

After the crash in the perpetual market, a series of repackagings appeared. A key question in repackagings is the present value of the default risk in the coupon stream up to a particular date as compared with the "tail" of the perpetual. Yield analysis is too crude to address this valuation problem.

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In 1986 almost half of the US\$47bn of floating rate note issues were perpetuals. In 1987, no perpetuals were issued, and FRN new issue volume had fallen by more than half.<sup>(1)</sup> Prices of perpetuals fell by up to fifteen per cent between December 1986 and May 1987. Bid-ask spreads on perpetuals rose from 10 basis points in July 1986 to 50 bp in August 1987. As a result of these events, the secondary market in perpetual FRNs virtually disappeared.

The sharp revision of the secondary market price of perpetuals occurred after January 1987, when the US and British bank regulators announced a higher capital backing for holdings of perpetuals. There was concern that these rules would be extended to Japanese banks, the largest group of investors in the perpetual FRN market. In parallel with these regulatory developments, perceptions of deterioration in the quality of issuer banks' Third World debt assets caused investors to re-evaluate the probability of default on the FRN coupons.

After the crash in the perpetual market, a series of "repackagings" appeared. These were designed to transform the perpetual FRN into a more attractive asset, and stimulate investor activity. All were variants of a simple idea, that the addition of a high quality zero coupon bond to the perpetual creates an asset with some of the characteristics of a dated FRN and, therefore, may enhance its desirability.

Table 1 shows a repackaging transaction of this type. Column A gives the characteristics of a perpetual that is being repackaged. It is paying Libor + 13bp and trading for a price of 86.9. Column B shows the zero coupon bond, issued by IBRD or the US Treasury, which is being packaged with the perpetual. This has a maturity of 28 years and a price of 11.5. Column C gives the characteristics of the package, based on the conservative assumption that the perpetual will be worth 50 after 28 years when the zero matures. All the yield calculations have been computed on the basis of an assumed Libor level of 6.38%, equal to Libor at the time of the repackaging.

The repackaging has created what appears to be a 28 year dated FRN with a yield to maturity of 86 basis points over Libor, on the conservative assumption that the perpetual is worth only 50 after 28 years.

### The problem with yield analysis

The simple repackaging described above looks superficially attractive, but it is hard to see any obvious source of value-added in the transaction. Indeed, even if there were value-added, it is hard to see why an investor could not just buy the two securities involved and create the package himself.<sup>(2)</sup> To the extent that the analysis based on yields conflicts with simple intuition, it must be the analysis of yields that is misleading. Table 2 shows the cash flows for each separate instrument and for the package given in Table 1. The assumptions are:

- 1) Libor remains at its current level of 6.38
- 2) The perpetual is worth 50 after 28 years
- 3) There is no default on the perpetual before 28 years

Typical yield analysis would compute the running yield on the package and its yield to maturity. These are 23bp and 86bp greater than Libor respectively. Thus the package appears to have many of the characteristics of a dated FRN with a yield to maturity 86bp over Libor, based upon a conservative estimate of the future price of the perpetual.

Despite the obvious value-added the package has characteristics which make it appear attractive against any scenario where the perpetual value after 28 years exceeds 50. The reason for this can, perhaps, be seen more clearly in Table 3. This shows the values imputed to three components of the package:

- a) the zero coupon bond
- b) the first 28 years coupon
- c) the "tail" of the perpetual assuming a price of 50 after 28 years

Since the price of the zero is known (11.5) its yield is derived from its price, and is 8.03. This is above the perpetual yield (and is considerably above Libor). This reflects both

an upward-sloping yield curve, and the yield spread between zero coupon and full coupon bonds, which will be positive when the yield curve is upward-sloping.<sup>(3)</sup>

Block A of Table 3 represents the value of the three components of the package, assuming that the price of the tail will be 50 in year 28. Each component has been present valued at the internal rate of return of its own instrument. The value of the zero is equal to its price, and the value of the package is considerably below its cost of 98.4. This reflects the fact that any investor who believed

the perpetual would be worth 50 in year 28 and who followed this valuation procedure would view the perpetual as overpriced at 86.9.

Block B of Table 3 shows the component values if each is valued at the internal rate of return on the package (7.24%). In this case the package value is equal to its price. The resulting component values are much higher than those imputed from the own yields of the zero and the perpetual. In particular, the imputed value of the zero is 76% higher than its market price. This is, of course, absurd, since the value of the zero is

**Table 1 Simple repackaging of perpetual and zero coupon bond**

Asset:	A Perpetual	B Zero	C Package
Coupon	L+0.13%	0	L+0.13%
Principal	100	100	150*
Maturity		28	28
Price	86.9	11.5	98.4
Running Yield	L+1.11%	0	6.61%
YTM	6.96%**	8.03%	7.24%

\* Assuming Libor stays constant at 6.38%  
 \*\* Assuming perpetual is worth 50 at maturity date of zero

**Table 2 Package of perpetual and 28-year zero coupon bond**

Cash Flow				Running Yield*	YTM*
Year	0	1-28	28		
Perpetual	-86.9	+L+0.13	+50.00	7.49	6.96
Zero	-11.5	0	+100.00	0.00	8.03
Package	-98.4	+L+0.13	+150.00	6.61	7.24

\* Assuming LIBOR is constant at 6.38

**Table 3 Value imputed to components of package (assuming perpetual price 50 after 28 years and LIBOR at 6.38 throughout)**

Component	Rate	A		B		C	
		Rate	PV	Rate	PV	Rate	PV
28 years of coupons	7.49	7.49	75.41	7.24	77.22	6.96	79.32
'tail' of perpetual	7.49	7.49	5.75	7.24	7.06	6.96	7.60
zero coupon bond	8.03	8.03	11.50	7.24	14.13	8.03	11.50
			92.66		98.41		98.42

Panel A: Each component discounted at the IRR on its own instrument  
 Panel B: Each component discounted at the IRR on the package  
 Panel C: Each component discounted at the IRR on its own instrument, assuming the tail to be worth 50 after 28 years

known to be equal to 11.5.

Block C of Table 3 shows the component values of the package if the perpetual is assumed to be worth 50 after 28 years. In this case the IRR on the perpetual has been computed using 50 as the residual value after 28 years. The sum of the component values now adds up to the package value, and the value of the zero coupon bond is equal to its price. Based upon these component values, there is no value-added in the repackaging and the apparent gain of increased yield and increased quality of the package relative to the perpetual is coming simply from the fact that the equilibrium yield on the zero coupon high quality bond exceeds the yield on the perpetual.

This illustrates the problem of attempting to summarise in a single number, yield, the value of a package of instruments with different cash flow profiles and risk characteristics. The problems with this type of analysis includes the following:

- 1) It ignores the interest rate expectations embedded in the yield difference between zero and full coupon instruments.
- 2) It treats fixed payments (the price appreciation of the zero) and floating payments (the coupons from the perpetual) in the same way, by assuming a fixed rate level.
- 3) It does not address the question of how the value of the perpetual should be split between the coupon stream prior to the zero coupon maturity date and the "tail".
- 4) It does not identify the source of value-added.

### Component value analysis

An alternative approach to analysing repackaging transactions is to identify the components of value in the package and value each component separately. In the case of the package of the zero and the perpetual, the components of value can be broken down in the following way:

Value of package equals:  
 Price of zero coupon bond ( $P_0$ )  
 + Present value of riskless coupons up to maturity date of zero ( $P_c$ )  
 - Value of default risk of coupons up to maturity date of zero ( $VD$ )  
 + Value of "tail" ( $PT$ )  
 + Value added from repackaging ( $VA$ )

To highlight the main questions that need to be addressed, suppose that the perpetual has

a spread over Libor which is  $X$  less than that required on a default-free dated FRN with the same liquidity as the perpetual and the same maturity as the zero coupon bond. Then the value of the package can be broken down as follows:

$$\text{Package value} = (P_0 + P_c) + (PT - VD) + VA$$

A default-free dated FRN with a yield equal to the coupon on the perpetual plus  $X$  would sell at par, so:

$$100 = P_0 + P_c + P_x$$

where  $P_x$  is the present value of an annuity stream of  $X$  with maturity equal to the zero coupon bond. Thus

$$\text{Package value} = (100 - P_x) + (PT - VD) + VA$$

This highlights the fact that a major component of the value of the package is the value loss from possible default before the maturity of the zero coupon bond. To analyse repackagings, or perpetuals themselves for that matter, what is required is a technique for valuing this default risk component.

One approach which could prove fruitful is the use of contingent claims analysis as pioneered by Emanuel (1983) and Ramaswamy and Sudaresan (1985). This approach values FRNs with default risk by using the hedging arguments developed in option pricing. The resulting valuations relate the price of the FRN to the asset and liability position of the issuer. These types of analysis differ from repackaging trades in that they use dynamic pricing analysis to address directly the question of the absolute value of the default risk component.

### More complex repackagings

The value decomposition in the previous section suggests that the total value of a package of a perpetual FRN and a zero coupon bond is:

Value of a package equals:  
 Par  
 - Present value of coupon loss relative to default-free dated FRN ( $P_x$ )  
 + Value of tail ( $PT$ )  
 - Value of default risk in coupons up to maturity date of zero ( $VD$ )  
 + Value-added in repackaging ( $VA$ )

This suggests further possibilities for extending the repackaging idea:

- a) Sell the "tail" separately

- b) Guarantee the "tail" value
- c) Add to the coupon stream
- d) Guarantee the coupons up to the maturity date of the zero
- e) Mix cash with the zero and the perpetual
- f) Generate value-added

Table 4 shows some of the permutations that have already appeared.

In each of the repackagings outlined in Table 4, a fee is taken by the repackaging agent. For the holder of a perpetual to submit it for repackaging, it must be the case, therefore, that either:

- a) the value-added by the repackaging exceeds the present value of fees
- or:
- b) the repackaging agent misprices a component of the transaction in a way that can be taken advantage of by the investor.

**Table 4 Repackaging structures**

1	Perpetual + zero = Package
2	Perpetual + zero + enhanced coupons = Dated FRN + Tail (Westpac/Morgan Guaranty)
3	Perpetual + zero + guarantee of coupons = Package (Schroders)
4	Perpetual + zero + guarantee of coupons + guarantee of tail value = Package (Merrill Lynch)

#### Sources of value-added

There are three plausible candidates for there being value added in these transactions. They are:

- a) Enhanced liquidity
- b) Central bank rulings allowing, in certain cases, the repackaged FRNs to be classed as general bank assets with standard capital requirements.
- c) The separation into component instruments with potentially different market segment investor clienteles.

Since liquidity is primarily related to issue size or market depth, repackagings which do

not aggregate issues into portfolios or create investor interest for some independent reason are unlikely to enhance liquidity. Most repackagings retain each repackaged perpetual as a separate instrument, so it is hard to believe that liquidity is being created independently of value-added from some other source.

The more favourable regulatory rulings given to repackaged perpetuals which include guarantees of coupon are a clear source of value-added. They are probably the only plausible reason for believing that there is aggregate value-added in perpetual repackagings. It is interesting, however, that there is no reason why banks holding perpetuals should not buy a third party guarantee, by a zero-coupon bond and obtain the ruling themselves. Thus there is no obvious reason to pay fees to investment bank intermediaries since the repackaging idea is public.

The most difficult repackagings to analyse are those where the components of the package are sold off as separate instruments. Thus the Westpac/Morgan Guaranty repackaging involved packaging a perpetual, a zero coupon bond, and an enhanced coupon stream, and selling two claims. One claim was the "tail" of the perpetual. The other claim was an enhanced dated FRN including the default risk in the perpetual coupon up to the maturity date of the zero.

In this case, the potential investor in the repackaged instrument must answer two questions:

- a) Is there aggregate value-added?
- b) Are the two components of the package priced properly?

In the Westpac repackaging there was not a favourable regulatory ruling, so that there was no aggregate value-added from this particular source. There was, however, a complex relative valuation problem to solve. The transaction is outlined in Table 5.

The repackaging delivered to the market two new instruments:

- a) An enhanced yield FRN including the default risk in the first 15 years of coupons of the perpetual.
- b) A claim on the tail of the perpetual.

There could be value-added from the transaction if each of these instruments tapped a particular investor clientele with strong preference for the particular risk and cash flow profile of the instrument. There could also be opportunities for investors if the relative pricing of the two instruments was wrong. Most zero-coupon investors use the instrument to hedge the cash flow profile

**Table 5 Westpac/Morgan Guaranty repackaging**

	Coupon	Face Value	Price	Value at 15 years*
Perpetual	L+0.15	100	88	?
15 year Deep discount bond	0.35	100	?	100
Enhanced FRN	L+0.50	100	100	100
Tail	0	100	18.5	?

\* Assuming no default on the deep discount bond

liabilities. For this purpose the tail of a perpetual is not very attractive, as it includes a large replacement risk if the perpetual defaults. The "tail" is, therefore, not likely to tap a strong source of investor demand which has been latent for lack of a properly targeted instrument.

The potential for relative mispricing of the two components of the packaging again highlights the importance of using valuation techniques other than yield analysis for repackagings of this type. It is quite simply impossible using yield analysis to answer the questions:

What is the present value of the default risk included in the first fifteen years' coupons?

and :

What is the value of the "tail"?

In this respect, floating rate note markets are now at a similar stage to the fixed rate debt markets when it became apparent that yield analysis is too crude to analyse bond-stripping.

### Summary

Repackaging perpetuials has added value to the holders of these instruments by changing their regulatory treatment. This value-added is small relative to the value losses incurred when the perpetual market crashed. One strange feature of this is that investors purchased the instruments at the prices they did initially. In a market which is extremely reluctant to accept long-dated zero coupon bonds at narrow default-risk spreads, even from high quality non-sovereign issuers, it is surprising that perpetuials with long effective lives were taken at very small yield spreads.

Repackaging transactions have highlighted

a weakness in current techniques of analysis of FRN markets. A key question in repackagings is the present value of the default risk in the coupon stream up to a particular date as compared with the "tail" of the perpetual. Yield analysis is too crude to address this valuation problem. The most hopeful technique seems to be the application of contingent claims analysis in the manner pioneered by Emanuel (1983).

### Footnotes

- (1) See Williams and Hole
- (2) This style of argument is, of course, that originated by Modigliani and Miller (1958)
- (3) See Schaefer (1977)

### References

- D Emanuel "A Theoretical Model for Valuing Preferred Stock", *Journal of Finance*, September 1983.
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continued overleaf ...

We gave JP Morgan the opportunity to comment on the prior paper. As lead manager of the Pacific Securities transaction and being closely associated with the FRN market they are able to provide a perspective that is unavailable to many others. Their comments are summarised below.

The repackaging of Perpetual FRNs was occurring at a difficult time in the FRN market. Investors were recognising that the low margins, on these instruments, did not reflect the risks of holding quasi equity. This was coupled with concern over the classification of the subordinated debt and the impact that this might have on the holder's capital position. The prices fell, liquidity fell, spreads widened and the cycle repeated itself.

One reason for the cycle repeating itself was the difficulty associated with valuing these instruments. In early 1987 people were grappling with the question of what is the value of a Perpetual? A starting point would be the valuation of a default free dated FRN, with liquidity similar to that of a Perpetual. Perpetuals are illiquid so what is the price of an illiquid dated FRN?

The repackaging was an attempt at establishing a floor value for an illiquid Perpetual. Investors were, in some instances, unable to accomplish the financial engineering themselves and this may have been caused by legal restrictions. To this extent the repackaging may release "value" for the investor. The single measure of "value", namely yield, does not adequately encapsulate the "return" that an investor might earn from repackaged FRNs. This is a problem not just for repackaged FRNs, similar deficiencies exist when yield analysis is applied to a portfolio or to fixed income bonds with embedded options.