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## Fixed-income derivatives made simple

What a trustee needs to know

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**Henderson Global Investors**



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## Fixed-income derivatives made simple

**“Derivatives should be seen as a help rather than a hindrance in the context of pension portfolio management, and trustees and fund managers, rather than simply ignoring them, should look closely at where they might gain from their deployment.”**

- OECD Secretariat<sup>1</sup>

A derivative is a financial contract between two parties, whose value is *derived* from an underlying asset's price.

Derivatives usage has surged in recent years: in the third quarter of 2004 alone, the combined value of exchange-traded fixed-income and currency contracts reached US\$268tn<sup>2</sup> - nearly four times the level just three years ago.

However, UK pension funds have been reluctant participants, owing to the instruments' perceived complexity, as well as several high-profile cases where they were blamed for large losses.

In fact, derivatives should be seen as simply tools that can make it easier and cheaper to manage portfolio risk. For pension funds, their flexibility can be highly efficient when constructing portfolios that better match liabilities. They carry risks, of course, but – properly understood and managed – derivatives can help *reduce* overall portfolio risk, rather than increase it.

This paper provides a simple introduction to derivatives commonly used in connection with fixed-income portfolio management. Some more obviously reside within the existing mandate of an asset manager, while others might be more useful for executing liability hedging transactions at an aggregate scheme level. In turn, we will discuss:

- Futures
- Options
- Interest rate swaps
- Inflation swaps
- Credit default swaps

We have also included two Appendices: a glossary of terms used throughout the document and an explanation of “portable alpha” portfolios (which employ derivatives).

<sup>1</sup> Source: “Developments in pension fund risk management in selected OECD and Asian countries”, OECD Secretariat paper (December 2004).

<sup>2</sup> Source: Bank of International Settlements Quarterly Review, December 2004.

## Futures

### What are they?

A fixed-income futures contract is effectively an agreement between two parties to buy or sell a bond for a specific price at a future date.

Although typically exchange-traded, contracts can also be established between two parties on an over-the-counter basis.

### Why are they useful?

Because the fixed-income futures market is large and liquid, it often provides a cheaper, more efficient way of modifying portfolio risk than the underlying bond market.

### How do they work?

Fund managers can *sell* (go short) or *buy* (go long) contracts, mainly to:

- *Hedge* (i.e., neutralise) an existing bond exposure. For example, if a portfolio is too sensitive to interest-rate changes, or is overweight in a particular market relative to the portfolio benchmark, fund managers can neutralise their exposure by going short in the futures market. Because of excellent liquidity and low dealing costs, they can often do this more quickly and more cheaply than by selling the physical bonds.
- *Overlay* risk onto a portfolio that tracks a benchmark index. For example, rather than modify portfolio duration by buying and selling physical bonds, fund managers can go long or short in the futures market. Less cumbersome and cheaper – they can achieve their objective with a single transaction, rather than several, and with lower dealing costs – it has the added advantage of leaving the actual portfolio composition unchanged (important if tracking a specific index is part of the investment strategy).
- *Arbitrage* (or exploit) price differentials between the futures and cash bond market.

To invest in futures, fund managers need to put up only a small amount of capital relative to the amount of assets they are committing to buy or sell. The entire position is fully backed, but fund managers may – depending on mandate constraints and clients' tolerance for risk – leverage the position by allocating some of that cash to other investment opportunities.

**Who is the counterparty?**

A futures exchange (or, more precisely, its clearing house) acts like a “bridge” between the two parties and thus assumes the counterparty role in a futures contract.

This has two important benefits:

- Company-specific counterparty risk is removed; and
- Daily mark-to-market pricing and margining (which require parties to settle any daily losses from pre-established margin accounts) effectively eliminate counterparty risk altogether.

**What are the risks?**

- Market conditions may change adversely during the life of the contract, and because parties are obliged to buy or sell at pre-determined prices, it could result in a loss.
- Futures contracts are based on the characteristics of certain physical bonds, but only the cheapest of these bonds is actually delivered when the contract expires. If relative bond values change during the contract period, the bond delivered may not be the one assumed by the parties at the outset when the contract is agreed.

## Options

### What are they?

Options give investors the *right*, but not the *obligation*, to buy or sell a security at a specific price in the future. The option to buy a security is known as a *call*, whereas the option to sell a security is called a *put*. Although typically exchange-traded, contracts can also be established between two parties on an OTC basis.

### Why are they useful?

They enable fund managers to express investment views more cheaply, and with less risk, than through physical assets. They can also be used, by managers and pension funds directly, to hedge (neutralise the risk of) existing positions.

### How do they work?

- If fund managers believe that an asset's price will fall, they buy a put option. If they are right, they will profit by purchasing the security at the new, lower market price and selling it to their counterparty at the higher, agreed price.
- Conversely, if the price of an asset is expected to rise in the future, they will purchase a call option. If they are right, they can then buy the asset from their counterparty at the agreed price and sell it in the market at a profit.
- If the asset's price does not move as the fund managers had anticipated, they will simply let the option expire. Their only cost will have been that of arranging the option.

#### **Example**

A fund manager owns 1,000 bonds: each is priced at 100p, for a total portfolio value of £1,000. He is worried that interest rates may rise: so, to protect the value of his portfolio, he pays 1p for put options that give him the right to sell each bond for 97.5p in three months' time.

If interest rates do rise, and the bond price slumps to 90p, he will exercise the option, selling all his bonds to his counterparty for 97.5p each and repurchasing them in the market for 90p. Minus the cost of the option, he will have made a £65 profit:

1	Buys 1,000 options at 1p each	(£10.00)
2.	Sells 1,000 bonds for 97.5p each	£975.00
3.	<u>Buys 1,000 bonds for 90p each</u>	<u>(£900.00)</u>
4.	<b>Profit</b>	<b>£65.00</b>

At the end of the transaction, the portfolio's composition is unchanged.

If, however, interest rates do not rise, and the bond's price does not fall, he will simply let the option expire. The only cost to him will be the £10 cost of the option.

**Who is the counterparty?**

For many transactions, an options exchange assumes the counterparty role by acting as a “bridge” between the two parties engaging in the transaction. As is the case for futures, this has two benefits:

- Company-specific counterparty risk is removed; and
- Daily mark-to-market pricing and margining – which require parties to settle any daily losses from pre-established margin accounts – effectively eliminate counterparty risk altogether.

However, options agreements can also be struck directly between two counterparties at agreed terms. For example, a pension fund wishing to hedge the downside risk inherent in an existing fund-manager mandate could purchase an option directly from an investment bank.

**What are the risks?**

- If markets do not move in the expected direction and the option is not exercised, the cost of the transaction cannot be recouped.
- If a pension fund purchases an option directly from an investment bank, without using a fund manager as an intermediary, it would be exposed to credit risk (i.e., the possibility that the bank could default on its obligations).

## Swaps

### What are they?

Swaps enable investors to exchange a series of cashflows at pre-agreed, regular intervals for a set period of time. Typically, swap agreements exchange only regular cashflows and do not exchange principal amounts.

Swaps are typically transacted between two counterparties on an over-the-counter basis.

### Why are they useful?

Swaps can often be a cheaper, more efficient way of modifying a bond portfolio's liability profile.

### How do they work?

- Two parties agree to exchange a series of cashflows.
- The transaction is viable because the current value of each series of cashflows is the same (using assumptions agreed on by both parties participating in the swap). Technically speaking, the present value of the cashflows is the same.

There are many different types of swaps. The most important ones for pension fund trustees to consider are **interest-rate swaps**, **inflation-linked swaps** and **credit-default swaps**. More detailed descriptions of all three, and examples of how they work, follow.

### Who is the counterparty?

An investment bank is the usual counterparty in a swap. This has three benefits:

- they are able to tailor the swap to suit perfectly the counterparty's needs because, if necessary, they are usually able to offset the resulting exposure by engaging in another transaction;
- all major investment banks have strong credit ratings, so the risk of them defaulting on a swap agreement is low; and
- when transactions are collateralised, the counterparty risk is further reduced. By depositing physical assets as security against any amount owed, credit risk can be mitigated in the event of default.

**What are the benefits?**

- Swaps markets are highly developed and offer better liquidity and greater variety than physical bond markets.
- Fund managers can quickly and cost-effectively modify a portfolio's profile by using swaps.
- The variety of swaps available enables managers to better match the client's objectives (including improving asset-liability matching, if this is an objective).

**What are the risks?**

- One of the parties could default on their payments. But collateral payments are made periodically, based on the market value of the swap; so, in the event of default, the loss would relate only to the market movement since the last collateral payment.
- If the collateral payment required is large, the investor may have to raise funds in order to meet it. However, this can be avoided by agreeing that assets other than cash can also be used as collateral. For example, a bond portfolio (or part of it) could be used.
- Should a position need to be unwound or adjusted, it can be more complicated to cancel a swap than to sell a physical bond.

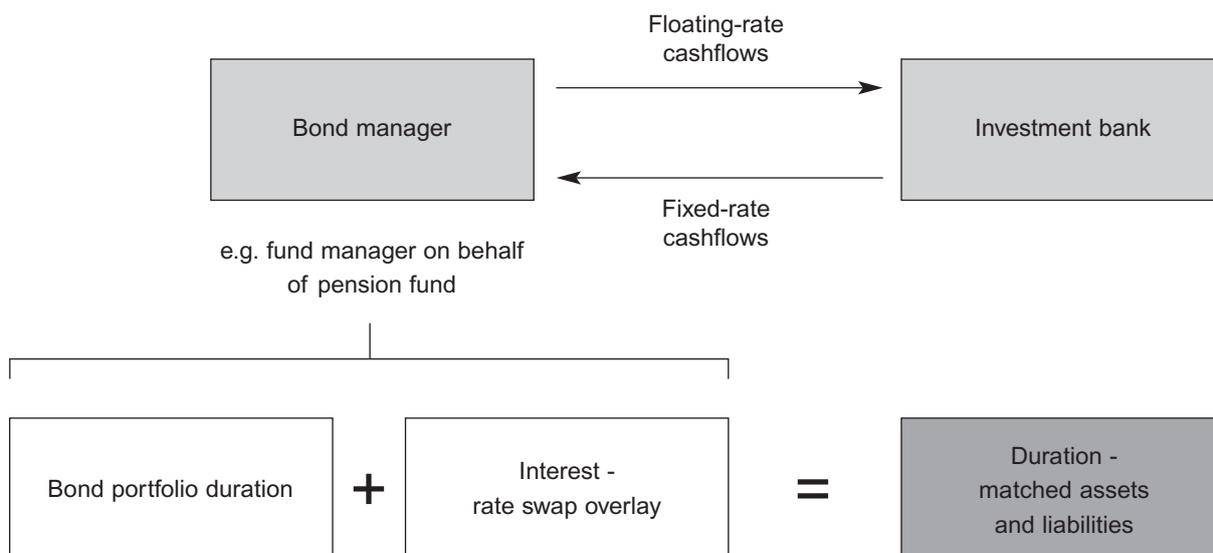
## Interest-rate swaps

Interest-rate swaps involve one party exchanging fixed-rate cashflows for another’s floating-rate cashflows over a fixed period. Many companies like them because they can better match their asset and liability exposures and reduce their borrowing costs.

Fund managers can use interest-rate swaps to match portfolio duration (interest-rate sensitivity) to the duration of a pension fund’s liabilities. This insures against the possibility that future interest-rate changes will not create a mismatch in the values of the assets and the liabilities. Managers achieve this by *overlaying* a bond portfolio with an interest-rate swap tailored to their client’s specific needs. Because interest-rate swaps are quick and cheap to implement, they are also appropriate tools for efficiently modifying portfolio duration in response to changing economic and market conditions.

An interest-rate swap entails:

- Agreeing to make floating-rate payments in exchange for fixed-rate payments for a fixed period (or vice versa).



Interest-rate swaps can be used either within an existing bond mandate or as an overlay strategy executed directly by the pension fund.

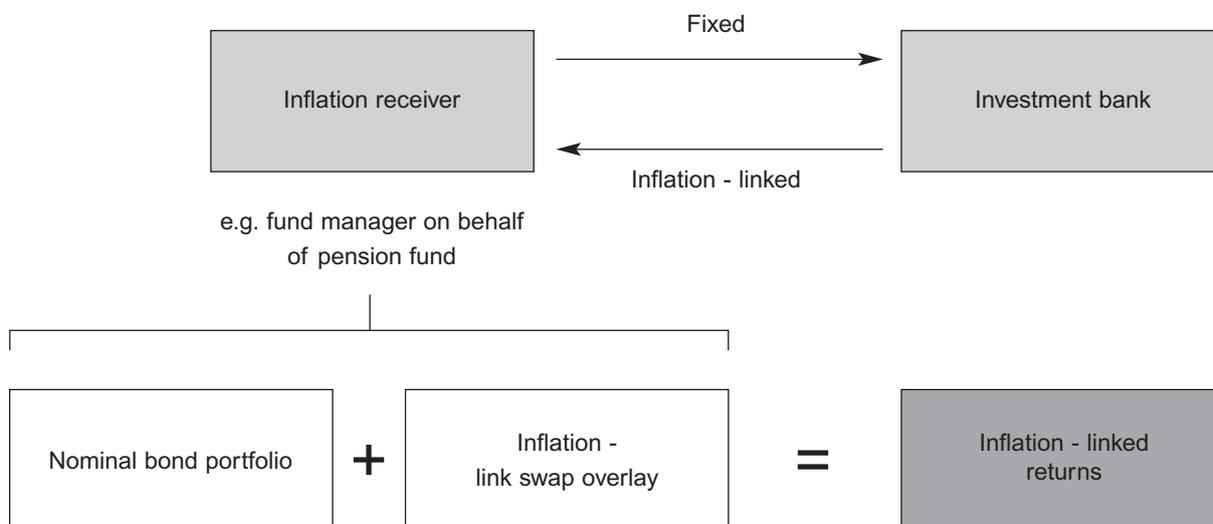
## Inflation swaps

The UK inflation-linked gilt and corporate bond markets are relatively small, making it difficult for investors to construct well-diversified portfolios or successfully match their assets and liabilities.

By using an inflation-linked swap, pension funds can exchange nominal cashflows for real cashflows. In effect, the swap replicates the benefits of investing in the inflation-linked bond market while avoiding its constraints. Furthermore, swaps can be tailored to specific needs, enabling pension funds to match their assets to their liabilities more accurately. For example, inflation swaps can be used to provide better hedging assets against Limited Price Indexation (LPI) liabilities. An added bonus is that inflation-linked swaps provide a higher yield than index-linked gilts (how much more will depend on the execution costs and what assets are generating the fixed cashflows).

The inflation-linked swap involves a two-step process:

- An investor purchases a diversified portfolio of conventional bonds. These could include non-government bonds to enhance portfolio yield.
- It swaps the cashflows this portfolio generates (i.e., future coupon and principal payments) for a counterparty's inflation-linked cashflows.



An investment bank will usually be the counterparty in an inflation-linked swap. It obtains the inflation-linked cashflows it swaps for the pension fund's nominal cashflows directly from an inflation payer (e.g., a utility company, part of whose revenues may be tied to the consumer-price index). The bank may also be expressing, and hoping to profit from, its own view on inflation.

The inflation swap could be used either within an existing bond mandate or as an overlay strategy executed by the pension fund.

## Credit-default swaps

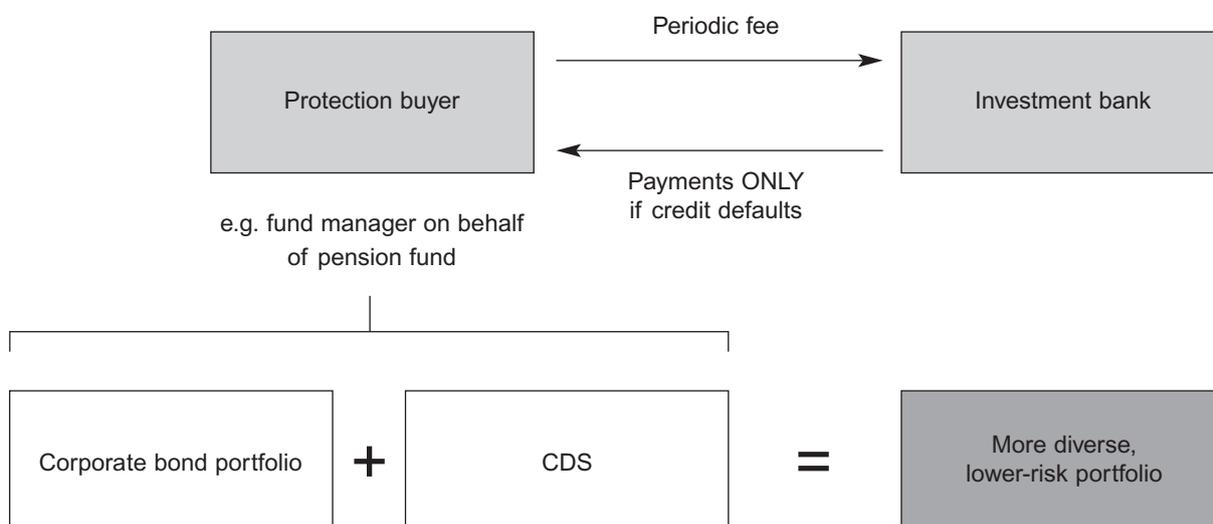
Credit-default swaps (CDS) can be used to modify the amount of credit risk in a portfolio.

A CDS resembles an insurance policy: it enables fund managers to *reduce* credit risk by transferring it to another party, without selling the underlying asset. But a large, liquid market for CDS has sprung up, enabling investors to buy – as well as sell – credit risk; as a result, fund managers can also use CDS to *increase* risk. Crucially, this broadens their investment universe: they can, for example, gain exposure to a particular maturity unavailable in the cash market or invest in foreign credits without currency risk. This diversity, and excellent liquidity and cheaper dealing costs, are the main attractions of the CDS market.

It is also possible to construct tailored CDS indices, which provide quick and cheap access to a large range of individual credits: they are particularly useful when large sums need to be invested in a diversified portfolio.

A CDS to reduce credit risk involves two phases:

- Fund managers pay a regular fee to a counterparty to protect their portfolio from a specific company defaulting on its bond payments.
- If the company does default, the counterparty will then – and only then – make a payment in return.



The length of the contract; what exactly constitutes a default; the value of the fee and the default payment are all stipulated in a contract agreement.

The counterparty in a CDS is typically an investment bank, which can hope to profit from its own (differing) view on the credit's risk, or engage in another transaction to transfer the exposure to another investor. This new investor can then sell the exposure to different investors in the CDS market, and so on.

## Conclusion

Derivatives usage has surged in recent years as changing market conditions have driven investors to manage their portfolios more “efficiently”.

The key benefits derivatives might offer to pension funds are:

- opportunities to benefit from “efficient” portfolio management;
- better liquidity and the possibility of diversifying away or hedging risk; and
- strategies that can achieve a closer asset and liability match.

Derivatives are not devoid of risks, so an understanding of what impact they might have on the overall risk and return profile of a pension fund scheme is crucial. Whether derivatives are executed at an aggregate scheme level or form part of a fund manager’s mandate, a robust assessment of risk-management procedures, systems and reporting is essential. Derivatives should not be employed without these pre-requisites or thorough analysis.

## Appendix 1: **Glossary**

Arbitrage	simultaneously buying and selling of assets across different markets to crystallise pricing inconsistencies, usually without risk.
Collateralisation	the process by which a counterparty will transfer assets, linked to the value of a derivative, to another counterparty in order to mitigate credit risk.
Derivatives	financial instruments, such as <i>futures</i> and <i>options</i> , whose value is derived from that of underlying securities.
Exchange traded	a transaction between a counterparty and a recognised exchange that mitigates the credit risk inherent in an <i>OTC</i> transaction.
Futures	an arrangement to buy or sell a commodity or financial instrument at an agreed price at a future date on pre-agreed terms.
Hedging	reducing the risk of unfavourable movements in commodity or security prices, or exchange or interest rates, by engaging in offsetting transactions.
Mark-to-market	the process by which a derivative is valued, based on the daily closing prices of underlying variables.
Options	the right, but not the obligation, to buy or sell a fixed quantity of a commodity, currency or security at a fixed price, on or until a particular date.
Over-the-counter (OTC)	a transaction between two counterparties who engage in a transaction directly, rather than through a recognised <i>exchange</i> .
Swap transaction	an agreement between two counterparties to exchange one cashflow type for another at regular intervals on pre-agreed terms, for a pre-agreed time span.

## Appendix 2: “Portable alpha”

### What are “portable alpha” portfolios?

Essentially, “portable alpha” portfolios allow fund managers to separate market returns from investment strategies that add value (“alpha”) to a portfolio. These strategies are “portable” because they can be selected from a broad range of asset classes, irrespective of the client’s chosen benchmark return. This chosen benchmark return may be that of a specific market index, but it can also be calculated on the basis of each client’s liability profile.

### How do they differ from traditional index-based mandates?

With traditional fixed-income mandates, fund managers seek to outperform a prescribed benchmark by establishing overweight or underweight positions relative to the benchmark’s composition. As such, their opportunity set is restricted to the asset classes and bonds that make up the index. With “portable alpha” mandates, fund managers seek to outperform the client’s chosen benchmark return by combining derivatives with investment strategies drawn from a broad range of asset classes.

### Why is this useful?

The broader the range of asset classes, the greater the possibility of finding uncorrelated “alpha” strategies, whatever the economic scenario.

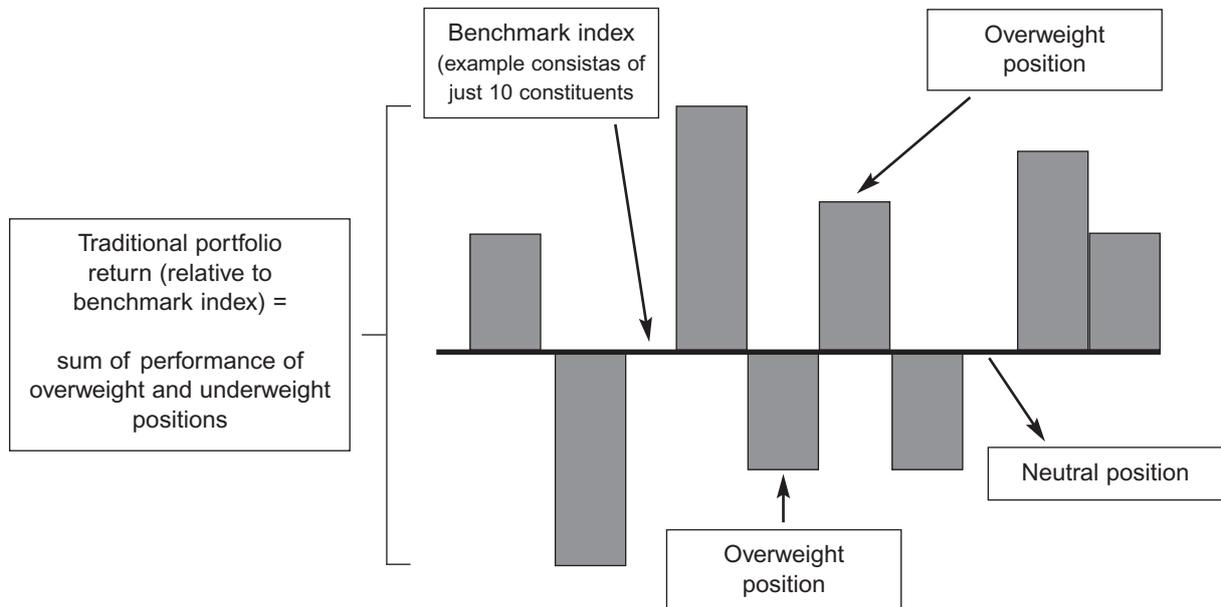
### How do fund managers construct a “portable alpha” portfolio?

They use a two-step process:

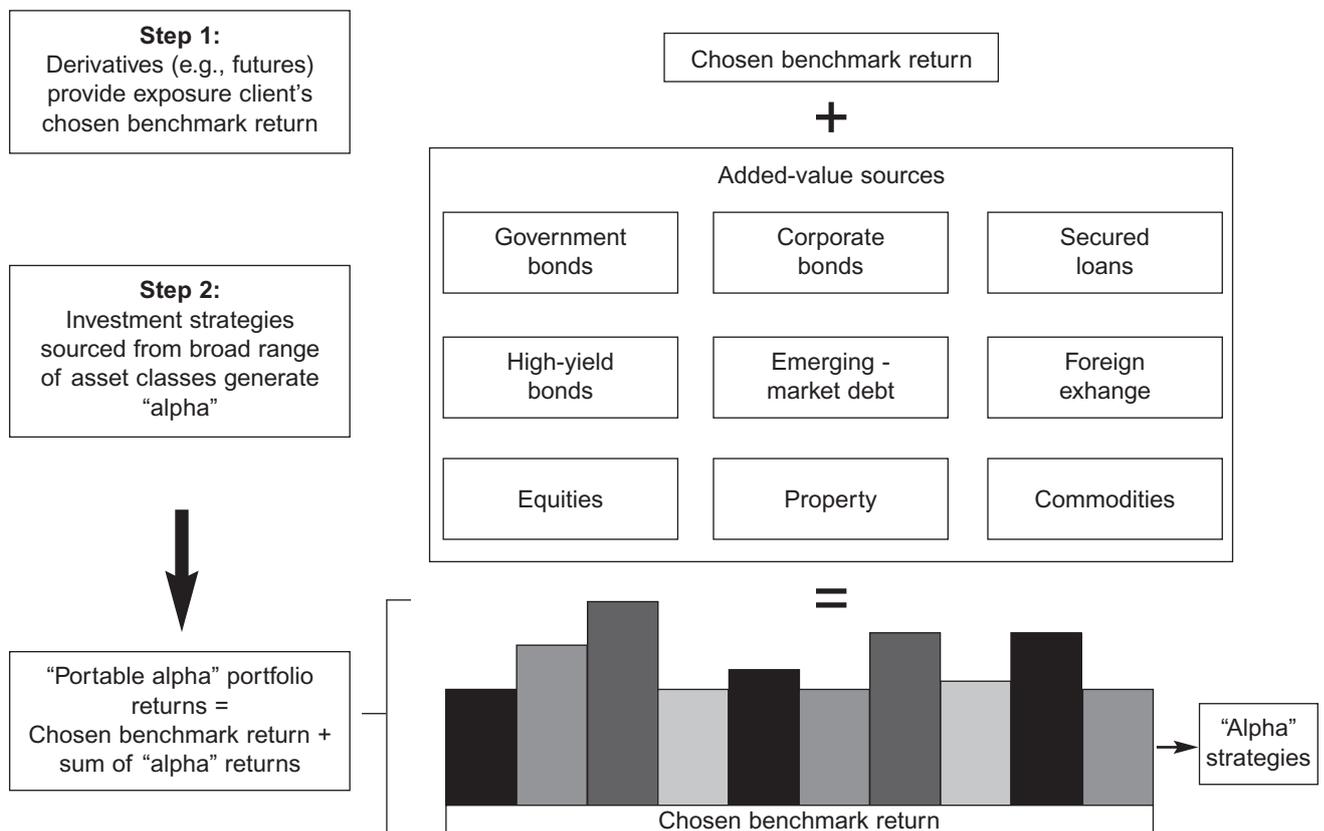
- 1 First, fund managers seek to *match* their client’s chosen benchmark return. They do this by using derivatives (e.g., futures or swaps), which require only a fraction of the cash needed to buy the equivalent physical bonds for the desired return. This exposure can be fully or partially backed by cash, depending on the client’s tolerance for leverage.
- 2 Second, fund managers seek to *outperform* their client’s chosen benchmark return. By using derivatives, only a small cash outlay is required to generate the client’s chosen benchmark return. Some of the remaining cash will back the derivative to reduce or completely eliminate leverage. The remainder will be invested in strategies drawn from a broad range of asset classes and expected to generate the strongest returns within a given timeframe.

The diagrams below illustrate the difference between traditional and “portable alpha” portfolios.

**Illustration of traditional portfolio**



**Illustration of “portable alpha” portfolio**



### What asset classes are included in a “portable alpha” mandate?

Investors can specify which asset classes are acceptable. However, the broader the mandate, the more likely fund managers will be able to find investment strategies that add value to the portfolio. Some of the asset classes that may be included are:

- Government bonds
- Corporate bonds
- High-yield bonds
- Collateralised debt obligations
- Emerging-market debt
- Secured loans
- Currencies
- Property
- Commodities
- Equities

### What are the risks of employing a “portable alpha” investment strategy?

- “Portable alpha” portfolios employ derivatives, which carry specific risks (please refer to specific sections within the main body of this document).
- The investment strategies selected by the fund managers may detract, rather than add, value to the portfolio.
- Fund manager selection is key, as they must be sufficiently experienced and well-resourced to make successful investment decisions across a broad range of asset classes.

### Building “portable alpha” portfolios using futures

To track exposure to a particular bond index, a fund manager purchases futures contracts. Although cash backs the position, some is invested elsewhere with the sole objective of maximising returns within prescribed risk parameters. Clients can specify which asset classes are admissible (e.g., high-yield bonds, emerging-market debt, equities, etc.), although the broader the mandate, the greater the opportunities for fund managers to identify uncorrelated, value-adding strategies.

***Example 1: Futures exposure does not match total assets but is fully backed by cash (i.e., portfolio is unleveraged).***

Total portfolio assets:	£100m
Futures contracts:	£1m outlay for £80m exposure
Liquid assets to back futures position:	£79m
Liquid assets invested in alpha portfolio:	£20m

**Example 2: Futures exposure matches total assets but is not fully backed by cash (i.e., portfolio is leveraged).**

Total portfolio assets:	£100m
Futures contracts:	£1.2m outlay for £100m exposure
Liquid assets to back futures position:	£78.8m
Liquid assets invested in alpha portfolio:	£20m

Because the futures position is not fully backed by cash, the portfolio effectively has £20m of leverage.

**Building “portable alpha” portfolios using swaps**

The swaps market offers more flexibility than the futures market, which simplifies the process of matching asset and liability duration. Although the cost of executing a swap is relatively small, fund managers should always keep sufficient cash (or similar assets) available to meet any obligations to their counterparty. The remainder of the portfolio’s assets can then be invested elsewhere with the sole objective of maximising returns within prescribed risk parameters (e.g., high-yield bonds, emerging-market debt, equities, etc.), although the broader the mandate, the greater the opportunities for fund managers to identify uncorrelated, value-adding strategies.

**Example**

Total portfolio assets, overlaid with interest-rate swap:	£100m
Liquid assets to meet swap obligations:	£80m
Alpha portfolio:	£20m

Because the swaps position is not fully backed by cash, the portfolio effectively has £20m of leverage.