



How the postponement of AGMs and dividend policy can impact the pricing of your derivatives

Q&A

DIVIDEND POLICIES AND EQUITY DERIVATIVES

Understand the impact of dividends on derivatives

KEY TAKEAWAYS ON DIVIDEND POLICIES

How the postponement of AGMs and dividend policies can impact the pricing of your derivatives?

Derivatives classes may have been introduced on your company's shares. A derivative listing on Euronext involves a number of benefits, including but not limited to, enhancing interest and liquidity in a company's share and, as various studies have shown, a possible stabilising effect on the underlying share price during the day.

In the unprecedented context brought on by COVID-19, several European national competent authorities are considering exceptional measures, such as allowing the postponement of AGMs for issuers or reviewing public funding in light of dividend policies. These measures can impact your dividend policy, and subsequently the pricing of your derivatives. You can read the best practices to maximise the smooth pricing of derivatives on:

<https://connect.euronext.com/en/support/derivatives-markets>.

Please be aware of the fact that the new date of the postponed AGM is very sensitive information, This AGM is normally followed by the new ex-date of the dividend. It is very important that you and your Investor Relations department is not answering any questions concerning this AGM date before it is publicly available.

To protect investors, it is important that you avoid announcing any high impact corporate actions with price-sensitive consequences on or just before an expiry Friday. Nor it is preferable to change a dividend date so that it moves from before a certain expiry Friday to after that expiry Friday. This has an immediate impact on the pricing of the derivatives because dividends are an important part of the formation of option prices. The price of a derivative (options and futures) is based on the following:

- Underlying share price
- Volatility
- Interest rate
- Dividend
- Lifetime of the contract

What are the expiry dates for options in 2020?

Options expire several times a year. The standard expiry date is the third Friday of the expiry month (calendar month) unless the third Friday is a public holiday and the exchange is closed, in which case it is the third Thursday. List of all upcoming expiry dates for year 2020:

April 17/04/2020

May 15/05/2020

June 19/06/2020

July 17/07/2020

August 21/08/2020

September 18/09/2020

October 16/10/2020

November 20/11/2020

December 18/12/2020

Ordinary of extraordinary? Wording matters

It is important that issuers use the right terminology when qualifying their dividends in their communications. The wordings "Special, Extra or Extraordinary" should only be used when appropriate as only non-ordinary dividends lead to a derivatives contract adjustment by Euronext. An ordinary dividend for the year 2019 should not be requalified as Extraordinary if in current environment:

- Its payment is postponed later in 2020;
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In doubt, do not hesitate to liaise with Euronext as individual cases may be more specific.

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HOW DO YOU PRICE AN OPTION?

How is the price of an option calculated?

Market Makers are the lubricant of our options markets, they have agreed to a contract to continuous put prices into the market at which others may trade with them, in this way providing liquidity to our markets. When doing so, Market Makers (MMs) generally do not do this based on a directional view of the market but based on a risk neutral pricing model.

In other words: the Market Maker calculates the prices of the options based on a pricing model (for Equity Options that would normally be the Cox, Ross & Rubinstein model or a variant thereof). A number of parameters are used to calculate option prices in such models, including:

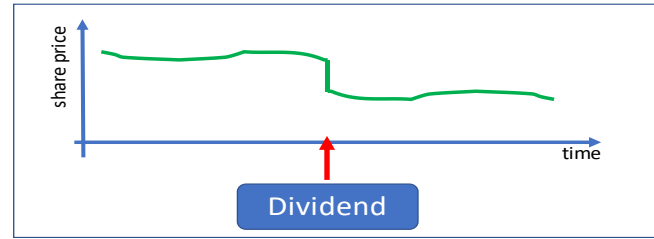
- Current price of the underlying shares
- Current interest rates
- Expected volatility during the lifetime of the option
- Expected dividend payments during the lifetime of the option

In this document we concentrate on the impact of the last one: the expected dividends

Why are dividends important for the price of an option?

If a share pays out a dividend, the share price will at that point in time drop by the dividend amount. The date on which the share trades ex-dividend is the crucial moment there. If a share trades at €70 on a certain day (day 1) and the next day (day 2) the share trades ex-dividend, with the dividend amount being €1.50, the model assumes the share price on the ex-dividend date will be €68.50. Reasoning behind this: if I can buy a share at €70 on day 1, on day 2 I will receive €1.50 dividend, so effectively my share will be worth only €68.50 on day 2.

So the pricing model anticipates a theoretical drop in the share price on the ex-dividend date, equal to the dividend amount.



What is the impact on option holders around dividend?

Dividends are paid to shareholders, not to option holders!

What happens to the option when a dividend is paid on the underlying shares?

The answer is not necessarily the same for all options but let's look at a put option first. If there is an option like this one: the right to sell the underlying shares at €75 (e.g. an August 75 Put option). And the example is the same as above. According to the pricing model, there will be a drop in the share price on the ex-date of €1.50 and if the share price was €70 before the ex-date, it will (theoretically) be €68.50 on the ex-date. The option, which gives the holder the right to sell the shares at €75 has now become more valuable: if I have the right to sell the shares at €75 with the share price at €68.50, the option has an intrinsic value of €6.50 ($75 - 68.50$), where it had an intrinsic value of €5.00 the day before ($75 - 70$).

So for put options there is a pricing effect around dividends.

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HOW DO YOU PRICE AN OPTION?

And for call options?

If there was a call option that gives the right to buy the shares at €65 (e.g. an August 65 call), and the same dividend event happens as before, this is the picture: before the ex-date, with a share price of €70, the option will have an intrinsic value of €5 (70-65). In other words: the option will be worth at least €5. Reasoning if I would be able to get (buy) the option for €0.00 and exercise it immediately (getting the shares for €65) and sell those shares again in the market for the market price (€70) I would have an instant profit of €5.00. This determines that in this case the price of the option would be at least €5.00. Next to that the price of the option may contain time value.

If now the share trades ex-dividend of €1.50 on the next day, the pricing model assumes the share price will drop to €68.50. There will be impact on the intrinsic value of the August 65 Call option. The intrinsic value will in that situation only be €3.50 (68.50 – 65). So due to the fact that the shares trade ex-dividend of €1.50, the price of the option drops €1.50 in value. So for call options, just as for put options, there is a pricing effect around dividend.

(In real life, someone owning such a call option prior to the ex-dividend may want to exercise his option before the ex-dividend data. This way he will collect the dividend).

How does this impact the pricing of options?

Anyone calculating the price of an option, including MMs, needs to take into account dividends, as stipulated above.

There are 2 dimensions of dividends that are important when pricing options:

- **The ex-dividend date**
- **The dividend amount**

Both of these are basically unknown to everyone, yet they should be assessed in order to properly price an option. In general, when looking at ex-dividend dates, we know that basically the ex-dividend date will be the day after the AGM. And most companies have a steady policy for the dates of their AGMs. So predicting the AGM date and therefore predicting the ex-dividend dates is generally not overly complex.

For the dividend amounts it is a bit harder.

There are three sources of information that help the MM to anticipate forthcoming dividends:

- The past (what are the dividends paid out in past years)
- The present (what is the current situation of the company)
- The future (what dividends are forecasted by independent forecasters)

Based on all of that, the MM needs to predict the dividends. And **as we have options in our markets with lifetimes up to 5 years, Market Makers need predict all dividends for the next 5 years.**

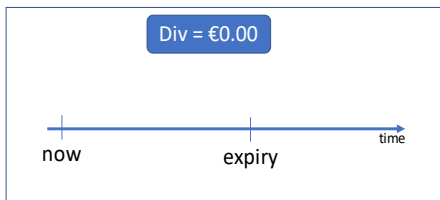
The dividends that impact the pricing of options the most are the dividends that are closest to the current date. In the next slide, we will share some examples of the pricing of options with dividends that are within a few months away of the current date.

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CASE STUDY

Example 1: prices with no dividend involved



The share price now is €70 and we are looking at two options which expire in 4 months' time.

August 65 Call

August 65 Put

There are no dividends foreseen during the lifetime of the option (between now and August), the prices of the options are (with given interest rates and volatilities):

August 65 Call €6.91

August 65 Put €1.89

Example 2: prices with dividend of €1.50



The share price now is €70 and we are looking at two options which expire in 4 months' time.

August 65 Call

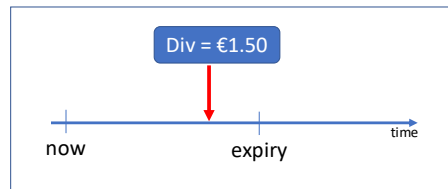
August 65 Put

A dividend of €1.50 is anticipated during the lifetime of the option, 1 month from now, the prices of the options are (with given interest rates and volatilities):

August 65 Call €6.12

August 65 Put €2.36

Example 3: prices with dividend of €1.50



The share price now is €70 and we are looking at two options which expire in 4 months' time.

August 65 Call

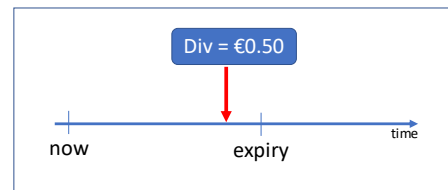
August 65 Put

A dividend of €1.50 is anticipated during the lifetime of the option, 3 month from now, the prices of the options are (with given interest rates and volatilities):

August 65 Call €6.56

August 65 Put €2.36

Example 4: prices with dividend of €0.50



The share price now is €70 and we are looking at two options which expire in 4 months' time.

August 65 Call

August 65 Put

A dividend of €0.50 is anticipated during the lifetime of the option, 3 month from now, the prices of the options are (with given interest rates and volatilities):

August 65 Call €6.75

August 65 Put €2.04

DIVIDEND POLICIES AND EQUITY DERIVATIVES

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COVID-19 AND DERIVATIVES

A summary of the option prices from the above scenarios:

	Call price	Dividend amount	Dividend date	Put
Example 1	€6.91	--	--	€1.89
Example 2	€6.12	€1.50	1 month away	€2.36
Example 3	€6.56	€1.50	3 months away	€2.36
Example 4	€6.75	€0.50	3 months away	€2.04

The largest pricing effect is seen in the call options.

Where are we today?

As explained before, MMs use the predictable AGM dates as forecasted ex-dividend dates. Generally speaking, a lot of companies have their AGMs planned for the time frame "March until June". With options basically expiring on the third Fridays of April and May and June, the exact timing of the AGM becomes pretty important for pricing options.

If an AGM was planned to take place in April, before the April expiry (third Friday) and would move into the first week of May, that would have large impact on the pricing of April options. MMs would have priced in the dividend into April options but with the mover of the AGM to after the April expiry, there would no longer be a dividend during the lifetime of the April options.

Similarly it would impact the pricing of other options, in particular the options with a relatively short time to expiry as demonstrated in the earlier examples. If the dividend in the examples was predicted to be €1.50 in one month time, the 4-month call option would have a price of €6.12 (ex.2). If then the AGM was moved several months away to end up after the expiry of the option, the price of the option would be €6.91 (ex.1).

Market Makers quote options in the market based on the theoretical prices they calculate and with a certain spread. There are maximum spreads which the MM must live up to. If in this example the maximum spread would be €0.50, that would create the following markets for these examples:

	Call price	Bid price	Ask price	Dividend amount	Dividend date
Example 1	€6.91	€6.66	€7.16	--	--
Example 2	€6.12	€5.87	€6.37	€1.50	1 month away

As demonstrated above, the bid and ask prices under the different scenarios are such that the bid price of ex.1 is higher than the ask price of ex.2.

In general one could argue that the proper predictions of dividend amounts and dividend dates are part of the daily business of Market Makers. However if there is general uncertainty in the market in relation to AGM dates and dividends, especially if such uncertainties would be coming from rules or laws, the additional uncertainties would result in a reduced market quality.

DIVIDEND POLICIES AND EQUITY DERIVATIVES

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SINGLE STOCK AND DIVIDEND FUTURES

What is a Single Stock future?

Stock futures are contracts which, at maturity, lead to the delivery of the underlying shares from the seller of the stock future to the buyer of the stock futures (the fact that our stock futures may ultimately lead to a cash settlement instead of a physical delivery does not impact its functioning).

The price of a stock future (SSF) can be calculated as follows:

$$\text{SSF} = \text{share price} + \text{interest} - \text{dividend}$$

Theoretically if I were to sell you a SSF, I have to sell you the underlying shares at maturity at a price we agree upon today. I would (from a hedging perspective) buy the underlying shares today so that I could deliver them to you at maturity. With that, I know my cost-price of the shares: the price I bought them for today. I would have to hold on to those shares until maturity so I would need to borrow the money for the shares from today until maturity. If the company were to pay a dividend during the lifetime of our contract (between today and maturity), I would receive such dividend (as I own the shares). The interest I have to pay would be added to my cost-price. The dividend received would be subtracted, which explains the above formula.

Example:

- Share price = €80.00
- Time to maturity = 3 months
- Interest = €0.20 until maturity
- Dividend = €1.00 (1 month before maturity)
- $\text{SSF} = \text{share price} + \text{interest} - \text{dividend}$
- $\text{SSF} = 80.00 + 0.20 - 1.00 = 79.20$

If I agree to sell you a stock future for 79.20 and deliver you the shares at maturity, I will be break even.

If at some point in time it would become clear that there will not be a dividend, where it was expected previously, the price of the SF will change.

Example: Dividend becomes €0.00 a day after we went into our contract, all other factors stay the same:

$$\text{SSF} = 80.00 + 0.20 - 0.00 = 80.20$$

So I have agreed to sell you the shares at maturity for €79.20. Effectively I receive €80.20 for the shares due to the dividend being skipped. For me as the seller of the SSF that is an additional profit, for the buyer of the SSF it is a loss. So basically: the change in the dividend (from €1.00 to €0) changed the economics of the contract we had (changes to other factors as share price and interest would not have changed the economics of the model as they got fixed when we entered into our contract (from a model point of view).

What is a Single Stock Dividend Future?

A Single Stock Dividend Future (SSDF) is a contract based on the difference between the actual dividend paid out during the lifetime of the contract and the amount of dividend agreed between the buyer and the seller of the contract.

Let's look at a SSDF with an expiry at June of this year. The dividend which is the basis of the value of the contract at maturity is: all the dividends from 1 January 2020 until 3rd Friday of June 2020. If it is expected that there will be one dividend during the lifetime of the contract of €1.00 and this dividend actually is paid out during the lifetime of the contract, the final value of the contract will be €1.00.

Suppose you have a portfolio of this particular share and you expect to receive a dividend of €1.00 somewhere in the first half of this year, you may want to insure against the dividend being skipped (for whatever reason). Basically you want to make sure you receive a €1.00 dividend on these shares, regardless of what the underlying company does.

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SINGLE STOCK AND DIVIDEND FUTURES

If you would sell a SSDF at €1.00, at maturity you would always receive the following amount:

SSDF price you agree upon – actual dividend amount paid out

- If the company paid out €1.00 (as expected): you will receive $1.00 - 1.00 = \text{€}0$ (but you already receive €1.00 dividend from the company)
- If the company paid out no dividend at all, you will receive: $1.00 - 0 = \text{€}1.00$
- If the company paid out €1.20 (€0.20 more than expected): you receive $1.00 - 1.20 = -\text{€}0.20$ (so your net dividend received is €1.00: you receive €1.20 from the company and have to pay €0.20 to your counterpart in the DF).

As demonstrated above, with SSDF one can insure against dividend risks.

The price of a SSDF any time can be calculated as the sum of all the expected dividends during the lifetime of a contract.

If at some time at the beginning of this year you would have asked me for a price for the above SSDF, with the general expectation that the dividend would be €1.00 sometime in May, the price I would have given you would have been €1.00 for the SSDF. If you wanted to buy a SSDF from me at that time, I could easily hedge my risk as follows:

$\text{SSDF} = \text{share} - \text{SSF}$

(with SSF being a Stock Future, which equals: $S + \text{interest} - \text{dividend}$)

In other words: if I sell you a SSDF I could hedge myself against the risks by doing :

- Buy the underlying share
- Sell a stock future

Let's look at the stock future first; the stock future price would be equal to:

$\text{SSF} = \text{shares} + \text{interest} - \text{dividend}$

(for the sake of simplicity we leave interest out of the equation now), with an expected dividend of €1.00)

$\text{SSF} = 80.00 - 1.00 = \text{€}79.00$

So as a hedge for selling SSDF to you I would buy a share at €80.00 and sell a SF at €79.00

At maturity of everything I expect:

- To have received a dividend of €1.00 on the shares I own
- Pay to you the difference: $\text{SSDF price} - \text{dividend} = 1.00 - 1.00 = \text{€}0$
- The shares I own are sold to my counter party in the SSF
- My net profit will be €0 (that I why I may want to add a little bit to my prices to make a profit)

If the dividend was skipped, my outlook would be at maturity:

- To have received a dividend of €0.00 on the shares I own
- Pay to you the difference: $\text{SSDF price} - \text{dividend} = 1.00 - 0.00 = -\text{€}1.00$
- The shares I own are sold to my counter party in the SSF
- My net result would be a loss of €1.00 (on the dividend I would need to pay to you)

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SINGLE STOCK AND DIVIDEND FUTURES

Below is an overview of the effects on the pricing of the Options, Single Stock Futures and Single Stock Dividend Futures in three different scenarios.

	Scenario 1: Simulation date : 15 April	Scenario 2: Simulation date : 15 April	Scenario 3: Simulation date : 15 April
	A dividend of €1.00 is expected to be paid in May.	No dividend is expected to be paid this year	A dividend of €1.00 is expected to be paid in October.
	S (share price)= 80.00	S (share price)= 80.00	S (share price)= 80.00
	Interest = 0.00 (for simplicity, it does not really impact the examples)	Interest = 0.00 (for simplicity, it does not really impact the examples)	Interest = 0.00 (for simplicity, it does not really impact the examples)
Jun '20 70 call	EUR 10.15	EUR 10.34	EUR 10.34
Jun '20 70 put	EUR 0.45	EUR 0.35	EUR 0.35
Dec '20 70 call	EUR 11.64	EUR 12.37	EUR 12.06
Dec '20 70 put	EUR 2.61	EUR 2.37	EUR 2.61
Jun'20 SSF	EUR 79.00	EUR 80.00	EUR 80.00
Dec'20 SSF	EUR 79.00	EUR 80.00	EUR 79.00
Jun'20 SSDF	EUR 1.00	EUR 0.00	EUR 0.00
Dec'20 SSDF	EUR 1.00	EUR 0.00	EUR 1.00

As shown in the examples above the effects of changes in the dividend policy with regards to amounts and/or timing are quite substantial for the pricing of derivatives.

The impacts are on all listed derivatives products. This uncertainty has a direct effect on the bid and ask prices that the Market Makers are quoting, It could even lead to no prices at all.

It is important that the new dates of the AGM and the accompanied dividend amounts are published to the market as soon as possible. Without good proper prices the investor will not trade the derivatives and will also not use the derivatives as a hedge for the underlying shares. This could also have an impact on the liquidity of the shares traded.

DIVIDEND POLICIES AND EQUITY DERIVATIVES

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ORDINARY VS EXTRAORDINARY DIVIDENDS

Special dividends and option pricing

When companies pay out special dividends, these are generally unpredictable (e.g. related to special financial results in the company). Euronext (like other trading venues) has special rules and procedures in place to cater for such special dividends (and other corporate actions that are not in line with every day operation of the underlying company).

In such cases trading venues make adjustments to the specifications of the options in order to compensate for such unpredictable events.

Suppose a company pays out a normal dividend every year of about €1.50 in early June. These dividends, as explained before, are included in the calculation of option prices. And as demonstrated above, they will impact the resulting prices of options. If now at the AGM the company decides to pay out an additional special dividend of say €2.50 per share, this will impact the prices of options. As there was no way anyone could have anticipated this, Euronext compensates for such unpredictable events.

Compensations are made by slightly adjusting the contract specifications (strike price and contract size of the options) in such a way that the economic value of the options before the special dividend and after the special dividend are identical. From an options-economic perspective special dividends have no impact at all on holders of options. They are economic non-events.

Could such corporate actions adjustments be made to cater for postponing of AGMs?

Apart from what our corporate actions policy says: a corporate actions adjustment needs an event. The “not paying out of a dividend” is not an event so it would not be very straight forward to make such adjustments. And if the AGM was postponed and a dividend would be paid out say in 4 months’ time (instead of in 3 weeks’ time), how would we want/need to look at that dividend in the light of predictability and adjustments?

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