

Asset-Backed Securities Markets

LEARNING OBJECTIVES

After reading this chapter, you will understand

- how asset-backed securities are created
- the basic structure of a securitization
- the parties to a securitization
- the primary motivation for a corporation to raise funds via a securitization
- the role of the special purpose vehicle
- the different types of structures: self-liquidating and revolving
- the various forms of credit enhancement
- the cash flow characteristics of the major types of asset-backed securities not backed by residential mortgage loans
- the credit risks associated with asset-backed securities
- the role of securitization in financial markets

A security created by pooling loans other than residential prime mortgage loans is referred to as an **asset-backed security (ABS)**. The market classifies securities backed by subprime mortgage loans as mortgage-related ABS. The two types of assets that can be used as collateral for an asset-backed securitization are existing assets/existing receivables or assets/receivables to arise in the future. Securitizations with the former type of collateral are referred to as **existing asset securitizations**. Securitizations of assets/receivables to arise in the future are referred to as **future flow securitizations**. The

from Chapter 25 of *Foundations of Financial Markets and Institutions*, 4/e. Frank J. Fabozzi. Franco Modigliani. Frank J. Jones.

Copyright © 2010 by Pearson Prentice Hall. All rights reserved.

types of non–real estate–related assets that have been securitized include consumer and commercial loans/receivables. Consumer loans/receivables that have been securitized include auto loans and leases, credit card receivables, student loans, and home improvement loans. Commercial loans/receivables that have been securitized include trade receivables (e.g., health care receivables), equipment leases, operating assets (e.g., aircraft, marine cargo containers), entertainment assets (e.g., film rights, music publishing royalties), franchise loans, small business loans, and whole businesses.

In this chapter, we will discuss the basic features of ABS and the motivation for their issuance, and provide an overview of the five major non-mortgage-related ABS types.

CREATION OF AN ASSET-BACKED SECURITY

To explain how an ABS is created and to understand the parties to a securitization, we will use an illustration.

Suppose that Exception Dental Equipment Inc. manufactures high-quality dental equipment. Although the company has cash sales, a bulk of its sales are from installment sales contracts. An installment sale contract is a loan to the buyer of the dental equipment (e.g., a dental practice) wherein the buyer agrees to repay Exceptional Dental Equipment Inc. over a specified period of time for the amount borrowed plus interest. The dental equipment purchased is the collateral for the loan. We will assume that the loans are all for five years.

The credit department of Exceptional Dental Equipment Inc. makes the decision as to whether or not to extend credit to a customer. That is, the credit department will receive a credit application from a potential customer and, based on criteria established by the company, will decide whether to make a loan. The criteria for granting a loan are referred to as **underwriting standards**. Because Exceptional Dental Equipment Inc. is granting the loan, the company is referred to as the **originator** of the loan.

Moreover, Exceptional Dental Equipment Inc. may have a department that is responsible for servicing the loan. Servicing involves collecting payments from borrowers, notifying borrowers who may be delinquent, and, when necessary, recovering and disposing of the collateral (i.e., the dental equipment in our illustration) if the borrower fails to make the contractual loan payments. While the servicer of the loans need not be the originator of the loans, in our illustration we are assuming that Exceptional Dental Equipment Inc. is the servicer.

Now let's get to how these loans are used in a securitization transaction. We will assume that Exceptional Dental Equipment Inc. has more than $300 million of installment sales contracts. We will further assume that Exceptional Dental Equipment Inc. wants to raise $300 million. Rather than issuing corporate bonds for $300 million, the treasurer of the corporation decides to raise the funds via a securitization. To do so, Exceptional Dental Equipment Inc. will set up a legal entity referred to as a **special purpose vehicle** (SPV). At this point, we will not explain the purpose of this legal entity, but it will be made clear later that the SPV is critical in a securitization transaction. In our illustration, the SPV that is set up is called DE Asset Trust (DEAT). Exceptional Dental Equipment Inc. will then sell to DEAT $300 million of the loans. Exceptional Dental Equipment Inc. will receive from DEAT $300 million in cash, the amount of funds it wanted to raise. DEAT obtains the $300 million by selling securities that are backed by the $300 million of loans. The securities are

the ABS we referred to earlier. In the prospectus for a securitization, these securities are usually referred to as *certificates*.

The Parties to a Securitization

Let's make sure we understand the parties to a securitization. In our hypothetical securitization, Exceptional Dental Equipment Inc. is not the issuer of the ABS (although it is sometimes referred to as the issuer because it is the entity that ultimately raises the funds). Rather, it originated the loans. Hence, in this transaction, Exceptional Dental Equipment Inc. is called the "seller." The reason it is referred to as the "seller" is because it sold the receivables to DEAT. Exceptional Dental Equipment Inc. is also called the "originator" because it originated the loans. The SPV in a securitization is referred to as the "issuer" or "trust" in the prospectus.

In our simple transaction, Exceptional Dental Equipment Inc. manufactured the dental equipment and originated the loans. But there is another type of securitization transaction involving another company, called a **conduit**, that buys the loans and securitizes them. For example, consider a hypothetical company, Dental Equipment Financing Corporation, whose business is to provide financing to dental equipment manufacturers who want to sell their equipment on an installment basis. Dental Equipment Financing Corporation would then develop a relationship with manufacturers of dental equipment (such as Exceptional Dental Equipment Inc.) to purchase their installment contracts. Dental Equipment Financing Corporation would warehouse the installment contracts purchased until it had a sufficient amount to sell to an SPV, which would then issue the ABS.

There will be a trustee for the securities issued. The responsibilities of the trustee are to represent the interests of the bond classes by monitoring compliance with covenants and in the event of default to enforce remedies as specified in the governing documents.[1]

Transaction Structure

In creating the various bond classes (or tranches) in a securitization, there will be rules for distribution of principal and interest. As explained in the previous chapter, the creation of the different bond classes results in securities with different risk/return characteristics. The structure is designed to create bond classes with investment characteristics that are more attractive to institutional investors. By doing so, the entity seeking to raise funds can obtain the best price for the securities it sells (referred to as "best execution").

As explained in the previous chapter, nonagency mortgage-backed securities are credit enhanced. All asset-backed securities are credit enhanced. Credit enhancement levels are determined relative to a specific rating desired by the seller/servicer for a security by each rating agency. Typically in a securitization, there are at least two classes of bondholders: senior bond classes and subordinate bond classes. This structure is the senior/subordinate structure.

Role of the Special Purpose Vehicle

To understand the role of the SPV, we need to understand why a corporation would want to raise funds via securitization rather than simply issue corporate bonds. There are four

---

[1] For a further discussion of the role of the trustee in a securitization, see Karen Cook and F. Jim Della Sala, "The Role of the Trustee in Asset-Backed Securities," Chapter 7 in Frank J. Fabozzi (ed.), *Handbook of Structured Financial Products* (Hoboken, NJ: John Wiley & Sons, 1998).

principal reasons why a corporation may elect to raise funds via a securitization rather than a corporate bond:

1. the potential for reducing funding costs
2. to diversify funding sources
3. to accelerate earnings for financial reporting purposes
4. for regulated entities, potential relief from capital requirements

We will only focus on the first of these reasons in order to see the critical role of the SPV in a securitization.[2]

Let's suppose that Exceptional Dental Equipment Inc. has a double B credit rating (i.e., a below investment-grade credit rating). If it wants to raise funds equal to $300 million by issuing a corporate bond, its funding cost would be whatever the benchmark Treasury yield is plus a credit spread for double B issuers. Suppose, instead, that Exceptional Dental Equipment Inc. uses $300 million of its installment sales contracts (i.e., the loans it has made to customers) as collateral for a bond issue. What will be its funding cost? It probably will be the same as if it issued a corporate bond. The reason is that if Exceptional Dental Equipment Inc. defaults on any of its outstanding debt, the creditors will go after all its assets, including the loans to its customers.

Suppose that Exceptional Dental Equipment Inc. can create a legal entity and sell the loans to that entity. That entity is the SPV. In our illustration, the SPV is DEAT. If the sale of the loans by Exceptional Dental Equipment Inc. to DEAT is done properly,[3] DEAT then legally owns the receivables, not Exceptional Dental Equipment Inc. As a result, if Exceptional Dental Equipment Inc. is ever forced into bankruptcy while the loans sold to DEAT are still outstanding, the creditors of Exceptional Dental Equipment Inc. cannot recover the loans because they are legally owned by DEAT.

The legal implication is that when DEAT issues the ABS that are backed by the loans, investors contemplating the purchase of any bond class will evaluate the credit risk associated with collecting the payments due on the loans independent of the credit rating of Exceptional Dental Equipment Inc. The credit rating assigned to the different bond classes created in the securitization will depend on how the rating agencies will evaluate the credit risk based on the collateral (i.e., the loans). In turn, this will depend on the credit enhancement for each bond class. So, due to the SPV, quality of the collateral, and credit enhancement, a corporation can raise funds via a securitization where some of the bond classes have a credit rating better than the corporation seeking to raise funds and where in the aggregate the funding cost is less than issuing corporate bonds.

Credit Enhancement Mechanisms

The different forms of credit enhancement for nonagency mortgage-backed securities and commercial mortgage-backed securities include external credit enhancement and internal credit enhancement. The credit enhancement forms are used both individually and in combination, depending on the loan types that are backing the securities.

External credit enhancement involves a guarantee from a third party. The risk faced by an investor is the potential for the third party to be downgraded and, as a result, the bond

[2] For a discussion of the other reasons, see W. Alexander Roever and Frank J. Fabozzi, "Primer on Securitization," *Journal of Structured and Project Finance* (Summer 2003), pp. 5–19.

[3] More specifically, it has to be a sale of the loans at a fair market value.

classes guaranteed by the third party may be downgraded. The most common form of external credit enhancement is **bond insurance**, referred to as a **surety bond** or a **wrap**. Bond insurance is a financial guararty from a monoline insurance company requiring that the insurer guarantee the timely payments of principal and interest if these payments cannot be satisfied from the cash flow from the underlying loan pool. The principal payments will be made without acceleration, except if the insurer elects to do so. However, the downgrading of the monoline insurers in 2008 makes it unlikely that this form of credit enhancement will be significant in the future.

Internal credit enhancements come in more complicated forms than external credit enhancements and may alter the cash flow characteristics of the loans even in the absence of default. Credit enhancement levels are determined by the rating agencies from which the issuer seeks a rating for the bond classes. This is referred to as "sizing" the transaction and is based on the rating agencies' expectations for the performance of the loans collateralizing the deal in question.

Most securitization transactions that employ internal credit enhancements follow a predetermined schedule that prioritizes the manner in which principal and interest generated by the underlying collateral must be used. This schedule, which is explained in the deal's prospectus, is known as the **cash flow waterfall**, or simply the **waterfall**. At the top of the waterfall would be cash flows due to senior bondholders (interest and principal, depending upon the principal repayment schedule) as well as some standard fees and expenses (e.g., administration and servicing fee). After the cash flow obligations at the top of the waterfall are met, cash flows down to lower priority classes (those AA, A, and BBB bond classes and so on). The cash flows that remain after all of the scheduled periodic payment obligations are met is the **excess spread**. The excess spread is the first line of defense against collateral losses, because deals that are structured to have a large amount of excess spread can absorb relatively large levels of collateral losses. If the excess spread is fully eaten away by losses, the next lowest-rated class will begin to be negatively affected by credit losses.

The most common forms of internal credit enhancement are senior/subordinate structures, overcollateralization, and reserve funds.

Example of an Actual Securitization

Let's look at an actual securitization—Caterpillar Financial Asset Trust 1997-A. For this securitization, Caterpillar Financial Asset Trust 1997-A is the SPV, the issuer, and the trust. The collateral (i.e., financial assets) for the transaction is a pool of retail installment sales contracts that are secured by new and used machinery manufactured primarily by Caterpillar Inc. The retail installment sales contracts carry a fixed interest rate and were originated by the Caterpillar Financial Funding Corporation, a wholly owned subsidiary of Caterpillar Financial Services Corporation. Caterpillar Financial Services Corporation is a wholly owned subsidiary of Caterpillar Inc., and because it sold the retail installment sales contracts to Caterpillar Financial Asset Trust 1997-A, Caterpillar Financial Funding Corporation is referred to in the prospectus as the "Seller."

The prospectus states that:

> THE NOTES REPRESENT OBLIGATIONS OF THE ISSUER ONLY AND DO NOT REPRESENT OBLIGATIONS OF OR INTERESTS IN CATERPILLAR

FINANCIAL FUNDING CORPORATION, CATERPILLAR FINANCIAL SERVICES CORPORATION, CATERPILLAR INC. OR ANY OF THEIR RESPECTIVE AFFILIATES.

As previously noted, this is the key feature in a securitization transaction—the separation of the collateral from the creditors of Caterpillar Inc. The servicer of the retail installment sales contracts is Caterpillar Financial Services Corporation, a wholly owned finance subsidiary of Caterpillar Inc., referred to as the "Servicer" in the prospectus. For servicing the collateral, Caterpillar Financial Services Corporation receives a servicing fee of 100 basis points of the outstanding loan balance.

The securities were issued on May 19, 1997, and had a par value of $337,970,000. In the prospectus, the securities were referred to as "asset-backed notes." The structure was as follows. There were four rated bond classes:

Bond Class	Par Value
Class A-1	$ 88,000,000
Class A-2	$128,000,000
Class A-3	$108,100,000
Class B	$ 13,870,000

This is a senior-subordinate structure. The senior bond classes in this transaction are Class A-1, Class A-2, and Class A-3. The subordinate class is Class B. The cash flow waterfall is as follows. The senior classes are paid off in sequence—first Class A-1 is paid principal until it has paid off its entire balance, then Class A-2 starts receiving principal payments until it is paid off entirely, and then finally Class A-3 is paid off. Class B begins receiving principal payments after Class A-3 is paid off. Any losses on the collateral are realized by Class B. If the losses exceed $13,870,000 (the par value of Class B) less the losses that can be absorbed by the reserve account, the senior classes absorb the loss on a pro rata basis.

Key Points That You Should Understand Before Proceeding

1. Securitization is an alternative funding source to issuing corporate bonds whereby ABS are issued.
2. In a securitization, the originator or conduit sells the loans or receivables to an SPV.
3. The SPV is the issuer of the ABS.
4. The different bond classes created have different risk/return characteristics from the collateral and are created so as to have appealing investment attributes to institutional investors.
5. The SPV plays a critical role in a securitization because it legally separates the loans and receivables sold to the SPV from the originator and therefore reduces funding costs because investors look to the credit risk of the collateral rather than the credit risk of the originator.
6. Securitizations require credit enhancement and the mechanisms for credit enhancing a structure are classified as internal and external.

COLLATERAL TYPE AND SECURITIZATION STRUCTURE

Structuring a securitization will depend on the characteristics of the underlying assets. Here we will discuss how two characteristics affect the structure: amortization and interest rate. Specifically, the structure depends on whether (1) the assets are amortizing or nonamortizing, and (2) the interest rate on the collateral is fixed or floating.

Amortizing versus Nonamortizing Assets

The collateral in a securitization can be classified as either amortizing or nonamortizing assets. **Amortizing assets** are loans in which the borrower's periodic payment consists of scheduled principal and interest payments over the life of the loan. The schedule for the repayment of the principal is called an **amortization schedule**. The standard residential mortgage loan falls into this category. Auto loans are amortizing assets. A prepayment is any excess payment over the scheduled principal payment. For an amortizing asset, projection of the cash flows requires projecting prepayments.

In contrast to amortizing assets, **nonamortizing assets** do not have a schedule for the periodic payments that the individual borrower must make. Instead, a nonamortizing asset is one in which the borrower must make a minimum periodic payment. If that payment is less than the interest on the outstanding loan balance, the shortfall is added to the outstanding loan balance. If the periodic payment is greater than the interest on the outstanding loan balance, then the difference is applied to the reduction of the outstanding loan balance. Because there is no schedule of principal payments (i.e., no amortization schedule) for a nonamortizing asset, the concept of a prepayment does not apply. Credit card receivables are examples of nonamortizing assets.

Typically, when amortizing assets are securitized, the collateral is fixed over the life of the structure. That is, no new assets are acquired. The collateral composition stays the same except for prepayments and defaults. Consequently, all principal received by the trust is paid out to the bond classes. The structure in this case is referred to as a **self-liquidating structure**. In the case of nonamortizing assets, for a period of time, referred to as the **lockout period** or **revolving period**, all principal received is used to purchase new collateral. Hence, new assets are being added to the collateral, and this structure is referred to as a **revolving structure**. After the lockout period, called the **amortization period**, principal received is distributed to the bond classes.

Fixed-Rate versus Floating-Rate Assets

The assets that are securitized can have a fixed rate or a floating rate. This impacts the structure in terms of the coupon rate for the bonds issued. For example, a structure with all floating-rate bond classes backed by collateral consisting of only fixed-rate contracts exposes bondholders to interest rate risk. If the reference rate for the floating-rate bond classes increases sufficiently, there could be a shortfall between the interest received from the collateral and the aggregate interest payment that must be made to the bond classes. If the collateral consists of only floating-rate contracts and the bond classes all have a fixed coupon rate, the exposure in this case is that the reference rate for the contracts will decline sufficiently so that the interest paid by the borrowers will be less than the total interest due to the bondholders.

To deal with situations where there may be a mismatch between the cash flow characteristics of the asset and the liabilities, interest rate derivative instruments are used in a securitization. The two common interest rate derivatives used are interest rate swaps and interest rate caps.

Key Points That You Should Understand Before Proceeding

1. The collateral in a securitization can be classified as either amortizing or nonamortizing assets.
2. When amortizing assets are securitized, the composition of the collateral is fixed over the life of the structure, all principal received by the trust is paid out to the bond classes, and the securitization is said to be a self-liquidating structure.
3. When nonamortizing assets are securitized, there is a lockout period or revolving period where all principal received is used to purchase new collateral. Hence, the securitization is said to be a revolving structure; following the lockout period, there is an amortization period where principal received is distributed to the bond classes.

REVIEW OF MAJOR NON-MORTGAGE-RELATED TYPES OF ABS

In this section, we briefly review five of the largest sectors within the ABS market that are not backed by real estate mortgage loans: (1) credit card receivable-backed securities, (2) auto loan-backed securities, (3) rate reduction bonds, (4) student loan-backed securities, and (5) Small Business Administration loan-backed securities.

Credit Card Receivable-Backed Securities

There are three general categories of credit card: general-purpose credit cards (Visa and MasterCard), independent networks (American Express and Discover), and private-label credit cards. The last category is the smallest, the largest issuer in this category by far being Sears, Roebuck & Co.

Credit card receivable-backed securities are backed by the cash flow of a pool of credit card receivables. The cash flow consists of finance charges collected, fees, and principal. Finance charges collected represent the periodic interest the credit card borrower is charged based on the unpaid balance after the grace period. Fees include late payment fees and any annual membership fees. Interest to the bond classes is paid periodically (e.g., monthly, quarterly, or semiannually). The interest rate may be fixed or floating.

A credit card receivable is a nonamortizing asset and therefore has a revolving structure. During the lockout period the principal payments made by credit card borrowers comprising the pool are retained by the trustee and reinvested in additional receivables to maintain the size of the pool. The lockout period can vary from 18 months to 10 years. So, during the lockout period, the cash flow that is paid out to the bond classes is based on finance charges collected and fees. The lockout period is followed by the principal amortization period, when the principal is no longer reinvested but paid to bondholders.

There are provisions in credit card receivable-backed securities that require early amortization of the principal if certain events occur. Such a provision, which is referred to as either an **early amortization provision** or a **rapid amortization provision**, is included to

safeguard the credit quality of the structure. The only way that the principal cash flows can be altered is by triggering the early amortization provision. Typically, early amortization allows for the rapid return of principal in the event that the three-month average excess spread earned on the receivables falls to zero or less. When early amortization occurs, the bond classes are retired sequentially (i.e., first the AAA bond, then the AA rated bond, etc.). This is accomplished by distributing the principal payments to the specified bond class instead of using those payments to acquire more receivables.

Auto Loan-Backed Securities

Auto loan-backed securities are issued by the financial subsidiaries of auto manufacturers (domestic and foreign), commercial banks, and independent finance companies and small financial institutions specializing in auto loans. The cash flow for auto loan-backed securities consists of regularly scheduled monthly loan payments (interest and scheduled principal repayments) and any prepayments. For securities backed by auto loans, prepayments result from (1) sales and trade-ins requiring full payoff of the loan, (2) repossession and subsequent resale of the automobile, (3) loss or destruction of the vehicle, (4) payoff of the loan with cash to save on the interest cost, and (5) refinancing of the loan at a lower interest cost. Although refinancings may be a major reason for prepayments of residential mortgage loans, they are of minor importance for automobile loans.

Rate Reduction Bonds

Rate reduction bonds are backed by a special charge (tariff) included in the utility bills of utility customers. The charge, called the competitive transition charge (CTC), is effectively a legislated asset. It is the result of the movement to make the electric utility industry more competitive by deregulating the industry. Prior to deregulation, electric utilities were entitled to set utility rates so as to earn a competitive return on the assets on their balance sheet. After deregulation, the setting of utility rates to recover a competitive return was no longer permissible. As a result, many electric utilities had a substantial amount of assets that they acquired prior to deregulation that would likely become uneconomic, and utilities would no longer be assured that they could charge a high enough rate to recover the costs of these assets. These assets are referred to as "stranded assets" and the associated costs referred to as "stranded costs." For this reason, rate reduction bonds are also known as **stranded cost bonds** or **stranded asset bonds**. Some market participants refer to this sector of the ABS market as the "utilities" sector.

The CTC is collected by the utility over a specific period of time. Because the state legislature designates the CTC to be a statutory property right, it can be sold by a utility to an SPV and then securitized. It is the legislative designation of the CTC as an asset that makes rate reduction bonds different from the typical asset securitized.

The CTC is initially calculated based on projections of utility usage and the ability to collect revenues. However, actual collection experience may differ from initial projections. Because of this, there is a "true-up" mechanism in these securitizations. This mechanism permits the utility to recompute the CTC on a periodic basis over the term of the securitization based on actual collection experience. The advantage of the true-up mechanism to the bond classes is that it provides cash flow stability as well as a form of credit enhancement.

Student Loan-Backed Securities

Student loans are made to cover college costs (undergraduate, graduate, and professional programs such as medical and law school) and tuition for a wide range of vocational and trade schools. **Student loan-backed securities**, popularly referred to as SLABS, have similar structural features to other ABS already discussed.

The student loans most commonly securitized are those made under the Federal Family Education Loan Program (FFELP). Under this program, the government makes loans to a student via private lenders. The decision by private lenders to extend a loan to a student is not based on the applicant's ability to repay the loan. If a default of a loan occurs and the loan has been properly serviced, then the government will guarantee up to 98% of the principal plus accrued interest. By far, the leading issuer of SLABS is Sallie Mae.[4] In 2006, Sallie Mae issued $34 billion of SLABS, almost six times more than the second largest issuer, Nelnet Student Loan.

Loans that are not part of a government guarantee program are called **private student loans**. These loans are basically consumer loans, and the lender's decision to extend such a loan will be based on the ability of the applicant to repay the loan. The largest issuers of ABS backed by private student loans are Sallie Mae (SML Private Credit), First Marble, Access Group, and Keycorp.

The cash flow for the student loans themselves involve three periods with respect to the borrower's payments: deferment period, grace period, and loan repayment period. Typically, student loans work as follows. While a student is in school—the deferment period—no payments are made by the student on the loan. Upon leaving school, the student is extended a grace period of usually six months when no payments on the loan must be made. After this period, payments are made on the loan by the borrower.

Prepayments typically occur due to default recoveries or loan consolidation. Default recoveries are payments made by the insurer of the loan. Consolidation of a loan occurs when the student who has loans over several years combines them into a single loan. The proceeds from the consolidation are distributed to the original lender and, in turn, distributed to the bondholders.

Small Business Administration Loan-Backed Securities

The Small Business Association (SBA) is an agency of the U.S. government empowered to guarantee loans made by approved SBA lenders to qualified borrowers. The loans are backed by the full faith and credit of the government. Most SBA loans are variable-rate loans where the reference rate is the prime rate. SBA regulations specify the maximum coupon allowable in the secondary market. Newly originated loans have maturities between five and 25 years.

Most SBA loans make monthly payments consisting of interest and principal repayment. The amount of the monthly payment for an individual loan is determined as follows. Given the coupon formula of the prime rate plus the loan's quoted margin, the interest rate is determined for each loan. Given the interest rate, a level payment amortization schedule

[4] Sallie Mae was originally a government-sponsored enterprise created by Congress to purchase student loans in the secondary market and to securitize pools of student loans. In December 2004, Sallie Mae (whose original name was the Student Loan Marketing Association) was privatized and, hence, is no longer a government-sponsored enterprise.

is determined. It is this level payment that is paid for the next month until the coupon rate is reset. The monthly cash flow that the investor in an SBA-backed security receives consists of the coupon interest based on the coupon rate set for the period, the scheduled principal repayment (i.e., scheduled amortization), and prepayments. Voluntary prepayments can be made by the borrower without any penalty.

The Small Business Secondary Market Improvement Act, passed in 1984, permitted the pooling of SBA loans. Securities backed by SBA loans are called **SBA loan-backed securities.**

Key Points That You Should Understand Before Proceeding

1. Credit card receivable-backed securities are backed by the cash flow of a pool of credit card receivables and the cash flow consists of finance charges collected, fees, and principal.
2. The cash flow for auto loan-backed securities consists of regularly scheduled monthly loan payments (interest and scheduled principal repayments) and any prepayments.
3. Rate reduction bonds, also called stranded cost bonds or stranded asset bonds, are backed by a state-legislative approved special charge, referred to as the CTC, charged by utility companies.
4. Student loan-backed securities are backed by federally guaranteed and private student loans and involve three periods with respect to the borrower's payments: deferment period, grace period, and loan repayment period.
5. The SBA loan-backed securities are backed by loans made by SBA lenders to qualified businesses and backed by the full faith and credit of the government.

CREDIT RISKS ASSOCIATED WITH INVESTING IN ASSET-BACKED SECURITIES

Investors in ABS are exposed to credit risk and rely on rating agencies to evaluate that risk for the bond classes in a securitization. While the three rating agencies have different approaches in assigning credit ratings, they do focus on the same areas of analysis. Moody's, for example, investigates (1) asset risks, (2) structural risks, and (3) third parties to the structure.[5] We discuss each here. In addition, rating agencies analyze the legal structure (i.e., the SPV). We also discuss the legal issue regarding securitizations in general.

Asset Risks

Evaluating asset risks involves the analysis of the credit quality of the collateral. The rating agencies will look at the underlying borrower's ability to pay and the borrower's equity in the asset. The reason for looking at the latter is because it is a key determinant as to whether the underlying borrower will default or sell the asset and pay off a loan. The rating agencies will look at the experience of the originators of the underlying loans and will assess whether the loans underlying a specific transaction have the same characteristics as the experience reported by the seller.

[5] Andrew A. Silver, "Rating Structured Securities," Chapter 5 in Frank J. Fabozzi (ed.), *Issuer Perspectives on Securities* (Hoboken, NJ: John Wiley & Sons, 1998).

The concentration of loans is examined. The underlying principle of asset securitization is that a large number of borrowers in a pool will reduce the credit risk via diversification. If there are a few borrowers in the pool that are significant in size relative to the entire pool balance, this diversification benefit can be lost, resulting in a higher level of credit risk referred to as **concentration risk**. To reduce concentration risk, concentration limits on the amount or percentage of receivables from any one borrower, region of the country, or industry (in the case of commercial assets) will be established by rating agencies. If at issuance the concentration limit is exceeded, some or all of the bond classes will receive a lower credit rating than if the concentration limit were within the established range. Subsequent to issuance, bond classes may be downgraded if the concentration limit is exceeded.

Employing statistical analysis, the rating agencies assess the most likely loss to a bond class that would result from the performance of the collateral. This is done by analyzing various scenarios that the rating agencies specify. Based on the result of the analysis, the rating agencies compute both a weighted average loss and variability of loss for each bond class. To appreciate why the variability of loss is important, suppose that a bond class has protection against a 7% loss in the value of the collateral due to defaults. To simplify the illustration, suppose that a rating agency evaluates two equally likely scenarios and that in the first scenario the loss is 6% and in the second scenario 4%. The weighted average loss is 5%. This is less than the 7% loss against which a bond class has protection and therefore the rating agency would expect it to be unlikely that the bond class would realize a loss. Let's change the two outcomes now. Suppose that the outcome of the two scenarios is that the loss is 8% in the first scenario and 2% in the second scenario. While the expected value for the loss is still 5%, the variability of the loss is much greater than before. In fact, in the second scenario if an 8% loss occurs, the bond class would realize a loss of 1% (8% loss in the scenario minus the 7% protection).

Structural Risks

The decision on the structure is up to the seller. Once selected, the rating agencies examine the extent to which the cash flow from the collateral can satisfy all the obligations of the bond classes in the securitization. The cash flow of the underlying collateral is interest and principal repayment. The cash flow payments that must be made are interest and principal to investors, servicing fees, and any other expenses for which the issuer is liable. This is described by the structure's cash flow waterfall. The rating agencies analyze the structure to test whether the collateral's cash flows match the payments that must be made to satisfy the issuer's obligations. This risk is referred to as **structural risk**. In analyzing this risk, the rating agency must make assumptions about losses and delinquencies and consider various interest rate scenarios after taking into consideration credit enhancements.

In considering the structure, the rating agencies will consider (1) the loss allocation (how losses will be allocated among the bond classes in the structure), (2) the cash flow allocation (i.e., the cash flow waterfall), (3) the interest rate spread between the interest earned on the collateral and the interest paid to the bond classes plus the servicing fee, (4) the potential for a trigger event to occur that will cause the early amortization of a deal (discussed later), and (5) how credit enhancement may change over time.

Third-Party Providers

In a securitization, several third parties are involved. These include third-party credit guarantors (most commonly bond insurers), the servicer, a trustee, issuer's counsel, a guaranteed investment contract provider (this entity insures the reinvestment rate on investable funds), and accountants. The rating agency will investigate all third-party providers. For the third-party guarantors, the rating agencies will perform a credit analysis of their ability to pay.

All loans must be serviced. Servicing involves collecting payments from borrowers, notifying borrowers who may be delinquent, and, when necessary, recovering and disposing of the collateral if the borrower does not make loan repayments by a specified time. The servicer is responsible for these activities. Moreover, while still viewed as a "third party" in many securitizations, the servicer is likely to be the originator of the loans used as the collateral.

In addition to the administration of the loan portfolio as just described, the servicer is responsible for distributing the proceeds collected from the borrowers to the different bond classes in the structure according to the cash flow waterfall. Where there are floating-rate securities in the transaction, the servicer will determine the interest rate for the period. The servicer may also be responsible for advancing payments when there are delinquencies in payments (that are likely to be collected in the future), resulting in a temporary shortfall in the payments that must be made to the bondholders.

The role of the servicer is critical in a securitization. Therefore, rating agencies look at the ability of a servicer to perform all these activities before they assign a rating to the bonds in a transaction. For example, the following factors are reviewed when evaluating servicers: servicing history, experience, underwriting standard for loan originations, servicing capabilities, human resources, financial condition, and growth/competition/business environment. Transactions where there is a concern about the ability of a servicer to perform are either not rated or the rating agency may require a backup servicer.

Recent cases have made rating agencies pay even closer attention to the importance of the underlying business of the seller/originator, the strength of the servicer, and the economics that will produce the cash flows for the collateral. Primarily, this was as a result of the alleged fraud of National Century Financial Enterprises (NCFE), purchaser of health care receivables that were then securitized and serviced, and DVI, a securitizer of medical equipment leases. In addition, NCFE and DVI highlighted the need for a trustee to be more proactive if the performance of the servicer deteroriates. That is, the trustee's role should be expanded beyond the traditional function of merely performing the ongoing tests on the collateral that are set forth in the deal documents. This is, in fact, happening in recent deals where the trustee under certain circumstances can take on an expanded role. This is referred to as a *trustee event trigger*.

Potential Legal Challenges

The long-standing view is that investors in ABS are protected from the creditors of the seller of the collateral. That is, when the seller of the collateral transfers it to the trust (the SPV), the transfer represents a "true sale" and therefore in the case of the seller's bankruptcy, the bankruptcy court cannot penetrate the trust to recover the collateral or cash flow from the collateral. However, this issue has never been fully tested. The closest challenge was the bankruptcy of LTV Steel Company. In the bankruptcy, LTV argued

that its securitizations were not true sales and therefore it should be entitled to the cash flows that it transferred to the trust. Although the case was settled and the settlement included a summary finding that LTV's securitizations were a true sale, the court's decision to permit LTV to use the cash flows prior to the settlement is a major concern to investors.

There are also concerns regarding the outcome of a bankruptcy involving Conseco Finance Corp. The firm filed for bankruptcy in December 2002. Conseco Finance had been the largest originator of manufactured housing loans, as, well as the originator of other types of assets. At the time of filing, Conseco was the servicer for its prior securitizations, charging a servicing fee of 50 basis points. The bankruptcy court took the position that a 50 basis points servicing fee was not adequate compensation, ordering it to be increased (to 115 basis points). That increase in the servicing fee was obtained by reducing the excess spread in the securitization transactions that Conseco was servicing. As a result of a reduction in the excess spread, the credit enhancement levels for the transactions being serviced were reduced and several of the subordinate tranches in those transactions were downgraded.[6]

Key Points That You Should Understand Before Proceeding

1. In assessing the risk on ABS, rating agencies focus on asset risks, structural risks, third parties to the structure, and the legal structure.
2. Evaluating asset risks involves the analysis of the credit quality of the collateral and considers the underlying borrower's ability to pay and the borrower's equity in the asset, the experience of the originators of the underlying loans, the concentration of the loans, and statistically estimated likely loss to a bond class that would result from the performance of the collateral.
3. The rating agencies analyze the structure to test whether the collateral's cash flows match the payments that must be made to satisfy the issuer's obligations, and in doing so they must make assumptions about losses and delinquencies and consider various interest rate scenarios after taking into consideration credit enhancements.
4. Because there are several third parties involved in a securitization (e.g., bond insurer, servicer, a trustee, issuer's counsel) and they all play an important role, the rating agency will investigate all of them to determine their ability to perform.

SECURITIZATION AND THE IMPACT ON FINANCIAL MARKETS

The three economic functions of financial intermediaries are as follows: (1) providing maturity intermediation, (2) reducing risk via diversification, and (3) reducing the costs of contracting and information processing. However, securitization is a vehicle for raising funds directly in the public market without the need for a financial intermediary. That is, securitization is said to result in financial disintermediation.

[6] For a further discussion of the implications of the Conseco Finance bankruptcy, see Frank J. Fabozzi, "The Structured Finance Market: An Investor's Perspective," *Financial Analysts Journal* (May–June 2005), pp. 27–40.

Let's see how securitization can fulfill the three economic roles of financial intermediaries. First, a pool of loans can be used to create ABS with different maturity ranges. For example, a pool of 30-year residential mortgage loans can be used to create securities with maturities that are short, intermediate, and long term. Hence, securitization provides maturity intermediation. Second, diversification within an asset type is accomplished because of the large number of loans in a typical securitization. Hence, securitization reduces risk via diversification. Finally, the costs of contracting and information processing are provided in asset securitization. The contracting costs are provided by the originator of the loans. Information processing is provided at two levels. The first is when a loan is originated. The second is when a rating agency rates the individual ABS in the transaction.

The key benefit of securitization to financial markets is that it allows for the creation of tradable securities with better liquidity for financial claims that would otherwise have remained in the portfolio of financial intermediaries and, therefore, highly illiquid. For example, very few institutional investors or individual investors would be willing to invest in residential mortgage loans, automobile loans, or credit card receivables. Yet they would be willing to invest in a security backed by these loan types. By making financial assets tradable in this way, securitization (1) reduces agency costs, thereby making financial markets more efficient; and (2) improves liquidity for the underlying financial claims, thereby reducing liquidity risk in the financial system. The concerns with the financial disintermediating impact of securitization are that fewer assets will be held in the portfolio of banks and as a result this will make it more difficult for the Federal Reserve to implement monetary policy. Moreover, there is a concern that securitization of loans from bank portfolios will lead to a lower profitability for banks and the loans not securitized and held in bank portfolios will be of lower credit quality.[7]

SUMMARY

ABS are created by pooling loans and receivables through a process known as securitization. The main parties to a securitization are the seller/originator (party seeking to raise funds), SPV, and servicer. The motivation for issuing ABS rather than issuing a corporate bond is the potential reduction in funding cost. The key to this savings is the role of the SPV.

ABS are credit enhanced to provide greater protection to bond classes against defaults. There are two general types of credit enhancement mechanisms: external and internal. External credit enhancements come in the form of third-party guaranties, the most common being bond insurance. Internal credit enhancements include reserve funds (cash reserves and excess spread), overcollateralization, and senior/subordinate structures.

In analyzing credit risk, the rating agencies will examine asset risks, structural risks, and third parties to the structure. Based on this analysis, a rating agency will determine the amount of credit enhancement needed for a bond class to receive a specific credit rating.

Securitization has resulted in financial disintermediation. While there are benefits of securitization, there are also concerns about its impact.

---

[7] For a further discussion, see Stuart I. Greenbaum and Anjan V. Thakor, "Bank Funding Modes: Securitization versus Deposits," *Journal of Banking and Finance*, 11 (1987), pp. 379–392; and Richard Cantor and Stanislas Rouyer, "Another Perspective on Credit Risk Transfer and Assets Securitization," *Journal of Risk Finance* (Winter 2000), pp. 37–47.

KEY TERMS

- Amortization period
- Amortization schedule
- Amortizing assets
- Asset-backed security (ABS)
- Auto loan-backed securities
- Bond insurance
- Cash flow waterfall (waterfall)
- Concentration risk
- Conduit
- Credit card receivable-backed securities
- Early amortization provision
- Excess spread
- Existing asset securitizations
- Future flow securitizations
- Lockout period
- Nonamortizing assets
- Originator
- Private student loans
- Rapid amortization provision
- Rate reduction bonds
- Revolving period
- Revolving structure
- SBA loan-backed securities
- Self-liquidating structure
- Special purpose vehicle (SPV)
- Stranded cost bonds (stranded asset bonds)
- Structural risk
- Student loan-backed securities
- Surety bond
- Surety wrap
- Underwriting standards

QUESTIONS

1. A financial corporation with a BBB rating has a consumer loan portfolio. An investment banker suggested that this corporation consider issuing an ABS where the collateral for the security is the consumer loan portfolio. What would be the advantage of issuing an ABS rather than a straight offering of corporate bonds?
2. Why is the entity seeking to raise funds through a securitization referred to as the "seller" or the "originator"?
3. In achieving the benefits associated with a securitization, why is the SPV important to the transaction?
4. In a securitization, what is the difference between a servicer and an SPV?
5. What is meant by a cash flow waterfall?
6. Explain the difference in the treatment of principal received for a self-liquidating trust and a revolving trust.
7. In a securitization, what is (a) a lockout period, and (b) an early amortization provision?
8. a. Why is credit enhancement required in a securitization?
   b. What entity determines the amount of credit enhancement needed in a securitization?
9. What is the limitation of a third-party guaranty as a form of credit enhancement?
10. An ABS has been credit enhanced with a letter of credit from a bank with a single A credit rating. If this is the only form of credit enhancement, explain whether this issue can be assigned a triple credit rating at the time of issuance.
11. A corporation is considering a securitization and is considering two possible credit enhancement structures backed by a pool of automobile loans. Total principal value underlying the ABS is $300 million.

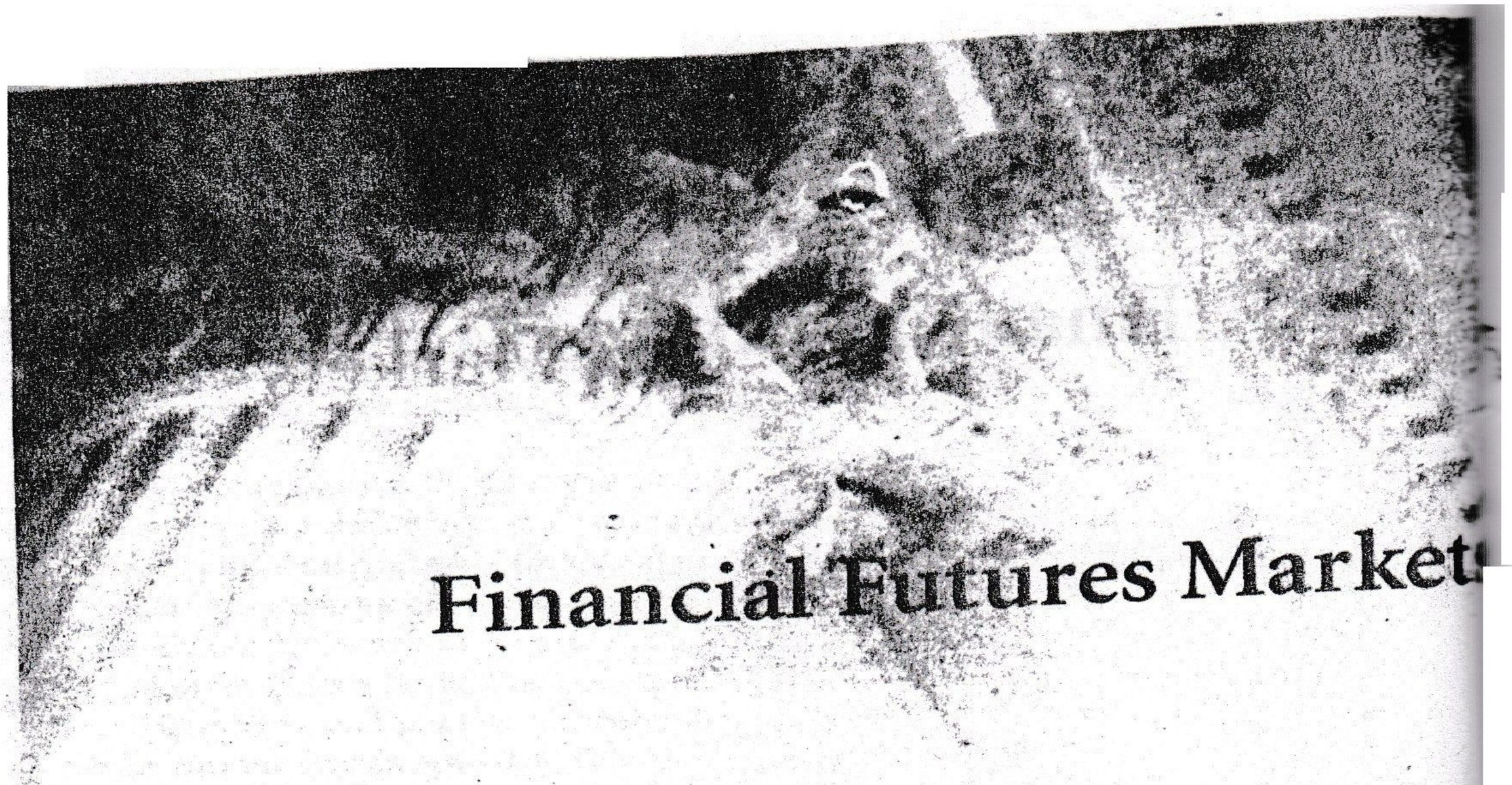
Principal Value for:	Structure I	Structure II
Pool of automobile loans	$304 million	$301 million
Senior class	$250 million	$270 million
Subordinate class	$50 million	$30 million

   a. Which structure would receive a higher credit rating and why?
   b. What forms of credit enhancement are being used in both structures?

12. a. What is meant by concentration risk?
    b. How do rating agencies seek to limit the exposure of a pool of loans to concentration risk?
13. What factors do the rating agencies consider in analyzing the structural risk in a securitization?
14. Why would an interest rate derivative be used in a securitization structure?
15. What is the cash flow for an auto loan–backed security?
16. The following questions relate to credit card receivable-backed securities.
    a. What happens to the principal repaid by borrowers in a credit card receivable–backed security during the lockout period?
    b. What is the role of the early amortization provision in a credit card receivable–backed security structure?
    c. How can the cash flow of a credit card receivable–backed security be altered prior to the principal-amortization period?
17. The following questions relate to rate reduction bonds:
    a. What asset is the collateral?
    b. Who is the servicer?
    c. What is a true-up provision in a securitization creating rate reduction bonds?
18. What are the components of the cash flow for an SBA-backed security?
19. a. What is the benefit of securitization to a financial market?
    b. What are the concerns with securitization?

Financial Futures Markets

om Chapter 26 of *Foundations of Financial Markets and Institutions*, 4/e. Frank J. Fabozzi. Franco Modigliani. Frank J. Jones.
pyright © 2010 by Pearson Prentice Hall. All rights reserved.



Financial Futures Market

LEARNING OBJECTIVES

After reading this chapter, you will understand

- what a futures contract is
- the basic economic function of a futures contract
- the differences between futures and forward contracts
- the role of the clearinghouse
- the mark-to-market and margin requirements of a futures contract
- the role of futures markets in the economy
- features of U.S. stock index futures contracts, single stock futures contracts, and narrow-based stock index futures contracts
- features of interest rate futures contracts
- findings of the General Accounting Office study on financial derivatives

In this chapter, we describe the financial futures market and the various contracts traded in it. The basic economic function of futures markets is to provide an opportunity for market participants to hedge against the risk of adverse price movements.

Futures contracts are products created by exchanges. To create a particular futures contract, an exchange must obtain approval from the Commodity Futures Trading Commission (CFTC), a government regulatory agency. In its application to the CFTC, the exchange must demonstrate that there is an economic purpose for the contract. While numerous futures contracts obtain approval for trading, only those contracts that spark investor interest and serve investor needs ultimately succeed.

Prior to 1972, only futures contracts involving traditional agricultural commodities (such as grain and livestock), imported foodstuffs (such as coffee, cocoa, and sugar), or

industrial commodities were traded. Collectively, such futures contracts are known as *commodity futures*. Futures contracts based on a financial instrument or a financial index are known as *financial futures*. Financial futures can be classified as (1) stock index futures, (2) interest rate futures, and (3) currency futures.

As the value of a futures contract is derived from the value of the underlying instrument, futures contracts are commonly called *derivative instruments*. Options, discussed in the next chapter, are another example of derivative instruments.

In the United States, the development of the markets for futures and options on stock indexes and debt obligations was a response to the need for an efficient risk-transference mechanism as stock price and interest rate volatility in the United States increased. Other countries have shared the U.S. experience with volatility and, as a result, developed derivative markets.

Historically, the trading of futures contracts has been via an open outcry environment where traders and brokers shout out bids and offers in a trading pit or ring. Although open outcry has been the primary method of trading certain types of futures contract, since 2004, trading in many financial futures in the United States has moved towards an electronic trading platform wherein market participants post their bids and offers on a computerized trading system. The trading of futures contracts outside the United States takes place on an electronic platform.

FUTURES CONTRACTS

A futures contract is an agreement between a buyer and a seller, in which

1. the buyer agrees to take delivery of something at a specified price at the end of a designated period of time
2. the seller agrees to make delivery of something at a specified price at the end of a designated period of time

Of course, no one buys or sells anything when entering into a futures contract. Rather, the parties to the contract agree to buy or sell a specific amount of a specific item at a specified future date. When we speak of the "buyer" or the "seller" of a contract, we are simply adopting the jargon of the futures market, which refers to parties of the contract in terms of the future obligation they are committing themselves to.

Let's look closely at the key elements of this contract. The price at which the parties agree to transact in the future is called the **futures price**. The designated date at which the parties must transact is called the **settlement date** or **delivery date**. The "something" that the parties agree to exchange is called the **underlying**.

To illustrate, suppose there is a futures contract traded on an exchange where the underlying to be bought or sold is Asset XYZ, and the settlement is three months from now. Assume further that Bob buys this futures contract, and Sally sells this futures contract, and the price at which they agree to transact in the future is $100. Then $100 is the futures price. At the settlement date, Sally will deliver Asset XYZ to Bob. Bob will give Sally $100, the futures price.

When an investor takes a position in the market by buying a futures contract (or agreeing to buy at the future date), the investor is said to be in a **long position** or to be **long futures**. If, instead, the investor's opening position is the sale of a futures contract (which means the contractual obligation to sell something in the future), the investor is said to be **in a short position** or to be **short futures**.

The buyer of a futures contract will realize a profit if the futures price increases; the seller of a futures contract will realize a profit if the futures price decreases. For example, suppose that one month after Bob and Sally take their positions in the futures contract, the futures price of Asset XYZ increases to $120. Bob, the buyer of the futures contract, could then sell the futures contract and realize a profit of $20. Effectively, he has agreed to buy, at the settlement date, Asset XYZ for $100 and to sell Asset XYZ for $120. Sally, the seller of the futures contract, will realize a loss of $20.

If the futures price falls to $40 and Sally buys the contract, she realizes a profit of $60 because she agreed to sell Asset XYZ for $100 and now can buy it for $40. Bob would realize a loss of $60. Thus, if the futures price decreases, the buyer of the futures contract realizes a loss while the seller of the futures contract realizes a profit.

Liquidating a Position

Most financial futures contracts have settlement dates in the months of March, June, September, or December. This means that at a predetermined time in the contract settlement month the contract stops trading, and a price is determined by the exchange for settlement of the contract. The contract with the closest settlement date is called the **nearby futures contract**. The next futures contract is the one that settles just after the nearby contract. The contract farthest away in time from settlement is called the **most distant (or deferred) futures contract.**

A party to a futures contract has two choices on liquidation of the position. First, the position can be liquidated prior to the settlement date. For this purpose, the party must take an offsetting position in the same contract. For the buyer of a futures contract, this means selling the same number of identical futures contracts; for the seller of a futures contract, this means buying the same number of identical futures contracts.

The alternative is to wait until the settlement date. At that time, the party purchasing a futures contract accepts delivery of the underlying; the party that sells a futures contract liquidates the position by delivering the underlying at the agreed-upon price. For some futures contracts that we shall describe later in this chapter, settlement is made in cash only. Such contracts are referred to as **cash settlement contracts.**

A useful statistic measuring the liquidity of a contract is the number of contracts that have been entered into but not yet liquidated. This figure is called the contract's **open interest.** An open interest figure is reported by an exchange for all the futures contracts traded on the exchange.

The Role of the Clearinghouse

Associated with every futures exchange is a **clearinghouse**, which performs several functions. One of these functions is to guarantee that the two parties to the transaction will perform. To see the importance of this function, consider potential problems in the futures transaction described earlier from the perspective of the two parties—Bob the buyer and Sally the seller. Each must be concerned with the other's ability to fulfill the obligation at the settlement date. Suppose that at the settlement date the price of Asset XYZ in the cash market is $70. Sally can buy Asset XYZ for $70 and deliver it to Bob, who in turn must pay her $100. If Bob does not have the capacity to pay $100 or refuses to pay, however, Sally has lost the opportunity to realize a profit of $30. Suppose, instead, that the price of Asset XYZ in the cash market is $150 at the settlement date. In this case, Bob is ready and willing to

accept delivery of Asset XYZ and pay the agreed-upon price of $100. If Sally cannot deliver or refuses to deliver Asset XYZ, Bob has lost the opportunity to realize a profit of $50.

The clearinghouse exists to eliminate this problem. When someone takes a position in the futures market, the clearinghouse takes the opposite position and agrees to satisfy the terms set forth in the contract. Because of the clearinghouse, the two parties need not worry about the financial strength and integrity of the party taking the opposite side of the contract. After initial execution of an order, the relationship between the two parties ends. The clearinghouse interposes itself as the buyer for every sale and the seller for every purchase. Thus, the two parties are then free to liquidate their positions without involving the other party in the original contract, and without worry that the other party may default. This function is referred to as the *guarantee function.*

Besides its guarantee function, the clearinghouse makes it simple for parties to a futures contract to unwind their positions prior to the settlement date. Suppose that Bob wants to get out of his futures position. He will not have to seek out Sally and work out an agreement with her to terminate the original contract. Instead, Bob can unwind his position by selling an identical futures contract. As far as the clearinghouse is concerned, its records will show that Bob has bought and sold an identical futures contract. At the settlement date, Sally will not deliver Asset XYZ to Bob but will be instructed by the clearinghouse to deliver to someone who bought and still has an open futures position. In the same way, if Sally wants to unwind her position prior to the settlement date, she can buy an identical futures contract.

Margin Requirements

When a position is first taken in a futures contract, the investor must deposit a minimum dollar amount per contract as specified by the exchange. This amount, called **initial margin,** is required as a deposit for the contract. Individual brokerage firms are free to set margin requirements above the minimum established by the exchange. The initial margin may be in the form of an interest-bearing security such as a Treasury bill. As the price of the futures contract fluctuates each trading day, the value of the investor's **equity** in the position changes. The equity in a futures account is the sum of all margins posted and all daily gains less all daily losses to the account. We develop this important concept throughout this section.

At the end of each trading day, the exchange determines the **settlement price** for the futures contract. The settlement price is different from the closing price, which many people know from the stock market and which is the price of the security in the final trade of the day (whenever that trade occurred during the day). The settlement price by contrast is that value that the exchange considers to be representative of trading at the end of the day. The representative price may in fact be the price in the day's last trade. But, if there is a flurry of trading at the end of the day, the exchange looks at all trades in the last few minutes and identifies a median or average price among those trades. The exchange uses the settlement price to mark to market the investor's position, so that any gain or loss from the position is quickly reflected in the investor's equity account.

Maintenance margin is the minimum level (specified by the exchange) to which an investor's equity position may fall as a result of an unfavorable price movement before the investor is required to deposit additional margin. The additional margin deposited is called **variation margin,** and it is an amount necessary to bring the equity in the account back to its initial margin level. Unlike initial margin, the variation margin must be in cash rather than interest-bearing instruments. Any excess margin in the account may be withdrawn by

the investor. If a party to a futures contract who is required to deposit variation margin fails to do so within 24 hours, the exchange closes the futures position out.

Although there are initial and maintenance margin requirements for buying securities on margin, the concept of margin differs for securities and futures. When securities are acquired on margin, the difference between the price of the security and the initial margin is borrowed from the broker. The security purchased serves as collateral for the loan, and the investor pays interest. For futures contracts, the initial margin, in effect, serves as good faith money, an indication that the investor will satisfy the obligation of the contract. Normally, no money is borrowed by the investor who takes a futures position.

To illustrate the mark-to-market procedure, let's assume the following margin requirements for Asset XYZ:

Initial margin	$7 per contract
Maintenance margin	$4 per contract

Let's assume that Bob buys 500 contracts at a futures price of $100, and Sally sells the same number of contracts at the same futures price. The initial margin for both Bob and Sally is $3,500, which is determined by multiplying the initial margin of $7 by the number of contracts, which is 500. Bob and Sally must put up $3,500 in cash or Treasury bills or other acceptable collateral. At this time, $3,500 is also called the equity in the account. The maintenance margin for the two positions is $2,000 (the maintenance margin per contract of $4 multiplied by 500 contracts). The equity in the account may not fall below $2,000. If it does, the party whose equity falls below the maintenance margin must put up additional margin, which is the variation margin. There are two things to note here. First, the variation margin must be cash. Second, the amount of variation margin required is the amount to bring the equity up to the initial margin, not to the maintenance margin.

To illustrate the mark-to-market procedure, we assume the following settlement prices at the end of several trading days after the transaction was entered into. Those prices are

Trading Day	Settlement Price
1	$99
2	97
3	98
4	95

First, consider Bob's position. At the end of trading day 1, Bob realizes a loss of $1 per contract or $500 for the 500 contracts he bought. Bob's initial equity of $3,500 is reduced by $500 to $3,000. No action is taken by the clearinghouse because Bob's equity is still above the maintenance margin of $2,000. At the end of the second day, Bob realizes a further loss as the price of the futures contract has declined another $2 to $97, resulting in an additional reduction in his equity position by $1,000. Bob's equity is then $2,000: the equity at the end of trading day 1 of $3,000 minus the loss on trading day 2 of $1,000. Despite the loss, no action is taken by the clearinghouse, because the equity still meets the $2,000 maintenance requirement. At the end of trading day 3, Bob realizes a profit from the previous trading day of $1 per contract or $500. Bob's equity increases to $2,500. The drop in price

from $98 to $95 at the end of trading day 4 results in a loss for the 500 contracts of $1,500 and consequent reduction of Bob's equity to $1,000. As Bob's equity is now below the $2,000 maintenance margin, Bob is required to put up additional margin of $2,500 (variation margin) to bring the equity up to the initial margin of $3,500. If Bob cannot put up the variation margin his position will be liquidated.

Now, let's look at Sally's position. Sally as the seller of the futures contract benefits if the price of the futures contract declines. As a result, her equity increases at the end of the first two trading days. In fact, at the end of trading day 1, she realizes a profit of $500, which increases her equity to $4,000. She is entitled to take out the $500 profit and use these funds elsewhere. Suppose she does, and her equity, therefore, remains at $3,500 at the end of trading day 1. At the end of trading day 2, she realizes an additional profit of $1,000 that she also withdraws. At the end of trading day 3, she realizes a loss of $500 with the increase of the price from $97 to $98. This results in a reduction of her equity to $3,000. Finally, on trading day 4, she realizes a profit of $1,000, making her equity $4,000. She can withdraw $500.

Leveraging Aspect of Futures

A party taking a position in a futures contract need not put up the entire amount of the investment. Instead, the exchange and/or clearinghouse requires only the initial margin to be put up. To see the crucial consequences of this fact, suppose Bob has $100 and wants to invest in Asset XYZ because he believes its price will appreciate. If Asset XYZ is selling for $100, he can buy one unit of the asset. His payoff will then be based on the price action of one unit of Asset XYZ.

Suppose further that the exchange where the futures contract for Asset XYZ is traded requires an initial margin of only 5%, which in this case, would be $5. This means Bob can purchase 20 contracts with his $100 investment. (We ignore the fact that Bob may need funds for variation margin.) His payoff will then depend on the price action of 20 units of Asset XYZ. Thus, he can leverage the use of his funds. (The degree of leverage equals 1/margin rate. In this case, the degree of leverage equals 1/0.05 or 20.) While the degree of leverage available in the futures market varies from contract to contract, as the initial margin requirement varies, the leverage attainable is considerably greater than in the cash market.

At first, the leverage available in the futures market may suggest that the market benefits mainly those who want to speculate on price movements. However, futures markets can also be used to reduce price risk. Without the leverage possible in futures transactions, the cost of reducing price risk using futures would be too high for many market participants.

Daily Price Limits

The exchange has the right to impose a limit on the daily price movement of a futures contract from the previous day's closing price. A **daily price limit** sets the minimum and maximum price at which the futures contract may trade that day.[1] When a daily price limit is reached, trading does not stop but rather continues at a price that does not violate the minimum or maximum price.

---

[1] For a discussion of price limits on equity index futures contracts on the Chicago Mercantile Exchange, go to *http://www.cme.com/market/riskman/pricelmt.html* and *http://www.cme.com/market/riskman/pricelmtfaq.html*.

The rationale offered for the imposition of daily price limits is that they provide stability to the market at times when new information may cause the futures price to exhibit extreme fluctuations. Those who support daily price limits argue that giving market participants time to digest or reassess such information if trading ceases when price limits would be violated gives them greater confidence in the market. Not all economists agree with this rationale. The question of the role of daily price limits and whether they are necessary remains the subject of extensive debate.

Key Points That You Should Understand Before Proceeding

1. A futures contract is an agreement between a buyer and a seller in which the buyer agrees to take delivery of something at the futures price at the settlement date and the seller agrees to make delivery.
2. A party to a futures contract can liquidate a position prior to the settlement date by taking an offsetting position in the same contract.
3. Associated with every futures exchange is a clearinghouse, which provides a guarantee function.
4. Parties to a futures contract must satisfy margin requirements (initial, maintenance, and variation), and futures contracts are marked to market at the end of each trading day.
5. Futures contracts are leveraged instruments that can be used to control risk.

FUTURES VERSUS FORWARD CONTRACTS

A **forward contract**, just like a futures contract, is an agreement for the future delivery of something at a specified price at the end of a designated period of time. Futures contracts are standardized agreements as to the delivery date (or month) and quality of the deliverable, and are traded on organized exchanges. A forward contract is usually nonstandardized because the terms of each contract are negotiated individually between buyer and seller. Also, there is no clearinghouse for trading forward contracts, and secondary markets are often nonexistent or extremely thin. Unlike a futures contract, which is an exchange-traded product, a forward contract is an over-the-counter instrument.

Although both futures and forward contracts set forth terms of delivery, futures contracts are not intended to be settled by delivery. In fact, generally fewer than 2% of outstanding contracts are settled by delivery. Forward contracts, in contrast, are intended for delivery.

Futures contracts are marked to market at the end of each trading day. Consequently, futures contracts are subject to interim cash flows as additional margin may be required in the case of adverse price movements, or as an investor who has experienced favorable price movements withdraws any cash that exceeds the account's margin requirement. A forward contract may or may not be marked to market, depending on the wishes of the two parties. For a forward contract that is not marked to market, there are no interim cash flow effects because no additional margin is required.

Finally, the parties in a forward contract are exposed to credit risk because either party may default on the obligation. Credit risk is minimal in the case of futures contracts because the clearinghouse associated with the exchange guarantees the other side of any transaction.

Other than these differences, which reflect the institutional arrangements in the two markets, most of what we say about futures contracts applies equally to forward contracts.

THE ROLE OF FUTURES IN FINANCIAL MARKETS

Without financial futures, investors would have only one trading location to alter portfolio positions when they get new information that is expected to influence the value of assets—the cash market. If they hear economic news that is expected to impact the value of an asset adversely, investors want to reduce their price risk exposure to that asset. The opposite would be true if the new information is expected to impact the value of an asset favorably: An investor would increase price risk exposure to that asset. There are, of course, transactions costs associated with altering exposure to an asset—explicit costs (commissions) and execution costs (bid–ask spreads and market impact costs).

The futures market is an alternative market that investors can use to alter their risk exposure to an asset when new information is acquired. But which market—cash or futures—should the investor employ to alter a position quickly on the receipt of new information? The answer is simple: the one that most efficiently achieves the objective. The factors to consider are liquidity, transactions costs, taxes, and leverage advantages of the futures contract.

The market that investors consider more efficient for their investment objective should be the one where prices will first be established that reflect the new economic information. That is, this will be the market where price discovery takes place. Price information is then transmitted to the other market. For many of the financial assets that we have discussed, it is in the futures market that it is easier and less costly to alter a portfolio position. Therefore, it is the futures market that will be the market of choice and will serve as the price discovery market. It is in the futures market that investors send a collective message about how any new information is expected to impact the cash market.

How is this message sent to the cash market? To understand how, it is necessary to understand that there is a relationship between the futures price and the cash price. More specifically, the futures price and the cash market price are tied together by the cost of carry. If the futures price deviates from the cash market price by more than the cost of carry, arbitrageurs (in attempting to obtain arbitrage profits) would pursue a strategy to bring them back into line. Arbitrage is the mechanism that assures that the cash market price will reflect the information that has been collected in the futures market.

Some investors and the popular press believe the introduction of a futures market for a financial asset will increase the price volatility of that financial asset in the cash market. That is, some market observers believe that, as a result of speculative trading of futures contracts, the cash market instrument does not reflect its fundamental economic value. The implication here is that the price of the financial asset would better reflect its true economic value in the absence of a futures market for that financial asset.

Whether or not the introduction of futures markets destabilizes prices of financial assets is an empirical question. Whether or not the introduction of futures contracts increases cash market price volatility, we might ask whether greater volatility has negative effects on financial markets. At first glance, it might seem that volatility has adverse effects from the points of view of allocative efficiency and participation in financial markets.

Actually, it has been pointed out that this inference may not be justified if, say, the introduction of futures markets lets prices respond more promptly to changes in factors that affect the economic value of a financial asset, and if these factors themselves are subject to large shocks.[2] Thus, the greater volatility resulting from an innovation may simply more faithfully reflect the actual variability of factors that affect the economic value of financial assets. In this case, "more" volatility of a financial asset's price need not be bad but, rather, may be a manifestation of a well-functioning market. Of course, to say that more volatility need not be bad does not mean that it is good.

For example, we describe in the following text one type of futures contract in which the underlying is a stock market index. Critics of these futures contracts assert that their introduction has created greater volatility for stock market prices. While the empirical evidence has not supported this view, the key point is that increased volatility of stock market prices may be due to the greater quantity and frequency of information released by the government about important economic indicators that affect the value of the common stock of all companies. That information itself is subject to a great deal of variability. Thus, if there is any observed increase in the volatility of stock prices, that volatility may be due to the substantial variability of economic information, not to the presence of a futures contract on a stock market index.

Clearly, price volatility greater than what can be justified by relevant new information is undesirable. By definition, it makes prices inefficient. This is referred to as "excess volatility."[3]

Key Points That You Should Understand Before Proceeding

1. The key role of futures contracts is that, in a well-functioning futures market, these contracts provide a more efficient means for investors to alter their risk exposure to an asset.
2. A futures market will be the price discovery market when market participants prefer to use this market rather than the cash market to change their risk exposure to an asset.
3. The futures market and the cash market for an asset are tied together by an arbitrage process.
4. The argument that futures markets destabilize the prices of the underlying financial assets is an empirical one, but greater price volatility by itself is not an undesirable attribute of a financial market.

U.S. FINANCIAL FUTURES MARKETS

In this section, we review the more important financial futures markets in the United States.

---

[2] Eugene F. Fama, "Perspectives on October 1987, or What Did We Learn from the Crash?" in Robert J. Barro, et al. (eds.), *Black Monday and the Future of Financial Markets* (Homewood, IL: Dow Jones-Irwin, 1989), p. 72.

[3] Franklin R. Edwards, "Futures Trading and Cash Market Volatility: Stock Index and Interest Rate Futures," *The Journal of Futures Markets*, Vol. 8, No. 4 (1988), p. 423.

Stock Index Futures Markets

In 1982, three futures contracts on broadly based common stock indexes made their debut: the Standard & Poor's 500 futures contract traded on the international Monetary Market of the Chicago Mercantile Exchange (CME), the New York Stock Exchange Composite futures contract traded on the New York Futures Exchange, and the Value Line Average traded on the Kansas City Board of Trade. Since then, broad-based and specialized **stock index futures contracts** have been introduced. In the United States, the exchange that offers the most popular stock index futures contracts is the CME. Table 1 lists the stock index futures

Table 1 List of Stock Index Futures Contracts Listed on the Chicago Mercantile Exchange*

Contract	Multiple
S&P 500	250
e-mini S&P 500	50
NASDAQ-100	100
e-mini NASDAQ-100	20
e-mini NASDAQ Composite	50
e-mini MSCI EAFE	50
S&P MidCap 400	500
e-mini S&P MidCap 400	100
S&P SmallCap 600	200
Russell 2000	500
e-mini Russell 2000	100
e-mini Russell 1000	100
S&P 500/Citigroup Growth	250
S&P 500/Citigroup Value	250
SPCTR Futures	125
Nikkei 225—Dollar based	5
Nikkei 225—Yen based	500
E-mini S&P Asia 50	25

* *"E-mini" contracts are one-fifth the size of the corresponding regular ("big") contract.*

Underlying/Index:

S&P 500: The stocks of the 500 large capitalization U.S. companies actively traded on the NYSE, the AMEX, and Nasdaq Stock Market.

NASDAQ-100: Modified, capitalization-weighted index of 100 of the largest and most active nonfinancial, domestic stocks traded on the Nasdaq Stock Market.

NASDAQ Composite: Market capitalization of all the stocks traded on the Nasdaq Stock Market.

MSCI EAFE: Non–U.S. stock index consisting of stocks from Europe, Australasia, and the Far East.

S&P MidCap 400: Index of mid capitalization stocks.

S&P SmallCap 600: Index of small capitalization stocks.

Russell 2000: Capitalization-weighted index of approximately 2,000 actively traded, small-capitalization U.S. stocks on the NYSE, the AMEX, and Nasdaq Stock Market.

Russell 1000: 1,000 largest companies in the U.S. based on total market capitalization.

S&P 500/Citigroup Growth: U.S. stocks in the S&P 500 that are classified as growth stocks.

S&P 500/Citigroup Value: U.S. stocks in the S&P 500 that are classified as value stocks.

SPCTR Futures: Industry-specific sector indexes comprising the benchmark CME S&P 500. There is a financial and a technology contract.

Nikkei 225: Price-weighted index comprised of the 225 top-tier Japanese companies listed in the First Section of the Tokyo Stock Exchange.

e-mini S&P Asia 50: Broad-based capitalization-weighted index of the 50 largest stocks traded in Hong Kong, Korea, Singapore, and Taiwan.

contracts traded on the CME. The most actively traded contract is the S&P 500 futures contract. On the Chicago Board of Trade (CBOT), stock index futures are traded on the Dow Jones Industrial Average.

The dollar value of a stock index futures contract is the product of the futures price and the contract's *multiple;* that is,

$$\text{Dollar value of a stock index futures contract} = \text{Futures price} \times \text{Multiple}$$

The multiple for each CME contract is shown in Table 1. For example, if the futures price for the S&P 500 is 1300, since the multiple is $250, the dollar value of a stock index futures contract is

$$1300 \times \$250 = \$325{,}000$$

For the S&P Nasdaq 100, suppose that the futures price is 1600. Since the multiple for this contract is $100, then the value of this futures contract is

$$1600 \times \$100 = \$160{,}000$$

Now that we know how the value of a stock index futures contract is determined, let's see how an investor gains or loses when the futures price changes. Once again, consider the S&P 500 futures contract. Suppose an investor buys (takes a long position in) an S&P 500 futures contract at 1300 and sells it at 1315; the investor realizes a profit of 15 times $250, or $3,750. If the futures contract is sold instead for 1280, the investor will realize a loss of 20 times $250, or $5,000.

Stock index futures contracts are cash settlement contracts. This means that, at the settlement date, cash will be exchanged to settle the contract. For example, if an investor buys an S&P 500 futures contract at 1300 and the settlement index is 1350, settlement would be as follows. The investor has agreed to buy the S&P 500 for 1300 times $250, or $325,000. The S&P 500 value at the settlement date is 1350 times $250, or $337,500. The seller of this futures contract must pay the investor $12,500 ($337,500 − $325,000). Had the index at the settlement date been 1280 instead of 1350, the value of the S&P 500 would be $320,000 (1280 × $250). The investor must pay the seller of the contract $5,000 ($325,000 − $320,000).

Single Stock Futures Contracts

Single stock futures are equity futures in which the underlying is the stock of an individual company. These contracts received approval for trading in the United States in 2001. Single stock futures are traded on two exchanges: OneChicago and Nasdaq Liffe Markets. OneChicago is a joint venture of the Chicago Board Options Exchange, CME Inc., and the CBOT. Nasdaq Liffe Market is a joint venture of the Nasdaq Stock Market and the London International Financial Futures and Options Exchange (an exchange that trades exchange-traded derivatives).

Single stock futures of only actively traded New York Stock Exchange and Nasdaq stocks are traded. The contracts are for 100 shares of the underlying stock. At the settlement date, physical delivery of the stock is required.

Narrow-Based Stock Indexes

Futures exchanges have found that there are investors who want to take long and short positions in the futures market for a group of stocks and do so by paying for only one trade. Hence, only one brokerage commission is paid to trade the group of stocks. These futures contracts are referred to as **narrow-based stock index futures**.

For example, as of August 31, 2006, OneChicago created "OneChicago Select Indexes." These indexes typically consist of the stock of from three to seven companies. The determination of the companies included is based on what large institutional investors who are customers of the exchange have identified as interesting for their trading strategies. The OneChicago Select Index F contains the following components and their initial share lots:

Underlying	Initial Share Lots
Bank of Montreal	400
Bank of Nova Scotia	500
Enbridge Inc Corp.	700
Sun Life Financial	500
Toronto-Dominion Bank	400
TransCanada Corp	700

The unit of trading for these indexes is the notional value of the index divided by 1,000. That is, the market value for each component of the index is multiplied by its number of shares specified in the contract. The sum of the market values of the components is then computed. The total market value is then divided by 1,000.

Interest Rate Futures Markets

In October 1975, the CBOT pioneered trading in a futures contract based on a fixed-income instrument—Government National Mortgage Association certificates. Three months later, the International Monetary Market of the CME began trading futures contracts based on 13-week Treasury bills. Other exchanges soon followed with their own interest rate futures contracts.

Interest rate futures contracts can be classified by the maturity of their underlying security. Short-term interest rate futures contracts have an underlying security that matures in less than one year. The maturity of the underlying security of long-term futures contracts exceeds one year. Examples of the former are the futures contracts in which the underlying is a three-month Treasury bill, three-month London Interbank Offered Rate (LIBOR), and 30-day federal funds. All of these contracts are traded on the CME. Examples of long-term futures are contracts in which the underlying is a Treasury bond and a Treasury note. The more actively traded contracts traded in the United States are described here. Most major financial markets outside the United States have similar futures contracts in which the underlying security is a fixed-income security issued by the central government.

Eurodollar Futures

A Eurodollar futures contract represents a commitment to pay/receive a quarterly interest payment determined by the level of three-month LIBOR. The dollar amount paid is based on a notional principal of $1 million on the settlement date. There are various quarterly

settlement dates for Eurodollar futures contracts available—March, June, September, and December—that extend out 10 years. The Eurodollar futures contracts trade on the CME, as well as the London International Financial Futures Exchange.

The contract is is traded on an index-price basis. The index-price basis in which the contract is quoted is equal to 100 minus the annualized futures LIBOR. For example, a Eurodollar futures price of 94.00 means a futures three-month LIBOR of 6%.

The minimum price fluctuation (tick) for this contract is 0.01 (or 0.0001 in terms of LIBOR). It means that the price value of a basis point for this contract is $25, found as follows. The simple interest on $1 million for 90 days is equal to

$$\$1{,}000{,}000 \times (\text{LIBOR} \times 90/360)$$

If LIBOR changes by one basis point (0.0001), then

$$\$1{,}000{,}000 \times (0.0001 \times 90/360) = \$25$$

The Eurodollar futures contract is a cash settlement contract. That is, the parties settle in cash for the value of the contract based on LIBOR at the settlement date. The Eurodollar futures contract is one of the most heavily traded futures contracts in the world. It is frequently used to trade the short end of the yield curve, and many hedgers have found this contract to be the best hedging vehicle for a wide range of situations.

Treasury Bill Futures

The Treasury bill futures contract, which is traded on the International Monetary Market, is based on a 13-week (three-month) Treasury bill with a face value of $1 million. More specifically, the seller of a Treasury bill futures contract agrees to deliver to the buyer at the settlement date a Treasury bill with 13 weeks remaining to maturity and a face value of $1 million. The Treasury bill that would be delivered by the terms of this contract can be newly issued or seasoned. The futures price is the price at which the Treasury bill will be sold by the short and purchased by the buyer. For example, a nine-month Treasury bill futures contract requires that, nine months from now, the short deliver to the long $1 million face value of a Treasury bill with 13 weeks remaining to maturity. The Treasury bill could be a newly issued 13-week Treasury bill or a Treasury bill that was issued one year prior to the settlement date and that therefore, at the settlement, has only 13 weeks remaining to maturity.

Treasury bills are quoted in the cash market in terms of the annualized yield on a bank discount basis. The Treasury bill futures contract is not quoted directly in terms of yield but, just like the Eurodollar futures contract, is quoted on an index basis that is related to the yield on a bank discount basis as follows:

$$\text{Index price} = 100 - (\text{Yield on a bank discount basis} \times 100)$$

For example, if the yield on a bank discount basis is 8%, then

$$\text{Index price} = 100 - (0.08 \times 100) = 92$$

Federal Funds Futures Contract

Using its three tools of monetary policy—open market operations, reserve requirements, and discount rate—the Federal Reserve influences the demand for, and supply of, balances that banks hold at Federal Reserve banks. By doing so, this alters the federal funds rate, which ultimately influences other short-term and long-term interest rates.

The 30-day federal funds futures contract, traded on the CBOT, is designed for financial institutions and businesses who want to control their exposure to movements in the federal funds rate. These contracts have a notional amount of $5 million, and the contract can be written for the current month up to 24 months in the future. Underlying this contract is the simple average overnight federal funds rate (i.e., the effective rate) for the delivery month. As such, this contract is settled in cash on the last business day of the month. Just like the other short-term interest rate futures contracts discussed above, prices are quoted on the basis of 100 minus the overnight federal funds rate for the delivery month. These contracts are marked to market using the effective daily federal funds rate as reported by the Federal Reserve Bank of New York.

Treasury Bond Futures

The underlying for a Treasury bond futures contract is $100,000 par value of a hypothetical 20-year, 6% coupon bond. While prices and yields of the Treasury bond futures contract are quoted in terms of this hypothetical Treasury bond, the seller of the futures contract has the choice of several actual Treasury bonds that are acceptable to deliver. The CBOT (where the contract is traded) allows the seller to deliver any Treasury bond that has at least 15 years to maturity from the date of delivery if it is not callable; in the case of callable bonds, the issue must not be callable for at least 15 years from the first day of the delivery month. Settling a contract calls for an acceptable bond to be delivered. That is, the contract is not a cash settlement contract.

The delivery process for the Treasury bond futures contract makes the contract interesting. At the settlement date, the seller of a futures contract (the short) is required to deliver to the buyer (the long) $100,000 par value of a 6%, 20-year Treasury bond. Since no such bond exists, the seller must choose from the list of acceptable, deliverable bonds that the exchange has specified. But this choice raises a problem. Suppose the seller is entitled to deliver $100,000 of a 4%, 20-year Treasury bond to settle the futures contract. The value of this bond, of course, is less than the value of a 6%, 20-year bond. If the seller delivers the 4%, 20-year, this would be unfair to the buyer of the futures contract who contracted to receive $100,000 of a 6%, 20-year Treasury bond. Alternatively, suppose the seller delivers $100,000 of a 10%, 20-year Treasury bond. The value of a 10%, 20-year Treasury bond is greater than that of a 6%, 20-year bond, so this would be a disadvantage to the seller.

How can this problem be resolved? To make delivery equitable to both parties, and to tie cash prices to futures prices, the CBOT has introduced **conversion factors** for determining the invoice price of each acceptable deliverable Treasury issue against the Treasury bond futures contract. The conversion factor is determined by the CBOT before a contract with a specific settlement date begins trading. The conversion factor is based on the price that a deliverable bond would sell for, at the beginning of the delivery month, if it were to yield 6%. The conversion factor is constant throughout the trading period of the futures contract. The short must notify the long, one day before the delivery date, of the actual bond that will be delivered.

The invoice price paid by the buyer of the Treasury bonds that the seller delivers is determined using the formula:

Invoice price = Contract size × Future contract settlement price × Conversion factor

Suppose the Treasury bond futures contract settles at 96 (0.96 in decimal form) and that the short elects to deliver a Treasury bond issue with a conversion factor of 1.15. As the contract size is $100,000, the invoice price is

$$\$100{,}000 \times 0.96 \times 1.15 = \$110{,}400$$

The invoice price in the formula is just for the principal. The buyer of the futures contract must also pay the seller accrued interest on the bond delivered.

In selecting the issue to be delivered, the short will select from all the deliverable issues the bond that is cheapest to deliver. This issue is referred to as the **cheapest-to-deliver issue** and is found by determining the issue that will produce the largest rate of return in a cash-and-carry trade. That is, for each deliverable issue the rate of return is calculated by assuming the issue is purchased and held to the futures delivery date. The rate of return calculated is called the **implied repo rate**. The cheapest-to-deliver issue is the one that offers the largest implied repo rate from among all the deliverable issues. This issue may change over the life of the contract. The cheapest-to-deliver issue plays a key role in the pricing of this futures contract.

In addition to the option of which acceptable Treasury issue to deliver—sometimes referred to as the **quality (or swap) option**—the short position has two more options granted under CBOT delivery guidelines. First, the short position is permitted to decide when in the delivery month actually to make the delivery. This is called the **timing option**. The second option is the right of the short position to give notice of intent to deliver up to 8:00 P.M. Chicago time after the closing of the exchange (3:15 P.M. Chicago time) on the date when the futures settlement price has been fixed. This option is referred to as the **wild card option**. The quality option, the timing option, and the wild card option (in sum, referred to as the *delivery options*) mean that the long position can never be sure which Treasury bond will be delivered or when it will be delivered.

Treasury Note Futures

There are three Treasury note futures contracts: 10-year, five-year, and two-year. All three contracts are modeled after the Treasury bond futures contract and are traded on the CBOT. The underlying instrument for the 10-year Treasury note futures contract is $100,000 par value of a hypothetical 6%, 10-year Treasury note. There are several acceptable Treasury issues that may be delivered by the short. An issue is acceptable if the maturity is not less than 6.5 years and not greater than 10 years from the first day of the delivery month. The delivery options granted to the short position and the minimum price fluctuation are the same as for the Treasury bond futures contract.

For the five-year Treasury note futures contract, the underlying is $100,000 par value of a 6% notional coupon U.S. Treasury note that satisfies the following conditions: (1) an original maturity of not more than five years and three months, (2) a remaining maturity no greater than five years and three months, and (3) a remaining maturity not less than four years and two months.

The underlying for the two-year Treasury note futures contract is $200,000 par value of 6% notional coupon U.S. Treasury note with a remaining maturity of not more than two years and not less than one year and nine months. Moreover, the *original maturity* of the note delivered to satisfy the two-year futures cannot be more than five years and three months.

Key Points That You Should Understand Before Proceeding

1. Equity futures contracts listed in the United States include stock index futures contracts, single stock futures contracts, and narrow-based stock index futures contracts.
2. Stock index futures contracts are cash settlement contracts whose underlying is a common stock index, and the dollar value of a stock index futures contract is the product of the futures price and the contract's multiple.
3. An interest rate futures contract is one whose underlying asset is a fixed-income instrument or an interest rate.
4. The listed interest rate futures contracts traded in the United States are the Eurodollar futures contract, the Treasury bill futures contract, the 30-day federal funds futures contract, and the Treasury bond and note futures contracts.
5. The Treasury bond and note futures contracts are unique in that the short is granted options as to which issue to deliver and, during the delivery month, when to deliver.

THE GENERAL ACCOUNTING OFFICE STUDY ON FINANCIAL DERIVATIVES

We have just explored our first derivative instrument. Some of these products are exchange traded, such as the futures contracts we discussed in this chapter. Other products are created by commercial banks and investment banking firms. These customized derivative products are called *over-the-counter* or *OTC derivatives*. Forward contracts are an example of an OTC derivative product. Swaps are another example of an OTC derivative. There are also OTC options.

There is public concern that commercial banks are creating OTC derivative products that put them in a position that could result in severe financial problems. Because it is the larger commercial banks that are creating OTC derivatives, this could have a rippling effect on the U.S. financial system. (One type of derivative, credit derivatives, did in fact have this effect.) Specifically, there is concern that banks creating OTC derivative products do not have the proper risk-management systems in place to effectively monitor their risk exposure. For example, a July 1993 report by a highly influential bank group—the Group of Thirty—recommended how to improve bank risk-management systems. However, the recommendations did not appear to be uniformly adopted since they did not carry the force of law. Moreover, end-users of derivatives—financial institutions and businesses—may not have the requisite skills and risk-management systems to use derivatives or might be using them for speculative purposes rather than controlling financial risk.

In May 1994, the General Accounting Office (GAO) prepared a report on *Financial Derivatives: Actions Needed to Protect the Financial System*. The study recognized the importance of derivatives for market participants. Page 6 of the report states:

> Derivatives serve an important function of the global financial marketplace, providing end-users with opportunities to better manage financial risks associated

> with their business transactions. The rapid growth and increasing complexity of derivatives reflect both the increased demand from end-users for better ways to manage their financial risks and the innovative capacity of the financial services industry to respond to market demands.

Despite the importance of derivatives, the study goes on to state:

> However, Congress, federal regulators, and some members of the industry are concerned about these products and the risk they may pose to the financial system, individual firms, investors, and U.S. taxpayers. These concerns have been heightened by recent reports of substantial losses by some derivative end-users.

The GAO study was undertaken because of these concerns. The cover letter to the GAO report stated that the objectives of the report were to determine

> (1) what the extent and nature of derivatives use was, (2) what risks derivatives might pose to individual firms and to the financial system, (3) whether gaps and inconsistencies existed in U.S. regulation of derivatives, (4) whether existing accounting rules resulted in financial reports that provided market participants and investors with adequate information about firms' use of derivatives, and (5) what the implications of the international use of derivatives were for U.S. regulations.

Here are some of the principal conclusions of the study. First, boards of directors and senior management have primary responsibility for managing derivative risks and, therefore, should have the necessary internal controls in place to carry out this responsibility. Moreover, regulations should provide a legal framework that would require OTC derivative product dealers to comply with a common set of basic standards to effectively manage risk.

Second, financial reporting requirements for derivative instruments are inadequate and the Financial Accounting Standards Board should implement comprehensive accounting rules for derivative products. Third, improving regulations for derivatives in the United States without coordinating with foreign regulators will reduce the effectiveness of the regulations. Finally, policymakers and regulators should not stifle the use of derivatives. Rather, a proper balance should be struck between allowing the financial services to be innovative in creating products useful to end-users and protecting the safety and soundness of the financial system.

SUMMARY

The traditional purpose of futures markets is to provide an important opportunity to hedge against the risk of adverse future price movements. Futures contracts are creations of exchanges, which require initial margin from parties. Each day positions are marked to market. Additional (variation) margin is required if the equity in the position falls below the maintenance margin. The clearinghouse guarantees that the parties to futures contracts will satisfy their obligations.

A buyer (seller) of a futures contract realizes a profit if the futures price increases (decreases). The buyer (seller) of a futures contract realizes a loss if the futures price decreases (increases). Because only initial margin is required when an investor takes a futures position, futures markets provide investors with substantial leverage for the money invested.

A forward contract differs in several important ways from a futures contract. In contrast to a futures contract, the parties to a forward contract are exposed to the risk that the other party to the contract will fail to perform. The positions of the parties are not marked to market, so there are no interim cash flows associated with a forward contract. Finally, unwinding a position in a forward contract may be difficult.

Investors can use the futures market or the cash market to react to economic news that is expected to change the value of an asset. Well-functioning futures markets are typically the market of choice for altering asset positions and, therefore, represent the price discovery market because of the lower transactions costs involved and the greater speed with which orders can be executed. The actions of arbitrageurs assure that price discovery in the futures markets will be transmitted to the cash market.

Critics of futures markets believe that these contracts are the source of greater price volatility in the cash market for the underlying asset. Although this is an empirical question not fully discussed here, even if price volatility in the cash market were greater because of the introduction of futures markets, this does not necessarily mean that greater volatility is bad for the economy.

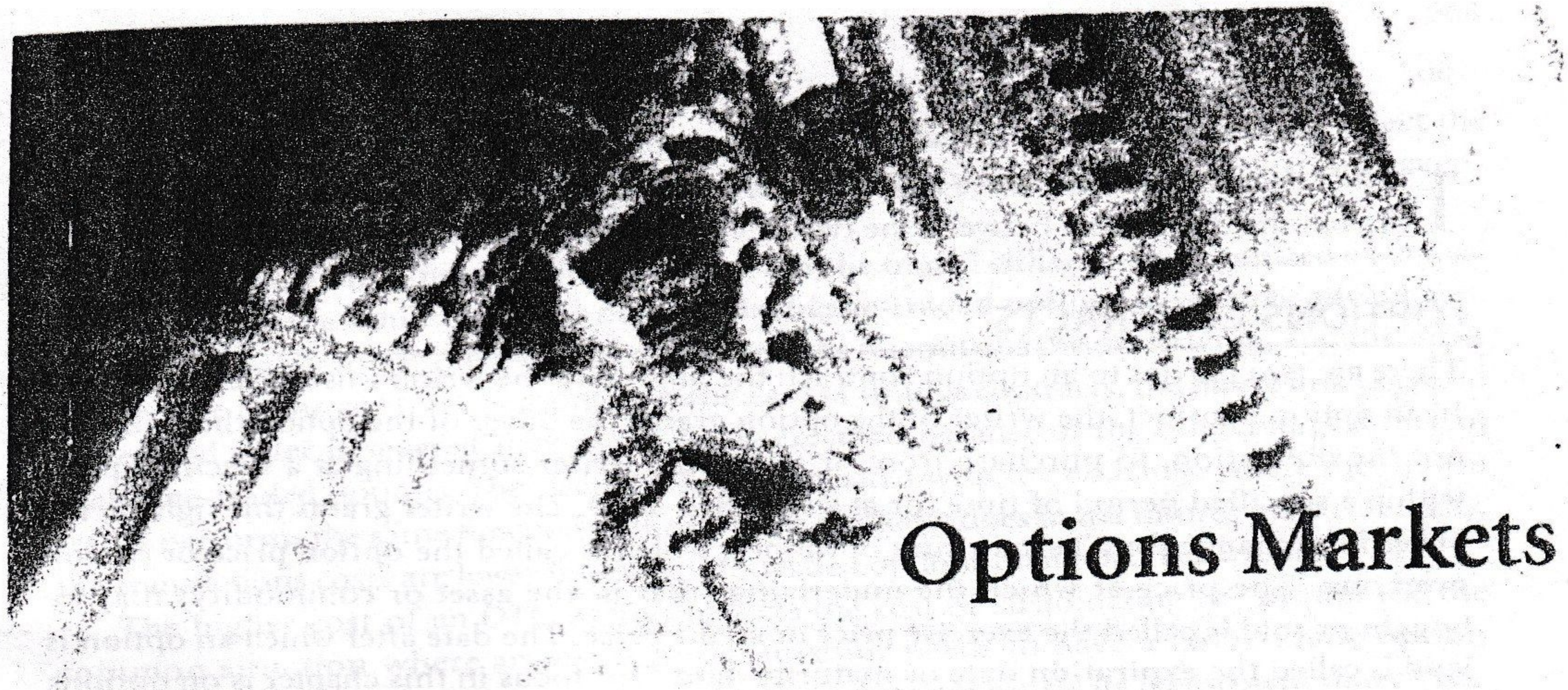
The financial futures contracts traded in the United States include stock index futures contracts (with the most actively traded contract being the S&P 500 futures contract), single stock futures contracts, narrow-based stock index futures, short-term interest rate futures contracts (Eurodollar futures, Treasury bill futures, and 30-day federal funds futures contracts), and Treasury bond and note futures.

The GAO study addresses the concerns of Congress and regulators regarding derivative products. There is concern that major banks and end-users do not have adequate risk-management systems in place. Inadequate accounting disclosure and the lack of coordination with foreign regulators were other concerns highlighted by the study.

- Cash settlement contract
- Cheapest-to-deliver issue
- Clearinghouse
- Conversion factors
- Daily price limit
- Equity
- Forward contract
- Futures contract
- Futures price
- Implied repo rate
- Initial margin
- Long position (long futures)
- Maintenance margin
- Most distant (deferred) futures contract
- Narrow-based stock index future
- Nearby futures contract
- Open interest
- Quality (swap) option
- Settlement date (delivery date)
- Settlement price
- Short position (short futures)
- Single stock futures
- Stock index futures contract
- Timing option
- Underlying
- Variation margin
- Wild card option

QUESTIONS

1. The Chief Financial Officer of the corporation you work for recently told you that he had a strong preference to use forward contracts rather than futures contracts to hedge: "You can get contracts tailor-made to suit your needs." Comment on the Chief Financial Officer's statement. What other factors influence the decision to use futures or forward contracts?
2. Explain the functions of a clearinghouse associated with a futures exchange.
3. Suppose you bought a stock index futures contract for 200 and were required to put up initial margin of $10,000. The value of the contract is 200 times the $500 multiple, or $100,000. On the next three days, the contract's settlement price was at these levels: day 1, 205; day 2, 197; day 3, 190.
   a. Calculate the value of your margin account on each day.
   b. If the maintenance margin for the contract is $7,000, how much variation margin did the exchange require you to put up at the end of the third day?
   c. If you had failed to put up that much, what would the exchange have done?
4. How do margin requirements in the futures market differ from margin requirements in the cash market?
5. "The futures market is where price discovery takes place." Do you agree with this statement? If so, why? If not, why not?
6. a. What is meant by a cash settlement futures contract?
   b. Identify at least three futures contracts traded in the United States that are cash settlement contracts.
7. a. What is meant by open interest?
   b. Why is open interest important to an investor?
8. What may be an alternative for an investor who wants to short the stock of a particular company instead of shorting in the cash market?
9. a. What was the motivation for the creation of a narrow-based stock index futures contract?
   b. How are the component stocks of a narrow-based stock index futures contract selected?
10. a. In a Treasury bond futures contract, there are choices or options granted to one of the parties to the contract. Which party has these choices, the buyer or seller?
    b. What are the options that are granted to the party?
11. On September 1, you sold 100 S&P 500 futures contracts at 1000 with multiples of $250, expiration date in three months, and an initial margin of 10%. After that date, the index fell steadily and you were not required to post any additional margin, but you also did not withdraw any of the cash profits you were earning. On November 1, the futures price of the contract was 900, and you reversed your position by buying 100 contracts.
    a. How much money did you make (ignoring taxes and commissions)?
    b. What was the rate of return on your invested funds?
    c. In those two months, the S&P 500 futures price fell 10%. Explain why your rate of return is so much higher than this level.
12. What is meant by an OTC derivative product?
13. What is the major concern with banks creating OTC derivative products?



Options Markets

LEARNING OBJECTIVES

After reading this chapter, you will understand

- what an option contract is, and the basic features of an option
- the difference between a call option and a put option
- why an option is a derivative instrument
- the different types of exercise styles for an option (American, European, Bermuda)
- the difference between an exchange-traded option and an over-the-counter option
- the difference between a futures contract and an option contract
- the risk/return characteristics of call and put options, to both the seller and the buyer of the options
- the hedging role of options in financial markets
- the extensive role that organized exchanges play in standardizing and guaranteeing option contracts traded on exchanges
- how stock options can change the risk/return profile of a portfolio
- the basic features of stock index options
- the basic features of interest rate options
- what an exotic option is
- some key aspects of non–U.S. options markets
- the basic features of options on futures or futures options

From Chapter 27 of *Foundations of Financial Markets and Institutions*, 4/e. Frank J. Fabozzi. Franco Modigliani. Frank J. Jones.
Copyright © 2010 by Pearson Prentice Hall. All rights reserved.

B. Fabozzi 4th-38(B)

In this chapter, we introduce a second derivative contract, an options contract, and we discuss the differences between the two.

OPTIONS CONTRACTS

There are two parties to an option contract: the *buyer* and the writer (also called the *seller*). In an option contract, the writer of the option grants the buyer of the option the right, but not the obligation, to purchase from or sell to the writer something at a specified price within a specified period of time (or at a specified date). The writer grants this right to the buyer in exchange for a certain sum of money, which is called the **option price** or **option premium**. The price at which the underlying (that is, the asset or commodity) may be bought or sold is called the **exercise price** or **strike price**. The date after which an option is void is called the **expiration date** or **maturity date**. Our focus in this chapter is on options where the underlying is a financial instrument or financial index.

When an option grants the buyer the right to purchase the underlying from the writer (seller), it is referred to as a **call option**, or simply, a **call**. When the option buyer has the right to sell the underlying to the writer, the option is called a **put option**, or simply, a **put**.

The timing of the possible exercise of an option is an important characteristic of the contract. This feature of an option is referred to as its **exercise style**. There are options that may be exercised at any time up to and including the expiration date. Such options are referred to as **American options**. Other options may be exercised only at the expiration date; these are called **European options**. A **Bermuda option**, also referred to as an **Atlantic option**, can be exercised only on specified dates.

Let's use an illustration to demonstrate the fundamental option contract. Suppose that Jack buys a call option for $3 (the option price) with the following terms:

1. The underlying is one unit of Asset XYZ.
2. The exercise price is $100.
3. The expiration date is three months from now, and the option can be exercised any time up to and including the expiration date (that is, it is an American option).

At any time up to and including the expiration date, Jack can decide to buy from the writer (seller) of this option one unit of Asset XYZ, for which he will pay a price of $100. If it is not beneficial for Jack to exercise the option, he will not, and we'll explain shortly how he decides whether or not it will be beneficial. Whether Jack exercises the option or not, the $3 he paid for the option will be kept by the option writer. If Jack buys a put option rather than a call option, then he would be able to sell Asset XYZ to the option writer for a price of $100.

The maximum amount that an option buyer can lose is the option price. The maximum profit that the option writer (seller) can realize is the option price. The option buyer has substantial upside return potential, while the option writer has substantial downside risk. We will investigate the risk/reward relationship for option positions later in this chapter.

There are no margin requirements for the buyer of an option once the option price has been paid in full. Because the option price is the maximum amount that the investor can lose, no matter how adverse the price movement of the underlying, no margin is needed. Because the writer (seller) of an option has agreed to accept all of the risk (and none of the reward) of the position in the underlying, the writer is generally required to put up the

option price received as margin. In addition, as price changes occur that adversely affect the writer's position, the writer is required to deposit additional margin (with some exceptions) as the position is marked to market.

Options, like other financial instruments, may be traded either on an organized exchange or in the over-the-counter (OTC) market. **Exchange-traded options** have three advantages. The first is standardization of the exercise price, the quantity of the underlying, and the expiration date of the contract. Second, as in the case of futures contracts, the direct link between buyer and seller is severed after the order is executed because of the interchangeability of exchange-traded options. The clearinghouse associated with the exchange where the option trades performs the same function in the options market it does in the futures market. Finally, the transactions costs are lower for exchange-traded options than for OTC options.

The higher cost of an OTC option reflects the cost of customizing the option for the common situation where an institutional investor needs to have a tailor-made option because the standardized exchange-traded option does not satisfy its investment objectives. Investment banking firms and commercial banks act as principals as well as brokers in the OTC options market. Most institutional investors are not concerned that an OTC option is less liquid than an exchange-traded option because they use OTC options as part of an asset/liability strategy in which they intend to hold them to expiration.

Key Points That You Should Understand Before Proceeding

1. An option is a contract in which the writer of the option grants the buyer the right, but not the obligation, to purchase from or sell to the writer something at the exercise (or strike) price within a specified period of time (until the expiration date).
2. The price paid by the option buyer is called the option price or option premium.
3. A call option grants the option buyer the right to buy something from the option writer, and a put option grants the option buyer the right to sell something to the option writer.
4. The maximum amount that an option buyer can lose is the option price, while the maximum profit that the option writer can realize is the option price; the option buyer has substantial upside return potential, while the option writer has substantial downside risk.
5. The option contract will specify the exercise style (American, European, Bermuda).
6. Options may be traded either on an organized exchange or in the OTC market.

DIFFERENCES BETWEEN OPTIONS AND FUTURES CONTRACTS

One distinction between futures and options contracts is that one party to an option contract is not obligated to transact at a later date. Specifically, the option buyer has the right but not the obligation to exercise the option. The option writer (seller), though, does have the obligation to perform, if the buyer of the option insists on exercising it. In the case of a futures contract, both buyer and seller are obligated to perform. Of course, a futures buyer does not pay the seller to accept the obligation, while an option buyer pays the seller an option price.

Consequently, the risk/reward characteristics of the two contracts are also different. In the case of a futures contract, the buyer of the contract realizes a dollar-for-dollar gain

when the price of the futures contract increases, and suffers a dollar-for-dollar loss when the price of the futures contract drops. The opposite occurs for the seller of a futures contract. Options do not provide this symmetric risk/reward relationship. The most that the buyer of an option can lose is the option price. While the buyer of an option retains all the potential benefits the gain is always reduced by the amount of the option price. The maximum profit that the writer (seller) may realize is the option price; this is offset against substantial downside risk. This difference between options and futures is extremely important because, as we shall see in subsequent chapters, investors can use futures to protect against symmetric risk and options to protect against asymmetric risk.

We will return to the difference between options and futures later in this chapter when we discuss the application of these derivative contracts for hedging purposes.

Key Points That You Should Understand Before Proceeding

1. Unlike a futures contract, only one party to an option contract is obligated to transact at a later date: the option writer.
2. Futures have a symmetric risk/reward relationship, while options do not because the buyer of an option retains all the potential benefits, but the gain is always reduced by the amount of the option price.

RISK AND RETURN CHARACTERISTICS OF OPTIONS

Here, we illustrate the risk and return characteristics of the four basic option positions: buying a call option (which market participants refer to as being **long a call option**), selling a call option (**short a call option**), buying a put option (**long a put option**), and selling a put option (**short a put option**). The illustrations assume that each option position is held to the expiration date and not exercised early. Also, to simplify the illustrations, we ignore transactions costs.

Buying Call Options

Assume that there is a call option on Asset XYZ that expires in one month and has a strike price of $100. The option price is $3. Suppose that the current price of Asset XYZ is $100. What is the profit or loss for the investor who purchases this call option and holds it to the expiration date?

The profit and loss from the strategy will depend on the price of Asset XYZ at the expiration date. A number of outcomes are possible.

1. If Asset XYZ's price at the expiration date is less than $100, the investor will not exercise the option. It would be foolish to pay the option writer $100 when Asset XYZ can be purchased in the market at a lower price. In this case, the option buyer loses the entire, original option price of $3. Notice, however, that this is the maximum loss that the option buyer will realize regardless of how low Asset XYZ's price declines.
2. If Asset XYZ's price is equal to $100 at the expiration date, again, there is no economic value in exercising the option. As in the case where the price is less than $100, the buyer of the call option will lose the entire option price, $3.
3. If Asset XYZ's price is more than $100 but less than $103 at the expiration date, the option buyer will exercise the option. By exercising, the option buyer can purchase

Asset XYZ for $100 (the strike price) and sell it in the market for the higher price. Suppose, for example, that Asset XYZ's price is $102 at the expiration date. The buyer of the call option will realize a $2 gain by exercising the option. Of course, the cost of purchasing the call option was $3, so $1 is lost on this position. By failing to exercise the option, the investor loses $3 instead of only $1.

4. If Asset XYZ's price is equal to $103 at the expiration date, the investor will exercise the option. In this case, the investor breaks even, realizing a gain of $3 that offsets the cost of the option, $3.
5. If Asset XYZ's price is more than $103 at the expiration date, the investor will exercise the option and realize a profit. For example, if the price is $113, exercising the option will generate a profit on Asset XYZ of $13. Reducing this gain by the cost of the option ($3), the investor will realize a net profit of $10 from this position.

Table 1 shows the profit and loss for the buyer of the hypothetical call option in tabular form, whereas Figure 1 graphically portrays the result. While the break-even point and the size of the loss depend on the option price and the strike price, the profile shown in

Table 1 Profit/Loss Profile for a Long Call Position

Assumptions:
Option price = $3
Strike price = $100
Time to expiration = 1 month

Price of Asset XYZ at Expiration Date	Net Profit/Loss*	Price of Asset XYZ at Expiration Date	Net Profit/Loss*
$150	$47	100	−3
140	37	99	−3
130	27	98	−3
120	17	97	−3
115	12	96	−3
114	11	95	−3
113	10	94	−3
112	9	93	−3
111	8	92	−3
110	7	91	−3
109	6	90	−3
108	5	89	−3
107	4	88	−3
106	3	87	−3
105	2	86	−3
104	1	85	−3
103	0	80	−3
102	−1	70	−3
101	−2	60	−3

* Price at expiration − $100 − $3.
Maximum loss = $3.

Figure 1 Profit/Loss Profile for a Long Call Position

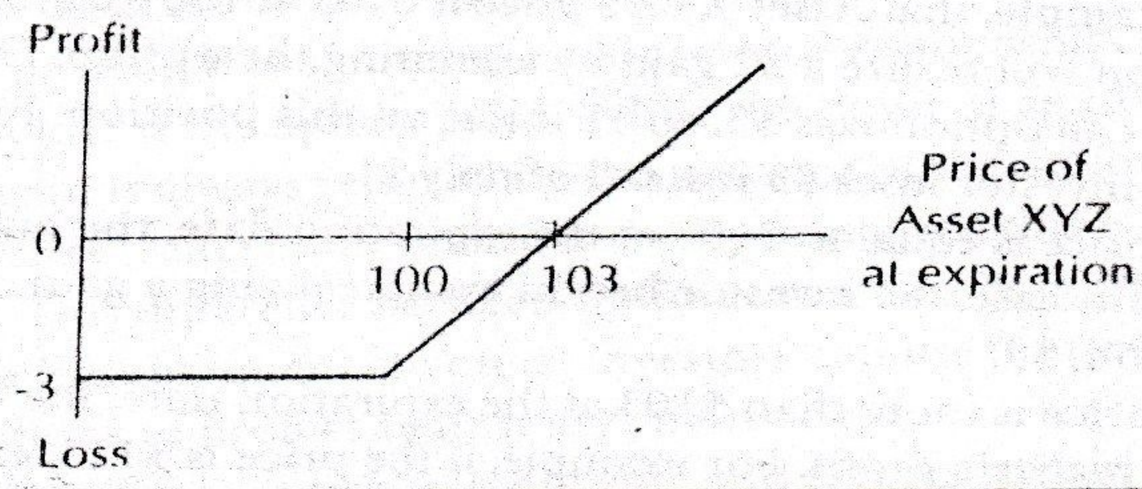


Figure 1 will hold for all buyers of call options. The shape indicates that the maximum loss is the option price and that there is substantial upside potential.

It is worthwhile to compare the profit and loss profile of the call option buyer to that of someone taking a long position in one unit of Asset XYZ. The payoff from the position depends on Asset XYZ's price at the expiration date. Consider again the five price outcomes given above (and again ignore transactions costs):

1. If Asset XYZ's price at the expiration date is less than $100, the investor in the call option loses the entire option price of $3. In contrast, a long position in Asset XYZ will have one of three possible losses:
   a. If Asset XYZ's price is less than $100 but greater than $97, the loss on the long position in Asset XYZ will be less than $3.
   b. If Asset XYZ's price is $97, the loss on the long position in Asset XYZ will be $3.
   c. If Asset XYZ's price is less than $97, the loss on the long position in Asset XYZ will be greater than $3. For example, if the price at the expiration date is $80, the long position in Asset XYZ will result in a loss of $20.
2. If Asset XYZ's price is equal to $100, the buyer of the call option will realize a loss of $3 (option price). Similarly, there will be no gain or loss on the long position in Asset XYZ.
3. If Asset XYZ's price is more than $100 but less than $103, the option buyer will realize a loss of less than $3, while the long position in Asset XYZ will realize a profit.
4. If the price of Asset XYZ at the expiration date is equal to $103, there will be no loss or gain from buying the call option. The long position in Asset XYZ, however, will produce a gain of $3.
5. If Asset XYZ's price at the expiration date is greater than $103, both the call option buyer and the long position in Asset XYZ will post a profit. However, the profit for the buyer of the call option will be $3 less than that for the long position. For example, if Asset XYZ's price is $113, the profit from the call position is $10, while the profit from the long position in Asset XYZ is $13.

Table 2 compares the long call strategy and the long position in Asset XYZ. This comparison clearly demonstrates the way in which an option can change the risk/return profile for investors. An investor who takes a long position in Asset XYZ realizes a profit of $1 for every $1 increases in Asset XYZ's price. As Asset XYZ's price falls, however, the investor loses dollar-for-dollar. If the price drops by more than $3, the long position in Asset XYZ results in a loss of more than $3. The long call strategy, in contrast, limits the loss to only the option price of $3 but retains the upside potential, which will be $3 less than for the long position in Asset XYZ.

Table 2 Comparison of Long Call Position and Long Asset Position

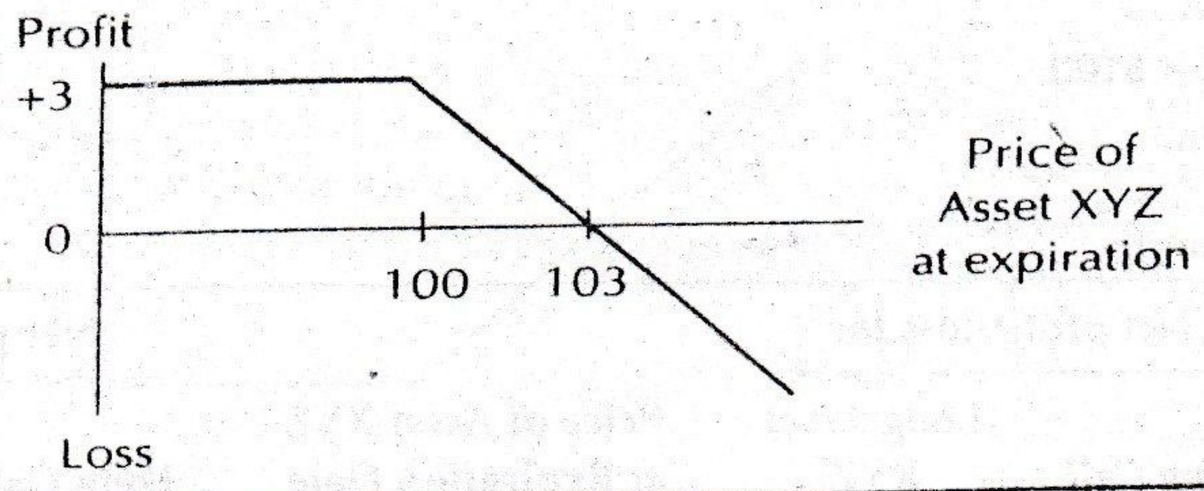
Assumptions:
Initial price of Asset XYZ = $100
Option price = $3
Strike price = $100
Time to expiration = 1 month

Price of Asset XYZ at Expiration Date	Net profit/loss for Long Call	Net profit/loss for Long Asset XYZ	Price of Asset XYZ at Expiration Date	Net profit/loss for Long Call	Net profit/loss for Long Asset XYZ
$150	$47	$50	100	−3	0
140	37	40	99	−3	−1
130	27	30	98	−3	−2
120	17	20	97	−3	−3
115	12	15	96	−3	−4
114	11	14	95	−3	−5
113	10	13	94	−3	−6
112	9	12	93	−3	−7
111	8	11	92	−3	−8
110	7	10	91	−3	−9
109	6	9	90	−3	−10
108	5	8	89	−3	−11
107	4	7	88	−3	−12
106	3	6	87	−3	−13
105	2	5	86	−3	−14
104	1	4	85	−3	−15
103	0	3	80	−3	−20
102	−1	2	70	−3	−30
101	−2	1	60	−3	−40

Which alternative is better, buying the call option or buying the asset? The answer depends on what the investor is attempting to achieve.

This hypothetical example demonstrates another important feature of options: their speculative appeal. Suppose an investor has strong expectations that Asset XYZ's price will rise in one month. At an option price of $3, the speculator can purchase 33.33 call options for each $100 invested. If Asset XYZ's price rises, the investor realizes the price appreciation associated with 33.33 units of Asset XYZ, while with the same $100, the investor could have bought only one unit of Asset XYZ selling at $100, realizing the appreciation associated with only one unit if Asset XYZ's price increases. For example, suppose that in one month

Figure 2 Profit/Loss Profile for a Short Call Position



the price of Asset XYZ rises to $120. The long call position will result in a profit of $566.50 [($20 × 33.33) − $100] or a return of 566.5% on the $100 investment in the call option. By comparison, a $100 investment in the long position in Asset XYZ results in a profit of $20, for only a 20% return on $100.

It is this greater leverage that attracts investors to options when they wish to speculate on price movements. There are some drawbacks of leverage, however. Suppose that Asset XYZ's price is unchanged at $100 at the expiration date. The long call position (33.33 options) results, in this case, in a loss of the entire investment of $100, while the long position in Asset XYZ produces neither a gain nor a loss.

Writing (Selling) Call Options

To illustrate the option seller's (writer's) position, we use the same call option as in the example of buying a call option. The profit and loss profile of the short call position (that is, the position of the call option writer) is the mirror image of the profit and loss profile of the long call position (the position of the call option buyer). Consequently, the profit of the short call position for any given price of Asset XYZ at the expiration date is the same as the loss of the long call position. Furthermore, the maximum profit that the short call position can produce is the option price. The maximum loss is not limited because it is the highest price reached by Asset XYZ on or before the expiration date, less the option price; this price can be indefinitely high. These relationships can be seen in Figure 2, which shows the profit/loss profile for a short call position.

Buying Put Options

To illustrate the position of the buyer of a put option, we assume a hypothetical put option on one unit of Asset XYZ with one month to maturity and a strike price of $100. Assume the put option is selling for $2 and that the current price of Asset XYZ is $100. The profit or loss for this position at the expiration date depends on the market price of Asset XYZ. The possible outcomes are:

1. If Asset XYZ's price is greater than $100, the buyer of the put option will not exercise it because exercising would mean selling Asset XYZ to the writer for a price that is less than the market price. In this case, a loss of $2 (the original price of the option) will result from buying the put option. Once again, the option price represents the maximum loss to which the buyer of the put option is exposed.
2. If Asset XYZ's price at expiration is equal to $100, the put will not be exercised, leaving the put buyer with a loss equal to the option price of $2.

3. If Asset XYZ's price is less than $100 but greater than $98, the option buyer will experience a net loss on the position; exercising the put option, however, limits the loss to less than the option price of $2. For example, suppose that the price is $99 at the expiration date. By exercising the option, the option buyer will realize a loss of only $1. This is because the buyer of the put option can sell Asset XYZ, purchased in the market for $99, to the writer for $100, realizing a gain of $1. Deducting the $2 cost of the option results in a net loss of $1 to the position.
4. If Asset XYZ's price is $98 at the expiration date, the put buyer will break even. The investor will realize a gain of $2 by selling Asset XYZ to the writer of the option for $100, and this gain exactly offsets the cost of the option ($2).
5. If Asset XYZ's price is below $98 at the expiration date, the long put position (the put buyer) will realize a profit. For example, suppose the price falls at expiration to $80. The long put position will produce a profit of $18: a gain of $20 for exercising the put option less the $2 option price.

The profit and loss profile for the long put position is shown in tabular form in the second column of Table 3 and in graphical form in Figure 3. As with all long option positions, the loss is limited to the option price. The profit potential, however, is

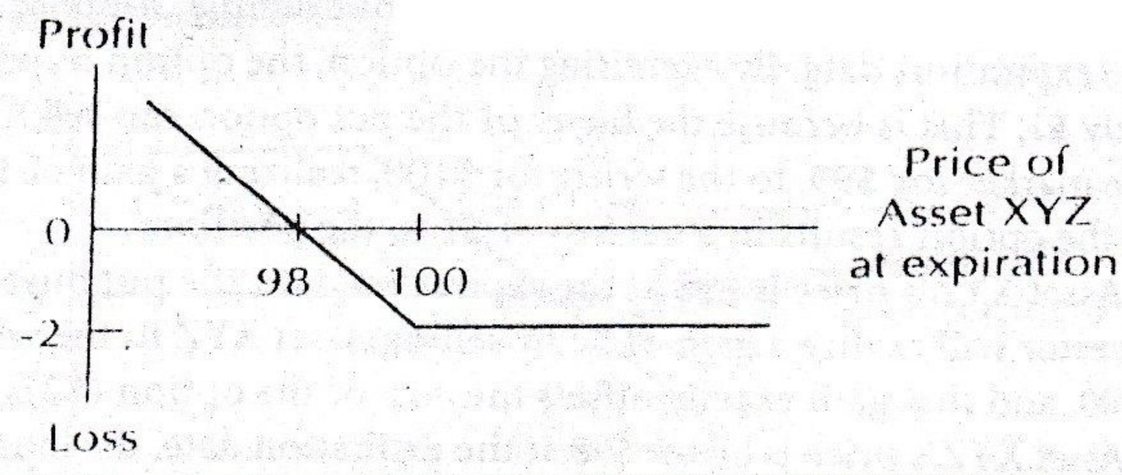
Table 3 Profit/Loss Profiles for a Long Put Position in Comparison to a Short Asset Position

Assumptions:
Initial price of Asset XYZ = $100
Option price = $2
Strike price = $100
Time to expiration = 1 month

Price of Asset XYZ at Expiration Date	Net profit/loss for Long Put*	Net profit/loss for Short Asset XYZ**
$150	−$2	−$50
140	−2	−40
130	−2	−30
120	−2	−20
115	−2	−15
110	−2	−10
105	−2	−5
100	−2	0
99	−1	1
98	0	2
97	1	3
96	2	4
95	3	5
94	4	6
93	5	7
92	6	8
91	7	9
90	8	10
89	9	11
88	10	12
87	11	13
86	12	14
85	13	15
84	14	16
83	15	17
82	16	18
81	17	19
80	18	20
75	23	25
70	28	30
65	33	35
60	38	40

* $100 − Price at expiration.
Maximum loss = $2.
** $100 − Price of Asset XYZ.

Figure 3 Profit/Loss Profile for a



substantial: the theoretical maximum profit is generated if Asset XYZ's price falls to zero. Contrast this profit potential with that of the buyer of a call option. The theoretical maximum profit for a call buyer cannot be determined beforehand, because it depends on the highest price that can be reached by Asset XYZ before or at the option expiration date, a price that is indeterminate.

To see how an option alters the risk/return profile for an investor, we again compare it to a position in Asset XYZ. The long put position is compared to taking a short position in Asset XYZ because this is the position that would realize a profit if the price of the asset falls. Suppose an investor sells Asset XYZ short for $100. The short position in Asset XYZ would produce the following profit or loss compared with the long put position (without considering transactions costs):

1. If Asset XYZ's price rises above $100, the long put option results in a loss of $2, but the short position in Asset XYZ realizes one of the following:
   a. If the price of Asset XYZ is less than $102, there will be a loss of less than $2, which is the loss to the long put position.
   b. If the price of Asset XYZ is equal to $102, the loss will be $2, the same as the maximum loss of the long put position.
   c. If the price of Asset XYZ is greater than $102, the loss will be greater than $2. For example, if the price is $125, the short position will realize a loss of $25, because the short seller must now pay $125 for Asset XYZ that he sold short at $100.
2. If Asset XYZ's price at expiration is equal to $100, the long put position will realize a $2 loss, while there will be no profit or loss on the short position in Asset XYZ.
3. If Asset XYZ's price is less than $100 but greater than $98, the long put position will experience a loss of less than $2, but the short position will realize a profit. For example, a price of $99 at the expiration date will result in a loss of $1 for the long put position but a profit of $1 for the short position.
4. If Asset XYZ's price is $98 at the expiration date, the long put position will break even, but the short position in Asset XYZ will generate a $2 profit.
5. If Asset XYZ's price is below $98, both positions will generate a profit; however, the profit for the long put position will always be $2 less than the profit for the short position.

Table 3 presents a detailed account of this comparison of the profit and loss profiles for the long put position and short position in Asset XYZ. While the investor who takes a short position in Asset XYZ faces all the downside risk as well as the upside potential, the long put position limits the downside risk to the option price while still maintaining upside potential (reduced only by an amount equal to the option price).

Writing (Selling) Put Options

The profit and loss profile for a short put option is the mirror image of the long put option. The maximum profit from this position is the option price. The theoretical maximum loss can be substantial should the price of the underlying asset fall; at the outside, if the price were to fall all the way to zero, the loss would be as large as the strike price less the option price. Figure 4 graphically depicts this profit and loss profile.

To summarize these illustrations of the four option positions, we can say the following: Buying calls or selling puts allows the investor to gain if the price of the underlying asset rises; and selling calls and buying puts allows the investor to gain if the price of the underlying asset falls.

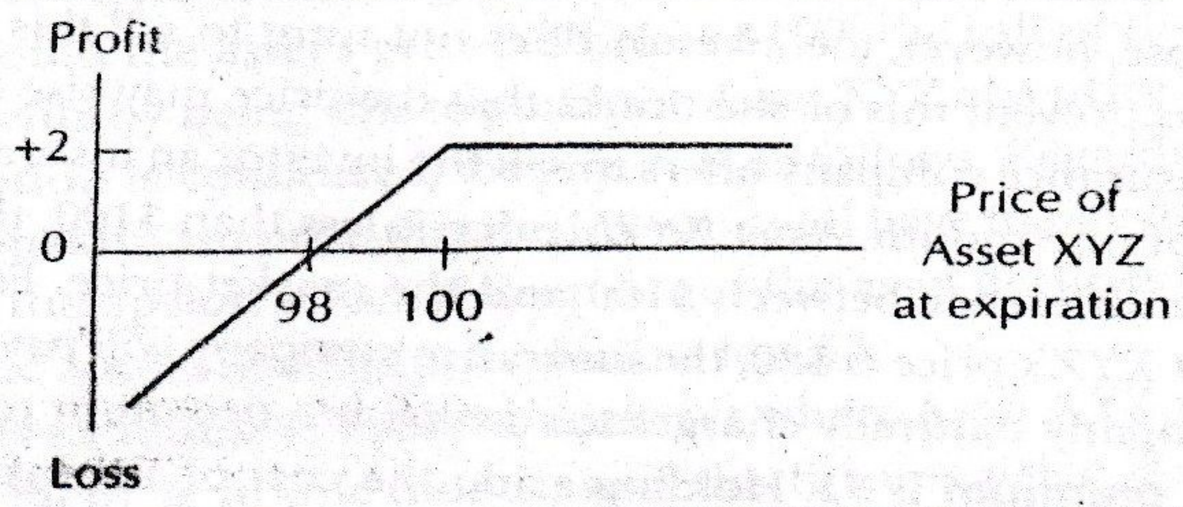
Considering the Time Value of Money

Our illustrations of the four option positions do not take into account the time value of money. Specifically, the buyer of an option must pay the seller the option price at the time the option is purchased. Thus, the buyer must finance the purchase price of the option or, assuming the purchase price does not have to be borrowed, the buyer loses the income that can be earned by investing the amount of the option price until the option is sold or exercised. In contrast, assuming that the seller does not have to use the option price amount as margin for the short position or can use an interest-earning asset as security, the seller has the opportunity to earn income from the proceeds of the option sale.

The time value of money changes the profit/loss profile of the option positions we have discussed. The breakeven price for the buyer and the seller of an option will not be the same as in our illustrations. The breakeven price for the underlying asset at the expiration date is higher for the buyer of the option; for the seller, it is lower.

Our comparisons of the option position with long and short positions in the underlying asset also ignore the time value of money. We have not considered the fact that the underlying asset may generate interim cash flows (dividends in the case of common stock.

Figure 4. Profit/Loss Profile for a Short Put Position



interest in the case of bonds). The buyer of a call option is not entitled to any interim cash flows generated by the underlying asset. The buyer of the underlying asset, however, would receive any interim cash flows and would have the opportunity to reinvest them. A complete comparison of the long call option position and the long position in the underlying asset must take into account the additional dollars from reinvesting any interim cash flows. Moreover, any effect on the price of the underlying asset as a result of the distribution of cash must be considered. This occurs, for example, when the underlying asset is common stock and, as a result of a dividend payment, the stock declines in price.

Key Points That You Should Understand Before Proceeding

1. There are four basic option positions: buying a call option, selling a call option, buying a put option, and selling a put option.
2. An option can be used to alter the risk/reward relationship from that of a position in the underlying.
3. The buyer of a call option benefits if the price of the underlying rises; the writer (seller) of a call option benefits if the price of the underlying is unchanged or falls.
4. The buyer of a put option benefits if the price of the underlying falls; the writer (seller) of a put option benefits if the price of the underlying is unchanged or rises.
5. In determining the payoff from an option, the time value of money as a result of having to finance the option price must be considered.

ECONOMIC ROLE OF THE OPTIONS MARKETS

Futures contracts allow investors to hedge the risks associated with adverse price movements. Hedging with futures lets a market participant lock in a price, and thereby eliminates price risk. In the process, however, the investor gives up the opportunity to benefit from a favorable price movement. In other words, hedging with futures involves trading off the benefits of a favorable price movement for protection against an adverse price movement.

Hedging with options has a variety of potential benefits. For now, we provide an overview of how options can be used for hedging, and how the outcomes of hedging with options differ from those of hedging with futures. A good way to show the hedging uses of options is to return to the initial illustration in this chapter where the underlying for the option is Asset XYZ.

First, let's consider an investor who owns Asset XYZ, currently selling for $100, which she expects to sell one month from now. The investor's concern is that, one month from now, Asset XYZ's price may decline below $100. One alternative available to this investor is to sell Asset XYZ now. Suppose, however, the investor does not want to sell this asset now because either some restrictions prevent this or she thinks that the price may rise during the month. Suppose also that an insurance company offers to sell the investor an insurance policy providing that, if at the end of one month, Asset XYZ's price is less than $100, the insurance company will make up the difference between $100 and the market price. For example, if one month from now Asset XYZ's price is $80, the insurance company will pay the investor $20.

The insurance company naturally charges the investor a premium to write this policy. Let's suppose that the premium is $2. Holding aside the cost of the insurance policy, the payoff that this investor then faces is as follows. The minimum price for Asset XYZ that the

investor can receive is $100 because, if the price is less, the insurance company will make up the difference. If Asset XYZ's price is greater than $100, however, the investor will receive the higher price. The premium of $2 that is required to purchase this insurance policy effectively assures the investor of a minimum price of $98 ($100 minus $2), while if the price is above $100, the investor realizes the benefits of a higher price (reduced always by the $2 for the insurance policy). In buying this policy, the investor has purchased protection against an adverse price movement, while maintaining the opportunity to benefit from a favorable price movement.

Insurance companies do not offer such policies, but we have described an option strategy that provides the same protection. Consider the put option on Asset XYZ with one month to expiration, a strike price of $100, and an option price of $2 that we discussed earlier in this chapter. The payoff to a long position in this put is identical to the insurance policy. The option price resembles the hypothetical insurance premium; this is the reason why the option price is referred to as the option premium. Thus, a put option can be used to hedge against a decline in the price of the underlying instrument.

The long put's payoff is quite different from that of a futures contract. Suppose that a futures contract with Asset XYZ as the underlying instrument has a futures price equal to $100 and a settlement date one month from now. By selling this futures contract, the investor would be agreeing to sell Asset XYZ for $100 one month from now. If Asset XYZ's price falls below $100, the investor is protected because she will receive $100 upon delivery of the asset to satisfy the futures contract. If Asset XYZ's price rises above $100, however, the investor will not realize the price appreciation because she must deliver the asset for an agreed-upon amount of $100. By selling the futures contract, the investor has locked in a price of $100, and fails to realize a gain if the price rises while avoiding a loss if the price declines.

Call options, too, are useful for hedging. A call option can be used to protect against a rise in the price of the underlying instrument while maintaining the opportunity to benefit from a decline in the price of the underlying instrument. Suppose, for example, that an investor expects to receive $100 one month from now, and plans to use that money to purchase Asset XYZ, which is selling currently for $100. The risk that the investor faces is that Asset XYZ's price will rise above $100 one month from now. Let us further suppose there is a call option such as we described earlier in the chapter. The option costs $3 and has a strike price of $100 and a month to expiration. By purchasing that call option, the investor has hedged the risk of a rise in the price of Asset XYZ.

The hedge outcome is as follows. If the price rises above $100 one month from now, the investor would exercise the call option and realize the difference between the market price of Asset XYZ and $100. Thus, if we hold aside the cost of the option for the moment, we can see that the investor is insuring that the maximum price she will have to pay for Asset XYZ is $100. Should the asset's price fall below $100, the call option expires worthless, but the investor benefits by being able to purchase Asset XYZ at a price less than $100. Once the $3 cost of the option is considered, the payoff is as follows. Regardless of the eventual price of the asset, the maximum price that the investor will have to pay for Asset XYZ is $103 (the strike price plus the option price). If the price of the asset declines below $100, the investor will benefit by the amount of the price decline less $3.

Compare this situation to a futures contract where Asset XYZ is the underlying instrument, the settlement is in one month, and the futures price is $100. Suppose that the

investor buys this futures contract. If one month from now the price of Asset XYZ rises above $100, the investor has contracted to buy the asset for $100, thereby eliminating the risk of a price rise; if the price falls below $100, however, the investor cannot benefit because she has contracted to pay $100 for the asset.

It should be clear now how hedging with options differs from hedging with futures. This difference cannot be overemphasized—options and futures are not interchangeable instruments.

Although our focus has been on hedging price risk, options also allow investors an efficient way to expand the range of return characteristics available. That is, investors can use options to "mold" a return distribution for a portfolio to fit particular investment objectives.[1]

Key Points That You Should Understand Before Proceeding

1. Hedging with futures involves trading off the benefits of a favorable price movement for protection against an adverse price movement.
2. Hedging with options allows the option buyer to limit risk but maintain the potential to benefit from a favorable price movement.
3. Options allow the investor to mold a risk/return relationship.

U.S. OPTIONS MARKETS

There are a variety of options traded in the United States. Here, we provide a survey of the major ones.

Stock Options

Options on individual shares of common stock have been traded for many years. Trading of standardized call options on common stock began on the Chicago Board Options Exchange (CBOE) in April 1973. Since then, the Securities and Exchange Commission (SEC) has granted permission to other exchanges to trade options: the American Stock Exchange in 1974, the Philadelphia Exchange in 1975, the Pacific and the Midwest Stock Exchanges in 1976, the New York Stock Exchange in 1982, and the International Securities Exchange in 2000. SEC permission to trade put options on common stocks on organized exchanges was not granted until March 1977.

The SEC approved the creation of a national clearing system for options, the **Options Clearing Corporation (OCC)**, jointly established by the CBOE and the American Stock Exchange. Since its establishment in 1974, the OCC has issued, guaranteed, registered, cleared, and settled all transactions involving listed options on all exchanges.

Exchange-traded stock options have a standardized quantity: One contract applies to 100 shares of the designated common stock. While most underlying stocks are those of listed companies, stock options on a number of OTC stocks are also available. However, all the companies are large and their shares are actively traded.

---

[1] See Stephen A. Ross, "Options and Efficiency," *Quarterly Journal of Economics* (February 1976), pp. 75–89; and Fred Arditti and Kose John, "Spanning the State Space with Options," *Journal of Financial and Quantitative Analysis* (March 1980), pp. 1–9.

The OCC has established standard strike price guidelines for listed options. For stocks with a price above $100, option strike prices are set at $10 intervals; for stocks with a price below $100 and above $30, strike prices are set at $5 intervals; and for stocks priced between $10 and $30 the interval is $2.50. While the strike price of exchange-traded options is not changed because of cash dividends paid to common stockholders, the strike price is adjusted for stock splits, stock dividends, reorganization, and other recapitalizations affecting the value of the underlying stock.

All exchange-traded stock options in the United States may be exercised any time before the expiration date; that is, they are American options. They expire at 11:59 P.M. Eastern Standard Time on the Saturday following the third Friday of the expiration month. Exchange rules require that investors wishing to exercise an expiring option must instruct a broker about the exercise no later than 5:30 P.M. Eastern time on the business day immediately preceding the expiration date. Notices to exercise a nonexpiring option on a date other than the expiration date must be made between 10:00 A.M. and 8:00 P.M. Eastern Standard Time. When a nonexpiring option is exercised, the OCC assigns the obligation the next day to someone who has an outstanding short position in an option of the same exercise price, expiration date, and underlying stock. This assignment is on a random basis.

Options are designated by the name of the underlying common stock, the expiration month, the strike price, and the type of option (put or call). Thus, an IBM call option with a strike price of 125 and expiring in January is referred to as the "IBM January call."

The expiration dates are standardized. Each stock is assigned an option cycle, the three option cycles being January, February, and March. The expiration months for each option cycle are as follows:

Option Cycle	Expiration Months
January	January, April, July, October
February	February, May, August, November
March	March, June, September, December

In addition, the practice is to trade options with an expiration date of the current calendar month, the next calendar month, and the next two expiration months in the cycle. For example, suppose a stock is assigned the January option cycle. In February, options with the following expiration months would be traded: February (the current calendar month), March (the next calendar month), April (first next expiration month in the January option cycle), and July (second next option cycle month in the January option cycle). In May, the following expiration months would be traded for a stock assigned to the January option cycle: May (the current calendar month), April (the next calendar month), July (first next expiration month in the January option cycle), and October (second next option cycle month in the January option cycle).

Stock Index Options

In March 1983, a revolution in stock options and investments in general occurred. At that time, trading in an option whose underlying instrument was a stock index, the S&P 100 (originally called the CBOE 100), began on the CBOE. There are options on all the major stock market indexes. In the United States, the four most popular stock index options in terms of trading volume are the S&P 500 Index Option (ticker symbol SPX), S&P 100

Index Option (ticker symbol OEX), Dow Jones Industrial Index Option (DJX), and NASDAQ 100 Mini Index Option (MNX). All of these contracts are listed on the CBOE. Index options can have an exercise style that is American or European. As with stock index futures, all stock index options have a multiple. For the four popular stock index options, the multiple is $100.

The S&P 500 Index Option contract is European and the underlying is the S&P 500. The underlying for the S&P 100 Index Option is a capitalization-weighted index of the 100 stocks from a broad range of industries within the S&P 500. While there are both American and European style S&P 100 Index Options, the more popular is the American style. The Dow Jones Industrial Index Option has a European exercise style. The underlying index for the NASDAQ 100 Mini Index Option is a modified capitalization-weighted index composed of the 100 largest nonfinancial stocks listed on the Nasdaq stock market. The "Mini" version of this contract means the underlying is one-tenth of the value of the Nasdaq 100 Index.

There are also stock index options for components of the major broad-based stock market indexes, selected industries, and selected sectors. For example, the CBOE lists the Dow Jones Transportation Average Index Option, Dow Jones Utility Average Index Option, Dow Jones Internet Commerce Index Option, Dow Jones Equity REIT Index Option, CBOE Internet Index Option, CBOE Oil Index Option, CBOE Technology Index Option, and Morgan Stanley Retail Index Option. There are stock index options based on some attribute of the components of an index other than industry or sector. For example, the CBOE lists stock index options based on a classification of the component stock of the Russell 3000 in terms of value and growth. The Russell 1000 Growth Index Option and Russell 1000 Value Index Option include the 1,000 largest stocks in terms of market capitalization in the Russell 3000 that are classified as growth and value, respectively. The underlying for the Dow 10 Index Option includes the top 10 dividend-yielding stocks in the Dow Jones Industrial Average, with each component stock equally weighted in the index.

There are also stock index options based on the exercise style and the length of the expiration period. We already gave one example of the former: the S&P 100 Index Option is available in American and European exercise style. Examples of options with different lengths to expiration when first issued include the Weekly Short-Term S&P 500 Index Option and the Weekly Short-Term S&P 100 Index Option. These options, both listed on the CBOE, expire the Friday following the Friday of the listing of the option. Ordinarily, stock index options are not long term. The S&P Long-Dated Option listed on the CBOE can have an expiration of 24 months.

If a stock option is exercised, a stock must be delivered. It would be complicated, to say the least, to settle a stock index option by delivering all the stocks that make up the index. Instead, stock index options are *cash settlement contracts*. This means that, if the option is exercised, the exchange-assigned option writer pays cash to the option buyer. There is no delivery of any stock.

The dollar value of the stock index underlying an index option is equal to the current cash index value multiplied by the contract's multiple. That is,

$$\text{Dollar value of the underlying index} = \text{Cash index value} \times \text{Contract multiple}$$

Each stock index option has a contract multiple. For example, for the S&P 100 Stock Index the multiple is $100. So, if the cash index value for the S&P 100 is 600, then the dollar value of the S&P 100 contract is $600 \times \$100 = \$60{,}000$.

For a stock option, the price at which the buyer of the option can buy or sell the stock is the strike price. For an index option, the strike index is the index value at which the buyer of the option can buy or sell the underlying stock index. The strike index is converted into a dollar value by multiplying the strike index by the multiple for the contract. For example, if the strike index is 590 for an S&P 100 index option, the dollar value is $59,000 (590 × $100). If an investor purchases a call option on the S&P 100 with a strike index of 590, and exercises the option when the index value is 600, then the investor has the right to purchase the index for $70,000 when the dollar value of the index is $60,000. The buyer of the call option would then receive $10,000 from the option writer.

There are also options on stock index futures. These options are not as widely used as options on stock indexes. Options on futures contracts are the contracts of choice in the interest rate options market, so we will postpone our discussion of options on futures until later in this chapter.

Long-Term Equity Anticipation Securities

For an individual stock and a stock index, only the next two expiration months are traded on an exchange. Consequently, the longest time before expiration of a standard exchange-traded option is six months. **Long-Term Equity Anticipation Securities (LEAPS)** are option contracts designed to offer option contracts with longer maturities. These contracts are available on individual stocks and some indexes. Stock option LEAPS are comparable to standard stock options except the maturities can range up to 39 months from the origination date. Index options LEAPS differ in size compared with standard index options having a multiplier of 10 rather than 100.

Interest Rate Options

Interest rate options can be written on cash instruments or futures. At one time, there were several exchange-traded option contracts whose underlying instrument was a debt instrument. These contracts are referred to as **options on physicals**. For reasons explained later, options on futures that are based on debt instruments have been far more popular than options on physicals.

Market participants have made increasingly greater use of over-the-counter options on Treasury, agency debentures, and mortgage-backed securities.[2] Certain institutional investors who want to purchase an option on a specific Treasury security or a Ginnie Mae pass-through can do so on an OTC basis. There are government and mortgage-backed securities dealers who make a market in options on specific securities. Typically, the maturity of the option coincides with the time period over which the buyer of the option wants to hedge, so the buyer is not concerned with the option's liquidity.

Besides options on fixed-income securities, investors can obtain OTC options on a yield spread (such as the spread between mortgage pass-through securities and Treasuries or between double-A corporates and Treasuries).

---

[2] For a more detailed discussion of OTC options, see Chapter 2 of Mark Pitts and Frank J. Fabozzi, *Interest Rate Futures and Options* (Chicago: Probus Publishing, 1989).

FLEX Options[3]

A **FLEX option** is an option contract with some terms that have been customized. It is traded on an options exchange and cleared and guaranteed by the associated clearinghouse for the exchange. The need for customization of certain terms is a result of the wide range of portfolio strategy needs of institutional investors that cannot be satisfied by standard exchange-traded options.

A FLEX option can be created for individual stocks, stock indexes, and Treasury securities. The value of FLEX options is the ability to customize the terms of the contract along four dimensions: underlying, strike price, expiration date, and settlement style (i.e., American versus European). Moreover, the exchange provides a secondary market to offset or alter positions and an independent daily marking of prices.

The development of the FLEX option is a response to the growing OTC market. The exchanges seek to make the FLEX option attractive by providing price discovery through a competitive auction market, an active secondary market, daily price valuations, and the virtual elimination of counterparty risk. The FLEX option represents a link between listed options and OTC products.

Exotic Options

OTC options can be customized in any manner sought by an institutional investor. Basically, if a dealer can reasonably hedge the risk associated with the opposite side of the option sought, it will create the option desired by a customer. OTC options are not limited to European or American types. An option can be created in which the option can be exercised at several specified dates as well as the expiration date of the option. As noted earlier, such options are referred to as Bermuda options.

The more complex options created are called **exotic options**. Here are just two types of such exotic options: alternative options and outperformance options. An **alternative option**, also called an **either-or option**, has a payoff which is the best independent payoff of two distinct assets. For example, suppose that Donna buys an alternative call option with the following terms:

1. The underlying is one unit of Asset M or one unit of Asset N.
2. The strike price for Asset M is $80.
3. The strike price for Asset N is $110.
4. The expiration date is three months from now.
5. The option can only be exercised three months from now (that is, it is a European option).

At the expiration date, Donna can decide to buy from the writer of this option *either* one unit of Asset M at $80 or Asset N at $110. Donna will buy the asset with the larger payoff. So, for example, if Asset M and Asset N at the expiration date are $84 and $140, respectively, then the payoff would be $4 if Donna elects to exercise to buy Asset M but $30 if she elects to exercise to buy Asset N. Thus, she will exercise to buy Asset N. If the price for both assets at the expiration date is below their strike price, Donna will let the option expire worthless.

---

[3] For a more detailed description of FLEX options, see James J. Angel, Gary L. Gastineau, and Clifford J. Weber, *Equity FLEX Options* (1999).

An **outperformance option** is an option whose payoff is based on the relative payoff of two assets at the expiration date. For example, consider the following outperformance call option purchased by Karl:

1. Portfolio A consists of the stock of 50 public utility companies with a market value of $1 million.
2. Portfolio B consists of the stock of 50 financial services companies with a market value of $1 million.
3. The expiration date is six months from now and is a European option.
4. The strike is equal to

Market value of Portfolio B − Market value of Portfolio A

At the expiration date, if the market value of Portfolio A is greater than the market value of Portfolio B, then there is no value to this option and it will expire worthless. The option will be exercised if the market value of Portfolio B exceeds the market value of Portfolio A at the expiration date.

Key Points That You Should Understand Before Proceeding

1. There are options traded on individual shares of common stock and options traded on common stock indexes.
2. The dollar value of a stock index option contract is equal to the index value multiplied by the contract's multiple.
3. There are interest rate options in which the underlying is a debt instrument (called an option on a physical) and a futures contract (called a futures option).
4. Exchange-traded options on futures that are based on debt instruments have been far more popular than exchange-traded options on physicals.
5. There has been increased use by institutional investors of OTC options on Treasury and mortgage-backed securities.
6. Complex OTC options are called exotic options.

FUTURES OPTIONS

An option on a futures contract, commonly referred to as a **futures option**, gives the buyer the right to buy from or sell to the writer a designated futures contract at a designated price at any time during the life of the option. If the futures option is a call option, the buyer has the right to purchase one designated futures contract at the exercise price. That is, the buyer has the right to acquire a long futures position in the designated futures contract. If the buyer exercises the call option, the writer (seller) acquires a corresponding short position in the futures contract.

A put option on a futures contract grants the buyer the right to sell one designated futures contract to the writer at the exercise price. That is, the option buyer has the right to acquire a short position in the designated futures contract. If the put option is exercised, the writer acquires a corresponding long position in the designated futures contract.

There are futures options on all the interest rate futures contracts reviewed in the previous chapter.

Mechanics of Trading Futures Options

As the parties to the futures option will realize a position in a futures contract when the option is exercised, the question is: What will the futures price be? That is, at what price will the long be required to pay for the instrument underlying the futures contract, and at what price will the short be required to sell the instrument underlying the futures contract?

Upon exercise, the futures price for the futures contract will be set equal to the exercise price. The position of the two parties is then immediately marked to market based on the then-current futures price. Thus, the futures position of the two parties will be at the prevailing futures price. At the same time, the option writer or seller must pay the option buyer the economic benefit from exercising. In the case of a call futures option, the option writer must pay the difference between the current futures price and the exercise price to the buyer of the option. In the case of a put futures option, the option writer must pay the option buyer the difference between the exercise price and the current futures price.

For example, suppose an investor buys a call option on some futures contract in which the exercise price is 85. Assume also that the futures price is 95, and that the buyer exercises the call option. Upon exercise, the call buyer is given a long position in the futures contract at 85, and the call writer is assigned the corresponding short position in the futures contract at 85. The futures position of the buyer and the writer is immediately marked to market by the exchange. Since the prevailing futures price is 95, and the exercise price is 85, the long futures position (the position of the call buyer) realizes a gain of 10 while the short futures position (the position of the call writer) realizes a loss of 10. The call writer pays the exchange 10 and the call buyer receives 10 from the exchange. The call buyer, who now has a long futures position at 95, can either liquidate the futures position at 95 or maintain a long futures position. If the former course of action is taken, the call buyer sells a futures contract at the prevailing futures price of 95. There is no gain or loss from liquidating the position. Overall, the call buyer realizes a gain of 10. If the call buyer elects to hold the long futures position, then he or she will face the same risk and reward of holding such a position. But the call buyer still has realized a gain of 10 from the exercise of the call option.

Suppose, instead, that the futures option is a put rather than a call, and the current futures price is 60 rather than 95. If the buyer of this put option exercises it, the buyer would have a short position in the futures contract at 85; the option writer would have a long position in the futures contract at 85. The exchange then marks the position to market at the then-current futures price of 60, resulting in a gain to the put buyer of 25 and a loss to the put writer of the same amount. The put buyer, now having a short futures position at 60, can either maintain that position or liquidate it by buying a futures contract at the prevailing futures price of 60. In either case, the put buyer realizes a gain of 25 from exercising the put option.

The exchange imposes no margin requirements for the buyer of a futures option once the option price has been paid in full. Because the maximum amount the buyer can lose is the option price, regardless of how adverse the price movement of the underlying instrument, there is no need for margin.

Because the writer (seller) of an option has agreed to accept all of the risk (and none of the reward) of the position in the underlying instrument, the writer (seller) is required to deposit not only the margin required on the interest rate futures contract position if that is

the underlying instrument, but, with certain exceptions, also the option price that is received for writing the option. In addition, if prices for the underlying futures contract adversely affect the writer's position, the writer would be required to deposit variation margin as it is marked to market.

Reasons for the Popularity of Futures Options

There are three reasons why futures options on fixed-income securities have largely supplanted options on physicals as the options vehicle used by institutional investors.[4] First, unlike options on fixed-income securities, futures options on Treasury coupon futures do not require payments for accrued interest to be made. Consequently, when a futures option is exercised, the call buyer and the put writer need not compensate the other party for accrued interest.

Second, futures options are believed to be "cleaner" instruments because of the reduced likelihood of delivery squeezes. Market participants who must deliver an instrument are concerned that the instrument to be delivered will be in short supply at the time of delivery, resulting in a higher price to acquire it. As the deliverable supply of futures contracts is more than adequate for futures options currently traded, there is no concern about a delivery squeeze.

Finally, in order to price any option, it is imperative to know at all times the price of the underlying instrument. As we mentioned in our discussions of the various bond markets, current bond prices are not easily available. In contrast, futures prices are readily available.

Key Points That You Should Understand Before Proceeding

1. A futures option gives the buyer the right to buy from or sell to the writer a designated futures contract at a designated price at any time during the life of the option.
2. If the buyer of the futures option exercises, the futures price for the futures contract will be set equal to the exercise price, but the position of the two parties is then immediately marked to market based on the then-current futures price.
3. There are several reasons why futures options on fixed-income securities have been used more by institutional investors than options on physicals.

SUMMARY

An option is a contract between two parties, the buyer and the seller (or writer). The buyer pays a price or premium to the seller for the right (but not the obligation) to buy or sell a certain amount of a specified item at a set price for a specified period of time. The right to buy is a call option, and the right to sell is a put option. The set price is the exercise or strike price. The period ends on the maturity or expiration date. If the right cannot be exercised until that date, the option is called a European option. If the option can be exercised at any time before the maturity date, the option is an American option. The item to which the

[4] Laurie Goodman, "Introduction to Debt Options," Chapter 1 in Frank J. Fabozzi (ed.), *Winning the Interest Rate Game: A Guide to Debt Options* (Chicago: Probus Publishing, 1985), pp. 13–14.

option applies is the underlying asset, and its value determines the value of the option. Hence, options are called derivative instruments.

Options traded on exchanges are standardized and guaranteed by the exchange and its clearinghouse, and trading in these options is monitored by the SEC. Customized options are traded in the unregulated OTC market.

Options differ from futures in several key ways. First, both parties to a futures contract accept an obligation to transact, but only the writer of an option has an obligation, and that occurs if the buyer wishes to exercise the option. Second, the option buyer has a limited, known maximum loss. Third, the risk/return profile of an option position is asymmetric, while that of a futures position is symmetric.

The risk/return profile of the option buyer is the mirror image of the risk/return profile of the option writer, whether the option is a put or a call, American or European. The purchase of a call option is like taking a long position in the underlying asset but with a fixed, maximum loss. The purchase of a put option resembles the short sale of the underlying asset but with a known maximum loss.

The essence of hedging with options is that it minimizes loss while reducing gains only by the price of the option. Thus, hedging with options is very much like taking out an insurance policy. Hedging with options differs from hedging with futures because the latter establishes a known, future price and does not allow the hedger to participate in gains that price changes might generate for the investor.

Options may be written on individual stocks or on bundles and groups of stocks. Those written on groups are called index options, the most popular being the S&P 100. Several stock index options are traded on major exchanges around the world. The exercise of stock options involves an exchange of cash for shares. By contrast, stock index options are cash settlement contracts, where the buyer receives the cash value of the difference between the exercise price (called the strike index) and the actual level of the stock market index. Options based on important government debt securities are also traded on major exchanges.

LEAPS and FLEX options essentially modify an existing feature of either a stock option, an index option, or both. LEAPS are designed to offer options with longer maturities. FLEX options allow users to specify the terms of the option contract.

An option on a futures contract gives the buyer the right to acquire a position in a futures contract—a long position in the case of a call option and a short position in the case of a put option. These options, referred to as futures options, are the option of choice in the fixed-income market.

OTC options can be customized in any manner sought by an institutional investor. Exotic options are the more complex options created in the OTC market. Two examples of exotic options are alternative options and outperformance options.

KEY TERMS

- Alternative option (either-or option)
- American option
- Bermuda option (Atlantic option)
- Call option (call)
- European option
- Exchange-traded option
- Exercise (strike) price
- Exercise style
- Exotic option
- Expiration (maturity) date

- FLEX option
- Futures option
- Long a call option
- Long a put option
- Long-Term Equity Anticipation Securities (LEAPS)
- Option
- Options on physicals
- Option price (option premium)
- Options Clearing Corporation (OCC)
- Outperformance option
- Put option
- Short a call option
- Short a put option
- Writer

QUESTIONS

1. Identify and explain the key features of an option contract.
2. What is the difference between a put option and a call option?
3. What is the difference between an American option and a European option?
4. Why does an option writer need to post margin?
5. Identify two important ways in which an exchange-traded option differs from a typical OTC option.
6. a. What are the main ways in which an option differs from a futures contract?
   b. Why are options and futures labeled *derivative securities*?
7. Explain how this statement can be true: "A long call position offers potentially unlimited gains, if the underlying asset's price rises, but a fixed, maximum loss if the underlying asset's price drops to zero."
8. Suppose a call option on a stock has an exercise price of $70 and a cost of $2, and suppose you buy the call. Identify the profit to your investment, at the call's expiration, for each of these values of the underlying stock: $25, $70, $100, $400.
9. Consider again the situation in question 8. Suppose you had sold the call option. What would your profit be, at expiration, for each of the stock prices?
10. Explain why you agree or disagree with this statement: "Buying a put is just like short selling the underlying asset. You gain the same thing from either position, if the underlying asset's price falls. If the price goes up, you have the same loss."
11. Why do stock index options involve cash settlement rather than delivery of the underlying stocks?
12. Suppose you bought an index call option for 5.50 that has a strike price of 200 and that, at expiration, you exercised it. Suppose, too, that at the time you exercised the call option, the index has a value of 240.
    a. If the index option has a multiple of $100, how much money does the writer of this option pay you?
    b. What profit did you realize from buying this call option?
13. How do LEAPS differ from standard stock options and standard index options?
14. a. What are the terms that can be customized in a FLEX option?
    b. Why was the FLEX option introduced by exchanges?
15. Suppose that you buy an alternative call option with the following terms:
    - The underlying asset is one unit of Asset G or one unit of Asset H.
    - The strike price for Asset G is $100.
    - The strike price for Asset H is $115.
    - The expiration date is four months from now.
    - The option can only be exercised at the expiration date.

    a. What is the payoff from this option if at the expiration date the price of Asset G is $125 and the price of Asset H is $135?
    b. What is the payoff from this option if at the expiration date the price of Asset G is $90 and the price of Asset H is $125?
    c. What is the payoff from this option if at the expiration date the price of Asset G is $90 and the price of Asset H is $105?

16. Suppose that you buy an outperformance call option with the following terms:
    - Portfolio X consists of bonds with a market value of $5 million.
    - Portfolio Y consists of stocks with a market value of $5 million.
    - The expiration date is nine months from now and is a European option.
    - The strike price is equal to

      Market value of Portfolio X −
      Market value of Portfolio Y

    What is the payoff of this option if at the expiration date the market value of Portfolio X is $10 million and the market value of Portfolio Y is $12 million?
17. Suppose you have a long position in a call option on a futures contract, and the strike price is 80. The futures contract price is now 87, and you want to exercise your option. Identify the gains from exercise, specifying any cash inflow and the futures position you get (and the price of the futures contract).