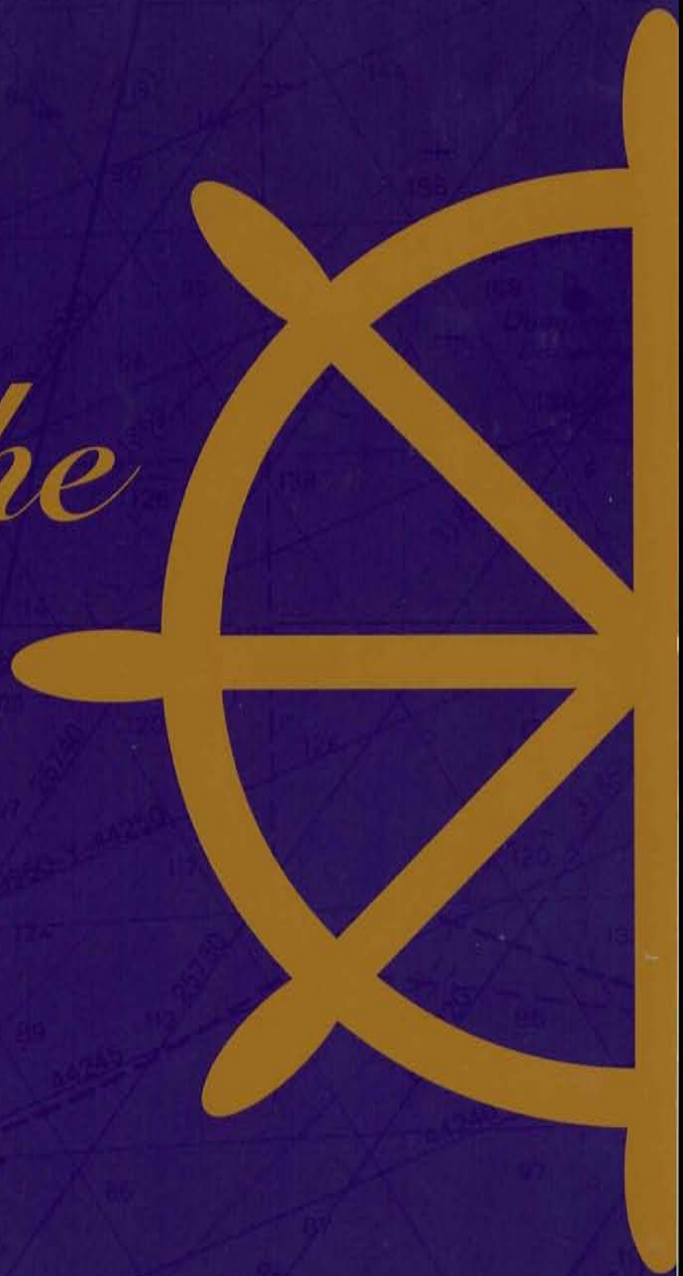


*Tools of the  
Trade:*

A Basic  
Guide  
to Financial  
Derivatives

FEDERAL RESERVE BANK OF BOSTON



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# uring the mid-1990s,

derivatives figured prominently in a number of high-profile financial reversals involving municipalities, corporations, investment firms, and banks. Yet even as these instruments gained notoriety, they remained somewhat of a mystery. The one certainty about derivatives was that people wanted to know more about them.

The Federal Reserve System responded by embarking on a major effort to increase public awareness. We, at the Federal Reserve Bank of Boston, hosted a daylong educational forum on managing the risks associated with investing in derivatives. Our target audience was not the Wall Street investment professional who worked with derivatives every day but, rather, the nonexpert who wanted to know more about derivatives in order to make an informed decision — either on the job or in the realm of personal financial planning.

The enthusiastic response to our conference indicated that the desire for information about derivatives was even greater than we had anticipated. Auditors, investment planners, municipal treasurers, CFOs, and even a few CEOs packed the Bank's auditorium to hear some of the country's foremost experts on financial derivatives discuss everything from what derivatives are to what types of expertise and control are needed to use these instruments wisely.

This publication is an outgrowth of that conference. Its primary purposes are to offer some insights into when and how derivatives can be valuable tools for managing financial risk and to focus on the pertinent questions to ask yourself and others before you or your company invests. We hope it will help to dispel the mystique that surrounds the varied group of financial instruments known collectively as derivatives.

*Cathy E. Hiechen*

*President and Chief Executive Officer  
Federal Reserve Bank of Boston*

*"If your mother tells you she loves you, check it out!"*

ACCORDING TO LEGEND, A BANNER ON THE WALLS OF A CHICAGO NEWSROOM ADMONISHES REPORTERS AGAINST TAKING WHAT THEIR SOURCES SAY AT FACE VALUE. THE BANNER READS: "IF YOUR MOTHER TELLS YOU SHE LOVES YOU, CHECK IT OUT!"

THOSE WORDS ARE EQUALLY GOOD ADVICE TO ANYONE CONSIDERING AN INVESTMENT IN FINANCIAL DERIVATIVES. WHAT FOLLOWS ARE TWO LISTS OF QUESTIONS TO ASK YOURSELF, AND OTHERS, BEFORE YOU INVEST IN DERIVATIVES.

## I.

- DO I UNDERSTAND WHAT I AM PURCHASING? DO I UNDERSTAND THE INVESTMENT WELL ENOUGH TO EXPLAIN IT TO SOMEONE ELSE IN CLEAR, UNDERSTANDABLE LANGUAGE?
- DO I UNDERSTAND HOW THE DERIVATIVE I AM CONSIDERING HAS BEEN PRICED OR VALUED? DOES THE PRICING ACCURATELY REFLECT CURRENT VALUE AND CONDITIONS?

*continued . . .*

## Some Are "Exotic," Others Are "Plain Vanilla"

Truisms don't always stand up to objective scrutiny. "Truck drivers know where to find the best food," is one that comes to mind.

Financial truisms are no exception. Some contain more truth than others.

The belief that derivatives are inherently risky gained broad acceptance during the mid-1990s when nationwide news reports highlighted the financial woes of a large U.S. multinational corporation and a Southern California county, both of which suffered significant losses after investing in derivatives. Almost overnight, financial derivatives went from obscurity to notoriety. The notion that "derivatives are very complex and very risky" gained broad acceptance, but many who expressed that view might have been hard-pressed to explain why.

The fact is that some derivatives are highly complex, but others are

quite simple. Some are "exotic," others are "plain vanilla." But more often than not, derivatives are effective instruments for managing financial risk.

Anyone who has ever bought a house knows that there's a time lag between applying for a mortgage and closing the sale. During that interval, rising interest rates can add significantly to the size of the monthly mortgage payment.

Sometimes mortgage applicants choose to hedge the risk of rising rates by paying the lender an upfront fee to guarantee, or "lock in," the rate at the time of application. The borrower is betting that the lock-in fee will amount to less than the cumulative monthly costs that could result if rates were to rise prior to closing.

Home mortgage rate lock-in agreements share certain attributes with derivatives transactions. Both allow the buyer to mitigate risk, and both enable the lender (or seller) to generate fee income in

exchange for assuming some of the risk. But unlike derivatives, home mortgage rate lock-ins are not making headlines, nor are they triggering any discernible degree of alarm.

### **New Packages for Old Things**

“Although derivatives seem complicated,” says Michelle Clark Neely, an economist at the Federal Reserve Bank of St. Louis, “their premise is really simple: They allow users to pass on an unwanted risk to another party and assume a different risk, or pay cash in exchange.” Neely and others broadly define derivatives as financial contracts that are linked to — or “derive” — their value from an underlying asset, such as a stock, bond, or commodity; a reference rate, such as the interest rate on three-month Treasury bills; or an index, such as the S&P 500.

Derivatives, says Boston Fed economist Peter Fortune, are “new packages of old things.” One way to look at those “packages” is to di-

vide them into four broad categories: forward agreements, futures, options, and swaps.

### **Forwards, Futures, Options, and Swaps**

*Forward Agreements:* There are no sure things in the global marketplace. Deals that looked good six months ago can quickly turn sour if unforeseen economic and political developments trigger fluctuations in exchange rates or commodity prices.


Over the years, traders have developed tools to cope with these uncertainties. One of those tools is the forward agreement — a contract that commits one party to buy and the other to sell a given quantity of an asset for a fixed price on a specified future date.

For example, an American company might agree today to buy a certain product from a Japanese manufacturer. The deal will be priced in yen, and payment will be made when the product is deliv-

**Derivatives are  
“new packages  
of old things.”**

*Peter Fortune*





**“... We’re sort of  
all passing risk  
around among  
ourselves and  
it’s ending up  
somewhere.”**

*Robert Pozen*

ered in six months. Both companies will base their business calculations on a certain dollar/yen exchange rate, but for the next six months they will face the uncertainty that a sharp fluctuation in the rate could make their deal less profitable than anticipated.

To protect themselves against exchange rate uncertainty, companies sometimes use forward agreements — agreements that guarantee a specified exchange rate on a given date in the future. Forward agreements are a form of derivative, and they are usually arranged through large, money-center banks. An American company might, for example, go to a money-center bank seeking to buy a certain amount of yen at a specified rate on a given date in the future. And a Japanese company might be looking to sell an equivalent amount of yen at a specified rate on the same future date.

Rather than dealing directly with one another, both sign a sepa-

rate agreement with the money-center bank, which in the parlance of derivatives becomes a counterparty to both. The bank is acting as a broker to the counterparties, and in return for accepting a portion of their risk, the companies pay the bank/broker a fee.

This type of forward agreement is known as an over-the-counter or OTC derivative. An OTC derivative is not traded daily on an organized financial exchange, and its terms are customized to the needs of the counterparties.

**Futures:** Chances are that most people think of corn or pork bellies when they hear the word “futures.” But in the world of derivatives, the word “futures” refers instead to such things as foreign exchange futures and stock index futures.

Futures contracts are forward agreements with an important difference. Whereas the terms of a forward agreement are generally customized to the needs of the counterparties and sold through

over-the-counter (OTC) dealers, futures contracts are standardized agreements traded on organized exchanges.

Buying and selling of futures agreements takes place in the trading pits of the Chicago Mercantile Exchange and other organized exchanges. Traders settle their accounts through the exchange's clearinghouse, and the clearinghouse, rather than an OTC dealer, becomes the counterparty to each transaction.

**Options:** As the name implies, trading in options involves choice. Someone who invests in an option is purchasing the right, but not the obligation, to buy or sell a specified underlying item at an agreed-upon price, known as the exercise, or strike, price.

There are two basic types of options — calls and puts. A call option gives an investor the right to buy the underlying item during a specified period of time at an agreed upon price, while a put op-

tion confers the right to sell it. Perhaps the best known underlying assets are shares of common stock. Standardized stock options are traded daily on a number of major exchanges.

**Interest Rate Swaps:** Interest rate swaps allow two parties to exchange or “swap” a series of interest payments without exchanging the underlying debt. The least complicated interest rate swaps are commonly referred to as “plain vanilla.” They usually involve one party exchanging a portion of its interest payments on a floating rate debt for a portion of the interest payments on another party's fixed rate debt. (For an explanation of a “plain vanilla” interest rate swap, see box, *Vanilla and Other Flavors*, p. 10.)

### The Source of the Difficulty

Basic derivatives are not particularly complicated, and in the proper context they can be effective tools for managing risk. So, why have they led some users into so much

- IS THE PROJECTED RETURN ON MY INVESTMENT OUTSIDE THE “NORMAL” MARKET RANGE? IF SO, WHY? IS THE PROJECTED RATE OF RETURN BASED ON A PARTICULAR SET OF ASSUMPTIONS? WHAT ARE THE ASSUMPTIONS? ARE THEY REALISTIC?
- WHAT DO I KNOW ABOUT MY COUNTERPARTY — THE OTHER PARTY IN MY DERIVATIVES TRANSACTION? ARE THERE MEASURES I NEED TO TAKE IN ORDER TO PROTECT MYSELF AGAINST COUNTERPARTY CREDIT RISK? HOW MUCH DOCUMENTATION SHOULD I ASK FOR? HOW MUCH DOCUMENTATION IS THE DEALER WILLING TO PROVIDE?
- IN THE EVENT THAT I NEED TO SELL A DERIVATIVE BEFORE IT MATURES, WHAT IS THE PROCEDURE FOR DOING SO AND HOW MUCH WILL IT COST ME?

## II.

THIS SECOND LIST, PREPARED BY FEDERAL RESERVE BANK PRESIDENT CATHY MINEHAN FOR PROSPECTIVE END-USERS OF DERIVATIVES, FOCUSES ON THREE AREAS: INVESTMENT STRATEGY, RELATIONSHIPS WITH COUNTERPARTIES, AND THE INTERNAL RISK MANAGEMENT PROCESS.

*continued . . .*

- DO I HAVE A WRITTEN INVESTMENT STRATEGY THAT HAS BEEN APPROVED BY THE RELEVANT GOVERNING AUTHORITY AND CONFORMS TO THE LAWS AND REGULATIONS THAT AFFECT THE KIND OF INVESTMENTS I CAN MAKE?
- DO I HAVE INDEPENDENT INTERNAL AND EXTERNAL MONITORING MECHANISMS SOPHISTICATED ENOUGH TO IDENTIFY DEVIATIONS FROM MY INVESTMENT STRATEGY?
- DO I HAVE A WAY OF ASSESSING THE CREDIT RISK ASSOCIATED WITH MY COUNTERPARTY?
- HAVE I GIVEN MY WRITTEN INVESTMENT STRATEGY TO MY COUNTERPARTIES, BE THEY BROKERS, DEALERS, OR BANKS FROM WHOM I AM PURCHASING A DERIVATIVE? HAVE THEY ACKNOWLEDGED THE UNIQUE ASPECTS, IF ANY, OF MY STRATEGY AND UNDERSTOOD THE LEGAL, REGULATORY, AND OTHER CONSTRAINTS INVOLVED?
- IF I RELY ON MY COUNTERPARTIES FOR INVESTMENT ADVICE, HAVE I INFORMED THEM OF THIS AND RECEIVED ACKNOWLEDGMENT, AS WELL AS AN EXPLANATION OF HOW

*continued . . .*

difficulty? The answer can be summed up in two words: complexity and speculation.

**Complexity:** A forward agreement is relatively uncomplicated. Two parties agree to the purchase or sale of a commodity at an agreed upon price on a specified future date.

But not all derivatives are so straightforward. Certain “exotic” derivatives, with names like Cacall, Caput, Contingent Premium Call, and Barrier Option, have features that make them more difficult to understand than the “plain vanilla” variety. On some derivatives, small changes in the value of the underlying asset, reference rate, or index may produce big changes in the value of the derivative. Investors may overlook the potential for this type of “leveraging.” The troublesome product for some investors has been “structured notes.” These are ordinary securities with derivative features added. The security sounds safe, and the investor may pay insufficient attention

to how the derivative works.

As always, investors who don’t understand what they are getting themselves into aren’t in the best position to fully assess the risk attached to a particular investment. (See the box, “*If your mother tells you she loves you, check it out!*”)

**Speculation:** A manufacturing company is hedging risk when it uses a forward agreement to limit the impact that exchange rate fluctuations might have on an international trade deal. But it’s probably fair to say that the same company would be speculating if it were to invest heavily in a foreign currency forward agreement solely on the assumption that a certain currency will move sharply in one direction or the other.

Not that the line between hedging and speculating is always clear. As Michelle Clark Neely of the St. Louis Fed puts it, “Any instrument that can be used to hedge can also be used to speculate.” There are times when treasurers or portfolio



managers might feel as if they are under pressure to increase the return on their money by investing heavily in “exotic” derivatives — the “no guts, no glory” approach to investing. Hedging can easily become speculation through greed or ignorance or carelessness.

### The Basic Risks

Whether a derivative is “plain vanilla” or “exotic,” there are points that investors ought to consider before entering into a deal:

**Market Risk:** Investors tend to base their decisions on certain assumptions: Interest rates will go up or down, the stock market will move higher or lower, the dollar will be stronger or weaker.

Bankers and investment bankers often rely on computer models to predict how markets will move. The models are based on a set of “normal” assumptions. But what is “normal”? Are the assumptions valid? And even if the assumptions are valid, the model might indicate

that there’s a certain probability of things going very wrong. If that probability becomes a reality, is the investor prepared to deal with the consequences?

If, for example, an unforeseen international crisis pushes oil prices far above the anticipated norm, a speculator who has sold oil options stands to lose a great deal of money. That’s because the speculator who sold the options doesn’t actually own the oil and must scramble to buy it at a very steep price if the party that bought the options chooses to exercise them.

In short, investors need to be sure they understand what they are getting themselves into. They need to determine how much risk they are willing to tolerate, and they need to think about what they will do if things go wrong.

**Liquidity Risk:** Investors who plan to sell a derivative before maturity need to consider at least two major points: 1) how easy or diffi-



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*Michelle Clark Neely*

CONFLICTS OF INTEREST WILL BE AVOIDED?

- DO MY INTERNAL RISK CONTROL MEASURES INCLUDE WRITTEN LIMITS ON THE MARKET AND CREDIT RISK I AM WILLING TO BEAR?
- DO I HAVE SYSTEMS AT MY DISPOSAL, WHETHER INTERNALLY OR THROUGH MY COUNTERPARTY, FOR MONITORING, VALUING, AND STRESS-TESTING MY INVESTMENT POSITIONS?
- IF VALUATIONS ARE DONE BY MY COUNTERPARTIES, CAN I VERIFY THEM INDEPENDENTLY?
- IS THE STAFF RESPONSIBLE FOR MANAGING AND OVERSEEING MY POSITIONS TRAINED TO EVALUATE THE RISKS INHERENT IN MY PORTFOLIO AND TO MONITOR THOSE WHO MANAGE MY INVESTMENTS?
- ARE THESE OVERSIGHT PERSONNEL INDEPENDENT AND ABLE TO OVERRULE THOSE DOING THE INVESTING, IF NECESSARY?

cult will it be to sell before maturity, and 2) how much will it cost. Are there fees or penalties for selling before maturity? What if the derivative is trading at a much lower price than they paid? Indeed, what are the chances that it could be trading at a lower price? (Of course, these are the same types of questions people ought to ask themselves when they invest in anything, from condominiums to collectibles.)

#### *Counterparty Credit Risk:*

Counterparty credit risk is a much greater concern in the OTC derivatives market. If one of the counterparties (buyer, seller, or dealer) defaults on an agreement — just walks away after the market takes an unfavorable turn — there's no organized mechanism for dealing with the fallout.

Matters are further complicated by the fact that many derivatives trades are done orally with little or no accompanying documentation. Add all this to the fact that the

OTC market has gone largely unregulated, and it's easy to see why much of the apprehension over derivatives has centered on the OTC variety.

Exchange-traded derivatives raise fewer concerns over counterparty risk, largely because the counterparty in each transaction is the exchange clearinghouse rather than a single OTC trader. The pooled capital of the clearinghouse members makes its contract guarantees stronger than those offered by an individual OTC dealer.

An organized exchange, notes Federal Reserve Bank of Richmond economist Robert Graboyes, also "enforces contract performance by requiring each buyer and seller to post a performance bond, known as a margin requirement. At the end of each day, traders are required to recognize any gains or losses on their outstanding commitments, a process known as marking the contracts to market." The exchange either adds or subtracts money from an



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*E. Gerald Corrigan*

investor’s account, depending on how much a derivative contract’s price has moved during the trading day.

The daily process of “marking to market” means that the pricing of exchange-traded derivatives is likely to be far less arbitrary or ambiguous than the pricing of OTC derivatives. Indeed, one of the primary concerns surrounding OTC derivatives is the question of whether or not pricing accurately

reflects current value and conditions. (This is also an important consideration when assessing liquidity risk.)

Robert C. Pozen, general counsel and managing director for Fidelity Investments, suggests that derivatives users can cope with counterparty credit risk by developing a list of approved dealers with whom they are willing to do business, because the likelihood of credit risk is lower with some dealers than others. Pozen also raises the possibilities of asking for collateral or asking for a third-party insurer to back the derivatives. But he acknowledges that insurance arrangements can cost a great deal of money.

**Interconnection Risk:** Interconnection risk, also known as “systemic risk,” is the danger that difficulties experienced by any single player in the derivatives market could trigger a chain reaction that might ultimately affect the entire banking and financial system.

As Michelle Clark Neely notes, policymakers’ apprehensions stem from the fact that so many OTC derivatives dealers are money-center banks. Regulators and policymakers are concerned, writes Neely, “that banks will be tempted to take large speculative bets on interest rates that could impair their capital or lead to failures. [And some] worry that the failure of one bank dealer may have a domino or systemic effect on the whole banking industry and, hence, taxpayers” in the form of a taxpayer-funded bailout.

**“Don’t bet the ranch!”**

In April 1995, the Federal Reserve Bank of Boston hosted an educational forum for users of derivatives, *What Should You Be Asking About Derivatives?* E. Gerald Corrigan, former president of the Federal Reserve Bank of New York, offered some valuable, plain English words of advice to those in attendance. When it comes to

derivatives, they are words to live by:

- Don't be shy about asking questions. That may seem very simple, but the fact of the matter is that derivatives intimidate people.
- Don't give a second thought to whether a question may or may not be stupid. It doesn't matter. Press. Press your own people. Press your dealer. If you can't find the answer to your question there, then talk to a regulator or lawyer. But ask questions and ask questions aggressively.
- If you don't understand how a particular transaction is valued, and if you cannot satisfy yourself as to how to determine that value, just don't do the transaction. Those extra 2 basis points won't make or break your life.
- If someone calls you on the phone and is trying to sell you a 10 percent piece of paper in a 7 percent market, tell them they have the wrong number.
- Don't bet the ranch on anything. None of us is smart enough to do that.

## Vanilla and Other Flavors

— Adapted from *On Reserve*, September 1995, Federal Reserve Bank of Chicago.

Basic derivative instruments such as futures and options are often referred to as “plain vanilla,” although this term is most often applied to an instrument called a swap. More exotic “flavors” include instruments such as “repos” and some that have more bizarre names like “frogs” or “swaptions.” While more complex, these instruments are similar to other derivatives in that they are a contract based on another asset.

Let's examine a swap. As the name implies, this instrument swaps one thing for another. Usually, it's an interest rate swap. For example, an organization with debt, payable at a fixed rate of interest, will swap its interest payments for a floating rate payment. Here's an example of how the system works.

CDB Corporation has borrowed \$1 million at a floating rate, currently 7 percent. CDB is concerned that rates will rise. CDB would like to make fixed interest payments of 8 percent.

NQ, Inc. has borrowed \$1 million at a fixed rate of 8 percent and has invested the funds at a variable rate. It is concerned that, if rates fall, the investment might not be profitable. It is willing to make CDB's interest payments at a floating rate over five years, if CDB will pay the 8 percent fixed rate on NQ's loan for the same period of time. The two parties agree to swap interest rates.

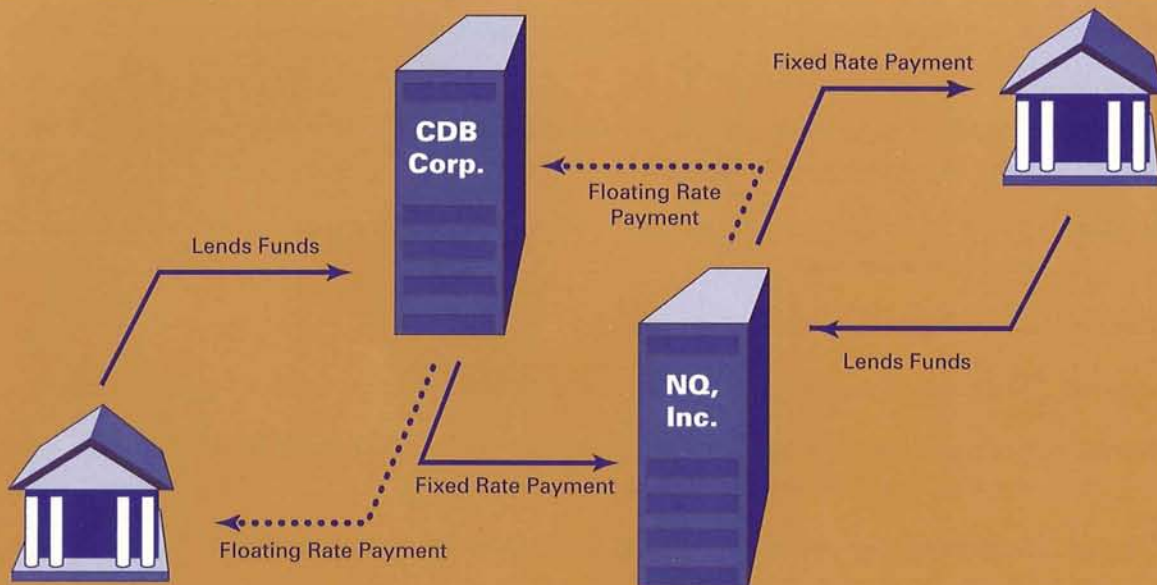
CDB will still make floating-rate interest payments to its bank, but will receive from NQ floating-rate interest payments exactly the same as what it is paying. Similarly, NQ will still make the 8 percent fixed-rate interest payments to its bank, but will receive from CDB interest payments pre-

cisely equivalent to the payments it is making. The net effect of this interest rate exchange is that CDB ends up making fixed-rate interest payments, in accordance with its wishes, and NQ ends up making floating-rate interest payments, in accordance with its preferences. Both companies will continue to make the appropriate principal repayments to their respective banks in accordance with their loan agreements.

Why did CDB and NQ use swaps? One answer is the expectations of the two companies, each trying to avoid a certain risk. The companies have different opinions of which way interest rates are

headed and different needs. Based on those opinions and needs, the companies are trying to manage their risk.

Interest rate swaps provide users with a way of hedging the effects of changing interest rates. CDB is reducing the risk of borrowing funds at a floating rate at a time when it expects rates will rise. NQ is gaining protection against falling interest rates. The lender of funds for each company is not affected because it receives the correct principal and interest payments. Such transactions, multiplied many times over, help foster a more liquid and competitive marketplace.



## A Brief Derivatives Lexicon

— Adapted from an article that originally appeared in *Financial Industry Studies*, August 1994,  
Federal Reserve Bank of Dallas.

- Cap:** An option-like contract that protects the holder against a rise in interest rates or a change in some other underlying reference beyond a certain level.
- Collar:** The simultaneous purchase of a cap and sale of a floor with the objective of maintaining interest rates, or some other underlying reference, within a defined range.
- Dealer:** A counterparty who enters into a [derivatives transaction] in order to earn fees or trading profits, serving customers as an intermediary.
- Derivative:** A contract whose value depends on (or derives from) the value of an underlying asset, typically a security, commodity, reference rate, or index.
- End-User:** A counterparty who engages in a [derivatives transaction] to manage its interest rate or currency exposure.
- Floor:** An option-like contract that protects the holder against a decline in interest rates or some other underlying reference beyond a certain level.
- Forward:** A contract obligating one counterparty to buy and the other to sell a specific asset for a fixed price at a future date.
- Future:** A forward contract traded on an exchange.
- Notional Amount:** The principal amount upon which interest and other payments in a transaction are based.
- Option:** A contract giving the holder the right, but not the obligation, to buy (or sell) a specific quantity of an asset for a fixed price during a specified period.
- Swap:** An agreement by two parties to exchange a series of cash flows in the future.
- Swaption:** An option giving the holder the right to enter (or cancel) a swap transaction.
- Underlying Reference:** The asset, reference rate, or index whose price movement helps determine the value of the derivative.

