EQUITY LINKED NOTES: An Introduction to Principal Guaranteed Structures

Abukar M Ali

October 2002

Introduction

In this article we provide a succinct description of a commonly used investment instrument in the capital markets, the equity-linked note. These are instruments that allows investors to secure downside protection for their initial investment, while still retaining a participation in any upside gain in the equity market. The equity side of the instrument is linked to the performance of an equity index, individual stocks, or a portfolio of indices and equities.

The basic instrument consists of a bond with no periodic income payments (zero coupon bond) plus a long call option on either a basket of indices or equities, single equity index, or stock. Alternative structures may include interest rate call or put options with lower coupon payments. At maturity, the holder of each note will receive the par amount of the note plus a supplemental redemption amount based on the percentage increase of the equity exposure. As an example, figure 1 below is the description of a medium term note issued by Morgan Stanley Dean Witter which has similar characteristics in terms of its guaranteed income and return profile. This is the "DES" page as featured on the Bloomberg analytics system.

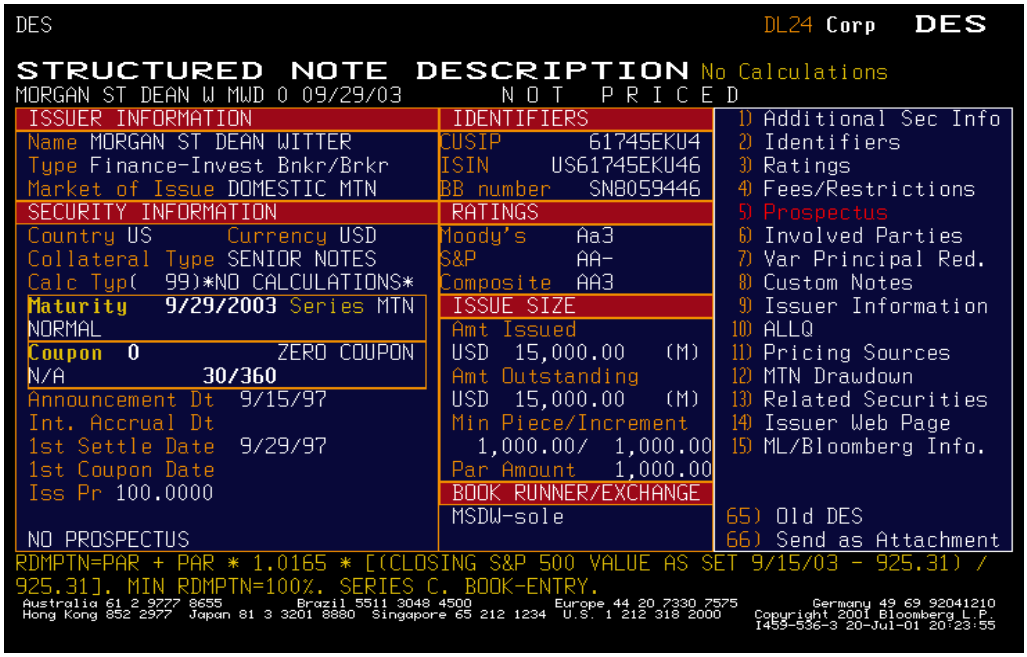

Figure 1

The bond described in figure 1 makes no periodic coupon payments and matures on 29 Sept 2003. The redemption of the bond is defined in accordance with the following formula:

FV + (FV x 101.65%) x [St - St-1]/ St-1

where

FV is the face value of the bond or the par amount, adjusted by a gearing or participation level of 1.0165;

St is the closing level of the index, which the bond's payoff is linked to the (**S&P 500 index**) on a date close to the bond maturity date;

St-1 is the index start level which (in this case) is set at 925.31.

Note that Bloomberg users can select **DES <go>** and then **7 <go>** to see the redemption formula as it is defined in the prospectus.

From the view point of the holder of the above instrument, the transaction operates as follows:

- the investor is guaranteed the return of his initial investment. That is $1000 per note, so the investor receives at least $1000;

- the investor's final cash receipt, that is, the redemption amount, is linked to the performance of the S&P 500 index. If the index appreciates over the stated level of 925.31 and stays at this level upon maturity of the bond, then the investor receives a redemption amount which is calculated as the face value amount multiplied by the percentage increase of the index adjusted by the participation level. For example, if the index doubles over the life of the bond, the investor simply doubles the original investment. If however the index declines below the index start level, the investor will receive the original investment.

The payoff of the instrument can be compared to a plain vanilla European call option on the S&P 500 with a strike set at the index start level and an expiry of the option on 15 September 2003. The option value is also modified with the rescaling factor. The option payoff is defined as:

Max (St - Et, 0).

At expiry, the option payoff is either the difference between the value at expiry and the strike level or zero. This implies that the note is worth the greater of the value of the original investment (floor or guaranteed part) or the original investment plus the value of the call option depending on where the index finishes of at expiry relative to the strike. The payoff and the structure of this instrument can also be viewed similarly to the structure of a plain vanilla convertible bond[1]. It is interesting to note that the investor is effectively

[1] The difference is that the equity-linked security we describe is cash settled while a convertible bond requires the holder to take delivery of the shares if conversion is optimal and the bond is converted.

paying the forgone income from the bond to purchase the call option. To put it differently, the effective cost of the call is the income forgone on the funds invested. This income forgone can be stated as the interest income on the equivalent bullet bond issued by the same issuer, which has a similar credit rating and maturity.

Figure 2 sets out the essential structural design of the principal protected note in a general framework.

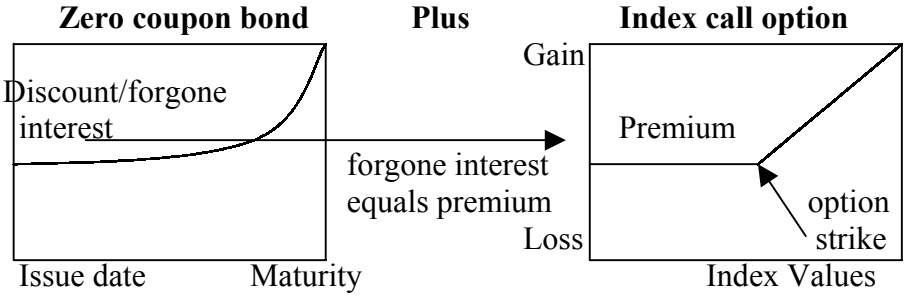

Figure 2

The decision by the issuer to market such a product is motivated by the opportunity of raising funds at a lower rate via the structured product than issuing a traditional bullet bond. However, the issuer assumes a final redemption risk as it has an exposure to the level of the S&P 500 index at maturity. This risk can simply be hedged through the purchase of a European style call option with the same terms as the embedded option. From the issuer's point of view, the economic basis of the issue/note is the differential value placed on the equity index call option by the investor (the purchaser of the option or the bond holder) and the writer of the call option[2].

Variable Participation Structures

The level of participation relative to the face value of the bond can also vary. In the standard structure the participation level is set at a 100% of the index increase, but can also be below 100%, above 100%, or can be capped to a certain level. The level of participation will depend on whether the forgone income is sufficient to engineer the degree of exposure to the underlying index. In addition, the guaranteed principal may also be less than 100%. In this case, the investor may be prepared to utilise a portion of the principal to purchase the required option. Below we note an example of how the cost of the option premium can be engineered to produce a lower premium if the forgone income from the bond is insufficient to finance the option.

Capped participation level

This is where the note principal is 100% guaranteed and where the participation level is 100%. In cases where the coupon available is insufficient to meet the amount of option premium required, one method for reducing the option premium is through the use of an option spread. This entails the purchase of a call option at a strike level set at-the-money

[2] The writer of the call option can be an institutional investor with a long position on a portfolio that has a perfect correlation with the index. Given a negative view of the market, a covered call strategy can be employed to hedge the portfolio.

and the sale of a call option at a strike level that is out of the money. The premium received for the second option effectively lowers the option cost that allows the net premium to be funded from the available coupon.

Figure 3 sets out the return profile of a principal protected capped return equity index linked note.

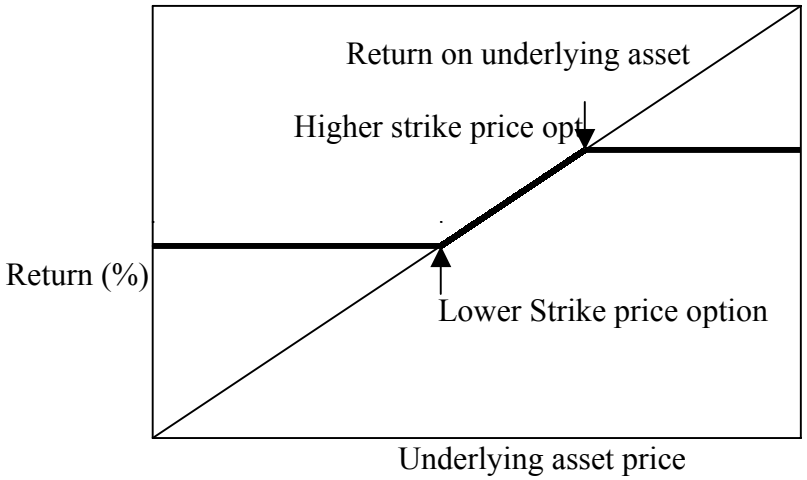

Figure 3

The issuer may also introduce a note that does not pay or guarantee 100% of the principal but allows the investor to get100% return on the index appreciation. This is another method of engineering sufficient funds to finance the call premium.

Investors have also purchased structures with embedded exotic options. For example, a security may incorporate a payoff linked not just to the single closing value of the index on a particular date, but also to the average closing values of the index on a series of dates. This type of option is known as an *Asian* option. To see an example of a security with such a payoff feature, type: **EC4143078 <CORP> DES <GO>** on the Bloomberg system to pull out a equity linked zero coupon bond that matures on 27 June 2008 and has been issued by the First Union National Bank. Users should then type, **5 <go>** from the DES page to see the redemption formula. Note that the payoff of the security payoff is only 80% of any increase in the index (in this case the Nasdaq 100 index). The final valuation dates are given on the next page. The value of the option on maturity is given by the average closing values on specified dates.

The redemption formula is shown at figure 4, the Bloomberg page DES for this security.

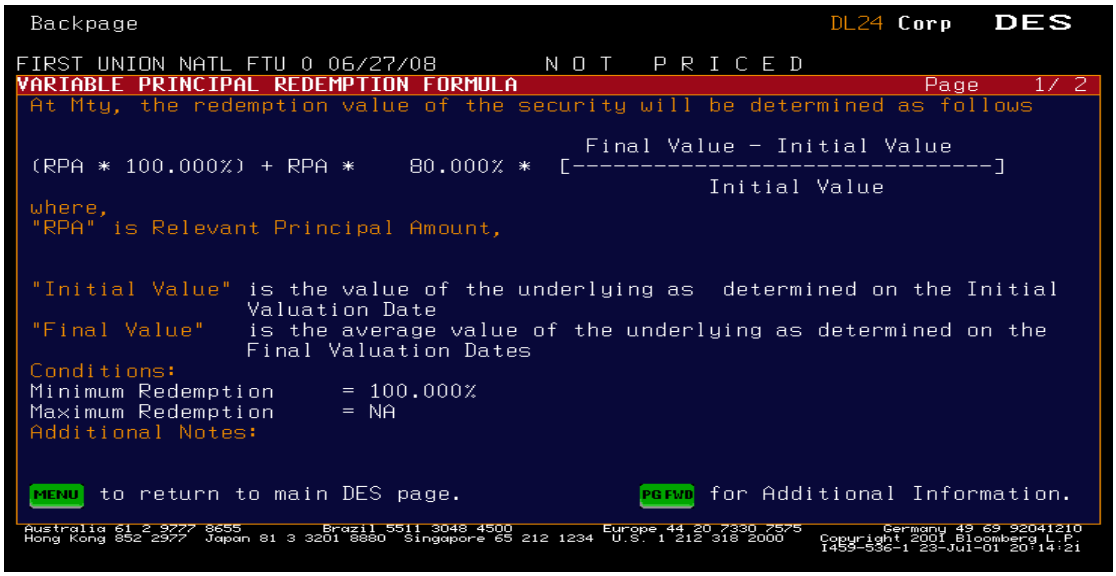

Figure 4

Other exotic embedded options such as *quanto* options are also issued. With these, the investor receives a return linked to the performance of an equity index denominated in a different currency to that of the currency of the bond. For example, this might be a note denominated in US dollars which is linked to the performance of the Nikkei 225 index. The investor's principal is guaranteed and the return is asymmetric. The structure is made up of a combination of a fixed interest security and the quanto call option. The major feature of this type of option is that is designed to primarily to have a principal amount or face value that is linked to a market variable. In this case, the call option on the Nikkei option is quantoed to enable any positive return on the option (resulting from the appreciation of the index) to be converted at a pre-agreed USD/YEN exchange rate. This quantity adjusting feature of the option allows the yen denominated increases in the underlying index to be captured in USD terms. To examine a security which has such a payoff on the Bloomberg, type: **EC2243102 <CORP> DES <GO>.**

Users of the Bloomberg can value a fixed income security with any embedded option type as an integrated product, by means of the OVX function. This allows users to determine the theoretical value of an equity linked note by valuing both the fixed income/guaranteed and the option component separately on a single screen.

For example, consider one of the securities introduced above by selecting on the Bloomberg system the following:

EC2243102 <CORP> DES <GO>.

Type again **OVX <GO>** to determine the theoretical value of the bond. This page is shown as figure 5.

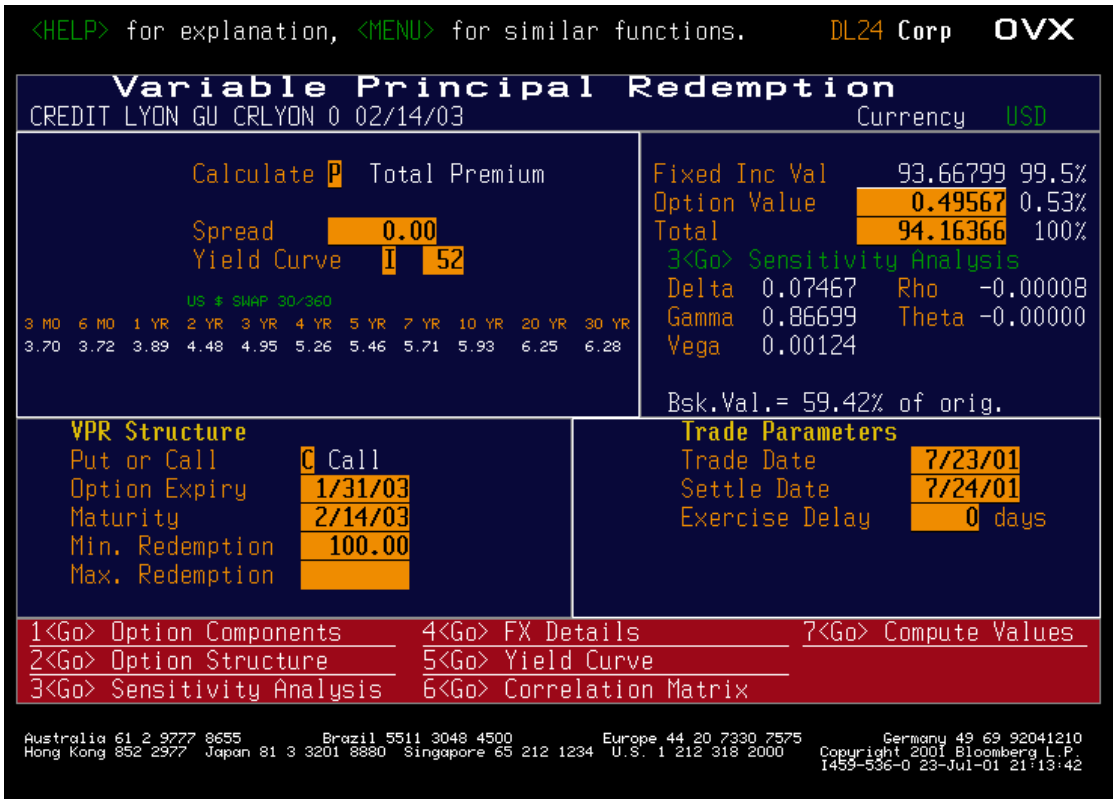

Figure 5

The screen defaults to calculate the total value/premium of the bond but also calculates each component separately. Users can therefore see the fixed income bond value and the option premium. Given that there is a market price available for the bond, one can observe how far the theoretical value is from the market price. The option components can be seen by typing 1 <go>. To see all the input parameters that is fed into the model such as the volatility level and dividend yield, type 4 <go>. Inputs are user-determined and can be altered as required. For example, one can change the participation level or change the structure of the equity exposure such that the security is linked a basked of indices instead of a single index.

Equity-linked notes are commonly used by commercial banks and retail finance houses to attract private sector funds that increasingly seek greater risk/return profiles but with an element of guarantee built in. The issuers invariably hedge their exposure to the stock or index that the note is linked, using exotic options bought from investment banks.

Acknowledgements
The author would like to thank Moorad Choudhry at Cass Business School, London for review comments on an earlier draft.

Abukar Ali is an application specialist and works in the Fixed Income and Derivatives Analytics division of Bloomberg L.P. in London. The views, thoughts, and opinions expressed in this article represent those of the author in his individual private capacity, and should not be attributed to Bloomberg L.P. in any way, or to Abukar Ali as a representative, officer or employee of Bloomberg L.P.