

1 Overview of Derivatives

A financial derivative is usually defined as an instrument whose value is *derived* from some underlying cash market instrument. Familiar examples include

- options to
 - buy (“call options”) or
 - sell (“put options”)

a specified security or commodity at a specified price on a specified date, and

- contracts such as
 - futures or
 - options

on equity indices such Standard & Poor’s 500.

Newer examples include *structured notes*, which are securities whose interest or principal payments depend on market conditions, such as floating rate notes and inverse floaters. *Swaps* of various kinds are also derivatives.

Various kinds of derivative are described by Hull, with both details of how their markets operate and the theory of pricing.

1.1 Exchange-Traded *versus* Over-the-Counter

A significant distinction is that between *exchange-traded* and *over-the-counter* (“OTC”) derivatives. Derivatives that are traded on an exchange are standardized to promote liquidity. They are “marked to market” as of the close of business every day, and the holder’s brokerage account is credited or debited with the day’s change in value. The holder is required to keep cash or securities in the account sufficient to cover the next day’s possible losses with a very high level of probability; this *margin* protects the other participants against default by the holder of an “out of the money” position. Each instrument is a contract between the holder and the exchange.

The OTC market consists of an informal system of dealers linked by telephone, and allows transactions to be customized to meet the precise needs

of the dealers' clients. Each transaction is formalized as a contract between two parties, with no exchange or clearing-house involved. These contracts may include a requirement for the posting of margin or *collateral*, but often do not.

A typical example of an OTC transaction is the *interest rate swap*. Two parties, such as a company ("A") and a dealer ("B") agree on a *notional principal amount*, say \$10 million, and to exchange for a certain period of time, say 5 years, a stream of payments based on that amount. A might agree to pay B a fixed stream based on an interest rate of 3% per annum, payments to be semi-annual. B might agree to make off-setting floating rate payments to A based on 6-month LIBOR (the London InterBank Offered Rate, currently 0.8%). They agree that on any given payment date, they will exchange the net difference of their obligations. Note that the principal amount never changes hands, which is why it is referred to as *notional*.

The cash flows for B are essentially the same as if it bought a fixed-coupon bond with a 3% interest rate, financing the purchase with a loan paying interest of 6-month LIBOR. If the fixed rate in the swap market differed much from the current yield in the bond market, an arbitrage opportunity would exist; as a result, swap rates and bond yields tend to track each other quite closely.

1.2 Risks

Exchange-traded and OTC derivatives carry the same *market* risk but have very different implications for *credit* risk. Market risk is caused by the change of value of an institution's positions as market conditions change. In extreme cases, market losses may cause an institution to have difficulty in meeting its obligations, resulting in bankruptcy, liquidation, or a rescue effort of some kind. Barings failed in this way, when unauthorized trading left them with a large exposure to a drop in Japanese equity markets, and such a drop occurred in response to the Kobe earthquake. Credit risk is the risk that an institution's failure to honor its commitments causes a loss to another institution. Peregrine Investments, the largest Asian investment bank outside Japan, recently ceased operations because of its probable failure to be repaid on loans made to Indonesian companies. Peregrine had already been weakened by losses in its holdings of Hong Kong equities, so its demise was caused jointly by credit risk and market risk.

1.3 Objectives

Why would the parties want to enter into such a contract? Often to hedge their liabilities. For instance, A might be in the process of raising \$10 million of capital by issuing bonds, and might have found that the bonds with a floating interest rate found a better market than fixed-rate bonds. Thus A is entering into a commitment to make floating rate payments to its debtholders. However, the company may be unwilling to face the risk that interest rates rise dramatically, and to achieve a more predictable set of cash flows it enters into the swap. The dealer, B, may have another client with the opposite wish, for instance an investor with interest income that is predominantly floating rate, who wishes to lock in a fixed rate of interest.

1.4 Legal Structure

The risks in transactions involving derivatives are materially affected by the legal environment governing the relationship between the parties. The preferred documentation consists of a Master Swap Agreement between them, and separate Swap Confirmations documenting each individual transaction, with all the documents comprising a single legal contract. The International Swaps and Derivatives Association (“ISDA”) has developed standard forms of both, which are typically used, with elections and modifications to suit the particular needs and preferences of the parties.

Many of the details of these agreements are minor, such as an agreement to combine offsetting payments due on the same day into a single net payment. More significant from the perspective of risk are agreements as to the circumstances under which all the transactions will be terminated, regardless of their individual terms, and the procedure for doing so. Typically these circumstances are limited to default or bankruptcy of one of the parties, but a material drop in credit rating may also be included. Also typically, all transactions are “marked to market”, and a single net termination payment is due from one party to the other. Of course, if the party with the obligation to make a payment is the one in bankruptcy, the other party may face a lengthy process with an uncertain outcome in obtaining that payment.

The jurisdictions within which the parties are organized also play a role. In the U.S., the U.K., Switzerland, and France, there is legislation that explicitly recognizes Master Swap Agreements, and requires the courts to respect their provisions (in France the requirement is restricted to regulated

banks and insurance companies). In other jurisdictions there is less certainty that a bankruptcy court would respect them. In some, there is in fact a near certainty that a court would “cherry-pick”, demanding full payment on transactions that were “in the money” to the failing entity, and making the other party stand in line with other unsecured creditors for payment on transactions that were “out of the money”.

Provisions under which one party can call for collateral to secure a net “in the money” position are also documented in the Master agreement, specifically as to when such a call can be made, how much collateral may be requested, and of what kind (often only U.S. Treasury securities are acceptable).

See the bookmarks for some further reading on some of these topics.

1.5 Credit Derivatives

Some of the difficulties in which financial institutions have found themselves in recent years can be traced to activities involving credit derivatives. The simplest such derivative is the single-name *Credit Default Swap* (CDS), which essentially provides insurance against a default by the issuer of a corporate bond.

The buyer of protection in a CDS makes regular premium payments to the seller, until the earlier of the maturity of the swap or an event of default by the issuer. If a default occurs before maturity, the buyer is compensated for the loss caused by holding the now defaulted bond. Typically, the compensation consists of the par value of the bond, in exchange for the delivery of the bond: *physical* settlement.

If the security is a floating rate note, the cash flows for the seller are essentially the same as if it bought the note, financing the purchase with a floating rate loan. The “premium” consists of the credit spread between the interest paid by the note and the interest payments made to the financing bank. In each case, when there is no default the seller’s cash flows consist only of receiving the premium, and when there is a default the seller is left owning the defaulted note.

If the premium in the CDS market differs much from the credit spread, an arbitrage opportunity would exist. That introduces a force that keeps the CDS premium and the credit spread close to each other. However, short term differences sometimes appear; entering a CDS requires no up-front payment, so the CDS market responds rapidly to changing circumstances. Financing

the purchase of a note or bond requires some arrangement, so credit spreads in the bond market tend to move more slowly.