

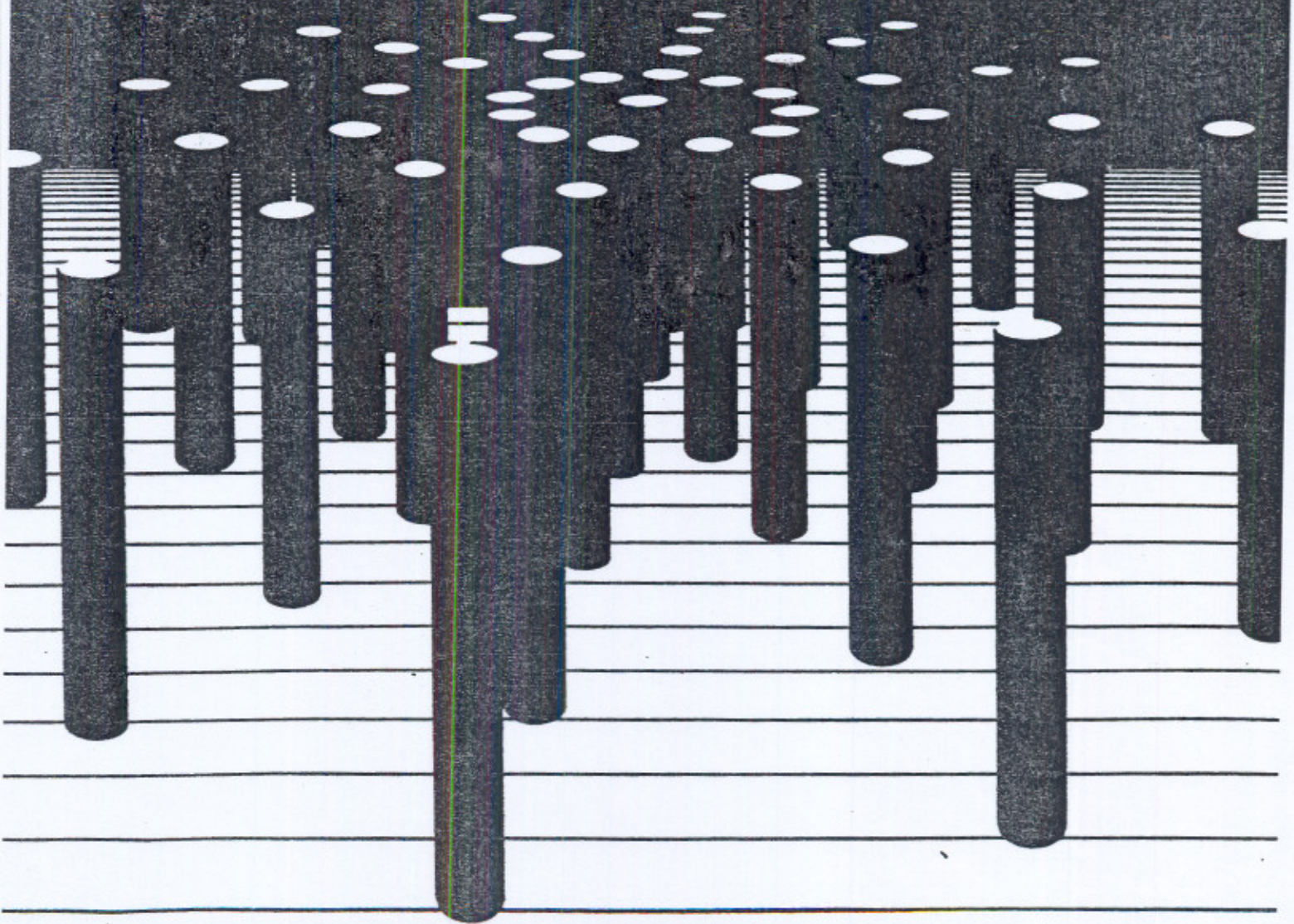
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■ Electronic data ■ Cash management

■ Liabilities and options

Corporate liabilities and options

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■ Many treasurers now regularly use currency options and interest rate options to hedge exposure. Corporate use of options for hedging has become increasingly sophisticated with increased competitiveness of the markets, greater understanding of the instruments, and improved computing technology for evaluation.

Despite this, there has been a relative neglect by corporations of some of the most valuable options sold and bought by them. These are the options embedded in corporate liabilities such as:

- convertible debt;
- debt with warrants;
- callable debt; and
- debt with currency options attached.

These options are sometimes the most important option trades that a company will undertake. They tend to be of long maturity, giving them high values, because the value of an option generally increases with its maturity.

One simple example is the option included in a convertible note. The holder of the note has the right to exchange the note for a specified number of shares. This effectively gives the holder of the note a call option on the shares of the issuing company. Given the size of some convertible issues, this can represent a major option transaction for the managers of the company, acting on behalf of their shareholders.

Why the neglect?

Although most companies have options extant in their liabilities there has, until recently, been little attention paid to the structuring, valuation, and rational use of these options. For example, the standard method of evaluating convertible notes, the 'earnings' or 'cross-over' approach completely ignores the fact that the liability being issued contains an option.

There appear to be several reasons for the tendency not to evaluate the options contained in corporate liabilities using the type of option valuation and analysis that is commonly applied to options used for hedging purposes. These include the following:

1. A focus on scenarios rather than the opportunity cost and value of the liability.

One important feature of the modern ap-

proach to option analysis is that it values the entire range of possible outcomes for the option rather than simply examining a couple of scenarios. Moreover, it values the option in a way that includes the full opportunity cost of the option compared with other possible transactions, such as borrowing and then making a deferred sale of equity.

2. The difficulty of applying standard option techniques to the complicated options contained in corporate liabilities.

The implementation of the option approach is complicated for such corporate liabilities as convertible debt, since the standard option models that are used for short-dated options have to be modified to analyse the types of options contained in corporate liabilities.

3. A belief that 'the market' does not use sophisticated option analysis to value these options.

Difficulties in valuing the embedded options are also experienced by the holders of corporate securities that contain options, and are one of the causes of the perceived market 'mispricing' of these liabilities.

An example: convertible debt

To illustrate the general approach of option analysis of corporate liabilities, consider the decision to issue the convertible note in Table 1.

To value this note using the earnings approach involves valuing the difference between the coupon stream on the bond and the dividend stream on the equity. This is shown in Table 2.

The first row of Table 2 is the coupon stream on the bond. This is present valued by discounting at 13%, the discount rate appropriate to the debt stream.

The second row is the projected dividend stream on the equity. This exceeds the bond coupon in year 6, so the earnings approach would assume conversion in that year. The dividend stream is present valued using the required rate of return on the equity. In this case, the required return on the equity has been computed as the dividend yield plus the expected growth rate.

The difference in the values of these two streams is then added to the share price, as shown in Table 5A. This gives a value for the convertible of 101.6 per \$100 of face value. The

logic of this is simply that, if the holder of the convertible is sure to convert at the end of year 6, then the value of the convertible is the value of the share plus the value of the excess income stream before conversion.

The alternative option approach values the convertible as a bond with a below market coupon rate, plus a call option on the equity. The reason for this is shown in Table 3, which splits the payoff at the maturity date of the convertible into two parts.

The first part is the payoff of 100 face value on the bond. The second part is the excess value arising from the choice to convert, when it is profitable to do so. This second component, in the 'convertible minus bond' row of Table 3, has exactly the same structure as a six year call option with an exercise price of 100 on the equity of the company.

Valuing the option requires a forecast of the volatility of the share, just as valuing short-dated currency and interest rate options requires volatility forecasts. The characteristics of the option embedded in the convertible are shown in Table 4.

All apart from the value of the underlying asset are straightforward. The value of the asset underlying the call option is the value of the share stripped of its next six years of dividends, since the holder of the convertible gets the share six years from now when the bond is converted and so misses these dividends.

Table 5B shows the resulting convertible value, 111.0, using a volatility forecast of 35%. This is considerably greater than the earnings approach valuation of 101.6 because the long-dated option included in the convertible is a very valuable security. Its value comes from being able to participate in any share price appreciation over the next six years, with no participation in possible falls in value.

How easy is it to value embedded options?

The analysis of the call option in the previous section ignored several features which, in practice, make the valuation of convertibles and other embedded options more complex. These include the possibility of exercising the conversion option before maturity, the yield spread between corporate debt and government debt, the risk of default on the bond, tax

Table 1:
Convertible note issue details

Convertible:	
Par value	100
Coupon rate	8%
Maturity	6 years
Alternative straight bond:	
Coupon rate	13%
Maturity	6 years
Equity underlying convertible:	
Price	90
Yield	5%
Expected growth	14%
Volatility	35%

Table 2: Forecast interest and dividend flows

YEAR	1	2	3	4	5	6	PRESENT VALUE
Interest	8.0	8.0	8.0	8.0	8.0	8.0	32.0 (at 13%)
Dividend	4.5	5.1	5.8	6.7	7.6	8.7	20.4 (at 19%)

Table 3: Convertible value at maturity (ex the last coupon)

	80	90	100	110	120
Share price at maturity					
Convertible value	100	100	100	110	120
Bond component	100	100	100	110	120
Convertible minus Bond	0	0	0	10	20

effects, issuer call options, investor put options, and the problem of forecasting volatility. This looks like a daunting list of problems, but, in fact, the same general approach as outlined above can handle all these features.

What happens if the market misprices these options?

A reason often given for not analysing the options in corporate liabilities in the way outlined in the previous sections is that the market will not pay the price that option analysis suggests. Thus, for the convertible with an earnings value of 101.6 and an option value of 113.3, it might be typical that the market will pay around 104. It is not possible to sell securities for more than the market will pay, so the option value is sometimes seen as irrelevant to the choice of issuing this liability.

At one level, this argument is, of course, true. It is important to realise, however, that the fact that the market will not pay the option value does not change the fact that it is an option that is being sold as part of the liability. From the point of view of the shareholders, what they are being asked to give up as a component of the liability issued is exactly those cash flows arising from an option. In making a choice between several alternative methods of financing it is surely relevant to compute the opportunity cost to the existing shareholders of raising funds in different ways.

A direct way to do this is to compute the value that the shareholders are being asked to give up in exchange for the funds that are being raised. This involves comparing the price that the market will pay for a security with an estimate of the value it is receiving. If the security contains an option, then the value of this option is part of the opportunity loss for shareholders. In the case above, the market is paying 104 for a security with an opportunity cost of 113.3, resulting in an opportunity loss of 9.3 for shareholders.

What do we mean by 'mispricing'?

In the convertible example above, the earnings value is 101.6, the market price 104.0, and the option value 113.3. This looks like a fairly significant difference of opinion between the market and the other two values. The difference is, in fact, even greater than at first

Table 4: Characteristics of call option embedded in convertible

Maturity:	6 years
Exercise price:	100
Volatility of asset:	35%
Interest rate:	13%
Value of underlying asset:	90.0 - 20.4 = 69.6

Table 5: Alternative valuations of the convertible

A. Earnings value: 101.6	Share value + PV(interest) - PV(dividends)
	90.0 + 32.0 - 20.4
B. Option value: 111.0	Bond value + Call option value
	80.0 + 31.0

appears, because a large component of the value is the value of the underlying share, about which there can be no disagreement.

The difference is, therefore, that the market is valuing the excess over the share price at 14.0 while the earnings value is 11.6 and the option value 23.3. This represents a very severe disagreement about the surplus value of the convertible over the share. It is important to realise that in a decision to issue a convertible rather than shares it is this incremental price/value relationship that should motivate the decision.

Options are a major part of the wave of 'financial engineering' that has recently swept corporate liability management. Floating rate debt agreements contain caps, floors and other options. Fixed rate debt agreements contain options to call or extend the debt. Euroconvertibles contain conversion options, call options and put options. Many debt deals for risky companies contain warrants or quasi-warrants as part of the mezzanine financing. Cross-border debt transactions contain various types of currency options. As an example of the last type of liability option, the Fairfax refinancing is reported to have been 'saved' by the introduction of a FEAR (foreign exchange appreciation right). From the information in press reports, this looks very much like a long maturity put on the Australian dollar, exercisable in US dollars.

All of these transactions represent the purchase or sale of options. They are often as sig-

nificant in size for the company involved as the explicit currency and interest rate options used to hedge exposure. Because they are part of larger liability trades, the price being paid or received for the option component is not always easy to see. This, combined with the fact that the option in liabilities are often long-dated and, therefore, difficult to value, means that they may be used without a full analysis of the relationship between the price paid for the option and the option value received. Given their size and their prevalence, however, an increasing number of users of such liabilities are turning to option analysis as one of the tools that they bring to bear on these decisions.

Some references

For those wishing to take the application of this approach further, a good starting point is:

R. Brealey and S. Myers: *Principles of Corporate Finance*, 3rd Edition, McGraw-Hill, 1988, Chapter 22: Warrants and Convertibles.

An accessible discussion of the circumstances under which it may be appropriate to use convertibles can be found in:

M. Brennan and E. Schwartz: 'The Case for Convertibles', *Chase Financial Quarterly*, Spring 1982.

The technological details of implementing the option approach are contained in:

M. Brennan and E. Schwartz: 'Convertible Bonds: Valuation and Optimal Strategies for Call and Conversion', *Journal of Finance*, December 1977.