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A first look at dividend volatility implied out of EURO STOXX 50® Index Dividend Options (OEXD)

In May of 2010 Eurex listed as the first exchange options on a dividend point index, the EURO STOXX 50® Index Dividend Options (OEXD). These options have shown a tremendous growth to an ADV of above 3,100 contracts during Q3 of 2017 and an end of quarter open interest of close to 1.1 million contracts. Given this liquidity, we investigate in this research note the daily settlement prices of EURO STOXX 50® Index Dividend Options and construct a model-free measure of their volatility. Finally, we highlight some remarkable effects of dividend derivatives – like 'pull-to-par' – using this new volatility measure.

The market in OEXD

EURO STOXX 50® Index Dividend Options settle in cash into the realized dividends paid during their settlement period, which starts the day after the 3rd Friday in December and ends on the expiration day, the 3rd Friday of December of the following year, the maturity year of the contract. During the settlement period, all paid regular, gross dividends are summed up and the final settlement value of the contract is the sum of all the paid dividends over the settlement period. Both regular dividends either paid in cash or in shares are taken into account, unless the index provider adjusts the underlying dividend point index to account for the dividend payment. Ten annual maturities are available. Table 1 provides a summary of the product specs for OEXD.

Table 1 – Contract specifications

	EURO STOXX 50® Index Dividend Options
Underlying	EURO STOXX 50® DVP (dividend points index)
Contract value	EUR 100 per index dividend point of the underlying.
Settlement	Cash settlement, payable on the first exchange day following the final settlement day.
Price quotation and minimum price change	The price quotation is in points, with two decimal places. The minimum price change is 0.01 points, equivalent to a value of EUR 1 per contract.
Contract months	The ten nearest successive annual contracts of the December cycle (from the first exchange day after the last trading day of the calendar year up to the final settlement day of the following calendar year) are available for trading at any time.
Last trading day and final settlement day	Last trading day is the final settlement day. Final settlement day is the third Friday of each December expiration month if this is an exchange day; otherwise the exchange day immediately preceding that day. Close of trading in the expiring option series on the last trading day is at 12:00 CET.
Daily settlement price	The daily settlement price is established by Eurex. The daily settlement prices for EURO STOXX 50® Index Dividend Options are determined through the Black / Scholes 76 model.
Final settlement price	The final settlement price is established by Eurex on the final settlement day at 12:00 CET based on the final value of the underlying index for the relevant contract period. Determining is the cumulative total of the relevant gross dividends declared and paid by the individual constituents of the underlying index as calculated in the form of index points by STOXX Ltd., Deutsche Börse AG as well as SIX Swiss Exchange for the contract period.
Exercise	European-style; an option can only be exercised on the final settlement day of the respective option series until the end of the Post-Trading Full Period (20:30 CET).
Exercise prices	At least nine exercise prices shall be available for each expiry for each call and put, such that four exercise prices are in-the-money, one is at-the-money and four are out-of-the-money.

Table 1 – Contract specifications

	EURO STOXX 50® Index Dividend Options
Strike price intervals	EURO STOXX 50® Index Dividend Options have execution prices with intervals in the amount of not less that one point. Option series with a term of up to 59 months may have exercise prices of five points or of ten points for option series with a term of more than 59 months.
Option premium / margining	The premium is payable in full in the currency of the respective contract on the exchange day following the day of the trade.

Figure 1 – OEXD monthly volume by trade type

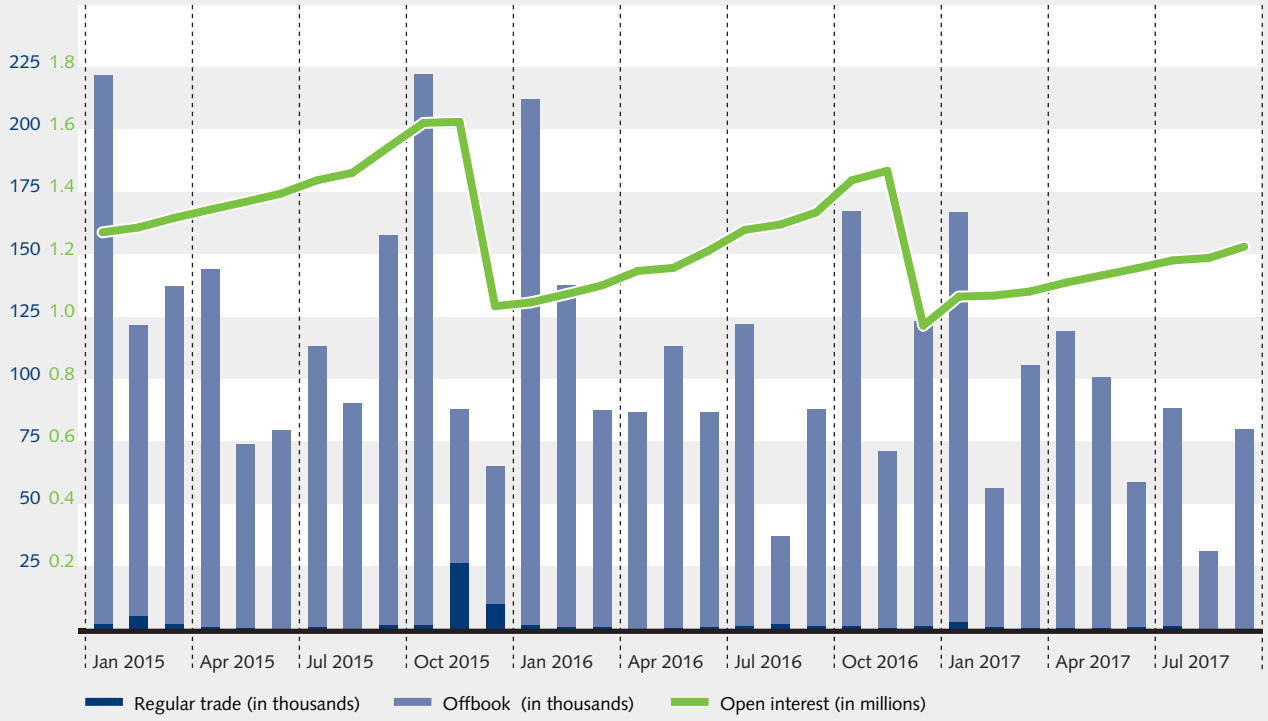
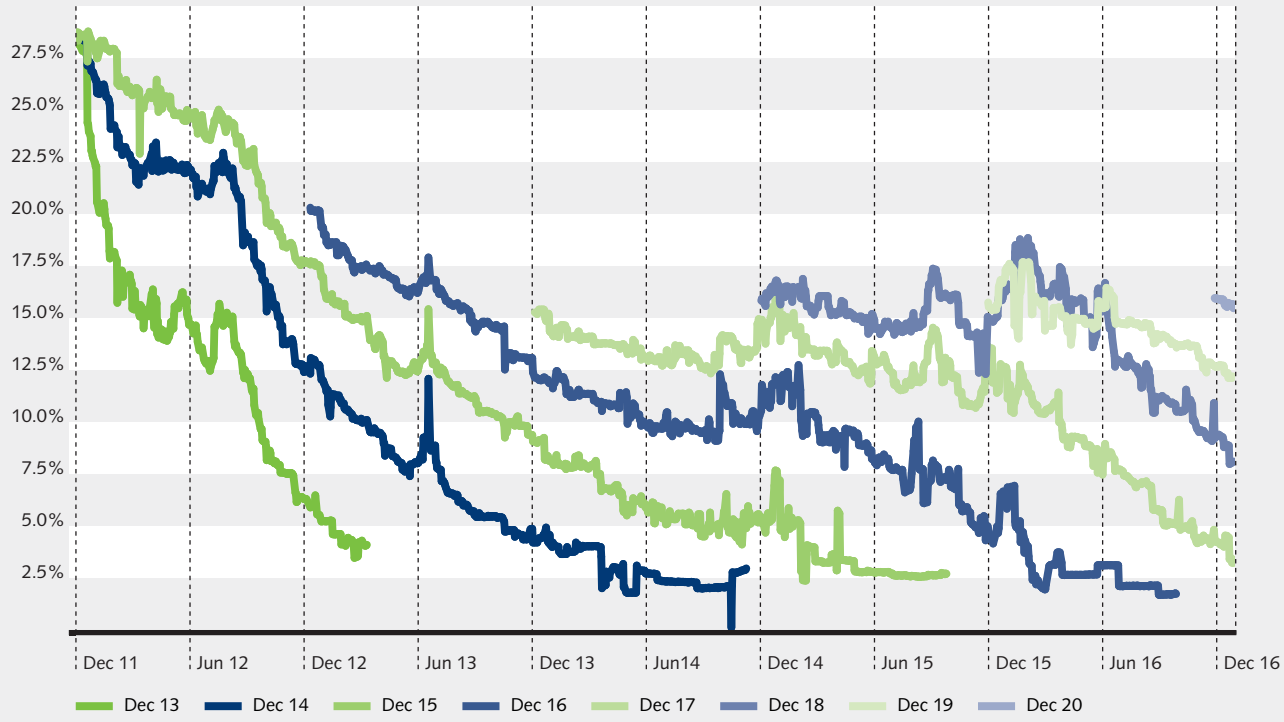


Figure 1 shows the development of monthly volumes and end-of-month open interest over the last two years. The contract is still predominantly traded through the Trade Entry Services (TES), with a majority of trades driven by client interest (about 55% is A-account volume). Typically, the second year maturity has the highest open interest. The first three annual maturities represent over 90% of open interest.

Measuring OEXD volatility

We use the square root of variance as the correct measure of volatility. Unlike other measures of volatility, as for example ATM implied volatility, variance takes into account the volatility levels of all options of the same expiry. Mathematically, this means that one has to evaluate a weighted sum of all out-of-the-money option prices of a given expiry – the so-called strip of options – at a given point in time. The weights of the summation are chosen in such a way that the strip is delta neutral and has a constant Vega. The actual methodology is identical to the one used for the VSTOXX® index. This approach provides for a model independent definition of variance and volatility. In Figure 2, we show the volatilites extracted in this way for expirations ranging from the December 2013 to December 2020. The data spans the last 5 years, from January 2011 until January 2017. Every color represents one so-called sub-index, i.e. a volatility level extracted from one OEXD yearly maturity.

Figure 2 – OEXD dividend volatility sub-indexes



For every sub-index, the volatility levels decays over time towards expiration. This is the "pull-to-par" effect. Over time, dividends, even dividends many years out, become more and more predictable. Companies release their financial numbers, provide business outlooks and give dividend guidance. As a result realized volatilities of dividends decrease over time the closer we get to the actual dividend date. This decay increases once the last year before the dividend payment has been reached and approaches zero once the dividend is announced.

Because of this information discovery process, the implied volatility levels of the sub-indexes steadily decay as time passes on towards expiration. This process starts many years before the actual dividends of the EURO STOXX 50® constituents are announced. The implied volatility sub-indexes approach zero during the settlement period of the contract, when all dividends have been announced. However, one can see that there are times when the volatility of one expiration decays faster then others.

A 2-year rolling index

From the sub-indexes we construct a two year rolling index by interpolating between the two nearest sub-indexes with less and more than 2×365 days to expiration. Figure 3 shows the result (page 4).

A rolling index has become a standard representation for volatility levels. The VSTOXX® for example is a 30-day rollling index, with 30-days being in the most liquid maturity range of the EURO STOXX® index options underlying the VSTOXX® index. At the same time the 30-day point is far enough away from expiration to avoid any impact from the closeness to the expiration. For dividend volatilities the 2 year maturity range represents the most liquid part of the OEXD term structure and avoids the impact of dividends being announced and paid occuring through-out the first year maturity.

But, for the dividend volatility a rolling index is not ideal. It contains the pull-to-par effect, not present for the VSTOXX® index. That means the rolling index does not only show the effect of a changing volatility level at a certain time horizon. It also has a contribution from the changing speed with which the nearby sub-indexes used in the index construction decay towards zero volatility.

Figure 3 – OEXD dividend volatility 2-year rolling index (volatility level in percent)

In summary, we constructed dividend volatility indexes extracted from the OEXD settlement prices. The VSTOXX® methodology was applied and both a two year rolling index as well as sub-indexes were constructed. Each sub-index corresponds to the volatility of one of the annual OEXD maturities. The pull-to-par effect for dividend derivatives is visible through the decay towards zero of sub-indexes as they get closer to expiration. Unlike for the VSTOXX® a rolling index does not only represent changes of a volatility level of a given time horizon, but also changes in the speed with which the pull-to-par effect drives the volatility level towards zero.

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