Trends in real interest rates

It is frequently claimed that UK interest rates are 'excessive'. The point is commonly made with reference to nominal interest rates, which have been, and still are, higher in the United Kingdom than in many other industrial countries. Nevertheless, real rates of interest are likely to have a greater and more long-lasting influence on investment and savings decisions. This note[1] attempts to set UK rates in an international context. First, pre-tax and post-tax rates in the United Kingdom, the United States, Germany, Japan, France, Italy and Canada (the G7 countries) are compared, extending the analysis undertaken in previous Bulletins.[2] *In general, these comparisons suggest that at the end of 1987 UK real rates of interest were a little higher than those in the rest of the G7 grouping, reflecting the authorities' commitment to the continuation of a successful anti-inflationary policy. Nevertheless, the discrepancy was considerably less than nominal rate differences suggest and would seem to have declined during the first quarter of 1988. Furthermore, taking the last decade as a whole, UK rates did not behave markedly differently from those in other countries. After presenting these conclusions, some of the difficulties in constructing real interest rates are discussed.*

The accompanying charts show various estimates of real short-term interest rates which might be relevant for commercial borrowers and private lenders in the G7 countries. Both pre-tax and post-tax figures are given from the first quarter of 1975 to the fourth quarter of 1987. Where available, figures for January 1988 are also shown as a guide to real interest rate movements during the first quarter of this year. To ease comparison, on each chart the respective unweighted G7 average rates are also plotted. The following developments took place over this period:

- For all countries, the second half of the 1970s was characterised by very low real interest rates. Post-tax, although not necessarily pre-tax, rates were almost always negative. The only exception was the positive post-tax rate paid by German borrowers during 1975–77.

- Real interest rates in most countries peaked quite sharply in 1981, typically becoming positive during the course of the year.

- Subsequently, while in general real interest rates remained positive, there was some decline followed by a further peak during 1984. For the pre-tax series, this was in most instances a little lower than at the preceding peak. In Canada and the United States, however, the later post-tax peaks were higher.

- Since then, the trend has been downwards, although generally some upturn has occurred through 1987. UK real interest rates have not fallen in line with those in other countries. However, the change in relative position is in part a reflection of the comparatively low level of UK rates in 1984.

- French and, to some extent, Italian interest rates have behaved in a rather different manner to those in other countries. In the first place they remained negative through the greater part of the early 1980s. Second, in both countries the 1981 peak was low and a strong upward trend resumed shortly afterwards. Finally, while Italian real interest rates have declined since 1984,.French rates only turned downwards at the end of 1986.

Comparison of international real interest rate levels has to be more tentative than the identification of broad trends. Bearing this in mind, however, the following observations may be made.

- In the third quarter of 1987 (the last period for which a full comparison is available), UK savers obtained the highest post-tax real rate of interest. Nevertheless, because Japanese and French savers have not paid tax on certain interest receipts to date, their underlying marginal rates were almost on a par with those available in the United Kingdom. Italian lenders received the lowest real rate of interest.

- The United Kingdom also had, albeit fairly marginally, the highest post-tax real rate of interest from the viewpoint of the large corporate borrower. In contrast, German company sector borrowers generally obtained the lowest real rate in the G7 grouping.

- It should be emphasised that, although net real interest rates in the United Kingdom were high in comparison with those in other industrial countries, their general behaviour over the last decade has not

(1) Written by J W Lomax in the Bank's Economics Division.
(2) See the December 1983 *Bulletin*, page 471 and the September 1986 *Bulletin*, page 359.

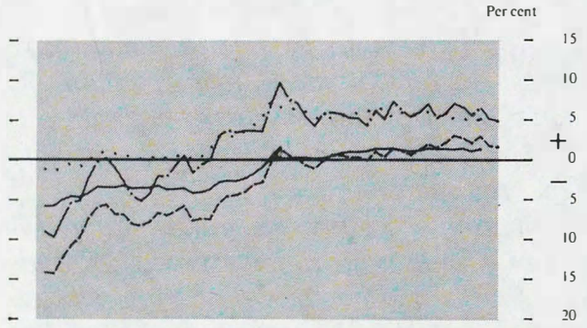
Charts 1–4
Real interest rates

Pre-tax G7 average — Pre-tax

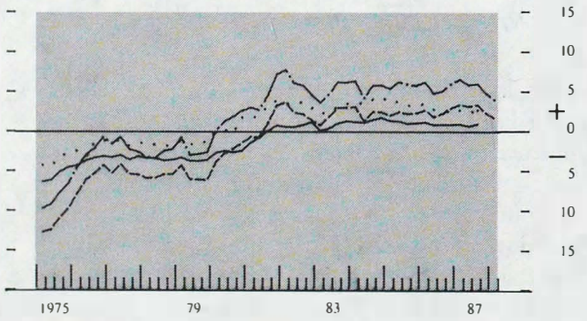
Post-tax G7 average — Post-tax

United Kingdom

Rates to borrowers

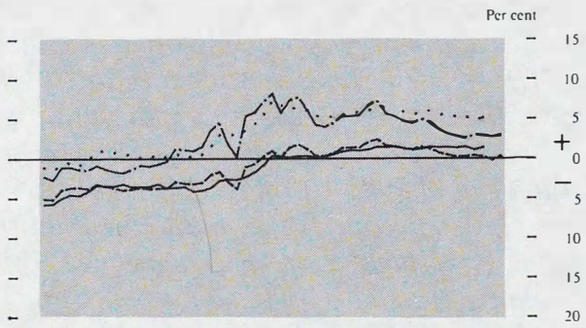


Rates to lenders

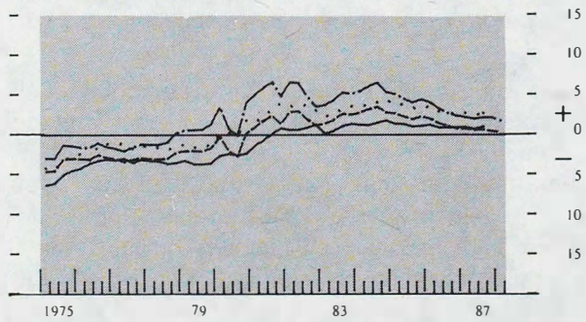


United States

Rates to borrowers

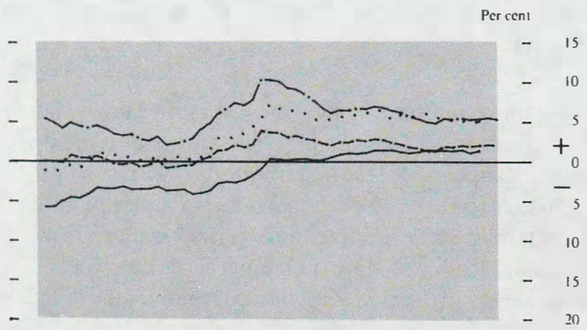


Rates to lenders

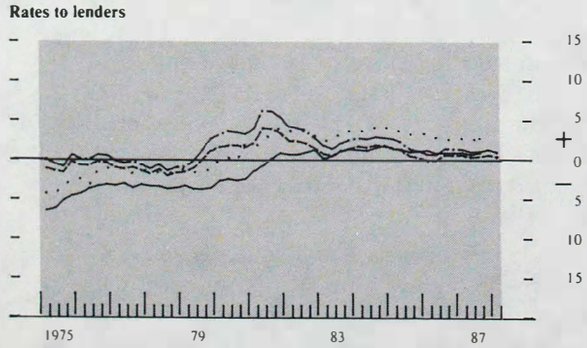


Germany

Rates to borrowers

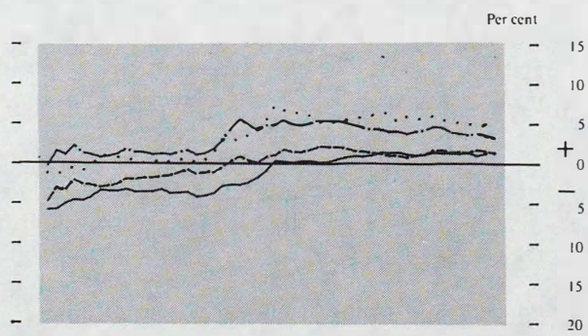


Rates to lenders

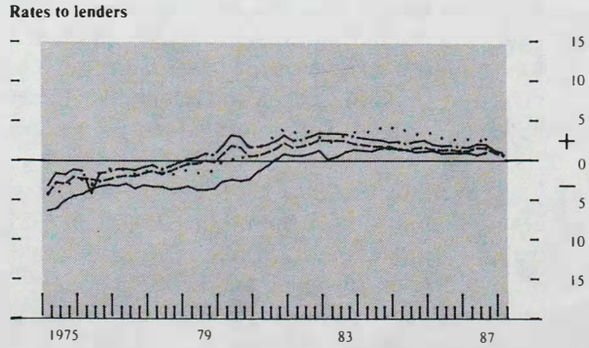


Japan

Rates to borrowers



Rates to lenders



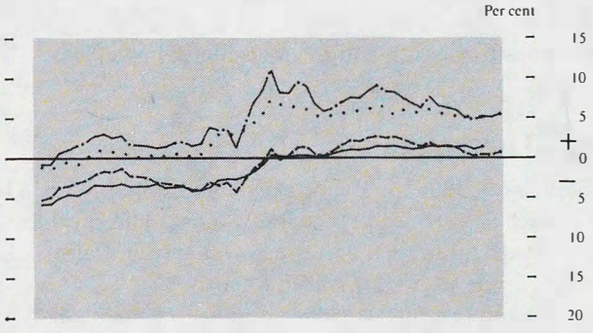
Charts 5–7
Real interest rates

· · · · · · Pre-tax G7 average — · — Pre-tax

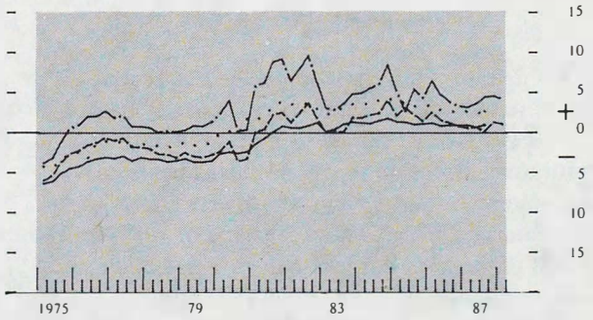
——— Post-tax G7 average – – – – – – Post-tax

Canada

Rates to borrowers

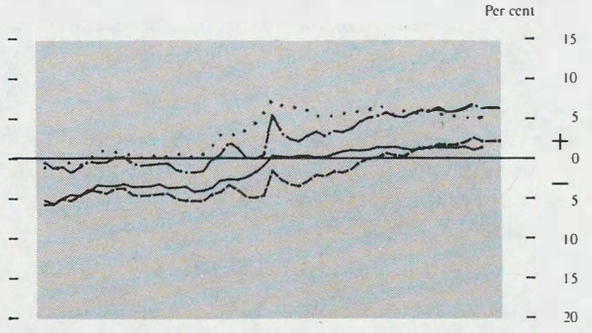


Rates to lenders

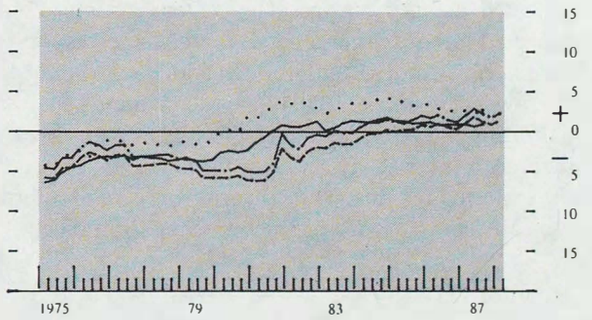


France

Rates to borrowers

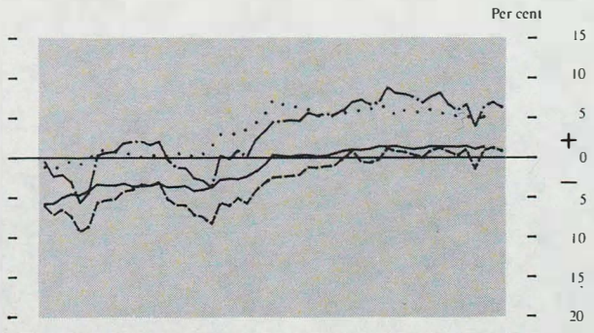


Rates to lenders

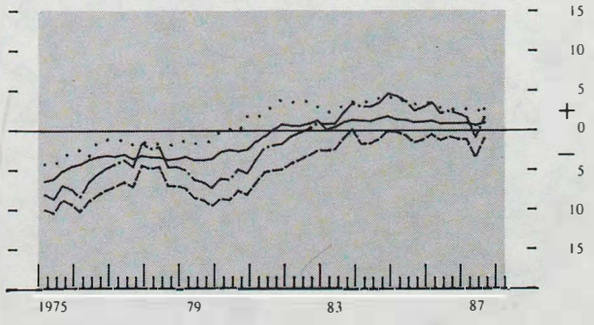


Italy

Rates to borrowers



Rates to lenders



been substantially out of line with international standards. Furthermore, in the first quarter of 1988 real interest rates in the United Kingdom declined relative to those in other countries. In any case, high real rates are not entirely deleterious given the role that interest rates play in the government's anti-inflation policy. Short-term interest rates are the essential instruments of monetary policy and are designed to bear down on inflation. To the extent that the authorities are successful in exerting such downward pressure, rates will be higher in real terms in the short term.

The remainder of this note examines some of the more important considerations affecting the computation of real rates of interest.

Calculation of real interest rates

Real interest rates measure the return on savings and the cost of borrowing after allowance has been made for expected changes in prices. Hence, for example, a high expected inflation rate generally leads to correspondingly high nominal rates of interest. In addition, where borrowers are able to offset interest payments against tax liabilities or lenders are subject to taxation on investment income, it is generally also appropriate to take account of the expected tax rate. Thus, the real net rate of interest is typically computed using the following formula:

Equation (1) $$r = \frac{1 + i\,(1 - t^e)}{1 + p^e} - 1$$

where r is a post-tax real rate of interest.
i is the corresponding pre-tax nominal rate.
t^e is the relevant expected tax rate.
p^e is the expected inflation rate.

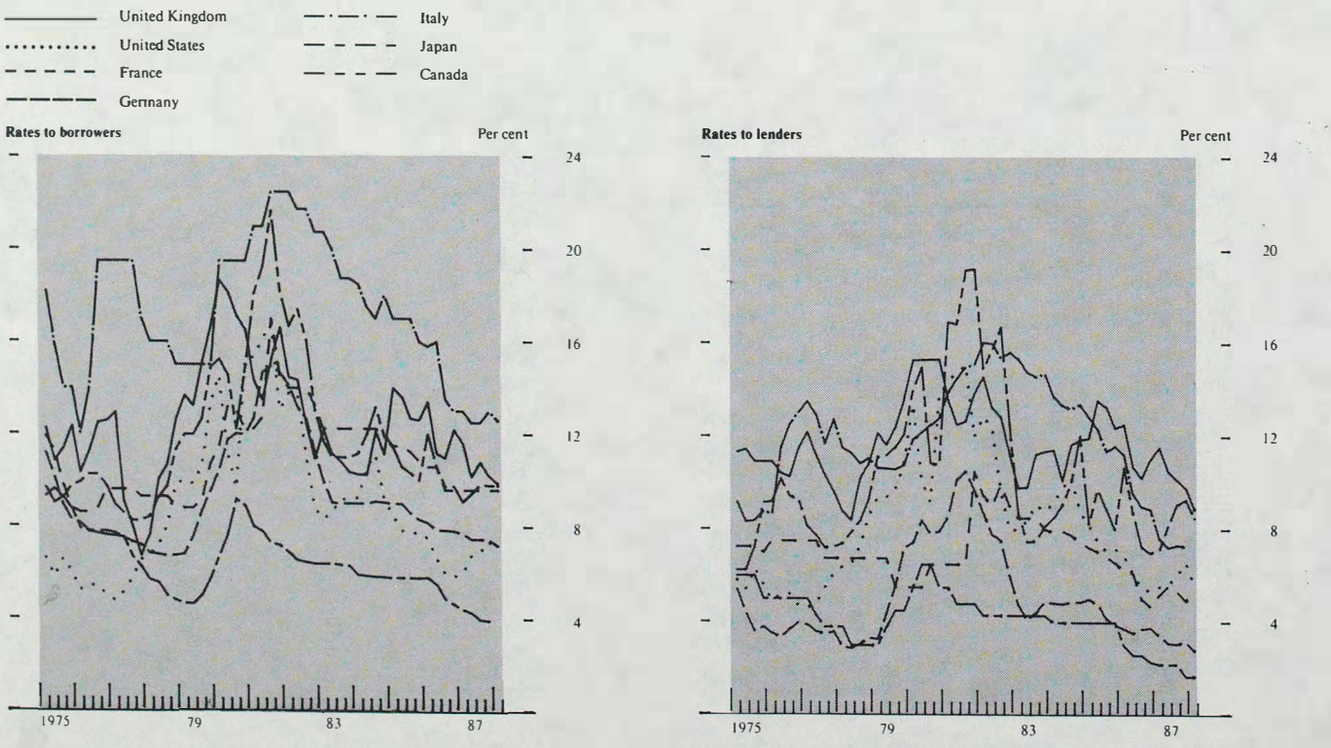
There is no single real net interest rate which adequately reflects both the cost of borrowing and the return on savings. Rather there are numerous real interest rates which could be applicable depending on the choice of the nominal rate, the measure of price change, the process of expectations formation and the marginal tax rate.

Nominal interest rates

As noted above, there is a wide range of nominal interest rates in each country from which to choose. The emphasis is on short-term funding, because longer-term inflation expectations are more difficult to identify.(1) Two alternative interest rates are considered—one facing large corporate borrowers, the other small private lenders. The various rates selected are specified in Table A.

Chart 8 illustrates the behaviour of the two sets of nominal interest rate measures on a quarterly basis over the period 1975–87. It can be seen that the range of interest rate values is quite large, varying between approximately 3% and 13% for borrowers and 2% and 12% for lenders during 1987. At the end of 1987, from the viewpoint of the large corporate borrower, Italian rates were higher than those in the other G7 countries and had been throughout most of the preceding decade.

Chart 8
Pre-tax nominal interest rates



(1) From 1981, they might be derived for the United Kingdom through the comparison of index-linked and ordinary gilts (see the article on inflation-adjusted sectoral saving and financial balances on page 232). Nevertheless, because such measures are not available on an equivalent basis in the other G7 countries, this method could not be used here.

Table A
Nominal interest rates facing borrowers and lenders in the G7 countries

	Large corporate borrower	Small private lender
United Kingdom	Inter-bank 3-month rate + 1%(a)	Gross rate of interest on building society shares
United States	3-month commercial paper rate	Treasury bill rate (3-months)(b)
Germany	Average of lending—current account credit 2	Bank deposit rates on less than DM 100,000
Japan	Short-term loans: all banks	6-month rate on postal savings certificates
France	Bank loans: base rate	Maximum regulated rate on time deposits
Italy	Bank credit: prime rate	Average rate on savings deposits
Canada	Bank prime rate on business loans	Time deposit receipts 3-month

(a) It is thought that large UK corporate borrowers may currently be able to borrow below the interbank rate + 1%. Nevertheless, precise borrowing rates are unknown. Furthermore, slight reductions do not significantly affect the conclusions of the present study.
(b) The Treasury bill rate is used for two reasons. First, no obvious deposit rate series is available. Second, US savings are frequently deposited in Money Market Mutual Funds, whose portfolios are largely composed of public sector debt instruments.

Nevertheless, UK rates ranked second and had been significantly in excess of those in Germany, Japan and the United States for some time. As regards small private lenders, interest rates in the United Kingdom were in fact higher than those in the rest of the G7 grouping between the first quarter of 1985 and the final quarter of 1987. In this period German and Japanese lenders obtained the lowest nominal rates of return.

Adjustment for inflation

The response of the nominal rate of interest to perfectly anticipated inflation can be broadly described as follows. Lenders expect the real value of their principal to depreciate and borrowers expect to be able to repay loans with money whose real value will have been eroded. Accordingly, at the initial level of nominal interest rates, the quantity of loans supplied decreases, while the quantity demanded increases. These forces act to raise the nominal rate of interest. Where inflation is underpredicted, debtors gain at the expense of creditors, and vice versa.

While it is sometimes assumed that the real rate of interest ought to be invariant to the correctly forecast inflation rate, this need not be the case. In the first instance, an anticipated rise in prices reduces individuals' real cash balances. If they respond by increasing steady state savings rates in order to preserve the value of such balances, downward pressure tends to be placed on the real rate of interest.[1] In this context, it might also be noted that complete adjustment of nominal interest rates to correct inflationary expectations is essentially a market clearing phenomenon and because of market interdependence full equilibrium in the capital market may also require equilibrium in the remainder of the economy.[2] Finally, the movement of nominal interest rates in some countries is still partly determined by institutional factors; therefore, they may not reflect underlying market equilibria, in the sense that observed rates may be lower (or, less frequently, higher) than the rates that would prevail in the absence of such constraints. Overall, the arguments suggest that when the expected rate of inflation is increasing, nominal interest rates are likely to adjust by less than the expected rate of inflation, and vice versa.

A number of different price indices might be used including, for example, the retail price index, wholesale input prices and wholesale output prices. Each of these indices may be open to criticism for being 'unrepresentative'. Furthermore, their composition and availability varies greatly between the G7 countries. For these reasons, more broadly based measures of inflation seemed appropriate. Thus, the GNP deflator was used in every instance except the United Kingdom. The United Kingdom is the only net oil exporter in the group. However, the contribution of the oil sector to total employment is small, and the oil price has been volatile. Therefore, the GDP deflator excluding oil seemed preferable.

A variety of techniques have been employed by economists to obtain 'expected' rather than 'actual' price indices. Typically, 'error learning', 'extrapolative' or 'rational' models of expectations formation have been postulated. The correct choice is far from obvious and, unfortunately, estimated real rates of interest are quite sensitive to the assumed model of expectations. In the present exercise a simple hybrid was computed, by averaging the current twelve-month rate and the outturn value for a year ahead.[3] For 1987, inasmuch as 1988 price forecasts were required, projections of inflation in the overseas countries based on Bank forecasts were used. The UK series is based on the projections in the FSBR. The estimated proxies are indicated in Table C.

Adjustment for taxation

Interest receipts by private lenders are generally subject to normal personal taxation rules (with some significant exceptions for French and Japanese savers)[4] and corporate borrowers' interest expenses can be offset against taxable income. This tends both to reduce the willingness to lend and to increase the desire to borrow in comparison with a zero-tax situation. Thus, nominal rates of interest tend to be higher than would otherwise be the case. Another point is that it is income including (net of) nominal rather than real interest receipts which is liable to tax. To see the effects of this, equation (1) may be written as:

Equation (2) $$i = \frac{(1+r)(1+p^e)-1}{1-t^e}$$

(1) See R A Mundell, 'Inflation and Real Interest', *Journal of Political Economy* (1963), pages 280–83.
(2) See T J Sargent, 'Anticipated Inflation and the Nominal Rate of Interest', *Quarterly Journal of Economics* (1972), pages 212–25.
(3) More specifically, the proxy for expected inflation over the next year at quarter t is:
$$\left\{\frac{\text{Price index at } t}{\text{Price index at } t-4} - 1\right\} \times 50 + \left\{\frac{\text{Price index at } t+4}{\text{Price index at } t} - 1\right\} \times 50$$
(4) In Japan, interest from bank deposits and postal savings deposits up to ¥ 3 million (£12,800) was tax exempt (until 1 April 1988). Similarly, in France the interest on savings deposits up to Fr. Fc.32,500 (£3,060) is exempt.

which shows that,[1] when inflation is anticipated, the nominal pre-tax rate of interest has to increase by more than the expected rate if the net real rate is to remain constant. For these reasons adjustment of gross real rates of interest for expected tax rates is required in order to establish underlying real interest rates.

In the context of such calculations a further range of issues may be raised. A fundamental point is that tax systems in different countries vary significantly and it is difficult to obtain directly comparable tax rates. Ideally, 'forward-looking' rates should be used; it is assumed here, however, that individuals and companies do not expect any changes from the prevailing rates set in annual budgets. For each country an attempt is made to use, or compute, tax rates which are approximately comparable to those in the United Kingdom. In the various calculations undertaken, account was taken of changes in tax rates over time.

The principal difficulties encountered in identifying tax rates for small private lenders were as follows. Tax rate structures in different countries are dissimilar. In particular, the number of marginal rates varies considerably. Thus for example, in 1987/88 UK non-zero marginal rates of tax on taxable interest receipts ran from 27% to 60%, with four intervening thresholds. In Germany, they varied continuously between 22% and 56%, while in the United States the spectrum was from 15% to 38.5% with two intermediate ranges. In each instance, a rate which seemed roughly equivalent to the basic rate of UK income tax has been used. An additional discrepancy between the various tax systems is that in some countries local taxes are collected.[2] The local rate was added to the national figure in order to obtain a comprehensive tax rate.

The arrangements governing corporation tax generally vary less among the G7 countries than is the case with personal taxation. Nevertheless, certain disparities do still exist. For example, local corporation taxes are collected in a number of countries and these were again added to national rates in order to obtain overall tax rates. An additional point is that whereas, in general, companies are able to offset interest payments against taxable profits, this is not the case where tax exhaustion occurs (ie income is insufficient to incur tax liability). These considerations were important, for example, in the United Kingdom where companies paid substantially more tax in 1986 than was the case in 1985. In such circumstances, the gross interest rate tends to be a more appropriate guide to the marginal cost of capital. Table B indicates the overall marginal tax rates used to obtain the two sets of post-tax interest rates in 1987.

Table B
Tax rates facing small private lenders and large corporate borrowers in 1987

Percentage rates

	Lender	Borrower
United Kingdom	27	35
United States	26	40
Germany	22	46 (a)
Japan	21	52
Canada	37.88	50.50
France	18.80	45
Italy	38.20	46.37

(a) The German rate is an average of the tax on undistributed profits (56%) and that on profits distributed to stockholders (36%).

In conclusion, it can be seen that there are many limitations involved in constructing real interest rates. Estimates depend on the nominal rate, the price index, the process of expectations formation and the marginal tax rate selected. This suggests the need for some caution in interpreting international comparisons. Therefore, computed figures should be regarded as only an approximate guide to the range of possible marginal interest rates facing different borrowers and lenders.

(1) Since $\frac{\delta i}{\delta p^e} = \frac{(1+r)}{1-t^e}$

(2) For Canada, Italy and Japan. In the United States, local taxes are very small and were therefore ignored here.

Table C
Proxies for inflation expectations

Per cent. per annum

	United States	United Kingdom	Japan	Italy	Germany	France	Canada
1975 Q1	9.05	23.21	9.52	18.72	5.39	12.40	10.47
Q2	8.68	22.62	7.75	18.51	4.92	12.52	9.78
Q3	7.71	20.12	7.95	16.42	4.49	10.91	8.48
Q4	7.10	18.60	6.22	17.42	3.19	10.66	8.53
1976 Q1	6.61	16.13	6.40	18.60	3.46	9.74	8.17
Q2	6.93	13.68	6.51	19.20	3.34	8.93	8.02
Q3	6.27	12.60	6.75	19.05	3.09	9.30	7.23
Q4	6.31	12.22	6.54	18.65	3.48	10.06	6.47
1977 Q1	6.42	13.89	6.18	18.47	4.05	9.36	6.15
Q2	6.97	11.94	5.47	17.27	4.05	9.30	5.54
Q3	7.17	12.83	5.09	17.04	3.72	10.28	6.42
Q4	7.36	12.46	4.69	14.55	4.24	10.22	6.47
1978 Q1	7.71	12.38	4.42	14.09	4.12	10.14	6.77
Q2	7.82	12.16	4.20	13.63	3.51	9.96	7.83
Q3	8.30	12.94	3.77	16.23	4.50	9.92	8.19
Q4	8.40	13.34	3.25	16.41	4.33	10.45	9.22
1979 Q1	8.74	12.97	2.84	16.44	4.17	10.63	9.68
Q2	7.82	15.06	3.43	17.93	4.55	10.68	7.83
Q3	8.98	15.68	3.60	18.29	4.40	10.90	8.19
Q4	9.39	16.62	3.74	19.37	4.53	10.90	10.63
1980 Q1	9.57	15.09	3.56	19.10	4.17	10.90	11.29
Q2	9.21	13.83	3.22	19.59	4.72	10.94	10.54
Q3	9.36	13.14	3.41	18.33	4.27	11.44	10.73
Q4	9.32	12.35	3.81	19.22	4.58	12.12	10.35
1981 Q1	8.97	10.22	3.69	18.26	4.53	12.22	10.38
Q2	8.37	9.52	2.77	17.04	3.87	12.16	10.00
Q3	7.94	7.61	2.30	17.16	4.23	10.99	9.45
Q4	6.87	6.22	1.56	17.08	4.10	10.88	9.17
1982 Q1	5.95	6.26	1.75	16.93	4.41	11.27	7.88
Q2	5.53	6.70	1.60	16.30	3.75	11.53	7.15
Q3	4.74	6.65	1.25	15.19	3.85	10.80	6.45
Q4	4.35	6.36	0.81	14.62	3.28	9.48	5.95
1983 Q1	4.15	5.96	0.86	14.41	2.98	9.13	5.44
Q2	3.93	4.82	0.85	13.77	2.74	8.44	4.47
Q3	3.59	4.71	0.94	11.99	2.35	8.61	3.71
Q4	3.52	4.78	1.28	10.94	2.38	8.18	3.14
1984 Q1	3.53	4.73	1.18	10.40	2.09	7.26	3.36
Q2	3.50	5.66	1.31	10.07	2.17	6.72	3.32
Q3	3.51	5.51	1.40	9.39	1.97	6.56	3.67
Q4	3.28	5.69	1.68	8.37	2.09	5.84	3.29
1985 Q1	2.97	6.16	1.63	8.17	2.39	5.86	2.91
Q2	2.91	6.85	1.90	8.31	2.60	5.99	2.87
Q3	2.96	6.89	1.61	8.68	2.75	5.24	3.24
Q4	2.67	6.20	1.47	8.46	2.78	4.47	3.47
1986 Q1	2.76	5.96	1.01	7.49	2.94	4.44	3.98
Q2	2.82	5.35	0.79	7.22	2.84	3.94	3.80
Q3	2.76	4.95	0.74	6.42	2.28	3.46	3.24
Q4	2.78	5.04	0.37	6.23	2.30	3.36	3.55
1987 Q1	3.07	4.64	0.45	5.88	2.00	2.88	3.84
Q2	3.26	4.36	0.14	5.65	1.98	2.36	4.40
Q3	3.34	3.91	0.18	5.54	1.97	2.68	4.42
Q4	3.80	4.78	0.41	5.51	1.87	3.04	4.44
1988 Q1	3.84	4.73	0.65	5.71	1.73	2.89	4.09