



# Swaps made simple

What a trustee needs to know

February 2005

***The NAPF is grateful to the following for their considerable contribution to the preparation of this guide:***

***AXA Investment Managers***



***PSolve Asset Solutions***



***Thanks are also extended to the Electricity Supply Pension Scheme, LRT Pension Fund and the BBC Pension Scheme for their help in reviewing this guide***

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## **Swaps**

Derivative markets have developed rapidly over the last few decades and now offer contracts on just about any financial security and, perhaps even more importantly, contracts to hedge almost any investment risk.

Swaps have been one of the fastest growing types of derivatives, and the reason is simple. Swaps provide one of the most efficient ways to hedge common and specific financial risks, which are inherent in most portfolios.

Over the following pages, we look at swaps, explaining the different types available, why pension funds should consider using them and, crucially, how swaps can be incorporated into portfolios successfully.

## Section 1: Introduction

The swap market has grown rapidly in the last 20 years. Interest-rate swaps first appeared back in 1981 and, today, are one of the world's most liquid financial instruments. Indeed, according to the International Swaps and Derivative Association (ISDA) survey, the interest-rate swap and related derivative instruments market stood at \$177 trillion in size (June 2004).

The term 'swap' encompasses an extremely wide-ranging variety of instruments, which can itself cause some confusion. In this guide, we will address three types:

- interest-rate swaps,
- inflation-rate swaps, and
- portfolio swaps.

Typically, swaps are used by:

- **Companies** to reduce their risks and manage their debt more efficiently. For instance, this may be achieved by exchanging a floating (variable) interest-rate exposure for a fixed interest-rate exposure.
- **Pension schemes** and **insurance companies** to manage interest-rate risk. (This is explained in detail later in this guide.)
- **Central banks** to control their balance sheets and exploit market opportunities.

### Most large companies already use swaps – why don't pension funds?

According to the ISDA survey, 95% of the top 500 global companies use swaps and derivatives. However, until recently, swaps have not been used very much by pension funds.

The main barrier to pension funds using these instruments has been a lack of true understanding of the way in which they could be used successfully and the reality of the associated risks. High-profile derivative disasters have concerned pension fund trustees to such an extent that the benefits of swaps have been overshadowed by the risks involved (or, more precisely, the perceived risks involved). Indeed, many pension funds are hesitant to publicise the use of derivatives - possibly because they fear potentially negative publicity for using 'risky' strategies - even though the strategies can actually reduce risk within funds.

The cause of derivative disasters has been the way in which derivatives have been used – as opposed to risks of the instruments themselves. For example, in one particularly high-profile case, the problem was the result of very strong convictions regarding an expected directional move of the markets to which the derivatives were connected.

As the true risks and benefits of swaps become more widely appreciated, pension funds may consider using them much more in the future. Implemented correctly, swaps can reduce some very specific risks, which are inherent in pension funds, better than any other strategy or instrument.

## Section 2: What are swaps?

Swaps are contractual agreements between two parties to exchange future cash flows on pre-determined dates over a specified period (i.e. until the swap matures). In the most basic (usually called ‘plain vanilla’) of swap contracts, the interest-rate swap, one party to the contract pays a fixed rate of interest, and the other pays a floating rate of interest.

Swaps are specifically tailored to the needs of both parties entering into them. As such, they are not traded on an exchange, but instead are traded ‘over the counter’ (OTC). Brokers – either independent or divisions of investment banks – provide live, tradable price quotes for a wide range of swaps. Additionally, brokers provide liquidity to the market by acting as intermediaries between investors wanting to take different positions.

Swaps are extremely flexible instruments. Unlike a bond, where the details are set in stone at the time of issuance, the various details of a swap can be amended, upon mutual agreement, at any time. However, even with this flexibility, each swap remains eminently liquid and easily valued.

### Different types of swaps are available

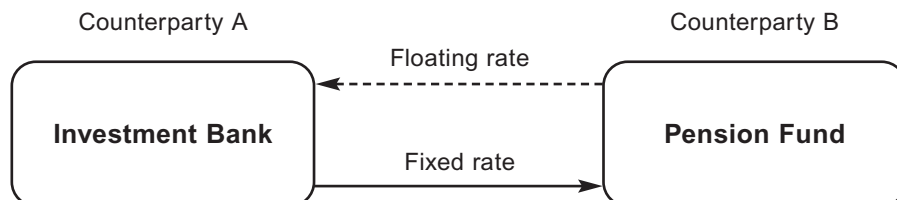
As mentioned earlier, swaps can be tailored to meet specific fund requirements and safeguard against various risks. Here, we look at the three main types of swaps currently available and, in the following sections, explain how pension funds can use them.

Type of swap	What is ‘swapped’		How the swap reduces the risk of the Pension Fund
	Counterparty A (Investment Bank)	Counterparty B (Pension Fund)	
Interest-rate swap	A floating rate	for a fixed rate	Less sensitive to interest-rate changes
Inflation-rate swap	A fixed or floating rate	for a variable rate linked to inflation	Protection against increases in inflation
Portfolio swap	The coupons and principal from a portfolio of bonds	for a schedule of defined payments	Exact matching of expected pension payments

### A. Interest-rate swaps

The two counterparties to an interest-rate swap enter into an agreement to exchange interest payments, over a period of time, on a specified underlying notional amount. Typically, one party (in this instance Counterparty A, the Investment Bank) pays a fixed rate of interest and the other party (in this instance Counterparty B, the Pension Fund) pays a floating rate.

The diagram below is an example of a fixed-for-floating interest-rate swap:



Counterparty A (the Investment Bank) is said to ‘swap’ a fixed-interest payment to Counterparty B (the Pension Fund) for a floating-rate interest payment. Over the life of the swap, the Pension Fund will pay the Investment Bank a floating rate and receive a fixed rate of interest in return.

How does the Pension Fund benefit by receiving a fixed rate on the swap?

As a result of “receiving a fixed rate” via an interest-rate swap, as described above, the interest-rate sensitivity of the Pension Fund’s assets become more closely aligned with the rate sensitivity of its liabilities. In other words, after such swaps are incorporated into a fund, the value of the assets of the Pension Fund will move more closely in tandem with the value of some of its liabilities as rates change. Thus, interest-rate swaps help to ‘immunise’ against rate movements, as the gains or losses on the swap contract will match gains or losses on the liabilities. A case study is provided in Section 6.

## **B. Inflation-rate swaps**

Inflation-rate swaps work in a similar way to interest-rate swaps. The difference is that Counterparty B (the Pension Fund) is, in this example, paying a fixed-rate in exchange for the prevailing rate of inflation, thus protecting the scheme against the effects of inflation on the bond portfolio. In the majority of cases, the Retail Prices Index (RPI), the UK’s leading measure of inflation, is used to represent the prevailing inflation rate.

How does a Pension Fund benefit from entering into inflation-rate swaps?

The benefit lies in obtaining inflation-linked assets, especially very long-dated ones, which match its inflation-linked liabilities.

The inflation-rate swap market is not as liquid as the interest-rate swap market, but is currently able to meet some pension fund needs efficiently, and is continuously developing. Until recently, the market had a lack of capacity and limited variety of contracts available. Thus, having a manager with experience and knowledge of this market is important in the execution of the contract.

**C. Portfolio swaps (also known as total-return or asset swaps)**

A portfolio swap, once again, amounts to a simple exchange of cash flows. Consider the following example:

- Counterparty B (the Pension Fund) buys bonds, and agrees to pay the coupons and the principal repayments from those bonds to Counterparty A (the Investment Bank), as they fall due.
- In exchange, Counterparty A (the Investment Bank) will pay Counterparty B (the Pension Fund) a pre-defined series of cash flows, tailor-made to the requirements of the scheme. The frequency of payments could be monthly, for instance.
- In this way, the scheme achieves improved cash-flow matching of assets to liabilities.

In most cases, both sides of the portfolio swap contract will be of equal value when the contract terms are agreed. In other words, the initial market value of the bond portfolio on one side of the swap equals the present value of the pre-defined payments on the other side of the swap.

If the quality of the bonds in the portfolio changes, or the requested payments to the scheme change over time, the swap can be 'restructured' – that is to say, modified to take into account the new characteristics.

**How does the Pension Fund benefit from swapping its bond cash flows for tailor-made cash flows?**

The Pension Fund achieves a much more accurate match to its pension payments – either payments due currently or that start at a future date. In this way, the fund is free to buy the 'best' bonds, unconstrained by liability payment dates, efficiently matching its assets to its liabilities.



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## Section 3: Why might pension funds use interest-rate, inflation-rate and portfolio swaps?

### Why use swaps?

The growing use of, and interest in, swaps by corporate and local authority pension schemes is the direct result of a period of sustained poor performance of assets and a widening of the liability gap. This difficult period has also led many funds to favour fixed-income investments, with the aim of reducing the volatility of assets relative to the pension liabilities, with trustees recognising that pension fund assets should bear a more direct link to the liabilities. Swaps achieve this objective better than any other instrument.

### Bridging the gap

For many pension funds, matching long-duration liabilities with conventional bonds is not always a practical solution. Very long-dated bonds are in scarce supply in the market place. More specifically, any pension fund with liabilities of an average duration greater than 17 years (which is the case for many schemes), would automatically have a mismatch. At the time of writing (winter 2004), the longest-duration, index-linked benchmark index available in the market has a duration of just over 16 years (FTSE >15 Year UK Gilts Indexed).

*Addressing this problem, at the time of writing (winter 2004), the Debt Management Office is in discussions about the feasibility of issuing "ultra-long" gilts, likely with a 50-year maturity. Although these bonds would be welcomed by the pensions industry ultra-long gilts would still not be able to match the flexibility, liquidity and maturity spectrum offered by the swap market. They are, however, a step in the right direction.*

However, **interest-rate swaps** can have very long maturities, often 50 years or more, and hence long durations. Since duration is additive, the incorporation of long-dated swaps into a fixed-income portfolio is an effective tool to increase the overall duration of the assets and match the duration of the liabilities. Swaps can limit the widening of a funding deficit and allow a closer matching of the liability profile.

Many pension schemes offer benefits that are linked to inflation. One very common benefit structure includes pensions that are increased broadly in line with inflation, and include a floor of 0% and a cap of 5% (although this cap may be altered to 2.5% for benefits accruing after April 2005). When inflation moves outside these boundaries, index-linked gilts will not be able to match the liabilities closely. An **inflation-rate swap** can be very useful in controlling the mismatch in these cases, as the maximum and minimum levels can be incorporated into the swap contract.

Finally, for a pension fund with a predictable schedule of pension payments, a **portfolio swap** can deliver exact matching of assets to liabilities. Whilst a scheme could attempt to invest in a portfolio of bonds with coupons that match their pension payment dates, this is rarely an adequate solution for several reasons. First, investing purely on the basis of matching pension payments may not result in buying the 'best' bonds (from an investment quality point of view). Secondly, not all payment dates are available from conventional bonds. For example, there are no index-linked gilts maturing between 2016 and 2020, making an exact match difficult for most schemes. Finally, restructuring such a bond portfolio when a fund's circumstances change could be very cumbersome and costly. Alternatively, rather than having to physically sell existing bonds and buy new bonds, a fund could restructure cash flows via a single swap contract, whilst leaving their existing bond portfolio intact.

### **Some of the main issues facing pension funds**

One of the most serious problems facing many pension funds is the mismatch of their assets and liabilities – a growing concern as more and more pension payments draw nearer. In recent years, pension funds have increased their focus on ways to:

- improve the link between the pension fund's assets and liabilities generally, and specifically control the risk of mismatch;
- match the pension fund's cash flows better; and
- match the nature of the pension fund's liabilities better, regardless of whether they are inflation-linked or fixed.

### **Strategies that pension funds can use to solve these issues**

Pension funds can employ a number of different strategies in order to address these issues. Here, the focus is on two:

Duration matching - protects (immunises) a pension fund from parallel moves in interest rates. This strategy tends to be more flexible, easier and cheaper to implement than cash-flow matching, as a greater range of bonds and swaps are available. In particular, interest-rate swaps can be an effective way to match duration, which is discussed shortly.

Cash-flow matching - is a special form of duration matching. This strategy aims to ensure the cash flows of the pension fund are paid as they fall due. Any interest-rate move, whatever the direction, will not affect a perfectly cash-flow matched fund. However, as discussed shortly, this match is difficult to achieve in practice using conventional bonds.

Both of the above strategies can be implemented using a range of different swaps, depending on what the trustees ultimately aim to achieve. For example, to implement a duration-matching strategy, the trustees might use interest-rate and/or inflation-rate swaps (depending on the nature of the liabilities), while a precise cash-flow-matching strategy is most likely to require the use of a portfolio swap.

### **Using interest-rate swaps to match duration**

One way in which swaps can impact the assets of a pension scheme is to increase the duration of the bond portfolio. But, why would the pension fund want to increase its sensitivity to moves in interest rates by participating in an interest-rate swap?

A pension fund's liabilities are generally much more sensitive to interest rates than are its assets. The swap brings them in line. In short, by participating in an interest-rate swap and increasing its asset duration (its sensitivity to interest-rate movements), the pension fund is able to match its long-term liabilities more closely.

In order to determine the sensitivity of a pension fund's future liabilities to rates, the future liabilities must be discounted to their present value.

Interest rates have an inverse relationship to present value. As such, as interest rates rise, the present value falls, meaning that the pension fund's liabilities will decrease. Conversely, if interest rates were to fall, then the pension fund's liabilities would increase. The longer the duration of the liabilities, the faster the present value of the liabilities will change when rates change.

By adding interest-rate swaps to a pension portfolio, thereby ensuring that the assets and liabilities have the same level of sensitivity to interest rate movements, and therefore rise and fall in value at the same rate (as rates change), a fund can be said to be duration matched. In other words, interest-rate swaps facilitate asset-liability duration matching.

### **Using portfolio swaps to match cash flows better**

Portfolio swaps can be used when the pension scheme wishes to match a future stream of cash flows more accurately than can be done using only conventional bonds, while achieving a good duration match.

### **Illustration: Transforming bond cash-flows into pension payments using a swaps contract**

#### **Using inflation-rate swaps to improve duration and/or cash flow matching**

Many pension schemes offer their members benefits that are linked to inflation. As such, assets that are index-linked provide a good liability-matching solution. Although index-linked gilts are an option for pension schemes wishing to hedge against inflation, inflation-rate swaps arguably present a more attractive alternative.

As mentioned previously, many pension schemes offer benefits that are increased broadly in line with inflation, but within a defined range. If inflation moves outside this range, index-linked gilts will not be able to match the liabilities closely. An inflation-rate swap can be very useful in controlling this mismatch.

#### ***So, why are index-linked gilts not the ideal answer for pension funds wishing to hedge against the risk of inflation?***

Owing to the risk-free nature of index-linked gilts, the yields offered by this asset class are low. Alternatively, slightly higher-yielding index-linked corporate bonds exist, but the supply is limited (plus, it should be highlighted that, unlike gilts, these are not risk free). Furthermore, none of these inflation-linked bonds have a sufficiently long duration to meet all needs.

Inflation-rate swaps are very flexible tools compared to market securities (in terms of maturity, liquidity and date of payments, for example) and, hence, are very efficient instruments to protect (immunise) the pension fund against the risk of inflation.

## Section 4: **Associated risks**

The previous sections have illustrated the benefits of swaps: they can be tailor-made to meet pension funds' needs, provide flexibility, are highly liquid and can enhance performance by removing many risks.

However, before entering into a swap contract, pension fund trustees should be familiar with the potential risks associated with their use, as well as the benefits. The relevant issues and risks include:

**Lack of understanding.** Trustees do not necessarily need to understand all of the detailed internal mechanics of how swaps work to use them effectively – much in the same way we do not need to understand the internal mechanics of a car to drive it. However, with the help of their advisers, trustees should understand all the risks associated with their use in the context of their fund.

**Swap administration.** As with every other financial instrument, an internal framework for administration must be constructed. Due to their relative complexity, the administration of swap contracts is often done by the fund manager, investment bank or investment consultant, who must communicate the issues/results to the trustees. Specific administration issues would include monitoring the efficacy of the swaps in matching asset and liability duration, management of collateral and restructuring the swaps, as required, as the liability benchmark changes.

**Market-value risk.** In most cases, the value of a swap is zero at the time it is transacted. Over time, the value of the swap will either increase (become positive) or decrease (become negative) as rates fluctuate. However, as long as the asset value of the pension fund remains constant in relation to its liabilities as rates fluctuate (which is the purpose of the swap when used in a duration/inflation-matching strategy), the risk of a decrease in the value of the swap is not relevant. There is no net effect on the solvency of the fund.

**Credit risk.** If the value of the swap becomes positive, then the pension fund has a credit-risk exposure to the counterparty of the swap, in this case the investment bank. In effect, the counterparty 'owes' the pension fund the positive value of the swap.

The pension fund's exposure to its counterparty is limited to the value of the swap. However, two factors can help mitigate this credit risk:

1. a careful selection of the counterparty; and
2. the implementation of collateral agreements.

The use of collateral agreements reduces counterparty risk. With such an agreement in place, when the value of the swap becomes positive or negative, over and above an agreed threshold level, then the party that 'owes' - the pension fund if the swap is negative and the investment bank if the swap is positive - puts up collateral (bonds). Collateral is thus similar in some ways to a security deposit.

The frequency with which the value of the swap is monitored and collateral adjusted is specified in the agreement and reflects a trade-off between risk and cost or effort.

**Legal risk.** Swaps are legal agreements and are not traded on an exchange. Rather, they are referred to as OTC (over-the-counter) instruments. Although much of the documentation is standardised (ISDA contracts), specific agreed-upon clauses often apply to protect against a variety of circumstances. The parties negotiating an ISDA contract must pay close attention to any non-standard clauses. The trustees can seek legal advice from a relevantly experienced practitioner on the contract.

**Liquidity risk.** Swaps are widely mistaken to be illiquid instruments simply because they are not traded on exchanges. However, as stated at the outset of this guide, swaps are, in fact, very liquid.

Please note that the discussion within this guide is based on our understanding of the current (winter 2004) Inland Revenue tax regime. Although the use of swaps does not generally result in significant tax burdens for most UK pension schemes currently, this position may change in the future if the Inland Revenue's tax treatment of swaps changes. If this were to occur, the use of swaps clearly would need to be revisited. However, this is a situation that is very unlikely to occur without substantial prior warning.

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## Section 5: **General implementation and practical issues associated with swaps**

This section includes a number of the key practical implementation issues that any pension fund should address with its investment consultant and manager before entering into a swap:

Question: ***Do we need a custodian to look after the swap?***

Answer: No. Because a swap is not a physical asset, it is not required to be held by a custodian. However, it is good practice that the custodian keeps records of all derivative contracts engaged in by the pension fund.

Question: ***How are counterparties selected?***

Answer: In general, the fund manager will select or recommend the counterparty. Counterparties used should have experience in dealing with pension funds and should be able to offer high quality reporting. In the case of large asset sizes, using more than one counterparty can be recommended.

Question: ***How much do swaps cost to implement?***

Answer: In the same way as a bond has a bid-offer spread, so does a swap, and of potentially a similar magnitude. The bid-offer spread for a simple interest-rate swap will vary roughly between 1 and 10 basis points (0.01 and 0.10%) depending on the maturities that are traded.

Question: ***What should we know about exiting a swap contract?***

Answer: Since the value of a swap is derived by a simple present-value calculation, its fair value can be calculated exactly. Once entered into, the swap can be exited at its current market value minus a bid/offer spread.

Question: ***How will the swaps' values be reported?***

Answer: The pension fund should ensure that the fund manager's reports include the counterparty valuation, which the fund manager should verify independently. This fund report, including swap valuations, can be used by the pension fund for production of its accounting statements. The pension fund should also be able to obtain an independent third-party valuation from another investment bank or via the investment consultant. In addition, the pension fund should obtain sufficient information to allow monitoring against any limits or restrictions it sets on the use of swaps.

Question: ***What documentation will be required to enter into a swap contract?***

Answer: Much of the documentation surrounding swaps has been standardised over the years. In general, a fund would need to sign an International Swaps and Derivatives Association (ISDA) agreement as well as a Credit Support Annex (CSA).

Other pension-fund-specific documentation that may require updating, for perusal for the counterparty, includes the:

- Trust Deed and Rules and
- Statement of Investment Principles and Funding Principles.

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## Section 6: A case study – The XYZ Pension Fund

In previous sections of this guide, we have explored three types of swaps and discussed ways in which pension funds can use them. Here, we take a look at a typical UK pension fund, with liability-matching needs, and illustrate how swaps can bridge the gap.

### The Problem

The XYZ Pension Fund was 75% funded (on an ongoing basis) and had relatively long liability duration, at approximately 21 years. As such, the Fund was particularly sensitive to movements in interest rates and bond yields. Even small movements in yields exposed the Fund to a materially increased funding deficit, relative to the duration of the assets (five years).

A primary objective of the trustees, in consultation with the Fund's sponsoring company, was to manage the level of volatility in the contribution rate, with a view to stabilising it.

Matching asset and liability duration with cash instruments was not practical, as the liabilities were longer than any available government, corporate or index-linked bonds.

### The Solution

The solution was a duration-matched Fund.

As a first step, it was agreed that the actuary would be accountable for determining the scheme-specific liability benchmark. Once the manager knew the value and nature of the liabilities, a tailor-made matching programme could be devised for the Fund.

### Implementation

Given the Fund's liability profile of broadly 65% non-index-linked payments (duration of approximately 20 years) and 35% index-linked (duration approximately 24 years), a liability-based benchmark was designed.

Matching Fund	%	Benchmark
Fixed interest	65	Merrill Lynch Sterling Non-Gilts + Swaps
Index-linked	35	FTSE-Actuaries Over 15 Year IL Index+ Swaps

ISDA and collateral agreements were signed by the client. A custodian was also appointed to provide an independent valuation of the assets.

In advance of implementing the swaps, the potential benefit versus cost of implementation was assessed. The actual overall cost was sufficiently low to suggest for this Fund that it was viable to proceed with the proposed strategy.

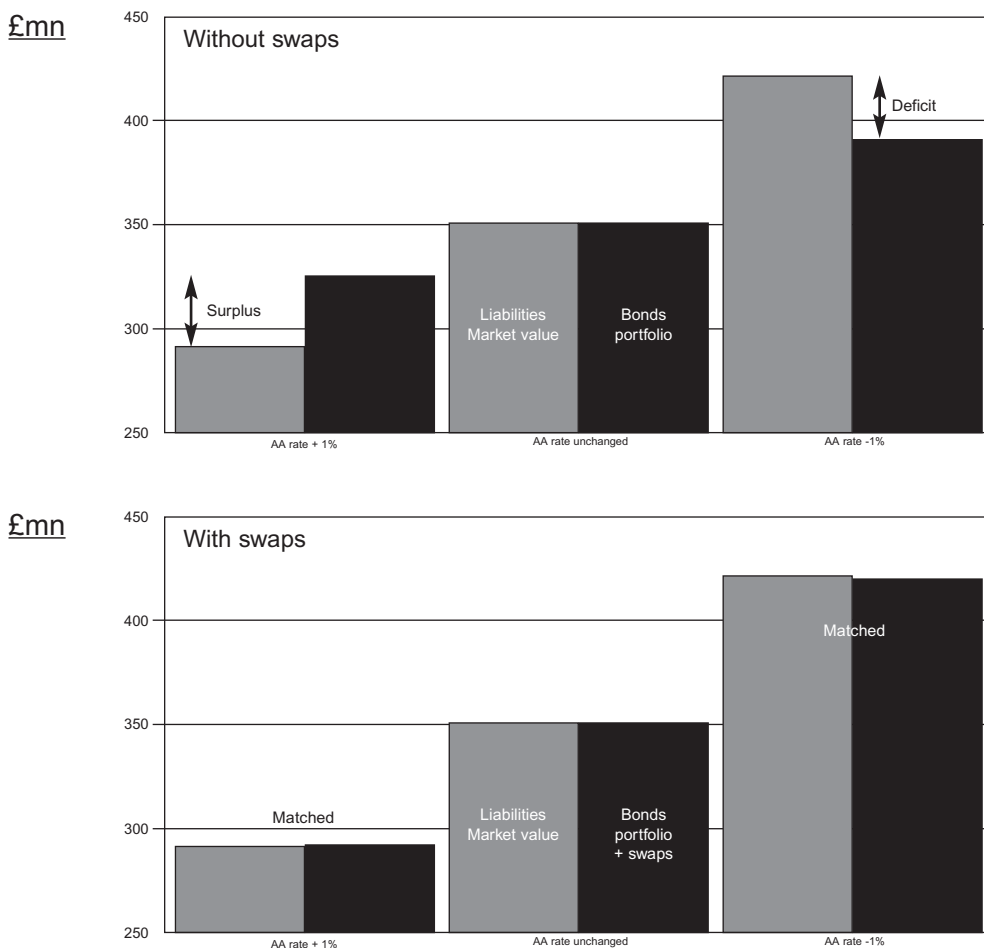
The completion of the ISDA and collateral agreements, as well as other administrative matters required some effort on behalf of the trustees before implementation. However, time spent on the swaps after execution was minimal.

**After the Fund was duration matched**

The use of swaps in the duration-matching process achieved a closer match between assets and liabilities for the Fund than could otherwise have been achieved with conventional assets. However, some ‘slippage’ will always exist, as the exact value of the liabilities cannot be predicted with perfect certainty (because the value of the pension depends on the future lifetime of the annuitant). The liability-benchmarked solution eliminated the vast majority of interest-rate and inflation risk, which was substantial.

**Conclusion**

Early signs are positive. It appears that the primary objective of reducing the volatility of contributions has been met. The additional benefits gained by increased matching of the liabilities via swaps far outweigh the efforts made to achieve them.



Note: The yields reflected in the swap curve are considered to be representative of AA rated corporate debt yields.



## Glossary

### **Cash-flow matching**

A special form of duration matching, this strategy uses portfolio swaps to ensure the cash flows of the pension fund are paid as they fall due.

### **Collateral agreements**

If the value of a swap goes above an agreed threshold level, then the party that is 'in debt' - the pension fund if the swap is negative and the investment bank if the swap is positive - puts up collateral (bonds). Collateral agreements involve a transfer of property, but not of beneficial ownership.

### **Counterparty**

A principal to a swap (or other derivative), as opposed to an agent, such as a broker.

### **Duration matching**

Using interest-rate or inflation-rate swaps to protect a pension fund from parallel moves of interest rates.

### **Inflation-rate swap**

An agreement between two parties to engage in a series of exchanges of, say, fixed-rate payments for the prevailing rate of inflation, or any relevant inflation rate pre-agreed between the parties, for instance RPI, LPI or CPI.

### **Interest-rate swap**

An agreement between two parties to engage in a series of exchanges of interest payments on the same notional principal denominated in the same currency.

### **ISDA**

International Swaps and Derivatives Association. An international trade organisation for OTC derivative markets, it also acts as a forum to discuss industry issues and promotes best practice within the derivatives business.

### **Notional principal**

The amount of principal on which the interest is calculated on a swap or related instrument. The principal for interest-rate swaps is purely notional, because no exchange of principal ever takes place.

### **OTC**

Over-the-counter stocks/contracts are not listed and traded on an exchange. Instead, a telephone and computer network that connects stock and bond dealers is used to make transactions.

### **Parallel moves of interest rates**

When short-term and longer-term interest rates rise or fall by the same amount, the yield curve shifts are said to be parallel.

### **Portfolio swap**

An agreement between two parties where one pays all the coupon and principal payments from a given portfolio of bonds to their counterparty and receives in exchange a flow of payments corresponding to their liabilities.



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