of value is primarily associated with changes in credit risk. The seller of a CDS provides protection to the buyer against declines in the value of the underlying. The seller does so for a premium. The contract will specify under what conditions the seller has to make payment to the buyer. Similar to options, the sellers of CDS may misjudge the risk associated with the contracts and incur losses far in excess of payments received to enter into the contracts.
5. The use of swaps has grown because they allow investors to manage risks associated with interest rates, currencies, and credit default risk. Additionally, they can willow investors to reduce borrowing and transaction costs, overcome currency exchange barriers, and manage exposures to underlying assets.