Research Note – Extending the Surface

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Summary

- In the upcoming major release of IvyDB US 4.0, OptionMetrics will be extending its surface to include a 10-day maturity curve along with a new call and put delta grid points of 10,15,85,90.
- This research note provides an overview of the implications for IvyDB US customers.

OptionMetrics has implemented a 10-day curve in order to create a standardized surface which closely mimics the volatility of weekly contracts. Additionally, we have extended our delta grid calculation to include deep in-the-money and deep out-of-the-money implied volatilities for calls and puts. However, the short maturity surface and new delta points carry several notable features which are not present in longer maturity surfaces. This note will discuss those properties.

1. 10-Day curve Prior to the Introduction of Weeklies

In the volatility surface file, OptionMetrics will be backdating all historical data to include a short-maturity curve. For SPX options the surface will be populated beginning on 10-28-2005, for other major indices starting on 06-04-2010, and for single-name options on 07-05-2010. These dates coincide with the introduction of weekly options on each type of security. Prior to these dates, the lack of weekly options results in unacceptably noisy 10-day surfaces, which is a result of the kernel smoother algorithm interpolating from distant maturity options and deltas. The 10-day surface is also not suitable for securities that currently do not list weekly option series.

2. Impact on Longer Maturities

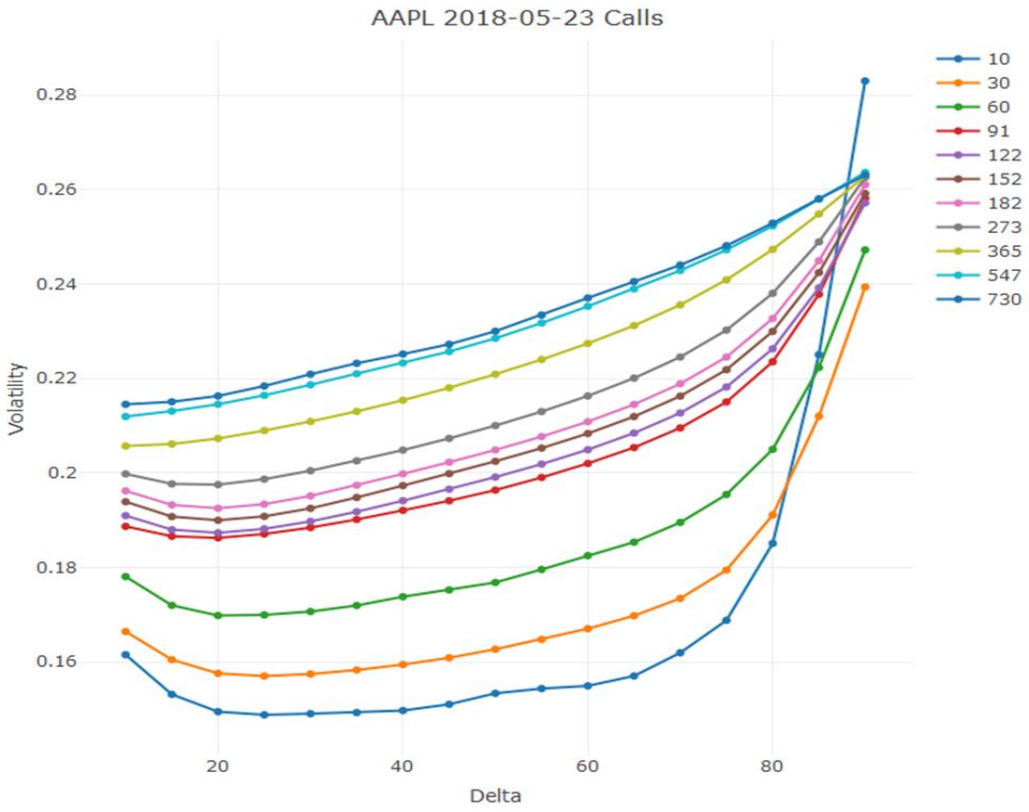
In previous calculations, surface points were only calculated from a set of options that were greater than 10 days to expiration. The introduction of weeklies into the surface results in changes to the smoothed implied volatility for other maturities, most notably for near-term points. We estimate the impact is minimal for surfaces with liquid options.

3. Early Exercise Premium in American Style Options

The embedded early exercise premium in American Style short-term equity options results in fundamentally different behavior of deep-in-the-money (ITM) options compared to their European-style counterparts. The early exercise right raises the premium on these options, resulting in implied volatilities that typically exceed those of longer maturity options for a fixed deep ITM delta.

In call options this effect is more pronounced for stocks with an upcoming dividend prior to expiration. For a call option holder, it is optimal to exercise on the ex-date and receive the dividend payment when the amount exceeds the remaining time value of the option.

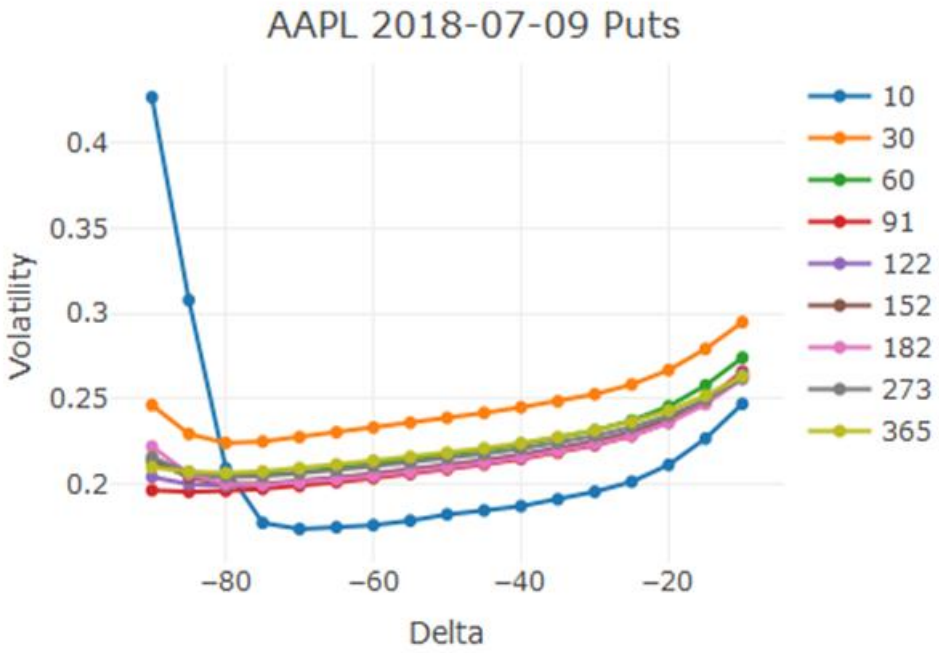
Figure 1



Source: OptionMetrics

There is also a similar effect present in deep ITM put options, with several cases for early exercise. In the first scenario the put holder evaluates the benefit of receiving cash immediately versus holding the option to expiration. If the option is exercised the strike price is paid and can be invested at the risk-free rate. When the interest paid exceeds the remaining time value of the option, exercise is optimal. The put holder will also exercise when the bid price of the option is below the intrinsic value, which can occur as a result of illiquidity or high transaction costs. Lastly, upcoming dividends play a role in the exercise decision, since a deep ITM option is often combined with underlying stock to create a synthetic position. For this strategy, the put generally should exercise immediately after ex-dividend. In summary, the possibility of early exercise is considered by market makers, which also results in relatively higher premiums for deep ITM American put options (Graph 2).

Figure 2



Source: OptionMetrics