

Modes of Termination of a Futures Position Vol 6 pg 60

- Delivery of the underlying asset.
- Cash settlement.
- A futures contract close-out/ offsetting.
- Exchange for physicals.

Important Notes Regarding Various Futures Contracts Vol 6 pg 66-72

- A movement of one tick (1 basis point) in the price of T-bill and Eurodollar futures is worth \$25.
- T-bond futures involve the use of conversion factors to value the various bonds that can be delivered by the short to satisfy her obligations under a futures contract.
- Stock index futures state a multiple that is used to compute payoffs on futures positions.
- Currency futures work in a similar to currency forwards except that they are much smaller in size.

OPTION MARKETS AND CONTRACTS

 Cross-Reference to CFA Institute Assigned Reading #70

European versus American Options Vol 6 pg 83

- A **European** option is one that can only be exercised at the option's expiration date.
- An **American** option can be exercised at any point in time up to, and including, the option's expiration date.

Moneyness and Intrinsic Value Vol 6 pg 85

Moneyness refers to whether an option is in-the-money or out-of-the-money.

- An option is *in-the-money* when immediate exercise of the option will generate a *positive* payoff.
- An option is *out-of-the-money* when immediate exercise will generate a *negative* payoff.
- An option is *at-the-money* when immediate exercise will result in neither a positive nor a negative payoff.

The **intrinsic value** of an option is the amount an option is in-the-money by. It is the amount that would be received by the option holder if she were to exercise an in-the-money option immediately. An option has zero intrinsic value if it is at, or out-of-the money.

Call Options Vol 6 pg 82

A call option gives the holder/buyer the right to buy (or call) the underlying asset, for the given exercise price, at the expiration date of the option.

A call option writer/seller has the obligation to sell the underlying asset to the holder of the call option, for the given exercise price, should the option holder choose to exercise the option.

- Any positive payoff for the call option holder means that a negative payoff of equal magnitude is borne by the call writer.
- Any profit for the call option holder means that a loss of equal magnitude is borne by the call option writer.

Option Position	Description	Payoffs	
		$S_T > X$	$S_T < X$
		Option holder exercises the option.	Option holder does not exercise the option.
Call option holder	Choice to buy the underlying asset for X	$S_T - X$	0
Call option writer	Obligation to sell the underlying asset for X if the option holder chooses to exercise her option	$-(S_T - X)$	0

Intrinsic value of a call option = $\text{Max} [0, (S_t - X)]$

Moneyiness	Current Market Price (S_t) versus Exercise Price (X)	Intrinsic Value $\text{Max} [0, (S_t - X)]$
In-the-money	S_t is greater than X	$S_t - X$
At-the-money	S_t equals X	0
Out-of-the-money	S_t is less than X	0

Put Options Vol 6 pg 82

A put option gives the holder/buyer the right to sell (or put) the underlying asset, at the given exercise price, at the expiration date of the option.

A put option **writer/seller** has the **obligation** to **buy** the underlying asset from the put option holder, for the given **exercise** price, *should the holder choose to exercise the option*.

- Any positive payoff for the put option holder means that a negative payoff of equal magnitude is borne by the put writer.
- Any profit for the put option holder means that a loss of equal magnitude is borne by the put option writer.

Option Position	Description	Payoffs	
		$S_T < X$	$S_T > X$
		Option holder exercises the option	Option holder does not exercise the option
Put option holder	Choice to sell the underlying asset for X	$X - S_T$	0
Put option writer	Obligation to buy the underlying asset for X if the option holder chooses to exercise her option	$-(X - S_T)$	0

Intrinsic value of a put option = $[0, (X - S_t)]$

Moneyiness	Current Market Price (S_t) versus Exercise Price (X)	Intrinsic Value Max $[0, (X - S_t)]$
In-the-money	S_t is less than X	$X - S_t$
At-the-money	S_t equals X	0
Out-of-the-money	S_t is greater than X	0

Important Relationships Vol 6 pg 85

- A *longer* time remaining till option expiration *increases* the time value of the option and hence, the total value of an option. The European put does not always follow this rule.
- For a call option, the *higher* the strike, the *lower* the intrinsic value of the option.
- For a put option, the *higher* the strike, the *higher* the intrinsic value of the option.
- When interest rates *decrease*, call option prices *decrease*, and put option prices *increase*.
- *Greater* volatility in the price of the underlying asset *increases* the value of both calls and puts.

Put-Call Parity Vol 6 pg 110

At any point in the time, the value of a portfolio composed of a call option and a zero-coupon bond (a fiduciary call), must be the same as the value of a portfolio consisting of a put option and the underlying asset (protective put), as long as:

- The call and put option, and the zero-coupon bond have the same time to maturity/ expiration (T).
- The exercise price of the call and the put, and the face value of the zero-coupon bond are the same (X).
- The call and the put are options on the same underlying asset as the one held in the protective put (S).
- The call and put can only be exercised at expiration- they are European options.

Option Value Limits Vol 6 pg 102

Option	Minimum Value	Maximum Value
European call	$EC_t \geq 0$	$EC_t \leq S_t$
American call	$AC_t \geq 0$	$AC_t \leq S_t$
European put	$EP_t \geq 0$	$EP_t \leq X/(1 + RFR)^T$
American put	$AP_t \geq 0$	$AP_t \leq X$

Option	Minimum Value	Maximum Value
European Call	$\text{Max} \left[0, S_t - \frac{X}{(1 + RFR)^T} \right]$	S_t
American Call	$\text{Max} \left[0, S_t - \frac{X}{(1 + RFR)^T} \right]$	S_t
European Put	$\text{Max} \left[0, \frac{X}{(1 + RFR)^T} - S_t \right]$	$\frac{X}{(1 + RFR)^T}$
American Put	$\text{Max} [0, X - S_t]$	X

Early Exercise of American Options Vol 6 pg 116

Early exercise of an American call option may be advisable when the underlying asset makes payments during the life of the option. When a stock pays a dividend, its value falls by the amount of the dividend on the ex-dividend date. If the ex-dividend date is very close to the option expiration date, and the dividend is so significant that it will reduce the price of the stock below the option’s exercise price (and take the call option out-of-the-money), early exercise of the American call option would be warranted.

It would be beneficial to exercise an American put prior to expiration when a company is in, or nearing bankruptcy and the stock price is close to zero. In this case, it is better for the put option holder to exercise her option immediately, and receive a payoff equal to the exercise price (intrinsic value = $X - 0 = X$) as opposed to waiting till expiration to receive the same payoff. Because of its potential benefits when the possibility of bankruptcy exists, an American put is almost always worth more than a European put.

Interest Rate Options Vol 6 pg 92

Interest rate options are options in which the exercise 'price' is an exercise rate and the underlying is a reference rate such as LIBOR. There is no deliverable asset in interest rate options; instead they settle in cash. Think about interest rate options as options to enter a hypothetical loan agreement.

- A call option holder has the right to *take* a loan at the exercise rate upon expiration of the option.
- A put option holder has the right to *give* a loan at the exercise rate.
- The term of the hypothetical loan starts upon expiration of the option, and lasts for the term of LIBOR being used.
- The payoff at expiration of an interest rate option equals the interest savings on the hypothetical loan.

Bond options and interest rate options behave differently when interest rates change.

- Bond options offer investors a play on bond prices. When interest rates *fall*, bond prices *rise* and the holder of a call option on bonds *benefits*.
- Interest rate options offer investors a play on interest rates. If interest rates *fall*, the holder of a call option on interest rates (the option to take a hypothetical loan at the relatively high exercise rate) does *not* benefit.

Interest Rate Options and FRAs Vol 6 pg 92

- The payoff to the long position in an FRA can be replicated by purchasing an interest rate call option and writing an interest rate put option, where the exercise rate of the call and put options equals the FRA rate.
- To replicate a short position in an FRA, an investor must purchase an interest rate put option and write a call option on interest rates, where the exercise rate of the call and put options equals the FRA rate.

FRA settlement versus Interest Rate Option Settlement Vol 6 pg 93

An important point worth remembering is that the settlement payment of the FRA occurs at the FRA expiration date, and the value of the payoff is the present value of the interest savings. On the other hand, the settlement payment for a interest rate option occurs at the end of the term of the hypothetical loan; not at the expiration of the option. Hence, there is no need to discount the interest savings when calculating the payoffs on interest rate options.

Interest Rate Caps and Floors Vol 6 pg 94

An interest rate cap is a series of interest rate call options with expiration dates that correspond to the reset dates on a floating-rate loan. A cap effectively places an upper limit on interest payments. Each caplet has an exercise rate equal to the desired cap rate. Issuers effectively purchase the cap, while bondholders write the cap.

An interest rate floor is a series of interest rate put options with expiration dates that correspond to the reset dates on a floating-rate loan. A floor effectively places a lower limit on interest payments. Each floorlet has an exercise rate that equals the desired floor rate. Interest rate floors offer protection to floating-rate bond *holders* against a *decrease* in interest rates. Bondholders effectively purchase the floor, while issuers write the floor.

An interest rate **collar** combines a cap and a floor.

SWAP MARKETS AND CONTRACTS

Cross-Reference to CFA Institute Assigned Reading #71

A **swap** is an agreement to exchange a series of cash flows at periodic settlement dates over a certain period of time.

Swaps can be thought of as a series of forward contracts where one forward contract expires on each settlement date. Swaps are similar to forwards in that:

- Swaps typically require no payment by either party at inception.
- Swaps are customized instruments.
- Swaps do not trade in secondary markets; they are over-the-counter instruments.
- Swap markets are largely unregulated.
- Default risk is an important consideration in swap markets.
- Most participants in swap markets are institutions.

Methods of Terminating a Swap Vol 6 pg 133

- Mutual termination.
- Offsetting swap contract.
- Resale to a third party.
- Swaption.

Currency Swaps Vol 6 pg 136

- The notional principal **is** exchanged at swap initiation.
- Interest payments are **not netted**. Full interest payments are exchanged at every settlement date in different currencies.
- At the end of the swap the notional principal is exchanged again.