Practical applications of the use of derivatives for the management of the interest rate margin in the mortgage sector

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Abstract

This paper describes the practical applications of derivative instruments made by lenders in the residential mortgage market, to manage interest rate risk. The instruments described are: interest rate swaps, interest rate swaptions, interest rate caps and floors and forward rate agreements. The central theme is the use of derivatives to manage the net interest rate margin between the lender's assets (loans to homebuyers) and liabilities (debt raised to finance the loans). Two strategies to manage the margin are discussed and the article concludes with an introduction to counterparty risk and controls management which must be considered when utilising derivatives.

INTRODUCTION

This article looks at the use of interest rate derivative instruments made by companies who lend to individuals for the purposes of buying residential property in the United Kingdom. As well as discussing the two basic risk management strategies adopted to manage the interest rate margin, the types of derivative instruments available and their intrinsic cashflows will be detailed from a practical perspective. The instruments illustrated are interest rate swaps, interest rate swaptions, interest rate caps and floors and forward rate agreements.

THE RESIDENTIAL MORTGAGE SECTOR

The commercial raison d'être of mortgage companies (lenders) is to generate a positive margin between the rate of interest at which they lend money to homebuyers and the rate at which they borrow money themselves. As illustrated in Figure 1, this margin will increase if the lender's interest rate cost falls and/or its lending rate increases.

In accounting terms, both sides of the lender's balance sheet are sensitive to changes in interest rates ie, both assets and liabilities influence the net interest margin.

Derivatives have played a key role in interest rate risk management strategies in response to changes in market lending and borrowing rates of interest in two distinct ways:

— strategy 1, to preserve a margin, irrespective of subsequent changes in market rates

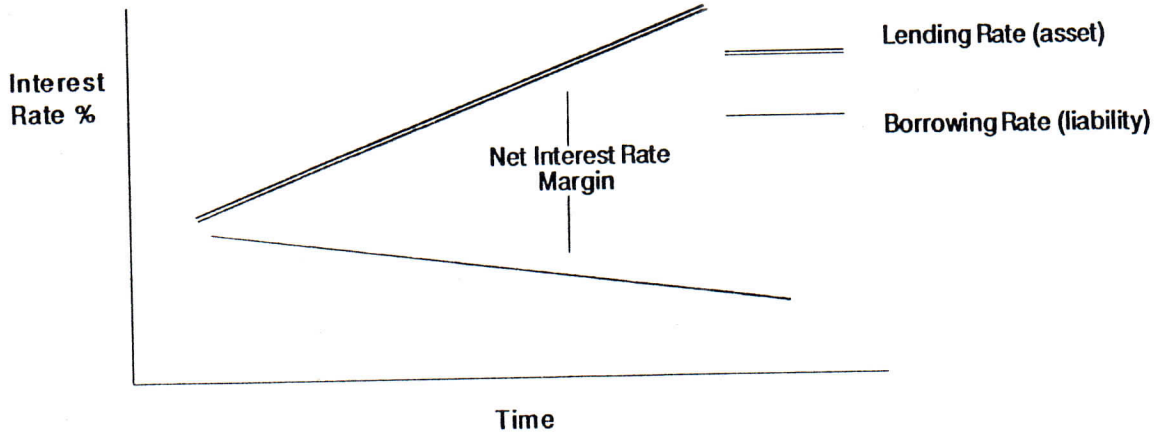
— strategy 2, to create opportunities for the lender to benefit from movements in market rates.

Strategy 1 locks in a known margin between identifiable assets and liabilities whereas strategy 2 allows the margin to be variable, ie it may increase or decrease over time and is not restricted to specific assets and liabilities but has a more general application to the lender's balance sheet. Both strategies utilise derivative instruments, whose unique cashflows, in conjunction with those of the underlying assets and liabilities, affect the lender's net interest margin.

Liability management

Derivaives have been predominantly utilised in conjunction with on-balance sheet liabilities (debt) as a mechanism to alter their cost, and hence the net interest margin. However, this

FIGURE 1: RELATIONSHIP BETWEEN BORROWING AND LENDING INTEREST RATES FOR MORTGAGE COMPANIES



strategy has often been adopted while fully recognising the interest rate basis of corresponding assets.

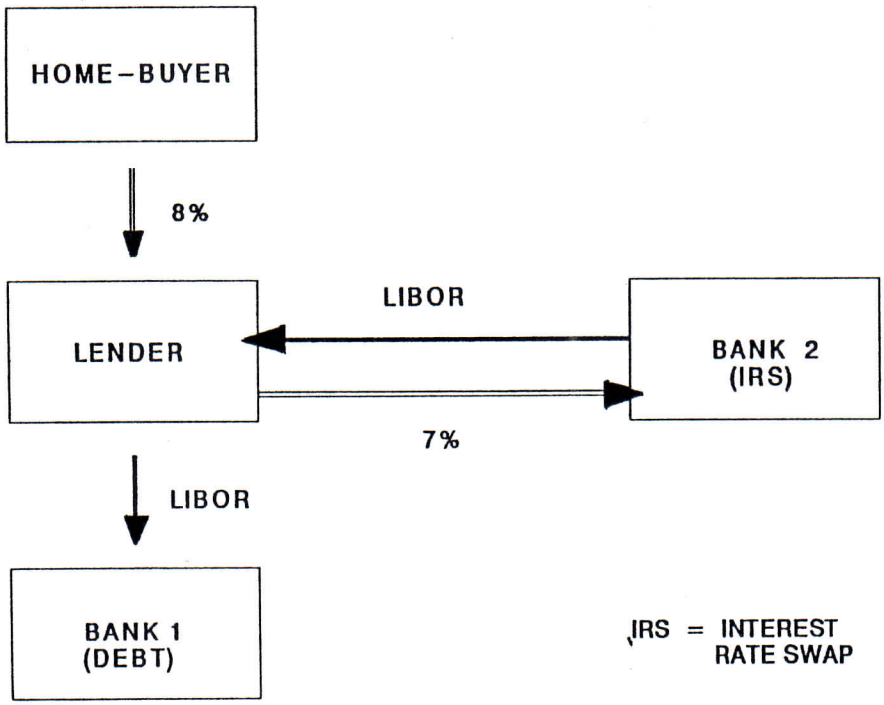
Interest rate swaps

One type of mortgage that has been common in the current low-interest rate environment in the UK is that where the homebuyer pays a fixed rate of interest to the lender for a pre-agreed time (eg three years from completion).

To match the fixed rate income-profile, lenders have used interest rate swaps to convert their underlying variable rate of interest on debt (which finances the fixed rate loans) to one where the lender effectively pays a fixed rate of interest. This transformation is illustrated in Figure 2.

The lender has borrowings where the interest rate payable to bank 1 is the London Interbank Offered Rate (LIBOR) and hence is variable. The variable rate debt finances loans to homebuyers. The latter pay a fixed rate to the lender at 8 per cent for, say, three years. The lender has an interest rate mismatch since it receives fixed rate but pays variable rate. To match the interest bases of its assets and liabilities, the lender can enter into an interest rate swap with bank 2.

FIGURE 2: USE OF SWAPS TO CONVERT PAYMENT OF VARIABLE RATE OF INTEREST TO FIXED RATE



Under the swap, the lender agrees to pay a fixed swap rate of 7 per cent for three years in return for LIBOR. The LIBOR receipt from bank 2 is passed on to bank 1. The lender receives 8 per cent but pays 7 per cent and hence keeps 1 per cent as a net interest margin. In order to lock-in a positive interest margin, the fixed rate payable by the lender must be lower than the fixed rate received from the homebuyer.

Market and timing risks

Although an interest rate swap facilitates strategy 1, the timing at which such risk management techniques should be executed is difficult to pin-point since the amount of the assets (loans to homebuyers) does not equal the amount of the corresponding liability (the swap) at the inception of the swap transaction ie, the asset is not created in total at one point in time but builds up as individual homebuyers take on loans. In contrast, the swap rate payable is based from inception on a (larger) fixed nominal amount which will not change during the life of the swap. Also, the rate of asset growth may be slower than forecast or may not occur at all (eg, the fixed rate offered to homebuyers may become unattractive compared to others on offer by competitors). To circumvent the timing risk, lenders may adopt a number of strategies.

Strategy 1: Wait until the assets materialise

Only on materialising do they enter into an interest rate swap (where the nominal amount of the swap equals the assets).

The risk here is that when the swap is eventually transacted, fixed rates payable on interest rate swaps at that time may have risen. As the fixed rate payable by homebuyers is contractually fixed (and hence cannot be increased) the effect is the net interest rate margin accruing to the lender will decrease. The market risk (that swap rates may rise before the sap is transacted) could be removed by the alternative strategy.

Strategy 2: Purchasing an option on an interest rate swap (a swaption)

A swaption can be regarded as an insurance policy. In the event of the market swap rates rising the policy (swaption) buyer (the lender) exercises its right under the option. This right will allow the lender to pay the pre-agreed swap rate (agreed when the swaption was purchased) rather than the current (higher) swap rate offered in the market.

As with most insurance policies, a premium would be payable by the lender to the option seller. This is an additional cash outflow not payable under interest rate swaps. In contrast to interest rate swaps, however, swaptions do allow the lender to benefit from favourable movements in interest rate swap rates during the option period (so-called American options).

If (during this period) the market offers lower swap rates than that which would be payable were the swaption exercised, the lender could try to sell the swaption in the market, arrange a separate swap and pay the market's (lower) swap rate.

Strategy 3: Forward starting interest rate swaps

An alternative to buying a swaption, but still avoiding the risk of interest rate swap rates rising up to the time a swap is transacted, is to agree a swap rate before it actually commences. Entering into a forward starting interest rate swap will protect against the timing mismatch between assets and liabilities (as well as avoiding option premia).

If, however, the anticipated assets do not materialise then such a risk management strategy can prove costly due to the obligation to pay a fixed rate under the swap, which is not offset by a fixed rate of income. The swap therefore becomes obsolete but the interest obligations must still be met by the lender.

The lender has a number of solutions to manage the obsolete swap position.

Swap termination

The lender could seek to terminate the swap by paying (or receiving) its market value at the time of cancellation. One method of quantifying its market value is to calculate the net present value (NPV) of the remaining cashflows payable and receivable under the swap. If market swap rates have risen since the swap commenced, it will have a positive NPV and hence will generate additional cash income if sold.

Retain the swap

The lender could continue to pay and receive cashflows under the swap. While it remains of value, the net income can be used to lower the overall interest charge on the lender's liabilities — hence increasing the net interest margin.

Reversing swap

The lender could enter into an equal and opposite (reversing) swap to convert the lender's interest basis to a variable rate. In addition to the variable rate, an additional (net) cost under the swaps would be payable if the lender receives a lower fixed rate under the reversing swap than the fixed rate payable under the original swap. One potential disadvantage of duplicating (as opposed to terminating) swaps is the credit capacity for the lender they absorb. The decision to retain or terminate the swap will also be influenced by forecasts of interest rates over the remaining period of the swap, as these will directly affect its value.

Loan repayments

Just as it is difficult to predict when assets will be generated so it is difficult to predict how long they will remain outstanding. It is a feature of loans to homebuyers in the UK that the homebuyer has an option to repay his/her loan at any time up to the agreed maturity date — around 25 years — particularly during the period where a fixed rate of interest is payable.

The corresponding interest rate swap transaction is unlikely to have such early cancellation options. The implications of the obsolete swap as a result of early loan repayments are the same as if the asset had not been generated (described above). Additionally, however, lenders can charge homebuyers early

repayment penalties which may compensate the lender for costs it may incur to terminate its swap transaction or additional interest costs of managing the obsolete swap.

Interest rate caps

This is another form of option product — and one which has been extensively utilised to facilitate strategies 1 and 2.

STRATEGY 1

Homebuyers are naturally concerned about the risk of rising costs on their variable rate loans but want to pay less if possible. In response, lenders have devised loan products incorporating interest rate caps which effectively limit the rate (the so-called strike rate) the homebuyer will pay the lender over an agreed time period (until the cap expires). Due to the nature of the option, the homebuyer will also be able to benefit from reductions in lending rates announced by the lender (in contrast to fixed rate loan products described above).

As the lender is effectively limiting its income stream by 'selling' the homebuyer an interest rate cap, to preserve an interest margin the lender purchases an interest rate cap to the same expiry date as that 'sold' to the homebuyer. Provided the lender's cap is set at a lower strike rate than that sold to the homebuyer, it will have preserved a positive interest margin until the caps expire.

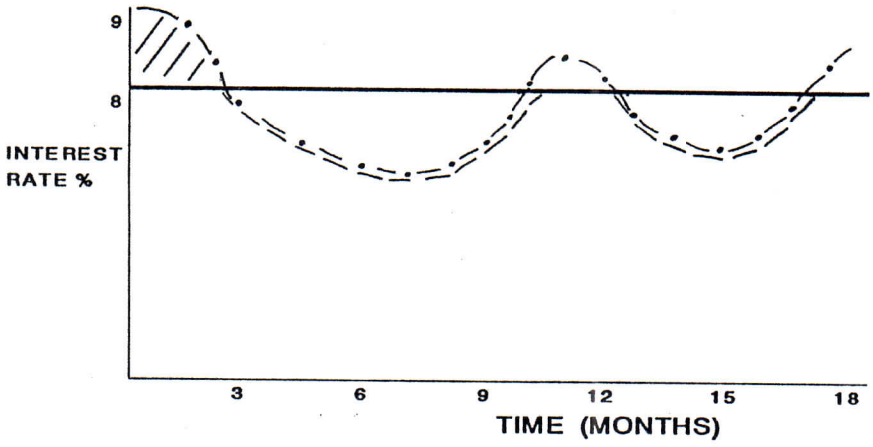
As illustrated in Figure 3 below, the lender could purchase an interest rate cap from a counterparty with a strike rate of 8 per cent. Every three months (assuming quarterly rate settings) the strike rate will be compared to an agreed market reference rate against which the lender pays interest on its underlying debt eg, three-month LIBOR. If on one of these setting dates LIBOR is set at, say, 9 per cent, the lender will exercise its option against the cap seller. This means the cap seller pays to the lender the interest difference between LIBOR and the cap strike rate (1 per cent) for the coming quarter based on the amount of the cap.

Assuming the lender resets the interest rate it pays on its underlying debt on the same setting date as the cap and pays three-month LIBOR, its interest rate will be 9 per cent (three-month LIBOR) for the coming quarter. However, the lender will receive 1 per cent in respect of the interest rate cap it bought. The net cost of the lender's variable rate debt is thus 8 per cent (the strike rate).

If LIBOR had instead set at 7.5 per cent, the lender would not exercise its interest rate cap as it is below the option's strike rate. It would therefore pay 7.5 per cent on its debt for the coming quarter. Such rate settings against LIBOR and the strike rate continue each quarter until the option expires. The effect is that the lender will not pay more than the cap's strike rate but will be able to pay less.

Although a cap agreement is executed formally between the lender and the counterparty (a bank) no corresponding interest rate cap is actually sold to the homebuyer by the lender, although the effect is the same under the terms of the loan agreement between

FIGURE 3: EFFECT OF AN INTEREST RATE CAP ON A HOME LOAN



KEY:

LIBOR RATE

INTEREST RATE CAP'S STRIKE RATE

LENDER'S NET COST OF DEBT

INTEREST INCOME TO LENDER FROM CAP SELLER

the lender and homebuyer. Similarly, there may not be corresponding rate settings. The loan agreement may simply state that the lender can set a lending rate at its discretion but which shall not exceed the cap strike rate for the stated period.

The lender will benefit from reductions in variable rates of interest payable on its debt during the period of the cap. If, in contrast, it continues to charge the homebuyer the same lending rate, or announce reductions in lending rates which take effect later than those on its debt, the lender's net interest margin will temporarily increase.

STRATEGY 2

As well as using derivatives to effectively match asset and liability cashflows, they have been used in isolation as a tool to implement management's views on future rates of interest payable on the lender's debt. Management, in an attempt to limit the adverse efects of rising rates, which may be predicted by economic indicators or not, could buy interest rate caps. Such a strategy will limit the cost on a nominal amount of debt where the rate payable is variable.

Management must be under no illusion that their strategy could fail, ie rates do not rise or,

contrary to expectations, actually fall. In such an event the cost of their strategy (the option premia) will not be recouped. If rates do rise, lending rates will probably rise correspondingly, to offset lenders' increased borrowing costs. Lenders who had capped their borrowing costs will continue to pay a lower rate on that portion of their variable rate debt which had been shielded by interest rate caps, while enjoying the benefit of a higher lending rate payable by homebuyers (other than those whose loans are fixed or capped). The effect is that these lenders' net interest margin will increase.

INTEREST RATE COLLARS

A collar is one description for a derivative instrument which combines an interest rate cap and a second derivative instrument called an interest rate floor. Interest rate floors can be regarded as the opposite of interest rate caps, ie a buyer of a floor will receive a rate of at least the floor's strike rate. A floor seller has an obligation to pay the floor buyer the floor strike rate if the buyer exercises the option.

Lenders have used collars to create loan products for homebuyers where the lending rate payable by the homebuyer will remain within a band (collar). These products thus include the features of capped loan products described above but also include an interest rate floor to limit the amount by which homebuyers can benefit from falls in lending rates — to the floor rate specified in the collar. The homebuyer's interest rate profile over time is illustrated in Figure 4.

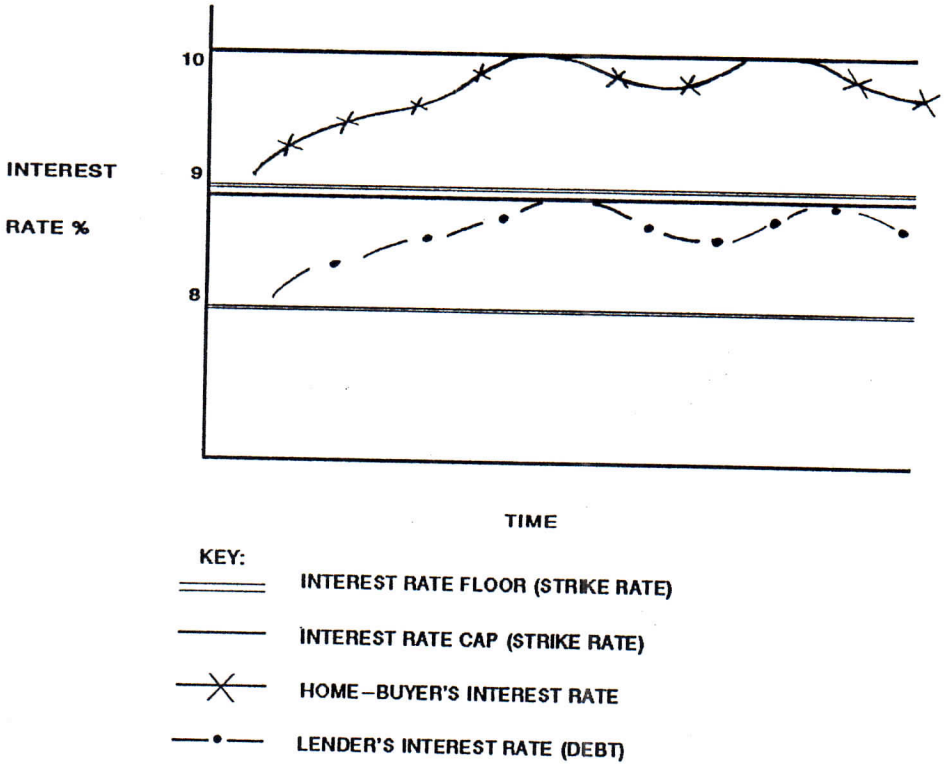
The lender has 'sold' the homebuyer an interest rate cap with a strike rate of 10 per cent and the homebuyer has 'sold' the lender an interest rate floor with a strike rate of 9 per cent. During the three-year life of the collared product, the effect of the cap is the lender cannot charge a rate in excess of 10 per cent. Likewise, the homebuyer having sold a floor has an obligation to pay a rate of at least 9 per cent, the homebuyer's effective rate is thus kept within a band between 9 per cent and 10 per cent for three years. As can be seen, such loan products offer homebuyers protection from rising rates with limited benefit of falling rates. To match the interest rate profile of collared loan products (strategy 1), lenders have a number of solutions.

Purchasing collars

This would necessitate the purchasing of a collar to match that 'sold' to the homebuyer. The lender's collar rates would be set at a level which generates a suitable net interest margin.

As illustrated above, the lender may arrange a collar with a counterparty where the lender purchases a cap with a strike rate of 9 per cent and sells a floor with a strike rate of 8 per cent. Assuming the reference rate is LIBOR, if LIBOR falls below 8 per cent that counterparty will exercise its option against the lender and receive a net rate of 8 per cent from the lender. Although the lender is paying 8 per cent it is receiving at least 9 per cent under the floor it has bought from the homebuyer, thus preserving a net interest margin of at least 1 per cent.

FIGURE 4: EFFECT OF AN INTEREST RATE COLLAR ON A HOME LOAN



If LIBOR rises above 9 per cent the lender can exercise its cap against the counterparty and thus limit its cost on variable rate debt to 9 per cent. In response to rising rates, the lender could raise the lending rate to 10 per cent which is the maximum payable by the homebuyer who has 'bought' a cap at 10 per cent. Even so, the lender has generated a net interest margin of 1 per cent.

Purchasing interest rate caps

The lender could simply purchase an interest rate cap which will limit the rate of interest payable on variable rate debt to the cap's strike rate. It will also allow the lender to benefit from reductions in market rates payable on debt if they fall below the floor rate. Under a collar strategy, the lender would be forced to pay at least the floor's strike rate.

One benefit of using collars to manage the interest rate risk on debt as opposed to caps alone, however, is that the cost of buying the cap element of the collar is offset by the premium received from selling the floor element of the collar. The net premium cost can be varied by setting the floor and cap strike

rates in line with, or at variance to, the market's strike rates for caps and floors. This may, however, affect the net interest margin.

FORWARD RATE AGREEMENTS

This derivative instrument has been used to effect strategy 2 ie, to limit the adverse effect of rises in interest rates on debt costs. They have been used in this respect to alter the repricing date (the date when the interest rate is reset) of variable rate debt so that it reprices sooner or later than the date previously agreed.

On the basis that three-month LIBOR is a proxy for the Government's or Central Bank's base rate (which in turn influences the rate set by lenders on their loans to homebuyers), lenders may choose to borrow at a rate which resets every three months according to the three-month LIBOR rate (rather than, say, each month or semi-annually) in order to more closely match the interest basis of its assets. For example, if a lender has issued a Floating Rate Note (FRN) where the interest rate is reset every six months, this can be converted to a three-month rate setting basis by selling Forward Rate Agreements (FRAs) at the time the FRN resets and for a nominal amount equal to the FRN. Such a strategy may, alternatively, be in response to the lender's view that short-term market interest rates will fall and hence the lender wishes to benefit from the fall sooner rather than later.

Lenders may, conversely, wish to protect a portion of their variable rate debt against possible rises in rates over the near term. Buying FRAs is a convenient method for managing short term interest rate risk as the forward start date can be specified precisely to match underlying debt repricing dates.

BASIS RISK

Although derivatives have been effectively utilised to manage interest rate risks, this may not be fully effective due to the presence of basis risk. Basis risk may be defined as the difference between the interest rate setting mechanism (basis) of an asset and that of its corresponding liability.

To illustrate basis risk, consider the scenario where an investor wishes to invest in the money market where the interest rate is based on the three-month sterling LIBOR rate. To invest, the investor takes out a loan from the bank with a rate payable based on the base rate plus 1 per cent.

Both rates are variable but the basis on which they are set is different ie, the investor is exposed to basis risk. The interest rate on his/her liability (the bank loan) is set according to the base rate whereas his/her income is set according to LIBOR. It is probable that the two rates will change at different times, hence the investor's net margin will change.

Building societies raise the majority of their funds — for mortgage lending — from retail depositors. Derivative instruments, such as caps and FRAs, tend to reset based on LIBOR. Hence, the use of derivatives by building societies to manage their retail deposit liabilities will introduce basis risk. Wholesale funded companies (which fund primarily based on LIBOR) do not suffer such basis risk when

using corresponding LIBOR-based derivatives to manage interest rate risks. However, even here basis risk may arise if, for example, the liability is reset according to, say, six-month LIBOR but the derivative is reset according to, say, three-month LIBOR.

CONCLUSION

Derivatives represent a key item of the lender's tool-box to manage interest rate risk. Interest rate risk management strategies have focused on preserving a margin between identified assets and liability groups or on a general basis to limit the lender's cost of variable rate debt from adverse movements in market interest rates, while allowing the potential to benefit from favourable movements.

Management must be sure their strategies clearly distinguish between speculation and a conscious decision to remove or limit the interest rate risk inherent in their assets or liabilities. Documentation supporting their strategies must be maintained for legal, audit and taxation purposes. Further, systems must be in place to monitor the risk management strategy to determine if it should be revised in response to changes in underlying assets and liabilities or market interest rates.

Although the implementation of derivatives can effectively mitigate one form of risk (interest rate risk) in doing so it may expose the user to additional risks such as counterparty and basis, which will need to be monitored as long as the derivative is in force.