Zero-coupon convertible bonds

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Zero-coupon convertible bonds or "optional convertible notes" (OCNs) are well-established in the market. When they are issued at a discount to par, they exhibit an implicit yield and trade essentially as coupon convertibles. Similarly, if they are issued at par but redeemed at a stated price above par, an implicit coupon is paid and so again these bonds trade in similar fashion to coupon convertibles. A zero-coupon bond issued at par and redeemed at par is a slightly different instrument for investors to consider. With these products, the buyer is making more of an equity play than he is with conventional OCNs, but with an element of capital protection retained.

A buyer of a par-priced zero-coupon OCN will have a view that the underlying equity has high upside potential. However the stock will have high volatility, so the OCN route is still lower risk than the pure equity route; the investor pays an opportunity cost in terms of interest foregone in order to retain the greater safety compared to pure equity. The softcall option is often built-in so that the issuer can force conversion if the equity has performed as expected, which caps the investor's upside.

In many cases, zero-coupon OCNs are issued in one currency but reference shares denominated in another (less liquid) currency, so that investors can have exposure to an equity without having to hold assets in the less liquid currency.

These products are for sophisticated investors only. Buyers often are taking a view on price volatility, rather than price *per se*, and the value of the note will increase if volatility increases. In other cases, the volatility trade is put on as an arbitrage, that is, a simultaneous position in which the trader is:

- long the OCN bond, and
- short the underlying equity.

In such a trade the investor benefits if volatility increases. For Issuers, the advantage of zero-coupon par priced OCNs is even greater than that afforded by conventional OCNs: they receive no-cost funding compared to a normal bond or loan. In return they are selling (for them) a cheap route to their equity should the share price perform.

ISIN	Country	CCY	Name	Rating	Coupon	Issue Price	Maturity date	Maturity price	Issue date	Yield %	Parity	Premium	Remarks
XS0242490000	Japan	JPY	Unipres 0% 11	nr	0	100	Mar-2011	100	21-Feb-06	-1.573	82.95	30.50	PRX/SHR= JPY1,490. Conversion price at issue 1490. Initial conversion premium 23.44%. Softcall date Mar-08, continous after that. Closing stock price must equal or exceed JPY 1788 for 30 days
XS0245196604	India	USD	Ranbaxy Labs 0% 11	nr	0	100	Mar-2011	126.765	15-Feb-06	4.900	62.54	58.81	Redeems at 126.765 hence actual yield of 4.9%. PRX/SHR=INR 716. Softcall date Mar-09 and continuous at par. Share price must be at or above INR 931 for 30 days. Conversion start date Apr-06.
XS0245217889	India	JPY	Tata motors 0% 11 (YEN)	BB	0	100	Mar-2011	99.253	16-Feb-06	-0.274	77.68	29.53	PRX/SHR=INR 1001. Conversion premium 30%. Softcall dates Mar-09 and Feb-11 at par. Stock price must be INR 1301 or above for 30 days. Negative yield as redeems below par
XS0245255038	France / Netherlands	USD	STM 0% 16	A3/A-	0	100	Feb-2016	116.118	15-Feb-06	1.688	73.19	34.23	PRX/SHR=USD 23. Init conversion prem 30%. Discrete put, Feb 2011 (price 107.758), Feb 2012 (109.381), Feb 2014 (112.7). Softcall at Mar 2011 at yield of 1.5%, stock price must equal or exceed 130% of the accreted value for 30 consecutive days
XS0242489333	Japan	JPY	AMS Life Science 0% 10	nr	0	100.5	Mar-2010	102.5	07-Feb-06	0.618	81.11		PRX/SHR=JPY 19,110. Current share price JPY 15,500. PRIVATE PLACEMENT. Call schedule (only on Feb and Aug each year up to Feb 2010). Putable on Mar-08 at par. Softcall from Sep-06 at par stock price must exceed JPY 22,932 for 20 consec days
JP344908P631	Japan	JPY	Taiho Kogyo Co Ltd	nr	0	100	Mar-2011	100	13-Feb-06	0.000	84.84		PRX/SHR=JPY 1761. Initial premium 10%. Softcall deom Apr-07 at par, stock price must equal or exceed JPY 2289 for 20 consecutive days.
JP310360P627	Japan	JPY	Aichi Steel #5	nr	0	100	Mar-2011	100	02-Feb-06	-0.990	74.65	41.05	PRX/SHR=JPY 1,440. Initial conv prem 20%. NO hardcall, softcall or put features. Current share price JPY 1075.
JP349740P625	Japan	JPY	Daifuku #3	nr	0	100	Mar-2011	100	25-Jan-06	-1.890	92.56	35.30	PRX/SHR=JPY 2586. Init conv prem 20%. NO call or put feature.
USY0547CAB2	India	USD	Bajaj Hindusthan 0% 11	nr	0	100	Feb-2011	133.578	27-Jan-06	4.720	81.56	30.74	PRX/SHR=INR 465. Init conv prem 30%. Softcall Feb-09 and Jan-11 (par) continuous, stock price must equal or exceed 130% of USD parity for 30 consecutive days. Current share price INR 382.
XS0240443944	India	JPY	Larsen & Toubro 0% 11	nr	0	100	Jan-2011	103.3	05-Jan-06	-1.259	93.81	17.60	PRX/SHR=INR 2,498. Conversion premium 35%. No call or put freature, poison put on delisting.

Figure 1 Zero-coupon OCNs issued during Q1 2006 (Source: Bloomberg L.P.)

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Example of zero-coupon par-priced OCN
We describe now a zero-coupon OCN, issued at par and redeemed at par in the event it is not converted. It is termed a convertible "quanto" note.

Convertible Quanto Note
The Index-linked Quanto Note is aimed at investors who wish to gain exposure to a company's equity, but do not wish to invest in assets denominated in the currency of that equity. An example would be investors who wish to gain exposure to a Japanese company share but do not wish to hold Yen-denominated assets.

The Note enables investors to gain from upside performance of the selected equity but with no associated foreign exchange risk. For added comfort, investors are protected against any downside performance of the underlying equity by means of the Note structure, which sets a "bond floor" of a minimum stated return. This is similar to the bond floor in a convertible bond. Purchasing the Note is equivalent to purchasing market volatility, in the expectation of higher volatility leading to higher equity prices, whilst retaining an element of downside market protection.

Figure 2 below illustrates the concept behind the Note.

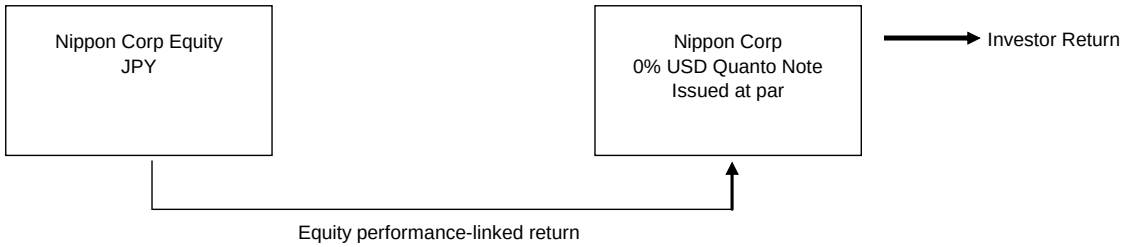

Figure 2

Investors are in effect holding a long position in an option and hence will be exposed to volatility. However the bond floor protects the Investor from downside risk, irrespective of volatility.

Example: Japanese equity Note
This Note is a USD-denominated bond, issued at par, that pays investors a return, in USD, connected to the share-price performance of a Japanese corporate entity (denominated in JPY). If the underlying equity rises in price (above a specified level, the "strike" price), the proportionate increase in the share price is paid out on maturity to the Note investor, as a percentage of par. At any time during its life, the price of the Note will reflect (among other things) this increase in underlying share price.

The value of the Note is comprised of two components, the intrinsic value and the option value. On first issue, an equity "strike" price is set on the Note. This may be at the current underlying share price, or above it. As the underlying share price rises above the "strike" price, the Note intrinsic value will increase proportionally with that of the equity. The option value is an additional value (the "premium") above the intrinsic value, and is composed of volatility, time value and the level of USD interest rates. These are standard option pricing parameters.

If the underlying equity falls in price, the investor is protected by the minimum value of the Note, known as the "bond floor". This is the minimum price of the Note at any one time, hence if the equity price falls below the level at which the bond floor kicks in, there is no further downside price risk for the investor.

We can illustrate this with an example. Consider the following terms for a USD Quanto note:

Underlying	Nippon Corp equity (JPY)
Strike	Y1,200
Spot	Y1,150
Note Offer	100.00%
Parity	95.83%
Premium	4.35%
Life	3 years
US 3 year rates	3.68%
Bond Floor	88.36%
Delta	0.50
Maturity price	100.00

The Note is issued at par with a "strike" of Y1,200.

Consider the following scenarios based on both upside and downside performance of the underlying equity.

If the shares rise to Y1700, a rise of 47.8%, the parity, or intrinsic value would be (1700/1200*100) or 141.66%. This is the minimum value of the Note. Hence a 47.8% gain in the shares has resulted in a minimum 41.66% gain in the Note.

Should the underlying equity price fall below the "strike" price, the note is protected because it carries a bond floor, currently at 88.36%, accreting to par at maturity. This represents the downside protection for the investor. The option premium above this floor will still reflect the three option components, and because time value is always positive, the total value of the Note will be above this bond floor up to maturity.

If the shares fell to Y800, the parity would be 66.66%, however the minimum value of the Note would still be the bond floor of 88.36%. Therefore in this instance a fall of 30.4% in the shares has resulted in a maximum 11.6% decline in the Note. However although the investor's capital is protected, he has foregone interest on it for the period of the investment.

Investors are not exposed to any foreign exchange (FX) risk because they pay USD for the note, and receive return in USD. However one of the option value parameters is the level of interest rates, hence investors are exposed to USD interest rates. A call option written on an equity will rise in value if (all other parameters held constant) there is a rise in interest rates, because the cost-of-carry associated with the equity also rises. This sensitivity is carried over in the value of the Note, because the secondary market price of the Note is related to the over-the-counter (OTC) options market.

A partial measure of the change in the price of an option with respect to a change in the price of the underlying equity is given by the *delta* of the option, which is

$$\delta = \frac{\text{change in Note price}}{\text{change in underlying price}} \qquad (1)$$

For convertible bonds, delta is defined in terms of the sensitivity of the bond's price to changes in its parity. The parity is given from the value of the underlying equity price. The value of this delta can be gauged from Figure 3, which illustrates an hypothetical bond's parity and bond floor. The delta is seen from the relationship of the parity and Note price.

In our example the delta is given as 0.5. So if the Note theoretical price moved from 100 to 100.5 while its parity changed from 95 to 96, the delta would be 0.5.

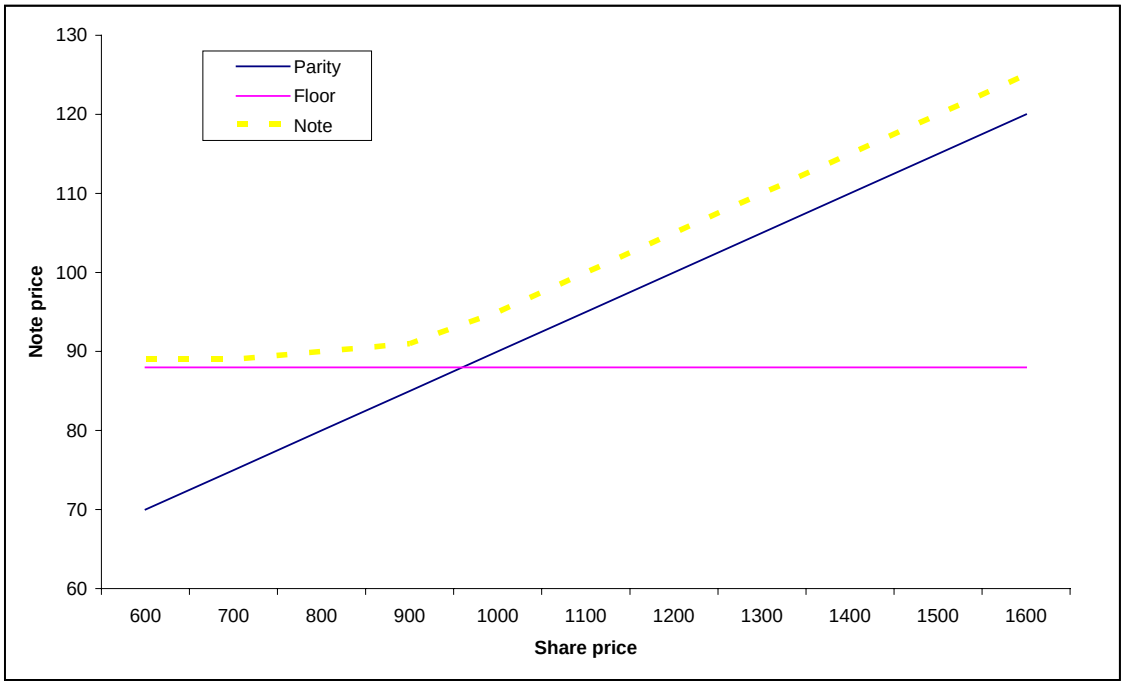

Figure 3

Examples of zero-coupon OCNs

Figure 1 is a selection of par-priced zero-coupon OCNs issued in January and February 2006.

The notes issued by Ranbaxy Labs, STM, AMS Life Sciences and Bajaj Hindustan can be viewed in a similar way to conventional convertible bonds. The investor is guaranteed a positive return (ignore credit-risk considerations of the Issuer) because the payment on maturity of the notes is above par. The Ranbaxy bond is an example of a note issued in one currency (USD) that references shares in another currency

(INR). This enables non-domestic investors, who may not desire the operational and settlement issues associated with holding INR assets, to have exposure to the equity. The bonds issued by Unipres, Tata Motors, Taiho Kogyo, Aichi Steel and Daifuku are examples of par-priced zero-coupon OCNs that redeem on maturity at par (or in one case below par). These securities pay a negative yield, and this is the interest foregone by the investor on the notes. If the share price performs as desired, the notes will be converted and the investor will gain; if they do not, there is still the safety of the capital repayment on maturity (credit-risk considerations of the Issuer ignored again). In some cases we can see that the premium on the bond is greater than it was on issue, indicating that the share price has dropped since the bond was issued.

These bonds represent an opportunity for investors to take a view on equity without having to buy the equity, so that an element of capital protection is retained. For the Issuer, they represent very low-cost funding, and also diversified funding from non-domestic investors.

The critical point to bear in mind regarding these notes is that they are instruments that focus on the Issuer's *equity*. It is the equity price, and/or equity price volatility, that is being targeted via these notes. Without a tradeable equity and a transparent equity price, the basic *raison d'etre* behind the notes would disappear.

Market pricing of par-priced zero-coupon OCN issued by subsidiary company to parent

Banks price OCNs using option pricing models such as Black-Scholes, and tree-based models such as the binomial or trinomial model. These make certain assumptions with regard to the behaviour of equity prices, and also use an assumed volatility level. They also require the underlying share price as one of their inputs. In other words, we require a traded equity for the option component to be valued.

In the absence of a traded equity, the market would fall back on the dividend valuation model used in earlier times. This would make assumptions on the equity valuation, and would be based on the financial data supplied by the subsidiary company. It has the advantage of assuming zero volatility, which is unsatisfactory in the "proper" convertible market but would be suitable when there is no traded equity.

In practice, the option element would have no value, because the equity of the subsidiary is 100% owned by the parent company in any case. An option to purchase more of this equity by the same parent would have no economic rationale to it. The shares do not trade so there is also no time value to the option. The value of the note would then be composed of the debt component only, however this pays 0% coupon and redeems at par. The note carries "negative value" to the holder, which is the face value of the note discounted by the parent's WACC or other suitable discount rate.[1]

[1] The WACC itself may be difficult to compute. A discount rate that can be applied with logic is the parent company's cost of debt, adjusted if need be to account for any specific issues in the relationship between the parent and the subsidiary. External investors will consider the subsidiary and its obligations to be the obligation of the parent company, unless the latter has indicated that it will be separating from the subsidiary.

Therefore this would be the price of the note if it was sold to an external third party. A side impact of this is that the sale would result in a realised mark-to-market loss for the parent, which purchased the note at 100.

If the parent gives notice to the market that it intends to divest the subsidiary company from the group, then the option element will acquire value. In the absence of a tradeable share, an implied share price will be calculated using the Issuer's financial reports as input data, via standard corporate finance valuation techniques. This then implies a value of the OCN option element based on the conversion terms of the note. This value is highly speculative but may still be of interest to sophisticated investors if they have a view on the subsidiary company as a stand-alone entity.

Note that this valuation approach ignores operational issues associated with any sell-off the subsidiary company, such as new ownership details, tax structure, and so on, which would also be considered by potential investors.

The views, thoughts and opinions expressed in this paper represent those of Moorad Choudhry in his individual private capacity, and should not be taken to be the views of any employing or affiliated institution, or the views of Moorad Choudhry as an employee or affiliate of any named or unnamed institution.

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