
Hedging with Financial Derivatives

Options

- Another vehicle for hedging
 - Interest-rate risk
 - Stock market risk
 - Options
 - Contracts that give the purchaser the option, or right, to buy or sell the underlying financial instrument
 - at a specified price – exercise price or strike price
 - within a specific period of time
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Options

- The seller – the **writer** of the option **is obligated** to buy or sell the financial instrument to the purchaser if the **owner** of the option **exercises** the right to sell or buy
 - The owner or buyer of an option does not have to exercise the option he or she **can let option expire without using**
 - The owner of the option is not obligated to take any action but rather has the right to exercise the contract if he chooses
 - The seller of an option, by contrast, has no choice, he or she must buy or sell the financial instrument if the owner exercise the option

Options

- Because the right to buy or sell a financial instrument the owner of an option is willing to pay an amount for it called a **premium**
 - There are two types of option contracts
 - American options
 - Can be exercised at any time up to the expiration date of the contract
 - European options
 - Can be exercised only on the expiration date
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Options

- Option contracts are written on a number of financial instruments
 - Individual stocks – stock option that existed for long time
 - Financial futures – financial futures option or futures option
 - Why option contracts are more likely to be written on financial futures than on underlying debt instruments such as bonds or certificates of deposit?
 - The price of the futures contract and of the deliverable debt instrument will be the same because of arbitrage
 - So investor should be indifferent about having the option written on the debt instrument or on the futures contract
 - However, financial futures contracts have been so well designed that their markets are often more liquid than the markets in the underlying debt instruments
 - Investors would rather have the option contract written on the more liquid instrument, in this case the futures contract
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Option Contracts

- A call option is a contract that gives the owner the right to buy a financial instrument at the exercise price within a specific period of time
 - A put option is a contract that gives the owner the right to sell a financial instrument at a exercise price within a specific period of time
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Profits and Losses on Option and Futures Contracts

- If you buy this futures contract at a price of 115 (that is, 115.000), you have agreed to **pay** \$115.000 for \$110.000 face value of long-term Treasury bonds when they are delivered to you at the end of February
 - If you sold this futures contract at a price of 115 (that is, 115.000), you agreed, in **exchange** for \$115.000, to deliver \$100.000 face value of the long-term Treasury bonds at the end of February
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Profits and Losses on Option and Futures Contracts

- An option contract on the Treasury bond futures contract has several key features:
 - It has the same expiration date as the underlying futures contract
 - It is an American option
 - The premium (price) of the option is quoted in points that are the same as in the futures contract
- If, for a premium of \$2.000, you buy one call option contract on February treasury bond contract with an exercise price of 115 (\$115.000 per contract)
 - You have purchased the right to buy the February Treasury contract for price of 115 at any time through the expiration date of this contract at the end of February
- If, for a premium of \$2.000, you buy one put option contract on February treasury bond contract with an exercise price of 115 (\$115.000 per contract)
 - You have purchased the right to sell the February Treasury contract for price of 115 at any time through the expiration date of this contract at the end of February

Examination how profits and losses occur

- In November the investor buy for a premium \$2.000 a call option on the \$100.000 February Treasury bond futures contract with a strike price 115
 - On the expiration date at the end of February, suppose that the underlying Treasury bond for the futures contract has a price of 110
 - If the investor exercises the call option and buys the futures contract at an exercise price of 115, he will lose money by buying at 115 and selling at the lower market price 110
 - Thus, he will not exercise the option and he will be out the \$2.000 premium he paid
 - In such a situation, in which the price of the underlying financial instrument is below the exercise price, a call options said to be “out of the money”

Examination how profits and losses occur

- On the expiration date at the end of February, suppose that the underlying Treasury bond for the futures contract has a price of 115
 - The call option is “at the money” and the investor is indifferent to whether he exercise his option to buy the futures contract or not
 - Because he has paid the \$2.000 premium, at the price of 115 his contract again has a net loss of \$2.000
 - On the expiration date at the end of February, suppose that the underlying Treasury bond for the futures contract has a price of 120
 - The call option is “in the money”
 - He would buy the futures contract at the exercise price of 115 and then sell it for 120, thereby earning a 5% gain (\$5.000 profit) on the \$100.000 Treasury bond contract
 - His net profit is \$3.000
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Examination how profits and losses occur

- Suppose that instead of purchasing the **futures option contract** in November, the investor decides to buy \$100.000 February Treasury **bond futures contract** at the price of 115
 - If the price of bond on the expiration day at the end of February decline to 110, the price of futures contract also falls to 110, the investor suffers the 5% loss (\$5.000)
 - At the price of 120, the investor would have a profit on contract of 5%, or \$5.000
 - At a price of 125, the profit will be 10% or \$10.000
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Examination how profits and losses occur

- Now you can see major difference between a futures contract and an option contract
 - Futures contract has a **linear profit function**
 - Profits grow by an equal dollar amount for every point increase in the price of the underlying financial instrument
 - The option contract is highly non linear
 - Profits do not always grow by the same amount for a given change in the price of the underlying financial instrument
 - The reason for this nonlinearity is that the call option protects the investor from having losses that are greater than the amount of the \$2.000 premium
 - This insurance-like feature of option contracts explains why their purchase price is referred **as a premium**
 - Once the underlying financial instrument's price rise **above the exercise price**, the investor's profit grow linearly

Examination how profits and losses occur

- If the investor buys not call but **put option** with an exercise price of 115 for a premium of \$2.000 and if he **sells the futures contract** rather than buying one
 - In this case if on the expiration date the Treasury bond futures contract have a price above the 115 exercise price, the put option is “out of the money”
 - The investor would not want to exercise the put option at the price below the market price and lose money
 - He would not exercise his option, and he would be out only the \$2.000 premium he paid
 - Once the price of the futures contract falls below the 115 exercise price, the investor benefits from exercising the put option because he can sell the futures contract at a price of 115 but can buy it at a price below this
 - The put option is “in the money”

Examination how profits and losses occur

- Two other differences between options and futures contracts must be mentioned
 - The first is that the **initial investment** on the contracts **differs**
 - When a futures contract is purchase, the investor must put up a fixed amount, the margin requirement, in a margin account
 - When an option contract is purchased, the initial investment is the premium that must be paid for the contract
 - The second important difference between the contracts is that
 - the futures contract requires money to change hands daily when contract is marked to market
 - the option contract requires money to change only when it is exercised
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Factors Affecting the prices of Option Premiums

- When the strike (exercise) price for a contract is set at a higher level
 - The premium for the **call option is lower** and the premium for the **put option is higher**
 - The higher the strike price, the lower the profits on the call option contract and the lower the premium that investor are willing to pay
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Factors Affecting the prices of Option Premiums

- The period of time over which the option can be exercised gets longer, the premiums for both call and put options rise
 - The fact that premiums increase with the term to expiration is also explained by the nonlinear profit function for option contracts
 - At the term to expiration lengthens, there is a greater chance that the **price** of the underlying financial instrument **will be very high or very low by the expiration date**
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Factors Affecting the prices of Option Premiums

- If the price becomes very high and goes well above the exercise price, the call option will yield a high profit
 - If the price becomes very low and goes well below the exercise prices, the losses will be small because the owner of call option will simply decide not to exercise the option
 - Similar, the put option will become more valuable as the term to expiration increases, because of the possibility of greater price variability of the underlying financial instrument increases as the term to expiration increases
 - When the volatility of the price of the underlying instrument is great, the premiums for both call and put options will be higher
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Interest-Rate Swaps

- Swaps are financial contracts that obligate each party to the contract exchange (swap) a set of payments it owns for another set of payments owned by another party
 - Currency swaps
 - Exchange of a set a payments in one currency for a set of payments in another currency
 - Interest-rate swaps
 - The exchange of one set of interest payments for another set of interest payments, all denominated on the same currency
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Interest-rate Swap Contracts

- Important tool for managing interest-rate risk
- First appeared in the U.S. in 1982 when there was an increase in the demand for financial instruments that could be used to reduce interest-rate risk
- The most common type of interest-rate swap – plain vanilla swap specified
 - The interest rate on the payment that are being exchanged
 - The type of interest payments
 - Variable or fixed
 - The amount of **notional principal**, which is the amount on which the interest is being paid
 - Time period over which the exchange continue to be made

Advantages of Interest-Rate Swaps

- To eliminate interest-rate risk companies could have rearranged their balance sheets by converting fixed rate assets
 - Into rate-sensitive assets and vice versa
 - Instead of engaging in an interest-rate swaps
 - But this strategy can be expensive for both companies for several reasons
 - Transactional costs
 - When they rearrange their balance sheets
 - Different financial institutions have information advantages in making loans to certain customers who may prefer certain maturities
 - Adjusting the balance sheet to eliminate interest-rate risk may result in a loss of these information advantages
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Advantages of Interest-Rate Swaps

- Interest-rate swaps solve these problems for financial institutions because in effect they allow the institutions to convert fixed-rate assets into rate-sensitive assets without affecting the balance sheets
 - Large transactional costs are avoided, and the financial institutions can continue to make loans where they have an information advantage
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Advantages of Interest-Rate Swaps

- Financial institutions can also hedge interest-rate risk with other financial derivatives such as futures contracts or futures options
 - Interest-rate swaps have one big advantage over hedging with these derivatives
 - They can be written for very long horizons, sometimes as long as 20 years, whereas financial futures and futures options typically have much shorter horizons, not much more than a year
 - If a financial institutions needs to hedge interest-rate risk for a long horizon, financial futures and option markets may not do it much good
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Disadvantages of Interest-Rate Swaps

- Swap markets like forward markets can suffer from a lack of liquidity
 - It might be difficult to arrange the swap
 - It might not be able to negotiate a good deal because it could not find any institutions to negotiate with
 - Swap contracts are subject to default risk
 - If interest rates rise up a particular company would love to get out of the swap contract because the fixed-rate interest payments it receives are less than it could get in the open market
 - It might then default on the contract, exposing the other company to the loss
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Disadvantages of Interest-Rate Swaps

- It is important to note that default risk of swaps is not the same as the default risk on the full amount of the notional principal because the notional principal is never exchanged
 - If the company goes broke because of default and it cannot make its interest payment to another company, the other company will stop sending the company its payment
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Disadvantages of Interest-Rate Swaps

- If interest rates have declined, this will suit the company just fine, because it would rather keep the fixed-rate interest payment, which is at higher rate, than receive the rate-sensitive payment, which has declined
- A swap contract does not necessarily mean that there is a loss to the other party
 - The company will suffer losses from a default only if interest rates have risen when the default occurs
 - Even then, the loss will be far smaller than the amount of the notional principal because interest payments are far smaller than the amount of the notional principal
 - The actual loss will equal the present value of the difference in the interest payments that the bank would have received if the swap were still in force as compared to interest payments it receives otherwise

Credit Derivatives

- In recent years, a new type of derivatives has come on the scene to hedge credit risk
 - Credit derivatives offer payoffs linked to previously issued securities, but ones that bear credit risk
 - These credit derivatives take several forms
 - Credit Options
 - Credit Swaps
 - Credit-Linked Notes
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Credit Options

- Credit options work just like the options
 - For a fee the purchaser gains the right to receive profits that are tied either to the price of an underlying security or to the interest rate
 - E.g. If you buy a bonds and worry about credit-rating agency downgrade of these bonds
 - A downgrade would cause the price of bonds to fall
 - To protect yourself you, you could buy an option to sell bonds at a strike price that is the same as the current price
 - You would not suffer any losses if the value of the bonds declined because you could exercise the option and sell them at the price you paid for them
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Credit Options

- A second type of credit option ties profits to changes in an interest rates such as a credit spread
 - The interest rate on the average bond with a particular credit rating minus the interest rate on default free bonds
- E.g A company which has a Baa credit rating plans to issue one-year bonds in three months and expects to have a credit spread one of percentage point
 - It will pay an interest rate that is percentage point higher than the one-year Treasury rate
- You are concerned that the market might start to think that Baa companies in general will become riskier in the coming months
- If this were to happen by the time the company is ready to issue bonds with higher interest rate than the one percentage point and company cost of issuing the bonds would increase
- To protect the company against these higher costs, the company could buy a credit option

Credit Swaps

- A transaction, in which risky payments on loans are swapped for each other
 - e.g. if a bank is specialized in lending to a particular industry in the local area, e.g. drill companies and another bank is specialized in lending to another industry, e.g. agriculture
 - Both banks have a problem because their loan portfolios are not sufficiently diversified
 - To protect the bank against a collapse in the oil market, the bank could reach an agreement to have the loan payments in particular volume will be paid the first bank and the same volume of first bank's loans will be paid by the second bank
 - As a result of this swap both banks have increased their diversification and lowered the overall risk of their loan portfolios because some of the loan payments to each bank are now coming from a different type of loans
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Credit Swaps

- Credit default swap that functions more like insurance
 - One party who wants to hedge credit risk pays a fixed payment on a regular basis, in return for a contingent payment that is triggered by a credit event such as the bankruptcy of a particular firm or the down grading of the firm's credit rating by a credit rating agency
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Credit-Linked Notes

- It is a combination of a bond and a credit option
 - Just like any corporate bond, the credit-linked note makes periodic coupon payments and a final payment of the face value of the bond at maturity
 - If a key financial variable specified in the note changes, the issuer of the note has the right (option) to lower the payments on the note
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Major concerns about derivatives

- Financial derivatives allow financial institutions to increase their leverage
 - They can in effect hold an amount of the underlying asset is many time greater than the amount of money they have had to put up
 - Increasing their leverage enables them to take huge bets on currency and interest-rate movements, which if they are wrong can bring down banks
 - The concern is valid
 - The amount of money places in margin accounts is only a small fraction of the price of futures contract, meaning that small in the price of the contact can produce losses that are many times the size of the initial amount put in the margin account
 - Although, financial derivatives can be used to hedge risk, they can be used by financial institutions to take on excessive risk
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Major concerns about derivatives

- The second concern is that financial derivatives are too sophisticated for managers of financial institutions because they are so complicated
 - A third concern is that banks have holding of huge national amounts of financial derivatives, particularly swaps, that greatly exceed the amount of bank capital and so these derivatives expose the banks to serious risk of failure
 - The conclusion is that financial derivatives do have their danger for financial institutions, but some of these dangers have been overplayed. The biggest danger occurs in trading activities of financial institutions, and regulators have been paying increased attention to this danger
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Summary

- An option contract gives the purchaser the right to buy (call option) or sell (put option) a security at the exercise (strike) price within the specific period of time
 - Financial institutions use futures options to hedge interest-rate risk in a similar fashion to the way they use financial futures and forward contract. Futures options may be preferred from macro hedges because they suffers from fewer accounting problems than financial futures
- Interest-rate swaps involve the exchange of one set of interest payments for another set of interest payments and have default risk and liquidity problems similar to those of forward contracts
 - As a result, interest-rate swaps often involve intermediaries such as large commercial banks and investment banks that make a market in swaps
 - Interest-rate swaps have one big advantage over financial futures and options, they can be written for very long horizons

Summary

- Credit derivatives are a new type of derivatives that offers payoffs on previously issued securities that have credit risk
 - These derivatives – credit options, credit swaps and credit-linked notes – can be used to hedge credit risk
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Thank you for your attention
