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Forecasting/Understanding Negative Basis in Futures

In normal circumstances, gross basis, the relative difference in price between physical delivery futures contracts and the cheapest-to-deliver (CTD) cash bond, is positive. In certain situations this price difference can become negative for entirely rational reasons; a situation that sometimes causes confusion among futures market participants and almost always results in questions seeking to understand the phenomenon.

Gross basis

To understand how this relative value can turn negative, we must first understand the definition and quoting convention for gross basis. In short, the gross basis is the price at which an investor can execute a cash-and-carry arbitrage trade by simultaneously buying a cash bond and selling a futures contract[1], or vice-versa. The gross basis is defined below in Equation 1.

EQUATION 1

$$\text{Gross basis} = P - (F \times CF)$$

where: **P** = Cheapest-to-deliver bond price

F = Futures contract price

CF = Conversion factor for the bond

On the delivery date for the futures contract, the contract and the bond are identical assets and, to ensure no-arbitrage conditions exist, must have an identical price; gross basis falls to zero at the delivery date, which is normally the last business day of the contract month.

Positive gross basis

In what most investors would refer to as normal circumstances, the yield curve is upward sloping with yields and coupons on most bonds higher than overnight financing rates. In this environment, an investor who has created an arbitrage position by buying the cheapest-to-deliver bond, borrowing cash to do so in the repo market and simultaneously selling the futures contract, has a positive carry position. Essentially, the investor earns the coupon on the bond, which is higher than the rate paid to borrow the cash used to buy that bond.

Since the futures contract has no cash flows associated with it besides some nominal costs for margining the position, and the bond and futures contract positions will be identical within a few months when the contract reaches the delivery period, the contract should trade at a price that is lower than the bond price to ensure that this risk-free arbitrage yields only about the same as other short-term investments[2]. The amount that the futures contract is discounted relative to the price of the cheapest-to-deliver bond is called the gross basis, and reflects the amount of positive carry the investor would receive if s/he had done the bond trade instead.

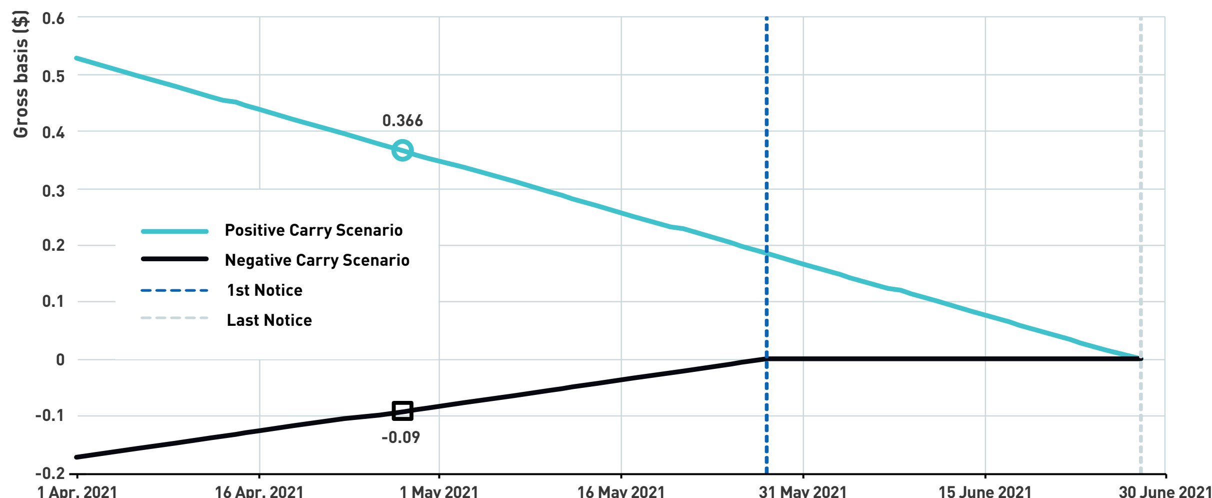
Figure 1 plots a theoretical gross basis, in the absence of any option value, for the scenario where a bond position purchased and financed to hedge a short position in futures contracts is positive carry. The bond will be delivered to settle the short futures contract on the last possible day so that the investor can reap the profitable carry for as long as possible, and the gross basis declines to zero on the last notice day for the contract (the vertical dotted line on the far right) when the two assets become identical.

1 This arbitrage trade is referred to, understandably, as a futures basis trade.

2 There are several embedded options in futures contracts. As option values are currently low and to simplify the concept of negative gross basis, we ignore them here with the exception of the timing option. Investors interested in the embedded options can refer to "Embedded Options in CGF and CGB Futures"

FIGURE 1

Gross basis, no options



Negative gross basis

Astute readers will have realized by now that, if an investor who bought the bonds to hedge a short position in a futures contract must give up some of the positive carry to ensure no-arbitrage conditions with an identical asset, then an investor who holds a negative carry bond position as a hedge to a short futures position must be additionally compensated in order to do the same. In the negative carry scenario, the relative price of the futures contract rises, so that the investor establishing a short position sells for a higher price. This higher price is demanded by the arbitrageur to compensate for the negative carry but results in the adjusted futures price exceeding the bond price and, based on the gross basis formula above, the gross basis then is negative.

Figure 1 also shows a hypothetical scenario showing the behavior of gross basis over time when the bond position is negative carry. In that figure, the gross basis is negative and steadily rises by the daily negative carry until the first notice date[3]. The bond and futures contracts are identical on the first notice date in this scenario because, to escape the negative carry, the arbitrageur can, and usually will, deliver at the first available date. After the first notice date, the gross basis should be zero since the trade is a pure arbitrage; an investor can sell the contracts, buy the bond, and deliver the bond immediately to settle the futures contract obligation with no risk.

Forecast for MX contracts

While negative gross basis does not matter to some investors, the situation can sometimes come as a surprise to others. More specifically, investors who are habitually long futures contracts should be aware that the contract is expected to steadily depreciate in value by the amount of the carry on an associated bond arbitrage hedge.

Given an understanding of how negative gross basis occurs, we can easily forecast when it will occur: when coupon rates of the cheapest-to-deliver bond are lower than short-term financing rates[4]. With the Bank of Canada holding the 0.25% target rate at least through 2022, according to recent statements, deliverable bonds will need a coupon that is lower than that rate[5] to be forced into a negative basis situation. Figure 2 shows estimates[6] for each contract until the end of 2022, with associated explanations below.

FIGURE 2

Trades at negative basis?

	CGB	CGF	CGZ
M21	Highly Unlikely	Possible	Possible
U21	Highly Unlikely	Possible	Possible
Z21	Highly Unlikely	Unlikely	Possible
H22	Highly Unlikely	Unlikely	Possible
M22	Highly Unlikely	Unlikely	Possible
U22	Possible	Unlikely	Possible
Z22	Possible	Unlikely	Possible

3 First notice date: the first day a short futures position (seller) may announce his intention to deliver the underlying instrument (cash bond) to the holder of the long futures position.

4 Secured financing, i.e. term repo rates to the delivery date of the contract.

5 This is a rule of thumb. In actuality, futures contracts could trade rich to bonds, forcing the price to a level that allows a small arbitrage and creating a negative basis situation, even though the coupon on a bond is the same as the short-term financing rate.

6 Estimates only! Markets can anticipate Bank of Canada policy changes at any time, even if the Bank has indicated they will not be raising the target rate.

For 10y CGB contracts after M21, the 1.25% June 2030 bond will be the CTD until the U22 contract, which will have the 0.5% December 2030 bond as the CTD, becomes the active contract in late May 2022. By that time, short-term rates may have begun to rise and the CGBU22 contract could experience negative basis levels.

For 5y CGF contracts, the 0.25% March 2026 bond is currently the CTD on the M21 contract, and will be for the U21 contract as well. Since the coupon rate is the same as the expected Bank of Canada policy rate to the delivery date, any richness in the contract could result in negative basis at any time[7]. In fact, M21 and U21 contracts can shift between positive and negative basis quite quickly, depending on market flows. It would appear at this time that the next 5-year bond, not yet announced, will have a higher coupon, so CGFZ21 will probably be a positive basis contract. The same scenario is expected for subsequent new 5-year bond issuances.

A similar situation exists for the 2y CGZ contract, where the 0.25% February 1, 2023 bond is the current CTD on M21 contracts. Gross basis can be positive or negative, given the near equality of coupon levels and financing rates. The U21 contract will experience the same effect, since the CTD for that contract, the 0.25% May 2023 bond, also has a low coupon. New 2-year bonds, not yet announced, will probably also have a 0.25% coupon, so contracts beyond CGZU21 can potentially exhibit negative gross basis levels.

7 Thus far, the exact opposite is true. Futures contracts have traded quite cheap relative to bonds such that Gross Basis has remained several cents above zero as of the end of March 2021.

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