

Arbitrage Strategies

This post is a review of arbitrage opportunities in public markets using publicly available information.

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Convertible Bonds

A convertible bond ('convertibles') is hybrid security that combines a straight bond and a call option to convert the straight bond at a specified conversion price, at a premium to the current market price of the stock.

Convertibles are attractive for issuers as they are lower yielding than bonds for two reasons: first, the call option; second, convertible bonds can be raised quickly (sometimes overnight.) The difference in yields between the convertible and a straight bond with the same characteristic is then the value of the call option. Convertible bonds might also be preferable over equity as they might have a tax advantage in certain jurisdictions. Riskier firms with more volatile stock prices prefer to issue convertible bonds as the value of the call option is higher, resulting in lower convertible yields.

Convertibles are attractive for investors as they offer a way to participate in the upside of the company with a floored loss from the bond, and are often priced below their intrinsic value to raise funds quickly and compensate for illiquidity in the secondary market. This article aims to identify underpriced bonds, when the ratio of offer-price to market-price is less than 1.

AQR states that the value of the convertible can be determined by the price and terms of the convertible bond, the issuer's stock price, the expected volatility of the issuer's stock, the credit spread associated with the convertible bond, and the term structure of interest rates. From recent research by Batten et al., that asset volatility and liquidity are the most important determiners of cheapness. The other factors impact both the intrinsic value and the market price of a bond.

The arbitrage portfolio is long the convertible and short either the debt or equity portion of the security to isolate the cheapness derived from volatility and liquidity (excluding factors such as changes in spreads, prices, and the term structure.)

Options Greeks

Delta	How a \$1 change in the underlying stock affects the price of the convertible.
Gamma	How a \$1 change in the underlying stock affects the delta.
Theta	How the price of the convertible will change after 1-day passes. (time decay)
Vega	How a 1 pt change in implied volatility affects the price of the convertible.
Rho	How a 1% change in interest rates affects the price of the convertible. (duration)

Types of arbitrage opportunities (hedges):

Delta/Equity hedge To hedge the equity portion, investors sell the underlying stock to hedge the delta (the stock has $\text{delta}=1$) and dynamically adjust as the delta changes.

Rho/Debt hedge To hedge the debt portion, investors can sell a portfolio of government stocks that match the rho, purchase credit default swaps, or sell more stock. This is more challenging due to illiquidity.

These arbitrage opportunities are imperfect due to risks:

Default/Basis Risk Issuers of convertibles are often riskier. Theoretically, shorting the equity and debt portion should isolate the convertible from this risk, however, due to the abovementioned challenges with hedging debt

perfectly, there may be basis risk (a.k.a. an imperfect hedge) which may lead to portfolio losses which depend on the mismatch, recovery rates, and path of default.

Refinancing Risk As a bond gets closer to maturity, it realizes its intrinsic value as there is no longer a discount to illiquidity. However, this poses a risk in leveraging and with a firm that invests in other strategies. An asset-liability mismatch between the leverage used and convertible could result in a situation where this is no leverage available in a down credit market.

Illiquidity Risk Unwinding a position in convertibles is expensive due to the illiquidity that generates profit for the strategy so any overall decrease in portfolio assets could be compounded by a position in convertibles.

This section presented opportunities and risks in convertibles. Overall, convertible arbitrage is low risk as it is held to maturity, however, it is important to consider them in the context of the portfolio and overall market as down markets impact the strategy significantly.

How do the Greeks change when the following changes?

Conversion Price Delta is higher closer to the conversion price, as it is in the money. A \$1.00 change when the stock price is \$0.50 below the conversion price will represent a profit for the convertible holder if the holder exercises conversion, while a \$1.00 change when the stock price is \$2.00 below the conversion price will increase the price as the holder is closer to the situation when they can convert, but can not yet convert. Similarly, the gamma which is the change in price as a result of the change in delta will be higher the closer the convertible is to the conversion price.

Time to maturity Delta is lower the closer it is to the maturity of the conversion. This is because there is less time for the stock price to go above the conversion price. For the same reason, the gamma and vega are also lower. Theta accelerates and then decreases over time as the value of time decay lowers.

Government bonds

A government bond is a security that provides a fixed stream of income to the lender. Government bonds can encompass a wide range of instruments. Such securities are issued at a discount to face value and are used to set the benchmark. Their prices are driven by factors such as:

1. Time to maturity: the time to maturity of the bond: days between the maturity and issuance date.
2. Duration: the duration of the bond: how a % change in interest rates affects price calculated by the weighted average of cash flows.
3. Convexity: the change in the duration of the bond as interest rates change calculated as the derivative of duration.
4. Liquidity: the amount of trading activity in the market for the bond. measured in a variety of ways, such as amihud, rolling volume, and bid-ask spread.
5. Issuer credit quality: how likely the creditor is to default measured through ways such as Moody's, S&P, Fitch, DBRS, CDS spreads.
6. Seniority and collateral: how senior the bond is in the debt tranche of the issuer and what is the collateral (i.e. taxing power vs. debenture.) This is usually the former.
7. Coupon: what is the coupon, when do these coupons get issued, and how often they get issued
8. Settlement date: when is the trade settled (this will determine if and how much of the coupons will be priced in.)
9. Embedded options: call, put, convert or other such options embedded within the bond structure. These are rare in government bonds.

Prices in government bonds are efficient relative to other markets, however, there are limits to this efficiency. With the same issuer quality, time to maturity, and duration, there are opportunities to profit through the liquidity premium. Some of these are described below:

Government guaranteed bonds CMHC bonds, guaranteed by the Government of Canada, trade at significantly lower price (higher yield) than Government of Canada bonds. Purchasing CMHC bonds and shorting the Canadian government at the same duration, convexity, and time to maturity can capture the yield gain without the associated risks.

Butterfly trading based on relative value of similar bonds with the same duration and convexity (buying the higher yielding bond and selling the lower yielding bond) until one year has passed. This strategy is referenced in the relative value paper from the Fontaine, Nolin 2017. It involves using a portfolio of three bonds to establish the relative value of a similar bond. This is challenging as the ability to short the three bonds may be limited.

Risks in the fixed income arbitrage are similar to those in convertibles:

Refinancing Risk An asset-liability mismatch between the leverage used and convertible could result in a situation where this is no leverage available in a down credit market.

Matching Risk The strategy involves approximately matching the convexity and cash flows of the portfolio of three bonds.

Liquidity Risk: Unwinding a position in convertibles is expensive due to the illiquidity that generates profit for the strategy so any overall decrease in portfolio assets could be compounded by a position in the less liquid bond.

Overall, the fixed income arbitrage strategy is valuable when held to maturity, however, caution should be taken as similar risks to convertibles remain when held as a trading instrument, and fixed income markets sometimes do not behave as indicated (for example, the United States is very different to Canada due to issuance frequency.)

To be explored in the future

Covered Interest Arbitrage

For example, at the same term to maturity, borrowing at Japanese rates in JPY and lending to the Indian Government in INR, and then setting up a forward agreement to exchange INR for JPY to capture real yield.

Merger Arbitrage

Capturing the price difference from when a merger is announced to when it concludes.