Markets: Derivatives

Mark Hendricks

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FINM Intro: Markets

Outline

Forwards and Futures

Swaps

Options

Forwards

A **forward contract** is an agreement to buy or sell an asset at a specific time for a specific price.

- Forward contracts are traded over-the-counter (OTC).
- They are settled at maturity, which introduces credit risk.
- FX is an important market in forward contracts.

Futures

Like a forward contract, a **futures contract** is an agreement to buy or sell an asset at a specific time for a specific price.

- Unlike a forward contract, a futures contract is normally traded on an exchange.
- Futures contracts trade in standardized contracts.
- A futures contract on an exchange is **marked-to-market**: it faces daily settlement.
- The underlying asset is rarely delivered; rather, the position is typically closed out.

Underlying securities

Before discussing other derivative contracts, consider two widely used underlying securities:

- **Foreign Exchange** (FX) derivatives allow traders to hedge the risk of changes in exchange rates. FX futures are particularly popular.
- **Commodities**. Rather than deal with uncertain future spot prices, futures and forwards on underlying commodities are widely traded.

Data: Warning!

Be sure which order FX quotes use. Consider FX involving the dollar...

- Direct exchange quotes are those which list dollar-per-currency. These are used with the British pound, Australian dollar, and the Euro.
- Indirect exchange quotes are those which list currency-per-dollar. These are used with the Japanese yen, Canadian dollar, and Swiss franc.
- Forward rates are always quoted the same way as the spot, whether that is direct or indirect.
- Futures contracts involving the U.S. dollar always use direct quotes.

Data: USD/GBP exchange rate

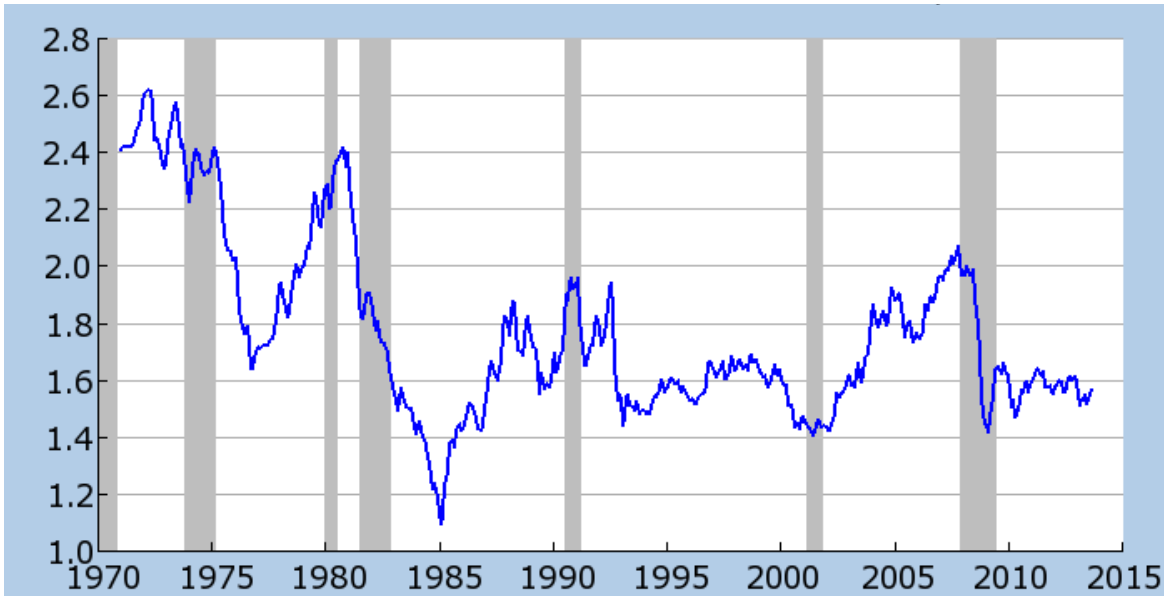

Figure: St. Louis Fed

Data: Yen/USD exchange rate

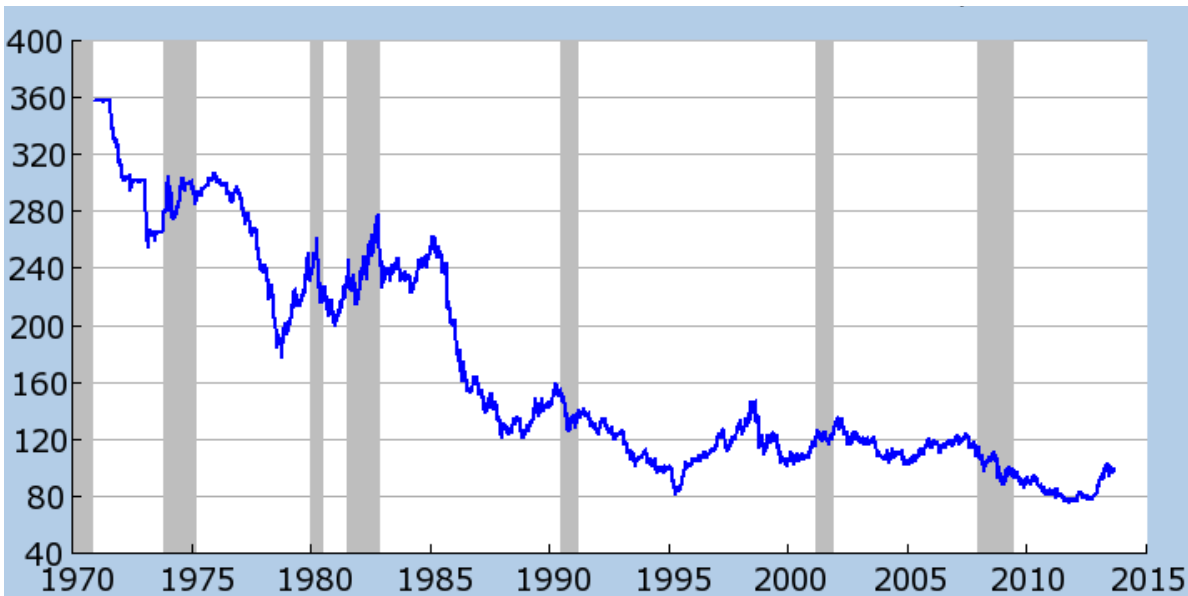

Figure: St. Louis Fed

Data: Most-traded currencies

Currency	% share
US Dollar	87.0%
Euro	33.4%
Japanese yen	23.0%
British pound	11.8%
Australian dollar	8.6%
Swiss franc	5.2%
Canadian dollar	4.6%
Mexican peso	2.5%
Chinese yuan	2.2%
New Zealand dollar	2.0%

Table: Most traded currencies, as measured by daily value traded.

Source: Wall Street Journal Sep. 5, 2013

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Swaps

A **swap** is an OTC transaction between two companies to exchange two cash flows at predetermined dates.

- Usually, the cash flows are a fixed and floating interest rate. This is a vanilla interest rate swap.
- Currency swaps are also popular. In a *fixed-for-fixed*, the two parties exchange fixed interest rate payments on different currencies.

Example: A swap contract

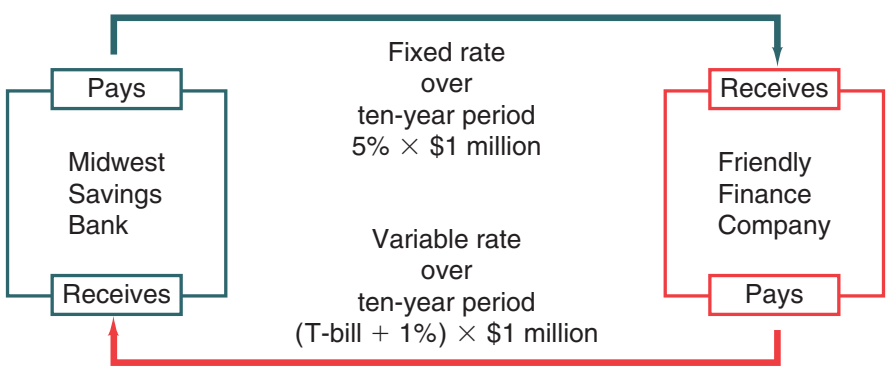

Figure: An illustration of a swap contract, with a notional principal of $1 million, and a term of ten years. Midwest Savings makes payments of 5% on the principal, while receiving a variable rate of Tbill plus 1% from Friendly Financing.

Source: Mishkin (2010)

OIS

In an **overnight interest swap** (OIS), a fixed rate is exchanged for the (geometric) average of an overnight rate.

- OIS have become popular in many currencies, and the rate is a benchmark for the money market.
- Like other swaps, the OIS payment is just the net difference, so there is no counterparty risk to the principal.
- Thus, the OIS removes the counterparty and volatility risk in LIBOR.

LIBOR-OIS spread

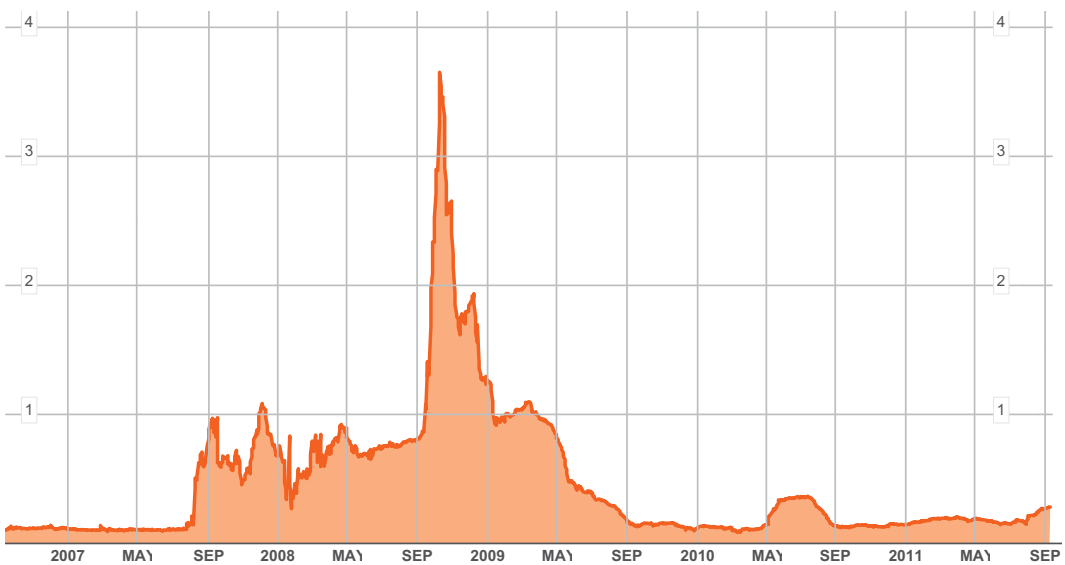

Figure: The LIBOR-OIS spread (percentage points).

Source: *Bloomberg.com.* Retrieved Sep 10, 2011.

The TED spread

The **TED** spread is similar to the LIBOR-OIS spread.

- TED stands for Treasury-Eurodollar. TED is calculated as LIBOR minus T-bill rates.
- This spread is typically positive but very small. This reflects the small default risk in LIBOR.

TED spread behavior

The TED spread behaved similarly to the LIBOR-OIS spread during the financial crisis.

- While it usually hovers around below one percentage point, it came close to five percentage points after Lehman.
- Like the LIBOR-OIS spread, the rate signals default risk.
- With the TED, investors perceive little risk of a U.S. default. With the OIS spread, the nature of a swap leaves little counterparty risk.

Credit Default Swaps

Credit default swaps (CDS) are contracts that make payment contingent on a reference entity defaulting in some fashion, (a *credit event* occuring.)

- If a credit even occurs, then the buyer of the CDS has the right to sell the bonds of the reference entity to the seller for face value.
- The total face value of bonds which can be sold in the case of an event is the *notional principal*.
- It is up to ISDA to declare whether a credit event has occurred.

CDS spread

The *CDS spread* refers to the total amount the buyer pays per year, as a percentage of the principal.

- The buyer of the CDS makes periodic payments to the seller at some rate on the principal amount protected.
- Note that there is substantial counterparty risk to the buyer of the CDS.

Sovereign Debt	basis points
Australia	83
France	220
Germany	102
Greece	8786
Ireland	724
Italy	484
Japan	143
Korea	161
Norway	45
Portugal	1082
United Kingdom	98
United States	49

Table: Sovereign CDS on five-year contracts, as of the end of 2011. Annualized quote (basis points.)

Source: WSJ

CDS trading

CDS are the most popular credit derivatives.

- CDS contracts are traded OTC.
- The International Swaps and Derivatives Association (ISDA) developed a standard contract for trading credit default swaps OTC.
- Unlike insurance, the parties in a CDS need not own the underlying security.
- For many firms, the notional principal of traded CDS is larger than the underlying debt market.

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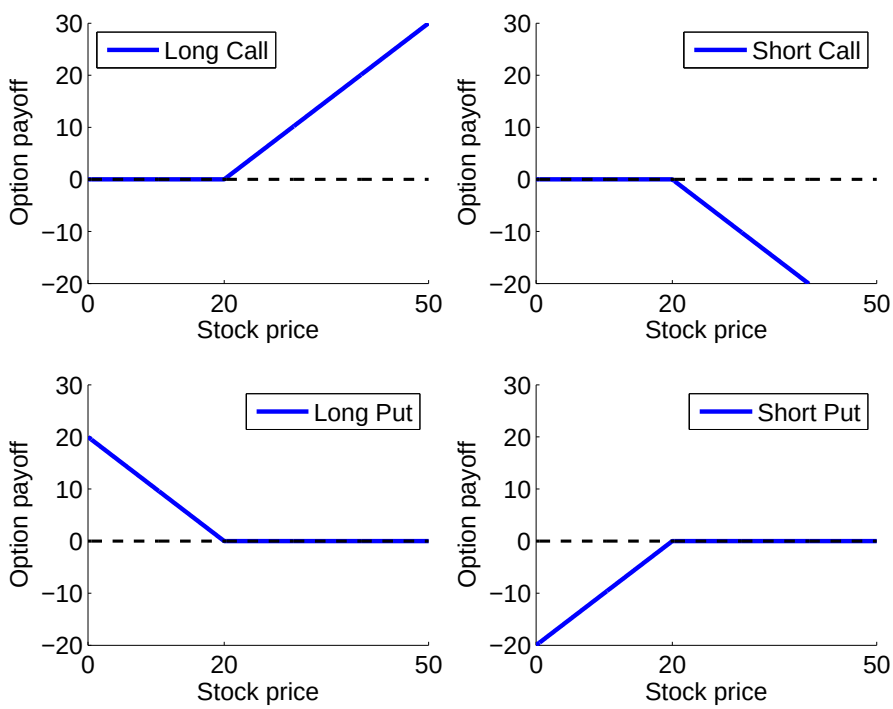
Options Payoffs



Call options

A **call option** on an asset gives the holder of the call the right, (but not obligation,) to *buy* the asset at a specified price.

- The call option must be purchased from a party willing to *write* the call. The price paid to buy the call is the *premium*.
- The *strike price* or *exercise* is the agreed price at which the call holder can buy the asset.
- If the security underlying the call has a price above the strike price, it is said to be *in the money.*

Call options

A call option is a contract between two parties—neither of which necessarily owns the underlying asset.

- Exercising a call does not create new shares.
- The call option must be purchased from a party willing to *write* the call. The price paid to buy the call is the *premium*.
- The *strike price* or *exercise* is the agreed price at which the call holder can buy the asset.
- If the security underlying the call has a price above the strike price, it is said to be *in the money.* Conversely, if the price of the underlying is lower than the strike, it is *out of the money*.

Put option

A **put option** on an asset gives the holder of the call the right, (but not obligation,) to *sell* the asset at a specified price.

- A put option is not the same as selling, or writing, a call option.
- The **long side of a put** option has limited upside—the underlying price can only go to zero—and limited downside—losing the premium if the option stays out of the money.
- The **seller of a call** has unlimited downside—the underlying asset can appreciate without limit—and limited upside—the premium gained by writing the call.

American vs. European

- **European** option stipulates that the option can *only* be exercised at the expiration date.
- **American** option allows the option to be exercised any time up to the expiration date.
- Most options traded in the U.S. are American style.
- However, foreign currency options and stock index options often are European style.

The naming has nothing to do with location.

Trading options

Options are traded on exchanges and OTC.

- Most options are traded electronically.
- Option maturities tend to be short, (months, not years.)

Warrants, convertibles, and employee stock options

- **Warrants** are options issued by a companies or financial institutions. Often, these are attached to new bond issues to give investors upside.
- **Convertibles** are bonds issued by a company that can be converted into equity at certain times, using a preset conversion rate. Thus, it is a bond with a call option on the stock attached.
- **Employee stock options** are call options issued by the firm to its employees.

All three of these differ from standard options in that at exercise, the company issues additional shares.

Differences from standard options

- Issuer is firm instead of third party.
- Maturity is often much longer (years) than standard options (weeks,months.)
- Dillution at exercise as firm issues new shares to fulfill.
- Taxes and regulation. Not registered as new security offering.

Warren Buffet has used warrants to great effect with Goldman Sachs (2008), G.E. (2008), and General Media General (2012.)

Many more

There are, of course, many other types of derivatives. For any that you encounter, consider the following

- Is the derivative OTC or exchange-traded?
- How standardized are the contracts?
- How much volume is traded?
- Who bears counterparty risk?

Markets for debt and derivatives

- The market for fixed income derivatives is larger than the markets for some of the underlying securities.
- Are interest rate swaps prices driven by underlying securities, or vice-versa?
- While equity options are much discussed, the volume of debt derivatives is much larger.

Data: Derivatives

	Gross market values ($ billions)
Interest rate	10,148
-swap	8,993
FX	2,579
CDS	421
Equity	495
Commodities	297
Unallocated	558
Total	14,498

Table: Gross market values of worldwide OTC derivatives contracts, as of the end of 2015. Categorized by type of underlying security. These are the market values, not the notional outstanding.

Source: BIS Stats. (2015)

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