Demand Derivatives

RealDay™ Strategies

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# Primer on Pricing

RealDay options are an innovation in options design. They were created to provide the hedger or trader a way to gain exact close-to-close exposure for one trading day. No other listed instrument can offer such precise coverage. The options accomplish this task by delaying the date that the strike price is determined — the trading day prior to option expiration. On that day, the strike is set based on the exact closing price of the underlying asset. Then, at the end of the next trading day, exercise is automatic and cash settled to, once again, the exact closing price of the underlying asset.

## Anticipatory Period and Active Period

On the following page is a pictograph of a RealDay option as it progresses through its life from listing to expiration. Essentially, there are two periods: the period before the strike price is set — the "Anticipatory Period" — and the period after the strike price is set — the "Active Period." The active period is always exactly one trading day. The Anticipatory Period is longer and encompasses all times/days prior to the strike price's being set. Note that the first trading day will be at least two weeks prior to expiration. Since, in the Active Period, the option behaves similarly to a standard option, this strategy article will not focus on how standard options behave, as this information is readily available.

## No Decay

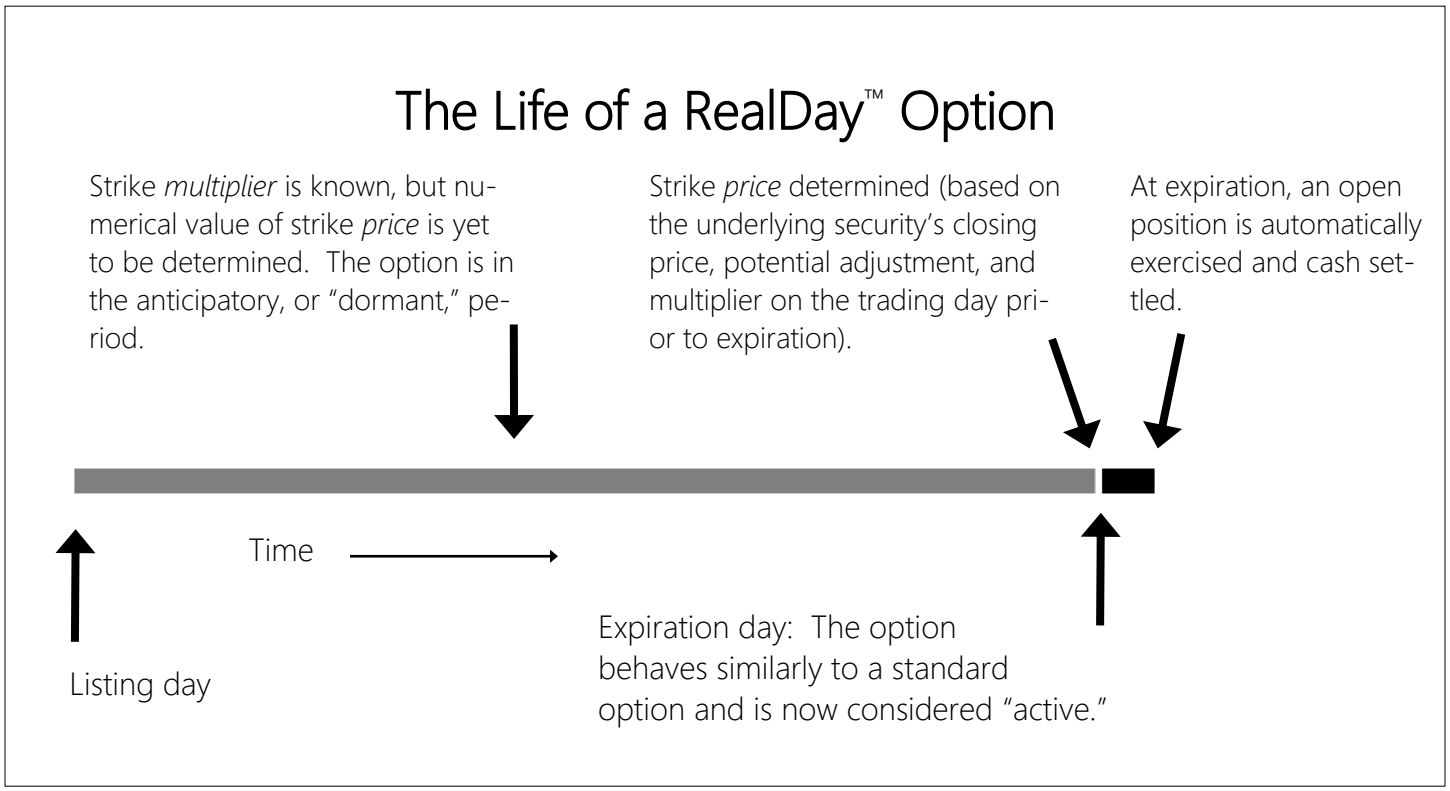
An interesting feature of RealDay options in the Anticipatory Period is that they do not experience time decay. In other words, they have zero theta.

## Theoretical Value

The theoretical value of a RealDay option is essentially unchanging during the Anticipatory Period (assuming that the inputs do not change). For example, if the theoretical price of a RealDay option is $0.97, then that same $0.97 theoretical price is valid for the entire Anticipatory Period. Of course, in the real world, all inputs may not remain constant — hence, the theoretical price may change.

## Options Model

Because of the delayed strike feature, one would assume that a special options model is needed. And, to be perfectly accurate, this is true. However, there is a way to "trick" a standard options model to calculate a theoretical value of a RealDay option with enough accuracy that the resulting difference is inconsequential.




## Inputs

In a standard options model, there are five inputs: Underlying price ("Underlying"), strike price ("Strike"), risk-free interest rate ("Rate"), days to expiration ("Days"), and volatility ("Vol"). In a model designed specifically for a forward-start option, there is another input for the date that the strike price is determined.

## Underlying

The price level of the Underlying does and does not have an effect on the theoretical value of a RealDay options premium. What is meant is that the *relationship* between the Underlying price and the option premium is unchanging. However, the option *premium* itself must change as the Underlying changes in order to keep the relationship constant. For example, suppose that the Underlying price is 100 and the theoretical value of the RealDay option is 0.42 (i.e., 42 basis points or bps). If the Underlying were to double to 200, the same 42 bps relationship would mean that the premium needs to rise to 0.84. Notice how this is very different than a standard option. Typically, a standard call option would have an immense return if the Underlying were to double. In the case of a RealDay option, the price would double only with respect to the premium, but would not change in percentage terms. As a final example, and continuing with the above, suppose that the underlying is an equity index and the Underlying makes a large upward move of, say, 5%, from 100 to 105. The theoretical premium will rise from 0.42 to 0.44. In other words, except for very extraordinary moves in the Underlying, the theoretical premium of a RealDay option is expected to vary only a few ticks due to the movement of the Underlying.

## Strike

If one looks closely at an options model, it is predominantly the relationship between the Underlying and the Strike, rather than the two price levels, that determines the theoretical premium. While we are used to inputting both the Underlying and a fixed Strike price into an options model, again, we can "trick" the standard options model to calculate the correct theoretical price of a RealDay option by using the current Underlying and the relationship between the Underlying and the Strike. For example, if we purchased the at-the-money (ATM) RealDay call option (i.e., Strike multiplier 1.000), then to calculate the correct theoretical options premium use the same Underlying price for both the Underlying and the Strike. If the Strike is not the ATM, but, say, the 1.010, then use the Strike that is 1% higher than the Underlying, etc.

### Rate

Because RealDay options are active for only one day, a changing Rate will have an immaterial effect on a RealDay option's theoretical premium.

### Days

The Active Period for a RealDay option is always exactly one trading day (but could be more calendar days if there is a weekend or holiday). To "trick" a standard option model into calculating the correct theoretical premium of a RealDay option, enter a maximum of one day, regardless of the time remaining to expiration. For example, if there are two weeks to expiration, enter 1 into the Days parameter. If there are two days remaining, again, enter 1 for the Days parameter, etc. Only if the time remaining is less then a day should the Days parameter be adjusted to less than 1 day.

### Vol

The final input into the options model is the annualized volatility. This value should be estimated just as one would do for any option. Be aware that in the case of a RealDay option, one is forecasting the volatility for only one specific day in the future (then annualizing that one-day value). For example, suppose that Vol is estimated at 20%, the Underlying is 100, and the Strike is the ATM; then the theoretical value of a RealDay call option is 0.42. If Vol were to double, then the theoretical value should double as well — to 0.84. Note that while a doubling of the Underlying and a doubling of Vol has the same effect on the RealDay option premium, it is much more likely for Vol to make a large move than for most Underlyings to do so.

Please note that the convenient linear property of the ATM option's price change with respect to Vol changes is unfortunately not the same for an out-of-the-money RealDay option.

### Putting It All Together

Again, we are only focusing on the anticipatory or dormant period. In the case of a RealDay option, the following table summarizes the effect of each of the five inputs into an options model.

**Effect on Theoretical RealDay Options Premiums in the Dormant Period**

| | Effect | Comments |
|---|---|---|
| Underlying | Very Small | Even a relatively large move in the Underlying has a small effect on a RealDay option's premium. |
| Strike | None | Until the Strike is fixed, it will remain at the same relationship to the Underlying and therefore has no effect. |
| Rate | None | For a one-day option, a changing Rate is so inconsequential that it can be ignored. |
| Days | None | The active period of a RealDay option is exactly one trading day, regardless of the length of time to listing. |
| Vol | Very Large | Implied volatility has, by far, the largest effect on a RealDay option premium. |

"To 'trick' a standard option model into calculating the correct theoretical premium of a RealDay option, enter a maximum of one day, regardless of the time remaining to expiration."

"Since the effect on the ATM RealDay option premium is linear as to the Underlying as well as to Vol, simply remember that an Underlying of 100 and a Vol of 10% equates to 21 bps."

Theoretical ATM RealDay Options Premiums in the Dormant Period

| Underlying | Volatility | | | | |
|---|---|---|---|---|---|
| | 10% | 15% | 20% | 25% | 30% |
| 105 | 0.22 | 0.33 | 0.44 | 0.55 | 0.66 |
| 104 | 0.22 | 0.33 | 0.43 | 0.54 | 0.65 |
| 103 | 0.22 | 0.32 | 0.43 | 0.54 | 0.65 |
| 102 | 0.21 | 0.32 | 0.43 | 0.53 | 0.64 |
| 101 | 0.21 | 0.32 | 0.42 | 0.53 | 0.63 |
| 100 | 0.21 | 0.31 | 0.42 | 0.52 | 0.63 |
| 99 | 0.21 | 0.31 | 0.41 | 0.52 | 0.62 |
| 98 | 0.20 | 0.31 | 0.41 | 0.51 | 0.61 |
| 97 | 0.20 | 0.30 | 0.41 | 0.51 | 0.61 |
| 96 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 |
| 95 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 |

Notice how the theoretical premiums change very little for a wide range of underlying prices (look down a single column). However, the theoretical premiums change fairly dramatically as implied volatility changes (look across a single row).

## Table Facts

The above table will come in handy when trading ATM RealDay options. Unlike standard options, which need a computer programmed with an options model to calculate the theoretical premium of any option throughout its life, a trader needs only the above table to know the theoretical premium of the ATM RealDay option during the dormant period. For example, suppose that the trader's estimate of volatility is 10% but that the Underlying is trading at 250. In the table find the 10% volatility and the 100 Underlying to get 21 bps. Next simply multiply the 21 bps by 250/100 to get a 0.53 premium. In fact, one does not need the table at all. Since the effect on the ATM RealDay option premium is linear as to the Underlying as well as to Vol, simply remember that an Underlying of 100 and a Vol of 10% equates to 21 bps. Then, for example, if the Underlying is 184 and the Vol is 27%, multiply 21 bps by 184/100 and 27%/10% to get a theoretical RealDay option premium of $1.04 — no option model needed!

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