

Recent yield curve behaviour—an analysis

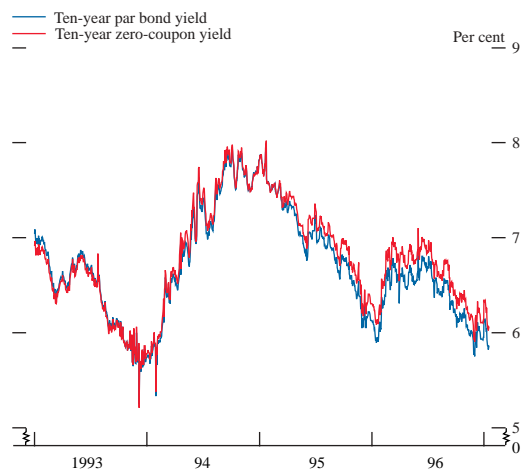
By Bill Allen, Deputy Director, Monetary Analysis.⁽¹⁾

This article analyses recent fluctuations in ten-year bond yields in six countries using an estimation technique to decompose them into different maturity segments, and draws conclusions about the effects on ten-year yields of the changing state of the business cycle and of changing longer-term inflationary expectations.

The analysis uses the yield curve estimation technique developed by Svensson (1994)⁽²⁾ to infer from the constellation of government bond prices zero-coupon yields—that is, the implicit yield of hypothetical bonds which have no interest or coupon payments but only a capital repayment. Although the technique requires various assumptions to be made, and it does not generate unique estimates of implicit yields, it nevertheless produces interesting results. This analysis aims to explain fluctuations in ten-year zero-coupon yields in the United States, Japan, Germany, the United Kingdom, France and Italy. Ten-year zero-coupon yields are of course not the same as ordinary ten-year bond yields, but they are much more easily analytically tractable; and in any case zero-coupon yields are the logical building blocks out of which ordinary bond yields are formed. Moreover recent fluctuations in ten-year zero-coupon yields and in ten-year par bond yields have been very closely aligned, as Chart 1, which shows German yields, illustrates.

The method of analysis is to decompose movements in ten-year zero-coupon yields into three components:

Chart 1
Comparison of German ten-year par bond yields and zero-coupon yields



- current two-year zero-coupon yields (0–2 year yields);
- the three-year zero-coupon yields two years in the future implicit in the current yield curve (2–5 year yields); and
- the five-year zero-coupon yields five years in the future implicit in the current yield curve (5–10 year yields).

This decomposition is a matter of arithmetic: the ten-year zero-coupon yield is a well-defined function of those three components and nothing else. The decomposition is interesting because the components are likely to reflect different influences in different degrees. Specifically, 0–2 year yields are likely to be the most affected by the state of the business cycle. Even if longer-term inflationary expectations were uniform across the world, countries where activity was cyclically strong and capacity utilisation high would have higher 0–2 year yields than countries where activity was cyclically weak and capacity utilisation low.

The business cycle is likely to have a relatively much weaker effect on the 5–10 year component. It is hard for the market to predict in what cyclical phase a country will be five years in the future; moreover 5–10 year yields embrace a period long enough to encompass more than one phase of the business cycle and are likely to reflect something closer to an ‘average’ business cycle phase. By contrast, longer-term inflationary expectations are likely to be relatively a much stronger influence on 5–10 year yields.

Those are the two extremes. As to the middle component, 2–5 year yields, the influences of the business cycle and of inflationary expectations seem likely to be more evenly balanced.

Of course other factors may also cause the shape of zero-coupon yield curves to change—for example, changes in the degree of uncertainty attached by the market to expectations of future yields. But such other influences are not separately identified or discussed in this article.

(1) The article is based on a talk given by Mr Allen at a seminar on ‘Central banks and long-term interest rates’ organised by the Camera di Commercio in Novara, Italy on 11 January 1997.

(2) Deacon and Derry (1994a and b) describe the application of the Svensson technique.

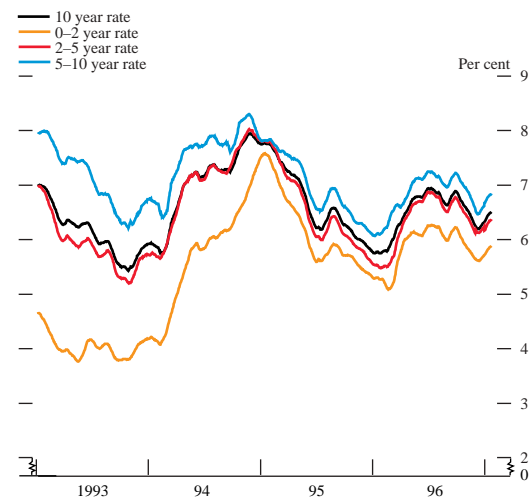
I have examined the period since the beginning of 1993. There was a worldwide fall in yields in 1993, and a convergence of yields (so that international yield differentials generally narrowed). The pattern was largely reversed in 1994, notably after the tightening in US monetary policy in February that year. Yields peaked in November 1994 and there was a steady fall until the end of 1995. Yields rose again during the first five months of 1996 (though not in Japan) but have fallen back since then.

Results

United States

There has been no clear trend in ten-year zero-coupon yields, upwards or downwards, over the period, but they have fluctuated within a range of about 240 basis points (see Chart 2). But there has been a gentle upward trend in 0–2 year rates, which is perhaps not surprising as the US economy has been in the expansionary phase of a

Chart 2
Zero-coupon yields in the United States^(a)



(a) Twenty-day moving average.

business cycle throughout the period since 1993. Counterbalancing the upward trend in 0–2 year yields have been downward trends in 2–5 and 5–10 year yields. These trends seem likely to reflect declining inflationary expectations, which in turn could have been caused by:

- the greater-than-expected success of monetary policy in restraining inflation during the cyclical upswing; and
- unexpected success in reducing current and prospective future budget deficits, which among other things will have reduced the pressures for future inflation.

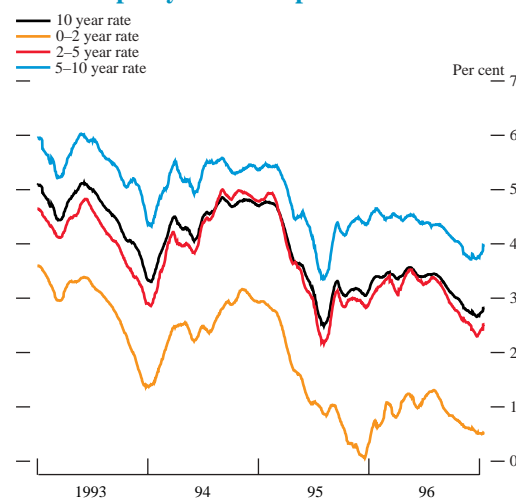
It might be expected that 0–2 year yields would fluctuate more widely than 5–10 year yields, because the state of the business cycle seems likely to be more volatile than longer-term inflationary expectations. Over the period, 0–2 year yields have in fact fluctuated more widely than 5–10 year yields, as the chart shows, but not much more widely. One possible explanation for the small size of the difference is that perhaps there have been significant

short-term fluctuations in longer-term inflationary expectations which have been separate from the cyclical influences on shorter-term yields but which have affected both shorter-term and longer-term yields.

Japan

Japan's experience has been quite different from that of the rest of the world. Yields have been much lower throughout the period and moreover there has been a strong downward trend (see Chart 3). The decomposition shows downward trends in all three components. There have been fluctuations in parallel with those of bond yields in the rest of the world, but they have been superimposed on the downward trends.

Chart 3
Zero-coupon yields in Japan^(a)



(a) Twenty-day moving average.

The fall in 0–2 year yields is readily explained by the prolonged period of slow economic growth in Japan, despite expansionary fiscal policy, and by the adoption of ultra-low short-term interest rates by the Bank of Japan in order to stimulate the economy. The behaviour of market interest rates will have been influenced by market expectations about how long the ultra-low short-term interest rate policy will need to last in order to stimulate economic revival. The evidence so far is that its expected duration has been continuously lengthening.

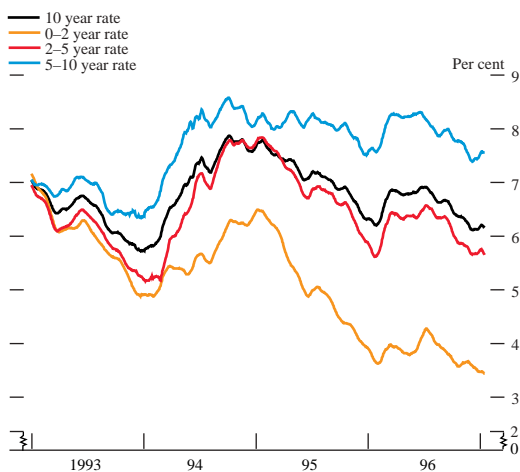
The reasons for the downward trend in 5–10 year yields are less easy to discern. It is possible that implicit forecasts of economic activity relative to the productive potential of the economy even 5–10 years ahead have been revised downwards, so that business cycle factors have had an influence at these maturities. Although inflation in Japan is very low—and probably negative if account is taken of various biases in measurement—the fiscal outlook is coloured by the large budget deficits which are the legacy of fiscal policies adopted in order to sustain economic activity, and in the long term by the implications of the ageing of the Japanese population. The extremely low level of 5–10 year yields in Japan is therefore puzzling. One possible explanation is that there are inhibitions to the capital outflows which would be needed to provoke a rise in yields.

Such inhibitions may have their roots in the experience of the mid-1980s when there were very large capital flows from Japan into US dollar-denominated securities. There followed a large depreciation of the dollar against the yen and consequent heavy capital losses to Japanese investors. It would not be surprising if current behaviour were influenced by that experience.

Germany

The profile of ten-year zero-coupon yields in Germany has been close to that in the United States, as indeed has the profile of ten-year par bond yields. The decomposition, in Chart 4, shows a quite different picture however. There is a strong downward trend in 0–2 year yields. This reflects the economic downturn which followed the post-reunification boom, and the subsequent rather hesitant recovery. There has also been a modest downward trend in 2–5 year yields.

Chart 4
Zero-coupon yields in Germany^(a)



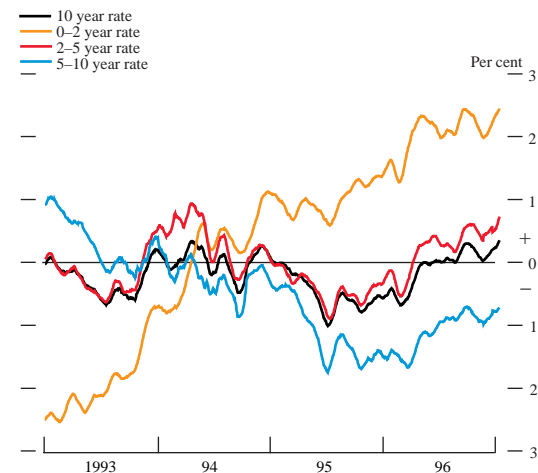
(a) Twenty-day moving average.

However, there has been a modest upward trend in 5–10 year yields over the whole period: the rise that took place in 1994 has subsequently been only partly reversed. A plausible explanation of this upward trend is that it betrays market concern that the future European Central Bank will not be able to achieve as good a price stability record as the Deutsche Bundesbank.

As in the United States, 0–2 year yields have fluctuated more widely than 5–10 year yields. The difference in degree of fluctuation is greater than in the United States, but is still perhaps less than might have been expected.

The decomposition of the yield differential between the United States and Germany is shown in Chart 5. If the interpretation suggested in this article is correct, then the close correlation between US and German ten-year zero-coupon yields since 1993 has been a coincidence—the result of relative business cycle influences moving in one direction and relative long-term inflationary expectations moving in the other direction, for largely unrelated reasons.

Chart 5
US/German zero-coupon yield differentials^(a)



(a) Twenty-day moving average.

United Kingdom

There has been no clear trend, either upwards or downwards, in the UK ten-year zero-coupon yield, either in absolute terms or relative to its German counterpart, as Charts 6 and 7 show. There has been an upward trend in

Chart 6
Zero-coupon yields in the United Kingdom^(a)

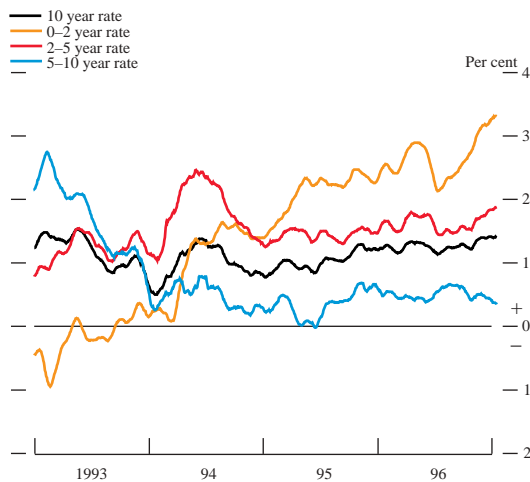


(a) Twenty-day moving average.

0–2 year yields since late 1993, which is readily explained by the sustained cyclical upswing in the UK economy, and which contrasts with the downward trend in German 0–2 year yields.

The 5–10 year zero-coupon yield declined sharply in 1993 and the differential with Germany also narrowed. No doubt this reflected unexpectedly low inflation in 1993 following sterling's departure from the exchange rate mechanism (ERM). The 5–10 year yield went up sharply in the first half of 1994, and there has been a gentle downward trend since the peak reached then. The differential with Germany in 5–10 year yields has fluctuated around an average of about 50 basis points since the end of 1993. This suggests that the credibility of UK monetary policy has not changed greatly relative to that of Germany since the end of 1993—though there are some reasons, as indicated above, for

Chart 7
UK/German zero-coupon yield differentials^(a)



(a) Twenty-day moving average.

thinking that Germany's monetary policy credibility has been adversely affected by the prospect of European Economic and Monetary Union (EMU). It also appears that since mid-1994 there has been a mild downward trend in longer-term inflationary expectations in the United Kingdom.

Another measure of the credibility of UK monetary policy is provided by the expected rate of inflation over the period beginning five years in the future and ending ten years in the future. This can be derived from yield curves calculated for conventional and index-linked gilt-edged stocks, and is shown in Chart 8. The profile is similar to that of the

Chart 8
Estimate of expected UK inflation over the period from five years in the future to ten years in the future^(a)

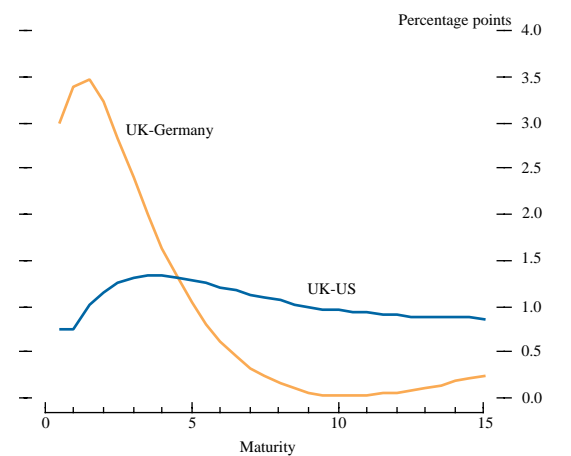


(a) Twenty-day moving average.

5–10 year zero-coupon yields, and likewise indicates a mild downward trend since mid-1994 in expected inflation.

The relationship between current UK ten-year zero-coupon yield differentials and the profile of expected future short-term interest rates is further illustrated by Chart 9, which shows expected UK/German and UK/US short-term interest rate differentials. There is a large

Chart 9
Expected short-term interest rate differentials as at 2 January 1997

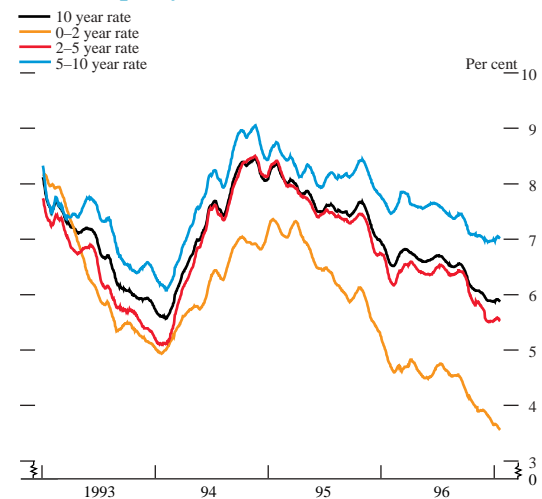


difference between the United Kingdom and Germany in the short-term interest rates expected to prevail in the next four years. This is likely to reflect the difference between the current cyclical position of the United Kingdom and Germany. By contrast, the UK/German short-term interest rate differential expected to prevail in the more distant future is very small indeed. The UK/US differential is much less variable.

France

Experience in France, illustrated in Chart 10, has been broadly similar to that in Germany. There has, though, been a mild downward trend in ten-year zero-coupon yields in France: in particular, the downward trend since the yield

Chart 10
Zero-coupon yields in France^(a)

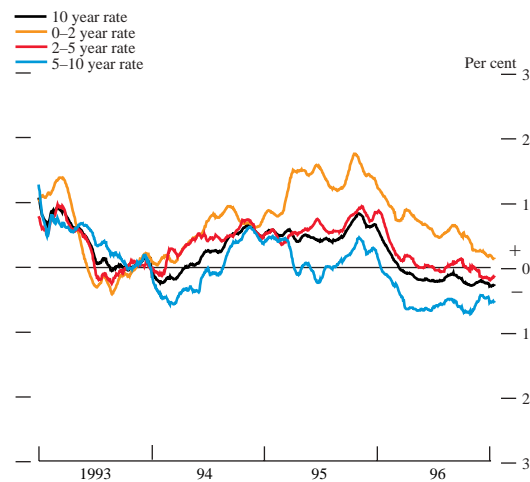


(a) Twenty-day moving average.

peak in late 1994 has been stronger in France than in Germany. As in Germany, there has been a downward trend in 0–2 year yields, but in contrast to Germany there has been no upward trend in 5–10 year yields.

The differences between French and German experience are illustrated more clearly in Chart 11, which shows the ten-year Franco-German zero-coupon yield differential and

Chart 11
French/German zero-coupon yield differentials^(a)



(a) Twenty-day moving average.

its decomposition. There is a modest downward trend in the ten-year yield differential, and in each of the three components. Perhaps surprisingly the 5–10 year zero-coupon yield in France has been lower than that in Germany since early 1996. This is hard to explain in the light of the expectation that France and Germany will both be part of EMU as from 1999. What possible explanations could there be?

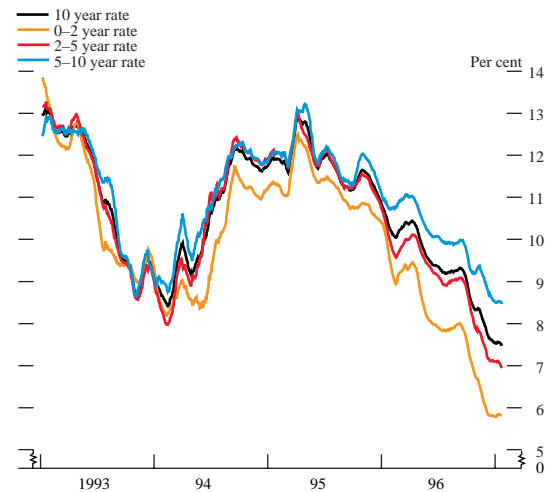
- Conceivably the market may attach some probability to the possibility that EMU may not take place—or at least, not on schedule in 1999. The size of the yield differential indicates that, in that case, the market expects inflation to be much lower in France than in Germany.
- The market, assuming that EMU will take place on schedule, may conceivably regard French government securities as a better credit risk than their German equivalents.
- Possibly the liquidity and other technical characteristics of the French government securities market are perceived as superior to those of the German market.
- Capital flows out of French government securities may be inhibited in some way. Specifically, after interest rates on saving deposits were reduced in January 1996, there were large inflows into insurance companies and mutual funds, which, beyond certain limits, typically invest largely in domestic government securities. But there is of course scope for other investors to switch out of French government securities if they so choose.

Of these explanations the latter two seem the most likely.

Italy

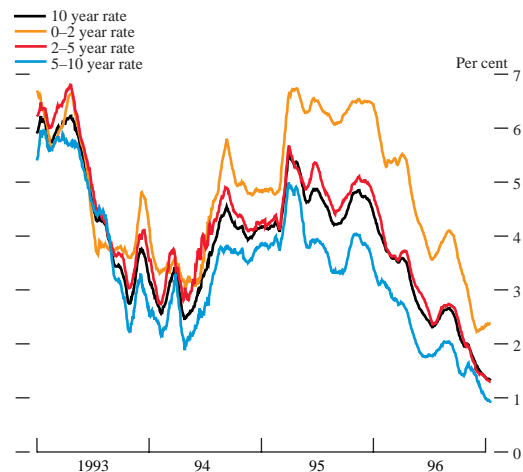
Italian ten-year zero-coupon yields have fallen dramatically since the beginning of 1993, both absolutely and relative to German yields (see Charts 12 and 13), and particularly since

Chart 12
Zero-coupon yields in Italy^(a)



(a) Twenty-day moving average.

Chart 13
Italian/German zero-coupon yield differentials^(a)



(a) Twenty-day moving average.

spring 1995. The decomposition shows that there have been downward trends in all three components. This appears to reflect a radical downward revision of longer-term inflationary expectations, partly reflecting falling actual inflation and partly associated with the belief either that Italy will join EMU or that Italian economic and monetary policy will be otherwise directed at sustainable price stability. Since spring 1995, yields have fallen by more at the 0–2 year maturity than at longer maturities, perhaps reflecting both the slowdown in the Italian economy and the reversal of the rise in short-term interest rates that took place in spring 1995 when the lira depreciated sharply in foreign exchange markets.

Conclusion

Ten-year zero-coupon yields can be decomposed into components which are likely to reflect different influences in different degrees. In particular, differences in the expected near-term paths of short-term interest rates, which arise because the countries concerned are in different phases of the business cycle, can account for a substantial proportion of longer-term yield differentials.

References

- Deacon, M P and Derry, A J (1994a)**, 'Estimating market interest rate and inflation expectations from the prices of UK government bonds'. *Bank of England Quarterly Bulletin*, Vol 34, August, pages 232–40.
- Deacon, M P and Derry, A J (1994b)**, 'Estimating the term structure of interest rates', *Bank of England Working Paper No 24*.
- Svensson, L E O (1994)** 'Estimating and interpreting forward interest rates: Sweden 1992–1993', *CEPR Discussion Paper No 1,051*.