Average Priced Options

How Future Price is Determined

An APO's underlying is based on an average of future price of active trading days in a calendar month.

For Example

To determine the Future price for the June 07 CL APO, we will need to use the Future prices of July 07 and August 07.

Let's begin with the first trading day of June and we will be able to see how the price is determined each day.

Looking at the calendar, we know that June has 21 trading days.
The first 13 of those days trades the N07 contracts, which is until they expire on 6/20.
The last 8 trading days of June use the Q07 contracts.

The Future price of N07 = X
The Future price of Q07 = Y
Daily APO Future price of M07 = Z
Average of settled Future price for M07 = N

So the first trading day of June the equation to figure out the APO Future price is:

$$(13 / 21 * X) + (8 / 21 * Y) = Z$$

Z is now a stored priced for that day.
So N = Z

The second trading day will then be:

$$(12 / 21 * X) + (8 / 21 * Y) + (1 / 21 * N) = Z$$

The third trading day will then be:

$$(11 / 21 * X) + (8 / 21 * Y) + (2 / 21 * N) = Z$$

The fifteenth trading day will then be:

$$(0 / 21 * X) + (7 / 21 * Y) + (14 / 21 * N) = Z$$

How It Moves

For the backmonths, the APO Future price moves just like any other commodity would. However, each day into the APO month would produce less change. This is because a stored average of prices is always factored in and even if there was a significant drop in the market one day it would only produce a small change in the APO's Future price. So the closer it gets to the end of the month the less the price would change.

Volatility Change

As APOs get closer to expiration the volatility begins to decrease. This is because each day accounts for a small percentage of the expiring settlement price. So, backmonth APOs generally have similar Vols to their American counterpart.

Theta Change

Unlike American and European Options, APOs actually have a decrease in theta as it gets closer to expiration. This is because the underlying has less of a chance to move the closer it gets to expiration.

How They are Settled

APOs are cashed settled and can only be expired on expiration day, which is the last trading day of the month.

Additional Info

1) Because the Curran Asian Approximation model calculations must iterate through the days in the averaging period, it is NOT possible to use fractional days to evaluate them.

2) Because Energy APOs derive from an average price swap which is calculated based on BUSINESS days, you need to be cognizant of how they will decay over time, especially during the averaging period. For example, on Monday through Thursday, moving forward one calendar day is typically the same as moving forward one business day. Therefore, theta will be fairly consistent during the week. However, on a Friday, if you look forward to Saturday, you will move forward one calendar day, but zero business days. Therefore the APO model calculations are really NOT valid when run on non-business days. To compensate for this, to calculate theta we will move forward to the next business day (i.e. Monday), and re-evaluate the option, then divide the change in price by the number of CALENDAR days to the next BUSINESS day. Though this will smooth out the theta to some extent, you will still have a jump in theta when comparing Monday through Thursday with a Friday. This is due to the fact over the weekend; the APO will lose three calendar days, but only one business day. This mismatch is unavoidable unless you switch to an all business day calculation for your bullet options and for your Asian options.

3) When rolling your account with Asian options, it is probably a good idea to roll on the current date. This is because if you move backwards one day, you will increase the number of calendar days to expiration by one, but NOT the number of days past in the averaging period. This is because the number of days past in the averaging period, and the average price to date are fixed based on the latest settlement price/date. Since this is static, we cannot move backwards in time during the averaging period. Therefore, if you roll your position with the value date set to the previous calendar day, your starting p&l will NOT equal your theta because your theta assumes that one calendar day passes AND one day passes in the averaging period, whereas in this case one calendar day will pass, but zero days will be added to the number of days past in the averaging period.

4) When linking volatilities between bullet options and Asian options, the Asian options will get their volatilities based on a simple weighted average of the bullet option based on number of days in the averaging period. However, there can be some bias in this method because the bullet options expire at different times than the Asians. For example, when evaluating at AO M07 option, it will take volatilities from the N07 and Q07 CL options. Since the Q07 options expire several weeks after the expiration of the M07 AO options, the Q07 component of the volatility is probably

overstated somewhat if you assume that the Q07 future is expected to get more volatile as it approaches expiration.

5) Because the value of an option during the averaging period is based on the number of days past in the averaging period, it is important to note that an average price option will change value once a settlement price is known. Theoretically, an APO should decay immediately after the closing range is finished for the day. However, our system does not retrieve settlement prices until they are all officially posted by the Exchange at around 7pm. Therefore, even if you type in settlement prices, PitTrader will not know that you intend those prices to be settlements, and will not change the number of business days past in the averaging period. This will cause your p&l to change once you download settlements for the day due to the fact that a new fixing date is now known by the system.

6) In order to get an accurate Vega, you must switch your Vega calculation method to the most accurate method – “Iterate with Model Derived Option Values”. This can be selected on the option parameters form on the Model/Smile tab. A future release of PitTrader will ensure that you cannot use any other method, but for now please ensure that you are using the proper method.