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Delta

Today our topic, subject and lesson are about an important aspect of finance which is Option Greek: Delta. When it comes to option traders Option Greeks are vital tools. Option Greeks help to improve investors' options positions, therefore, gaining deeper insight into their options positions and thus making more informed decisions. Hence, this issue of finance will break down what Delta is, why it matters and how readers can calculate it and use it for trading options.

Delta and its important

In simple words, the underlying asset price changes the sensitivity of an option price represented by a delta. Therefore, Delta points, help and provide investors with the direction of the path of the underlying asset's price changes similar a compass helps to find the right direction and understand the way of the option's value movement.

Call options Delta behave

First, Delta takes on a positive value ranging from 0 to 1 which means an increase in the underlying asset price indicates the option's price value also increases. Like an ice cream melting as the sun gets hotter, hence a positive correlation.



Call Option Data

Put options Delta behave

Conversely, contrariwise and inversely, Delta of the put option behaves the oppositely of a call option. Therefore, it is negative and generally ranges from 0 to -1. Furthermore, it indicates that a rise in the underlying asset price will lead to a decline in the put option's price. With an example it becomes easier to understand, therefore, let's think of exercise as the underlying asset price and the body weight is as delta for the put option. As a person is involved and engage in regular exercise (similar increase in the stock price in on the financial market), therefore, the person's body weight (put option delta) decline.



Put Option Data

Delta a Static Value

Delta is more than just a static value; hence, it is like a slider with a range of possibilities ranging from -1 to 1. For instance, a delta of 0.5 implies statically that for each \$1 increase in the underlying asset's price, the trader's option's value is expected to increase by \$0.50. It's analogous to realising that your ice cream gets softer by 50% for every degree it warms up. You are now acquainted with the behaviour of Delta. Next, let's dive into the nuts and bolts of how to calculate Delta.

How to Calculate Delta?

Delta can be calculated using the following:

$$\text{Delta} = \frac{\text{Change in Option Price}}{\text{Change in Underlying Asset Price}}$$

Let's illustrate this with an example:

Suppose a stock XYZ is trading at \$100, and the \$100 strike call option price is \$5. When the price of the stock XYZ changes from \$100 to \$101, then the \$100 strike call price changes from \$5 to \$5.5. What is the delta of this option?

$$\text{Delta} = \frac{\text{Change in Option Price}}{\text{Change in Underlying Asset Price}}$$

$$\text{Delta} = \frac{(\$5.5 - \$5)}{(\$101 - \$100)}$$

$$\text{Delta} = 0.5$$

In this way, you can calculate the Delta of any option. However, doing this manually for every option can be a tedious process. You can use the mibian Python library to programmatically compute Delta of any option.

How Traders Use Delta?

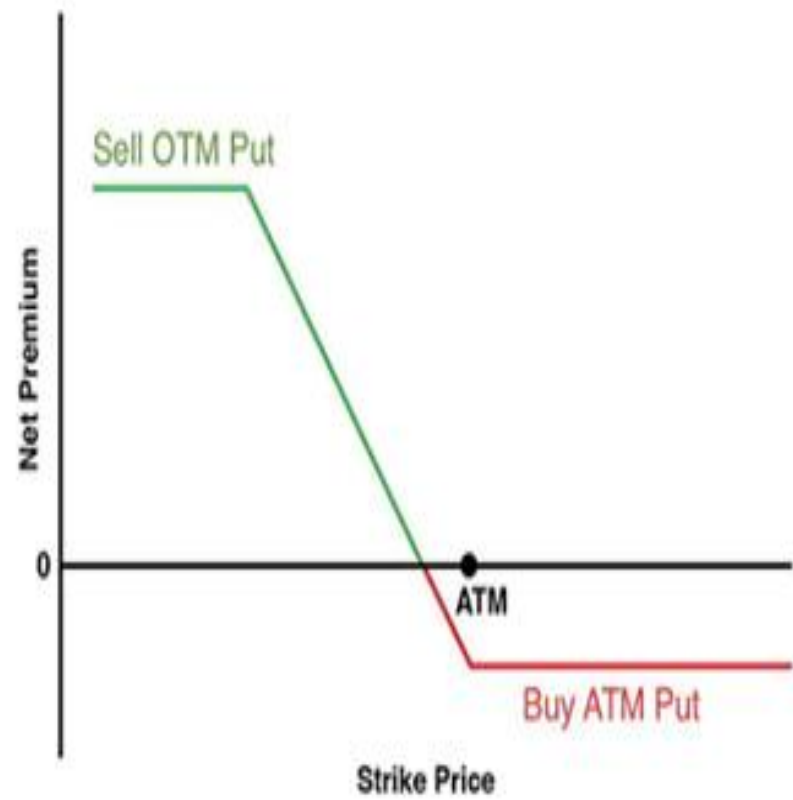
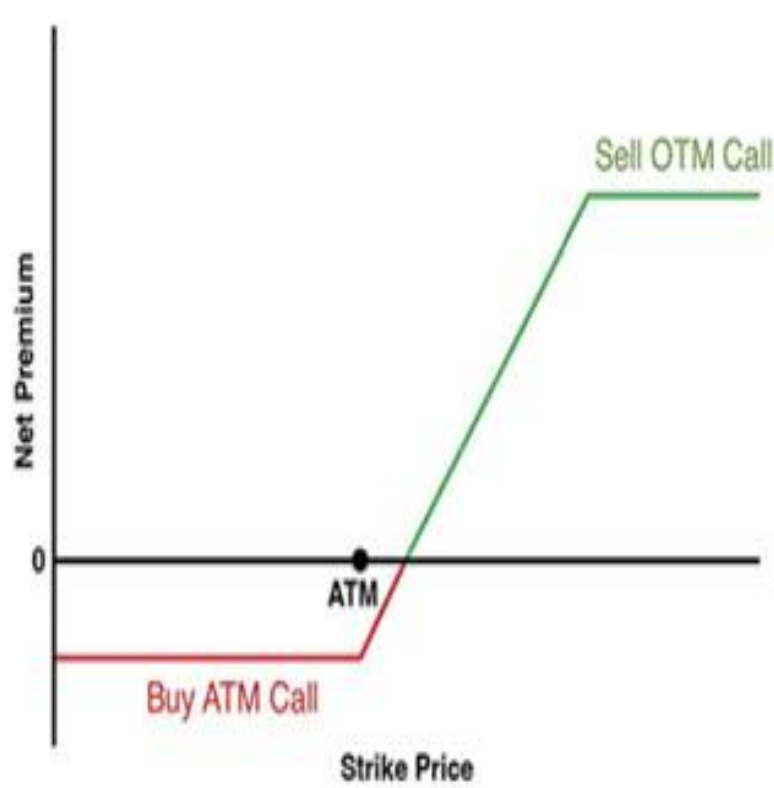
Traders find Delta invaluable for a variety of reasons. It helps them determine position sizes, manage risk, and develop trading strategies. If you hold a positive view on a stock, one common strategy is to purchase a call option. However, it's essential to be aware that acquiring a call option introduces exposure to various Greeks, such as Vega, Theta, etc, potentially influencing the option's price. To partially mitigate the impact of these other Greeks, you may opt for a bull call spread to capitalise on bullish price movements.

Conversely, if your outlook is bearish, you can either buy a put option or employ a bear put spread.

Nevertheless, prior to implementing any trading strategy, it is crucial to conduct a thorough backtest. This process allows for an evaluation of the strategy's effectiveness, providing insights into its historical performance.



Options Spread Trading



Options Backtesting

Entry Conditions

We will check the following conditions for entry:

1. If sma_20 is greater than sma_50 and ADX value is greater than 20 then we will generate signal as 1.
2. If sma_20 is less than sma_50 and ADX value is greater than 20 then we will generate signal as -1.

```
# SMA entry condition
condition_1 = (data['sma_20'] >= data['sma_50'])

# ADX entry condition
condition_2 = (data['ADX'] >= 20)

# SMA entry condition
condition_3 = (data['sma_20'] < data['sma_50'])

# Generate entry signals
data['signal'] = np.where(condition_1 & condition_2, 1, np.nan)
data['signal'] = np.where(condition_3 & condition_2, -1, data['signal'])
```

Exit Conditions

signal stores 0 when days_to_expiry is less than days_to_exit_before_expiry.

We will exit the trade if the net_premium on the given date crosses above the take-profit, below the stop-loss or at expiry. The other condition for exit can be difference in value of signal and current_position. For example, if the current_position is 1 and the signal is -1 we will exit the position. We can enter the trade again if the entry conditions are met. The conditions for SL and TP have been defined in the next part of the code.

```
# Generate signal as 0 when days to expiry is less than days to exit before expiry
data['signal'] = np.where(data.days_to_expiry <= config['days_to_exit_before_expiry'], 0, data['signal'])
data.tail()
```

Date	spot_open	spot_high	spot_low	spot_close	Expiry	futures_close	ADX	sma_20	sma_50	days_to_expiry	signal
2022-05-20	16043.80	16283.05	16003.85	16266.15	2022-05-26	16253.25	25.945619	16513.4950	16949.414	6	-1.0
2022-05-23	16290.95	16414.70	16185.75	16214.70	2022-05-26	16183.35	24.958370	16465.6325	16953.439	3	0.0
2022-05-24	16225.55	16262.80	16078.60	16125.15	2022-05-26	16104.70	24.320691	16424.1925	16949.035	2	0.0

Trade Generation

```
-----
Trade No: 1 | Entry | Date: 2019-04-01 00:00:00 | Premium: -70.8 | Position: 1.0
Trade No: 1 | Exit Type: Expiry or Signal Based | Date: 2019-04-22 00:00:00 | Premium: 11.5 | PnL: -59.4 | Cum PnL: -59.4
-----
```

```
Trade No: 2 | Entry | Date: 2019-04-26 00:00:00 | Premium: -147.4 | Position: 1.0
Trade No: 2 | Exit Type: SL | Date: 2019-05-13 00:00:00 | Premium: 45.8 | PnL: -101.6 | Cum PnL: -161.0
-----
```

```
Trade No: 3 | Entry | Date: 2019-05-14 00:00:00 | Premium: -142.6 | Position: 1.0
Trade No: 3 | Exit Type: TP | Date: 2019-05-20 00:00:00 | Premium: 266.2 | PnL: 123.6 | Cum PnL: -37.4
-----
```