
# Option Pricing

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# Purpose

Discuss how options are priced

Break down Intrinsic and Extrinsic Value in relation to an option's premium

Review how Volatility is a major factor in how the market's expectations can change option pricing

# How Options are Priced

Option Pricing Theory estimates an option contract's value based on the probability that the contract will expire In The Money (ITM).

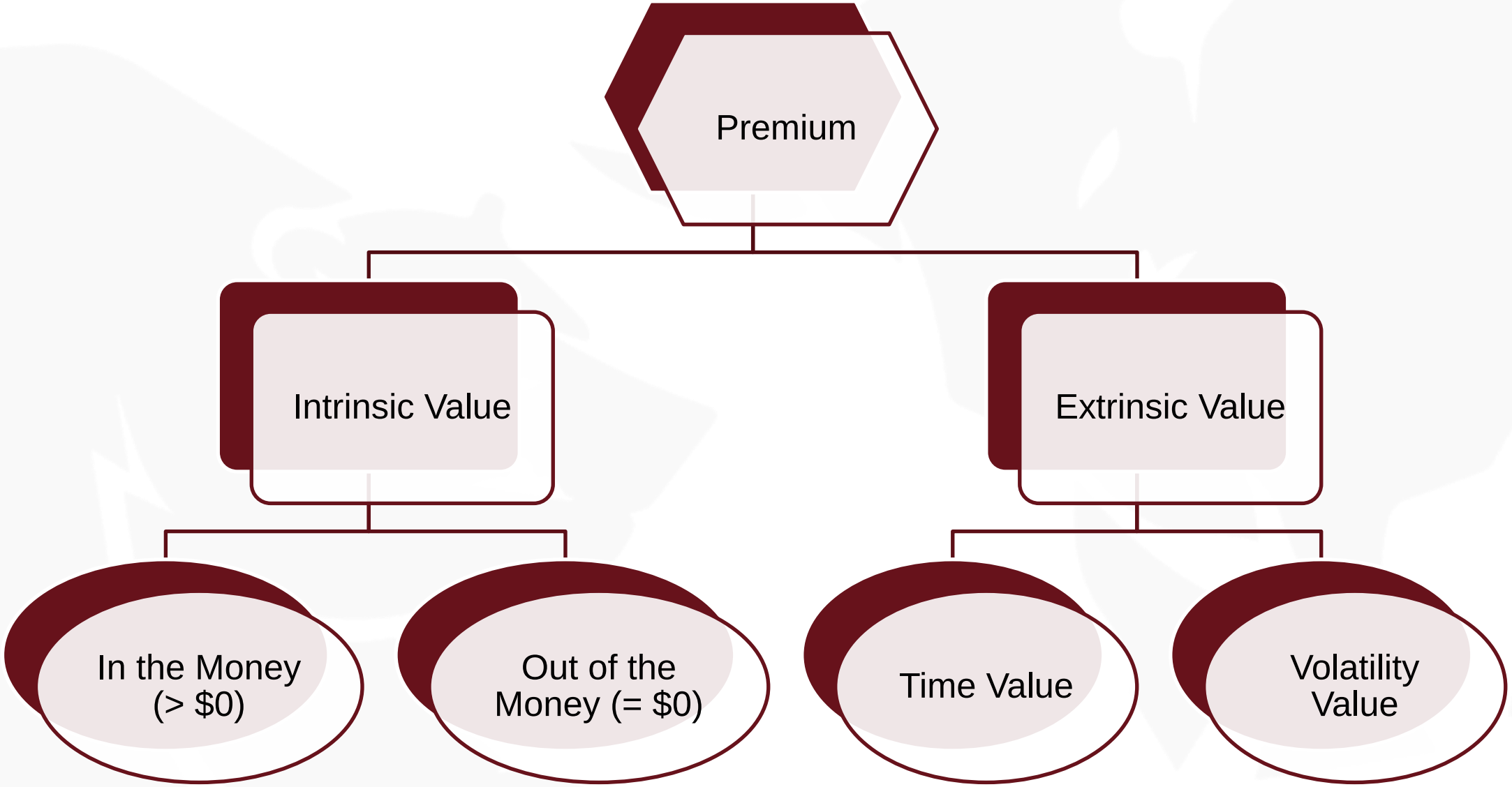
- How likely will the Strike Price be lower than (Calls) or higher than (Puts) the Stock Price
- Out of the Money (OTM) is when the Strike Price is higher than (Calls) or lower than (Puts) the Stock Price

Pricing Models derive the option's Fair Value based on several factors:

- Current Market Price
- Strike Price
- Volatility
- Time to Expiration
- Interest Rate

Such models include Black-Scholes, Binomial Tree, and Monte-Carlo Simulation.

# Premium


Premium
Intrinsic Value
Extrinsic Value
In the Money (> $0)
Out of the Money (= $0)
Time Value
Volatility Value

# Intrinsic Value

Value of any given option if it were exercised

- How much of the Premium can be derived from the difference in Strike Price vs Stock Price

**Calls**

Stock Price – Strike Price

Scenario: Stock XYZ Price = $120/Share

| Strike Price | ITM/OTM | Intrinsic Value |
|---|---|---|
| 100 | ITM | $20 |
| 110 | ITM | $10 |
| 120 | ATM | $0 |
| 130 | OTM | $0 |
| 140 | OTM | $0 |

**Puts**

Strike Price – Stock Price

Scenario: Stock XYZ Price = $175/Share

| Strike Price | ITM/OTM | Intrinsic Value |
|---|---|---|
| 150 | OTM | $0 |
| 160 | OTM | $0 |
| 175 | ATM | $0 |
| 190 | ITM | $15 |
| 200 | ITM | $25 |

# Extrinsic Value

If Intrinsic Value is the inherit value of the option contract, the remaining portion of the option's premium is considered the Extrinsic Value.

- Known as 'Time Value'
- Majority of pricing based on Time to Expiration and Volatility

Any Option trading OTM will have a Premium based solely on Extrinsic Value

Call

| Value | Price |
|---|---|
| Stock Price | $100 |
| Strike Price | $90 |
| Premium | $12 |
| Intrinsic Value | $10 |
| Extrinsic Value | $2 |

| Value | Price |
|---|---|
| Stock Price | $150 |
| Strike Price | $140 |
| Premium | $4 |
| Intrinsic Value | $0 |
| Extrinsic Value | $4 |

Put

# Volatility

Refers to changes in the Market Price of the underlying asset

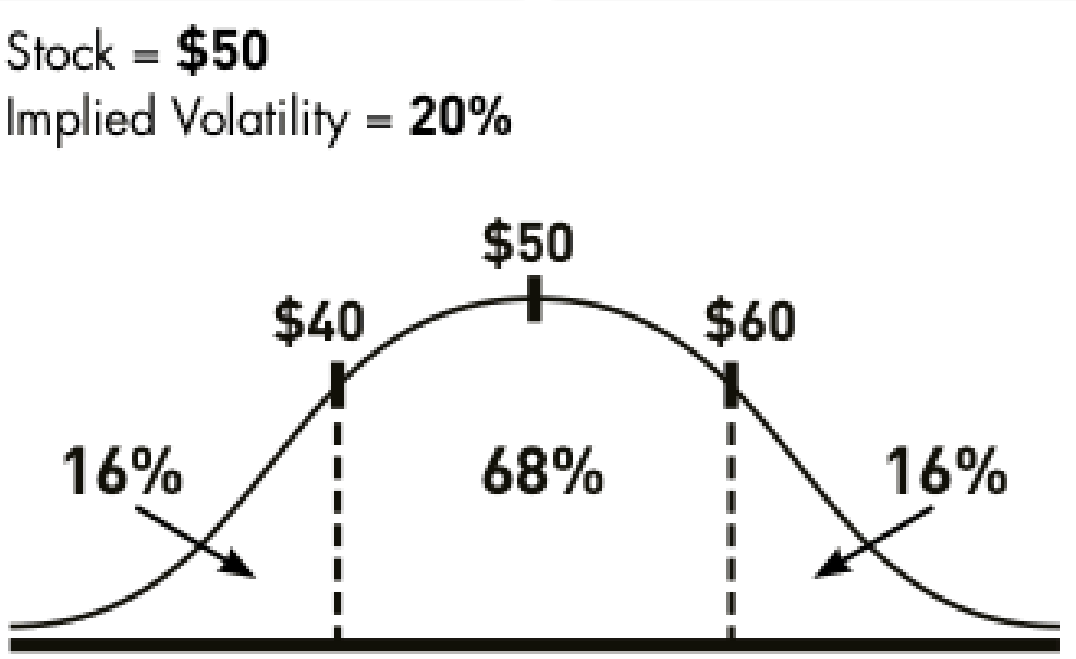
A portion of an option's pricing is based on the market's prediction of the underlying degree of movement in the future.

- Implied Volatility (IV)
- Realized Volatility (RV)

Higher volatility can make options more expensive

Tends to increase around major events (Earnings, Known Catalysts, FOMC, etc.)

Typically, you want to buy options when volatility is low and sell options when volatility is high




*Implied Volatility Curve showing Standard Deviation Probability*