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# DEVISING A NON-STANDARD CONVERTIBLE ZERO-COUPON BOND TO ENHANCE CORPORATE GOVERNANCE

**Rodolfo Apreda**

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# DEVISING A NON-STANDARD CONVERTIBLE ZERO-COUPON BOND TO ENHANCE CORPORATE GOVERNANCE

**Rodolfo Apreda**

Professor Rodolfo Apreda holds a Ph D in Economics (University of Buenos Aires, 1998), and a Master in Political Sciences (University of Cema, 2005). He is Director of the Ph D Program in Finance and also the Center for the Study of Private and Public Governance, at the University of Cema.

***Abstract***

This research paper brings forward a non-standard convertible zero-coupon bond endowed with a set of distinctive features attached to it so as to strengthen the corporate governance of the issuer, namely that conversion actually takes place at maturity date only; that conversion is mandatory; it offers investors a pay-off function tailored to match the conversion; there is no call provision whatsoever; it is suitable for private or public placements; credit-risk rating is of the essence and, lastly, it requires from the company a track record statement on behalf of investors. Although this sort of bond actually provides the company with a powerful financing vehicle, we argue that it could also play a constructive role if it were used in compensation packages for rewarding both senior managers and the Board of Directors.

***JEL: G34, G32, G11, G12***

***Key Words: zero-coupon bond, convertible bond, corporate governance, covenants, compensation packages, track record statement.***

***Institutional Disclaimer***

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## INTRODUCTION

In the early 80s, some investment banks offered trust funds by which investors[1] could buy securities that were equivalent to zero-coupon bonds[2]. Such financials actually relied on Treasury Notes and Treasury Bonds bought beforehand in bulk, which were next sold like claims to single coupons of interest with a determined maturity, or single principals at their contractual maturity. They were the forerunners of what shortly after would be known as Treasury Strips.

It was in 1985 that the Treasury set up a market for investors to purchase directly coupons of interest and principal, instead of proxies of them[3]. The market for **Strips** (Separate Trading of Registered Interest and Principal of Securities) was born and strove for greater efficiency at an astonishing pace.

Among the consequences springing out of this technological achievement, we point to the following ones:

a) Market participants, either dealers or analysts, could figure out the temporal structure of rates of return for not only short maturities but also longer ones, even reaching a span of time up to 30 years; besides, they were able to adjust the temporal structure by the so-called yield curve[4], getting access to a powerful forecasting tool.

b) Grounded on the temporal structure of rates of return, cash-flows valuation became more precise and technical, by giving rise to risk-adjusted spot rates and

[1] From institutional investors and big players to banks and corporations, even household units in pursuit of retirement schemes or educational expenses of children.

[2] A number of corporations and municipalities had issued zero-coupon bonds before the 80s.

[3] Sack (2000) makes for a good reference.

[4] For a deeper analysis in this issue, see Sack (2000) and Dybvig et al. (1996).

by assimilating each cash flow to be discounted to a zero-coupon bond[5] .

c) The development of this technology encouraged financial and non-financial companies to issue long-term zero-coupon bonds to meet their funding requirements. The new market provided with a plentiful source of liquidity to qualified players and market-makers.

It is for this paper to bring forward a non-standard convertible zero-coupon bond intended not only as a financing vehicle but also as a driver of better corporate governance.

In section 1, we are going to delve into the nature of a simple zero-coupon bond. Section 2 will outline the valuation technique of such bonds profiting from the temporal structure of rates of return. Next, section 3 will focus on investment accounting, while section 4 is going to deal with risks involved in trading zero-coupons before they reach maturity date. Afterwards, section 5 will expand upon convertible zero-coupons and call provisions usually attached to them. Section 6 will show forth the convertible zero-coupon bond which is the target of this paper. Lastly, section 7 will draw upon pragmatic consequences this security entails for corporate governance.

## 1. THE NATURE OF A ZERO-COUPON BOND

Let us assume that our decision-making involves an investment horizon

$$\mathbf{H = [\, t\, ;\, T]}$$

[5] Apreda (2009b, 2009c) handles this subject, providing new frameworks of analysis that includes a governance risk rate not only to discount cash-flows but also to appraise the cost-of-capital rate.

where **t** is the starting date, when we intend to buy a security, and **T** is the end of the horizon, when either we sell the security or its maturity takes place eventually. As from now, we are going to deal with bonds purchased at **t** and held till maturity date **T** unless otherwise stated, as it will happen in section 4.

***Definition 1***

***By a Zero-Coupon Bond[6] is meant a bond purchased at date t, with maturity at date T, such that the following constraints are met:***

- ***V( t ) < V( T ),***
- ***there is no interest payment along the life of the bond,***
- ***at maturity date, the bond pays off V( T ) only.***

As might be expected, this sort of discount bond comprises a simple cash position for the investor. In point of fact, its underlying cash-flow vector **F** becomes

$$\mathbf{F = [\, f(t) ; f(T) \,] = [\, -V(t) ; V(T) \,]}$$

By the way, **V(t)** could refer to either the value at the issuing date or any other date when an investor makes up his mind to purchase it[7].

## 2. VALUATION

For any financial asset, its return along the investment horizon can be figured out by means of the relationship

[6] Henceforth, we are going to use ZC-bond for short.

[7] In this latter case, there are risks on the side of the seller as we are going to expand later on in section 4.

$$R(t;T) = \frac{V(T) + I(t;T) - V(t)}{V(t)} \qquad (1)$$

where **R(t;T)** stands for total return expected to be earned throughout the horizon[8], while **I(t;T)** refers to total interest payments expected to be collected in the horizon[9].

When we deal with ZC-bonds, it holds true from definition 1 that

$$I(t;T) = 0$$

On that ground, the total return expected from a ZC-bond in (1) comes out like

$$R(t;T) = \frac{V(T) - V(t)}{V(t)} \qquad (2)$$

Relationship (2) hints to the fact that when investing in ZC-bonds the only source of return stems from a change in value that accrues as time passes by.

Singling out **V(t)**, we get the valuation formula

$$V(t) = \frac{V(T)}{[\,1 + R(t;T)\,]} \qquad (3)$$

Notice that **V(t)** in (3) arises out of discounting **V(T)** with the total holding return, from point to point in the horizon.

[8] If valuation were done at date **t**, all values **V(T)**, **I(t; T)**, and **R(t; T)** need to be assessed as expected and contingent upon the analyst's information set **Ω(t)** up to that moment.

[9] Calling for precision, **I(t; T)** should add up all interest inflows along the horizon, plus the capitalization of each collection up to date **T** usually by means of risk-free assets.

For practical purposes, we need to calibrate **R(t; T)** so that other investment alternatives might be easily contrasted with this one.

In the first place, if the period unit were a semester, and there were exactly **N** semesters within the horizon, we should find out a semester rate of return equivalent to (2) by means of next relationship:

$$[\ 1 + R(t\ ;T)\ ] = [\ 1 + s(t\ ;N)\ /\ 2\ ]^{N}$$

which we plug into (3) to reach the standard valuation construct

$$V(t) = \frac{V(N)}{[\ 1 + s(t\ ;N)\ /\ 2\ ]^{N}} \qquad (4)$$

where **s(t; N)** stands for ″the nominal yearly rate of return that will yield the ZC-bond from **t** = **0** (the purchasing date) till maturity date **T** = **N**, by compounding such rate semester after semester.″ This sort of rates go by the name of ***spot rates*** and they come forth from the temporal structure of rates of return. In real practice, however, they are framed like risk-adjusted rates. A very sensible and widely used concoction is the following:

(5)

$$s_{adjusted}(0; j) / 2 = s_{US\text{-}strips}(0; j) / 2 + cr\text{-}rate / 2 + credr\text{-}rate / 2$$

where **US-strips** means the Treasury-Strip spot rate in a nominal and yearly basis, drawn out of the yield curve; **cr-rate** stands for ″country-risk rate, in a nominal and yearly basis″; **credr-rate** denotes ″credit-risk of the issuer, net of country-risk[10], in a nominal and yearly basis″, the three of them to be compounded through

[10] In order to avoid double-keeping.

semesters. We substitute (5) for the former spot rate in (4):

(6)

$$V(t) = \frac{V(N)}{[\,1 + s_{adjusted}(t;N)/2\,]^{N}}$$

In the second place, if the compounding-period unit were the semester but there would not be exactly **N** semesters within the horizon, we have to work out a relationship like (6) to cope with the mismatching of semesters into the whole horizon. The procedure is very simple indeed.

Let us suppose that the number of days in the horizon amount to

$$T - t$$

days and we measure semesters as comprising 180 days each. The actual number of semesters will be equal to

$$(T - t)/180$$

Hence, and taking advantage of (6), the ultimate valuation follows:

( 7 )

$$V(t) = \frac{V(T)}{[\,1 + s_{adjusted}(t;T)/2\,]^{(T-t)/180}}$$

### 3.- INVESTMENT ACCOUNTING

If the investor kept the ZC-bond till expiration date, he may be able to record the accrual of value in his financial statements, and realize the monetary inflow in the Income and Losses Statement. The whole valuation and recording of this accrual is denoted **Investment Accounting.** In this context, the bond will be regarded as a

risk-free asset[11].

Therefore, the investor would resort to (7) and register the earning of return as time passes by:

$$[\ 1\ +\ s_{adjusted}(t\ ;\ T)\ /\ 2\ ]^{(T\ -\ t)\ /\ 180}\ =\ V(T)\ /\ V(t)$$

where

$$s_{adjusted}(t\ ;\ T)$$

is the yearly nominal rate of return, to be compounded by semesters, that suits to figuring out the accrual. In point of fact, $s_{adjusted}(t\ ;\ T)$ becomes the internal rate of return of the whole investment from date **t = 0** till maturity date **T = N**[12].

Last of all and profiting from investment accounting, buyers and holders of ZC-bonds can amortize the difference between **V(T)** and **V(t)** as taxable income over the life of the bond.

## 4.- RISKS OF TRADING BEFORE-MATURITY DATE

Let us assume, without loss of generality, that an investor bought a ZC-bond at issuing date **t**, but later on he starts to suffer liquidity constraints and makes up his mind to sell the financial in the market at date **t(1)** so that

$$t\ <\ t(1)\ <\ T$$

[11] But if the investor did not keep the bond till maturity date and sells it before such date, he would face a winning or a losing outcome on account of the market discount rate in contrast with the value accrued up to that date. More background about this is given in section 4.

[12] In the technical appendix attached at the end of this paper the interested reader will find the accrual algorithm developed at length.

Within this setting, he must make a contrast between two values, the one that is given by his records from the investment accounting procedure, and the value the market dealer sets at **t(1)** for the bidding price. Let us expand on this matter further:

- ***Investment accounting valuation (iav):***

By compounding **V(t)** with the spot rate contractually settled at issuing date **t = 0**, we reach to

$$V(t(1), iav) = V(t) \times [\, 1 + s_{adjusted}(t; T) / 2 \,]^{(t(1) - t) / 180}$$

- ***Market valuation (mv):***

By discounting **V(T)** at **t(1)**, we attain

$$V(t(1), mv) = \frac{V(T)}{[\, 1 + s_{adjusted}(t(1); T) / 2 \,]^{(T - t(1)) / 180}}$$

The investor compares then the difference between these values, by followint next rule:

a) if $V(t(1), iav) < V(t(1), mv)$

then he reaps a benefit from the transaction.

b) if $V(t(1), iav) > V(t(1), mv)$

then he incurs a loss from trade.

As from date **t(1)**, the new investor should make the investment accounting with the rate $s_{adjusted}(t(1); T) / 2$, which gives the holding return till expiration date

arising from the new acquisition price.

## 5.- CONVERTIBLE ZERO-COUPON BONDS

Broadly speaking, zero-coupon bonds can be designed and offered with a conversion feature, by which investors may exchange them for ordinary stock. More precisely:

***Definition 2***

***By a convertible zero-coupon is meant a financial combo consisting of***

- ***a zero-coupon bond,***
- ***a conversion feature which establishes that, under contractual conditions, the bond will be convertible in ordinary shares, preferred shares, or other bonds.***

By and large, convertible bonds allow investors the contingent choice of exchanging the bond for other securities from the same company, mainly ordinary shares. It is a contingent choice since conversion takes place under a well-defined set of conditional future states of the world already settled in the issuance prospect.

In the most frequent scenario, conversion triggers off when the stock price in the market is higher than its contractual exercise price. That is, the standard conversion follows since a convertible bond is a financial combo that comprises a simple bond plus an embedded option which gives each investor the right to buy shares from the bond's issuer. Valuation of such combo must take into account its dual nature. A remarkable contribution to standard convertibles valuation can be found in Brennan and Schwartz (1980).

At this juncture, it must be stressed that the convertible developed in this paper is non-standard, since it does not involve a call option, as we are going to show later in section 6.

The above-mentioned exercise price stems from a contractual device called ″conversion rate″, denoted **(CR)**, which itemizes the number of shares to be exchanged for the nominal value of the bond′s trading unit[13].

There is a variegated assortment of customized convertibles and most of them include calls provisions. By this covenant, the issuing company can perform the call provision at any time after certain contractual date. Either issuers of coupon-bearing bonds or zero-coupon ones resort most of the time to this covenant which, as Narayanan and Lin (1989) argued, still adding the fact that with a corporate rate tax less than 50%, they are not optimal. Both authors found evidence that zero-coupon bonds with call provisions have more restrictive financing covenants than those without call provisions.

The rationale behind a call provision lies on refunding, by which the company would be able to redeem the ZC-bond by issuing another bond with lower internal rate of return. Unlike what happens with coupon-bearing bonds, a callable ZC-bond sets a fixed price and not a time-dependent price, an example of which will be given below.

Thus, and for the sake of illustration, let us consider the convertible ZC-debenture that Corning Inc. issued up to 2,7 billion dollars in November 8, 2000, with maturity date 15 years thereafter. Chan, J. and Bruner, R. F. (2001) have extensively dealt with this bond, which carried along three embedded options:

[13] For instance, if the nominal value for each issued unit of the bond were 1,000 dollars, and the conversion rate came defined as 1:10, the exercise price of each unit of stock would amount to 100 dollars.

- The right to convert the bond to common stock (in fact, an American option that could be exercised since the issuance date).
- A redemption option (anytime from November 8, 2005) that amounted for the company to be long a call, and the investor to be short a call.
- A pair of put options on behalf of the investor, to be exercised on November 8, 2005, and November 8, 2010.

## 6.- DEVISING A NON-STANDARD CONVERTIBLE ZERO-COUPON BOND

At departure from the conventional batch of callable and convertible bonds, this paper sets forth a tailor-made design which requires a closer examination of its non-standard nature. As a starting point, two features are worthy of being remarked:

- This bond intends not only to finance any company, but also to enhance its corporate governance.
- The security can be offered either by means of a public or a private placement. Empirical evidence witnesses the fact that for most countries in the world, private placements are absolutely favored against public ones. On this point, we refer the reader to Carey et al. (1993) as well as to Easterbrook and Fischel (1996).

### *a) Conversion takes place at maturity date only*

Here we have a feature that stands out in stark contrast with many convertible bonds, most of them coupon-bearing whose conversion may be exercised, or not, over a contractually well-defined period.

Accordingly, investors who bought this non-standard ZC-bond would know for certain that there will be only a distinctive date for the undertaking of conversion,

irrespective of how well or badly the share price had performed before that date.

If the ZC-bond were held through expiration date, the investor would grant himself the accrual in his books of the whole amount gained under the guise of holding return. Otherwise, if conversion took place prior to maturity, as usually happens with standard convertibles, he could only claim the return accrual till exercise date only.

***b) Conversion is mandatory at maturity date***

Usually, holders of convertible bonds give heed to an exercise period over which conversion might be claimed. If over the full span of the exercise period, conversion were not convenient, those investors would be entitled to collect **V(T)** at expiration date, that is to say, they cash the bond principal at maturity date.

In contradistinction to this standard procedure, investors who buy the ZC-bond we are dealing with must exchange the bond for ordinary shares at maturity date which means they forfeit the principal redemption of **V(T)** in cash.

To put it differently, this bond entails an uncommon attribute that makes a difference with other types of convertibles: there is no embedded call-option in this financial. The investor, when purchasing the convertible, does not acquire any right to buy the company's stock but he must swap the bond for stock

***c) Conversion brings about a well-determined pay-off function***

Let us assume that for each issued unit of the bond, with nominal par value **V(N)**, the contract established a conversion rate equal to **W** ordinary shares from the company:

$$\mathbf{CR = 1 : W}$$

In other words,

$$\mathbf{V(N) = W \times S_{\text{exercise price}}(N)}$$

At maturity date, when the market value of each ordinary share counts up to **S(N)**, the investor would face the following pay-off function, defined upon two non overlapping settings[14].

- **Decision-making for setting 1**

$$\text{If} \quad \mathbf{V(N) = W \times S_{\text{exercise price}}(N) \rangle W \times S(N)}$$

then the investor receives the following combo:

$$\begin{cases} \mathbf{W} \text{ units of newly issued ordinary shares} \\ \text{Cash for the difference} \quad \mathbf{V(N) - W \times S(N)} \end{cases}$$

Therefore, the investor is compensated in cash up to the conversion value.

- **Decision-making for setting 2**

$$\text{If} \quad \mathbf{V(N) = W \times S_{\text{exercise price}}(N) \langle W \times S(N)}$$

then the investor receives **W** units of newly issued ordinary shares and reaps the market-price gap over the exercise price[15]:.

[14] Here we assume an expiration date **T= N**. That is to say, in the horizon there exactly **N** semesters. If this were not the case, relationship (7) would hence ensue and we should denote the par value as **V(T)** instead.

[15] More precisely, and in monetary value:

**Pay Off (setting 1) = $W \times S_{\text{exercise price}}(N) + [S_{\text{exercise price}}(N) - S_{\text{market}}(N)] \times W = W \times S_{\text{exercise price}}(N)$**

***Remarks:***

- The mechanism of conversion avoids the company to keep and add money at the end of regular periods so as to ultimately build up the amount it will need to pay off the principal to bondholders at maturity date. Therefore, and in contrast with conventional convertibles, no sinking fund would be required at all[16].

- For valuation purposes, this bond ″redeems″ the principal value **V(T)** either as stock or cash-stock mix. That is to say, what the bond promised when it was issued at date **t**, it delivers at expiration date eventually.

***d) There are no Call Provisions whatsoever***

This contractual rule sends out an unmistakably signal to markets. In point of fact, the covenant seeks to protect the bondholders' property rights in case the company were weighing up an early redemption of the bond on the grounds of future reorganization, merger or acquisition.

Putting it in other words, no early redemption will be allowed regardless of impending changes in the organization. Otherwise, bondholders would be able to trigger off the default claim which lies on this sort of covenants.

***e) Track Record Statement***

We regard this covenant as a key driver for shaping up the company's corporate governance. Period after period, the company must attach to its Financial Statements an externally audited ***Track Record Statement*** rendering the following

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**Pay Off ( setting 2 ) = W × $S_{\text{exercise price}}$ (N)**

The difference lies on setting 1 which delivers a mix of cash and stock.

[16] More background on sinking funds and their consequences for Corporate Governance, can be found in Apreda (2007).

variables of analysis in full detail:

- Stock price performance in the period. In case of a private placement, a technical value performance.
- The outstanding amount of the convertible zero-coupon bond held by creditors, with an account of any repurchase carried out through the period, either by means of open-market transactions or private agreements.
- Capital structure of the company, displaying varieties of stock issued and its voting differential rights.
- Credit-risk rating must be enforceable and duly reported.
- A complete review of all standing bonds and bank loans, either publicly or privately held.
- Dividends policy from five years prior to the issuance of the convertible zero-coupon bond up to the statement date.

Summing up this section, the bond becomes operational in that it goes straight for its goal of raising finance at date **t**, and making the conversion attainable at maturity date **T**, by means of the above-described rules of design that must become, to all intents and purposes, embedded covenants in the bond indenture, within the framework of fiduciary duties towards creditors[17].

## 6.1 COUNTERVAILING FORCES IN THE ZC-BOND DESIGN

Looking over the covenants developed out of section 6, we realize that some of them play countervailing roles to balance not only sensible constraints set upon the issuer but also relative levels of freedom on behalf of investors.

i) As conversion takes place at maturity date only, and it is also mandatory, the investor knows for certain that the income to be accrued will evolve

[17] By fiduciary duties, we wish to highlight here at least three of them: trust, diligence and good faith. On this subject, see Black (2001), Flannigan (2004), Easterbrook and Fischel (1996).

and will be recorded in his books period after period, which helps financial income being assessed ahead of time.

On the other hand, covenants a) and b) prevent the company from disbursing cash flows or delivering new shares to investors prior expiration date. By the same token, covenant d) means that the company had forfeited its rights to any call provisions at all.

ii) If the company's stock underperformed in the market, widening the gap settled in the indenture by the exercise price, the less the market price becomes, the more cash the investor would collect as follows from the pay-off function[18] in covenant c). Besides, investors are able to follow up the company' performance through the Track Record Statement.

Therefore, the company faces here an incentive to perform better and cut down some common agency problems usually arising in other sort of debt commitments.

## 7.- PRAGMATIC CONSEQUENCES FOR CORPORATE GOVERNANCE

So far we have considered the financial engineering pertaining to the convertible ZC-bond we are concerned with. We now turn to the underlying matter of Corporate Governance[19].

Broadly speaking, Corporate Governance refers to the field of knowledge and

[18] The convertible may fall out of favor among investors, leading to massive sales orders and the plunging of the bond value, which should increase the company's liabilities in cash, as the gap between the market price and the exercise price widens.

[19] Incidentally, that Corporate Governance is one side of the coin, while Corporate Finance is its other side, was firstly noticed by Oliver Williamson (1983).

practice whose main concerns are[20]:

- The founding charter of the organization and its ownership structure
- Fiduciary duties of the Board of Directors and their control rights
- Fiduciary duties of the management and their decision rights
- Covenants on behalf of creditors
- Conflicts of interests among shareholders, Directors, managers, creditors and other stakeholders
- Accountability and compliance risks
- Transparency
- Compensation packages for the management and Board

The zero-coupon bond set forth in this paper handles the following governance variables:

a) ownership structure,
b) covenants on behalf of creditors,
c) accountability and compliance risks,
d) transparency,
e) compensation packages.

Let us delve further upon these issues.

***a) ownership structure***

Compulsory conversion opens the door to new shareholders. In many countries, for a company to issue convertibles it is required that the ownership structure be

[20] More background on this subject can be found in the paper *The Semantics of Governance*, by Apreda (2006a), who called each component in the definition, **the basic variables of analysis in Corporate Governance.**

changed to that of a corporation, and the placement procedure be a public offer[21].

Besides, when bondholders get access to the new stock, the ownership structure bears changes in important issues like the shaping of majorities, differential voting rights, Board composition, dilution and preference rights, standing compensation plans related to stock, as well as minorities' rights.

In continental Europe, as well as in Latin American countries, most companies are family-owned and closed, with a strong cultural and institutional bias against public placements in domestic Stock Exchanges[22]. Prevented the owners from issuing convertibles by current regulations, the only sensible way would be a private placement among older stockholders[23] or institutional investors alike.

***b) covenants on behalf of creditors***

In this sort of ZC-bond, there are three features that are worthy of being remarked.

- Firstly, the company has no right to call the bond before maturity.
- Secondly, the bond has a compulsory conversion at maturity date, which means that creditors will be given new stock, or new stock plus the

[21] In Argentina, the regulation constrains the issuance of bonds to corporations (limited public companies), foundations and cooperatives, but for convertible bonds only corporations are allowed to issue them, and its public placement becomes compulsory.

[22] For the sake of illustration, in Argentina there are almost 100 listed companies. The best time for listing took place in the 60s, when almost 560 companies were listed (see Apreda, 2009, 2001). Australia, in contrast, with less population than Argentina it has more than 2,500 companies listed, pointing to another institutional framework and culture, as a matter of course. A remarkable comparative analysis focused on OECD members can be found in Roe (2003).

[23] This would bring about, of necessity, a change in the Shareholders Agreement, since manifold problems ought to be taken into account, like succession issues, and new generations entering the Board. We refer the reader to the book *Codes of Good Governance Around the World* (2009a), edited by Professor Lopez Iturriaga, Nova Science Publishers, New York, for detailed information upon this matter; in particular the Argentina case is developed by Apreda in chapter 2, pp. 35-54.

difference between the exercise price and the market price.

- Lastly, the company must fulfill all the requirements of the Track Record Statement.

***c) accountability and compliance risks***

Accountability deals with making commitments and be held responsible for their compliance (Apreda, 2009a, 2006a). This notion of paramount importance in Corporate Governance, has been further qualified in the literature with the introduction, by the Basel Committee on Banking Supervision (BIS, 2010, 2005), of the compliance function whose goal is to cope with compliance risks. Whereas the compliance function was intended for financial institutions around the world, an expansion of it to non-financial institutions can be found in Apreda (2006b).

To all intents and purposes, the Track Record Statement plays the role of a gatekeeper for compliance risks.

***d) transparency***

Following the benchmark provided by the Basel Committee on Banking Supervision (BIS, 2010, 1998), information should be regarded as transparent when it is comprehensive, timely, relevant, comparable, reliable and material[24].

If we looked back to our convertible zero-coupon bond, three points would stand out:

- As a bond, it is a liability that must be disclosed in the Financial Statements. On the other hand, as a zero-coupon bond, there are no cash outlays since it does not pay any interest over the whole life of the bond.

[24] According to the Basel Committee (1998), information must be regarded as material "*if its omission or misstatement could change or influence the assessment or decision of a user relying on that information*."

- The bond indenture must contain the conversion feature as well as a detailed description of the pay-off function at expiration date.
- The Track Record Statement is fully enforceable.

Therefore, for market analysts would become an easier task following up how things are going on with this sort of bond, and also to assess the current and the future capital structure of the firm.

***e) compensation packages***

The convertible ZC-bond we are discussing would successfully meet basic requirements for transparency and accountability if the company resorted to this financial to devise compensation packages for executives and directors. Let us delve into how this bond can qualify as a component of certain compensation package.

- **Maturity**

Agency problems are topical among stockholders, managers, and Directors. Therefore, it seems advisable to cope with such conflicts of interest (mainly short-termism, rent-seeking, and soft budget constraints[25]) by setting a long-term expiration date around 10 years. Besides, a covenant should be included in the package contract to forbid any further change in the exercise price or the expiration date[26].

- **Investment accounting**

On behalf of managers and directors, the accrual of the bond's returns takes place as time passes by. To accomplish such goal, the company will run individual accounts for each beneficiary, but cash flows will not be delivered to them until

[25] For a thorough treatment of these matters, the reader is referred to Apreda (2005, 2002b).

[26] Such deviant behavior became standard practice in many companies, some of them involved with the wave of scandals in the aftermath of Enron′s demise (more about Enron in Apreda, 2002).

maturity. That is to say, at expiration date they receive the whole of returns

$$V(T) - V(t)$$

in cash, plus the shares endowed through the conversion ratio.

- **The conversion feature**

One thing is to issue this bond for investors who agree to finance an investment project, and quite another thing to make use of it as a compensation device.
In the former case, there is (as we saw in section 6c) a pay-off function that pulls the trigger at expiration date, delivering stock only, or a composite consisting of shares plus the balance in cash when the stock price had fallen below the exercise price.

But for executives and directors, the conversion feature must consist only of full delivery of shares. The rationale for this choice can be outlined this way:

i. compensation packages intend to reward good performance;

ii. when performance comes below expectations or settled targets, managers and directors must be held accountable for that, and share the downside with stockholders.

- **Tenure**

This is a thorny contractual matter and we are going to focus on two unavoidable contingencies to cope with.

i. If maturity took place while the executive is in his tenure, then he should receive shares plus the accrued return from the bond. This follows regardless the company had decided, before expiration date, to build up and grant to the executive a new convertible bond as a subsequent compensation package.

ii. If tenure ended before the maturity date, there are some alternative ways to deal with such scenario. For the sake of illustration, we point to a pair of likely contractual settings:

- The executive leaves the company in good terms. He could claim shares plus the accrued returns up to that moment, or hold his rights till maturity date, albeit tenure had expired.

- The executive leaves the company in bad terms. If such were the case, the company should deliver the accrued returns only, and the executive ought to forfeit his rights upon the shares.

## CONCLUDING REMARKS

A convertible zero-coupon like the one brought forth in this research paper is advisable and feasible for financial and non-financial companies, on the grounds of two advantage points:

a) It is a financing vehicle for new investment projects for those investors who are not only interested in becoming bondholders but also shareholders of the issuing company. However and at variance from conventional coupon-bearing convertible bonds, investors only get the accrual of the holding return, year after year, since they are not entitled to getting back the principal. Lastly, this bond does not return the principal, because there is no call option embedded, while exchange for stock is compulsory.

b) Alternatively, it offers a transparent and reliable compensation tool for the Management and the Board of Directors, which diminishes agency problems, and it is conditional upon a distinguished tenure.

The technical improvements that such convertible bears to notice fall under the following headings:

- conversion takes place at maturity date only,
- conversion is mandatory at maturity date,
- conversion offers investors a compulsory pay-off function at maturity date,
- call provisions are ruled out before expiration date,
- a Track Record Statement must be enforced and released.

Corporate governance is streamlined with this convertible zero-coupon bond, mainly through ownership structure changes, covenants set up on behalf of creditors, accountability as well as transparency practices, compliance risks and, additionally, compensation packages.

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**TECHNICAL APPENDIX**

Let us delve into the algorithm underlying the investment accounting process.

***Stage 1: How does V(0) growth***

At date **t = 0**, the ZC-Bond values

$$V(0) = \frac{V(N)}{(1 + s(0,N)/2)^{N}}$$

at date **t = 1**,

$$V(0) \times (1 + s(0,N)/2)^{1}$$

at date **t = 2**,

$$V(0) \times (1 + s(0,N)/2)^{2}$$

at date **t = j**,

$$V(0) \times (1 + s(0,N)/2)^{j}$$

and,,lastly, at date **t = N = T**,

$$V(0) \times (1 + s(0,N)/2)^{N} = V(N) = V(T)$$

**Remark:** If **[t; T]** did not exactly comprise **N** periods, then slight changes would ensue by means of relationship (7), in section 2.

***Stage 2: How does the holding return accrue period after period***

Let us denote as **HR(j − 1, j)** the holding return from date t = j − 1 through t = j.

At date **t = 1**,

$$\mathbf{HR(0,\ 1)\ =}$$

$$\mathbf{= V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}\ -\ V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 0}}$$

$$\mathbf{= V(0)\ \times [\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}\ -\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 0}\ ]}$$

$$\mathbf{=\ V(0)\ \times\ s(0,N)\ /\ 2\ )}$$

at date **t = 2**,

$$\mathbf{HR(1,\ 2)\ =}$$

$$\mathbf{= V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 2}\ -\ V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}}$$

$$\mathbf{= V(0)\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ 1} \times\ [\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}\ -\ 1\ ]}$$

$$\mathbf{=\ V(0)\ \times\ s(0,N)\ /\ 2\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}}$$

at date **t = j**,

$$\mathbf{HR(j - 1,\ j)\ =}$$

$$\mathbf{= V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ j}\ -\ V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ j\ -\ 1}}$$

$$\mathbf{= V(0)\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ j\ -\ 1} \times\ [\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}\ -\ 1\ ]}$$

$$\mathbf{=\ V(0)\ \times\ s(0,N)\ /\ 2\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ j\ -\ 1}}$$

and,,lastly, at date **t = N = T**,

$$\mathbf{V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ N}\ -\ V(0)\ \times\ (\ 1 + s(0,N)\ /\ 2\ )^{\ N\ -\ 1}}$$

$$\mathbf{= V(0)\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ N\ -\ 1} \times\ [\ (\ 1 + s(0,N)\ /\ 2\ )^{\ 1}\ -\ 1\ ]}$$

$$\mathbf{=\ V(0)\ \times\ s(0,N)\ /\ 2\ \times (\ 1 + s(0,N)\ /\ 2\ )^{\ N\ -\ 1}}$$

***Stage 3: How does the total holding return accrue at the end of the day?***

We must solve

$$\mathbf{HR(0, N)} = \Sigma \ \mathbf{HR(j - 1, j)} \qquad j: 1, 2, 3, \ldots\ldots , N$$

which amounts to

$$\mathbf{HR(0, N)} = \Sigma \ \mathbf{V(0) \times s(0,N) / 2 \times ( 1 + s(0,N) / 2 )^{j-1}}$$

that is to say:

$$\mathbf{HR(0, N)} = \mathbf{V(0) \times s(0,N) / 2 \times \left[ \Sigma \ ( 1 + s(0,N) / 2 )^{j-1} \right]}$$

or, equivalently,

$$\mathbf{HR(0, N) = V(0) \times s(0,N) / 2 \times \{ ( 1 + s(0,N) / 2 )^{N} - 1 \} / \{ s(0,N) / 2 \}}$$

$$\mathbf{HR(0, N) = V(0) \times \{ ( 1 + s(0,N) / 2 )^{N} - 1 \}}$$

$$\mathbf{HR(0, N) = V(0) \times ( 1 + s(0,N) / 2 )^{N} - V(0)}$$

Hence,

$$\mathbf{HR(0, N) = V(N) - V(0)}$$

As we said in section 3, buyers that hold ZC-bonds till maturity are able to amortize the difference between **V(T)** and **V(t)** like taxable income over the whole life of the bond.