

# White Papers



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## Web-based, Electronic Retail Trading of ATM Binary Options

### Abstract

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*An easy-to-use, web-based electronic trading platform plus several market innovations designed to simplify the trading decision are generating excitement and activity into retail binary options trading. This White Paper will describe binary options in theory and in practice, study the binary options purchase decision and conclude with an illustrative example.*

A binary option, also referred to as a digital option or fixed return option, has only two possible outcomes at expiration each of which pays out a fixed value depending upon whether or not a certain condition has been fulfilled. In most cases, the value of a binary option is based upon the price of an underlying security or asset with the condition being that the price must reach or exceed a certain level for the option to expire in-the-money and pay the higher value. This higher value can represent a return of 70% or even more of the amount initially invested in the option.

A distinguishing feature and investment advantage of a binary option is that it need only expire in-the-money by just one tick to pay the higher value. Binary options thus provide a way for customers to earn a significant return even when markets are relatively tranquil. In contrast, a larger market move is required to earn positive return on the purchase of a regular option, whether a call or put, as the expiration price must lie sufficiently beyond the strike price to at least recoup the cost of the option premium.

### The Evolution of Binary Options

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Binary options have, for some time, been available in the over-the-counter market but they are typically marketed as exotic options to institutional clients and often packaged with other derivative-type products. In the United States, the retail customer had to wait until mid 2008 with the listing on the American Stock Exchange and the Chicago Board Options Exchange of binary options on select stocks and various indices. However, these exchange-traded binary options have not attracted any significant retail customer base.

During the last few years, though, a web-based electronic retail market has developed in binary options that is becoming popular among investors, especially those with little prior investment experience or who have limited risk capital. Indeed, this nascent binary options market is reminiscent of where the retail forex market was eight or ten years ago. It represents a new investment alternative with low-cost entry where all trading is conducted over a web-based, real-time platform on which customers can trade these options with a simple click of the mouse. Online tutorials and a demo trading account are also usually provided. But unlike the retail forex market that over the years at least in the United States has become more expensive in terms of curtailed leverage and rising minimum account funding requirements, binary options are and should continue to be affordable. In fact, a customer can select their desired investment in a binary option to match their desired risk exposure starting from as low as U.S. \$50 or even less.

Like the over-the-counter market, web-based trading of binary options is between the customer who buys and the principal dealer who sells. The principal dealer earns income by selling options at a slight premium or mark-up to their theoretical fair value and, in turn, typically does not charge the customer a commission fee. In general, once an option is purchased, it is held until expiration and cannot be sold nor can it be exercised prior to expiration. Binary options commonly expire in one hour and can be purchased up to 10 minutes prior to expiration with new options being offered every hour during the trading day.

### Above/Below Binary Options

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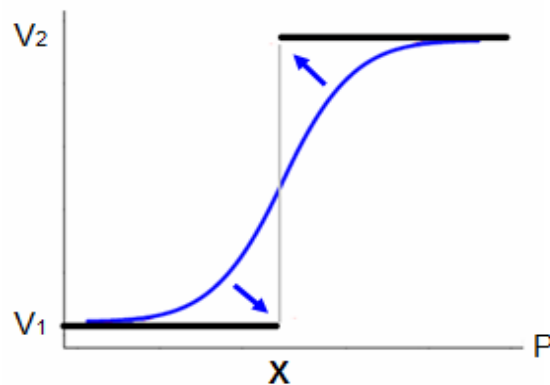
While several types of binary options are available in the retail market, the most common is the above/below or high/low binary option. This binary option will return the maximum value if the option expires in-the-money meaning that the expiration price is above the option's strike price in the case of a binary call option or below the option's strike price in the case of a binary put option. At any given time that a binary option, whether call or put, is offered, the strike price is the current market price of the underlying instrument and buying that option "locks in" the market price as the strike price.

The above/below binary option reduces the investment decision to one of pure direction: If customers expect prices to rise, then they will buy a binary call option and if they expect prices to fall, then they will buy a binary put option. This simplicity appeals to many beginning investors especially those who view regular options trading as being complex and even overwhelming given the wide range of available strike prices and maturities associated with any particular market. Moreover, the short life of a binary option means that the customer need only have to predict price movements over, say, the next hour and not over the subsequent days or weeks that is typically required when buying a regular option.

### Valuation of an Above/Below Binary Option

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The diagram below shows the expiration value (solid black lines) and theoretical value before expiration (blue curve) of an above/below binary call option that has two values at expiration,  $V_1$  and  $V_2$  where  $V_2 > V_1$ . The greater expiration value will be realized if the option expires in-the-money meaning that the price of the underlying instrument,  $P$ , at option expiration is greater than the strike price of the option,  $X$ .



Like their regular or vanilla counterpart, the theoretical value of a binary option prior to expiration responds to changes in the component variables. For example, since the theoretical value is a smooth function in  $P$ , it can be differentiated with respect to  $P$  and this provides the delta of the binary call option or price sensitivity with respect to changes in price of the underlying instrument. As the binary option approaches expiration, the theoretical value will collapse to the expiration value, as indicated by the blue arrows. As well, the theoretical value is sensitive to the volatility in price of the underlying instrument, widening away from the expiration value around the central inflection point as volatility increases.

Binary options also have some unique differences. For example, so long as the probability density function of price changes used to compute a theoretical option price is symmetrical around a mean of zero – as is typically the case – then the theoretical value of an above/below at-the-money binary option will lie mid way between the two expiration values and this is invariant to changes in time to expiration and volatility. Also, an above/below at-the-money binary call option will have the same theoretical value as an above/below at-the-money binary put option that has the same payout.

### The Investment Decision

The certainty or probability that a customer needs to have of a purchased above/below binary option expiring in-the-money can be calculated by comparing the expected net gain with the expected net loss as follows:

$$p(\text{NET GAIN}) + (1-p)(\text{NET LOSS}) = 0$$

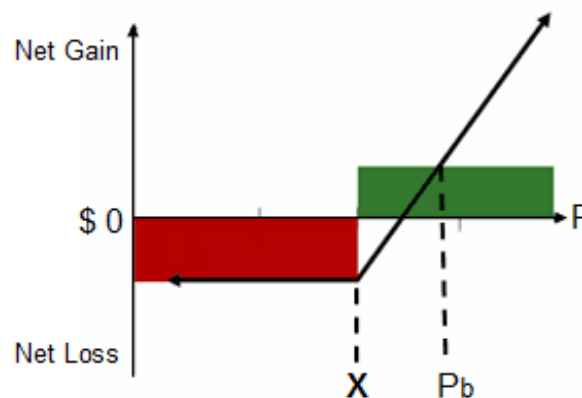
where  $p$  is the probability that the option expires in-the-money. If  $C$  is the cost of the binary option, then:

$$\text{NET GAIN} = V_2 - C \quad \text{and} \quad \text{NET LOSS} = V_1 - C \quad \text{so that,}$$

$$p = -(V_1 - C) / (V_2 - V_1)$$

Consider, for example, an above/below binary option that costs \$100 and will return \$170 if the option expires in-the-money and \$10 otherwise. Using the formula above, a customer will buy this option only if they assign a probability greater than 56% to the likelihood that it will expire in-the-money. Since a probability of 50% represents a pure guess, the customer need only be a little sure of their price prediction. Put another way, over repeated trials, if the customer is correct at least 56% of the time in their price expectation, then buying binary options should result in net profit.

In contrast and as illustrated in the diagram below, buying a regular option that is similar to its binary counterpart is likely a more difficult decision as the price of the underlying instrument must move farther in order to outperform the binary option.

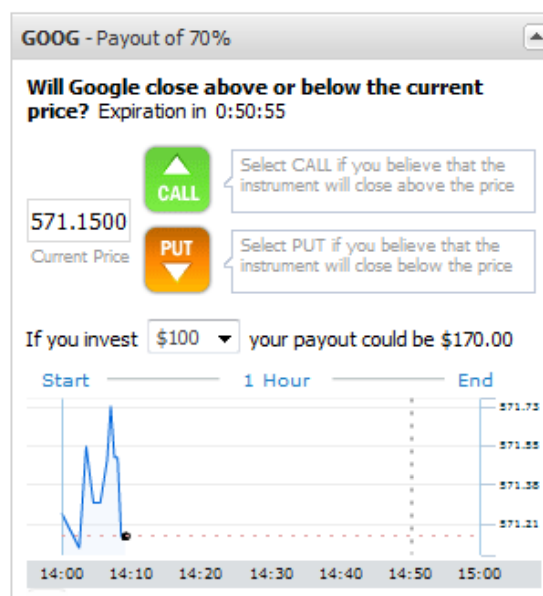


*The price of the underlying instrument at option expiration need only be above the strike price,  $X$ , of this above/below at-the-money binary call option in order to realize the option's maximum value (green shaded area). In contrast, the price of the underlying instrument must rally by more, to beyond  $P_b$ , before the corresponding regular or vanilla call option earns a greater payout. Many traders may have more confidence in their ability to predict the former rather than the latter. For these traders, binary options may be the logical choice.*

## Above/Below Binary Option Example

Web-based, electronic retail trading of binary options is available on the major foreign currency rate pairs, select precious metals, and several actively-traded U.S. exchange-listed common stocks.

The image below illustrates the simplicity of the web-based trading approach. In this example, a customer can purchase above/below binary call and put options on Google (GOOG) that have a 70/10 percent payout. These one-hour binary options started trading at 2:00 p.m. and will expire about 51 minutes later at 3:00 p.m. They stop trading 10 minutes prior to expiration as indicated by the vertical dashed line at 2:50 p.m. The current share price of Google as shown is \$571.15 and the tick-by-tick movement of this share price since the options started trading is shown by the blue line chart.



A customer who anticipates that the share price of Google at 3:00 p.m. will be above the current price of \$571.15 will click on the green CALL icon to purchase a binary call option struck at the current price. Alternatively, a customer who anticipates that the share price of Google at 3:00 p.m. will be below the current price of \$571.15 will click on the orange PUT icon to purchase a binary put option struck at the current price. In either case, if the customer's price expectation turns out to be correct, then the customer will earn a net return of 70% of the amount invested in the option. In this case, a \$100 investment will return \$170. If not, then the customer will receive only 10% of the initial investment or, in this case, will receive \$10 resulting in a net loss of \$90. After purchase, the customer can watch the price of Google progress on a tick-by-tick basis right through to 3:00 p.m. at which time an expiration price will be displayed on the trading platform.

## Conclusion

Web-based, electronic retail trading of binary options is in a growth phase. In addition to the features described above, customers can no doubt look forward to an increase in the range of underlying instruments that can be traded as well as enhancements and extensions to the functionality of the electronic trading platform, all of which will further drive customer interest into retail binary options trading.

## Disclosures

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INVESTING IN BINARY OPTIONS INVOLVES RISK OF LOSS AND IS NOT APPROPRIATE FOR EVERYONE. ONLY RISK CAPITAL SHOULD BE USED. BINARY OPTIONS TRADING MAY BE PROHIBITED BY LAW IN SOME AREAS. CUSTOMERS SHOULD CHECK WITH THEIR LOCAL REGULATORY AUTHORITIES.

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