Understanding and modelling swap spreads

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Interest rate swap agreements were developed for the transfer of interest rate risk. Volumes have grown rapidly in recent years and now the swap market not only fulfils this purpose, but is also used to extract information about market expectations and to provide benchmark rates against which to compare returns on fixed-income securities such as corporate and government bonds. This article explains what swaps are; what information might be extracted from them; and what appear to have been the main drivers of swap spreads in recent years. Some quantitative relationships are explored using ten-year swap spreads in the United States and the United Kingdom as examples.

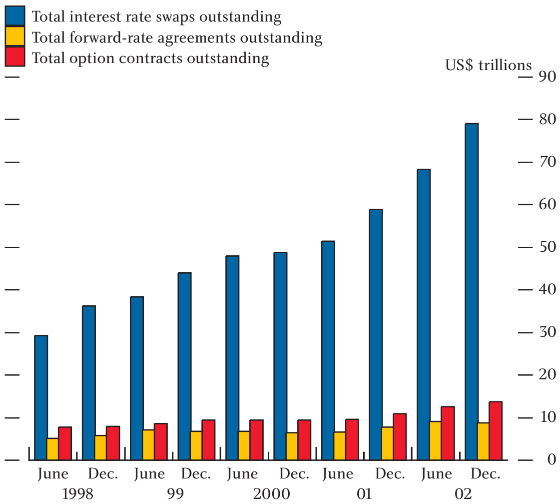
Introduction

A swap is an agreement between two parties to exchange cash flows in the future. The most common type of interest rate swap is a '*plain vanilla fixed-for-floating*' interest rate swap(1) where one party wants to receive floating (variable) interest rate payments over a given period, and is prepared to pay the other party a fixed rate to receive those floating payments. The floating rate is agreed in advance with reference to a specific short-term market rate (usually three-month or six-month Libor).(2) The fixed rate is called the swap rate and should reflect, among other things, the value each party attributes to the series of floating-rate payments to be made over the life of the contract. Swap markets serve as a link between government debt, corporate debt and money markets, across currencies (via basis swaps)(3) and maturities.

Differences between swap rates and government bond yields of the same maturity are referred to as swap spreads. If the swap and government bond markets are priced efficiently, swap spreads may reveal something about the perception of the systemic risk of the banking sector. This is because the risk of the systemic failure of the banking sector is embedded in Libor rates. If however, the swap and government markets are not priced efficiently at all times, swap spreads may be altered by perceptions of the economic outlook and supply and demand imbalances in both the swap and the government bond markets.

The volume of swap transactions has increased rapidly in recent years (see Chart 1). Swaps are the largest type of traded interest rate derivatives in the OTC (over-the-counter)(4) market, accounting for over 75% of

Chart 1
OTC interest rate contracts by instrument in all currencies



Source: BIS.

(1) Another common type of swap is a currency swap involving the exchange of principal and interest payments in one currency for principal and interest payments in another currency.
(2) The London Interbank Offered Rate (Libor) is a measure of the interest rate at which banks borrow funds from other banks in the London interbank market. US dollar and sterling Libor rates are determined each day by averaging over a panel of banks determined by the British Bankers' Association. The euro area has a similar interbank rate, called Euribor.
(3) A basis swap is an interest rate swap carried out between two floating rates set against two different reference rates. The cash flows (interest payments) exchanged are calculated from two floating-rate indices which might differ by currency and/or by instrument, eg Libor, certificate of deposit or Treasury bill.
(4) Over-the-counter means an asset that is not traded on an exchange but traded as a result of direct negotiation between buyers and sellers.

the total amount traded of these contracts.(1) Initially developed as a means of allowing institutions to manage interest rate exposures on their asset and liability portfolios more effectively, more recent demand has come from hedging and speculative sources. One recent source of demand—for hedging mortgage-backed security portfolios—will be discussed later.

To illustrate how interest rate swaps can be used to manage interest rate risk, suppose that an institution has floating-rate liabilities (debt), and that it pays 5 basis points over a reference rate such as three-month Libor, but has fixed-rate paying assets. Should interest rates rise, it will be paying out more via its floating debt payments but its fixed-rate asset income will remain the same, ie it will incur a loss. To reduce this interest rate risk exposure, the institution can enter into a swap where it pays a fixed rate, and receives a floating rate. As interest rates rise, part of the gap between its floating-rate payments and its fixed-rate income will be closed by its incoming floating-rate coupons. The key idea is that an institution can *synthetically* create either fixed or floating-rate assets via a swap agreement.

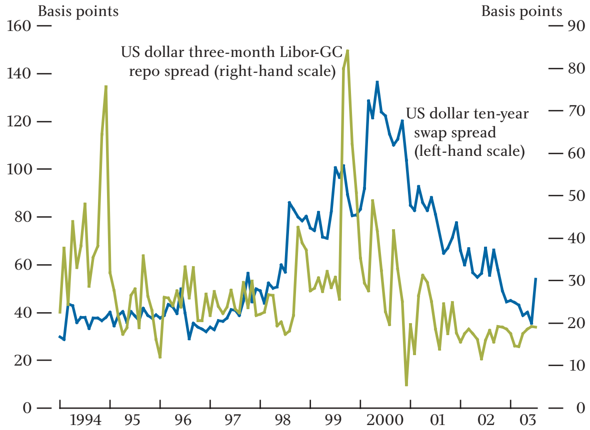
The fixed 'leg' in a swap can be thought of as a fixed-rate bond trading at par and paying a coupon equal to the swap rate, that is, the swap rate is equivalent to a par yield.(2) The large volume of swap contracts outstanding implies that par yields of swaps are easily obtainable for different maturities allowing market participants to build and use swap yield curves. Indeed, swap yield curves have become popular as benchmarks against which market participants can assess the returns on their (fixed-income) assets.(3)

The theory: fair value of swap spreads

Compared with a government bond yield curve, the swap yield curve also reflects expectations of the future spread between the relevant Libor rate and the general collateral (GC) repo rate(4) of equivalent maturity.(5) This Libor-GC repo spread should reflect the premium that investors require to compensate them for the probability of a systemic failure of the banking sector. This premium would be embedded in the Libor rate, but it is not present in the GC repo rate. We note, however, that there is survivorship bias in the Libor indices; the risk of an individual bank defaulting has an almost negligible impact on Libor and hence on swap rates since banks whose credit rating deteriorates drop from the Libor panel.

So, in theory, the fair value of the swap spread should encapsulate the compensation required by interbank lenders to offset expected losses on a series of rolling unsecured loans (referenced to Libor) over the life of the swap. This relies on there being a close relationship between expectations of future Libor-GC repo spreads and the swap spread, and there is some evidence to suggest that this relationship does not hold closely in practice. By way of example, Chart 2 plots the current three-month Libor-GC repo spread against the US dollar ten-year swap spread.

Chart 2
Swap spreads and the Libor-GC repo spread in the United States



Sources: Bloomberg and Thomson Financial Datastream.

Chart 2 shows that the US dollar ten-year swap spread displays persistent deviations from the Libor-GC repo spread, while the latter seems to revert quickly to its long-run average, having been affected by short-run disruptions such as the three months prior to the Millennium.(6) There is also some academic evidence to indicate that expected future Libor-GC repo spreads, and

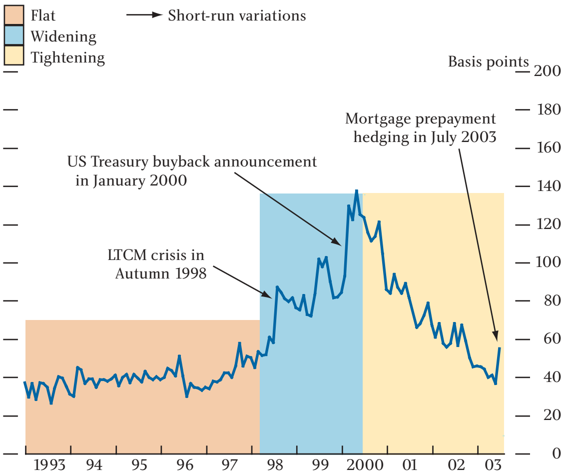
(1) In currency terms, euro and US dollar interest rate swaps accounted for over 70% of all interest rate swaps outstanding at the end of June 2003. Sterling interest rate swaps only accounted for 7% of all OTC interest rate derivatives (source: BIS).
(2) See Cooper and Scholtes (2001).
(3) See Haubrich (2001).
(4) A repo is a bilateral agreement in which one party ('seller') agrees to sell securities to the other ('buyer') and, at the same time and as part of the same transaction, the seller agrees to repurchase equivalent securities at an agreed price on a specified future date. The economic effect of this transaction is to create a collateralised loan from the buyer to the seller. The return on this collateralised loan, the repo rate, is typically quoted and used to calculate the repurchase price.
(5) See Cooper and Scholtes (2001) for a detailed explanation.
(6) The R-squared of the regression of the three-month Libor-GC repo spread on the US dollar ten-year swap spread is only 0.03 during the 1993–2003 period.

hence banking sector risk, are not the main drivers of observed swap spreads.(1) Rather, external factors may affect the relative pricing of swaps and government bonds—for example, the strong demand coming from hedging sources noted above. In the remainder of this article, we attempt to quantify the impact of these and other factors on US dollar and sterling swap spreads in recent years.

Main drivers of US dollar swap spreads

Since 1993 there have been three phases in ten-year swap spreads in the United States(2) (see Chart 3). Swap spreads fluctuated in a narrow range during the 1993–98 period, significantly widened during the 1998–2000 (May) period, and have been tightening since their peak in May 2000.

Chart 3
Medium-run developments and short-run variations of US dollar ten-year swap spreads



Sources: Bloomberg and Thomson Financial Datastream.

Swap spreads have fluctuated around these three phases, but there have been three noticeable short-term variations of swap spreads (see Chart 3). The first was during Summer/Autumn 1998. In August 1998, Russia defaulted on its sovereign debt, and liquidity began to dry up rapidly worldwide as derivative positions were quickly unwound. By mid-September, mounting margin requirements drove the hedge fund Long Term Capital Management (LTCM) to the verge of collapse. LTCM answered its margin calls by liquidating many of its leveraged positions.(3) This unwinding process was exacerbated by the fact that other market participants faced similar selling pressures to LTCM. There was a noticeable reduction in the risk capital employed by hedge funds, which were typically receiving fixed payments in swaps, thereby widening swap spreads. Simultaneously, many investors moved their funds rapidly into high-credit securities, especially government bonds, causing bond yields to fall, putting further widening pressure on swap spreads.

The US Treasury announcement of debt buybacks in January 2000 had an even larger effect on US dollar ten-year swap spreads. Expectations that the US fiscal position would continue to improve implied that the stock of US Treasury debt outstanding was decreasing to a point where the Treasury had to buy back off-the-run(4) bonds to maintain liquidity in their on-the-run bonds. At the time, some market participants even predicted the disappearance of the US Treasury debt market during the coming decade. The reduced prospective supply of Treasuries pushed down Treasury yields and widened swap spreads by over 50 basis points in the following four months.

Finally, in July 2003 US dollar swap spreads widened sharply following a wave of mortgage prepayment hedgers actively paying fixed in swaps during the month. This was associated with the sharp rise of US Treasury yields in July 2003 that caused mortgage prepayment hedgers to pay fixed in swaps in order to reduce the average *duration* of their assets (see the section on mortgage prepayment hedging for a more detailed explanation).

The US Treasury announcement of debt buybacks in January 2000 demonstrates the potential influence of relative imbalances in supply between the government bond and swap markets. Similarly, several demand factors can be seen to be linked to swap spread fluctuations in recent years. Demand for swaps often comes from two main sources: issuers of corporate/credit paper and national funding agencies, and mortgage prepayment hedgers in the United States (as in July 2003). Demand for bonds, in contrast, appears to increase during 'flight-to-quality' periods.

(1) See Litzenberger (1992), Grinblatt (1995) and Collin-Dufresne and Solnik (2001).
(2) This article uses the US dollar swap market as the 'proxy' to study the interplay between swap spreads and other factors. The US dollar swap market is a long-established and very liquid swap market. Sterling interest rate swaps were one quarter of all US dollar interest rate swaps outstanding at the end of June 2003 (source: BIS).
(3) See IMF (2003) for a detailed explanation.
(4) On-the-run government bonds are those that are the most recently issued by the government, that is, they are highly liquid due to frequent trading activity. Off-the-run government bonds are assets less frequently traded, ie more illiquid, that were issued prior to the on-the-run bond.

Finally, deviations in swap spreads also seem to be linked to changes in risk preferences of investors, that is, risk and liquidity premia.

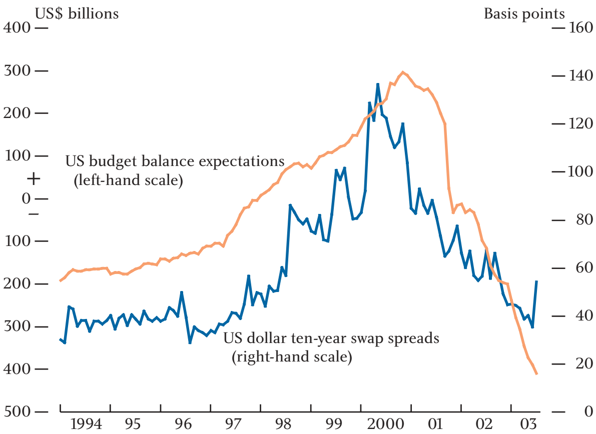
Hence, the risk of a systemic failure of the banking sector, supply and demand imbalances, and risk and liquidity premia seem to be relevant theoretical drivers associated with movements in swap spreads. This section suggests five different variables which empirically seem to help us to quantify the impact on swap spreads over recent years of these theoretical influences. These variables are: expectations of government issuance, the slope of the yield curve, equity-implied volatility, the on-the-run/off-the-run spread and the effective duration of mortgage-backed securities.

Expectations of government bond issuance

In a cyclical slowdown, market participants might expect tax revenues to fall, leading to increased government borrowing. Government bond prices could fall in response to the extra supply—government bond yields would increase and swap spreads would tighten. In contrast, during periods of high economic growth, governments tend to decrease their debt issuance as tax revenues increase. This might then be associated with widening swap spreads.

A measure of expectations of government bond issuance is expectations of fiscal balances. Consensus Economics provides a monthly average[(1)] estimate of budget balance expectations for the current and subsequent fiscal year. Chart 4 shows that there is an apparent long-run

Chart 4
Swap spreads and budget balance expectations in the United States



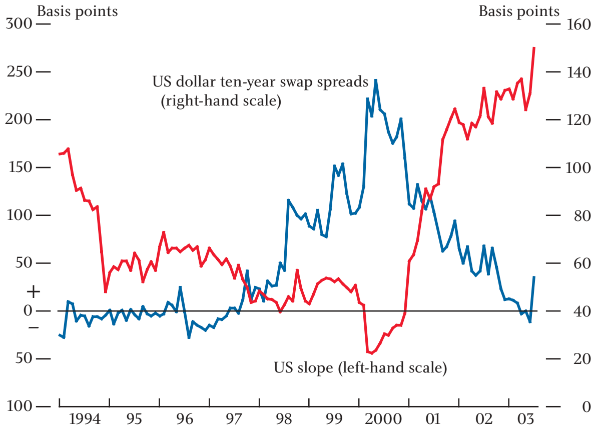
Sources: Bloomberg, Consensus Economics and Thomson Financial Datastream.

relationship between this measure and swap spreads. The more positive the budget balance expectations, the smaller the expected government bond issuance, and hence the wider the swap spreads.

The slope of the yield curve

Empirically, swap spreads tend to tighten when the yield curve steepens, and widen when the curve flattens (see Chart 5).

Chart 5
Swap spreads and the slope[(a)] in the United States



Sources: Bloomberg and Thomson Financial Datastream.

(a) Calculated as the difference between the yield on ten-year US Treasuries and on two-year US Treasuries.

One reason for this behaviour is related to the fact that issuers of corporate debt and national funding agencies are increasingly an important part of the OTC swap market. These institutions usually focus on the total cost of funding their liabilities, typically hedging these liabilities by entering into swap contracts. In a steep yield curve environment the cost of funding long-dated fixed-rate liabilities increases, and these institutions prefer to swap their long-maturity fixed-rate bond issuance for shorter-maturity liabilities by paying floating in the short end and receiving fixed payments in the long end. As swap rates are the prices (fixed rates) that the market is willing to pay to receive floating interest rate payments, this additional demand to receive fixed in the long end may, *ceteris paribus*, cause swap rates to fall, and swap spreads to tighten.

The slope of the yield curve may also be linked to swap spreads via the extent to which it reflects expectations of future economic growth.[(2)] The yield curve usually inverts in anticipation of recession for two reasons: the bond market anticipates future monetary easing, and the demand for risk-free assets shifts along the curve. To

(1) Consensus Economics provides an average of the expectations of budget balances of several economic forecasters.
(2) See Cooper, Hillman and Lynch (2001).

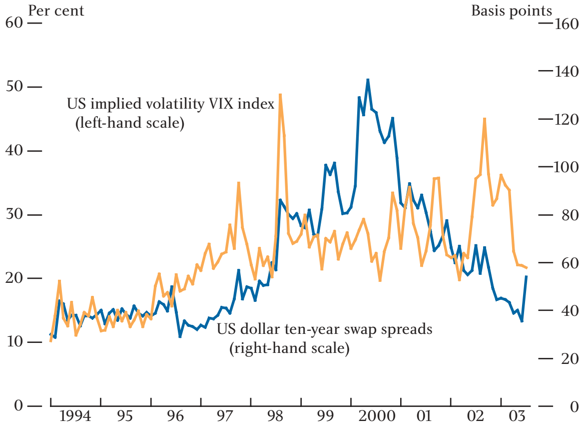
demonstrate this second effect, suppose that an economic slowdown is expected during the following year, then there is likely to be increased demand for long-term government bonds, which will provide fixed receipts in the economic downturn. This may cause the price of long-term bonds to increase causing the yield to maturity to fall. In the meantime, shorter-term assets may be sold to finance the purchase of the long-term government bonds, bringing down the price of the shorter-term asset and thus increasing its yield. The net effect is to cause the yield curve to flatten or invert.(1)

In an inverted yield curve environment swap spreads are likely to widen for two reasons. First, assuming that the term structure of swap rates remains constant, swap spreads of long maturities are likely to widen as long-term government bond yields fall. Second, economic slowdowns are normally associated with increasing risks to the stability of the financial system, raising expectations of future Libor-GC repo spreads and putting widening pressure on swap spreads.

Risk and liquidity premia

A general increase in the perceived level of uncertainty is also often associated with 'flights to quality'. Chart 6 shows that spikes in uncertainty, as measured by the implied volatility of equity markets, have at times been associated with increases in swap spreads. Similarly,

Chart 6
Swap spreads and VIX(a) equity-implied volatility in the United States



Sources: Bloomberg and Thomson Financial Datastream.

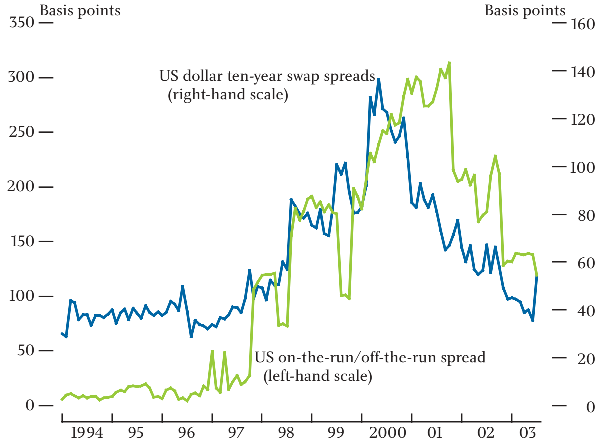
(a) The VIX index (Chicago Board Options Exchange Volatility index) calculates an estimate of future volatility, based on the weighted average of the implied volatility of eight call and put options traded on the Standard & Poor's 100 equity index.

increases in risk premia(2) (the amount of return investors require for a given level of risk) would also lead to an increase in demand for risk-free assets—though risk premia are difficult to measure directly.

In addition, during economic downturns the liquidity premium between swap rates and yields on the on-the-run benchmark government bond usually rises, widening swap spreads: government bonds in such periods tend to be the most liquid assets in fixed-income markets, and thus other instruments like swaps usually pay a liquidity premium above the government bond yield.(3)

Chart 7 shows the spread between the on-the-run ten-year benchmark bond and a basket of off-the-run bonds that fall within a ten-year maturity range. Compared with swap spreads, there is some evidence of low-frequency correlation between the two series.

Chart 7
Swap spreads and the on-the-run/off-the-run spread in the United States



Sources: Merrill Lynch (via Bloomberg) and Thomson Financial Datastream.

A recent driver of swap spreads: mortgage prepayment hedging in the United States

In the past few years, swap spreads have also been driven by factors relating to the structure of the US mortgage market. When interest rates fall sufficiently, US homeowners may exercise an option to refinance their fixed-rate mortgages at the lower rates. As a result, Government Sponsored Enterprises (GSEs) such as Fannie Mae and Freddie Mac, which own portfolios of mortgage-backed securities (MBS), may find themselves with a fall in the *duration* of their assets as more of the

(1) See Harvey (1993).
(2) Increasingly, market participants refer to the concept of risk appetite, usually used as the opposite of risk premia.
(3) The liquidity premium is associated with changes in consumer confidence and the stock of US Treasury supply available to investors during economic downturns. See Longstaff (2003) for a detailed explanation.

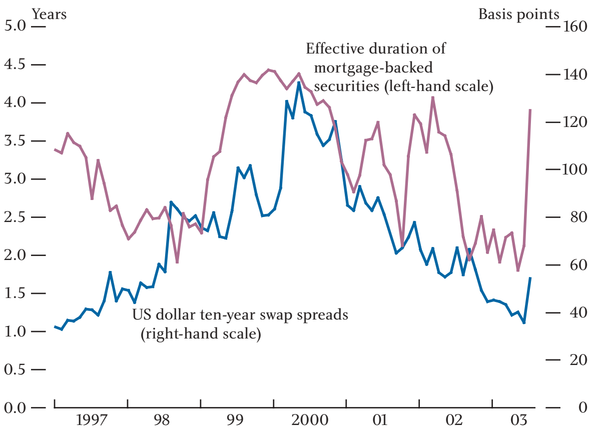
mortgages backing these securities are repaid early.(1) With no major change in the duration of their liabilities, this exposes them to interest rate risk.

One way of adding duration to their asset portfolios in a falling interest rate environment is to buy long-maturity Treasuries. This would, *ceteris paribus*, tend to widen swap spreads. Agencies, however, do not usually do this because US Treasuries only remain an effective hedge to add duration while they show similar yield movements to US GSEs' (agency) bonds. As this relationship broke down after the LTCM crisis of Autumn 1998, US GSEs began increasingly to use interest rate swaps(2) to extend duration, receiving fixed and paying floating, causing swap spreads to tighten.(3)

In contrast, if, as in July 2003, there is a sharp rise in long-term interest rate expectations (reflected in long-term Treasury yields), the incentive of US homeowners to exercise the option to refinance their fixed-rate mortgages diminishes significantly. This will increase the *duration* of the portfolios of mortgage-backed securities, which will trigger a wave of mortgage prepayment hedging activity, whereby hedgers pay fixed in swaps to reduce the *duration* of their assets.

The effective duration of the Merrill Lynch Mortgage-Backed Securities master index potentially offers a simple way to capture this effect empirically (see Chart 8).

Chart 8
Swap spreads and effective duration of mortgage-backed securities in the United States



Sources: Merrill Lynch (via Bloomberg) and Thomson Financial Datastream.

Changes in refinancing activity of US mortgage-holders are usually followed by changes in the effective duration of mortgage-backed securities, and hence, changes in swap spreads.

Assessing the quantitative effect of these factors on US dollar ten-year swap spreads

In this section, the impact of the proxy variables explained above on swap spreads is evaluated via a contemporaneous regression framework. This provides a way to undertake *ex-post* analysis of swap spreads, ie to help to explain why swap spreads moved over past months. The description of the factors already discussed suggests that the following signs might be expected:

Table A
Expected relationship between swap spreads and explanatory variables

Variable	Coefficient sign	Initial movement	Impact on swap spreads
Treasury issuance expectations	–	Increase	Tightening
Slope	–	Steepening	Tightening
On/off spread	+	Increase	Widening
Implied volatility	+	Increase	Widening
Effective duration of mortgage-backed securities	+	Increase	Widening

We noted from Chart 2 that, in recent years, there have been persistent deviations of swap spreads from the levels that may be represented as a long-run equilibrium, ie representing only banking sector risk. To capture the potential influence of the factors listed above on these persistent deviations, we use a multivariate error correction model (VECM).(4) This allows us to identify an 'equilibrium' relationship of swap spreads over our sample period (the past six years),(5) indicating the direction in which swap spreads must move following short-run shocks in order to re-establish the medium-run trends apparent in the data.

Changes in swap spreads are regressed against monthly changes in their main drivers and the medium-run adjustment variable. The equation estimated is given below.

(1) See also Box 7 of the *Bank of England Financial Stability Review*, June 2002 (page 72).
(2) See special report of *Risk* magazine, 'Convexity hedging and its impact on US swap spreads', March 2002, Vol. 15, No. 3 (available at www.risk.net).
(3) GSEs have also been reported to hedge duration by expanding their balance sheets by purchasing mortgage-backed securities funded by issuing short-term liabilities.
(4) See Fernandez-Corugedo, Price and Blake (2003) for an explanation and a practical application of the VECM.
(5) Over this period at least one cointegrating relationship is identified for US dollar ten-year swap spreads using Johansen's cointegration test. See Johansen (1995) for further detail.

$$(1)\ D(swap\ spread) = \alpha_1{}^*\ D(budget\ expectation)^{(1)} + \alpha_2{}^*\ D(slope) + \alpha_3{}^*\ D(on/off\ spread) + \alpha_4{}^*\ D(equity\text{-}implied\ volatility) + \alpha_5{}^*\ D(effective\ duration\ of\ MBS) - MREC(-1)$$

Note: D represents the change in the variable, such that $D(swap\ spread) = swap\ spread_t - swap\ spread_{t-1}$. *MREC* is the medium-run adjustment (error correction) variable that accounts for the persistent deviations in swap spreads.

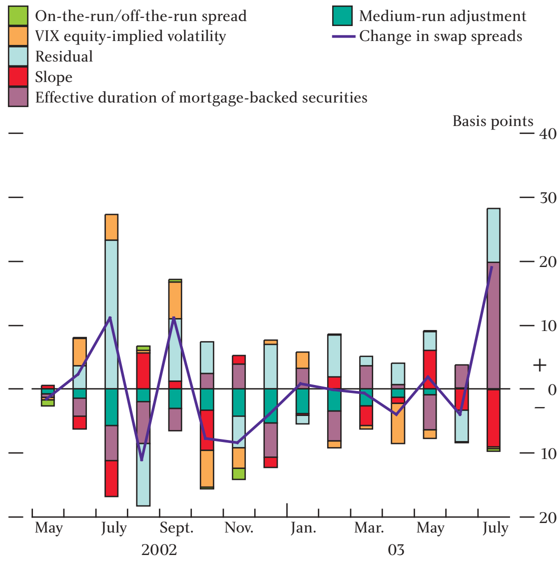
Table B shows the results of regressing changes of US dollar ten-year swap spreads against the explanatory variables and the medium-run adjustment over the past six years[2] (January 1997–August 2003). Changes in the slope, changes in equity-implied volatility, changes in the effective duration of mortgage-backed securities and the medium-run adjustment are all significant at the 5% level. All the coefficients have the expected sign, except changes in budget balance expectations. The results suggest that an increase in the slope of the yield curve of 1 basis point would lead to a tightening in swap spreads of 0.19 basis points, and that an increase in the effective duration of mortgage-backed securities of one year would lead to a widening of swap spreads of 11 basis points.

Table B
OLS regression of US dollar ten-year swap spreads versus main drivers during January 1997–August 2003 period

Variable	Coefficient	t-stat
D(Budget expectation)	-0.07	-1.86
D(Slope)	-0.19	**-3.45**
D(On/off spread)	0.05	1.39
D(Implied volatility)	0.71	**4.02**
D(Effective duration of MBS)	11.03	**4.37**
MREC(-1)	-0.19	**-3.11**
R-squared	**0.40**	

Chart 9 shows the contribution of changes in the explanatory variables and the medium-run adjustment to changes in US dollar ten-year swap spreads in recent months. The residuals show the extent to which the model fails to explain the change in swap spreads completely.

Chart 9
Contribution to changes in US dollar ten-year swap spreads(a)



Sources: Bloomberg, Thomson Financial Datastream and Bank calculations.

(a) Based on the regression of monthly US dollar ten-year swap spreads against the explanatory variables and the medium-run adjustment variable during the January 1999–August 2003 period. The near failure of Long Term Capital Management (LTCM) caused a significant shock in swap spreads worldwide. The potential for obtaining spurious results is minimised by starting the regressions in January 1999. Budget balance expectations are excluded from the regression as they appear to be insignificant and have the opposite sign to their expected relationship with the swap spread.

Throughout the past year, the slope of the yield curve appears to have played an important role in causing short-run variations in swap spreads. As noted previously, this may reflect an increase in demand to receive fixed payments when the slope steepens. It may also reflect changes in expectations of future economic growth. Similarly, changes in equity-implied volatility seem to be clearly associated with short-run movements in swap spreads, usually reflecting changes in the perceived level of uncertainty. More recently, however, there has been a large impact of mortgage prepayment hedging activity on swap spreads.

Chart 9 shows that, in July 2003, US dollar ten-year swap spreads widened by some 19 basis points,[3] despite changes in the slope of the yield curve suggesting a 9 basis point tightening of swap spreads.[4] According to

(1) This article uses budget balance expectations to measure expectations of government bond issuance. Increases in expected government bond issuance are equivalent to decreases in budget balance expectations. That is, an increase in budget balance expectations would imply a widening of swap spreads.
(2) Effective duration of mortgage-backed securities is only available since January 1997.
(3) This article uses US dollar swap spreads estimated as the spread between the ten-year swap rate from Bloomberg and the ten-year government bond benchmark yield from Thomson Financial Datastream. This can be problematic if we want to have an accurate estimate of the levels of swap spreads currently traded in the market because ten-year swap rates have constant ten-year maturity, while Treasury benchmark bonds have a variable maturity. Benchmark bonds are only ten years' maturity whenever the US Treasury issues a new ten-year note. This might distort the amount of change of swap spreads during the month, especially at times when a new benchmark bond is issued.
(4) Reflected by the product of the change in the slope in July 2003 and the regression coefficient during the January 1999–August 2003 period.

the model, this was mainly caused by the change in the effective duration of mortgage-backed securities, which implied a 20 basis points widening of swap spreads. This change in the effective duration of mortgage-backed securities was associated with US Treasury yields rising significantly in July 2003. The yield of the on-the-run ten-year Treasury note increased by over 90 basis points during the month, motivating a wave of mortgage prepayment hedgers actively paying fixed in swaps during the month. This was reflected in an increase of the effective duration of mortgage-backed securities of 1.8 years, which in turn, was associated with wider swap spreads.

Assessing the quantitative effect of these factors on sterling ten-year swap spreads

An interesting extension to this exercise is to use the model to account for movements in sterling ten-year swap spreads. Sterling ten-year swap spreads are regressed against the slope of the UK gilt yield curve, expectations of future gilt issuance, implied volatility of the FTSE 100 equity index, US dollar ten-year swap spreads and the medium-run adjustment variable.(1) Unlike in the US swap market, mortgage prepayment hedging is not a driver of sterling swap spreads.(2) The rationale for including US dollar ten-year swap spreads is to examine whether movements in sterling ten-year swap spreads are influenced by movements in ten-year swap spreads across the Atlantic. Chart 10 shows that there seems to be a close relationship between sterling and dollar ten-year swap spreads.

Chart 10
Sterling versus US dollar ten-year swap spreads

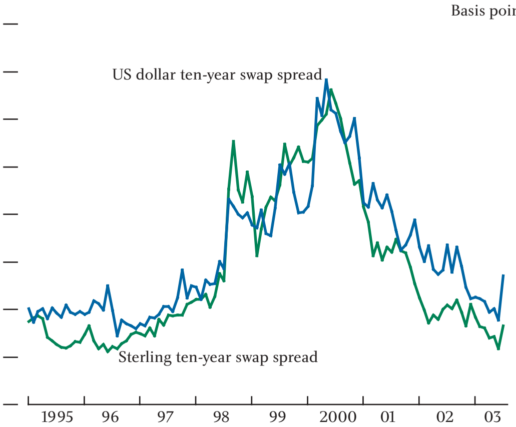


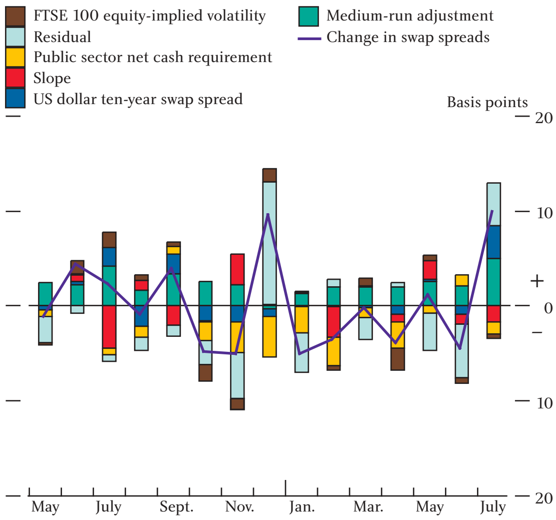
Table C shows the results of regressing changes of sterling ten-year swap spreads against the explanatory variables over the June 1994–August 2003 period. Changes in the slope, changes in equity-implied volatility, changes in US dollar ten-year swap spreads and the medium-run adjustment variable are all significant at the 5% level. All the coefficients have the expected sign.(3)

Table C
OLS regression of sterling ten-year swap spreads versus main drivers during June 1994–August 2003 period

Variable	Coefficient	t-stat
D(US swap spread)	0.32	**3.74**
D(Public cash requirement)	-0.42	-1.07
D(Slope)	-0.09	**-2.51**
D(Implied volatility)	0.28	**2.19**
MREC(-1)	-0.25	**-4.23**
R-squared	**0.26**	

Chart 11 shows the contribution of changes in the explanatory variables and the medium-run adjustment to changes in sterling ten-year swap spreads.

Chart 11
Contribution to changes in sterling ten-year swap spreads(a)



Sources: Bloomberg, Thomson Financial Datastream and Bank calculations.

(a) Based on the regression of sterling ten-year swap spreads against the explanatory variables and the medium-run adjustment variable during the January 1999–August 2003 period.

In July 2003, sterling ten-year swap spreads widened by 9 basis points.(4) According to the model, the change in US dollar swap spreads accounted for 4 basis points of this widening. The medium-run adjustment variable implied an extra 5 basis points widening, suggesting that

(1) Estimated using a Vector Error Correction Model (VECM). At least one cointegrating relationship is identified for sterling ten-year swap spreads using Johansen's cointegration test.
(2) UK investors tend to hold more floating-rate mortgages than in the United States, so refinancing is less of an issue.
(3) Note that Consensus Economics provides UK expectations of public sector net cash requirements instead of expectations of budget balance. The expected coefficient on the public sector net cash requirement variable should be of opposite sign to the budget balance variable in the United States.
(4) Similarly to the United States, this article uses sterling swap spreads estimated as the spread between the ten-year government bond benchmark yield from Thomson Financial Datastream and the ten-year swap rate from Bloomberg.

in July 2003 sterling ten-year swap spreads were trading at levels very low compared with their average since June 1994.(1) In contrast, market participants expected an increase in future UK Treasury issuance of £1 billion, suggesting a 1.2 basis points tightening of sterling swap spreads, and the yield curve steepened implying an extra 1.7 basis points of tightening.

One explanation for the historically narrow levels of sterling swap spreads in recent months is that institutional and regulatory factors have been important drivers of sterling swap spreads. Market contacts suggest that the hedging activities of UK pension-related funds and foreign corporations issuing in sterling have had an impact on sterling swap spreads. It has been suggested that both of these classes of market participants may create a tightening bias in the sterling swap market by receiving fixed in swaps. Pension funds use swaps when adjusting their asset/liability mismatch. Foreign corporations have been reportedly issuing in sterling due to the attractiveness of issuing very long-dated sterling debt. They then swap their sterling debt back into their domestic currencies.

The introduction of FRS 17(2) and the replacement of the Minimum Funding Requirement(3) may have also increased the appeal of UK corporate debt relative to UK gilts, increasing the tightening pressure on sterling swap spreads.

Conclusion

The fair value of swap spreads is theoretically related to expectations of the future spread between the Libor rate and the general collateral (GC) repo rate. Evidence, however, suggests that there seems to be no clear relationship between the current Libor-GC repo spread and actual swap spreads.

This article suggests other drivers that seem to be linked to swap spread movements in recent years. The relationships between the ten-year swap spread and these drivers are quantified in the US dollar and the sterling swap markets. These relationships are modelled in a contemporaneous regression framework so that we can attempt to analyse changes in swap spreads on a monthly basis. The differences between the US dollar and the sterling ten-year swap markets are found to be quite significant. The use of swaps in hedging mortgage-backed portfolios is an important US market specific factor.

Use of simple models of the type presented in this article may prove useful in analysing why swap spreads changed *ex post*. Whether such models can be useful for forecasting future swap spreads is more debatable; although market participants are known to use such models to inform their trading strategies.

(1) Ten-year sterling swap spreads were around 30 basis points at the end of July 2003, a level significantly lower than their average of 54 basis points during the June 1994–August 2003 period.
(2) See Duggan (2002).
(3) See Department for Work and Pensions (2001).

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