

**MONTREAL EXCHANGE**

# **Stock financing and option prices**



Market makers trade options on a delta neutral basis. This means that when they purchase a put (call) option, they buy (short sell) the underlying security in a quantity equal to the delta of the option.

In order to short the stock, one needs to borrow it. While for the most commonly traded stocks and ETFs, net borrowing costs<sup>1</sup> are minimal (of the order of 10-15 bps per annum) some stocks and ETFs are “hard to borrow” for a variety of reasons, resulting in elevated borrowing rates, which sometimes exceeding a few percent per annum.

In this note, we will look at the relationship between the borrowing rate of the underlying security and options prices. Additionally, we will highlight practical implications and potential ways in which different types of investors can implement an option strategy to secure this additional yield.

## Pricey puts or cheap calls?

Option prices observed in the market place need to satisfy the well-known “put-call parity” relationship, otherwise there would be risk-free arbitrage opportunities. One can expect that if this relationship holds, then for a given maturity the implied volatility of a call and put with the same strike price should be equal.

Yet, we notice that for some stocks (ETFs), the implied volatilities of a call and put of same maturity and strike displayed on option monitoring systems can be different.

In table 1 we can see that the implied volatility of the at-the-money call and put options (\$11 strike) on Horizons Marijuana Life Sciences Index ETF (HMMJ CN) for January 2020 are not equal (respectively 58.2% and 63%). Are the puts (calls) really pricier (cheaper) than they should be, given the difference in the implied volatilities? If so, can we arbitrage this difference, given that prices seem have deviated from the put-call parity relationship?

**Table 1: HMMJ CN options prices and implied volatility (as of Oct 15th, 2019)**

CALL OPTIONS					PUT OPTIONS		
BID	ASK	Imp. Vol.	STRIKE	EXPIRATION	BID	ASK	Imp. Vol.
2.2	2.3	64.1%	9	17-Jan-20	0.6	0.7	66.7%
1.55	1.65	60.2%	10	17-Jan-20	1	1.1	65.2%
1.05	1.15	58.2%	11	17-Jan-20	1.5	1.6	63.0%
0.65	0.8	57.8%	12	17-Jan-20	2.15	2.3	63.0%
0.45	0.55	57.5%	13	17-Jan-20	2.95	3.05	63.4%

Source: Montréal Exchange website

The fact is that risk-free arbitrage opportunities are virtually non-existent in the market place; therefore, we must look for the explanation of these puts (calls) being “pricier” (“cheaper”) in a different place.

Let us remember that implied volatility is a calculated number. One needs to input five variables (stock price, strike price, time to maturity, interest rates and dividend yield) into a model to determine its value. Most investors and option monitoring systems use the Black Sholes model.

So, where does the borrowing cost fit in all this? Should it not be also an input in to the option pricing? And how does it affect option prices?

An easy way of explaining the role the borrowing cost in option pricing is to remember that: if an investor is long the stock (ETF), he/she is able to lend it out and collect a lending fee (the borrowing rate paid by the borrowing party).

This additional “lending income” can be thought of as either some additional dividend that the holder of stock (ETF) receives, or a reduction in the interest rate that he/she pays.

<sup>1</sup> Net borrowing cost is the borrowing cost minus the interest (usually overnight rate) that the investor receives on the cash generated from the short sale of the stock (ETF). (ex.: borrow rate of 1.50% - 1.25% overnight rate = 0.25% net borrow cost)

So, to use the Black Sholes formula we need to make an adjustment to the dividend yield input to take into account the lending fee received by the owner of stock.

$$\text{Div Yield Adjusted} = \text{Div Yield} + \text{Stock lending fee}$$

As we mentioned, the stock lending fee for most stocks (ETFs) is quite small when compared to their dividend yield (10bps versus a few percent). But if the stock is “hard to borrow” this fee comes into play and will have a noticeable effect on option prices.

Quick reminder: the higher the dividend yield, the higher the price of puts versus calls of same strike and same maturity.

What explains the fact that HMMJ CN January 2020, \$11 strike puts are nearly 30 cents (after adjusting for stock price of 10.70) pricier than the \$11 strike calls of the same maturity is that HMMJ CN has higher adjusted dividend yield than the one the monitoring system took into account.

But we know that HMMJ CN does not pay (nearly) any dividends. So, the only thing left to explain the higher price of the puts is a high “borrow cost”. (i.e. a high adjusted dividend yield)

Let us look for the value of the adjusted dividend yield that we need to put into the Black Sholes model in order to obtain the same implied volatility for the \$11 call and \$11 put.

Using the Black Sholes model and an optimization method, we find that by inputting a value of 7.3% for the adjusted dividend yield, both the \$11 strike put and call of January 2020 have a 61.5% implied volatility. This means that the option prices observed in the market indicate that the borrowing rate for the ETF is 7.3% per annum.

HMMJ CN’s borrow is quite high (recall blue chip stocks have a borrow rate of 0.10%-0.15%).

Why is that the case?

- Usually the borrow rate tends to be high if a lot of investors want to sell the stock (ETF) short. For example, this was also the case for many speculative and/or high growth stocks specially in the tech-sector before and during the tech-bubble. Those betting on an overvaluation of these stocks and an impending drop in their value were short selling them, reducing the pool of available stock for borrow.
- The stock (ETF) is hard to borrow simply because it is held by investors who do not wish to lend their holdings or might not have the set-up and infrastructure that is required to lend them.

This means that an investor with a long position in this ETF could benefit from a yield of 7.3% per annum by lending out their holdings.

Takeaway: if the you see a put (call) that seems too pricey (cheap) according to pricing models (i.e. higher implied volatility versus calls of same strike and maturity), it is likely that the explanation has to do with stock financing and/or dividend uncertainty. You should investigate the implied borrowing rate – based on “live” option prices.

## The case of cannabis stocks

An investor who wants to sell short the cannabis ETF, could alternatively look into short selling its component stocks in the appropriate weights, essentially creating a short position in the ETF.

Given that HMMJ CN has a high borrow rate, one could expect that its component stocks also have elevated borrow rates.

Table 2 shows the top 8 components (in weight) of HMMJ CN as of October 11th, 2019. All of them have listed options available either in Canada or in the US.

**Table 2: HMMJ CN component weights and option availability (Oct 11th, 2019)**

COMPONENT STOCK	% WEIGHT	OPTIONS
CANOPY GROWTH CORP	10.26	Yes
CRONOS GROUP INC	10.2	Yes
AURORA CANNABIS INC	9.56	Yes
GW PHARMACEUTICALS PLC	8.92	Yes in US
TILRAY	7.64	Yes in US
APHRIA INC	7.4	Yes
SCOTTS MIRACLE-GRO CO/THE	7.06	Yes in US
CHARLOTTE WEB HOLDINGS INC	6.34	Yes

Source: Horizon ETFs and LFC

By using options prices observed in the market we can determine the implied borrow rate for each of these stocks. To do this we need find the adjusted dividend yield that makes the at-the-money put and call options implied volatility equal.

Table 3 shows the implied borrow rate obtained using options price in the market (1). The results are quite staggering. As expected, most cannabis stocks are very hard to borrow. Tilray (TLRY) represents the most extreme case where it costs 43% of the stock value per year to secure a borrow for the next 3 months in order to short it.

**This means that:**

1. An investor who holds TLRY and intends to hold it at least 3 months, could lend it out and receive approximately 9.5% of the average value of the stock over the next 3 months (recall we used 3 months options to obtain the borrow rate).
2. An investor who has a bearish view on the stock and decides to short it, needs the stock to drop either quite rapidly (otherwise he/she pays interest at the tune of 3% per month) or the stock to drop by a large amount if he/she keeps a short position for a protracted period of time. (to compensate for the interest he/she pays on the borrow)

**Table 3: HMMJ CN component implied stock borrow rate based on market option prices for January 2020 (on Oct 18th, 2019)**

COMPONENT STOCK	IMPLIED BORROW RATE
CANOPY GROWTH CORP	22.0%
CRONOS GROUP INC	8.5%
AURORA CANNABIS INC	17.6%
GW PHARMACEUTICALS PLC	0.0%
TILRAY	43.0%
APHRIA INC	19.3%
SCOTTS MIRACLE-GRO CO/THE	0.0%
CHARLOTTE WEB HOLDINGS INC	Low liquidity in options

Source: Interactive Brokers and LFC calculation

To validate the order of magnitude of the borrow rates obtained using option prices (in table 3), we also checked these rates directly at a broker. Table 4 shows the overnight borrow rate provided by Interactive Brokers on Oct 21st for these same stocks.

The fact that borrow rates are quite high is readily confirmed. Additionally, we see the same pattern in rates. However, we notice that for some stocks the broker quoted higher borrow rates than the one embedded in option prices.

## Why?

Keep in mind that borrow rates in table 4 are overnight borrow rates. In fact, borrow rates could be viewed in a similar way to interest rates. They have different maturity and their price (i.e. rate) is driven by supply and demand. An investor can “lock-in” a borrow rate (by borrowing the stock from another investor who holds a long position) for a given period of time: a day, a week, a month, etc. This affects the size of the inventory of stock available in the market to be borrowed.

If a lot of investors have locked-in the borrow, then the number of outstanding shares available for borrow in the market is limited and the short-term borrow rate (overnight) will be driven up. (i.e. borrow gets expensive) One can actually get a quantitative sense of the stock availability. The number of shares investors borrow to short the stock (called short interest) is reported regularly to regulator and the data is accessible to all. By comparing the short interest to total outstanding shares (called short interest ratio) an investor has a reliable metric to this effect.

For instance, Tilray (TRLY) on September 30th had 8 million shares in short interest for a total of about 15.2 million outstanding shares: a short interest ratio of over 50%. Compare this to Microsoft (MSFT) with a short interest of 53 million shares for over 7 billion outstanding shares, a ratio of 0.75%!

It is therefore no surprise that TRLY is hard to borrow. The fact that the stock has dropped nearly 78% year-to-date (as of Oct 21st, 2019) indicates that is quite likely that a lot of short positions were built and held throughout this correction, driving the cost of borrow increasingly higher.

**Table 4: Actual overnight borrow rates for HMMJ CN components quoted by Interactive Brokers on Oct 21th, 2019**

COMPONENT STOCK	IMPLIED BORROW RATE
CANOPY GROWTH CORP	34.0%
CRONOS GROUP INC	6.5%
AURORA CANNABIS INC	38.7%
GW PHARMACEUTICALS PLC	0.4%
TILRAY	75.7%
APHRIA INC	46.1%
SCOTTS MIRACLE-GRO CO/THE	0.3%
CHARLOTTES WEB HOLDINGS INC	Low liquidity in options

Source: Interactive Brokers

## Do not miss on the income (from lending your stock)

It is important for investors to monitor the borrow rate of stocks (ETFs) which are part of their portfolio as some opportunities might present themselves to improve the performance of the portfolio or reduce the risk thanks to high borrow rates.

If an investor is long a stock which has a high borrow rate – either by conviction or because it is part of a mandatory construct of his/her portfolio, such as an indexing portfolio – he/she should make sure to not miss out on the additional yield.

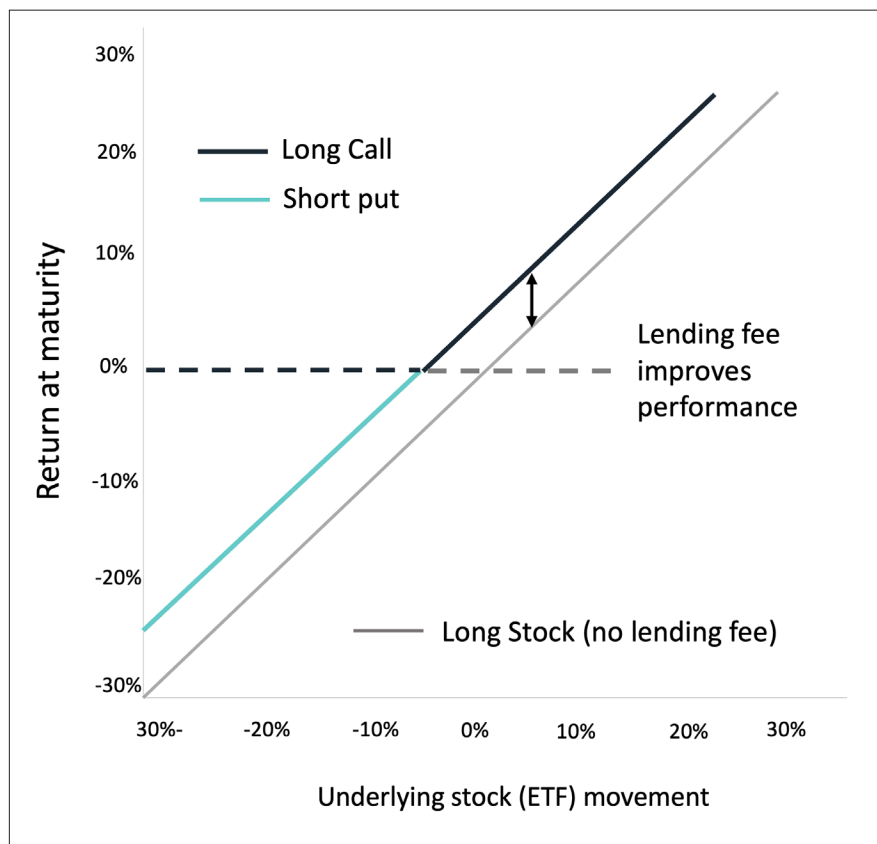
To do this:

- a) Check if your custodian is providing you with any of the revenues generated from lending your stock (ETF).
- b) If not, make you sure you enquire about it and understand why you are not receiving any revenues.
- c) Compare the fees you receive from your custodian to the borrow rates implied by option prices in the market: are you getting a fair share of the revenues?

If for any reason you are not getting the benefits of the lending fees and you intend to hold the stock (ETF) for some time, then you should create a synthetic long position and sell your stock at the same time.

This is achieved by: selling a put and buying a call of the same strike for the maturity that corresponds to the investment horizon you intended for your long stock (ETF) position. Simultaneously, sell your long stock position.

### Synthetic long stock (ETF) position via options



Option traders call this package made of 3 trades executed simultaneously a “reverse conversion”.

In conclusion, it is important to remind that if all three 3 legs of the trade are not executed simultaneously, the investor incurs a risk. For instance, the stock price could drop between the time he/she finished executing the option part of the trade and he/she initiates the sale of the stock.

On the bright side, the Montreal Exchange offers two solutions that allow the investor to partially or fully eliminate this execution risk.

1) The Montreal Exchange provides 2 legs of this strategy as a combined single product. In fact, investors can buy (sell) a call and sell (buy) a put of same strike and maturity as one security. Option traders call this strategy a “risk reversal”.

2) An investor (usually their brokers if they have the appropriate operational set-up and accounts) can call the Montreal Exchange trading line and place an order for the simultaneous execution of all 3 legs of the reverse conversion.

The ability to trade a risk reversal helps reduce noticeably the execution risk, while that of executing the reverse conversion fully eliminates the slippage risk. This allows the benefits of stock lending to be accessible to investors who do not have access to advanced or automated trading systems.



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In addition to niche derivatives strategies, LFC also provides risk-management, hedging and overlay advisory services to family offices, institutional investor and businesses.

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