

Understanding Intrinsic Value and Time Value of an Option

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To buy an option, an investor must pay an option premium. The option premium can be thought as the sum of two different numbers that represent the value of the option. The first is the current value of the option, known as the intrinsic value. The second is the potential increase in value that the option could gain over time, known as the time value.

- [Intrinsic Value of an Option](#)
- [Time Value of an Option](#)
- [Why Intrinsic and Time Value Matter](#)

Intrinsic Value of an Option

The intrinsic value of an option represents the current value of the option, or in other words how much in the money it is. When an option is in the money, this means that it has a positive payoff for the buyer. A \$30 call option on a \$40 stock would be \$10 in the money. If the buyer exercised the option at that point in time, he would be able to buy the stock at \$30 from the option and then subsequently sell the stock for \$40 on the market, capturing a \$10 payoff. So the intrinsic value represents what the buyer would receive if he decided to exercise the option right now. For in the money options, intrinsic value is calculated as the difference of the current price of the underlying asset and the strike price of the option.

For options that are out of the money or at the money, the intrinsic value is always zero. This is because a buyer would never exercise an option that would result in a loss. Instead, he would let the option expire and get no payoff. Since he receives no payoff, the intrinsic value of the option is nothing to him.

If the stock price of IBM is currently \$100, then the intrinsic value of a \$85 call option on this stock is \$15, which is the price of the IBM stock (\$100) minus the strike price of the option (\$85). For a \$110 put option on the same stock, the intrinsic value is \$10, which is the strike price (\$110) of the option minus the current price of the IBM stock (\$100).

Intrinsic Value (Underlying Stock Price: \$100)

Type	Strike Price					
	\$85	\$90	\$95	\$100	\$105	\$110
Call	\$15	\$10	\$5	\$0	\$0	\$0
Put	\$0	\$0	\$0	\$0	\$5	\$10

The intrinsic value of an option is calculated differently depending on if it is a call option or a put option, but it always uses the strike price of the option and the price of the underlying asset:

- In the money call options: $\text{Intrinsic Value} = \text{Price of Underlying Asset} - \text{Strike Price}$
- In the money put options: $\text{Intrinsic Value} = \text{Strike Price} - \text{Price of Underlying Asset}$

In the table above, we can see how the intrinsic value of call and put options changes based on the strike price when the price of the underlying stock is \$100. When an option is being sold, the intrinsic value should not be greater than the option's premium. If it is, any smart investor would buy and exercise it immediately, because the option is profitable. For example, a call option of \$80 with a \$4 premium for IBM stock, which is currently worth \$100, would have an intrinsic value of \$20 ($\$100 - \80). This is greater than the \$4 premium and represents a \$16 profit for the investor, excluding any fees or commissions paid. After an option is purchased, the intrinsic value can become greater than the premium if the value of the option increases. This is how option buyers can realize a profit on options.

Time Value of an Option

The time value of an option is an additional amount an investor is willing to pay over the current intrinsic value. Investors are willing to pay this because an option could increase in value before its expiration date. This means that if an option is months away from its expiration date, we can expect a higher time value on it because there is more opportunity for the option to increase or decrease in value over the next few months. If an option is expiring today, we can expect its time value to be very little or nothing because there is little or no opportunity for the option to increase or decrease in value.

Time value is calculated by taking the difference between the option's premium and the intrinsic value, and this means that an option's premium is the sum of the intrinsic value and time value:

- $\text{Time Value} = \text{Option Premium} - \text{Intrinsic Value}$
- $\text{Option Premium} = \text{Intrinsic Value} + \text{Time Value}$

For example, let's say our \$85 call on IBM stock has a premium of \$16. IBM stock is currently trading at \$100, so our intrinsic value is \$15 (\$100 - \$85). This means that our time value is \$1 (\$16 - \$15). What about purchasing an at the money or out of the money option? Remember that the intrinsic value of at the money and out of the money options is always zero. If we purchase the \$110 call option with a premium of \$2 on the same \$100 IBM stock, our intrinsic value is zero. That means the time value is \$2, or equal to the option's premium.

For options that are at the money (ATM) or out of the money (OTM), the premium will be equal to the time value, because ATM or OTM options always have an intrinsic value of zero. The premium being equal to the time value reflects the fact that ATM or OTM options could still increase in value, becoming in the money and potentially profitable before their expiration date. For options that are deep in the money (ITM), the premium may be mostly intrinsic value. This reflects the fact that the option does not need time to become in the money like ATM or OTM options, because it already is. It only needs time to become profitable for the option buyer.

Why Intrinsic and Time Value Matter

Intrinsic value and time value of an option help investors understand what they are paying for if they decide to purchase an option. The intrinsic value of the option represents what it would be worth if the buyer exercised the option at the current point in time (this is not the same as the profit). The time value represents the possibility that the option will increase in value before its expiration date. These two concepts can help investors understand the risk and reward of an option.

When an investor purchases an OTM or ATM option, whose premium is equal to its time value, there is a greater risk that the option will be worthless at its expiration date, since it is already out of or at the money. But the time to expiration also presents the opportunity that it will become in the money -- this is why it is important to understand the time value as a part of an option's premium. Due to the greater risk of the option having no value, OTM and ATM options have lower premiums than ITM options on the same underlying asset. You are paying less money than the investor who purchases the ITM option, and taking on greater

risk. However, this greater risk also comes with greater reward as OTM and ATM have larger percent gains in profit than ITM options.

When an investor purchases an ITM option, there is less risk that the option will be worthless at its expiration date because it is already valuable. This is reflected in the option's premium, which now includes the intrinsic value in addition to the time value. Because the risk is less, the option typically has a higher premium. You are paying more to decrease the risk that the option is worthless, but you are also accepting a potentially lower percent gain in profits.

Let's say you wanted to purchase both an ITM and OTM call on GE stock, which is currently trading at \$50 a share. One ITM call option you buy has a \$45 exercise price and a \$10 premium. An OTM call option you buy has a \$60 exercise price and a \$1 premium. Let's say the price of GE stock rises to \$62. The profit from your \$45 call would be \$7 (remember that profit is the difference in the price of the underlying asset and the strike price, or the intrinsic value, less the option premium):

- Profit = Intrinsic Value - Option Premium
- \$45 call intrinsic value: $\$62 - \$45 = \$17$
- \$45 call profit: $\$17 - \$10 = \$7$

This is a 70% increase from the \$10 premium you paid. The profit from your \$60 call would be \$1, which is a 100% increase from the \$1 premium you paid ($\$62 - \$60 - \$1 = \1).

Stock Price	\$45 Strike Price, \$10 Premium		\$60 Strike Price, \$1 Premium	
	Profit/Loss	Percentage	Profit/Loss	Percentage
\$50	-\$10	-100%	-\$1	-100%
\$55	\$0	0%	-\$1	-100%
\$60	\$5	50%	-\$1	-100%
\$61	\$6	60%	\$0	0%
\$65	\$10	100%	\$4	400%
\$70	\$15	150%	\$9	900%

As we can see in the table above, the OTM option has much larger percentage gains in profit than the ITM option when it does become profitable. However, it requires a very large increase in the value of the stock to reach these levels. In our initial example, the stock price was \$50. In order to realize the 900% return on the OTM option, the stock would need to rise in value to \$70 per share, which is a 40% increase from \$50.

In addition, the ITM option is profitable when the OTM option is not. If the stock price reaches \$60, the ITM option will generate a \$5 profit, but the OTM option will generate a loss of \$1. The ITM option is profitable in more circumstances than the OTM option, because it is profitable anytime the stock price is greater than \$55. The OTM option only becomes profitable once the stock price is greater than \$61.

Calculating Options Moneyness & Intrinsic Value

Value of an Option:

When traders talk about the value of an option contract, they tend to use a common set of terms to describe the varying levels of an option contract. The terms they use are time until expiration, time value, intrinsic value, and moneyness.

Moneyness:

Moneyness is a term to describe whether a contract is either “in the money”, “out of the money”, or “at the money”.

A call option is said to be “in the money” when the future contract price is above the strike price. A call option is “out of the money” when the future contract price is below the strike price.

DID YOU KNOW? - Approximately 20% of the total volume at CME Group is Options Volume. This is impressive given that options have been around only about 35 years while futures have a much longer history—150 years.

For a put option, the contract is said to be “in the money” when the future contract price is below the strike price, and “out of the money” when it is above the strike price. The term “at the money” refers to the strike that is closest to the underlying futures contract. When this happens both the call and the put option will be “at the money” at the same time.

The terms “in the money” and “out of the money” refer to the option contract itself and do not represent the profitability of your trade, nor does it depend on whether you have bought or written the option.

Time Value & Intrinsic Value:

When an option is in the money it is said to have intrinsic value, and when the contract is out of the money it has no intrinsic value. When an option expires out of the money, traders will say that contract has “expired worthless”. Intrinsic value is the value of the option if it expired at this moment.

Up to this point we described the value of an option contract at the point of expiration, but what is the value of the contract before expiration?

The value of an option is comprised of two parts, the intrinsic value and the time value. When added together, they give you the “option value”.

$$\text{Option Value} = \text{Intrinsic Value} + \text{Time Value}$$

When an option contract expires, the time value would be zero. At this point the option value is equal to the intrinsic value.

$$\text{Option Value} = \text{Intrinsic Value} + 0$$

Let's look at an example when the option has time value greater than zero. Suppose a call option will expire in one month. Here the option value will be higher than the intrinsic value. Even as the futures contract price moves around, the option value will still be greater than the intrinsic value, and that difference is the time value.

As time moves towards expiration, the time value shrinks or decays. The time value of an option (before its expiration date) will always be greatest when the option is at the money.

You can see the entire option value will always be greater than the intrinsic value until it reaches expiration.

Summary

There you have it, you now know how to use terms like moneyness, time value, and intrinsic value to express the value a put or call option.