The pricing of over-the-counter options

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Earlier this year, the Bank carried out a survey of firms involved in trading over-the-counter options to investigate how they price and manage the risk associated with the instruments, and to assess the extent of differences in their approaches. This article explains the background to that survey, and outlines its main results.

Over-the-counter (OTC) derivatives—and OTC options in particular—are part of a growing financial market, and one which raises particular challenges for participating institutions and their supervisors. Assessment and management of the risks incurred in trading these products are not straightforward.(1) Accordingly, earlier this year the Bank undertook a survey to investigate how different institutions priced options and related instruments in the OTC market. It circulated a list of equity, foreign exchange and interest rate option and swap instruments to banks active in derivative markets and to several leading securities firms. Participants were asked to provide the prices and hedging risk parameters on each of the instruments; about 35 banks and securities firms responded. This article explains the background to the survey and presents its main findings.

Just as it is vitally important for institutions trading in the derivatives markets to verify the accuracy of their pricing and risk management models, it is important for the Bank of England to know how the banks that it is supervising price and manage these products, since for many they are a significant and growing part of their business.

The survey allowed the Bank to assess the uniformity of both the pricing and risk assessment parameters of a range of products. It also allowed it to identify those banks that priced products differently from their peers, for closer scrutiny as part of its prudential role, particularly in implementing the Capital Adequacy Directive (CAD) for UK banks. Within the CAD framework, banks will be required to allocate capital against the market risks arising from their trading activities; the directive requires that the models employed by banks to price option products be recognised by the competent authorities before they are used to calculate how much capital a bank must set aside against market risk. The survey was one of several methods employed to assess the option-pricing models used by banks.

The survey was also useful to the organisations taking part. All the participating institutions were sent information about the mean, range and standard deviation of the price and delta for each of the instruments that they priced.

Option products and the OTC market

Derivative instruments are contracts whose value is derived from the value of some underlying asset. The underlying asset may be a debt instrument, bond, share, share index, exchange rate, futures contract or commodity price. An *option* is a derivative contract that gives the purchaser the right, but not the obligation, to buy or sell an underlying asset at a certain price (the *exercise* or *strike price*) on or before an agreed date. For this right, the purchaser pays a premium to the seller. The seller (or writer) of an option has a duty to buy or sell at that price, should the purchaser exercise the right.

Derivatives are extremely important in risk management because they allow risks to be separated and traded. For example, a company buying raw materials in US dollars may face difficulties if the dollar rises in value above a certain level. The firm's risk can be minimised if it buys an option giving it the right to buy dollars at that rate. If the dollar stays below the rate, the firm pays only the premium; but if it rises above it, the firm can exercise the option and buy dollars at the price agreed earlier below the market rate. The firm in effect purchases insurance against the risk of a high dollar exchange rate by trading the risk in the derivatives market.

A number of standardised derivative products are traded through exchanges. However, if their risks cannot easily be hedged using these standardised contracts, customers can purchase tailor-made—or 'over-the-counter'—contracts.

The pricing of options

The prices of exchange-traded derivatives are highly transparent and readily available; by contrast, price information is less easily obtainable for OTC derivatives. This is partly because OTC transactions are tailored to the requirements of the individual customer; however, some OTC derivative transactions have become increasingly standardised over time. Because they are traded in liquid competitive markets, market forces will ensure that the pricing of these individual products remains relatively

(1) An article in the May 1995 *Quarterly Bulletin*, 'Statistical information about derivatives markets', set out current initiatives to encourage firms to disclose information about their derivatives business, and steps being taken to improve the availability of aggregate statistics about over-the-counter derivatives markets.

Options: some terminology

Like a number of areas of the financial markets, the options market has generated a good deal of its own terminology. This box provides an explanation of some of the main terms used in this article.

Some basic definitions

An *option* is a derivative contract that gives the purchaser the right to buy or sell an underlying asset at a certain price on or before an agreed date.

The *underlying* asset is the variable on which a futures or option contract is based. The *strike* or *exercise price* is the price at which the buyer of the option has the right to buy or sell. The *pay-off* is the amount that an option pays out at expiry. A *call option* gives the holder the right to buy the underlying asset by (or sometimes *on*) a certain date at a certain price. A *put option* gives the holder the right to sell the underlying asset by (or sometimes *on*) a certain date at a certain price.

European options are options that can be exercised only on the expiry date itself. *American options* can be exercised at any time up to the expiry date.

Volatility is the variability of the price of the underlying asset. The *term structure of volatility* is the curve describing the implied volatilities of options with different maturities.

An option is *in the money* if the exercise price is more favourable than the current market price of the underlying—that is the current market price is lower if it is a put and higher if it is a call. An option is *at the money* (spot) if the exercise price is equal to the market price of the underlying. And it is *out of the money* if the strike price is less favourable than the current market price.

A *vanilla option* is a loose term for a simple and widely traded option. An *exotic option* is one with an unusual underlying asset, pay-off, exercise price, expiry condition or some combination of these; however, the definition of which products are 'exotic' varies from institution to institution, and some products thought of as exotic some years ago are now seen as 'vanilla'.

Risk and risk parameters

The *sensitivity* is a measure of how much a derivative changes in value in response to a change in the price (or the volatility) of the underlying asset.

Dynamic hedging is the process of rehedging an option position in response to market movements.

The partial differentials used to describe and manage option risk are sometimes known as 'the Greeks', because they are named after Greek letters: delta, gamma, kappa, rho and theta. An option's *delta* is the rate of change in its valuation with respect to a change in the price of the underlying asset. *Gamma* measures the rate of change of the rate of change in the value of an option with respect to a change in the price of the underlying asset.

An option's *kappa* (or *vega*) is the rate of change in its valuation with respect to a change in the volatility of the price of the underlying asset. Its *rho* is the rate of change in its valuation with respect to a change in the (risk-free) interest rate used to discount the value of the option. And its *theta* is the rate of change in its valuation with respect to time.

Some option products

Purchasing a *straddle* involves buying a call and a put with the same strike price and expiry date.

A *cap* guarantees that the rate charged on a loan at any given time will be the lesser of the prevailing rate and the cap rate. A *floor* places a lower limit on the interest rate that will be charged. *Collars* specify both upper and lower limits for the rates that will be charged. A *collarlet* is a collar for an individual period.

A *down and out option* is similar to an ordinary option, except that if the underlying asset's price reaches a certain barrier the option ceases to exist. It is also known as a *knock-out*. An *up and in option* is the converse of a down and out: it comes into existence only when the barrier is reached.

A *quanto option* is a cross-currency option in which the pay-off is denominated in a different currency to the underlying asset. An *Asian option* is one where the pay-off depends on the average price of the underlying asset during at least some part of the life of the option. A *digital* or *binary option* pays off nothing if the asset price is above (or below) the strike price and pays a fixed amount if it ends up below (or above) the strike price.

In its simplest form, a *swap* is a transaction in which one party, A, agrees to pay the other party, B, cash flows equal to interest at a predetermined fixed rate on a notional principal for a number of years. At the same time, party B agrees to pay party A cash flows equal to interest at a floating rate on the same notional principal over the same period. In a *forward starting swap* the two parties agree to enter into such a transaction, but at a predetermined future date.

A *swaption* is an option on an interest rate swap. It gives the holder the right to enter into a certain interest rate swap at a certain time in the future.

uniform. Alongside these more standardised products, 'structured' or 'exotic' deals—which are individually constructed to meet the needs of the buyer—are also growing in importance. These products are often traded at a premium over their 'theoretical' valuation. And in their case, market forces may not be so effective in ensuring uniformity of pricing.

It is widely accepted that the price of an option is influenced by five factors: the price of the underlying asset; the exercise price of the option; the volatility of the price of the underlying asset; the time to expiry of the option; and the rate of interest. There is less consensus about how these factors should be combined to price individual products, especially the more 'exotic' variants. So the prices of options quoted by different firms at a particular time vary, for several reasons: differences in the inputs to models used in pricing, reflecting differences in traders' views about market prices and volatility; differences in the choice of the model used to value a product or to construct the yield curve; differences in the credit quality of the counterparties; and differences in traders' risk appetite.

One of the objectives in designing the survey was to isolate the pricing variability that was due to the choice of model. For this reason, participants were asked to give prices based on standardised market data and credit quality, so that the only source of pricing variability would be the models used. For about half the products, participants were provided with market data to use as inputs to their pricing models, including complete yield curves for two currencies. To standardise the credit quality dimension, they were asked to assume that prices were being made to a good-quality interbank name (with a rating of A or better) with whom the quoting institution had ample credit lines available. Most of the exotics chosen were products with widely available and generally accepted (although not necessarily unique) pricing formulae. There would have been much more diversity in the results if products for which there is no consensus on the choice of pricing model had been included.

Although Black and Scholes were not the first to provide a formula to value options, their model was the first to be widely accepted and is still by far the most commonly used approach for valuation, especially for simpler products.(1) But although variants of the model are commonly used even for the more 'exotic' products, the assumptions necessary within the Black-Scholes framework are considered by some market practitioners to be too restrictive for many of the more complex products, especially where the underlying instrument is the yield curve. In these cases, institutions have either developed in-house models or adopted models from the academic literature which they consider to be more accurate than the original Black-Scholes framework.

Pricing models can be categorised according to the method by which a price is obtained. Almost all option-pricing models are variants of Black-Scholes, but some are analytical models, some are based on simulation techniques and others are solved using numerical methods. Within the latter category, so-called 'lattice' models are the most common: these are of two types, binomial models and trinomial models. Lattice models are particularly useful for American options and interest rate options; they model the path of the price of the underlying asset by dividing the exercise period up into a number of sub-periods and assuming that during each the price of the underlying asset will either move up or down (in the case of a binomial model), or move up or down or stay the same (in the case of a trinomial model). Using these paths for the price of the underlying asset, the option can be valued.

Option risk management

An institution that buys or sells a derivative has to address the issue of how to hedge the risks arising from the trade. Options are particularly difficult to deal with, partly because they must be continually rehedged. The need for rehedging arises because the risk on an option changes as markets move (because the probability that the option will be exercised changes) and with the passage of time, even if markets are static. In addition, unlike other derivative instruments—such as futures, forward rate agreements and swaps—the value and risk position on an option change as the volatility of the underlying asset changes. As a rule, it is riskier to sell an option than to buy one, because the amount at risk with a bought option is limited to the premium. Also in general, most 'exotic' options are more difficult and risky to manage than straightforward 'vanilla' options, although there are exceptions to this rule.

In deciding how to hedge any derivative instrument, market practitioners assess how the instrument changes in value in response to small changes in the market price. For most products, a hedge based on this sensitivity can be effective in protecting the value of the portfolio from small market movements. In the case of option products, this process (known as 'delta hedging') is only the first step in protecting the value of the portfolio. The complicating factor with options is that the relationship between their market value and that of the underlying asset is not linear, and so it is also necessary to consider how the value of the portfolio changes in response to larger changes in the value of the underlying asset. The variable used to measure the non-linear component of the change in value is termed the option's gamma, and practitioners try to minimise risk by keeping the gamma value positive or close to zero. The third risk that it is particularly important to manage is an option's vega: the change in its value as a result of a change in the volatility of the price of the underlying asset. This risk is minimised by keeping the vega close to zero.

For both actively traded derivatives and the more exotic products, there is no market information about the current risk assessment of the product: the risk parameters are not quoted. But it is important that option traders calculate them accurately, and recalculate them on a timely basis as market conditions change. If the delta, gamma or vega is incorrectly

(1) See Black, F and Scholes, M, 'The pricing of options and corporate liabilities', *Journal of Political Economy*, *81*, May–June 1973, pages 637–59.

estimated, the resulting option hedges will be incorrect—leading to unexpected gains or losses in the value of the hedged portfolio.

Results of the survey

In the survey, participants were asked to price and provide hedge parameters for twelve different derivative products. These varied considerably in complexity and standardisation. A number were actively traded derivative products, and the majority of these positions were at-the-money. Most respondents priced these products, and the price and risk estimates provided showed relatively small variations for most positions. Other positions were in more 'exotic' derivative products—for example barrier options and digital options, both of which are traded in less competitive, less transparent markets. A number of these deals were not currently at-the-money. For these, there was, as expected, less consensus about the prices, risk parameters and the techniques used to obtain them. And fewer firms gave responses for these more sophisticated products, reflecting the fact that exotic option trading is a specialised activity that tends to be concentrated in a small number of institutions.

The survey divided the products into two groups: those to be priced using market rates at 4.00 pm on the specified day; and those to be priced using rates (for foreign exchange spot rates, volatilities, yields curves, etc) specified by the Bank. A brief summary of the individual products is given in Table A.

The results of the survey are summarised in Table B. The figures in the table are the standard deviations of the price and delta of each of the positions, measured as a percentage of the average sterling valuation of the option or the average sterling equivalent risk parameter. So, for example, where the standard deviation of the price of a position was £600 and the average price quoted was £60,000, the price variation figure is 1%; the smaller the percentage standard deviation, the less the variability in the price or Greek risk parameter.

The dispersion in the results reflected differences in the products. As explained above, for those products for which standardised market data was used (products 8 to 12), the variation in pricing should have reflected the choice of pricing model only, and accordingly there should have been less variability in the results. This was, generally, what was observed. The notable exception was the foreign exchange up and in option, which was so far out of the money that it was in effect worthless. Many respondents assigned a value to the option somewhat arbitrarily—for example 0.01% of the nominal value—which produced some dispersion in the responses.

Within the narrower variability of prices for products for which standardised data was used, there were still differences in the values assigned. These largely reflected modelling differences. A range of about 20 models was used by respondents, a figure which would have been still higher if small variations in the models had been counted.

At present, there are only a small number of products for which there is almost complete consensus among practitioners about the method for pricing. These are the collar (where the Black model is used) and the 'vanilla' European foreign exchange option (where the Garman-Kohlhagen version of Black-Scholes is used). A range of models was used to value the forward starting swap, but most of these were mathematically equivalent. For the other products, a range of models was used, but in general they did not lead to very large differences in pricing. With the exception of the collar and the forward starting swap, the range was wider for interest rate products than for equity or foreign exchange products. This reflected the fact that there are many ways of representing the movements of the yield curve and there is little consensus within the market about how this is best achieved.

There was considerably more variation in the prices of the products for which market data were not provided. Analysis showed that generally the variation resulted from differences

Table A
Products used in the survey

Products priced using market rates (as at 4.00 pm on 6 February 1995)

1 *Equity straddle*: an at-the-money straddle on 100,000 BAT Ords with expiry in one year's time, priced:
(a) as an American-style straddle.
(b) as a European-style straddle.

2 *Equity digital option*: a call option on 100,000 BAT Ords, with expiry in one year's time.

3 *Equity quanto option*: an at-the-money call option on the Standard and Poor's index with expiry in 18 months' time, priced:
(a) at-the-money with the strike and spot rate of the Standard and Poor's index assumed to be $450.
(b) at-the-money with the strike and spot rate assumed to be the prevailing level of the Standard and Poor's index on 6 February.
(c) out-of-the-money with a strike of $450 and taking the spot rate as the prevailing level of the Standard and Poor's index on 6 February.

4 *American foreign exchange option*: an option currently at-the-money on the US dollar/sterling exchange rate with expiry in three months' time.

5 *Collar*: a collar on sterling interest rates where the cap was 1% above, and the floor was 1% below, prevailing three-month Libor rates, priced:
(a) as a single collarlet three months forward for a period of three months.
(b) as a single collarlet six months forward for a period of six months.
(c) as a single collarlet three months forward for a period of six months.
(d) as a collar with two fixings each for a three-month period.

6 *Swaption straddle*: a short swaption straddle, currently at-the-money with expiry in two years' time.

7 *Bond option*: a put option on the 7¼% March 1998 UK Treasury, with expiry in 18 months' time.

Products priced with inputs provided by the Bank of England

8 *Foreign exchange option*: an option at-the-money on the US dollar/sterling exchange rate with expiry in one year's time, priced:
(a) as a dollar put, using yield curve data given.
(b) as a dollar call, using yield curve data given.
(c) as a dollar put, using own yield curve data.

9 *Foreign exchange barrier option*: an option on the US dollar/sterling exchange rate, with expiry in one year's time, priced:
(a) as a down and out sterling call.
(d) as an up and in sterling put.

10 *Foreign exchange Asian option*: a put option, currently at-the-money on the US dollar/sterling exchange rate, with expiry in one year's time, priced:
(a) as a sterling call, assuming flat volatility.
(b) as a sterling put, assuming flat volatility.
(c) as a sterling call, assuming term structure of volatility.
(d) as a sterling put, assuming term structure of volatility.

11 *Forward starting swap*: a four-year swap, starting in two years' time, using:
(a) own discount factors and yield curve given.
(b) both discount factors and yield curve given.

12 *Swaption*: a put on the swap described in 11, using:
(a) own discount factors and yield curve given.
(b) both discount factors and yield curve given.

Table B
Variations in the survey prices and risk parameters

Instrument	Price variation (a)	Delta variation (a)	Sample size	Models used
1 (a) American equity straddle	6%	14%	20	Black-Scholes; Cox-Ross; Cox-Rubenstein; Cox-Ross-Rubenstein; Binomial; Trinomial.
1 (b) European equity straddle	6%	27%	20	Black-Scholes; Cox-Ross-Rubenstein; Binomial; Trinomial.
2 Equity digital	6%	33%	19	Black-Scholes variants; Garman.
3 (a) Equity quanto	9%	7%	5	Black-Scholes variants; Trinomial (Jarrow Rudd parameters); Garman.
3 (b) Equity quanto	1%	2%	4	
3 (c) Equity quanto	2%	4%	12	
4 American foreign exchange	2%	2%	31	Black-Scholes; Cox-Ross-Rubenstein; Binomial; Odd even Cox-Ross.
5 (a) Collar	26%	26%	18	Black; Binomial.
5 (b) Collar	10%	9%	14	
5 (c) Collar	10%	9%	12	
5 (d) Collar	6%	8%	15	
6 Swaption straddle	3%	85%	32	Black; Hull & White; Binomial.
7 Bond option	38%	39%	17	Black-Scholes; Forward yield diffusion model; Black-Derman-Toy; Black; Binomial.
8 (a) Foreign exchange option	0%	4%	24	Black-Scholes; Garman-Kohlhagen.
8 (b) Foreign exchange option	1%	3%	8	
8 (c) Foreign exchange option	1%	4%	5	
9 (a) Foreign exchange barrier	4%	3%	14	Black-Scholes variants; Cox-Ross-Rubenstein; Rubenstein and Reiner; Binomial.
9 (b) Foreign exchange barrier	20%	71%	19	Black-Scholes variants; Cox-Ross-Rubenstein.
10 (a) Foreign exchange Asian option	1%	3%	7	Black-Scholes variants; Cox-Ross-Rubenstein.
10 (b) Foreign exchange Asian option	1%	3%	13	
10 (c) Foreign exchange Asian option	1%	2%	8	
10 (d) Foreign exchange Asian option	1%	2%	3	
11 (a) Forward starting swap	4%	3%	34	Discounted cash flows.
11 (b) Forward starting swap	3%	2%	17	
12 (a) Swaption	1%	4%	27	Black; Black-Scholes; Hull & White; Binomial.
12 (b) Swaption	1%	7%	12	

(a) The standard deviation of the responses as a percentage of the average valuation offered.

in the volatilities assumed in pricing the product. Some of the variation was because some respondents modelled a product using a term structure of volatility—that is using a model which assigned different volatilities to options of different terms—rather than assuming that volatility was the same for options with different periods to maturity. The other source of the dispersion in prices was the use of different yield curve interpolation techniques to derive market interest rates for dates in the future for which no market rates were available.

Another way in which the variations in the results can be explained is to draw the distinction between 'exotic' and 'vanilla' products. This distinction is based on the complexity of the product and the frequency with which it is traded. In the survey portfolio, the equity digital, equity quanto, foreign exchange barrier option and the foreign exchange Asian option would be defined by most market participants as 'exotic', and the bond option would be defined as difficult.(1) As a general rule, there was considerably more variability in both the prices quoted by respondents for 'exotics' and their estimates of the delta parameters.

There were, however, some anomalies. For example, although the American equity straddle was a relatively straightforward option product, it showed more variability than other 'vanilla' products. This may have been because it was based on a single equity, rather than an index, and information on the volatility of this underlying asset may have been less readily accessible. In addition, the instrument was priced by many institutions that did not actively trade options on individual equities. The dispersion in the pricing of product 5 appears anomalous since there was little variation in the models chosen and it was a 'vanilla' product. The dispersion reflected the range of market rates used to price the product and the fact that, because product 5(a) had a low market value and delta, the absolute level of variability in the pricing was much less than that indicated by the percentage variability.

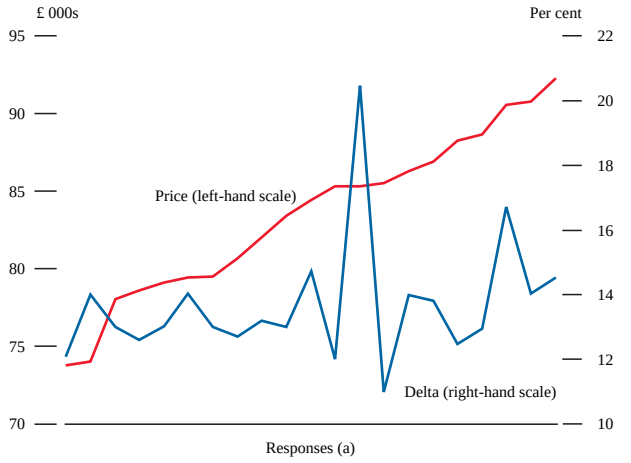
Equity options

Products 1 to 3 were options on an individual stock or an equity index. Only about 20 institutions priced these products and several that submitted responses for certain instruments indicated that they did not trade the instruments. This was the case particularly for the American equity straddle, where the underlying asset was an individual equity. In general, the estimates for the risk parameters were quite uniform; Chart 1 shows an example of the variation in the price and delta of the American equity option product. The exception was the quoted deltas for the equity digital. This was not surprising, however, since the product featured a discontinuous pay-off function; some institutions chose not to quote a delta because they felt it was too unstable. Although the equity quanto was categorised as 'exotic', it showed less price volatility for positions 3(b) and 3(c) than the other equity options. One explanation for this may have been that the market liquidity for Standard and Poor's options is deeper than for individual stock options and

(1) Although instrument 7 was a straightforward bond option, it had some features which led to particular pricing problems.

therefore that the volatility assumptions were more uniform than those for the options on individual stocks. Most of the sample used variants of the same, Black-Scholes model to price all of the equity options.

Chart 1
American equity option

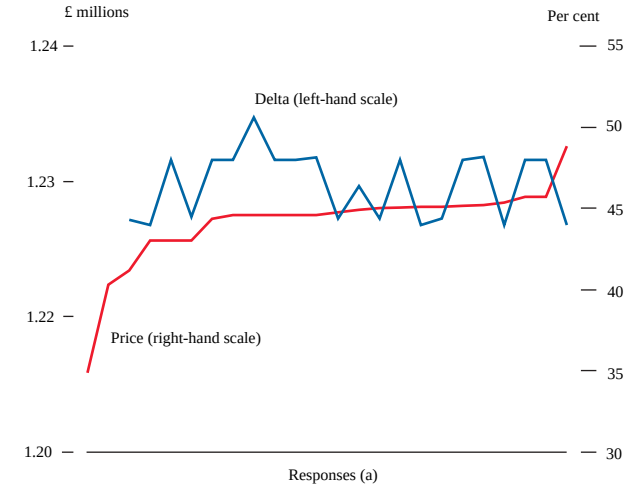


(a) The responses received are ordered on the *x*-axis from lowest to highest price quoted.

Exchange rate options

The foreign exchange options were products 4, 8, 9 and 10. With the exception of the up and in option (discussed above), these products showed uniformity of pricing across the sample—see the example in Chart 2. This may in part have been because the products themselves were quite

Chart 2
European foreign exchange option



(a) The responses received are ordered on the *x*-axis from lowest to highest price quoted.

straightforward, but it may also have reflected the liquidity of the foreign exchange market. As a result of this liquidity, there was more consistency in the volatility estimates than in the equity or fixed-income markets. An additional factor was that a large number of respondents used the same commercial software package to price the products.

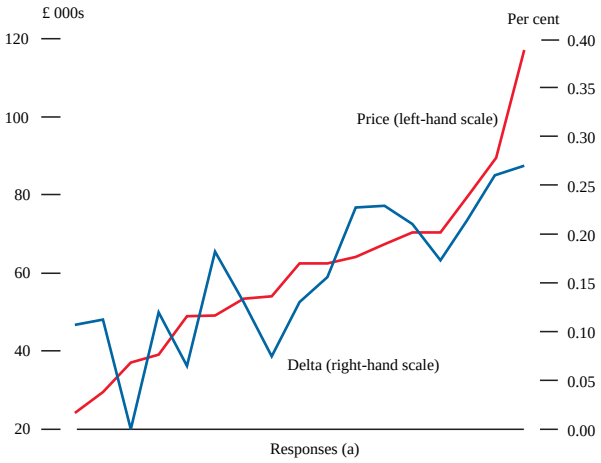
Interest rate products

Of the products covered in the survey, the interest rate products (instruments 6, 7, 11 and 12) were both the most difficult to model and those priced most differently. This was not because the products were particularly 'exotic' or because the inputs varied, but rather because of differences in estimating the yield curve and modelling its variability. For interest rate options, the underlying asset is a series of points on the yield curve, rather than a single point as in the case of equity and foreign exchange products. Rates are available for certain maturities; others must be interpolated from available market data.

There is a range of approaches for constructing the current market yield curve, based on different combinations of market deposit rates, futures prices and swap rates, and different interpolation techniques. And there is little market consensus on how to model the random movements in the yield curve. Models range from very simple representations of yield curve volatility to multi-factor models.

The impact that these differences in yield curve modelling made on the dispersion of the price and delta volatility was quite substantial. For example, there was price variation of 3%–4% in the simple forward starting swap (a product with no option component), despite the fact that all the input parameters were provided. The range of prices and deltas on the collar reflected the range of volatility assumptions across the sample. And the variation in the price of the bond option was a combination of the range of modelling

Chart 3
Bond option



(a) The responses received are ordered on the *x*-axis from lowest to highest price quoted.

assumptions and of assumptions about the bond's volatility, which were from 14% to 20%. Chart 3 shows the resulting price and delta variations for the bond option; the product incorporated a number of features that made it particularly difficult to price.

Conclusions

The objectives in conducting the survey were twofold: to increase further the Bank's knowledge of market practice in the pricing and risk management of derivative positions; and to contribute to its supervisory oversight of banks' traded derivatives activity.

The survey provided valuable information on the choice of pricing models and yield curve construction techniques, and the use of commercially available software. The importance of the method of yield curve construction for interest rate swaps and options was particularly striking, and was identified as a main contributor to the variation in prices in these products. The survey results also highlighted those products that were particularly difficult to price—such as the bond option—and those where the risk was not easily quantifiable. And they indicated the range of techniques used by different institutions to estimate the risk parameters.

On the supervisory side, the survey was useful in identifying several banks that were pricing products very differently from the rest of the market. Participants to the survey were provided with feedback on the mean, range and standard deviation of the prices and deltas of the products that they priced. This information has been useful both to the banks themselves and to their supervisors in the work in preparation for the implementation of the Capital Adequacy Directive in the new year.

More generally, the survey confirmed the Bank's preliminary views that there is significant variation in the pricing of different OTC products and that for some products the potential risk is not easily or uniformly quantifiable. Most institutions are aware of this uncertainty when pricing products and managing the risk in their derivative portfolios; but it is an issue which the Bank, as a supervisor, will need to continue to monitor.