United Kingdom
Debt
Management
Office

Gilt Review

1999 | 2000

The United Kingdom
Debt Management Office
is an Executive Agency of
HM Treasury

August 2000

CHEAPSIDE HOUS

Page No

Chapter 1: The economic and market background 2

Chapter 2: UK government financing 8
Financing remit 1999-2000 8
Financing remit 2000-01 15
The gilt portfolio 19

Chapter 3: Gilts market developments 21

Chapter 4: The transition to cash management 28

Chapter 5: Gilts market liquidity 34

Chapter 6: The DMO's yield curve model 48

Annexes:
A) Gilts in issue as at 31 March 2000 57
B) Gilt remit 59
C) Cash management remit 63
D) List of GEMMs and IDBs 66

Chapter 1: The economic and market background

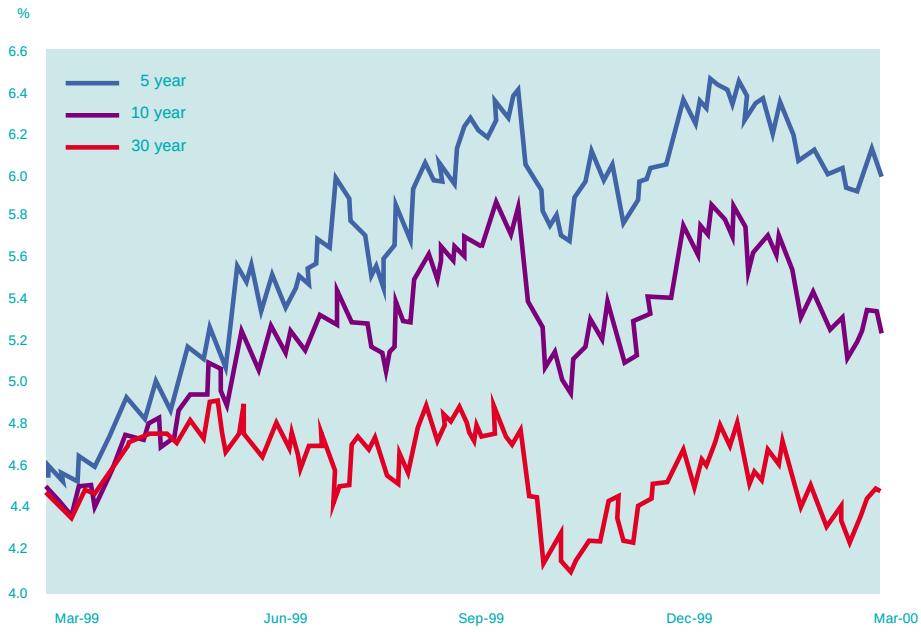
Gilts market review 1999-2000

Gilt yields rose from the lows of the previous year and the yield curve inverted significantly as international and UK economic data increasingly pointed to signs of resurgent economic growth. Interest rates began to rise in response.

The major structural change in the gilts market over 1999-2000 has been the considerable outperformance of ultra-long dated gilts compared with short- and medium-dated maturities. Over the year, the yield on the 30-year benchmark (6% 2028) rose by only 3 basis points (to 4.50%). However, the yield on the 5- and 10-year benchmark gilts increased by 143 and 75 basis points respectively (to 5.98% on 5% 2004[1] and 5.23% for 5¾% 2009).

The spread between the 5- and 30-year benchmarks increased over the year from 8 to 148 basis points and between the 10- and 30-year benchmarks from 1 to 73 basis points. The outperformance of longer maturities was, however, driven as much by a mismatch between supply and demand for long-dated gilts as economic fundamentals. The change in gilt yields over the year is shown in chart 1 below.

Chart 1
Benchmark gilt yields 1999-2000

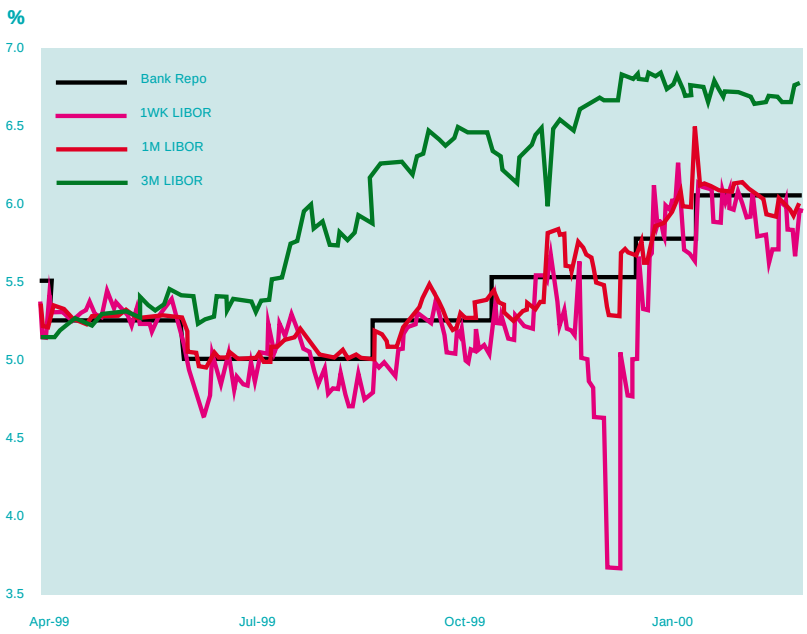


Source: DMO

[1] Data for 6¾% 2004 were used for the first quarter of the financial year.

Gilt yields began the financial year rising slowly but steadily (continuing a trend begun in late January 1999). Increasingly robust economic data (particularly in the US), helped push all yields higher. As the first quarter of the financial year progressed, the gilts market increasingly began to expect an end to the then prevailing path of interest rate reductions – particularly after the MPC's decision to reduce UK rates on 10 June, which the market had not anticipated. Expectation thereafter of higher rates to come pushed up yields on shorter-dated gilts most, with the 5/30-year benchmark spread widening from 8 to 71 basis points in the April-June period.

Chart 2
UK interest rates 1999-2000



Source: Bank of England

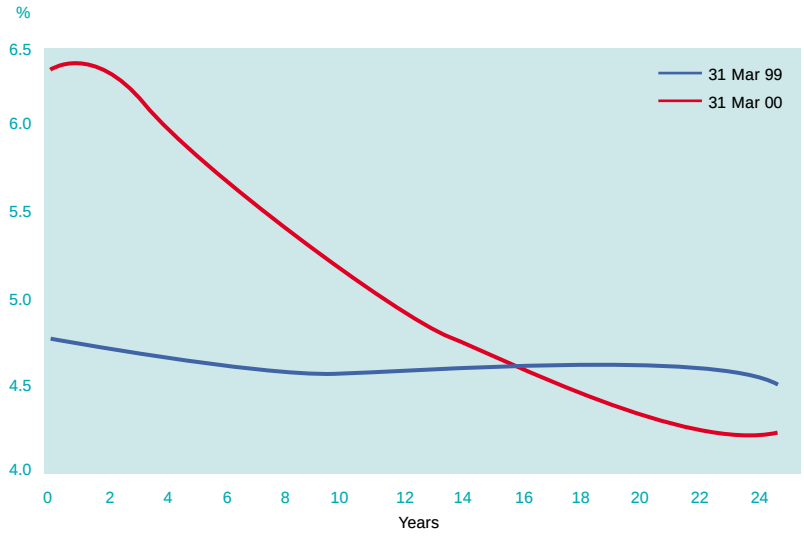
This direction continued through the summer period, as economic data continued to show signs of recovery in the major economies. The other key factor was growing evidence of trading difficulties at the long-end of the gilt curve, exacerbated by a shortage of supply relative to demand. This led the DMO to issue £400 million (nominal) of 6% 2028 by tap on 6 August for market management reasons – the first conventional tap since 1996. The DMO also consulted the market about bringing forward the scheduled November auction (of 6% 2028) to alleviate the position. In the event, the market had a preference for the auction not to be moved.

Expectations of a transition to a period of rising interest rates was given impetus by the MPC's decision to increase UK rates on 8 September 1999. This helped re-establish inversion of the yield curve. By the end of September the 5/30 year spread had reached 134 basis points.

The final three months of 1999 saw the first sustained rally in the gilts market since the start of the year, with yields falling along the curve until mid-November. The trend was led, as throughout the year, by long-dated gilts. The yield on 6% 2028 reached a record intra-day low of 4.01% on 5 November 1999 (the lowest recorded yield on a 30-year gilt since the 1950s). The impact of market rumours on the possible content of the review of the Minimum Funding Requirement played a significant part in moving yields at the long-end of the curve. All yields then began to rise, in increasingly thin trade towards the Millennium period, as continuing robust economic data led to a growing expectation of further interest rate increases early in 2000.

Gilts fell back in January 2000 (taking yields to 4-month highs) against the backdrop of continuing robust economic data, particularly in the UK and US, but rallied again in February, in part as further rate rises internationally were interpreted by the market as pre-emptive strikes against inflationary pressures. After a fairly quiet March, gilts ended the year on a weaker note, in part in response to market perceptions that the Budget on 21 March was expansionary. The overall shift in the yield curve over the year can be seen in chart 3 below.

Chart 3
Zero-coupon yield curves



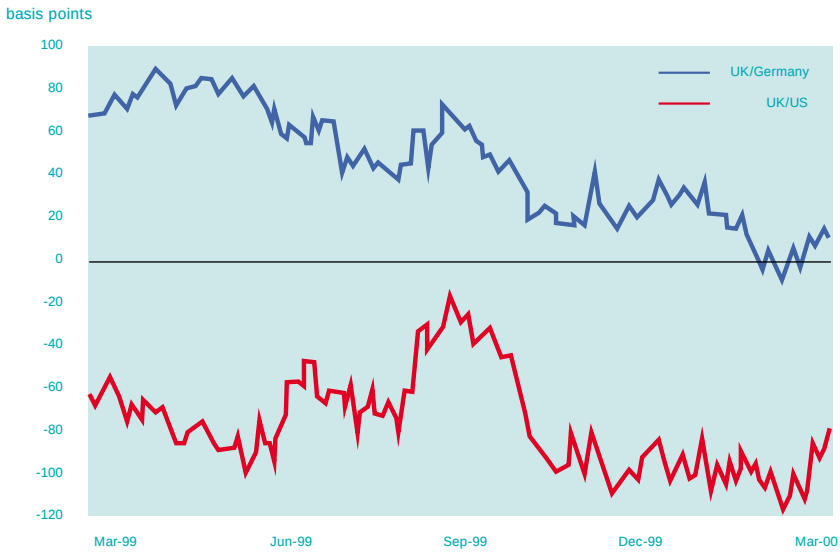
Source: DMO

International comparisons

Gilts outperformed major overseas bond markets over the financial year. At ten-year maturities, yields moved from 62 to 80 basis points below US Treasuries and closed from 64 basis points above to 10 basis points above German Bunds, having traded as much as 10 basis points under Bunds in early March 2000, reflecting in part incipient inflationary fears on the Continent and a weak euro. This was the first time since 1972 that 10-year gilts had traded through their 10-year German counterparts.

Chart 4 below shows the 10-year Gilt-Treasury and Gilt-Bund spreads in 1999-2000.

Chart 4
International 10-year spreads 1999-2000

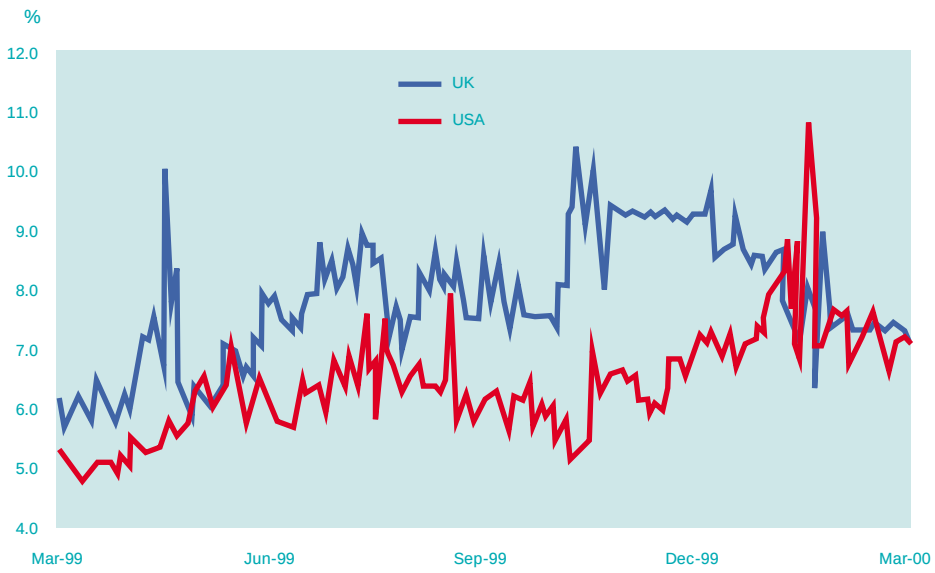


Source: DMO

Gilts market volatility

The chart below compares implied gilt market volatility (at around 10 years maturity) derived from option prices with US Treasury implied volatility. The volatility of bond prices can be used both as an indicator of uncertainty attached to prospective returns and market liquidity. The issue of liquidity is covered in more detail in chapter 5. In general, volatility increased in both the UK and US markets through 1999, with UK volatility above that in the US. The final quarter of the year saw a sustained fall in volatility with UK levels dropping toward those in the US.

Chart 5
Implied bond market volatility



Source: DMO

Index-linked gilts

Index-linked gilt yields generally mirrored the movement in conventional gilts through the year, but began the year more strongly, with yields falling for most of April 1999 before reversing ahead of increased supply prospects with the 30-year index-linked auction in late April. After the uncovered April auction, yields moved sharply higher and then continued to follow conventional bonds higher, through the summer and autumn, reaching peaks in late October 1999 before rallying alongside conventional bonds towards the end of 1999. Index-linked stocks ended the financial year underperforming conventional bonds after Budget projections of subdued inflation, and higher gilt (and corporate bond) supply than predicted.

As with conventional gilts, longer-dated maturities outperformed shorter- and medium-dated stocks, with the spread between 10- and 30-year index-linked gilts widening from 6 to 50 basis points over the course of the year. This again reflected structural institutional demand for longer-dated maturities.

The course of 10- and 30-year index-linked yields over the year can be seen in the chart below[2].

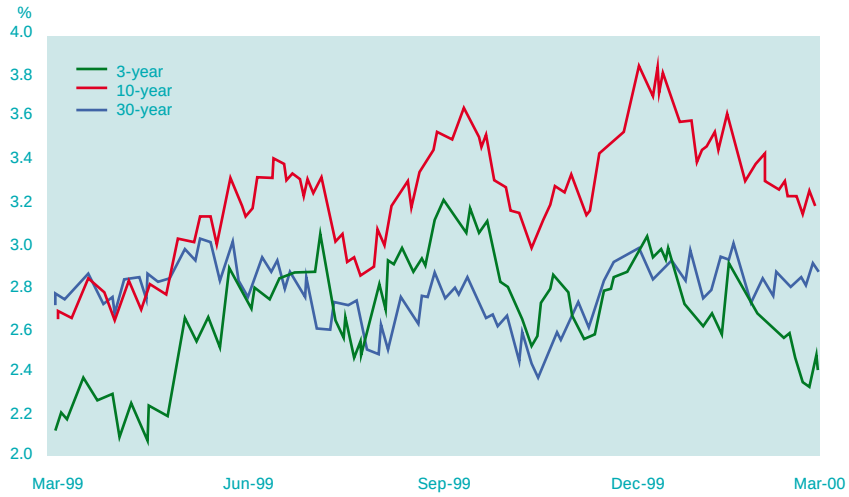
Chart 6
10- and 30-year index-linked real yields 1999-2000

Source: DMO

[2] Calculated using a 3% inflation assumption.

The chart below shows break-even inflation rates at 3-, 10- and 30-year maturities over the course of the financial year. 30-year rates remained fairly constant, but 3- and 10-year rates increased throughout the early part of the year as the expectation of interest rate increases grew. Rates fell back in the autumn as index-linked gilts rallied with conventionals, but then began to climb again as interest rate increases were digested, before peaking early in 2000. Increasingly benign interest rate expectations contributed to a general decline in rates toward the end of the financial year.

Chart 7
Break-even inflation rates 1999-2000



Source: DMO

Chapter 2: UK government financing

The DMO's annual remit, contained in the Debt Management Report published by HM Treasury each March, contains a projection of the required gilt sales for the coming financial year. It details the intended split between conventional and index-linked financing, including the maturity mix of conventional sales. This chapter reviews the remit for 1999-2000 and looks forward to the remit for 2000-2001.

The main feature of 1999-2000 was, as in the previous year, a declining gilt financing requirement, due to the continuing health of the public finances. Despite this, the Government delivered on its commitment to supply a minimum of £2.5 billion (cash) of index-linked gilts. In general, gilt sales were maintained at the expense of the level of the stock of short-term debt.

A) The financing remit for 1999-2000

The remit for 1999-2000, published on 9 March 1999, forecast gilt sales of £17.3 billion, based on a forecast central government net cash requirement of £6.2 billion, and a financing requirement of £21.0 billion. As in previous years, the underlying objective was to finance the central government net cash requirement plus maturing debt and any net finance required for the foreign exchange reserves through the issue of debt.

The financing requirement for 1999-2000 took account of the then scheduled transfer to the DMO of Exchequer cash management in the course of the year. This resulted in an increase in the planned level of Treasury bills and other short-term debt.

An innovation welcomed by the market was the provision in the 1999-2000 remit of an indication of how gilt issuance would be affected by specific changes to the financing requirement. In particular:

- Any increases or reductions to the financing requirement were to be accommodated first by an adjustment to the level of planned Treasury bill issuance of up to £3 billion;

- Any increases or reductions to the financing requirement of more than £3 billion would be accommodated through a combination of adjustment to the size and number of gilt auctions and, as necessary, changes to Treasury bill issuance (but in such a way that a minimum Treasury bill stock of £5 billion would be maintained);

- If the financing requirement were to increase or decrease by a sufficient amount to justify a change to the auction programme (and it was not too late in the financial year to make the change) the expectation was that the DMO would first add a long gilt auction (in the case of an increase in the financing requirement). If the financing requirement fell, the DMO would first cancel a short auction.

In the event, the first provision took effect from 20 April 1999, when the financing arithmetic was restated, following the publication of the outturn central government net cash requirement for 1998-99. The outturn, showing a surplus of £4.5 billion, was £1.8 billion higher than at the time of the Budget. The resultant increase in the residual over-financing adjustment contributed substantially to the reduction in the financing requirement to £19.3 billion. However, the volume of planned gilt sales remained unchanged at £17.3 billion, with the lower financing requirement being absorbed through a reduction in planned Treasury bill sales.

Table 1: The 1999-2000 gilt financing requirement (£ billion)*

	Budget 9 Mar 1999	20 Apr 1999	PBR 9 Nov 1999	Budget 21 Mar 2000	1999-2000 Outturn 20 Apr 2000
Central government net cash requirement (forecast)	6.2	6.2	1.1	-5.8	-9.2
Net financing for official reserves	2.4	2.3	2.3	2.2	2.2
Gilt redemptions	14.8	14.9	14.9	14.9	14.8
Gilt sales residual from 1998-99	-2.3	-4.1	-4.1	-4.1	-4.1
Financing requirement	**21.0**	**19.3**	**14.2**	**7.2**	**3.7**
Financed by:					
National Savings	0.1	0.1	-0.9	-1.0	-1.1
T- bills & other short-term debt	3.6	1.9	0.8	-5.7	-8.8
Gilt financing requirement	**17.3**	**17.3**	**14.2**	**13.8**	**13.6**
Gilt sales (net of secondary market purchases)				**13.8**	**13.6**

** figures may not sum due to rounding.*

On 9 November 1999, a revised forecast for the central government net cash requirement of £1.1 billion for 1999-2000, was published in the Pre-Budget Report. This change, with a revised contribution from National Savings of -£0.9 billion compared to +£0.1 billion at the time of the 1999 Budget, reduced the financing requirement by £5.1 billion, to £14.2 billion. However, planned gilt sales were reduced by only £3.1 billion – involving the cancellation of the March 2000 conventional auction. The difference was accounted for by a further reduction in planned Treasury bill sales.

Planned gilt sales fell to a range of £13.8-£14.6 billion, leaving some room for manoeuvre for the DMO in setting the size of the then remaining conventional and index-linked auctions.

The 2000 Budget included a new forecast for the 1999-2000 central government net cash requirement of a surplus of £5.8 billion. This reduced the Government's estimated financing requirement to £7.2 billion. Gilt sales by the time of the 2000 Budget were already £13.8 billion, resulting in a further reduction in the level of Treasury bills and other short-term debt.

The publication of the outturn of the central government net cash requirement for 1999-2000 on 20 April 2000 showed a further increase in the size of the surplus to £9.2 billion, reducing the financing requirement to £3.7 billion. Outturn gilt sales were £13.6 billion (net sales having fallen towards the end of the 1999-2000 financial year as a result of purchases by central government bodies).

Gilt sales

The breakdown of planned net gilt sales by type across the year was as shown below:

Table 2: Planned gilt sales 1990-2000

Gilt type	March 1999 remit (£bn)	November 1999 remit (£bn)	Outturn (£bn)
Short conventional	5.0	2.4	2.0
Medium conventional	3.0	2.8	2.6
Long conventional	5.8	5.8 - 6.2	6.0
Index-linked	3.5	2.9 - 3.3	3.0
Total	**17.3**	**13.8 - 14.6**	**13.6**

A major factor contributing to final net gilt sales of £13.6bn were secondary market purchases of short-dated gilts by central government bodies - in particular the Commissioners for the Reduction of the National Debt (CRND). The impact of such purchases (totalling £0.6 billion) on the cash proceeds raised from gilt auctions (and the tap) can be seen from the table below:

Table 3: Gross and net gilt sales

Gilt type	Gross sales (£bn)	Net sales (£bn)
Short conventional	2.4	2.0
Medium conventional	2.7	2.6
Long conventional	6.1	6.0
Index-linked	3.0	3.0
Total	**14.2**	**13.6**

Gilt auctions

The 1999-2000 remit published with the 1999 Budget included a calendar for five conventional and four index-linked auctions on the following dates:

Gilt auction calendar 1999-2000

Date	Stock
Wednesday 28 April 1999	Index-linked
Wednesday 26 May 1999	Conventional
Wednesday 23 June 1999*	Conventional
Wednesday 28 July 1999	Index-linked
Tuesday 28 September 1999	Conventional
Wednesday 27 October 1999**	Index-linked
Wednesday 24 November 1999**	Conventional
Wednesday 26 January 2000	Index-linked
Wednesday 29 March 2000**	Conventional

** changed to Tuesday 22 June 1999 following consultation with the market and a wish to avoid the publication on 23 June of the June 1999 MPC minutes.*

***subject to confirmation following the Chancellor's decisions on the budgetary timetable.*

The final scheduled conventional auction was cancelled at the time of the publication of the Pre-Budget Report on 9 November 1999. Two of the four conventional auctions held were of the 30-year benchmark 6% 2028 (accounting for £5.6 billion of long conventional gross gilt sales). The remaining £0.5 billion of long issuance was accounted for by the tap issue on 6 August 1999, which was held in response to exceptionally difficult trading conditions at the long-end of the gilt curve.

The other two conventional auctions were of the new 5-year benchmark 5% 2004, subsequently built up by a conversion offer announced at the same time as the details of the auction and a switch auction (see below) and the 10-year benchmark $5^{3}/_{4}$% 2009. All four index-linked gilt auctions were held as planned, and the Government maintained its commitment to a minimum supply of at least £2.5 billion (cash) of index-linked gilts for the foreseeable future.

Table 4: Results of gilt auctions held in 1999-2000

Date	Stock	Nominal issued £bn	Cover	Yield tail (bp)	Lowest accepted price (LAP)	Yield at LAP
28 April 1999	$4^{1}/_{8}$ % IL 2030	0.5	0.94	*	£179.34	1.97%
26 May 1999	6% 2028	2.5	2.24	2	£120.20	4.72%
22 June 1999	5% 2004	2.5	2.01	2	£98.70	5.30%
28 July 1999	$2^{1}/_{2}$% IL 2011	0.375	1.93	*	£225.50	2.19%
28 September 1999	$5^{3}/_{4}$% 2009	2.75**	2.54	1	£100.30	5.71%
27 October 1999	$2^{1}/_{2}$% IL 2016	0.35***	2.65	*	£204.61	2.34%
24 November 1999	6% 2028	2.0	1.79	2	£128.60	4.27%
26 January 2000	$2^{1}/_{2}$% IL 2024	0.35***	2.54	*	£187.01	1.93%

** Index-linked gilts are issued through a uniform price auction format.*

*** Includes £200mn created for the 8% Treasury 2009 switch facility (see below).*

**** In both cases an additional £0.02 bn nominal was issued for separate sale to CRND.*

Table 5: Result of conventional gilt tap issue in 1999-2000

Date	Stock	Nominal issued (£bn)	Price when exhausted	Yield when exhausted
6 August 1999	6% 2028	£0.4	£125.30	4.45%

The Government had aimed to issue about 20 per cent of gilt sales in index-linked stocks. In practice, such issuance accounted for 22 per cent of total sales. For the second successive year conventional gilt issuance was weighted towards long-dated gilts, which accounted for 43 per cent of all gilt sales and 57 per cent of conventional gilt sales. The overall breakdown was as follows:

Table 6: Breakdown of gilt sales 1999-2000

Type	% of total issuance	% of conventional issuance*
Short conventional	15	19
Medium conventional	19	25
Long conventional	44	57
Index-linked	22	-

** figures may not sum due to rounding*

Conversion offer

One conversion offer was held during the financial year, from 9½% 2004 into the then recently issued 5% 2004, in order to enhance its benchmark status. The offer opened on 1 July and settled on 26 July 1999. The main results of the offer are summarised in the table below.

Table 7: 9½% 2004 into 5% 2004 conversion offer

Type	Source gilt 9½ % 2004	Destination gilt 5% 2004
Nominal in issue before offer	£3,412 million	£2,500 million
Acceptances received	£3,105 million (91%)	-
New stock created	-	£3,789 million
Nominal in issue after offer	£307 million	£6,289 million

Switch auctions

The size of 5% 2004 was subsequently increased further by the first gilt switch auction which was held on 21 October 1999, following a consultation exercise with the market in the summer.

The DMO announced on 12 October 1999 its intention to auction 5% 2004 in exchange for up to £1 billion (nominal) of 8% 2003 on a bid-price basis. The offer was covered 5.13 times with an average bid-price for 5% 2004 of £94.75. £1.12 billion (nominal) of 5% 2004 was issued against a purchase of £999.6 million (nominal) of 8% 2003. The nominal in issue of 5% 2004 was increased to £7,408 million (nominal) as a consequence.

The second switch auction, of £1,500 million (nominal) of 8% 2015 in exchange for 6% 2028, was held on 9 February 2000. The offer was covered 1.44 times with an average bid-price for 6% 2028 of £122.03. £1,611.7 million (nominal) of 6% 2028 was issued against a purchase of £1,499.8 million (nominal) of 8% 2015. The nominal in issue of 6% 2028 was increased to £11,512 million (nominal) and the amount of 8% 2015 reduced to £12,287 million (nominal).

8% 2009 for 5¾% 2009 switch facility

On 20 September 1999 the facility which had been in place since 11 January 1999 to allow holders of 8% 2009 to switch into 5¾% 2009 was closed. The facility had been introduced in response to requests from market makers to address illiquidity in 8% 2009, which was left with £560 million (nominal) in issue (too large to be declared a rump stock) after a conversion offer from 8% 2009 into 5¾% 2009 in November 1998.

During the eight months the facility was open £167 million (nominal) of 8% 2009 was switched against £197 million (nominal) of 5¾% 2009, reducing the amount of 8% 2009 available in the market to £393 million (nominal). 8% 2009 was declared a rump stock on 21 September 1999 (as was the undated 4% Consolidated Stock).

£400 million (nominal) of 5¾% 2009 was created at the launch of the facility to be available for switching. £203 million (nominal) remained unused at the end and £200 million (nominal) of this was added to the amount of 5¾% 2009 created for auction on 28 September 1999; taking the auction amount to £2,750 million (nominal).

Gilt maturities

£14.846 billion of gilts in market hands matured in 1999-2000.

Table 8: Gilt maturities 1999-2000*

Date	Gilt	Nominal in issue (£mn)	Nominal in central government hands (£mn)	Redemption amount (£mn)
26 March 1999	12¼% 1999			38**
19 May 1999	10½% 1999	1,252	15	1,237
10 August 1999	6% 1999	6,950	476	6,474
22 November 1999	10¼% 1999	1,798	15	1,783
22 November 1999	2½% IL 1999	2	0	2
28 January 2000	8½% 2000	109	93	17
3 March 2000	9% 2000	5,358	42	5,317
Less late redemptions carried into 2000-01				*-22*
Total				**14,846**

** figures may not sum due to rounding*

*** late redemption of a small proportion of a 1998-99 maturity.*

Net gilt issuance

Net gilt issuance in 1999-2000 was therefore -£1.2 billion (£14.2 billion issued less £14.8 billion redemptions and £0.6 billion of secondary market purchases).

B) The financing remit for 2000-01

The DMO's gilt remit for 2000-01 was published in the Debt Management Report on 21 March 2000, following the Chancellor's Budget statement. (For the first time a separate Exchequer Cash Management remit was also published - see below). On the basis of a forecast central government net cash requirement surplus of £4.9 billion in 2000-01, gilt sales of £12.2 billion were planned. The remit is re-produced in full in Annex B.

Financing of official reserves

A significant contribution to the financing requirement (£3.5 billion) is planned to come from financing of official reserves. The Government decided:

- as in 1999-2000, to refinance foreign currency reserves maturing in the current year by additional gilts issuance. These total €4.5 billion, (€2 billion in January 2001 and €2.5 billion in February 2001) equivalent to £2.8 billion at then prevailing exchange rates. These debts need to be refinanced to maintain foreign currency reserves at their current level. Given the current spread between the gilt yield curve and the sterling swaps curve, swapping out of gilts continues to be a more cost-effective method of financing the foreign currency reserves than borrowing directly in foreign currency;

- to replace $1.2 billion of forward contracts to purchase foreign currency with spot foreign currency reserves, equivalent to £0.8 billion at then prevailing exchange rates.

Debt buy-backs

A further significant addition to the financing requirement is scheduled to come from planned buy-backs of £3.5 billion of less liquid, shorter maturity gilts in market hands. At least £2.5 billion will be purchased through reverse auctions of non-strippable conventional gilts with over £1 billion in issue and maturities in calendar years 2003 to 2008. The DMO undertook to consult the market about the methodology to be adopted in such auctions before launching any buy-backs.

Between them, these transactions are scheduled to add some £7 billion to the financing requirement in 2000-01. This will enable further issuance of gilts into benchmark stocks particularly at the long-end, and complement conversion offers and switch auctions as instruments for maintaining liquidity along the yield curve, which in turn should help minimise the Government's future costs of borrowing, when the financing requirement is expected to be higher.

Short-term debt for cash management

The financing requirement for 2000-01 took account of the DMO's new responsibility for Exchequer cash management. It was intended that the transfer would be accompanied by an increase in the stock of Treasury bills. The planned stock of Treasury bills and other short-term debt had run down in 1999-2000 as the central government net cash requirement moved progressively into surplus, and gilt sales were largely maintained. At the time of the 2000 Budget, the extent of this reduction was estimated at £9.5 billion – the unwinding of this reduction appears as the gilt sales residual in the financing arithmetic. Underlying this was a planned increase in the stock of Treasury bills to £10 billion by the end of March 2001.

Remit contingencies

As in 1999-2000, the remit indicated how gilt issuance would be affected by changes to the financing requirement. However the contingencies set out were more extensive than the previous year and were primarily focussed at protecting the level of gilt issuance against a possible falling financing requirement in 2000-01, in an attempt to give some certainty of gilt supply to the market.

The remit identified contingencies totalling £9.7 billion (at prevailing exchange rates), which could be triggered if the financing requirement fell (although no priorities were given as to which of the contingencies would be triggered first):

- pre-financing foreign currency debt due to mature in 2001-02 (up to £3.8 billion) and 2002-03 (up to £1.9 billion);
- some repayment of the Ways and Means facility at the Bank of England (up to £2 billion);
- reducing the assumed level of Treasury bill stock at end-March 2001 (by up to £2 billion).

In the event that the financing requirement increased in 2000-01, the following contingencies were also identified:

- first, scaling back the debt buy-back programme, and;
- second, increasing the stock of Treasury bills by up to £5 billion;
- third, scheduling additional gilt auctions.

The planned breakdown of gilt sales (March 2000 remit)

The focus of planned gilt sales was heavily directed to longer-dated issuance, reflecting structural demand. The breakdown was:

Table 9: Planned gilt sales (cash) in 2000-01 (2000 Budget)

Gilt type	£bn
Short conventional	0.0
Medium conventional	2.2
Long conventional	6.5
Index-linked	3.5
Total	**12.2**

Revision to the remit on 20 April 2000

The publication of the outturn of the central government net cash requirement for 1999-2000 on 20 April 2000 showed a surplus of £9.2 billion (£3.4 billion higher than at the time of the Budget). The main consequence of this was to further increase the gilt sales residual from 1999-2000 to £12.8 billion, contributing in turn to a £3.3 billion reduction in the financing requirement in 2000-01 to £7.9 billion.

However, planned gilt sales remained unchanged at £12.2 billion as a result of the implementation of some of the contingencies outlined above. The contingencies implemented involved a total reduction of £3.3 billion in the following planned levels of short-term debt in 2000-01:

- a reduction of £2 billion in the planned end-year level of the Ways and Means facility at the Bank of England (to £15 billion).
- a reduction of £1.3 billion in the planned end-year level of the Treasury bill stock (to £8.7 billion).

At the same time that the DMO announced the triggering of the above remit contingencies, it also reported the expectation that HM Treasury would further revise the 2000-01 remit once the size and timing of the 3G radio spectrum auction was clear. The auction had not finished by 20 April but the size of the cash proceeds was by then large enough to imply a significant reduction in the Government's financing requirement in 2000-01.

Impact of Spectrum proceeds on the 2000-01 Remit

Total receipts from the auction of 3G radio spectrum licences in 2000-01 are forecast to be £22.5 billion – over 7 times the £3 billion assumed in the 2000 Budget forecast. The receipts are all expected to flow through to the central government net cash requirement in 2000-01, providing cash receipts £19.5 billion in excess of those estimated in the Budget.

As a result, HM Treasury set out the impact on the financing requirement in a reply to a Parliamentary question on 12 June 2000. Planned gilt sales were reduced by £2.2 billion, to £10.0 billion with the scheduled September conventional gilt auction being cancelled. £2.2 billion of planned medium maturity conventional gilt issuance was cancelled.

All the remaining contingencies outlined in the original remit were triggered: a further £5.9 billion of pre-financing of foreign currency debt and a further £0.7 billion reduction, to £8 billion, in the planned level of the Treasury bill stock at end-March 2001.

The reduction in planned gilt sales and the exercise of the remaining contingencies accounted for £8.8 billion of the £19.5 billion additional spectrum proceeds, leaving £10.7 billion to be used to reduce the levels of net short-term debt. No decisions will be taken on the composition of this reduction until the Pre-Budget Report expected in the autumn.

The table below shows the financing arithmetic as presented in the Budget and as updated on 20 April and 12 June.

Table 10: 2000-01 Gilt financing arithmetic (£billion)

(figures may not sum due to rounding)

	Buget 21 March 2000	**20 April 2000**	**12 June 2000**
Central government net cash requirement forecast	-4.9	-4.9	-4.9
Impact of spectrum receipts			-19.5
Replacing foreign currency debt*	3.5	3.5	9.5
Gilt redemptions	18.6	18.6	18.6
Debt buy-backs	3.5	3.5	3.5
Residual from 1999-2000	-9.5	-12.8	-12.8
Financing requirement	**11.2**	**7.9**	**-5.6**
Less			
National Savings contribution	-0.8	-0.8	-0.8
DMO cash deposit at Bank of England	-0.2	-0.2	-0.2
Origional short-term debt contingencies			
Repayment of Ways and Means	-	-2.0	-2.0
Reduction in planned Treasury bill stock	-	-1.3	-2.0
Further reductions in net short-term debt			-10.7
Gilt sales planned	**12.2**	**12.2**	**10.0**
Of which:			
Short conventionals	0.0	0.0	0.0
Medium conventionals	2.2	2.2	0.0
Long conventionals	6.5	6.5	6.5
Index-linked	3.5	3.5	3.5

**including original remit financing (worth £3.6bn on 12 June 2000) and implementation of contingencies (worth £5.9 bn) both estimated at current exchange rates.*

The table below shows the planned mix of gilt sales under the 2000-01 remit and the progress of sales (£bn cash) to the end of June.

Table 11: Gilt sales to end June 2000

Gilt type	Remit	Sales at auctions	Market purchases (net)
Short conventional	0.0	0.0	0.2
Medium conventional	0.0	0.0	0.1
Long conventional	6.5	2.4	0.0
Index-linked	3.5	0.8	-0.1
Total	**10.0**	**3.2**	**0.2**

The revised gilt auction calendar for 2000-01 was as follows.

Date	Type
Wednesday 3 May 2000	$2^{1}/_{2}$% IL 2020
Wednesday 24 May 2000	$4^{1}/_{4}$% 2032
Wednesday 26 July 2000	$2^{1}/_{2}$% IL 2013
Wednesday 25 October 2000*	Index-linked
Late November/early December 2000*	Conventional
Wednesday 24 January 2001	Index-linked
Wednesday 28 March 2001*	Conventional

** subject to confirmation following the Chancellor's decisions on the Budgetary timetable.*

C) The gilt portfolio

In nominal terms there were £290.6 billion of gilts outstanding at the end of March 2000 (including the inflation-uplift on index-linked gilts). This was a reduction of £1.2 billion (0.4%) on the amount outstanding at the end of March 1999, reflecting the excess of redemptions over new issuance. The market value of the portfolio, however, fell by £15.5 billion (4.5%) reflecting lower gilt prices.

Table 12: The gilt portfolio 1999-2000

	31 March 1999	31 March 2000
Nominal value[3]	£291.8bn	£290.6bn
Market value	£347.4bn	£331.9bn
Weighted average market yield:		
Conventional gilts	4.65%	5.57%
Index-linked gilts	1.96%	2.31%
Average maturity	10.45 years	10.57 years
Average modified duration	7.4 years	7.4 years
Average coupon[4]	7.99%	7.79%

[3] Including IG uplift.
[4] Of conventional, double-dated and undated gilts.

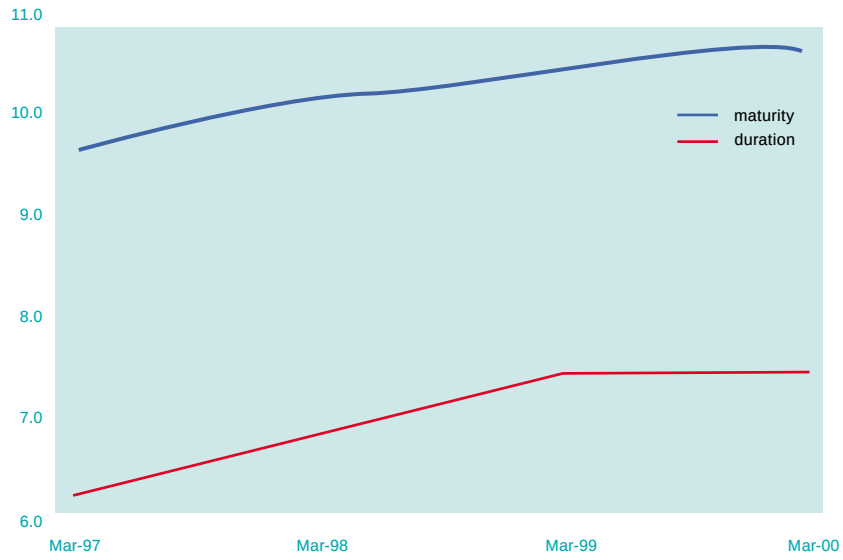
The breakdown of the portfolio by maturity at the end of March 2000 compared to a year earlier is shown in the table below.

Table 13: Maturity composition of the gilt portfolio

%	31 March 1999	31 March 2000
Ultra-short (0-3 years	18.8	19.7
Short (3-7 years)	24.0	26.6
Medium (7-15 years)	32.8	26.7
Long (15+ years)	23.3	25.9
Undated	1.1	1.1

The chart below shows how the maturity and modifed duration of the gilt portfolio has changed over the past three years. Both have shown rising trends, with portfolio maturity rising from 9.68 years to 10.57[5] years and modified duration rising from 6.23 to 7.41 years, both reflecting the recent bias towards longer-dated issuance.

Chart 8
Portfolio maturity and duration (years) 1997-2000



Source: DMO

[5] These numbers have been calculated using a different methodology than the previous DMO publications (before the Q2 2000 Quarterly Review). The DMO now calculates portfolio maturity by weighting by market as opposed to nominal value.

Chapter 3: Gilts market developments

Gilt-edged Market Makers

During 1999-2000, the number of recognised Gilt-edged Market Makers (GEMMs) was increased to 17, with the formation of Intercapital Gilt Trading who specialise in providing market making services to the retail end of the market (including acting as an index-linked Gilt-edged Market Maker). This development has been helpful in extending gilts market services to the wider investing community. Of the 17 GEMMs currently active in the market, 9 are index-linked market makers.

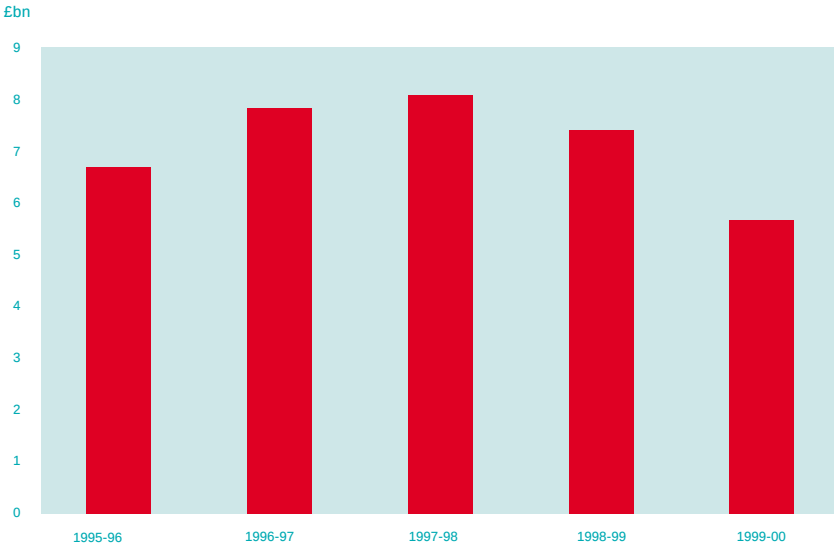
Inter-Dealer Brokers

Amongst the gilt-edged Inter-Dealer Brokers (IDBs), Garban ceased trading following its merger with Intercapital-WCLK, but Dowgate, a subsidiary company of King & Shaxson Bond Brokers Ltd. started business as an IDB shortly afterwards.

Gilts market turnover

In 1999-2000 market turnover in gilts fell by 23% to £1.4 trillion, or £5.7 billion per day, compared to 1998-99. Chart 9 below shows the trend over the last five years.

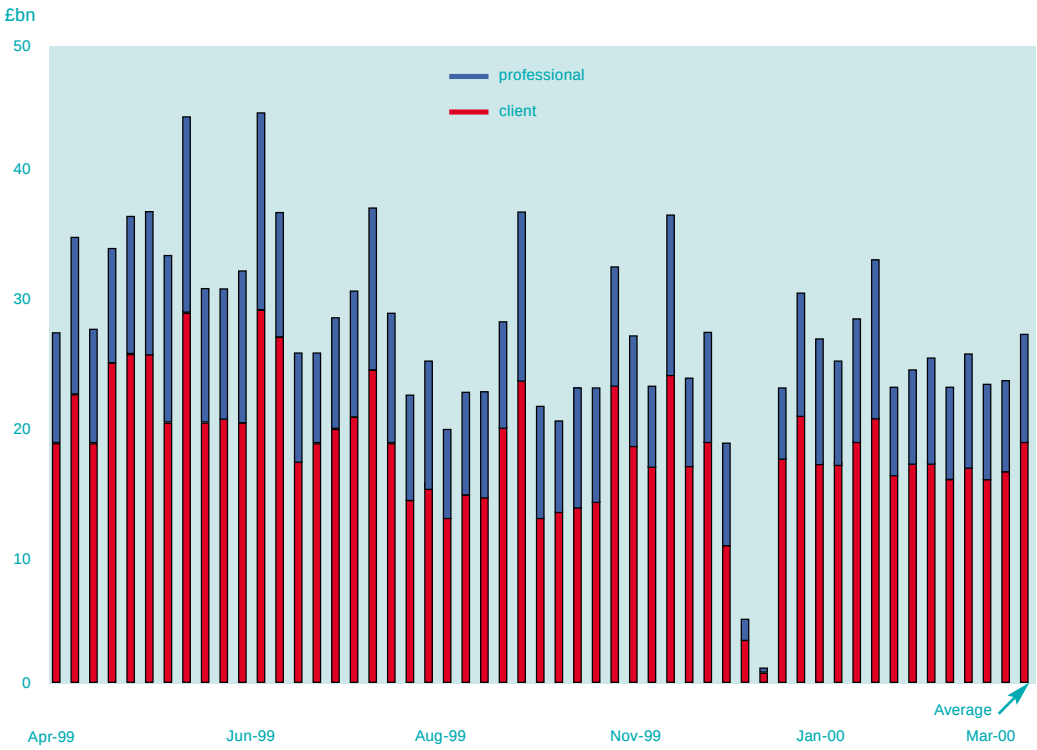
Chart 9:
Average daily turnover in UK government bonds (£bn)



Source GEMMs

The average weekly turnover of gilt trades through Gilt-edged market makers in 1999-2000 was £27.4 billion. Chart 10 below shows the weekly aggregates through 1999-2000 broken down by professional and client trades. The volume of 'customer' business has declined from a peak weekly average of nearly £27 billion in October 1998, to a level in June 2000 of around £15 billion per week[5]. This chart also shows the extent of the Y2K "lock-down".

Chart 10:
Aggregate daily turnover of all GEMMs (week by week basis)



Source: GEMMs

Gilts market turnover data is currently published by the DMO on a quarterly basis in the Quarterly Review and on an annual basis in this publication. The London Stock Exchange also publishes gilts market turnover data via its secondary market factsheet – available on its website, www.londonstockex.co.uk - and by subscription.

Volumes in the long gilt future tell a similar story. This decline in market activity is in part a reflection of the low level of issuance, but there is also considerable anecdotal evidence to suggest that intermediaries have become much less willing to take risk positions. This is no doubt a continuing reflection of the problems of hedge funds in Autumn 1998 and that investors have become more driven to follow buy-and-hold strategies for regulatory or internal reasons. The lack of liquidity itself may inhibit the willingness of some peripheral investors to research the market.

The DMO will continue to try and address these issues in its programme of issuance, switch auctions and conversions, as discussed in chapter 2 above. For a more detailed analysis on gilts market liquidity see chapter 5 below.

---

[6]According to figures reported to the DMO by the GEMMs.

Remit flexibility

An innovation welcomed by the market was the provision in the 1999-2000 remit of an indication of how gilt issuance would be affected by specific changes to the financing requirement. These provisions are described in chapter 2 (pages 8-9 above).

The concept of remit flexibility was added to in the 2000-01 remit with the publication of a quantified series of contingencies should the financing requirement fall (or rise) significantly. Given the unexpected size of the receipts from the auction of 3G Spectrum licences – all the contingencies were triggered on 12 June 2000. This is discussed in more detail in chapter 2 (pages 16-17 above).

Switch auctions

The remit for 1999-2000 envisaged the DMO launching a process of switch auctions, subject to consultation with the market. On 7 July 1999 the DMO published its proposals for the conduct of switch auctions and following consideration of feedback, published its final proposals on 13 September 1999.

Switch auctions are seen as a further tool to build-up benchmark gilts in addition to conversion offers, at a time of low primary issuance (new stocks will not be launched through a switch auction). Switch auctions will be for between £½-2 billion (nominal) of the source stock. Only stocks within the same maturity bracket (0-7 years, 5-15 years, or 14 years or longer) are eligible for switching. Auctions are held on a competitive bid basis, with the DMO first publishing an indicative clean price for the source stock. GEMMs then bid a quantity of the source stock and a clean price for the destination stock.

The DMO will consult the market quarterly about the identity of future switch auction candidates and announce their decisions in the regular quarterly auction announcements alongside outright auctions.

Strippable gilts

A further stock was added to the list of strippable stocks in 1999-2000, the new 5-year benchmark 5% Treasury 2004. This took the number of strippable gilts in issue to eleven, with a total of £116.4 billion nominal in issue (of which £2.45 billion was held in stripped form at the end of March 2000).

Table 14: List of strippable gilts - amounts in issue and stripped (at 31 March 2000)

Gilt	Redemption Date	Amount in issue (£m nominal)	Amount stripped (£m nominal)	% of issue
8% Treasury 2000	7 December 2000	9,800	88	0.9
7% Treasury 2002	7 June 2002	9,000	206	2.3
$6^{1}/_{2}$% Treasury 2003	7 December 2003	7,987	94	1.2
5% Treasury 2004	7 June 2004	7,408	1	0.0
$8^{1}/_{2}$% Treasury 2005	7 December 2005	10,373	465	4.5
$7^{1}/_{2}$% Treasury 2006	7 December 2006	11,700	304	2.6
$7^{1}/_{4}$% Treasury 2007	7 December 2007	11,000	294	2.7
$5^{3}/_{4}$% Treasury 2009	7 December 2009	8,827	81	0.9
8% Treasury 2015	7 December 2015	12,287	179	1.5
8% Treasury 2021	7 June 2021	16,500	448	2.7
6% Treasury 2028	7 December 2028	11,512	294	2.6
Total		**116,394**	**2,454**	**2.1**

Standing repo facility

The DMO issued a paper to the market in September 1999, clarifying the conditions under which the DMO would undertake a special repo operation and seeking market participants' views on whether an automatic facility would be useful. As a result of comments received, the DMO introduced an automatic facility on 1 June 2000. The facility will be available to all DMO counterparties, who have signed the relevant documents, at a penal rate of 10% of the Bank of England's repo rate, charged on an overnight basis. Any such repo operations would involve a simultaneous reverse repo with the counterparty at the General Collateral rate, and as a result would be cash neutral for the Exchequer. The stock(s) and amount(s) involved in such transactions would be announced to the market at the time.

CGO/CREST merger

The transfer of ownership and responsibility for the existing CGO service from the Bank of England to CRESTCo took effect on 24 May 1999. This marked the first step in transferring gilts settlement to CRESTCo. The Bank continued to operate and support CGO on CRESTCo's behalf until the migration of gilts activity into CREST was complete. Gilts settlement activity successfully migrated from the Bank of England to CRESTCo on the weekend of 1-2 July 2000.

CRESTCo intends to introduce full delivery versus payment (DVP) into its settlement system by the end of 2001. This will result in all CREST transactions being settled in central bank money (rather than settlement bank money). This will eliminate the very large exposures that settlement banks acquire to each other in the course of the day.

Settlement in central bank money will be partially facilitated by the self-collateralisation of many gilt transactions. Self-collateralisation will involve the simultaneous repo of gilt stock to one of the settlement banks, and onward to the Bank of England, in return for central bank money to pay for the purchase of that stock.

A number of working groups are currently developing the specifications of the new system, are considering how market participants' behaviour will impact on the demand for liquidity at any one time and are modelling members' intra-day demand for liquidity. Further details are available from CRESTCo.

LIFFE

The two gilt futures contracts, the long gilt and five-year contract, began trading on LIFFE's electronic trading platform, Connect, on 12 April 1999 (ending the previous open-outcry trading environment). The short-sterling interest rate futures contract was added to the system on 6 September 1999.

Activity in the long gilt futures contract has declined significantly in the financial year 1999-2000. Average daily volumes have fallen from a peak of 48,393 in May 1999 to 20,593 in March 2000. Unsurprisingly, the trough in volumes occurred in December 1999 at an average daily volume of 12,706 contracts.

In addition, in response to comments from market participants, LIFFE introduced a block trading facility for financial futures. This enables participants to negotiate large trades bilaterally off-screen and just report the completed transaction to LIFFE. This is one of a suite of wholesale trading products offered by LIFFE.

Impact of electronic trading systems on the secondary market for gilts

The DMO issued a consultation paper on 24 January 2000 on how the DMO's relationship with the GEMMs might change as a consequence of the possible introduction of electronic trading systems to the gilts market. These systems could greatly benefit market transparency, but there is a risk that they could lead to some fragmentation of the market, undermining the DMO's objective of maintaining a liquid, efficient and orderly gilts market.

The paper explored whether the current arrangements are still appropriate and how they might be modified to achieve the same end-investor access and ease of execution at tight prices across the full range of gilts in a trading environment characterised by electronic trading systems. It did not come to a firm conclusion but sought market views on a number of possible approaches and the implications arising. The consultation period ran until 3 March 2000. The DMO published its response on 23 June 2000.

Following a review of the responses the DMO proposed, in line with the balance of views expressed by the GEMMs and other market participants, that an inter-GEMM market with quote obligations in a set of designated benchmarks be established. The proposal would require the GEMMs to provide firm quotes in a subset of gilts in minimum size on a continuous basis to each other. This market would only be available to the GEMMs who would trade on a fully anonymous basis and would represent an extension to the existing IDB structure.

However, given that the DMO would not expect all GEMMs, particularly those specialising in servicing the retail investor, to be in a position to meet the mandatory quote obligations in the inter-GEMM market, the DMO intends that GEMMs can apply to be classified as specialist retail GEMMs (RGEMMs). The DMO would expect RGEMMs to be able to access the inter-GEMM market on some basis, perhaps as price-takers. The precise benefits and obligations of RGEMMs will be determined in due course following further consultation with the market.

The DMO believes that a committed market between the GEMMs will improve their access to liquidity and aid them in fulfilling their wider market-making obligations. The DMO hopes that the existence of this central committed market will facilitate and encourage the development of a range of other electronic trading initiatives in the wider market. Additionally, it hopes that this model will make it more likely that entry barriers facing prospective GEMMs remain at an acceptable level, maintaining a high degree of competition in the provision of market-making services.

In a similar vein, a number of the GEMMs added gilts to their single dealer platforms, providing firm quotes to their clients. The DMO would expect the number of these services offering gilts to grow in the coming year.

Benchmark gilt price screen published by the DMO

The DMO is developing a real-time benchmark gilt price screen, which it aims to make available on its wire service pages in the near future. It is envisaged that the prices shown will be indicative mid-prices based on GEMMs' published quotes. The DMO plans to make this service available on a 'best endeavours' basis in order to promote transparency in the gilts market. Those wishing to deal in gilts should continue to contact a GEMM for a firm bid or offer price.

DMO Publications

In addition to the annual Gilt Review, the 1998-99 version of which was published by the DMO on 30 July 1999, the DMO also publishes a quarterly review early in each month following the previous quarter (January, April, July and October). These publications review developments in the gilts market set in both the national and international context and provide updated information on the gilt portfolio and central government holdings. From April 2000, they also covered the DMO's Treasury bill issuance.

On 30 September 1999 the DMO published 'Gilts: an Investor's Guide', aimed primarily at the institutional investor. The guide complements a retail investors' guide published jointly by the DMO and the Bank of England in June 1998. These publications are available on the DMO website.

As an Executive Agency of HM Treasury the DMO is obliged to publish its Annual Report and Accounts. In addition to the accounts themselves this publication covers the DMO's performance against targets as well as briefly reviewing gilts market developments. The DMO's first Annual Report and Accounts, for 1998-99 was published on 29 October 1999 and that for 1999-2000 on 26 July 2000.

DMO website

The DMO's website can be found at www.dmo.gov.uk and has been configured in a way that is intended to be as beneficial to its readership as possible. At present it comprises:

- information regarding the structure and organisation of the DMO;
- the Debt Management Report, including the DMO's financing remit;
- the gilt auction calendar;
- copies of the DMO's major publications;
- all major announcements and press releases;
- static data relating to the gilts market including the current gilt stock list and gilt ISIN and SEDOL codes.

Although fully functional, the site is still under development and the DMO is expanding coverage on the site to include specific information on index-linked gilts, information for retail investors in gilts and on the DMO's Exchequer cash management operations. Plans are also in place to incorporate an on-line user operable database providing both the market and the general public with easy access to useful information about developments in the gilts market, including historic gilt prices, yields and auction history.

Chapter 4: The transition to Exchequer cash management

The assumption of full responsibility for Exchequer cash management by the DMO on 3 April 2000 represented a significant development in the structure of the sterling money markets in London.

The move completed the restructuring of Government debt and cash management foreshadowed in the Chancellor's statement of 6 May 1997, announcing that the responsibility for the setting of official interest rates was being transferred from the Treasury to the Bank of England. The Chancellor also decided that the Bank's role as the Government's agent for debt and cash management and role as banker to Central Government departments was to be transferred to HM Treasury.

The transfer of debt management took place on 1 April 1998 when the DMO began operation. Following the transfer of Exchequer cash management to the DMO, the Bank of England continues with its responsibility for operations in the London money markets relating to its monetary policy objectives.

The DMO consulted the market closely during the development of the new cash management framework. A detailed description of the new framework was published on 4 December 1998 and the first version of the DMO's operational notice on 29 July 1999. An updated version of the operational notice was published on 6 January 2000.

Responsibility for cash management was transferred two years after debt management to cater for the development and introduction of new support systems. Latterly the transfer was delayed until the end of Q1 2000 to take account of the market's preference to avoid the transfer being too close to the 'lock down' period around the Millennium.

To ensure a smooth transition to the new arrangements the features of the new regime have been phased in. The Debt Management Account, through which all the DMO's gilt and cash transactions now pass, came into operation on 15 November 1999 (dealing initially with gilt transactions only).

On 14 January 2000, the DMO took over responsibility from the Bank for the conduct of weekly ('structured') Treasury bill tenders, although the Bank retained responsibility for determining the size and maturity of the tenders until the transfer of cash management was completed.

On 14 February 2000 the DMO began bilateral dealing with its counterparties in the money markets, in small size, with the aim of helping to balance the daily flows of cash into and out of the Exchequer accounts at the Bank of England. During this period, the Bank retained final responsibility for balancing the Exchequer flows daily.

On 3 April 2000 responsibility for all Exchequer cash management transferred fully from the Bank to the DMO.

The results of the Treasury bill tenders carried out by the DMO under the transitional arrangements were as shown in the following table.

Table 15: Treasury bill tenders: January-March 2000

Date	Maturity	Size	Cover	Alloted	Average yield %	Average price
14 Jan	3 month	£100mn	9.75	£100mn	5.7250	£98.593
21 Jan	3 month	£100mn	8.70	£100mn	5.8390	£98.550
28 Jan	3 month	£100mn	6.30	£100mn	5.8496	£98.547
4 Feb	3 month	£100mn	9.20	£100mn	5.8860	£98.554
11 Feb	3 month	£100mn	5.55	£100mn	5.9200	£98.546
18 Feb	3 month	£100mn	7.35	£100mn	5.9480	£98.539
25 Feb	3 month	£100mn	6.06	£100mn	5.9299	£98.527
3 Mar	3 month	£100mn	6.85	£100mn	5.9500	£98.538
10 Mar	3 month	£100mn	7.95	£100mn	5.9300	£98.543
10 Mar	1 month	£250mn	6.88	£250mn	5.8460	£99.554
17 Mar	3 month	£100mn	9.45	£100mn	5.9282	£98.544
17 Mar	1 month	£500mn	5.89	£500mn	5.8500	£99.553
24 Mar	3 month	£100mn	5.70	£100mn	5.9000	£98.550
24 Mar	1 month	£750mn	3.99	£750mn	5.7297	£99.547
31 Mar	3 month	£100mn	5.96	£100mn	5.9289	£98.543
31 Mar	1 month	£150mn	4.23	£150mn	5.8000	£99.541

Until March, all DMO tenders had been for 3-month maturity bills but additional (£1.65bn) tenders of 1-month maturity bills were held in March, increasing the total Treasury bill stock towards £3bn. £1.3bn of the additional proceeds were invested in short-term assets to help manage the cash inflow expected in late April. The stock of Treasury bills ended the financial year at £2.8 billion.

Table 16: Treasury bill stock: January – March 2000

Date	3 month stock	1 month stock	Total £mn
07 Jan	1,300	3,000	4,300
14 Jan	1,300	1,800	3,100
21 Jan	1,300	600	1,900
28 Jan	1,300	0	1,300
04 Feb	1,300	0	1,300
11 Feb	1,300	0	1,300
18 Feb	1,300	0	1,300
25 Feb	1,300	0	1,300
03 Mar	1,300	0	1,300
10 Mar	1,300	250	1,550
17 Mar	1,300	750	2,050
24 Mar	1,300	1,500	2,800
31 Mar	1,300	1,500	2,800

The DMO's cash management role

The Exchequer's cash flow has a fairly regular seasonal and monthly pattern; but it is also subject to considerable uncertainty, associated largely with unpredictability in the timing of some tax and expenditure flows. The DMO's approach is to rough tune the seasonal pattern of flows through the issue of Treasury bills, bilateral dealing in a range of money market instruments and occasional 'ad hoc' tenders of Treasury bills and repo.

The variation in the forecast of Exchequer flows however means that there is usually a need to fine tune the flows and this is done through bilateral dealing on a daily basis, as well as occasional 'ad hoc' tenders. Apart from the weekly issue of Treasury bills, most of the DMO's dealing is done on a bilateral basis, and mainly in the secured markets. A few 'ad hoc' Treasury bill and reverse repo tenders have been held. To take account of shorter-term cash inflows and outflows, arrangements have been put in place with the Bank of England and settlement banks designed to cope with late changes in the forecast for the day without disadvantage to the market. HM Treasury also has in hand a programme to improve both the forecasting and monitoring of the daily cash flows.

An important part of the DMO's approach is to avoid being the cause of rates moving noticeably and to avoid distorting prices or trading patterns. In its bilateral dealings with the market the DMO is a price-taker and its remit is to balance the Exchequer cash flows effectively: the DMO does not run the cash management operation with a profit target. The DMO is working with the market, responding to market developments and balancing cost and risk in a way similar to other users of the market.

The DMO cash management remit

For the first time the Debt Management Report also included a cash management remit for the DMO (this is reproduced in full in Annex C).

The remit specifies that the DMO's main objective in carrying out its cash management operations is to offset, through its market operations, the expected cash flow into or out of the National Loans Fund on every business day. It is to do this in a cost-effective way, balancing cost and risk in its strategies and without influencing the level of short-term interest rates. The DMO also has to take account of the operational requirements of the Bank of England for implementing its monetary policy objectives.

The DMO is to carry out its cash management objectives primarily by a combination of the following main activities:

- structured weekly Treasury bill tenders;
- bilateral operations with DMO counterparties;
- ad hoc tenders of Treasury bills (and repo or reverse repo transactions).

Maturity of structured Treasury bill tenders

The DMO may hold tenders for Treasury bills of the following maturities in 2000-01:

- one month (approximately 28 days);
- three months (approximately 91 days);
- six months (approximately 182 days) and;
- twelve months (approximately 364 days).

However, the DMO expects to give priority to establishing fully the shorter maturities before introducing longer maturity instruments.

Level of Treasury bill stocks

The DMO will manage transactions with a view to running down the stock of bills in months of positive cash flow (ie. surplus) and increasing them in months of higher net expenditure. Once the Treasury bill stock rises above £5 billion, it expects to maintain a minimum stock of £5 billion thereafter.

The DMO began the financial year with a Treasury bill stock of £2.8 billion. At the time of the Budget, the forecast level for the end of the financial year was £10 billion, but this was reduced to a target level of £8 billion in the 12 June 2000 re-statement of the financing arithmetic.

Bilateral operations with the market.

The DMO trades on a daily basis with its counterparties in a range of instruments:

- purchases from the market for future resale (reverse repo);
- sale to the market for future repurchase (repo);
- outright sale and purchase of gilts, Treasury bills and eligible bills;
- unsecured cash borrowing and lending with its counterparties.

Other than gilts, collateral used in repo and reverse repo transactions with the DMO may include selected euro denominated Government securities, selected eligible bank bills, selected supranational sterling and euro denominated securities and Treasury bills.

The cash management impact of the Spectrum auction proceeds

The DMO faced a major early challenge on cash management in handling the cash receipts from three of the successful bidders for the 3G radio spectrum licences. £8.2 billion was received from the first two bidders on 9 May and £3.9 billion from the third on 16 May. The first of these was amongst the largest ever cash payments to Government on a single day.

The DMO (in consultation with the Bank of England, the Radiocommunications Agency and some major private sector banks) successfully put in place arrangements designed to:

- minimise disruption in the payments clearing system arising from the flow;
- minimise disruption to the London money markets arising from the flow from the private to public sectors;
- minimise any risk of default or delay in the payments;
- and to do the above in a cost-effective way.

To this end a number of private sector bank accounts were opened into which the auction proceeds paid by successful bidders could be paid. Any amounts held overnight in these buffer accounts were collateralised by the banks. Subsequently, any monies paid into these accounts were transferred into the public sector according to a previously agreed schedule – thereby smoothing flows and any market price adjustment. Part of the 9 May 2000 payment (of £8.2 billion) was handled in this way.

In addition the DMO held a one-month reverse repo tender for £1 billion on the morning of 9 May (thereby lending a proportion of the Spectrum proceeds against gilt collateral). The tender was covered 6.72 times at an average (and lowest) yield of 5.85%.

German Bonds
UK Gilts
SHORT STERLING
LONG GILT
FTSE INDEX

Chapter 5: Gilts market liquidity

Introduction

In general, a liquid secondary market for bonds lowers the funding costs for issuers by reducing the liquidity premium demanded by purchasers of those securities in the primary market. If potential investors are confident that they can liquidate any holdings in the secondary market without incurring significant transaction costs, then they will be prepared to bid more for the asset, so reducing the cost of the issuer's finance. A liquid secondary market means that, all other things being equal, the cost of reversing a position is low and it is also less risky for investors to participate in bond auctions. Therefore issuers have an incentive to develop and maintain a liquid market in their securities.

In addition, a liquid market is believed to improve the price efficiency, and therefore the information content of observed prices, of a market. Therefore policy makers and other market participants who extract information from a government bond market have an interest in ensuring that the information content of prices, and consequently bond yields, is high.

More specifically, liquidity, and price efficiency, in the government bond market is important as it functions as a pricing benchmark for several other securities markets.

What is meant by liquidity?

One of the most accepted definitions of a liquid market is one where a large trade can be executed with little price impact. However, measuring the price impact of trades can be difficult; it is generally done by examining the bid-ask spread for different size trades. Where the spread cannot be observed, other measures of activity, such as the level of turnover and the turnover ratio, are taken as proxies for liquidity measures. It is on these latter types of measures that we focus in this chapter.

Bid-ask spread

Many measures of liquidity concentrate on observing or estimating the bid-ask spread prevalent in the market at a particular time. The spread compensates dealers for the costs they incur in providing market-making services. It should cover the cost of processing the order, and provide sufficient return to compensate the dealer for the market risk involved in acquiring an unwanted position[7] and the risk that the dealer is transacting with a more informed counterparty.[8] If we assume that there is little private information in the gilts market, and that the cost of processing an order is independent of trade size, then if spreads were observed to be independent of trade size, i.e. suggesting inventory risk is independent of trade size, then this would indicate a very liquid market. Additionally, very liquid markets are characterised by tight spreads, with the order-processing component of the spread dominating the risk components.

---

[7] This is generally referred to as inventory risk and reflects the risk that the price of the security will move against the dealer before he can unwind any unwanted position.

[8] This is referred to as asymmetric information risk; dealing with a more informed counterparty means that you will take the wrong side of the trade, e.g. you will buy when the market will fall once the private information is revealed.

We cannot observe firm bid-ask spreads directly in the gilts market. In the absence of firm quotes, techniques are available to infer the spread from a time series of transaction prices, under certain assumptions. These assumptions, viewed from the dealer's perspective, are generally:

(i) that orders are independent of one another, i.e. the probability of a buy order does not depend on whether the previous order was a buy or a sell order, and;

(ii) that buyers and sellers are equally distributed, i.e. the probability of a buy order is equal to the probability of a sell order.

Unfortunately, we do not have access to such a time series of transactions prices but even if we did our results would be hampered by the fact that the two assumptions above are likely to be invalid. The gilts market is increasingly dominated by the activities of index-tracking funds, who tend to trade in the same direction, so invalidating assumption (i) and, possibly, invalidating assumption (ii).

Anecdotal evidence suggests that spreads in the gilts market have increased since autumn 1998 when there was widespread turmoil in world bond markets. Spreads initially increased to compensate dealers for the increased risk involved and have probably narrowed somewhat since then, but it appears that they have not come in to pre-LTCM crisis levels.

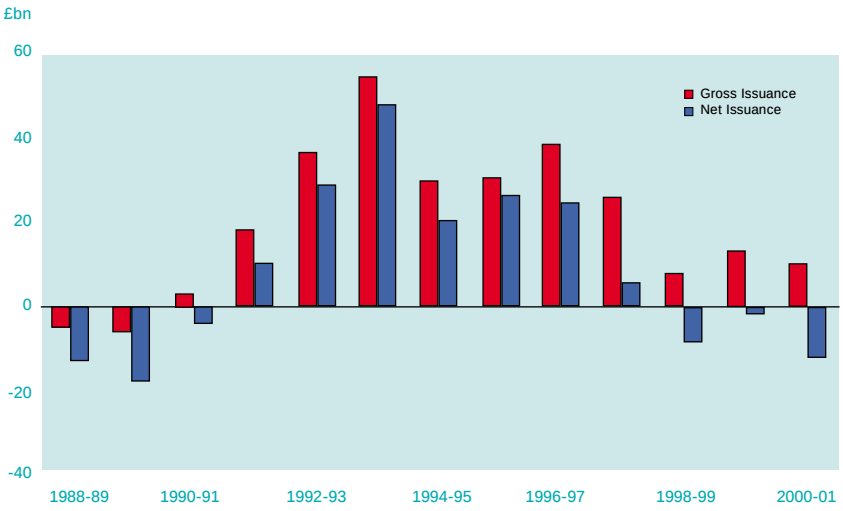
One suggestion is that spreads pre-LTCM crisis were not fully reflective of the true level of liquidity in the market; competition had driven spreads to unsustainable levels and that spreads observed today are simply a more accurate reflection of dealers' costs rather than an indication that the market is more illiquid. However, a range of other evidence supports the general theory that the gilts market is now more illiquid than it was at the beginning of 1998.

Size of the market

A 'big' market is generally accepted to be a more liquid one. In this case size can be considered in terms of the total value of gilts outstanding, in terms of the size of individual issues and the size of the investor base.[9] Gross and net issuance has been on a downward trend since its peak in 1993-94 with net issuance negative in the last two financial years and expected to be negative this financial year (see Chart 11). The nominal value of the portfolio has fallen from £304 billion at the beginning of 1998 to £295 billion at the end of June 2000.

[9] Other measurements of activity are discussed below.

Chart 11
Gross and net gilt issuance 1988-89 to 2000-01



Source: DMO

However, first the Bank of England and then the DMO have had an active programme of conversions and switches since 1996 with the aim of building up the size of particular bonds in order to improve their liquidity; i.e. the size of individual issues influences their liquidity. The average size of bonds in the gilt portfolio has increased by 14% from £3.7 billion at the beginning of 1998 to £4.2 billion at the end of June 2000. Over the same time the average size of the 20 largest gilts in the portfolio has increased by 8% from £8.9 billion to £9.6 billion. So although the total size of the market has declined, suggesting less liquidity in the market, the average issue size has increased, suggesting the opposite.

Of course, a large issue size is simply a general characteristic of liquidity, it is not a sufficient condition. Large issues can still be illiquid if they are tightly held. Rather, it is perhaps the size of the issue that is held loosely and available to be traded that is important. However, this is difficult to measure as data on individual holdings of particular stocks are not freely available. In the absence of this information, the absolute size of the issue is the best proxy available.

The size of the investor base can also influence the liquidity of the market. The more diverse the range of investors, with differing transaction needs, investment horizons and differing perceptions of the value of the asset, the more trading flows that should be generated, resulting in greater liquidity. Good two-way trading flows are a characteristic of a liquid market. For example, all index-tracking funds may be buyers of a particular gilt, while a proprietary trading fund may be a seller of that gilt, as a directional trade, providing the other side to a deal. This provides a dealer with more risk-sharing possibilities, reducing the need for the dealer to increase their inventory to an unacceptable risky level. A reduction in a dealer's customer base, reduces their ability to offset orders in one direction with orders in the opposite one, increasing the cost at which a dealer can lay-off risk. This increase in cost will be passed onto customers in the form of wider spreads, i.e. the market becomes more illiquid.

Anecdotal evidence suggests that some investors (such as proprietary trading funds or hedge funds) with perhaps more short-term horizons than traditional investors (such as insurance companies and pension funds) have scaled back their activities in the market in recent years. This will have made it difficult for dealers to find the natural opposite side of a trade quickly, increasing their inventory risk, thereby increasing transaction costs in the market.

However, ONS data on the distribution of holdings at the end of each quarter do not show any notable change in the pattern of ownership over the period (Table 17). There does not appear to be any particular change in the level of interest by other financial institutions (which would probably include the proprietary and hedge funds); nor does the level of interest of overseas investors appear to have deteriorated. Of course, these data only reflect holdings at the end of every quarter and will not capture any short-term change within a quarter, and so do not reflect all trading activity of investors.

Table 17: Distribution of holdings

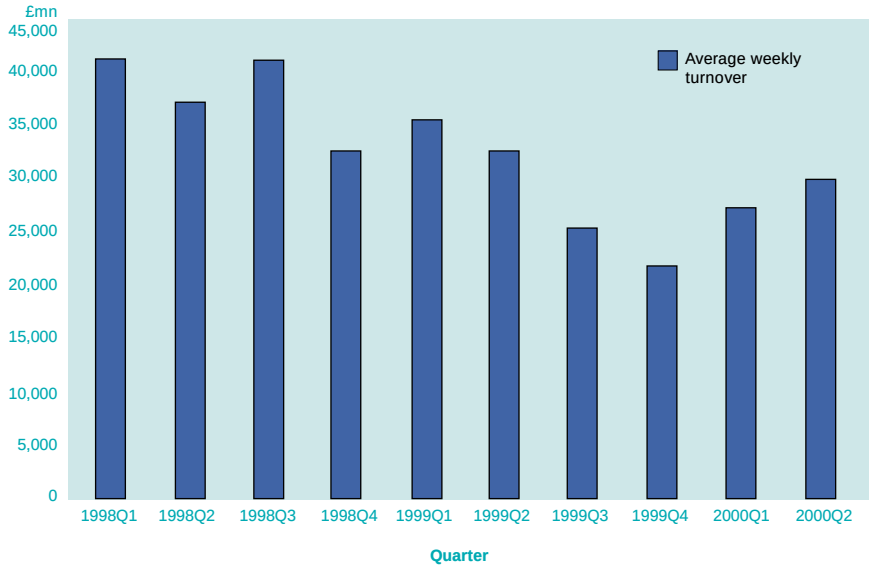
	Local authorities & public corporations	Building societies/banks	Insurance cos & pension funds	Other financial institutions	House-holds	Over-seas
1998 Q1	1%	5%	64%	5%	6%	19%
Q2	1%	5%	65%	4%	5%	18%
Q3	1%	6%	63%	4%	7%	18%
Q4	1%	5%	63%	5%	7%	19%
1999 Q1	1%	3%	64%	5%	8%	19%
Q2	1%	3%	64%	4%	9%	19%
Q3	1%	3%	64%	5%	10%	17%
Q4	1%	3%	64%	5%	10%	17%
2000 Q1	1%	3%	65%	5%	8%	18%

Source: ONS. Due to rounding, these percentages may not sum to 100%.

Measures of activity

Chart 12 shows the average weekly cash turnover in the gilts market (excluding activity in the strips market) by quarter for the period January 1998 to June 2000. This is based on data received from the London Stock Exchange on trades that have been matched for settlement. Clearly market turnover has declined over the period, however there does appear to be some recovery since the trough in 1999 Q4, when the level of turnover in the market was adversely affected by concerns regarding the approach of the year 2000.

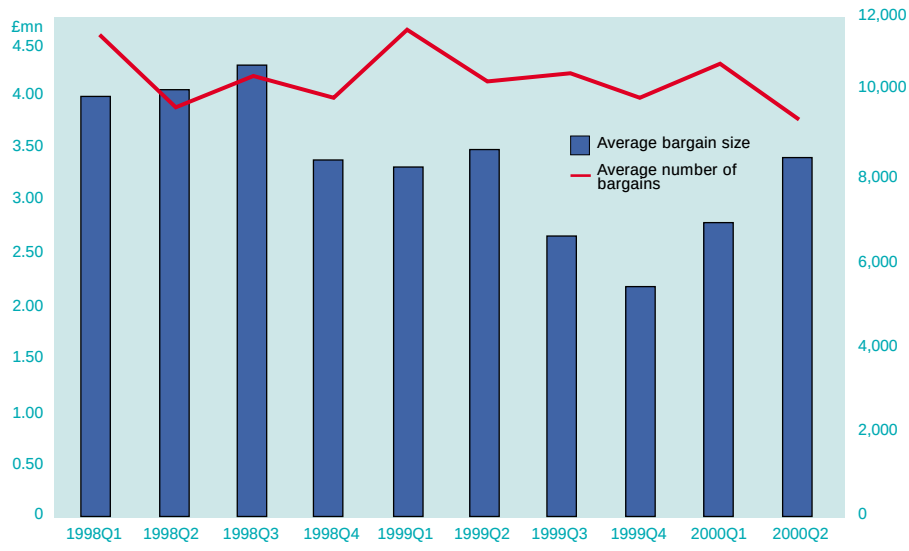
Chart 12
Average weekly turnover (£mn) on the London Stock Exchange



Source: London Stock Exchange

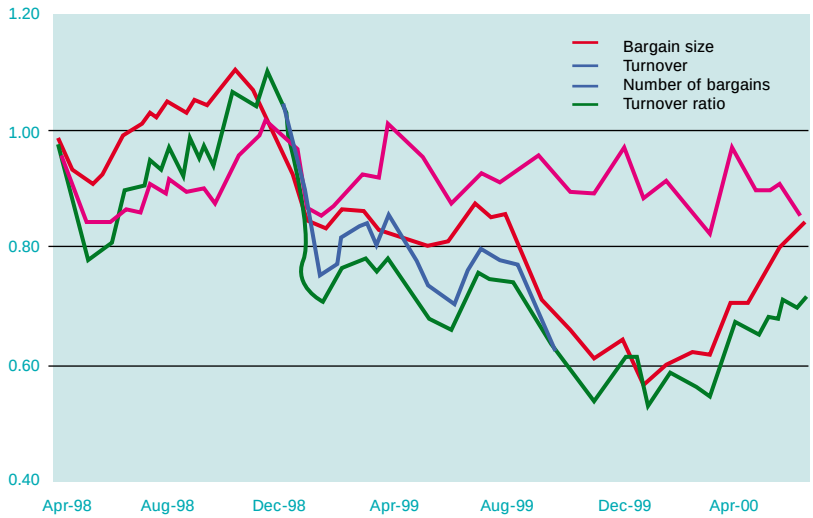
From Charts 13 and 14, it is apparent that this decline in total activity is driven by a decline in the average size of each trade rather than a decline in the number of transactions. This suggests that fewer large trades are being executed overall, perhaps because they are now more costly to execute, so supporting the traditional definition of a decline in liquidity.

Chart 13
Average number of bargains and average bargain size (£mn)



Source: London Stock Exchange

Chart 14
Index of 13-week moving average in overall turnover, number of bargains, bargain size and turnover ratio



Source: London Stock Exchange

Another way to consider the value of market turnover is to consider it relative to the size of outstanding portfolio, i.e. the speed at which the stock outstanding turns over; this effectively normalises turnover to account for the size of the market. We can construct a measure of the turnover ratio by comparing total value of turnover with the market value of the outstanding portfolio at the beginning of the quarter. The evolution of the turnover ratio displays the same pattern as the average size of the bargain (Chart 14).

The average bargain size, the number of transactions executed and the turnover ratio all provide proxies for trading intensity. Trading intensity is important because the period of time that a market maker must wait before receiving an offsetting order will influence their inventory-control costs. Therefore, inventory risk diminishes as trading intensity increases and this will be reflected, in a competitive dealership environment, in lower bid-ask spreads. These measures indicate that, although the number of transactions has not changed particularly, trading intensity does appear to have declined.

The market by quartile

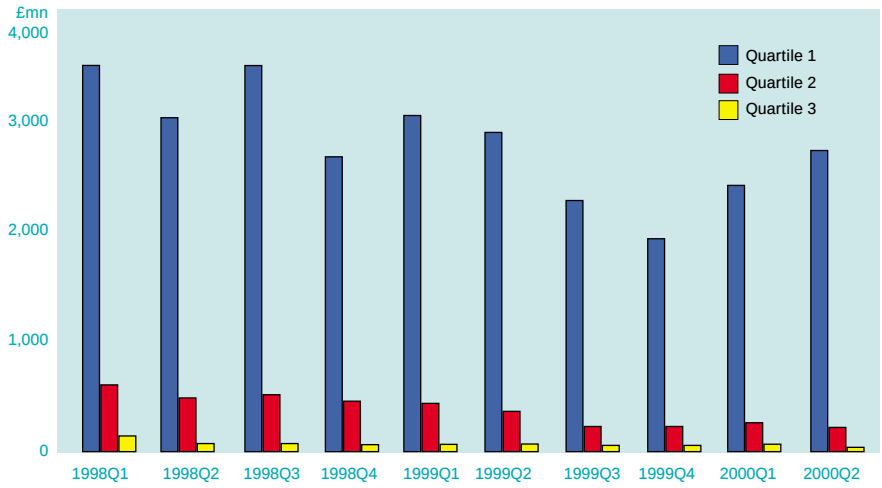
One might question whether this decline in activity is common across all stocks or whether the less liquid stocks are suffering more. To address the question of whether more liquid bonds are more resilient to changes in general market liquidity we split the data into four quartiles based on total turnover in the whole period with 20 or 21 stocks in each quartile. The bottom quartile includes all the rump stocks, which are not expected to trade actively in the market, and so are disregarded.

Charts 15 to 17 show the absolute levels of activity in each quartile. Charts 18 to 21 depict the relative declines and improvements in trading activity across each quartile. It is these latter charts on which we focus.

Examining the data across the quartiles suggests that liquidity in stocks in quartile 1 did not deteriorate as much as that in stocks in quartile 2 and 3, and has recovered quicker (as demonstrated in Charts 18 and 19). Additionally, the deterioration in liquidity in the less liquid stocks has been driven by a combination of a drop in average bargain size and a fall in the number of bargains. So interest in these stocks has declined more than that in the more liquid stocks. Equivalently, the more liquid the stock the more resilient they are to changes in overall market liquidity.

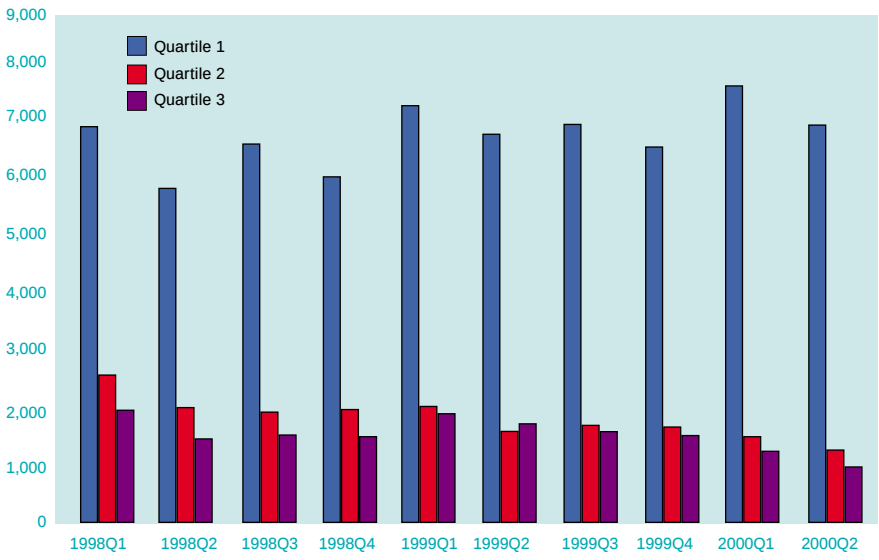
Since the size of the bond is generally found to be positively correlated with its liquidity, the DMO policy of building benchmarks appears to be worthwhile in improving market resilience.

Chart 15
Quarterly turnover by quartile



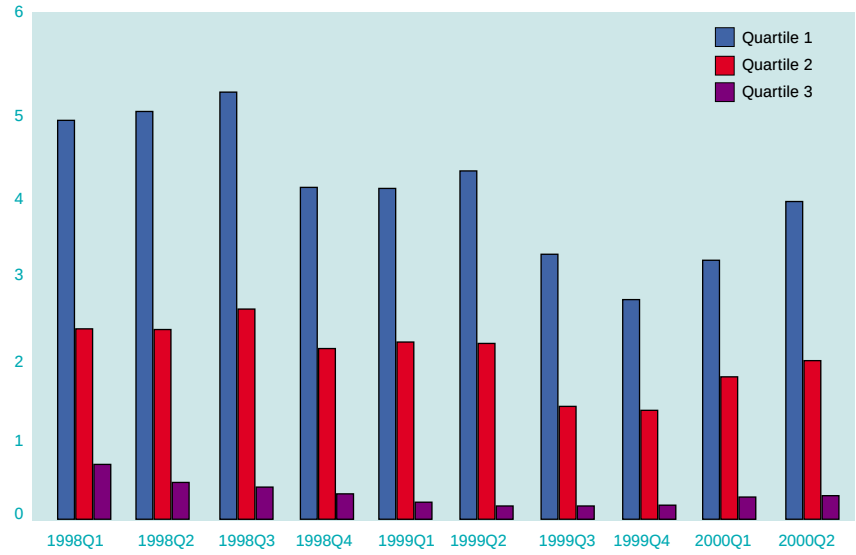
Source: London Stock Exchange

Chart 16
Quarterly number of bargains by quartile



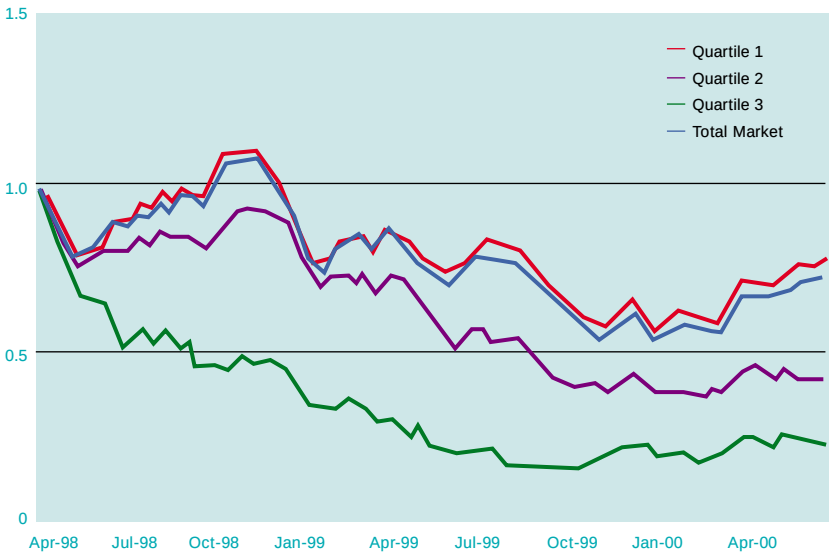
Source: London Stock Exchange

Chart 17
Quarterly average bargain size by quartile



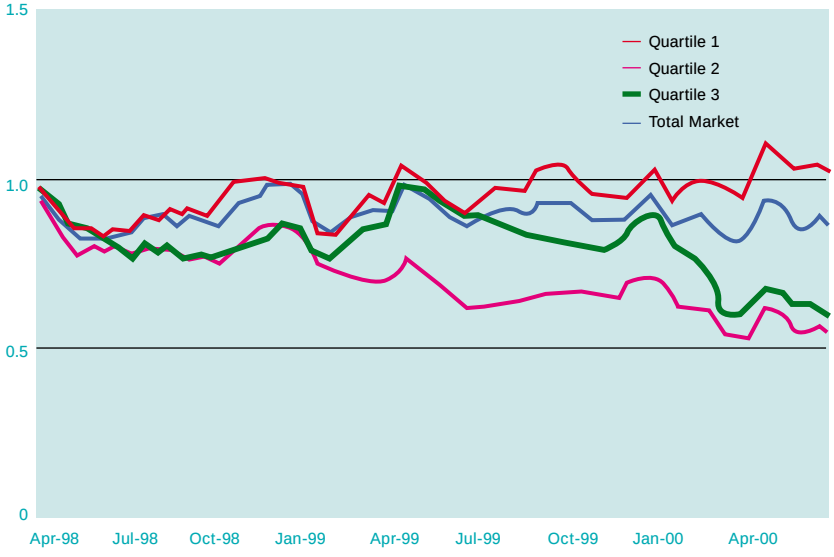
Source: London Stock Exchange

Chart 18
Index of 13-week moving average in turnover by quartile



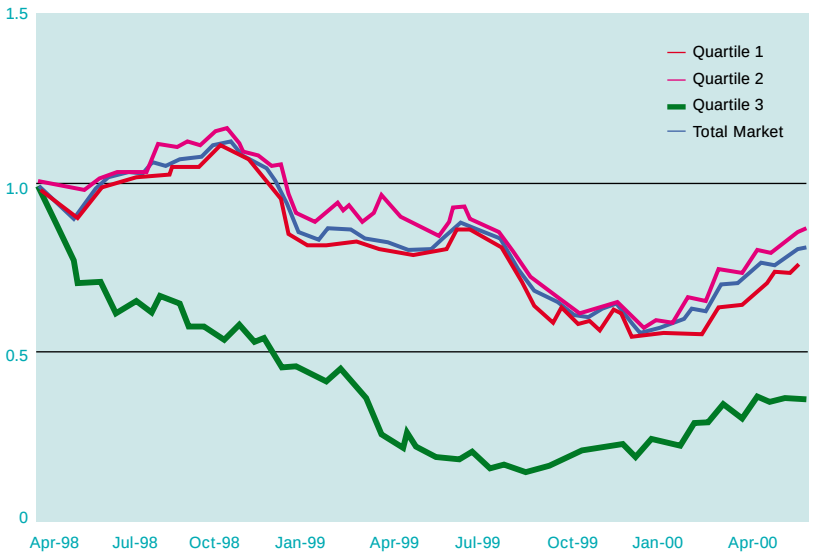
Source: London Stock Exchange

Chart 19
Index of 13-week moving average in number of bargains



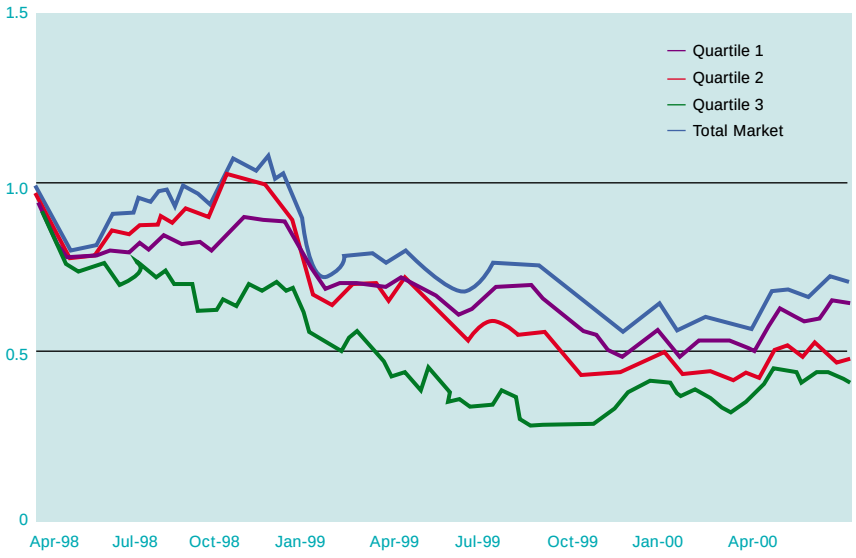
Source: London Stock Exchange

Chart 20
Index of 13-week moving average in bargain size



Source: London Stock Exchange

Chart 21
Index of 13-week moving average in turnover ratio

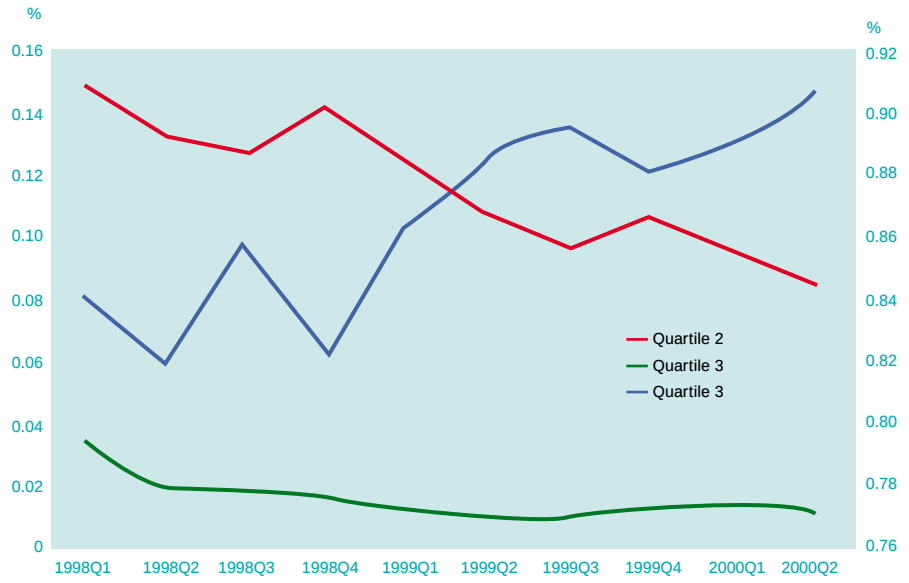


Source: London Stock Exchange

Concentration

One might expect that a decline in liquidity would be associated with an increase in concentration in the market. Chart 22 shows the proportion of turnover accounted for by each quartile of stocks. From this it is clear that activity has become more concentrated in the top 20 stocks. The proportion of activity they account for has increased from 84% to over 90% over the period. So, declining liquidity has been associated with increased concentration of turnover across stocks.

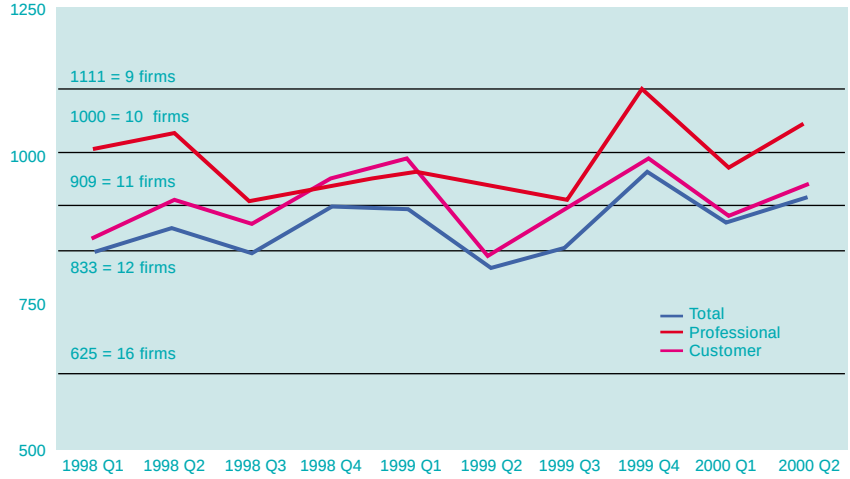
Chart 22
Proportion of turnover accounted for by quartile



Source: London Stock Exchange

Next, consider the concentration of business across the market makers as measured by a Herfindahl index based on each GEMM's share of total weekly turnover as reported by the GEMMs first to the Bank of England and subsequently to the DMO. From Chart 23 we see that the level of concentration in the market has been broadly consistent with between 11 and 12 firms having an equal market share. Given that there were 16 firms active in the market (17 from 1 January 2000), this indicates a high degree of competition amongst the market makers. This suggests that the reduction in liquidity has not resulted in an increase in the degree of concentration or a reduction in the level of competition amongst the GEMMs.

Chart 23
Quarterly Herfindahl index

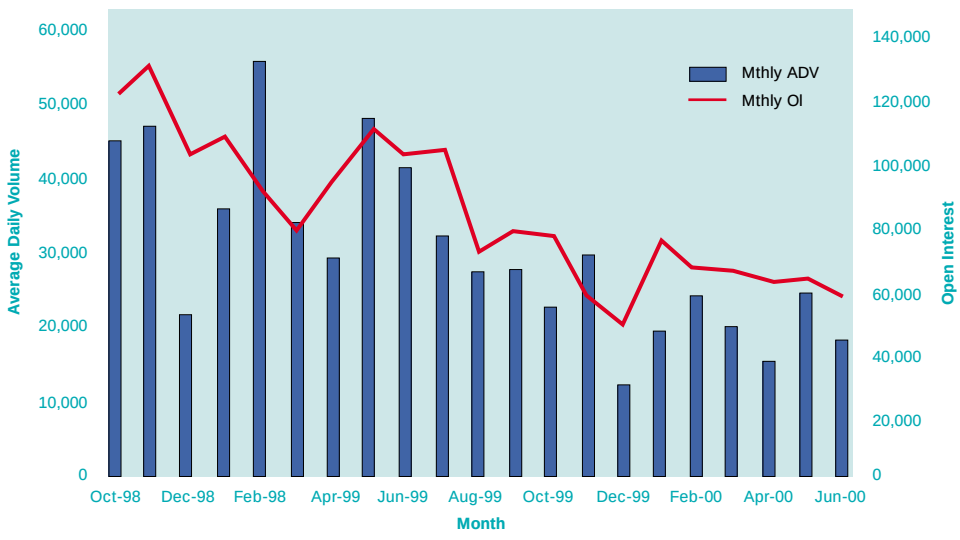


Source: GEMMs

Complementary markets

The existence of other complementary markets should provide a positive externality to liquidity in the gilts market. The most obvious market to consider is the futures market. A well functioning and developed futures market should enhance the liquidity of the underlying cash market. The futures market should provide a hedge to dealers in the underlying cash market, providing them with a tool for managing their inventory risk. So, liquidity in the two markets should be correlated. However, if that hedging tool is not available and is itself illiquid then the cost of dealers' services will increase to reflect the increased risk they are undertaking. Chart 24 shows the level of open interest and average daily volume in the long gilt futures contracts since October 1998; this covers the period following the change in contract size. There has been a steady decline in activity in this contract, which will have a negative impact on its effectiveness as a hedging tool, with a consequent negative impact on the liquidity of the underlying cash market.

Chart 24
Activity in the long gilt futures contracts (Oct 1998 to June 2000)



Source: LIFFE

Volatility

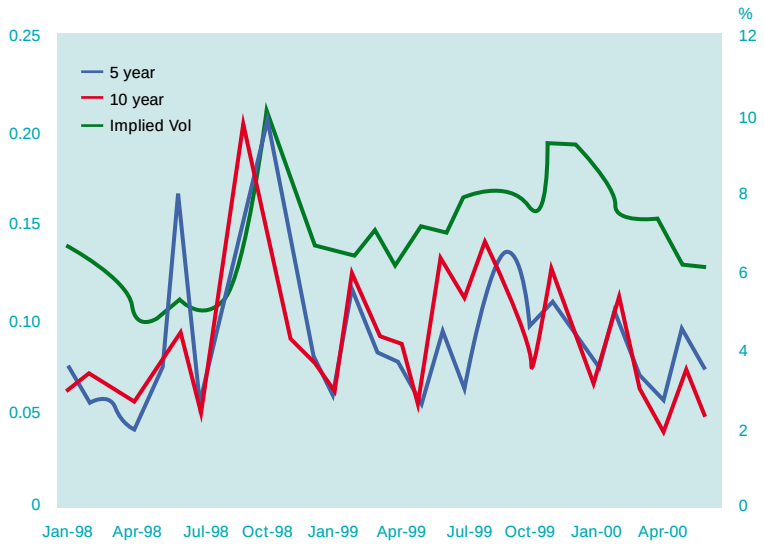
It is also be interesting to consider the volatility of the market over this period. *A priori,* we might expect the bid-ask spread to be increasing with volatility as the market risk dealers face increases. However, the relationship between volatility and the level of turnover is less clear. A volatile market can be associated with increased levels of turnover as speculators seek to profit from market uncertainty; so volatility can lead to increased turnover. However, an illiquid market can be slow at incorporating new information in prices, therefore observed transactions prices will tend to change sharply, increasing the volatility of prices. So poor liquidity can lead to increased volatility.

One standard measure of volatility of the gilts market is the level of implied volatility in the option on the long gilt futures contract. This is a forward looking measure of volatility and should reflect the general market expectation of volatility between the trade date and the exercise date of the option; this is shown in Chart 25. From this, it appears that market volatility peaked in the autumn of 1998 (the height of the LTCM crisis), with another peak around the end of 1999 (reflecting concerns over the millennium), but has otherwise been broadly constant.

However, turnover in these options has been very poor, calling into question the quality of information we can derive from these figures and whether it actually is a fair representation of the market's expectation of volatility of the underlying markets. It may be more appropriate to consider the level of volatility observed in actual prices in the cash market. Using estimated par yield curves, we measure the monthly standard deviation of five-year and ten-year yields (Chart 25). This provides a simple measure of market volatility. From this we again observe a peak in volatility in autumn 1998, but the level of volatility has been on a downward trend since then.

Both measures of volatility suggest that the observed decline in liquidity has not been associated with any significant increase in volatility in the market.

Chart 25
Monthly volatility of the gilts market



Source: LIFFE

Conclusion

Liquidity in the gilts market has declined since the beginning of 1998 as evidenced by a drop in absolute turnover and the ratio of turnover to size of the portfolio. On the overall picture, it appears that this drop in activity is driven by a decline in the average size of each trade rather than by a declining number of bargains. So interest in the market remains but fewer large trades are being done, perhaps reflecting the higher cost of doing these trades now than in the past. However, this reduction in liquidity has not been associated with any marked increase in concentration in GEMM activity or in the level of market volatility. Additionally the data do appear to suggest that the level of liquidity in the market has stabilised and that some improvement may soon be apparent.

If we examine the data in more detail, it appears that while interest, as evidenced by the number of bargains executed, has been resilient in the most liquid stocks, it has declined in the less liquid stocks. And while some recovery is apparent in activity in the more liquid stocks, the less liquid stocks appear to be lagging behind, due in large part to the continuing decline in the number of transactions in these stocks. This is also evidenced by the fact that activity in the market has become more concentrated in these more liquid stocks.

Chapter 6: The DMO's yield curve model

Introduction

The most commonly used measure of a bond's return is the *gross redemption yield* – the single rate that, if used to discount each of the bond's cash flows individually, equates the bond's total present value to its price in the market. Implicit in this definition is the assumption that it will be possible to re-invest all of the bond's future coupon payments at the current redemption yield - clearly an unrealistic assumption. Using redemption yields to discount bond cash flows has the disadvantage that there is not a unique discount rate for a given maturity. Given this, it is more desirable to look at zero-coupon yields.

The *zero-coupon rate* for a given maturity is the rate at which an individual cash flow on this future date is discounted to determine its value today and can be thought of as the yield to maturity of a zero-coupon bond. The *zero-coupon yield curve* is simply the continuous curve of zero-coupon rates. When calculating the net present value of a bond's cash flows using the zero-coupon curve, a different zero-coupon rate is used for each cash flow. Across the market, all cash flows on a given date - irrespective of which bond they originate from - are discounted using the same zero-coupon rate. This chapter examines the method used by the DMO to estimate the zero-coupon gilt yield curve.

Types of yield curve

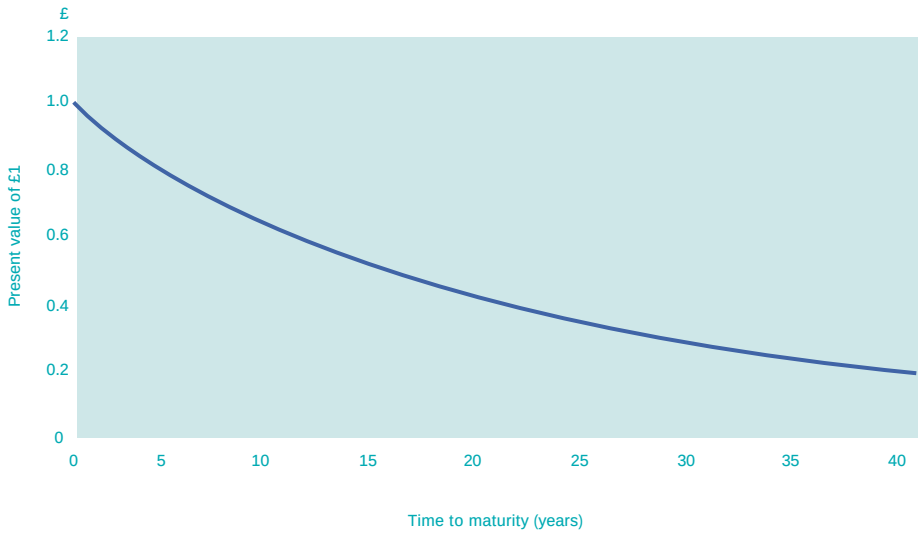
Once estimated, the zero-coupon yield curve can be transformed uniquely into three other curves: the par yield curve, the discount function and the implied forward rate curve. Since the zero-coupon yield curve is not representative of the observed yield on a coupon-paying bond it is sometimes useful to look at the *par* yield curve instead. A coupon-paying bond is said to be priced at par if its current market price is equal to its face value.

The *par yield* at a given maturity represents the coupon required on a (hypothetical) coupon-paying bond of that maturity to ensure that it is trading at par. The *discount function* at a maturity *t* represents the value today of £1 repayable in *t* years' time. The implied forward rate curve consists of future one-period interest rates implied from the zero-coupon curve. It contains the same information as the zero-coupon curve but, because it is in effect a marginal curve (whereas the zero-coupon curve gives an average of expected rates over the chosen horizon), it shows the curve in a more detailed fashion.

Since the zero-coupon curve, par curve, discount function and forward curve are all unique transformations of each other, if it is possible to obtain or estimate rates for one of the curves, these rates can be transformed to give the other curves.

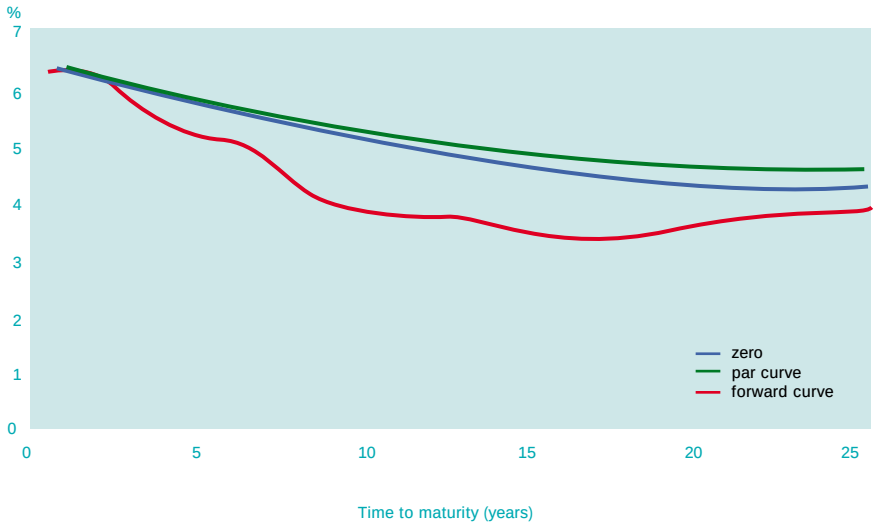
Charts 26 and 27 show the discount function from the DMO's yield curve model for 31 March 2000 and the corresponding zero curve, par curve and implied forward rate curve.

Chart 26
Discount function for 31 March 2000



Source: DMO

Chart 27
Yield curves for 31 March 2000



Source: DMO

Constructing the yield curve

If a market has liquid zero-coupon government bonds maturing at every future date, the yields on these could be used to construct the yield curve directly. With the existence of the UK strips market it is possible to observe the prices of over 50 traded zero-coupon bonds with maturities at six-month intervals right across the maturity spectrum. However, the strips market has grown slowly since its inception in December 1997 and suffers from low levels of liquidity. For example, by the end of June 2000 just £2.5 billion nominal (or 2.2%) of strippable gilts were held in stripped form and weekly turnover in gilt strips averaged around £50 million nominal, compared with around £30,000 million nominal in non-strips. This low level of liquidity means that the yields on these securities cannot be relied upon at present for the construction of the yield curve[10].

[10] The same is true of Treasury bills.

Instead, the yield curve must be estimated using the prices of coupon-paying bonds. This introduces problems of its own. For instance, conventional gilts are not equally spaced through the maturity spectrum - there are many "gaps" over which one needs to interpolate in order to construct a continuous yield curve. Also, the technical task of identifying the yield curve is further complicated by the existence of six-monthly interest payments.

Choice of model

In order to construct a continuous yield curve it is necessary to specify a functional form for the curve to be fitted to the data. When deciding which functional form to use it is important to consider the shapes that the yield curve should be allowed to take - in other words, what trade-off to make between the "smoothness" of the curve (removing "noise", such as pricing anomalies, from the data) and its "responsiveness" (its flexibility to accommodate local changes in the shape of the curve). The purpose to which the yield curve is to be put is clearly relevant to this decision.

Whilst for macroeconomic analysis it may be desirable to fit a fairly simple function to the data in order to capture the general shape of the curve, for most of the analysis performed by the DMO it is important that the yield curve fits closely to the data, suggesting a more complex functional form.

The yield curve model employed by the DMO was originally developed by Mark Fisher, Douglas Nychka and David Zervos at the US Federal Reserve Board[11]. In common with many of the academic studies on yield curve modelling this model uses a cubic spline (or piecewise cubic function) for its functional form, giving the curve a high degree of flexibility. Intuitively, a cubic spline can be thought of as a number of separate cubic functions, joined "smoothly" at a number of so-called *join* or *knot* points. The greater the number of knot points the higher the degree of flexibility of the resultant curve.

In addition to specifying the number of knot points it is also necessary to decide on their location (ie. the maturities at which they should be located). Although the knots could be distributed evenly over time to maturity it is common to concentrate them towards the short-end to capture the (typically) greater complexity of the curve at shorter maturities.

Although much of the early research on yield curves used regression splines, more recently several studies - including the FNZ paper - have used smoothing splines. Whilst for regression splines the number of parameters (or knot points) must be chosen exogenously, smoothing splines have a penalty function that penalises excess roughness (i.e. oscillatory behaviour) in the curve and automatically determines the effective number of parameters. An increase in the penalty reduces the effective number of parameters. This means that the model allows the data to determine the appropriate number of parameters. In the DMO model, the extent to which the penalty function reduces oscillations in the fitted yield curve depends on the size of a parameter which is referred to as the roughness penalty. If this parameter was zero there would be no smoothing of the curve and the resulting

[11] For more details on the "FNZ" model see paper 95-1 in the Federal Reserve Board's Finance and Economics Discussion Series "Fitting the term structure of interest rates with smoothing splines".

forward curve could oscillate wildly. Alternatively, if it was large, the estimated forward curve would be inflexible and could be close to a straight line. The DMO determines the optimal value of the roughness penalty using a technique which is referred to as *generalised cross validation* and which is explained below.

Given a set of observations it is possible to fit numerous alternative curves through these points. The "goodness of fit" of each curve can be measured by taking an observation that was omitted from the estimation and measuring the difference between this observation and its estimated value implied by the curve[12]. The lower this difference the better the fitted curve. Since the choice of observation to omit is arbitrary, cross validation is employed to ensure a more rigorous approach. This technique avoids the problem of identifying which observation to exclude by looping over all the observations in turn, omitting each one and then fitting a curve. The differences between the omitted observations and the curve's estimated values are squared and added together to give an overall cross validation "score". Different values of the roughness penalty parameter give different scores, forming a function referred to as the cross validation function. The optimal value of the roughness penalty can then be found by minimising the cross validation function. However, fitting forward rate curves while repetitively omitting different observations makes standard cross validation a computationally expensive estimation procedure. Instead, the DMO employs a variant called generalised cross validation, which formulates the function to be minimised in a slightly simpler way in order to produce a more efficient solution.

Although generalised cross validation determines the effective number of parameters used, for a given run of the yield curve it is still necessary to specify an initial set of parameters from which to construct the optimal set. Fisher, Nychka and Zervos suggest choosing the number of knot points to be roughly one third of the sample size. With their sample size of between 160 and 180 bonds, applying this rule resulted in 50 to 60 knot points. With the much smaller number of bonds in the UK market, application of the "one third rule" means that the DMO's model currently uses 10 knot points. The maturities at which these knots are located are 0, 2, 4, 6, 8, 10, 12, 15, 20 and 40 years.

Another issue when constructing a spline based model is what form to use for the cubic spline equation itself. A cubic spline is usually defined to be a linear combination of underlying component or basis functions. Care is required when choosing the form of these component functions of the cubic spline since not all basis functions are equally capable of producing reliable estimates of the yield curve. When fitting the model to the data, some spline bases can result in inaccuracies arising from calculating the difference between large numbers. In keeping with the FNZ model, the DMO solves this problem by employing a basis of B-splines. These are functions which are identically zero over a large portion of the maturity spectrum and thus avoid the loss of accuracy introduced with other bases. Whilst for some yield curve models the function is fitted to the zero-coupon curve, the DMO's model fits to the implied forward rate curve.

---

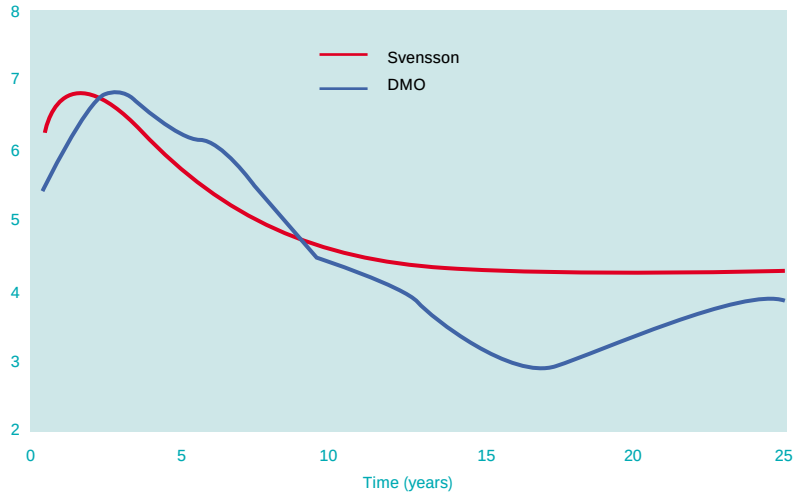
[12] It is important that the observation used was not included in the estimation since otherwise this would lead to biased results.

Separate from the question of how flexible the model should be is the issue of whether the model should be constrained to produce asymptotically flat forward rates for long maturities. The argument for imposing such a constraint is the view that market participants are unlikely to have different expectations for the interest rate in 24 years' time from that in 25 years' time, for example. However, in practice observed yields do trend downwards at the long end in some markets. For instance, for several years now the supply/demand disequilibrium at the long end of the UK market has resulted in the longest dated gilts trading at a relative price premium (and hence lower yield) to other gilts.

Another less significant reason why the yield curve might - in practice - slope downward at the long end is because of the convex nature of long bonds. The *convexity* of a bond is a measure of the curvature of its price/yield relationship (i.e. the degree to which the curve defining the relationship between a change in the bond's price and its corresponding change in yield diverges from a straight-line). In principle, a given bond will fall in price less than a less convex one when yields rise, and will rise in price more when yields fall, ie. convexity can be equated with the potential to outperform. Thus, other things being equal, the higher the convexity of a bond the more desirable it is to investors, and some investors may be prepared to accept a bond with a lower yield in order to gain convexity. Given that the longest dated gilts are considerably more convex than shorter dated securities this could lead to them trading at a premium to other gilts.

Again, the purpose to which the yield curve is to be put is relevant to whether a constraint should be imposed. Whilst it may be reasonable to impose an asymptotic constraint if the model is to be used to indicate the underlying interest rate expectations of market participants, for relative value analysis it is important that the curve accurately reflects the rates available in the market. With these factors in mind, the DMO's yield curve model is not constrained to flatten at the long-end. Chart 28 below compares the implied forward curve obtained from the DMO model for 25 October 1999 with that from the Svensson model[13]. The latter uses a simple functional form which is constrained to produce a flat forward curve at long maturities.

Chart 28
Implied forward rate curves for 25 Oct 1999



[13] For more details see: Lars Svensson, "Estimating and interpreting forward interest rates: Sweden 1992-94", International Monetary Fund Working Paper No.114 (September 1994).

Minimising yield or price errors

When fitting the yield curve model, the parameters of the model are estimated by minimising the errors between actual bond prices and the corresponding theoretical prices derived from the model. Minimising price errors sometimes results in fairly large errors for short maturity bonds since their prices are less sensitive to movements in yields than for longer maturity bonds[14]. The estimation of the short-end of the curve can usually be improved by choosing the parameters to minimise yield errors instead, although this may lead to a slight deterioration in the fit of the curve at the long-end. Rather than follow the original FNZ approach of minimising price errors, the DMO has modified the model to minimise price errors weighted with respect to the reciprocal of duration. Minimising duration-weighted price errors in this way is an approximation to minimising yield errors.

Tax effects

Tax rules can materially affect the prices of bonds and, if their effects are ignored in the modelling process, can distort the estimate of the yield curve. Prior to April 1996, tax-paying investors in the gilt market were taxed on coupon income, but were exempt from taxation on capital gains. This led to a pronounced tax effect in the market as tax-paying investors bid up the prices of low-coupon bonds relative to high-coupon bonds. As a result of this, the Bank of England - as the former government debt manager in the UK - employed a complex tax model when estimating the yield curve.

Under the tax regime effective from April 1996 this “coupon effect” largely disappeared, with just $3^{1}/_{2}$% Funding 1999-2004 and $5^{1}/_{2}$% Treasury Loan 2008-12 being grandfathered under the old regime. However, the new regime introduced a distortion of its own, albeit slight compared with that under the previous system. This arose because investors in strippable gilts were able to benefit from delayed tax payments on coupon income relative to those holding non-strippable bonds. In order to compensate for this when estimating the yield curve, the DMO employed a model which calculated, for each coupon of a given gilt, when the tax would be paid under quarterly accounting (the system for non-strippable gilts) and when it would be paid if the bond were strippable. The present value of the tax payments under both scenarios was then computed and the difference obtained.

As investors paying the difference between the payments (i.e. investors in non-strippable bonds) would have received some tax relief on the earlier payment which is spread over the life of the bond, the model made a further allowance for this. Since the tax treatment between strippable and non-strippable bonds was harmonised in April 1999 it is now no longer necessary to make a tax adjustment to the yield curve.

[14] For a given change in yield, the price of a short-dated bond will change much less than that of a longer-dated bond.

Choice of which bonds to use in the estimation

One of the important issues to consider when modelling the yield curve is which bonds to use in the estimation. To produce a meaningful measure of the government bond yield curve, only government bonds should be used since only they are normally regarded as being free from default risk. For example, the price of a corporate bond will typically be lower than that of a government bond of identical coupon and maturity, reflecting the credit risk of the corporate issuer.

In addition to conventional bonds, in many markets government bonds also exist with embedded optionality or with cash flows which are either linked to inflation (index-linked bonds) or that are periodically reset (floating rate securities). Bonds with embedded optionality give either the issuer or the holder some discretion to redeem early or to convert to another security. For example, several gilts are double-dated, giving the Treasury the option to redeem the bond at face value at any time between two dates specified at the time of issue. The embedded optionality will affect the valuation of such bonds relative to other bonds in the market. The extent to which the option will impact on a bond's price depends on the market value of the option. Hence, in order to incorporate callable bonds successfully in the estimation of the yield curve it is necessary to build in an option pricing model. The additional complexity that this gives rise to means that in practice callable bonds are normally excluded from the yield curve estimation. This is the practice followed by the DMO.

Since the return on index-linked bonds is measured in real rather than nominal terms it is inappropriate to use them in the estimation of the nominal yield curve. There is currently only one floating rate bond in the UK market and since this only provides a measure of very short-term (i.e. 3 month) interest rates it too is excluded from the estimation.

Another selection criterion used when deciding which bonds to use in the yield curve is that of liquidity. For instance, a curve fitted to prices of bonds that are so illiquid that they rarely trade (and for which it may be difficult to obtain good quality prices) runs the risk of being mis-informative. As a result, illiquid bonds are often dropped from the estimation process. The simple proxy that the DMO uses to build an automatic liquidity criterion into the estimation procedure is to exclude all stocks of size below a given nominal amount outstanding. At present this nominal floor is set at £400 million – the same as the rump[15] threshold currently used by the DMO. The DMO also excludes bonds trading when-issued as well as all bonds with less than 3 months to maturity due to the difficulty of accurately estimating the curve at very short maturities[16]. A full list of the bonds currently used by the DMO to estimate the yield curve appears in the Appendix.

---

[15] Rump stocks are relatively small gilts (in terms of nominal outstanding), which GEMMs are not required to make a market in, but for which the DMO will be prepared to make a price if requested.

[16] This is partly due to the fact that a slight inaccuracy in the price can lead to a large yield error for short-dated bonds.

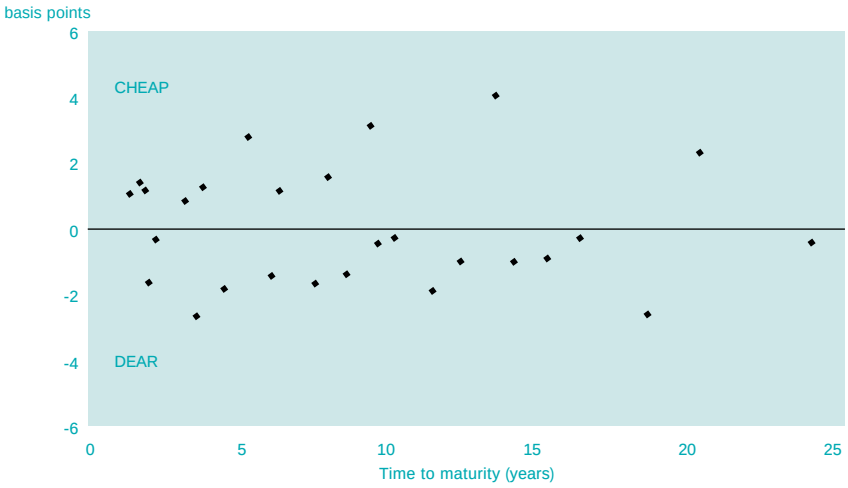
Uses of the DMO yield curve model

The DMO routinely runs its yield curve program at the end of each day, as well as occasionally running it on an intra-day basis. The DMO makes extensive use of the data from its model. For instance, the rates at which public corporations and local authorities can borrow from the Government[15] are determined from the par yield curve. These rates are usually published once a week, but following large market movements they are re-fixed on a more frequent basis.

The DMO also uses its model for internal monitoring of the value of individual bonds relative to the yield curve. The difference between the actual yield on a bond and its theoretical yield implied by the yield curve is referred to as the bond's cheap/dear residual or its *theoretical spread*. On a given day, the theoretical spread for a bond gives an indication of whether it is trading cheap (positive spread) or expensive (negative spread) relative to the yield curve.

Chart 29 below illustrates the cheap/dear residuals for a range of gilts on a recent date. In addition to monitoring the absolute level of cheapness or dearness of individual bonds the DMO looks at how their cheapness/dearness has changed over time. Theoretical prices from the DMO's yield curve model also have a role to play in any reverse auctions that the DMO undertakes. Reverse auctions are of a multiple stock format and in order to rank the bids the DMO accepts stock from the highest relative yields offered (as measured against the theoretical bond yields from the yield curve).

Chart 29
Theoretical spreads of bonds against the yield curve



The DMO also uses its yield curve model when setting the terms for gilt conversions. Conversion terms are decided by the DMO, using its yield curve model to provide a benchmark ratio for the offer. This benchmark ratio is calculated by valuing both the source and destination stocks by discounting each of the cash flows to the conversion date using the forward yield curve on the date of announcement of the conversion terms. The DMO then derives the published conversion ratio from this benchmark ratio by taking some account of the observed cheap/dear characteristics of the source and destination bonds.

[17] National Loans Fund (NLF) and Public Works Loan Board (PWLB) rates.

Appendix:
Bonds used to estimate the yield curve as at 30 June 2000

8%	Treasury 2000
10%	Treasury 2001
7%	Treasury 2001
7%	Treasury 2002
9¾%	Treasury 2002
8%	Treasury 2003
10%	Treasury 2003
6½%	Treasury 2003
5%	Treasury 2004
6¾%	Treasury 2004
9½%	Conversion 2005
8½%	Treasury 2005
7¾%	Treasury 2006
7½%	Treasury 2006
8½%	Treasury 2007
7¼%	Treasury 2007
9%	Treasury 2008
5¾%	Treasury 2009
6¼%	Treasury 2010
9%	Conversion 2011
9%	Treasury 2012
8%	Treasury 2013
8%	Treasury 2015
8¾%	Treasury 2017
8%	Treasury 2021
6%	Treasury 2028
4¼%	Treasury 2032

Annex A

Gilts in issue at 31 March 2000 (£mn nominal)

Conventional gilts		Redemption date	Dividend dates	Amount in issue	Amount held in stripped form	Central govt holdings (DMO & NILO)
13%	Treasury 2000	14-Jul-00	14 Jan/Jun	3,171	-	96
8%	Treasury 2000	07-Dec-00	7 Jun/Dec	9,800	88	219
10%	Treasury 2001	26-Feb-01	26 Feb/Aug	4,406	-	15
11 1/2%	Treasury 2001-2004	19-Mar-01	19 Mar/Sep	1,620	-	142
	Floating Rate 2001	10-Jul-01	10 Jan/Apr/Jul/Oct	3,000	-	16
7%	Treasury 2001	06-Nov-01	6 May/Nov	12,750	-	749
7%	Treasury 2002	07-Jun-02	7Jun/Dec	9,000	206	79
9 3/4%	Treasury 2002	27-Aug-02	27 Feb/Aug	6,527	-	47
8%	Treasury 2002-2006	05-Oct-02	5 Apr/Oct	2,050	-	118
8%	Treasury 2003	10-Jun-03	10 Jun/Dec	7,600	-	418
10%	Treasury 2003	08-Sep-03	8 Mar/Sep	2,506	-	0
6 1/2%	Treasury 2003	07-Dec-03	7Jun/Dec	7,987	94	115
5%	Treasury 2004	07-Jun-04	7 Jun/Dec	7,408	1	79
3 1/2%	Funding 1999-2004	14-Jul-04	14 Feb/Aug	543	-	32
6 3/4%	Treasury 2004	26-Nov-04	26 May/Nov	6,500	-	373
9 1/2%	Conversion 2005	18-Apr-05	18 Apr/Oct	4,842	-	0
8 1/2%	Treasury 2005	07-Dec-05	7 Jun/Dec	10,373	465	188
7 3/4%	Treasury 2006	08-Sep-06	8 Mar/Sep	4,000	-	261
7 1/2%	Treasury 2006	07-Dec-06	7 Jun/Dec	11,700	304	132
8 1/2%	Treasury 2007	16-Jul-07	16 Jan/Jul	7,397	-	216
7 1/4%	Treasury 2007	07-Dec-07	7 Jun/Dec	11,000	294	91
9%	Treasury 2008	13-Oct-08	13 Apr/Oct	5,621	-	0
5 1/2%	Treasury 2008-2012	10-Sep-12	10 Mar/Sep	1,000	-	58
5 3/4%	Treasury 2009	07-Dec-09	7 Jun/Dec	8,827	81	242
6 1/4%	Treasury 2010	25-Nov-10	25 May/Nov	4,750	-	269
9%	Conversion 2011	12-Jul-11	12 Jan/Jul	5,273	-	82
7 3/4%	Treasury 2012-2015	26-Jan-12	26 Jan/Jul	800	-	177
9%	Treasury 2012	06-Aug-12	6 Feb/Aug	5,361	-	0
8%	Treasury 2013	27-Sep-13	27 Mar/Sep	6,100	-	305
8%	Treasury 2015	07-Dec-15	7 Jun/Dec	12,287	176	83
8 3/4%	Treasury 2017	25-Aug-17	25 Feb/Aug	7,550	-	179
8%	Treasury 2021	07-Jun-21	7 Jun/Dec	16,500	448	105
6%	Treasury 2028	07-Dec-28	7 Jun/Dec	11,512	294	65
2 1/2%	Treasury	Undated	1 Apr/Oct	474	-	0
3 1/2%	War	Undated	1 Jun/Dec	1,909	-	0
				222,144	**2,454**	**4,951**

Gilts in issue at 31 March 2000 (£mn nominal)

Index-linked gilts		Redemption date	Dividend dates	Amount in issue	Nominal including inflation uplift	Central govt holdings (DMO & NILO)
2½%	I-L Treasury 2001	24-Sep-01	24 Mar/Sep	2,150	4,535	38
2½%	I-L Treasury 2003	20-May-03	20 May/Nov	2,700	5,660	14
4⅜%	I-L Treasury 2004	21-Oct-04	21 Apr/Oct	1,300	1,583	0
2%	I-L Treasury 2006	19-Jul-06	19 Jan/Jul	2,500	5,941	14
2½%	I-L Treasury 2009	20-May-09	20 May/Nov	2,625	5,503	26
2½%	I-L Treasury 2011	23-Aug-11	23 Feb/Aug	3,475	7,696	3
2½%	I-L Treasury 2013	16-Aug-13	16 Feb/Aug	4,200	7,774	7
2½%	I-L Treasury 2016	26-Jul-16	26 Jan/Jul	4,495	9,092	45
2½%	I-L Treasury 2020	16-Apr-20	16 Apr/Oct	3,800	7,562	0
2½%	I-L Treasury 2024	17-Jul-24	17 Jan/Jul	4,820	8,148	40
4⅛%	I-L Treasury 2030	22-Jul-30	22 Jan/Jul	2,150	2,627	3
				34,215	66,121	190

"Rump" Gilts		Redemption date	Dividend dates	Amount in issue	Central govt holdings (DMO & NILO)
13¾%	Treasury 2000-2003	25-Jul-00	25 Jan/Jul	53	4
9½%	Conversion 2001	12-Jul-01	12 Jan/Jul	3	3
9¾%	Conversion 2001	10-Aug-01	10 Feb/Aug	35	28
10%	Conversion 2002	11-Apr-02	11 Apr/Oct	21	11
9½%	Conversion 2002	14-Jun-02	14 Jun/Dec	2	2
9%	Exchequer 2002	19-Nov-02	19 May/Nov	83	65
11¾%	Treasury 2003-2007	22-Jan-03	22 Jan/Jul	234	58
9¾%	Conversion 2003	07-May-03	7 May/Nov	11	9
12½%	Treasury 2003-2005	21-Nov-03	21 May/Nov	152	42
13½%	Treasury 2004-2008	26-Mar-04	26 Mar/Sep	95	10
10%	Treasury 2004	18-May-04	18 May/Nov	20	5
9¾%	Conversion 2004	25-Oct-04	25 Apr/Oct	307	58
10½%	Exchequer 2005	20-Sep-05	20 Mar/Sep	23	13
9½%	Conversion 2006	15-Nov-06	15 May/Nov	6	2
8%	Treasury 2009	25-Sep-09	25 Mar/Sep	393	26
12%	Exchequer 2013-2017	12-Dec-13	12 Jun/Dec	57	1
2½%	Annuities	Undated	5 Jan/Apr/Jul/Oct	3	0
3%	Treasury	Undated	5 Apr/Oct	56	3
3½%	Conversion	Undated	1 Apr/Oct	98	74
2½%	Consolidated	Undated	5 Jan/Apr/Jul/Oct	275	22
2¾%	Annuities	Undated	5 Jan/Apr/Jul/Oct	1	0
4%	Consolidated	Undated	1 Feb/Aug	358	14
				2,286	450

Annex B

The Debt Management Office Remit for 2000-01

Gilt Remit

(as published in the Debt Management Report on 21 March 2000)

Objectives

1. The Debt Management Office (DMO), an Executive Agency of HM Treasury, has been given the following objectives in respect of Government debt management:

- to meet the annual remit set by Treasury Ministers for the sale of gilts, with high regard to long-term cost minimisation taking account of risk;

- to advise Ministers on setting the remit to meet the Government's debt management objectives, and to report to Ministers on the DMO's performance against its remit, objectives and targets;

- to develop policy on and promote advances in new instruments, issuance techniques and structural changes to the debt markets that will help to lower the cost of debt management, liaising as appropriate with the Bank of England, Financial Services Authority, London Stock Exchange, and other bodies; and to provide policy advice to Treasury Ministers and senior officials accordingly;

- to conduct its market operations, liaising as necessary with regulatory and other bodies, with a view to maintaining orderly and efficient markets and promoting a liquid market for gilts;

- to provide, including in liaison with the Bank of England and CRESTCo, a high quality efficient service to investors in Government debt, and to deal fairly and professionally with market participants in the gilt and money markets, consistent with achieving low cost issuance;

- to contribute to HM Treasury's work on the development of the strategy for the debt portfolio; and

- to make information publicly available on the debt markets and DMO policies where that contributes through openness and predictability to efficient markets and lower costs of debt issuance.

Quantity of gilt sales

2. The Debt Management Office, on behalf of the Government, will aim for gilt sales of approximately £12$^{1}/_{4}$ billion in 2000-01.

Pace of gilt sales

3. The DMO will aim to sell gilts at a broadly even pace through the year. Within-year seasonal fluctuations in the pattern of central government expenditure and revenue will be met by other financing means governed by the Exchequer cash management remit, mainly changes to the weekly Treasury bill tender.

Amount and maturity mix of index-linked gilt issuance

4. Over 2000-01, the DMO plans to sell £3.5 billion (cash), about 30 per cent of its gilt sales in index-linked stocks.

5. Four auctions of index-linked stocks are planned in 2000-01. Issuance will be directed at medium and longer-dated maturities (i.e. stocks dated 2009 and longer).

6. To ensure the medium-term viability of the index-linked auction programme, the authorities remain committed to a minimum supply of £2.5 billion (cash) of index-linked stocks for the foreseeable future.

Amount and maturity mix of conventional gilt issuance

7. Four auctions of conventional stocks are planned in 2000-01; three in the long (15 years and over) maturity area and one in the medium (7 - 15 years) area.

8. HM Treasury will consider accommodating reductions in the forecast 2000-01 financing requirement by: pre-financing foreign currency debt maturing in 2001-02 (up to £3.8 billion) and 2002-3 (up to £1.9 billion); some repayment of its Ways and Means facility at the Bank of England (up to £2 billion); and reducing the assumed Treasury Bill stock at end-March 2001 (up to £2 billion).

9. Increases in the financing requirement will be accommodated first by scaling back the buy-back programme and second by increasing the stock of Treasury bills by up to £5 billion.

10. For 2000-01, there are no plans to meet the financing requirement through sales of gilts with a maturity of less than 3 years, but the DMO reserves the right to tap sub-3 year gilts for market management purposes.

Buy-backs of gilts

11. The DMO may offer to buy-back from the market a total of £3.5 billion (cash) of debt in 2000-2001. At least £2.5 billion will be through reverse auctions of non-strippable conventional gilts with over £1 billion (nominal) in issue and maturities in calendar years 2003 to 2008. The DMO will consult the market about the methodology to be adopted in any such auctions and publish its conclusions before launching any buy-backs.

Method of issuance of gilts

12. Auctions will constitute the primary means of issuance of all gilts (conventional and index-linked). The DMO plans to hold four auctions of conventional gilts and four auctions of index-linked gilts on the calendar set out below. All auctions will be single auctions held on the day indicated.

Gilt auction calendar 2000-01

DATE	TYPE
Wednesday 3 May 2000	Index-Linked
Wednesday 24 May	Conventional
Wednesday 26 July 2000	Index-linked
Wednesday 27 September 2000	Conventional
Wednesday 25 October 2000*	Index-linked
Late November 2000/early December 2000*	Conventional
Wednesday 24 January 2001	Index-linked
Wednesday 28 March 2001*	Conventional

* Subject to confirmation following the Chancellor's decisions on the Budgetary timetable.

13. Each auction of conventional gilts is planned to be for between £1½ billion and £3 billion (cash) of stock on a competitive bid-price basis. Each auction of index-linked gilts will be for between £0.5 billion and £1.25 billion (cash) of one stock on a uniform price basis.

14. The programme of conventional and index-linked gilt auctions may be supplemented between auctions by official sales of stock by the DMO "on tap". Taps of stocks will be used only as a market management instrument in conditions of temporary excess demand in a particular stock or sector. The DMO would only contemplate taps of stocks in exceptional circumstances.

15. After an auction, the DMO will generally refrain from issuing stocks of a similar type or maturity to the auction stock for a reasonable period. Such stock will only be issued if there is a clear market management case.

16. For the purposes of market management, the DMO may create and repo out stock in accordance with its response to the consultation exercise on special repo operations dated 22 February 2000.

In-year consultation and announcements on auctions

17. Towards the end of each calendar quarter, the DMO will publish, with the agenda for the consultation meetings with gilt market participants, details of progress to date with the gilt issuance programme, including any changes to the Government's financing requirement and any changes to the gilts auction programme. The DMO will then consult Gilt-edged market makers and end-investors on the auction programme for the following quarter, the auction date and any other issues that may arise. Following that consultation, at the end of

the quarter, the DMO will announce plans for the auctions scheduled for the coming quarter. For each auction, this will indicate the stock to be auctioned or, where relevant, the approximate maturity of a new stock.

18. The auction plan for the first quarter of 2000-01 will be announced at 3.30pm on Wednesday 31 March 2000.

19. Full details of these, and subsequent, auctions will be announced at 3.30pm on the Tuesday of the week preceding the auction.

Coupons

20. As far as possible, coupons on new issues of gilts will be set to price the stock close to par at the time of issue.

Buy-ins of short maturity debt

21. The DMO will have responsibility for buying in stocks close to maturity to manage Exchequer cash flows.

Conversions and Switch Auctions

22. In order to build up the pool of benchmark stocks further, the DMO envisages making offers for the conversion of unstrippable stocks into benchmarks of similar maturity during 2000-01. The programme of conversion offers may be supplemented by switch auctions into benchmark stocks during 2000-01. In particular the DMO will look closely at the merits of further switches out of the 8% Treasury 2015 into longer maturity stocks. Details of any future switch auction stocks will be announced at the same time as the end-quarter announcements of forthcoming outright auctions.

Reviews to the remit

23. This remit, and in particular the timing of auctions and the allocation between maturity bands and index-linked, may be varied during the year in the light of substantial changes in the following:

- the Government's forecast of the gilt sales requirement;
- the level and shape of the gilt yield curve;
- market expectations of future interest and inflation rates; and
- market volatility.

24. Any revisions to this remit will be announced.

Annex C

Exchequer Cash Management Remit: 2000-2001

(as published in the Debt Management Report on 21 March 2000)

Objective

1. The DMO's primary objective in carrying out its Exchequer cash management operations will be to offset, through its market operations, the expected cash flow into or out of the National Loans Fund on every business day; and to do so in a cost effective manner. In doing so the DMO should:

- balance cost and risk in its choice of strategies;
- manage cash flows without influencing the level of short-term interest rates.

2. The DMO should also take account of:

- the operational requirements for the Bank of England for implementation of its monetary policy objectives;
- its impact on the efficiency of the sterling money market.

3. The DMO will carry out its objective primarily by a combination of:

- structured weekly Treasury bill tenders;
- bilateral market operations with DMO counterparties.
- ad hoc tenders of Treasury bills (and repo or reverse repo transactions);

4. The DMO and the Bank of England will work together to avoid clashes in the delivery of their respective objectives in the money markets. The DMO will not take speculative positions on interest rate decisions by the Bank nor hold operations which by their nature or timing in the day could be perceived to clash with the Bank's open market operations.

I) Structured Treasury bill tenders

Timing and schedule of announcements

5. The DMO will hold structured Treasury bill tenders on the last business day of each week. When announcing the result, the DMO will also announce the quantity and maturity of Treasury bills on offer in the structured tender in the following week and may give the maturity and indicative size of any ad hoc tenders in the following week.

6. Following the final structured tender at the end of each quarter, the DMO will issue a notice outlining the maturities of Treasury bills likely to be available via structured tenders over the following quarter.

Maturities

7. The DMO's structured Treasury bill tenders in 2000-01 may be of the following maturities:

- one month (approximately 28 days);
- three months (approximately 91 days);
- six months (approximately 182 days) and;
- 12 months (approximately 364 days)

8. The DMO expects to give priority to fully establishing the shorter maturities before introducing the longer maturity instruments.

Level of stocks

9. The DMO will manage Treasury bill transactions with a view to running down the stock of bills in months of positive cash flows and increasing it in months of higher net expenditure. Once the Treasury bill stock rises above £5 billion outstanding, a minimum stock of £5 billion outstanding is expected to be maintained thereafter.

Interaction with Bank of England's money market operations

10. The DMO may also issue Treasury bills to the market to assist the Bank of England in its management of the sterling money markets. In response to a request from the Bank, the DMO will add a specified amount to the size(s) of the next structured bill tender(s) and deposit the proceeds with the Bank, remunerated at the weighted average yield(s) of the respective tenders. The amount being offered to accommodate the Bank's request will be identified in the DMO's weekly structured bill tender announcement. Treasury bills issued at the request of the Bank will be identical in all respects with the rest of the stock of Treasury bills outstanding.

II) Bilateral operations with the market

11. In pursuit of its cash management objectives, the DMO expects to trade on a daily basis with its counterparties across a range of instruments.

12. The DMO's bilateral operations may comprise:

- purchase from the market for future resale (reverse repo);
- sale to the market for future repurchase (repo);
- outright sale and purchase of gilts, Treasury bills and eligible bills ;
- unsecured cash borrowing and lending with its counterparties.

13. The DMO would give prior notice to the market if it planned to introduce additional instruments for use in its bilateral operations.

14. Other than gilts and Treasury bills, collateral used in the repo and reverse repo transactions may include selected euro denominated Government securities, eligible bank bills, supranational sterling and euro denominated securities. In carrying out these transactions, the DMO may make use of those of its own holdings of marketable gilts, or funds managed by NILO, which are maintained for collateral purposes. If required, HM Treasury may issue gilts or Treasury bills to the DMO for collateral purposes.

III) Ad hoc tenders

15. The DMO may also issue short maturity Treasury bills (up to 28 days) at ad hoc tenders. The objective of such tenders will be to provide additional flexibility for the DMO in smoothing Exchequer cash flows. Treasury bills issued in ad hoc tenders will be identical in every respect with those issued by structured tenders.

16. In addition to issuing Treasury bills, the DMO may also execute repo or reverse repo transactions at ad hoc tenders. For such transactions, collateral used would either be gilts or Treasury bills.

17. The DMO may also hold ad hoc tenders for buying in gilts (or gilt strips) with a residual maturity of less than six months.

Timing of ad hoc tenders

18. The DMO will usually announce its intention to hold ad hoc tenders in the weekly announcement of the structured tender result. Such announcements will indicate the day(s) of the following week on which ad hoc tender(s) are expected to be held, together with a guide to the expected maturity and size.

19. The precise details of the maturity and nominal on offer will be announced at the opening of the offer on the morning of the tender (usually at either 8.30 or 10.00am). The DMO may hold ad hoc tenders for the same maturity date on successive business days. Ad hoc tenders will be open for 15 minutes.

20. The DMO may hold up to two ad hoc tenders per day. The DMO will not hold a second ad hoc tender on gilt auction days or Monetary Policy Committee decision days.

ANNEX D

Gilt-edged Market Makers (GEMMs) and Inter-Dealer Brokers (IDBs)

A) GEMMs
(**indicates additional IG GEMM Status)

ABN AMRO Bank NV
250 Bishopsgate
London
EC2M 4AA

Barclays Capital**
5 The North Colonnade
Canary Wharf
London
E14 4BB

Credit Suisse First Boston Gilts Limited
One Cabot Square
London
E14 4QJ

Deutsche Bank AG
Winchester House
1 Great Winchester Street
London
EC2M 3UR

Dresdner Bank AG**
Riverbank House
PO Box 18075
2 Swan Lane
London
EC4R 3UX

Goldman Sachs International Limited
Peterborough Court
133 Fleet Street
London
EC4A 2BB

Intercapital Gilt Trading**
2nd Floor
Park House
16 Finsbury Circus
London
EC2M 7UR

JP Morgan Securities Limited
PO Box 161
60 Victoria Embankment
London
EC4Y OJP

Lehman Brothers International (Europe)**
1 Broadgate
London
EC2M 7HA

Merrill Lynch International**
Ropemaker Place
25 Ropemaker Street
London
EC2Y 9LY

Morgan Stanley & Co. International Limited**
25 Cabot Square
Canary Wharf
London
E14 4QA

Greenwich Nat West Gilts Ltd**
135 Bishopsgate
London
EC2M 3UR

HSBC Bank Plc**
Thames Exchange
10 Queen Street Place
London
EC4R 1BQ

Société Générale (London Branch)
S G House
41 Tower Hill
London
EC2A 2DD

Winterflood Gilts Limited**
Walbrook House
23-29 Walbrook
London
EC4N 8LA

Salomon Brothers UK Limited
Victoria Plaza
111 Buckingham Palace Road
London
SW1W OSB

UBS Warburg
2 Finsbury Avenue
London
EC2M 2PP

B) IDBs

Cantor Fitzgerald Gilts
1 America Square
London
EC3N 2LT

Dowgate
25 Dowgate Hill
London
EC4R 2GN

Garban-Intercapital WCLK Ltd.
Park House
16 Finsbury Circus
London
EC2M 7UR

United Kingdom
Debt
Management
Office

Cheapside House
138 Cheapside
London EC2V 6BB