CFA LEARNING OUTCOMES DECODED

In our series *Learning Outcomes Decoded*, we break down a single Learning Outcome Statement (LOS) from the CFA level 1 curriculum. Andrew White, CFA, the author of this article, is a Content Developer on the CFA team at The Princeton Review and a portfolio manager at Awaken Capital.

DERIVATIVES:
FACTORS AFFECTING OPTION VALUE

LOS: Identify the factors that determine the value of an option and describe how each factor affects the value of an option

This LOS is a major point in the implementation section of the learning module that is highly testable material. Understanding this LOS requires knowledge of six factors that determine the price of an option, be it a call or a put option. An increase in each of these factors impacts long option value as follows:

Factor	Call Value	Put Value
Value of the underlying	+	−
Exercise price	−	+
Time to expiration	+	+ / −
Risk-free interest rate	+	−
Volatility of the underlying	+	+
Income/cost related to owning the underlying	− / +	+ / −

Value of the Underlying

A call option appreciates in value if the spot price of the underlying rises, while a put option appreciates if the spot price of the underlying falls.

Exercise Price

The exercise price is the price level that determines whether an option buyer chooses to transact at contract maturity. A call option is valuable if it has a low exercise price compared to the spot price of the underlying. The value of a put option is high if it has a high exercise price compared to spot.

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Time to Expiration

Time value, or the difference between an option's price and its exercise value, represents the likelihood that favorable changes to the underlying price will increase the profitability of exercise. The one-sided (or asymmetric) payoff profile of an option allows the buyer to ignore any outcomes where the option will expire unexercised.

For both a call and a put option, a long time to expiration results in a high option value. For a call option, the price appreciation potential of an underlying is essentially unlimited and increases over longer periods, while the downside is limited to the loss of the premium. For a put option, a long time to expiration offers high potential for price depreciation below the exercise price, while the loss is limited to the premium if the underlying price rises.

Risk-Free Interest Rate

The risk-free rate is the opportunity cost of holding an asset. For example, an option's exercise value is equal to the difference between the spot price and the present value of the exercise price:

$$\text{Call Option Exercise Value: Max } (0, (S_t - PV(X)))$$

$$\text{Put Option Exercise Value: Max } (0, (PV(X) - S_t))$$

A high risk-free rate lowers the present value of the exercise price, increasing the exercise value of a call option and decreasing the exercise value of a put option.

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Volatility of the Underlying

Volatility is a measure of the expected dispersion of an underlying asset's future price movements. Higher price volatility of the underlying increases the likelihood of a higher positive exercise value without affecting the downside case in which the option expires unexercised. This increases the value of both the call and the put option.

Income or Cost Related to Owning Underlying Asset

Income or other non-cash benefits (such as convenience yield) accrue to the owner of an underlying asset but not to the owner of a derivative. Income or other benefits of ownership decrease the value of a call and increase the value of a put. Carry costs (such as storage and insurance for commodities) have the opposite effect, increasing the value of a call option and decreasing the value of a put.

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PRACTICE QUESTION

Holding other factors constant, a lower exercise price (X) increases the value of

A. a put option only.

B. a call option only.

C. both a call option and a put option.

B is correct. A lower exercise price increases the value of a call option, since for a given underlying price at maturity of S_T, the call option settlement value of Max $(0, S_T - X)$ will increase for a lower X.

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