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North America

High Grade Strategy Notes

Debunking the Dollar Price Discount

- High grade investors routinely apply a “dollar price” discount to bonds that trade significantly above par. The common rationale for doing so assumes a discount for additional jump-to-default risk as well as a discount for illiquidity.
- This makes sense at the long end of the curve. But according to risk-neutral bond-pricing theory, in the present environment, high-coupon bonds with maturities inside of 10-years should trade tighter than par-coupon bonds of similar maturity before taking into account liquidity.
- Current market convention does not take this result into consideration. Most market participants always assume that a high-coupon bond should trade wide to a par-coupon bond regardless of the bond’s maturity.
- Consequently, we think there’s a strong argument for buying high-dollar priced bonds inside of 10-years from a purely theoretically point of view. We don’t expect the market to change its behavior any time soon, but investors are clearly being overcompensated for taking on additional jump-to-default risk at the front end of the curve, in our opinion. While it lasts, we’d look to take advantage.

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Debunking the Dollar Price Discount

High grade investors routinely apply a "dollar price" discount to bonds that trade significantly above par. In this short paper, we argue that the market's current convention – namely, adjusting spreads wider by anywhere from 0.5bp to 3bp for every dollar above par – is misguided, especially in an environment where yield curves are so steep.

The common rationale for a dollar price discount is twofold. First, there's the argument that buying a high-coupon bond entails an added amount of jump risk as the loss in the event of default is greater. Second, high coupon bonds tend to be significantly less liquid than more recently issued par-priced bonds, as many investors face significant barriers to selling their above-par inventory or adding to it because of tax implications.

Of these two arguments, it's the first where market intuition needs to evolve, in our opinion. In essence, what the market fails to appreciate is the certainty around a bond's cash flows.

In the Treasury market, one routinely observes bonds with above market coupons trading at *lower* yields than bonds priced at par with the same maturity. Obviously, one isn't concerned with the risk of default – at least we hope – when it comes to US Treasuries. As such, it's easier to rationalize this behavior: risk free bonds with different coupons are more likely to trade with a yield that's a function of their duration and convexity metrics, regardless of dollar price.

And yet, we'd argue, that the same effect should be observable in credit as well, at least to some degree. In particular, when corporate yield curves are very steep – as they are inside of 10-years – there's a strong argument that high coupon bonds should trade at *lower* yields than identical maturity and equally liquid par-priced bonds. Essentially, the owner of a high-coupon bond receives a greater percentage of their total cash flows sooner, at a time when there's less default risk. And as a bond's maturity decreases, the relative certainty of receiving the near-term off-market coupons begins to outweigh the added jump-to-default risk.

Finding the inversion point

To prove this point, we use a theoretical model that relies on modeling a company's survival probability term structure in order to correctly capture the risky nature of a bond's cash flows. Much in the same way that one can solve for the risk-neutral probabilities of default that rationalize the term structure of CDS (for instance, CDSW does this on Bloomberg), one can do the same thing using a company's outstanding corporate bonds. [1] [2]

After solving for the bond-implied risk-neutral probabilities of default/survival, it's straightforward to construct a par-coupon yield curve as well as yield curves for bonds with off-market coupons.

In Figure 1, we show an example using a hypothetical set of par bonds (shown in Figure 2) under current interest rates. After solving for the bond-implied risk-neutral default/survival probabilities, we graph a 6% coupon curve and a zero-coupon curve

[1] When doing this we assume that recovery upon default is measured as a percentage of par and not a percentage of market value. This ensures that the model accounts for the added jump-to-default risk in buying a corporate bond that is well above par.

[2] The basic outline of the model we use is best described in *Defining, Estimating and Using Credit Term Structures* published by Lehman Brothers in 2004. However, a variant of the model is also described in Schönbucher's book, *Credit Derivatives Pricing Models* published in 2003.

to demonstrate that there's a point at which the certainty of receiving large coupons in the near term outweighs the added jump-to-default risk. In our example, the 6% coupon and zero-coupon curves cross at approximately 15 years.

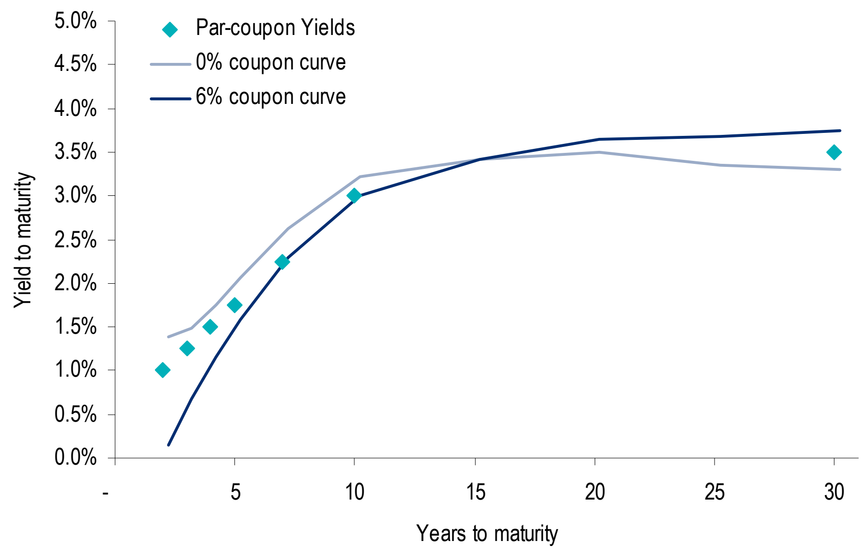
As such, while our 6% 30yr bond hypothetically should trade 25bp wider than our 3.5% 30yr par coupon bond (roughly 0.6bp for every dollar above par), our 6% 5yr bond should trade about 16bp tighter than its par coupon equivalent.

Figure 2. Example calibration securities

Bond	CPN	MATURITY	YTM	PRICE
2y Bond	1.000%	10/3/2014	1.00%	100
3y Bond	1.250%	10/3/2015	1.25%	100
4y Bond	1.500%	10/3/2016	1.50%	100
5y Bond	1.750%	10/3/2017	1.75%	100
7y Bond	2.250%	10/3/2019	2.25%	100
10y Bond	3.000%	10/3/2022	3.00%	100
30y Bond	3.500%	10/3/2042	3.50%	100

Source: Citi Research

Figure 1. Example par-coupon, zero-coupon, and 6% coupon curves



Source: Citi Research

Back to the real world

When one's working with real world securities, calibrating a risk-neutral default/survival probability model from bond prices can be challenging given that high-coupon corporate bonds currently trade somewhat divorced from theory. In other words, since most high-coupon bonds trade wider than their par-coupon equivalents, there is no way to rationalize all of an issuer's bonds with a single risk-neutral default/survival probability curve. Either one calibrates to the par-coupon curve and uses the results to provide a theoretical price for the off-market coupon bonds, or one does the reverse.

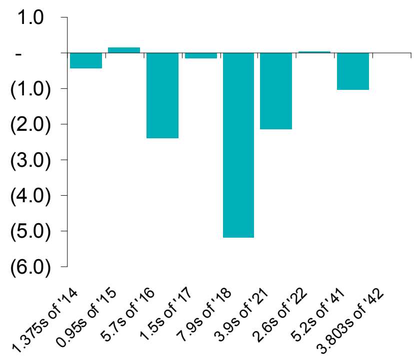
To our minds, it makes far more sense to use the par-coupon curve when solving for the probabilities of default/survival and then try to explain the implied errors in the off-market coupon bonds. After all, the par-coupon bonds most likely were issued more recently and trade with greater liquidity. Nevertheless, this is an assumption we make during our analysis and should be viewed as such.

In Figure 3, we show the result of applying the process to Caterpillar Inc. We highlight the bonds used for calibration and the model-predicted yields of the off-market coupon bonds.

In particular, the CAT 7.9s of 2018 stand out as significantly mispriced, in our view. The current yield is around 1.76%, but the model-predicted yield is only 1.04% - roughly 5 points higher.

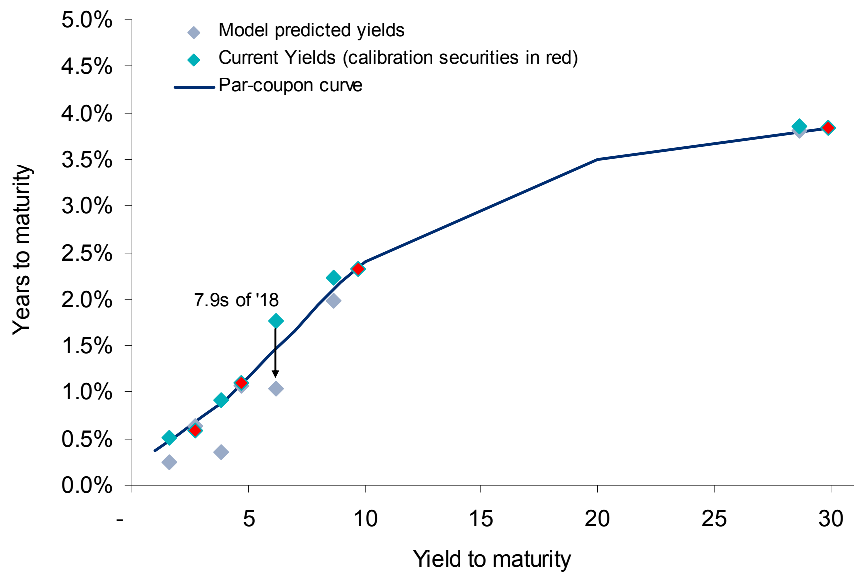
Of course, the model does not take into account liquidity, which, in practice, clearly contributes to the high-dollar discount. Indeed, the CAT 7.9s of 2018 haven't traded in block size in over two months according to TRACE even though the issue size is $900mm.

Figure 4. Model error (pts)



Source: Citi Research

Figure 3. Caterpillar Inc yield curve as of Oct 9, 2012



Source: Citi Research

And yet, we'd argue that liquidity alone is an insufficient excuse for pricing high-coupon bonds so cheaply. For if one looks at the model implied errors for each Caterpillar bond (Figure 4), it's clear that the shorter-dated bonds have larger errors than the longer-dated bonds. In other cases, the errors at the long end are of similar magnitude to the errors at the short end when expressed in price terms. Consequently, the error when viewed in terms of spread or yield is actually much greater at the short end than the long end. Frankly, that's somewhat perplexing and challenges the assertion that liquidity is the only factor at play. Indeed, we'd expect the liquidity premium (and hence the model error for high-coupon bonds) to grow as one extended out in maturity, not decrease or stay the same.

Where's the value

As such, from a purely theoretical perspective, we think that high-coupon bonds with maturities inside of 10-years look extremely cheap. Many longer-dated high-coupon bonds look cheap to us as well. But at the 30-year point, it's clear that high-coupon bonds should trade back of par-coupon bonds because it's a region where the bulk of a bond's cash flows remain subject to significant uncertainty and jump-to-default risk. In contrast, inside of 10-years, one can only justify the cheapness of high-dollar priced bonds as a discount for illiquidity. And if that's the case, it's an extremely punitive discount.

The reason why many market participants value high-coupon bonds incorrectly is that they start from the perspective that a high-coupon bond should *always* trade back of an identical maturity par-coupon bond. As a result, if investors believe that the lower bound for a high-coupon bond in terms of spread or yield is the par-coupon curve, then even if they accurately apply a liquidity discount, the resulting

spread/yield will be too high for shorter-dated bonds, where the starting point is actually below the par-coupon curve.

In short: as long as the market convention remains flawed, in our opinion, we'd look to take advantage.

Appendix A-1

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