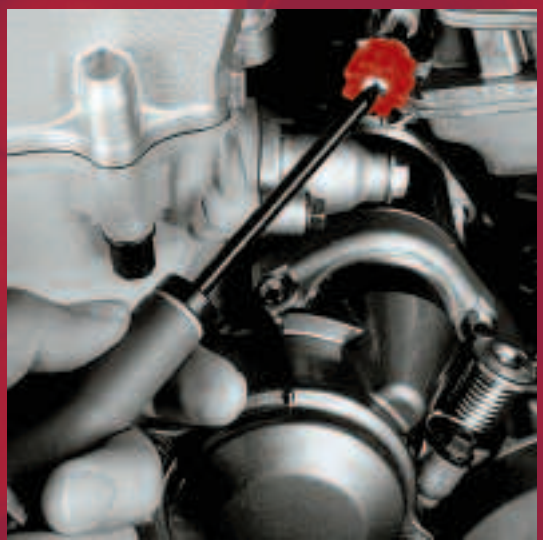
Guide to Structured Investment Management

for Institutional Investors



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1. General

1.1. The Basis of Structured Investment Management

1.1.1 Management with “pre-defined goals”

One way of viewing Structured Management is to look at it as an investment management approach where the manager makes a firm engagement to achieve a certain level of performance or at the least a certain minimum level. In contrast with traditional management techniques, where managers merely have an obligation regarding the resources they will employ, managers of structured products are engaged to generate certain performance levels, and generally have this engagement underwritten by a bank.

As in a traditionally managed fund the manager will stress his or her talents as an investor, the manager of a structure will, more prosaically, be engaged to produce a precise and verifiable return. This engagement is sometimes called the “formula” and the associated structured fund a “formula-based” fund. The formula will depend on market parameters.

A sample formula could be:
Initial NAV x [100% + 100% x increase in the DJ Euro Stoxx 50].

Structured Management does not necessarily offer guaranteed or protected capital. In the early days, the aim of Structured Management was to offer both performance and guaranteed capital, but, over time, it has diversified into a wide range of structures, not all of which guarantee the capital invested.

1.1.2. Stochastic Management

Another, more scientific, view of Structured Management is to examine what makes it possible: the relatively recent discoveries made in the financial theory of options. This theory is based on the stochastic nature of financial variables.

Underlying this approach is the discovery by eminent Nobel prizewinners that a share’s value is not determined solely by its ability to rise or fall, but also by various statistical parameters.

Volatility is the best known of these. It reflects the propensity of the value of a share to change with a greater or smaller amplitude. Volatility has become a sort of value in its own right: the options markets allow any investor to buy or sell volatility just as they would any other security.

Correlation between shares is also playing an increasingly important role. The coefficient of correlation between two shares is a parameter with a value between –1 and 1. It represents the movement of one share relative to the other. A correlation of 1 indicates that the two shares will move perfectly in sync, whilst a figure of –1 indicates that their price movements will be mirror images of each other.

Other, more or less subtle parameters are also used by professionals. These include the “smile”, which represents the fall in local volatility when the price of a security rises.

There is a further parameter which is to Structured Management as energy is to machinery: liquidity.

A hugely complex concept, liquidity underpins everything: without liquidity there is no market. The existence of a market is the core hypothesis.

These parameters create market opportunities and opportunities for diversification in the same way as the underlying stocks themselves do. Thus, for instance, certain structures will allow an investor to buy or sell volatility.

Structured Management offers additional diversification through positions on parameters other than just the price of underlying shares, and arbitrage potential beyond simply playing rising or falling prices.

We can divide Structured Management into two main categories according to the financial techniques used:

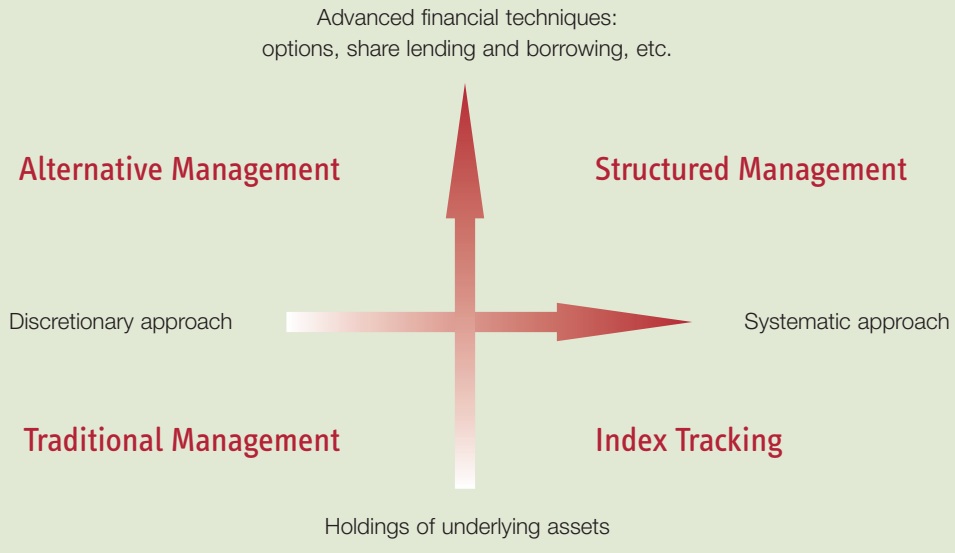
- **Constant Proportion Portfolio Insurance (CPPI) Management, using portfolio insurance techniques;**
- **Formula-based Management based on the use of options.**

These two categories are covered in more detail in Chapter 2 of this guide.

1.2. The Positioning and Advantages of Structured Management

In terms of its application, Structured Management is characterised by the use of advanced financial techniques on the one hand, and on the other the systematic approach of the managers involved.

Figure 1: Positioning of Structured Management in the investment management universe



Structured Management is intended to complement other management approaches. Its main appeal lies in its ability to meet specific investment challenges, such as:

■ **protection against a loss of capital or of performance**
This protection is made possible by the use of techniques allowing attractive leverage on risk-bearing assets.

■ **diversification of the market scenarios covered**
Structured Management enables investors to generate returns in market conditions where other management approaches generally cannot do so: U-shaped or bell-shaped markets, erratic markets or those with no real trend.

1.3. The main types of underlying securities and of structures

Structured Management funds can be arranged into a square matrix according to the type of underlying security and the type of indexing used.

For example, a capital guaranteed fund indexed on the value of the DJ Euro Stoxx 50 uses an index of French equities as its underlying security and the so-called “zero coupon plus call” indexing structure.

This structure, which was first used in the 1980s, has served as the basis for a diversification of underlying instruments and structures.

1.3.1. Types of underlying securities

Structured Management has gradually been adapted to increasingly elaborate underlying securities. The chronology of this expansion is explained below.

■ **Equity indices:** the first structures used a given index. These structures were therefore indexed to an equity index, and also offered a capital guarantee.

■ **Equity baskets:** over time indices came to be seen as a too-standardised representation of the equity market. Structures based on baskets of stock, generally blue chip issues, were thus added to the range.

■ **Index baskets:** another way of diversifying from the initial single index approach was to use a number of underlying indices.

■ **Basket of funds:** creation of the first mutual investment funds based on a basket of other funds.

■ **Hedge funds:** hedge funds can provide an underlying component in Structured Management. They offer the advantage of low volatility.

1.3.2. Types of structures

Advances in financial techniques, particularly in the field of equity and index derivatives, have enabled the creation of structures offering increasing diversification in investment strategy.
A brief history of the development of the sector is explained below.

1975

Structures based on "stop loss" techniques: developed in the mid-1970s, these techniques consisted of selling holdings if prices fell to a predetermined level, so as to limit losses.
These techniques were then developed to create CPPI Management techniques which came into use in the mid-1980s.

"Zero coupon plus call" structures: the first structures of this type used a zero coupon bond and a "plain vanilla" call option on an index. This offered investors their initial capital plus a percentage of any gain by the index. For example, an initial investment of 100 would be redeemed after a given number of years at 100 + 80% of any increase in the DJ Euro Stoxx 50.

This basic structure was further developed to offer a range of so-called "exotic" structures, as listed below.

1990

Exotic structures:

- Call spread: indexing was capped. For instance the investor would receive, at maturity, 100 + 100% of any increase in the DJ Euro Stoxx 50 up to a limit of a doubling of the index.
- "Asian" variations: where, for example, the investor receives 100 + 100% of any increase in the DJ Euro Stoxx 50, but calculated using the average value of the DJ Euro Stoxx 50 over the last two years of the investment term.

1998

"Correlation structures": these structures take into account the correlation between underlying instruments. They therefore require new techniques using new concepts. Some examples include:

- Everest: a "worst of" structure which pays, at maturity, 200% of the initial value plus the return (whether positive or negative) of the worst performing share in a basket of 12 shares, with a guaranteed minimum payment equal to the initial investment.
- Altiplano: on an initial investment of 100, an investor will receive 200 at the end of the ten-year term unless one of 20 shares falls in value by more than 40% over the last five years, in which case the payment will be 100 + some share of the performance of the basket of 20 shares if it is positive.
- Crystallisation indexing: a typical example is given by the "Emeraude" product. This structure offers the best increase within a basket of shares observed on an annual basis from inception, and uses a conservative management approach. Thus each year, the value of the share which has risen the most is locked in.

2. Structured Management Techniques

2.1. CPPI Management

CPPI Management uses portfolio insurance techniques. These are designed to limit the losses caused by falling markets and are based on a strategy of dynamic portfolio protection.

Various portfolio insurance techniques have been developed since the 1970s:

- Stop-Loss techniques.
- The Constant Proportion Portfolio Insurance (CPPI) technique.

CPPI, which was introduced in the mid-1980s, is one of the most frequently used portfolio insurance techniques and is therefore examined in more detail below.

2.1.1. Aims and principles

CPPI Management aims to protect against losses of capital or of performance.

The principle is simple. It consists of investing part of the initial capital in risk-free assets and the other part in risk-bearing assets such as shares, fixed income or equity mutual funds, diversified funds or even hedge funds.

Depending on the performance of the risk-bearing assets, automatic buying and selling is carried out to rebalance the portfolio as determined by a range of parameters defined at the outset. Thus when the value of the risk-bearing assets falls, the exposure to such assets is reduced, where as when it rises, exposure is increased.

2.1.2. Structural factors

The rules for rebalancing will depend on the following parameters:

- **The type of insurance required**

One example could be a guaranteed payment on maturity of 100% of the highest NAV achieved during the lifespan of the fund.

Once the nature of the insurance has been decided, an initial parameter, known as the “floor”, is set. The floor represents that part of the NAV that the manager cannot allow himself to lose. It is therefore equal to the present value of the guaranteed future value of the fund.

■ **The nature of the risk-bearing assets to which the fund will be exposed**

Depending on the nature of the asset class to which the manager is seeking exposure, a Multiplying Coefficient is set. This determines the level of the allocation to risk-bearing assets and is a multiple of the 'cushion', which in turn is equivalent to the difference between the floor and total NAV.

The use of this Coefficient is possible as the maximum loss on the class of risk-bearing assets is considered to be well below 100%.

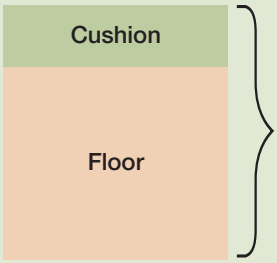
Thus the Multiplying Coefficient can range from 3 for equities, to 5 for hedge funds and 8 for bonds.

These two parameters are then used continuously to determine the distribution of the fund between risk-free and risk-bearing assets. They also serve to enable the NAV of a CPPI fund to be determined at any time.

Figure 2: NAV of a CPPI fund

At any time the NAV can be assessed in two different ways:

1: NAV=Cushion+Floor



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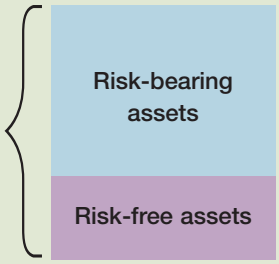
2: NAV=Risk-bearing assets (RBA) + Risk-free assets (RFA)



From which we can see:

■ **Cushion = NAV – Floor**

■ **Allocation to risk-bearing assets = multiplying coefficient x Cushion**

2.1.3. Dynamic management of risk-bearing assets

At any point, the allocation to risk-bearing assets is given by the following formula:

$$\text{Risk-bearing allocation} = \text{multiplying coefficient} \times \frac{\text{NAV} - \text{Floor}}{\text{NAV}}$$

To avoid excessive trading costs a tolerance level is also defined. This sets the maximum percentage change in the price of a risk-bearing asset beyond which exposure is adjusted, for example 5%. In concrete terms, this means that no rebalancing of the fund will take place for variations in the value of the risk-bearing allocation of less than ±5%.

The examples given below demonstrate the changes in the allocation of a CPPI fund over its term. For simplicity they do not include fees of any sort.

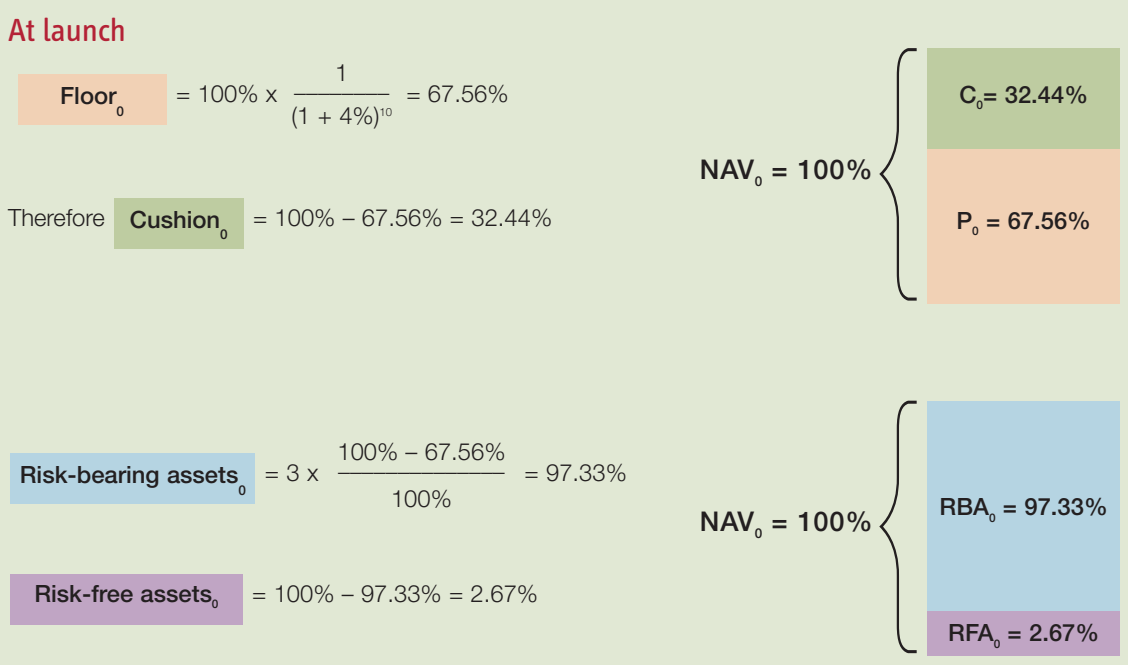
Fund details

- Term: 10 years.
- Risk-bearing asset: DJ Euro Stoxx 50 with 100% exposure a tlaunch.
- Guarantee: the investor is guaranteed to receive 100% of the highest NAV observed over the life of the fund.

Structural factors

- Multiplying coefficient: 3.
- Tolerance threshold: ±5%.
- Risk-free rate*: 4%.

Figure 3: Numeric examples



* For the purposes of this example, the risk-free rate is considered to be constant.

After the first month: the index has gained 5%

Calculation of new guarantee

$$NAV_1 = RBA_0 \times (1 + 5\%) + RFA_0 \times \left(1 + \frac{\text{risk-free rate}}{12}\right)$$

$$= 97.33\% \times (1 + 5\%) + 2.67\% \times \left(1 + \frac{4\%}{12}\right) = 104.88\%$$

Thus the NAV guaranteed at maturity is: **$Guarantee_1 = Max\ (NAV_0, NAV_1) = 104.88\%$**

Determination of the new allocation

$$Floor_1 = Guarantee_1 \times \frac{1}{(1 + \text{risk-free rate})^{\text{remaining time}}}$$

$$= 104.88\% \times \frac{1}{(1+4\%)^{10\,-\,1/12}} = 71.08\%$$

$$Risk\text{-}bearing\ assets_1 = 3 \times \frac{104.88\% - 71.08\%}{104.88\%} = 96.67\%$$

$$Risk\text{-}free\ assets_1 = 104.88\% - 96.67\% = 8.21\%$$

$NAV_1 = 104.88\%$ → **$C_1 = 33.80\%$**, **$P_1 = 71.08\%$**

$NAV_1 = 104.88\%$ → **$RBA_1 = 96.67\%$**, **$RFA_1 = 8.21\%$**

After the second month: the index has fallen 5%

Calculation of new guarantee

$$NAV_2 = RBA_1 \times (1 - 5\%) + RFA_1 \times \left(1 + \frac{\text{risk-free rate}}{12}\right)$$

$$= 96.97\% \times (1 - 5\%) + 8.21\% \times \left(1 + \frac{4\%}{12}\right) = 100.07\%$$

Thus the NAV guaranteed at maturity is: **$Guarantee_2 = Max\ (NAV_1, NAV_2) = 104.88\%$**

Determination of the new allocation

$$Floor_2 = Guarantee_2 \times \frac{1}{(1 + \text{risk-free rate})^{\text{remaining time}}}$$

$$= 104.88\% \times \frac{1}{(1+4\%)^{10\,-\,2/12}} = 71.31\%$$

$$Risk\text{-}bearing\ assets_2 = 3 \times \frac{100.07\% - 71.31\%}{100.07\%} = 86.20\%$$

$$Risk\text{-}free\ assets_2 = 100.07\% - 86.20\% = 13.87\%$$

$NAV_2 = 100.07\%$ → **$C_2 = 28.76\%$**, **$P_2 = 71.31\%$**

$NAV_2 = 100.07\%$ → **$RBA_2 = 86.20\%$**, **$RFA_2 = 13.87\%$**

2.1.4. Advantages and limitations of CPPI Management

CPPI Management offers several advantages:

- The structure employed allows initially **invested capital and/or part of the gains made to be guaranteed.**
- **The allocation to risk-bearing assets is optimised** thanks to the dynamic rebalancing process and the leverage used.
- This is a management approach that is particularly well suited to **assets with low volatility.**

However, the technique also has some drawbacks:

- Costs only known retrospectively: CPPI management generates rebalancing costs (proportionate to the volatility of the underlying asset), and transaction and opportunity costs which are only known retrospectively.
- Greater dispersion of performance: the investor has some chances of winning the "jackpot", but also a considerable risk of merely getting their initial investment back.
- Performance dependent on market patterns: CPPI Management is highly sensitive to market movements. Once a fund has disinvested significantly from the risk-bearing asset it is difficult for it to reinvest and thus benefit from a recovery.

2.2. Formula-based Management

2.2.1. Aims and principles

Formula-based Management aims to draw on advances in financial structures to benefit from the strength of financial markets while the same time protecting initial capital, or to generate returns in market conditions where it is impossible to do so with traditional investments.

Formula-based Management is characterised by the fact that the management company makes a firm engagement on the capital and performance at maturity, according to the risk/return goals of the investor. This undertaking takes the form of a formula.

In terms of allocation, part of the initial capital is invested in risk-free assets, in order to underwrite the capital guarantee, with the remainder invested in options.

The options can be established on a wide range of underlying instruments and enable a broad range of market scenarios to be played.

Option investments are managed by a counterparty bank which will deliver, on maturity, the contractual returns according to which market scenario has materialised.

2.2.2. Structural Factors

A formula-based fund has two components:

- **A risk-free asset element**

This component is used to guarantee the return of initial capital at maturity or to provide a regular income stream. The initial allocation to this segment depends on interest rates.

In the case of a capital guaranteed formula-based fund, the value of this element grows steadily towards 100% of the initial investment at maturity.

- **An options element**

This component gives exposure to the selected underlying security and allows the implementation of a strategy that reflects expected market conditions.

The initial allocation to options is known as the stub (Initial NAV – Initial allocation to risk-free assets).

Figure 4: NAV of a formula-based fund at inception and maturity

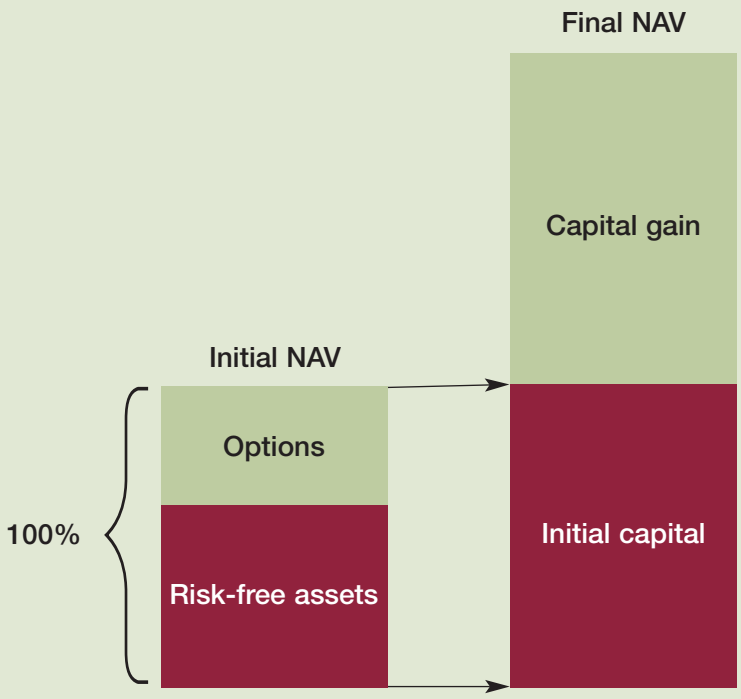


Figure 5: Sample structure

Aim

- produce a 10-year fund
- 100% capital guarantee at maturity
- with exposure to any increase on the DJ Euro Stoxx 50

Creation of a zero-coupon bond worth 67.56% of the initial investment

- A zero-coupon bond currently worth 67.56% is guaranteed to be worth 100% in 10 years' time*

Leaving 32.44% to invest in options

- This is the stub
- It is used to buy a 10-year call on the DJ Euro Stoxx 50

Determination of option price: 30.90%

However the fund has 32.44% to invest in the option

Calculation of exposure to upside of the DJ Euro Stoxx 50

- 32.44 / 30.90 = 104.98%

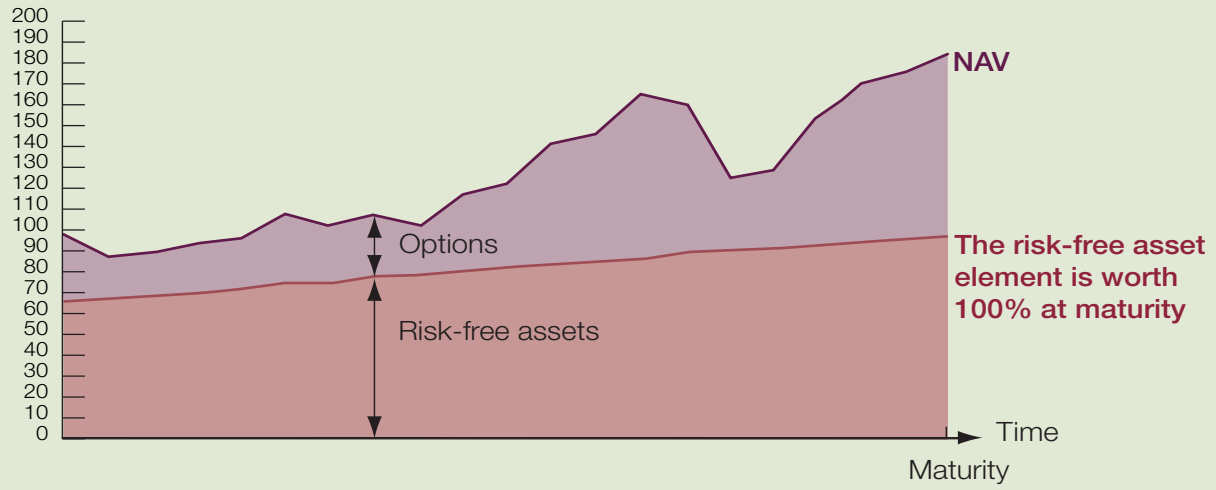
Result

The manager can offer a 10-year fund that:

- guarantees 100% of the initial capital at maturity
- offers nearly 105% of the upside of the DJ Euro Stoxx 50 over 10 years

* Assuming a risk-free rate of 4%.

Figure 6: Change in the allocation of a formula-based fund over its lifespan



■ **The component invested in risk-free assets** at inception is determined as a function of interest rates

Assuming a risk-free 10-year rate of 4%, this component will initially be set at:

$100/(1+4\%)^{10} = 67.56\%$

This will be worth 100% at maturity.

Over the life of the product, like any bond, its value will fluctuate as a function of interest rates, rising when rates fall and falling when they rise.

■ **The value of the component invested in options** will be determined by the performance of the underlying and the redemption profile of the options acquired.

2.2.3. Management of option assets by a counterparty bank

The option element is managed by an institution prepared to give an undertaking on a predetermined return. This is usually a bank; more precisely the derivative products division of that bank.

Whatever the legal form taken by the Structured Fund, management of the cover for its engagements is carried out by a bank, generally using a swap.

The bank is engaged to pay at maturity the gains generated by the option element. Over the life of this element it will endeavour to cover this engagement by taking market positions that reduce its risk as much as possible.

To cover its risk, the bank will draw on research into the stochastic behaviour of the underlying instruments. Its aim is to use the markets to ensure that its overall portfolio carries no risk, or the least possible risk.

The basic trading approach is called "delta hedging", which uses the fundamentals of the options theory. It is based on discoveries made by several researchers, but most notably Robert C. Merton and Myron S. Scholes, who were awarded the Nobel Prize for this work in 1997. It is worth noting the terms used in their citation for this prize:

> "Robert C. Merton and Myron S. Scholes have, in collaboration with the late Fischer Black, developed a pioneering formula for the valuation of stock options. Their methodology has paved the way for economic valuations in many areas. It has also generated new types of financial instruments and facilitated more efficient risk management in society."

Their research showed that it is possible to cover an option with its underlying. For an option on a given underlying, it is always possible to construct a risk-free portfolio consisting of the option plus a certain quantity, whether positive or negative, of the underlying, known as the **Delta.** By continuously adjusting the quantity of the underlying, one may obtain a portfolio with no overall risk.

The method for calculating **Delta** depends on the mathematical models developed by the banks. The effectiveness of these models is kept under constant review.

In reality, when the counterparty bank sells an option to an investor, it simultaneously carries out an initial hedging operation by buying or selling a certain quantity of the underlying: this is the initial Delta.

Delta will then change as a function of the price of the underlying, with the bank adjusting its hedging by buying or selling the underlying.

Figure 6: Management of option assets by the banking counterparty – worked example

Year	0	1	2	3	4	5	6	7	8	9	10
Price of underlying	**100**	95	125	90	80	70	75	100	115	165	165
Value of Call*	**30.90**	26.22	45.21	20.05	13.13	7.34	7.55	17.24	23.81	66.28	65.00
Gain/Loss on Call for the seller		4.68	-18.99	25.16	6.92	5.79	-0.22	-9.68	-6.58	-41.46	0.28
Delta*	**65.45**	62.14	74.84	56.91	47.83	36.18	37.42	58.62	71.59	98.29	100.00
Gain/Loss on Delta		-3.27	18.64	-26.19	-5.69	-4.78	1.81	9.35	8.79	35.80	0.00
Impact for the banking counterparty		1.41	-0.35	-1.03	1.23	1.01	1.59	-0.33	2.21	-5.67	0.28

* As a percentage of nominal value.

Notes on Figure 6

At inception

The investor buys a 10-year call with a strike price of 100 on the DJ EuroStoxx 50 for 30.90, with the bank receiving this as the call premium.

To cover its position, the bank buys the underlying (futures on the DJ EuroStoxx 50 index) to an extent determined by its formula for calculating Delta, in this instance 65.45% of the nominal value.

After year 1

The index has fallen 5%.

The call is now worth 26.22, generating a potential gain of 4.68 for the banking counterparty.

However this is partially offset by the loss of 3.27 on the bank's holding of the underlying.

Over subsequent years

The Delta is adjusted according to changes in the underlying and gains and losses on the option are offset by gains and losses on the Delta.

At maturity total losses on the option come to 34.10 where as total gains on the Delta are 34.45, producing a small gain, of 0.35, for the banking counterparty.

Delta hedging alone ignores residual risks, but these remain significant for the counterparty banks. These include, amongst others:

- **Vega risk**
  The Delta hedging model assumes that the volatility of the underlying instrument is constant. In practice volatility can change. This risk is called Vega risk, Vega being the change in the value of a portfolio for a change in its volatility.

■ **Gamma risk**
The bank may also run a Gamma risk. This arises by the fact that it needs to sell the underlying if its price falls and buy it if the price rises. This creates the liquidity risk of being unable to adjust the Delta quickly enough.

■ **Correlation risk**
The correlation between two underlying instruments can change. There are various parameters for managing this risk and research into this area is ongoing.

Some risks can never be fully covered. The banks therefore make use of statistical coverage of one risk by another. This means that the size of the options book is critical. A bank with substantial positions on certain types of risk is better placed to offer attractive pricing as the diversity of its products protects it from certain risk factors.

2.2.4. Advantages and limitations of Formula-based Management

Formula-based Management offers unique advantages stemming from the nature of the options in which it invests:

■ **A source of protection against the volatility of risk-bearing assets:** whereas CPPI funds are sensitive to market downturns (once they have disinvested significantly, they find it difficult to reinvest and thus benefit from a recovery), a zero-coupon plus plain-vanilla call structure benefits fully from any rebound. The performance produced depends only on the initial and final value of the underlying instrument, even if this drops sharply shortly after the inception of the fund.

■ **A source of diversification thanks to the range of market scenarios covered:** options can be used to generate positive returns in U-shaped or bell-shaped markets, erratic markets or those without any real trend. For each of these market patterns it is possible to choose an option which will generate investment returns. Even if one limits oneself to simple options there are many examples: a cliquet (or ratchet) call option will perform well in a U-shaped market, a maximum call option will work well in a bell-shaped market where as a Reverse Convertible structure will generate returns in a stable market.

■ **An approach that can be adapted to highly specific risk/return profiles:** Formula-based Management allows an investor's specific constraints in the risk/return relationship to be integrated in the structure. For example, an investor could choose to forgo part of the upside on the underlying at maturity in return for the locking-in of gains made over the lifespan of the investment. The "Emeraude" structure was designed to meet this need. Thus Formula-based Management enables the creation of bespoke performance profiles.

■ **Excellent visibility:** the formula for calculating NAV on maturity is defined at the outset and the management approach is systematic. In addition, this technique has the advantage of offering an "all in" cost, with the cost of the option known from the outset.

However, Formula-based Management has a certain number of limitations, notably:

■ **Dependence on interest rates at the time of launch:** the lower rates are, the greater the cost of the zero-coupon bond guaranteeing capital and thus the lower the leverage on the performance of the underlying risk-bearing assets.

■ **The need to wait for the full term to achieve the target return:** although the structure's value increases as the scenario generating its performance takes shape, it is still necessary to wait for maturity to benefit from the guaranteed capital and return.

2.3. Comparison of the two families in four different market scenarios

We will compare the performance of three different structured products in four different market scenarios:

■ Bull market

■ U-shaped market (falling then rising)

■ Volatile bell-shaped market (rising then falling)

■ Erratic market (with no clear direction over the investment period).

The structures to be compared are as follows:

■ CPPI fund indexed on the DJ Euro Stoxx 50

Maturity: 10 years

Multiplying coefficient: 4

Redemption at maturity: 100% of the highest NAV over the investment period

■ Formula-based fund 1 indexed on the DJ Euro Stoxx 50

Maturity: 10 years

Return at maturity: 100% of initial capital + 105% of any upside in the DJ Euro Stoxx 50 index (zero-coupon plus plain-vanilla call structure)

■ Formula-based fund 2 indexed on the DJ Euro Stoxx 50

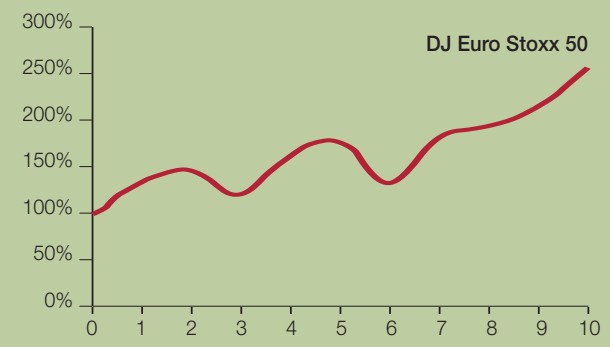
Maturity: 10 years

Return at maturity: 100% of initial capital + 50% of the sum of annual positive performances of the DJ Euro Stoxx index (zero-coupon plus ratchet call[1] structure).

The figures given on the following pages exclude any fees.

1. A ratchet call (or cliquet call) locks in the rise in the index each year, without reference to performance in previous years. In other words the "meter is reset" each year.

Figure 1: Bull market



Performance of the three funds over the period

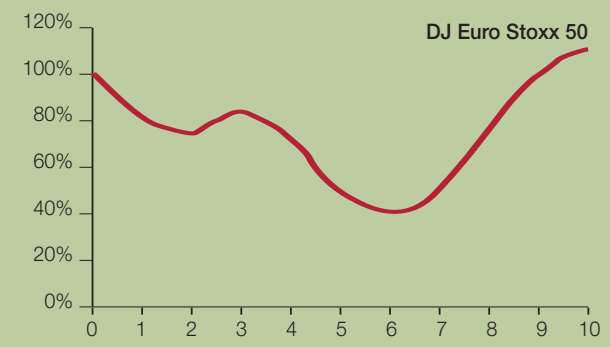
	Payout at maturity	Annual return
CPPI Fund	258.99%	9.98%
Formula-based fund n°1	268.00%	10.36%
Formula-based fund n°2	182.82%	6.22%
DJ Euro Stoxx 50*	260.00%	10.03%

■ The CPPI fund benefited from the rise in the index over the period.

■ Formula-based fund n°1 (zero-coupon plus call) generated a better return than the CPPI product as it is less sensitive to index volatility.

■ Formula-based fund n°2 (zero-coupon plus ratchet call) generates a lower return under these market conditions due to the high cost of this strategy (the premium paid for 'resettting the meter' on an annual basis is that the investor receives only half of each year's return).

Figure 2: U-shaped market



Performance of the three funds over the period

	Payout at maturity	Annual return
CPPI Fund	100.00%	0.00%
Formula-based fund n°1	112.60%	1.19%
Formula-based fund n°2	166.05%	5.20%
DJ Euro Stoxx 50*	112.00%	1.14%

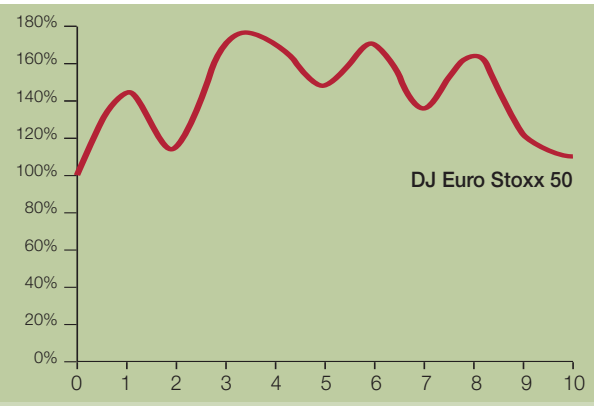
■ The CPPI fund suffered from the fall in the index at the beginning of the period. This led to it being converted into a cash investment without exposure to the rally at the end of the period.

■ Formula-based fund n°1 benefited from the rise in the index over the period, but this was minimal with initial and final values very close.

■ Formula-based fund n°2 is by its nature less dependent on the initial market level (as the meter is reset every year). As a result it benefited from the years of gains in the index and was the best performer over the period.

* Excluding dividends.

Figure 3: Volatile bell-shaped market



Performance of the three funds over the period

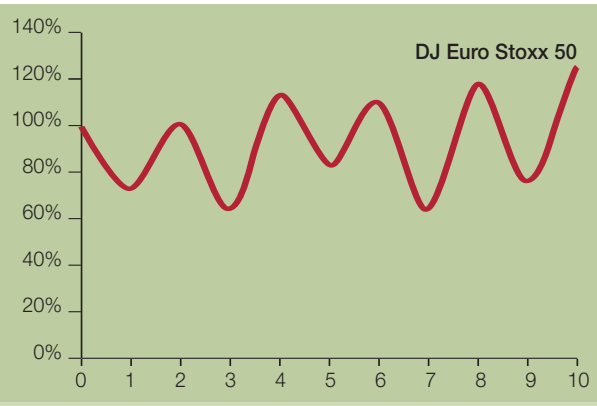
	Payout at maturity	Annual return
CPPI Fund	193.94%	6.85%
Formula-based fund n°1	110.50%	1.00%
Formula-based fund n°2	166.12%	5.21%
DJ Euro Stoxx 50*	110.00%	0.96%

■ The lock-in effect means that the CPPI fund retains the strong gains seen at the beginning of the term.

■ Formula-based fund n°1 suffers by not being exposed to the market gains at the beginning of the period.

■ Formula-based fund n°2 produces a return close to that of the CPPI fund, but nevertheless lower due to the high cost of the strategy implemented (re-establishing a base point each year without being penalised by the previous year's base point).

Figure 4: Erratic market



Performance of the three funds over the period

	Payout at maturity	Annual return
CPPI Fund	104.52%	0.44%
Formula-based fund n°1	126.25%	2.36%
Formula-based fund n°2	247.58%	9.49%
DJ Euro Stoxx 50*	125.00%	2.26%

■ The CPPI fund produces a very low return. It is hampered by the fall in the index at the beginning of the period and is negatively affected by market volatility, thus reducing its ability to take advantage of the slight increase seen at the end of the period.

■ Formula-based fund n°1 provides a better return than the CPPI fund, as its performance depends only on the initial and final values of the index.

■ Formula-based fund n°2 benefits from the highly volatile nature of the index by locking in gains without being hit by losses.

* Excluding dividends.

2.4. Summary

Table 1: The right structure for given market conditions

Market scenario	Bull	Volatile U-shape	Bell-shape	Erratic
CPPI Fund	***	*	***	*
Zero-coupon plus call	***	*	*	**
Zero-coupon plus ratchet call	*	***	***	***

Key:
*** Strong performance.
** Acceptable performance.
* Disappointing performance.

Tables 2 & 3: effects of changes in interest rates and volatility over the investment period

Interest rates	Rise*	Fall*
CPPI fund	Positive: the manager will have additional resources with which to acquire risk-bearing assets	Negative: the resources available for the acquisition of risk-bearing assets are reduced
Zero-coupon plus call	Negative on secondary market valuations, but nil on maturity	Positive on secondary market valuations, but nil on maturity
Zero-coupon plus ratchet call	Ditto	Ditto

* Relative to the time at which the structure is designed.

Volatility	Rise*	Fall*
CPPI	Negative due to costly trading operations	Positive as market performance can be captured with fewer trades
Zero-coupon plus call	Positive if implied volatility rises (generally but not always the case)	Negative if implied volatility falls (generally but not always the case)
Zero-coupon plus ratchet call	Ditto	Ditto

* Relative to the time at which the structure is designed.

3. Investment and Product Selection

Before any investment decision, the institutional investor needs to carefully examine the structured product offered in light of a number of parameters: requirements and constraints, fees, legal structure, market parameters, the expertise of the structuring team and so on.

3.1. Suitability to investor needs

3.1.1. Some criteria to be considered

The list below summarises a number of factors that need to be assessed prior to any investment decision:

- **Investment term:** the nature of structured products is such that performance undertakings are given at maturity, where as at inception all available resources are optimised to enhance this final return. As a result the proposed investment term is key. The investor must be aware that the most favourable exit point from a 10-year product is after 10 years. This is in part because it is at this point that the counterparty bank will honour its guarantees and in part because the structuring institution will have focused the use of resources on providing the best possible return at the full term. Note, however, that structuring teams are just as capable of offering products for the short term (1 year), medium term (3 to 4 years) and long term (10 or more years). Thus a clear expression of the investor's needs is essential.

- **Exchange rate risk:** structured products can include currency hedging for any investor needing to invest in a benchmark currency.

- **Suitability for expected market conditions:** investors must first define expected market scenarios over the investment term, so as to be able to assess how structured products match up to their view of the fundamentals. Thus an investor might choose to play a long-term rise in the market (six years or more), stability over the short to medium term, or a fall in the short term. Products can be structured to reflect any market scenario. Some structures are suitable for a number of market scenarios. Clearly as the number of scenarios covered by the structure increases, the level of upside exposure decreases.

- **Suitability of the economic choices made:** the investor must be able to assess whether or not the economic choices within the structure offered are suitable. To explain what we mean by "economic choices", let us look at an example. Suppose that an investor wishes to play on a rise in the market over a ten-year period. It may be that it is more important for this investor to protect against a market downturn over the final two years of the investment term – such as that seen between April 2000 and April 2002 – than to maximise leverage on upside exposure. It is perfectly legitimate to take the view that it is not worth paying for extra leverage on upside exposure if the upside could turn out to be significantly less at the end of the period than it had been over the life of the product. If such a choice is made, the structuring institution would offer a zero-coupon plus averaged call, or better still a zero-coupon plus "Emeraude" call, rather than the standard zero-coupon plus plain vanilla call structure.

■ **The payment structure offered:** the inherent flexibility in Formula-based Management allows institutions to offer investors a wide range of payment structures combining distribution and accumulation options. In particular, some capital guaranteed structures can be used to offer high guaranteed annual coupons in the early part of the structure's term, which can be highly attractive to some investors seeking to generate a predetermined performance pending a recovery of the markets. It is therefore important that investors should decide whether they wish to benefit from investment performance on maturity only or if they would prefer to receive distributions at predefined stages of the investment term. This decision must be taken at the outset, to allow the structuring institution to offer the best possible return formula.

■ **The selection of underlying instruments:** we have seen that Formula-based Management can cover a wide range of underlying instruments: equity indices, equity baskets, mutual funds and hedge funds. Each of these categories has its own advantages and it is important that the investor selects that which is best suited. The table below sets out the benefits of each type:

	Equity basket	Equity index	Index basket	Fund basket	Hedge fund basket
Main advantages	Allows a more selective approach than an index alone	Gives representative exposure to a given market	Simultaneous representative exposure to a number of selected markets	Gives exposure to the inherent advantages of actively managed funds: 1) Diversification allowing a dilution of the specific risk associated with each stock; 2) Management approach allowing a reduction of volatility and expectation of more stable returns	Gives exposure to the inherent advantages of hedge fund management: 1) Managers are not tied to a benchmark and are free to use their talents; 2) Volatility is controlled; 3) Performance is not correlated with that of equity or bond markets

■ Secondary market valuation considerations: it is essential that the investor has the information available to allow an assessment of how the structured product in question will behave on the secondary market. In general, structured products carrying a capital guarantee behave better in a falling market, due to their zero-coupon component. This factor thus generates a considerable reduction in volatility on the downside, while still offering upside exposure comparable, at maturity, with that of a non-guaranteed product.

3.1.2. Some additional valuation tools

In addition to these qualitative criteria, the structuring team should be able to supply a range of quantitative data that will assist in assessing the characteristics of the structured product in question.

■ **Backtesting, modelling performance on historic data:** backtesting consists of calculating the performance at maturity of a product with a similar structure to that being offered (same term, same underlying, same formula for calculating final value, etc.) if it had been launched in the past. Backtesting thus gives an idea of the way in which a product behaves in various market conditions, whether rising or falling:

■ What performance is generated in unfavourable market conditions?

■ What performance is generated when the market is favourable?

However, backtesting is not a complete answer, as past performances do not predict future behaviour and the same financial asset (shares in Bouygues or Vivendi for instance) can reflect a very different economic reality today to that it represented ten or twenty years ago.

■ Secondary market price modelling: these data help assess the value of a given fund not at maturity but over the course of its life, as a function of a range of scenarios in which parameters such as the price of the underlying(s), interest rates and volatility are adjusted. This modelling can provide a good idea of how a product will behave in the secondary market.

3.2. Selection of Providers

Structured Management involves a number of different providers, whose quality must be checked.

The three main providers are:

■ The structuring team designs the overall characteristics of the investment, according to client requirements and market prices and parameters.

Their role is essential. They are responsible for matching the investor's requirements to the resources available on the market. They must have expertise in the products used and be capable of innovation.

For example, an investor might be considering a standard zero-coupon plus call structure. However if the volatility of the underlying is high, the structuring team should be able to offer alternative solutions that will allow the investor to take advantage of the high volatility rather than suffer from it.

In addition the structuring team needs to have an approach that is not only stochastic but also fundamental, thus taking account of the market scenarios which are most likely to come about. Thus it is clear that the abilities of the structuring team are crucial.

The importance of this role continues over time. A structured product follows its course and the investor must be prepared to change products, replacing the existing one with a new one, if the opportunity arises. Thus the advisory role of the structuring team continues throughout the investment term.

■ The banking counterparty defines the hedging policy for the options element and is responsible for executing this policy. The credit rating of the banking counterparty is another consideration for the investor, as there is a counterparty risk.

■ The administrator coordinates the management of the basic elements required to produce the desired risk/return profile, within the overall investment envelope, and is responsible for regulatory aspects of the investment.

3.3. Commissions and derivative prices

1 – Entry and exit fees

Any investor buying units in a mutual fund generally pays an initial fee and an exit fee, even if these are very small in some cases.

Formula-based funds have the specific feature of not charging such fees to institutional investors.

2 – Administration and accounting fees – between 5 and 50 basis points per year

These include fixed costs (such as auditors' fees) and variable costs (such as payments to the custodian, valuing agent and financial institutions.

3 – Financial management fees – between 20 and 200 basis points per year

These fees cover all operations carried out by the manager: structuring of the fund, management of fund assets and off-balance-sheet positions, independent valuation of options, centralisation and execution of Buy and Sell orders. They also include the margin of the manager and of the distributor if this is not the same entity as the manager.

Note that for a CPPI fund, the cost of transaction management is between 100 and 150 basis points per year.

4 – Miscellaneous external costs

These include underwriting fees (0 to 20 basis points per year), paid to the bank which provides the guarantee to the investor, and the cost of derivative instruments (10 to 25 basis points per year).

Thus, for an institutional investor, the cost of a formula-based fund is generally in a range from around 0.40% to 3.00% per year.

NB: The cost of derivatives

A specific feature of the derivative instruments bought by an institutional investor is that their cost is included in their price.

In broad terms, the price of a derivative includes three listed components:

1 – The option premium. This is the sum of the Intrinsic Value and the Time Value of the option. This component is highly dependent on market conditions. For instance if markets are very volatile, the Time Value will be higher.

2 – The cost of implementing hedging: This covers the cost of all the transactions carried out by the bank over the lifespan of the option to enable it to pay the investor the contractually agreed amount at maturity. These costs include brokerage fees.

3 – Underwriting margins: underwriting margins are provisions designed to cover against "unhedgeable risks" such as Vega (change in volatility), Gamma (adjustment of hedges) and correlation (see Chapter 2), or more generally used to cover general risks born by the banking counterparty (these are not merely theoretical; there are cases of trading losses by the derivatives departments of banks). These margins are difficult to measure, as they are determined by a judgement made about stochastic variables. In our experience, they generally represent between 0.10% and 0.25% of the NAV of a fund per year.

3.4. Implementation of Structured Management

Structured Management can be implemented in a variety of ways:

- with a banking institution, using a swap or a structured note
- through a management company: via a mutual fund or a management mandate.

The choice of the legal framework for the investment takes several factors into account:

- the investor's regulatory framework
- the level of regulatory protection sought by the investor
- counterparty risk
- tax impact, and so on.

We describe three types of commonly used contract below.

3.4.1. Direct Swap

The investor enters into a swap with a bank. Through this swap the investor exchanges the return on a particular asset, such as a money market asset, against the return defined by the structure.

This method is simple: a swap is not a particularly complex instrument. It offers the advantage of avoiding counterparty risk. The counterparty risk consists of the default risk on the bank. In the event of default, the two legs of the swap counterbalance, and the investor would only lose the balance of the two legs if it is in his favour.

There are various methods (collateral, reset, etc.) which enable counterparty risk to be eliminated altogether.

Swaps also have a degree of liquidity, as the bank will allow closure of the swap at a marked-to-market price.

3.4.2. Structured note

A bank, or the subsidiary of a bank, will issue a security such as an EMTN, BMTN or warrant which reproduces the returns defined by the Structured Product. The investor subscribes to this issue.

This method has the advantage of being extremely simple. Its only drawback is that it does not remove counterparty risk.

The bank generally undertakes to make a secondary market in the security. Should the need arise, the investor can thus sell the security to the bank, which will cancel it.

3.4.3. Mutual fund

The mutual fund approach is also simple for the investor.

The fund buys various assets and enters into a swap with a banking counterparty.

Counterparty risk is low or non-existent, as with a direct swap.

Liquidity is guaranteed, as the regulations demand that the management company allows units to be redeemed at their NAV.

The regulatory framework offers considerable protection to investors, notably:

- to many countries the management company must “act independently” and “act for the sole benefit of subscribers” (article L214-3 of the Code Monétaire et Financier);
- net asset values are independently audited;
- the fund is obliged to supply certain information.

The management company has an important role as the interface between investors and the bank. The management company chooses the banking counterparty, unless the client requests a specific bank. It also has a role to play in the selection of a structure, and in optimisation of the financial engineering. It manages investments and redemptions and guarantees the liquidity of units, under the control of the auditors.

4. Management – monitoring a product over time

4.1. Term Sheet – the summary document of reference

Before any final commitment, the investor should receive a term sheet which summarises the terms and conditions of the structure of the offer.

This document is vitally important as it will form the basis for all the legal documentation produced for the fund. Thus investors should review the term sheet thoroughly before proceeding with any investment decisions.

The main headings are as follows:

- **The counterparties legally involved in the structure:** the issuer and the guarantor for a security or EMTN, the management company and guarantor for a mutual fund, and so on.
- **The investment type:** the legal form through which the investor will have access to the structure (bond, EMTN, mutual fund, swap, OTC, etc.).
- The **name** of the product.
- The **currency** in which it is denominated.
- **The nominal value:** this is the nominal value of each unit multiplied by the number of units issued.
- The product calendar giving **dates of issue, payment, initial observation** (which provides the base-point observation of the price of the underlying) and maturity.
- **Issue price:** expressed as a percentage of the nominal price of each unit.
- **Unit value:** this is the value allocated to the fund at issue, and therefore generally paid by the subscriber and redeemed at maturity in the case of a 100% capital guaranteed product.
- **The basket of underlying instruments:** this lists the underlying securities of the product.
- **The coupon:** sets the level of any coupon payments.
- **Payment at maturity:** this heading gives the formula by which the redemption value of each unit will be determined at maturity.
- **Secondary market details:** the secondary market to be used, settlement and clearing details, valuing agent.
- ISIN code.
- Market of listing, where appropriate.

Illlustration: Sample Term Sheet

Indicative Terms and Conditions at XX/XX/XX

Jade Coupon

Issuer	SGA Société Générale Acceptance NV
Guarantor	Société Générale (Moody's As3, Standard & Poors AA)
Type	EMTN
Name	Jade Coupon
Currency	Euro
Nominal	To be determined
Issue date	To be determined
Settlement date	To be determined
Investor	XXXX
Initial observation date	To be determined
Maturity date	To be determined
Issue price	X%
Unit value	€X
Underlying basket	An equally weighted basket of the following 20 shares

EADS	ABB LTD
PHILIP MORRIS	AHOLD
ADIDAS	RSA
CANON	NISSAN MOTOR
ALSTOM	BRIDGESTONE CORP
AMERICA ONLINE	COMMERZBANK
SIEMENS AG	COCA COLA
CHEVRONTEXACO	BAYER
SCHLUMBERGER	SUN MICROSYSTEMS
SEVEN-ELEVEN JAPAN	SAP AG

Capital guarantee	100% at maturity
Maturity	4 years
Coupon	**At each annual payment date k, for k from 1 to 4,** the investor will receive for each unit:
Redemption at maturity	At the maturity date, the investor will receive (in addition to the coupon determined above) for each unit: Unit value x 100%
Annual observation date k	The anniversary date of the initial observation (or the next trading day) for k from 1 to 4
Annual payment date k	The sixth trading day after the annual observation date k
Secondary market	Société Générale undertakes in normal market conditions, to offer firm prices on a daily basis throughout the entire life of the EMTN, with a maximum bid/offer spread of 1%.
Valuing agent	Société Générale
Settlement & clearing	Clearstream / Euroclear
ISIN code	To be determined
Listing	A listing on the Luxembourg Market may be requested

4.2. Understanding risk indicators and negotiating reporting

The quality of reporting is important:

■ in assessing the performance of the product and its secondary market;

■ to inform decisions to redeem the product or to make additional investments.

The information supplied must, as a minimum requirement, include the following:

■ net asset value at the closing date;

■ performance table (since inception, year to date, last quarter);

■ table identifying the contribution of each underlying instrument to overall performance.

Depending on the product in question the investor can also require additional information, particularly the inclusion of risk indicators that will provide alerts concerning the performance of the product. For example:

■ Assuming that the investor has bought a product with the following characteristics:

– Investment term of 8 years;

– Full capital guarantee at maturity;

– Based on a basket of 12 shares;

– Annual coupon of 8% if no share has lost more than 50% of is value relative to its initial price at the end of each of the twelve months of the year in question, or 2% otherwise;

– Basket enhancement clause: the share posting the worst performance is definitively removed from the basket at the end of each year in which one or more of the shares has lost more than 50% relative to its initial price.

■ In order to properly monitor this product the investor should require reporting to include:

– A summary table of coupons paid in prior years;

– A table allowing the chances of receiving the 8% coupon in the current year to be assessed. For example, such a table could show the performance since inception of those shares still included in the basket at each monthly observation date.

The frequency of reporting must be negotiated as part of the contract. Reports should be issued on at least a quarterly basis.

4.3. Assessing the quality of the secondary market

The secondary market has a central role given that it allows investors to strengthen certain investment lines, cash out their investments or switch to assets as part of the management of their overall portfolio.

A certain number of factors will help an investor assess the quality of a secondary market, notably:

■ liquidity (daily, weekly or monthly);

■ the possibility of making sizeable trades;

■ the security and efficiency of settlement and clearing procedures;

■ the cost of the secondary market, for instance the size of the bid/offer spread for a bond issue or exit fees for a fund.

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