Structured products linked to hedge fund returns

By Charles Smithson and Russell Schreiber

In this column, Charles Smithson and Russell Schreiber provide an overview of a new family of derivatives – products linked to hedge fund returns. This is the final column in Charles Smithson's latest series of Class Notes, an educational series designed to pull together the threads of recent developments in financial products and risk management.

Structured products linked to hedge fund returns are a relatively new family of products. They derive their value from that of an underlying managed account, a fund of hedge funds or a hedge fund index. Some of these products lower the risk to the investor by giving up some of the returns to pay for principal protection. These are called principal-protected structures. Others – so-called leveraged structures – allow the investor to increase risk in order to increase expected returns.

Principal protected structures[1]

As early as the mid-1980s, investors were being offered principal-protected investment products linked to commodity trading advisers (CTAs).[2] While the variety of principal-protected structures linked to hedge fund returns has expanded, most can be assigned to one of three categories: option-based structures; fixed threshold structures; and variable threshold structures (constant-proportion portfolio insurance (CPPI)).

☐ **Option-based structures.** An option-based capital-protected investment comprises two components: a zero-coupon bond with face value equal to the initial investment and the same maturity as the structured product; and an at-the-money call option expiring at the maturity of the structured product.

For example, consider a $100 investment in a five-year, capital-protected structure. If the current five-year zero-coupon interest rate is 4.56%, the current price of a $100 five-year, zero-coupon bond is about $80. After purchasing the zero-coupon bond (to guarantee the principal at maturity of the structure), the amount available for purchasing the call option on the fund of funds, managed account or hedge fund index is about $20. Suppose further that the premium for a five-year, at-the-money call option is 25% of the notional. The $20 available for investment in the option will provide for an option on $80, so the 'participation rate' is 80%. That is, in addition to receiving $100 at maturity by virtue of the zero-coupon bond, the investor will also participate in 80% of the positive performance of the fund of funds, managed account or hedge fund index.

The preceding example illustrates several characteristics of this type of structure:

■ If the investment is held to maturity, the returns are path-independent. The total return earned by the investor depends only on the performance of the hedge fund at maturity.

■ The structure is sensitive to interest rates at origination. In a low-interest environment, the participation rate can be significantly lower than 100%. (In our example, if the five-year, zero-coupon rate was 5.9%, rather than 4.56%, the participation rate would have been 100%, rather than 80%. Conversely, if the five-year, zero-coupon rate was 3.3%, the participation rate would have been only 60%.)

☐ **Fixed threshold structures.** The classic fixed threshold structure is a stop-loss arrangement in which an investment linked to a fund of funds, managed account or hedge fund index reverts to a fixed-income security if the net asset value (NAV) of the underlying falls below a predefined threshold. The structure is analogous to a barrier option, where the predetermined threshold is the 'trigger' for the option.

This structure can be attractive to an investor because, if the trigger is not hit, the investor participates completely in the upside of the underlying managed account, fund of funds or hedge fund index. (In the language of the preceding option-based structures, the 'participation rate' would be

[1] This discussion is based on Mattoo (2003)
[2] These were essentially a zero-coupon bond plus a long CTA position

Investable hedge fund indexes

The success of equity indexes such as the S&P 500 is largely due to the fact that they can be traded in the form of futures contracts, index-linked options or tracker funds. Hedge fund indexes have been published for more than a decade but, until recently, they were used as an analytical tool or as a benchmark for alternative investment portfolios and strategies.

Standard & Poor's (S&P) launched the first investable hedge fund index in co-operation with PlusFunds. In addition to S&P, investable indexes are currently offered by Dow Jones, Morgan Stanley Capital International, HFR Global Hedge Fund Index, Credit Suisse First Boston/Tremont Index and FTSE. The number of managers comprising the index ranges from five for specific strategy indexes to 97 for the most broadly diversified index.

Investable indexes must be transparent. The funds in the index must be investable and therefore open to new investment. The funds in the index must provide significant amounts of information to the index provider, as well as audited financial results. The funds in the index must provide high liquidity, so the index providers can increase allocations or divest rapidly. ■

This discussion is based on Ferry (2004) and Walker & Butcher (2004)

100% if the trigger is not hit.) And the threshold structure is attractive to the fund manager because, as long as the trigger is not hit, the assets under management are fixed and are close to 100% of the notional.

☐ **Variable threshold structures (CPPI).** Essentially, the variable threshold structure is a classic threshold structure where the underlying exposure is adjusted dynamically. That is, the underlying exposure to the managed account, fund of funds or hedge fund index can be leveraged or de-leveraged. The de-leveraging has the effect of smoothing the NAV over time, thereby reducing the probability that a jump will result in the trigger being hit and the structure terminating early. The proportion of assets allocated to the underlying fund of funds is a function of the relative difference between the current NAV and a reference curve:

$$\frac{NAV(t) - NAVTrigger(t)}{NAVInitial}$$

where *NAVTrigger* is the point on the reference curve at time *t*. The reference curve itself can be fixed or variable.

Like the fixed threshold structure, CPPI behaves like a barrier option. However, in the case of CPPI, the underlying is a basket composed of a fixed-income instrument, as well as the fund of funds, managed account or hedge fund index.

The CPPI structure is less sensitive to the interest rate than are the option-based structures. However, the CPPI structure does introduce path-dependency. Also, the volatility of the return to the hedge fund investment is not an explicit parameter in the pricing of a CPPI structure – 'vega risk' is not priced into the transaction.[3]

Leverage structures[4]

Hedge fund leverage had been the business of private bankers, lending cash to high-net-worth individuals and taking hedge funds as collateral. In the late 1990s, however, investment banks entered the arena, bringing with them their knowledge of forwards, options and other derivatives. The result was that leverage on hedge funds became a specialist derivatives business.

The hedge fund leverage structures are 'limited recourse' structures. The recourse of the leverage provider is limited to the hedge fund portfolio. The investor's other assets are protected from a claim by the leverage provider.

[3] *Instead, the manager of the structure will react to a spike in volatility by de-leveraging the investment in the fund of funds or hedge fund index*

[4] *This section drew from Le Saint (2004)*

Example of CPPI structure – HSBC's Steps

HSBC's Structured Enhanced Protected Securities (Steps) provide exposure to a fund of hedge funds or a hedge fund index ('underlying fund'). To protect the investor's principal, the 'portfolio assets' are allocated to the underlying fund and a fixed-income obligation (FIO) on the basis of the 'coverage ratio' (CR):

$$\frac{\textit{Net portfolio assets} - \textit{FIO cost}}{\textit{Net portfolio assets}}$$

where net portfolio assets = value of the portfolio assets minus costs (accrued fees and applicable borrowing obligations and related interest expenses associated to borrowings, if any); and FIO cost = cost of buying an FIO whose principal amount equals the Steps principal amount.

As the CR increases, the allocation to the underlying fund increases; as CR decreases, the allocation to the underlying fund decreases. For example:

If CR is rising	If CR is falling	Allocation to underlying hedge fund
CR ≤ 9.0%	CR ≤ 6.5%	0%
9.0% < CR ≤ 15.5%	6.5% < CR ≤ 13.0%	33%
15.5% < CR ≤ 22.5%	13.0% < CR ≤ 20.0%	66%
22.5% < CR ≤ 32.5%	20.0% < CR ≤ 30.0%	100%
CR > 32.5%	CR > 30.0%	150%

The table illustrates that CPPI permits leveraged returns. Because the structure does not entail purchase of a zero-coupon bond at the outset, but merely tracks zero-coupon prices, the initial allocation to the underlying fund is 100%. Also, if the value of the hedge fund increases relative to the cost of a zero-coupon bond, the allocation can exceed 100%. ■

Example of leveraged structure – HSBC's Stairs

HSBC's Structured Alternative Investment Return Securities (Stairs) provide non-recourse leverage to a fund of hedge funds or a hedge fund index (the 'reference portfolio').

The investor receives a multiple of the return of the reference portfolio. So that the maximum loss does not exceed the investor's original investment, the structure includes a knock-out termination (KOT) event mechanism. The structurer tracks the ratio:

$$(\textit{NPV of final leverage amount})/(\textit{value of ref. portfolio})$$

where the final leverage amount is the leveraged amount plus accrued interest compounded annually. If this ratio exceeds a set percentage (for example, with three times leverage, 82.5%), a KOT event occurs and the Stairs redeem. In the event of a KOT, investors are likely to suffer a loss of principal that could be as much as 100% of the original investment. ■

There are a number of structures employed.

☐ **Collateralised fund obligations.** A portfolio of hedge funds is placed into a special-purpose vehicle and the liability is divided into equity and debt tranches. The debt-holders receive an interest rate (usually Libor plus a spread). The equity-holders receive the hedge fund performance minus the interest paid to the debt holders. (Note the similarity of this structure to the debt-holders lending cash to the equity-holders with the hedge funds as collateral.) If the performance of the hedge fund portfolio is so poor that the hedge fund portfolio value is lower than the face value of the debt, the debt holders receive less than their initial capital.

☐ **Fund-linked products.** Fund-linked products are typically structured in the form of options. The options can be either 'accreting-strike' or 'fixed-strike' call options.

An 'accreting strike' call option (also referred to as a 'delta-one' option) is an in-the-money call option on the underlying managed account, fund of hedge funds or hedge fund index. The option premium corresponds to the capital committed by the investor and the strike price corresponds to the loan. The strike price increases over time with accrued interests. At maturity, the option buyer receives the value of the underlying hedge fund portfolio minus the strike (that is, the loan and accrued interests). To hedge the call, the

Structured products linked to hedge fund returns for European retail Investors

☐ **UCITS Mutual Funds.** In 2004, financial institutions began structuring Undertaking for Collective Investments in Transferable Securities (UCITS) funds to provide European retail investors with exposure to hedge funds. The funds are mutual funds that invest in funds of hedge funds or hedge fund indexes.

☐ **Tracker Certificate on London Stock Exchange.** In October 2004, Dresdner Kleinwort Wasserstein listed a Tracker Certificate linked to a hedge fund index on the London Stock Exchange. This product was aimed at retail investors. The certificate is structured as a zero-strike call on the HFR Global Index. The settlement amount at maturity will be equal to:

$$(HFRX\ Global\ Index\ Price - replication\ fee) \times multiplier$$

where the replication fee is 2% a year based on the index value and the multiplier is 0.01 (that is, 100 certificates give exposure to one index point). ■

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option writer buys the underlying hedge fund portfolio and sells it back at maturity. During the investment period, if the value of the underlying portfolio falls below a trigger level, the option writer would de-leverage the product by resetting the strike price and the nominal exposure (which corresponds to selling hedge funds and redeeming a part of the loan). The de-leverage/re-leverage mechanism can also be embedded in an underlying fund of funds, as well as the interest payments, instead of having them in the option payout.

A fixed-strike call option is a traditional European-style call option on the underlying managed account, fund of hedge funds or hedge fund index. The premium is determined by an option pricing model. At expiry, the investor receives *Maximum* [(*value of underlying – strike price*), 0].

☐ **Collateralised loan transactions.** While collateralised leverage transactions are attractive to investors who want to maintain their ownership of the hedge fund portfolio, they require more documentation than the option-based structures. The arranger provides the custody facility, the pledged account and the leverage facility.

☐ **Funds with embedded leverage.** The investors buy the funds (investment companies or trusts), which borrow from banks and invest the leveraged asset in the portfolios of hedge funds. Leverage is provided to the fund either by a fund-linked product or a collateralised leverage transaction. ■