Expectations and the Term Structure of Interest Rates

This article discusses the relationship between interest rates of alternative maturity. Some of the underlying concepts used are somewhat complicated. Nevertheless, care has been taken to use a step-by-step approach and the article should be reasonably accessible to interested readers.

Executive Summary

The expectations hypothesis for the term structure of interest rates implies, inter alia, that positively-sloped yield curves are associated with rising long-bond rates. This prediction is associated with the concept of market efficiency, which leads to the presumption that in the absence of inside information, financial markets do not leave unexploited profit opportunities. An intuitive interpretation of the association between positively-sloped yield curves and rising long-bond interest rates follows from this. Any yield margin gains obtained by investing in long bonds relative to shorter maturity financial assets are expected to be entirely eroded by additional capital losses associated with rising long-bond yields.

This article examines the evidence for and against the expectations hypothesis in this context, and concludes that the expectations hypothesis is questionable in empirical terms. A brief survey of the various reasons advanced to explain the apparent inconsistencies follows. Sluggish market reactions to new information impacting on inflation and interest rates are suggested as the most likely explanation.

Introduction

A major concept in economics is known as the efficient markets hypothesis. Essentially this theory is a dual concept about the use of information in competitive markets. First, it is generally assumed that market participants make appropriate use of all relevant information, at least up to the point where the extra costs of obtaining more information exceed the extra benefit of any additional information obtained. Secondly, the efficient market hypothesis credits investors with at least the same level of understanding of economic relationships as the
economists who study their behaviour. In economists' jargon this second proposition is known as 'rational expectations'. These twin assumptions lead to the presumption that, in the absence of inside information, speculators in financial markets are unable to benefit from the discovery of profitable trading rules based on past information. Although the efficient markets hypothesis has attracted a great deal of interest and research, it remains very much in dispute.

A closely related theory is the expectations hypothesis of the term structure of interest rates. In its most general form, this theory holds that long-term bond yields are arithmetical or geometrical averages of expected short-term interest rates. The return on holding a long-term bond is then equal to the return available by investing in a sequence of short-term bonds throughout the period of the long-term bond’s maturity. This is an area of particular interest to a central bank, since central banks usually operate monetary policy by conducting their actions in a way designed to affect short-term interest rates. However, expenditure decisions within an economy are likely to be influenced by long-term interest rates as well as short-term interest rates and, given that expenditure decisions in turn have real economic activity effects that have potential consequences for inflation, it follows that central banks have a strong interest in the relationship between long and short interest rates.

A somewhat simplified algebraic articulation of the expectations hypothesis is:

\[ R_{t}^{(n)} = \frac{1}{k} \sum_{i=0}^{k-1} E_{i} R_{t+i/m}^{(m)} + c \]  

where \( R_{t}^{(n)} \) is the yield available at time \( t \) on an \( n \)-period zero coupon bond.

\( R_{t}^{(m)} \) is the same but has a shorter \( m \)-period maturity.

\( E_{i} \) is an expectation formed at time \( t \).

\( k = n/m \) is an integer.

The \( c \) term in the equation is the term premium, which for the moment can be considered as the extra amount investors in long-term bonds demand as compensation for the additional risks implicit in holding a long-term bond. The premium may vary across maturities, but for any particular maturity it is treated as a constant in the sense that it does not vary over time. This assumption is made to ensure that a change in a long-term interest rate can be interpreted as reflecting a changed expectation of some current or future short-term interest rate rather than a change in one or more term premia.

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1 Fama (1976) provides the formal definition.
2 See Lucas (1972) for a seminal paper on the rational expectations hypothesis.
3 Equations (1), (2), (3) and (4) are presented in Campbell and Shiller (1991). The notation follows theirs.
Tests of the Expectation Hypothesis

Equation (1) can be altered in a number of ways to allow the idea to be checked against real world data, but the academic research literature concentrates on two, both of which are specified in terms of the spread (written as \( S_i^{(n \cdot m)} \)) between a longer-term \( n \)-period interest rate and its shorter-term \( m \)-period interest rate counterpart:

\[
S_i^{(n \cdot m)} = \ln^{(m)} - \ln^{(n)}
\]  \hspace{1cm} (2)

Equations (1) and (2) can be manipulated together to show that:

\[
S_i^{(n \cdot m)} = \left( \frac{n-m}{m} \right) \{ E_i \ln^{(n \cdot m)} - \ln^{(n)} \} + c
\]  \hspace{1cm} (3)

Equation (3) specifies a relationship concerning the slope between two points of the yield curve, and expected short-term changes in long-bond yields. As explained below, the intuition behind the equation is that expected returns to investors are the same irrespective of any bond’s particular maturity. If that weren’t the case, investors would choose the higher-yielding alternative, which would in turn alter interest rates in a way that made expected returns equal.

We can illustrate how this equation works, and the underlying intuition, with a numerical example. For simplicity, we will ignore the term premium. Choosing hypothetical 1 year and 20 year bond yields of 5 percent and 10 percent respectively, and plugging them into the equation, produces the forecast that a 19 year yield one year hence (i.e. setting \( m = 1 \)) is expected to be 5/19 percentage points higher than the current 20 year yield. Using this forecast, we want to show how Equation (3) captures the idea that the returns from investing in a bond with one year to maturity are equal to the returns from buying a 20 year bond and holding that bond for a year.

Remembering that the equation is defined in terms of zero coupon bonds, we can work out that an investor who at the outset paid $100 for a 20-year zero-coupon bond earning a 10 percent yield would have purchased a bond with a face value of 

\((100 + (20 \times 10)) = $300.5\)

Looking forward a year, this bond will have 19 years to maturity at an expected yield of 10 and 5/19ths percent and, accordingly, would at the time when it was first purchased have an expected one-year-ahead market value of 

\((300 - (19 \times 10 \text{ and } 5/19ths)) = $105.\)

This is the same overall return as available to the investor who at the outset paid $100 for a $105 face value bond maturing in one year.

Coupon interest payments can be introduced and the same result applies. It is useful to think about the equation as a market arbitrage relationship: the term premia aside, investors expect combined interest and capital gains to be equal irrespective of the maturity of their investment.

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4 Unless otherwise stated the empirical results reported throughout this article relate to the United States.

5 In these examples, yields are not compounded. The importance of this simplification is discussed below.
To help make the algebra simple, the equation is specified in terms of arithmetic averages and so ignores the effect of compound interest. However, this is not a particularly important limitation as usually the equation is used in a context where \( n \) is high (say 10 years or 120 months) and \( m \) is small (say 1 month). Thus any implicit compounding bias in the \( R_{i}^{(m)} \) term is very nearly matched by the bias in the \( R_{i}^{(n-m)} \) term. Also the twin assumptions of large \( n \) and small \( m \) mean that \( E_{i} R_{i}^{(n-m)} \) very nearly equals \( E_{i} R_{i}^{(m)} \).

Using the latter expression rather than the former in Equation (3) gives the following equation, which is only valid for large \( n \) and small \( m \) values:

\[
S_{i}^{(n,m)} = \left( \frac{n-m}{m} \right) \left( E_{i} R_{i}^{(m)} - R_{i}^{(n)} \right) + c \quad (3')
\]

This equation predicts that a positively sloped yield curve is expected to result in rising long-term bond yields over short holding periods, while negatively sloped yield curves are associated with an expectation of falling long-bond yields, again with respect to short-term holding periods. Though the original Equation (1) seemed plausible, this implication seems somewhat strange. But that is not the main problem. The main problem with Equations (3) and (3') is that they simply do not withstand empirical scrutiny. As long ago as 1938, Macaulay wrote:6

“To preserve the theoretical relationship between present long term and future short term interest rates, the ‘yields’ of bonds of the highest grades should fall during a period in which short term rates are higher than the yields of the bonds and rise during a period in which short term rates are lower. Now experience is more nearly the opposite.’

Beginning from around 1979 the equations have been tested econometrically on financial market data drawn from many different time periods in a number of different countries. Generally these studies employ a rational expectations assumption which includes the property that market expectations of future outcomes are accurate, on average. This avoids the need to measure expectations directly, as \( R_{i}^{(n-m)} \) is used as a substitute for \( E_{i} R_{i}^{(n-m)} \) (for \( i=1 \) to \( k \)). That is, the actual interest rate for the \( n \) period bond at time \( t + im \) is used instead of the expectation of that interest rate at time \( t \). Statistics summarising these studies are provided in Table 1. The statistics suggest that a large, if not overwhelming, body of empirical evidence is against the version of the expectations hypothesis represented by Equation (3) and its close equivalents. Empirically, the statistical techniques used by the studies generate estimates of the \( (n-m)/m \) term in Equation (3) which are nearly always negative. This is perverse, as by definition the \( (n-m)/m \) term is positive.

A corollary of this empirical result is that a naive investment strategy of investing in long-maturity financial instruments when the yield curve is positive is likely to produce systematic profits. An investor pursuing this strategy would have a high interest coupon return (from investing at the long end of the yield curve, in circumstances where long rates are higher than short rates) augmented by the

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6 Macaulay (1938).
likely capital gain associated with the expectation that long-bond interest yields will fall. This is certainly not a risk-free proposition as interest rates are inherently erratic. Thus, for any particular holding period the chances of long-bond yields moving against the investor are only slightly lower than the prospects of a movement in the direction favourable to the investor backing this strategy. Nevertheless, it seems to be the case that, contrary to one of the implications of expectations hypothesis, positively-sloped yield curves generally fall over time, while negatively-sloped yield curves generally rise.

It is often said that it is the exception which proves the rule. In this case the exception is the behaviour of New Zealand bond market from around 1985. New Zealand is the only country identified where short-term changes in long-bond yields have been generally consistent with the expectations hypothesis. This probably occurs because of the sheer scale of restructuring in financial markets which has occurred since late 1984, which resulted in both steep negatively-sloped yield curves and a general decline in interest rates throughout the subsequent period until late 1991. This is a pattern which is observed in overseas economies, but instances of it invariably have been brief.

Equations (1) and (2) can also be used to generate the relationship:

\[
S_{t}^{(m,0)} = \sum_{i=1}^{k-1} (1 - i/k) \times \left( R_{t+i|m}^{(m)} - R_{t+i+1|m}^{(m)} \right) + c
\]  

(4)

This is known as the perfect foresight spread, which is the spread that would have pertained in period \( t \) – today, for example – if Equation (1) applied, and if the succession of actual m-period interest rates between today and (n-m) periods hence were known perfectly today. The perfect foresight spread is thus a long-period weighted average of changes in a succession of short-period rates. In this respect it is quite different from Equation (3) which defines a relationship concerning short-term changes in long-bond interest rates. An intuitive understanding of the weights is perhaps most easily gained by working through a simple example where \( m \) is set equal to one year. Assume that one year interest rates are 3 percent today, 4 percent next year, and 5 percent the year after. In this example:

\[
S_{t}^{(2,1)v} = (1 - \frac{1}{2}) \times (4 - 3) = \frac{1}{2} \times 1 = \frac{1}{2}
\]

Equation (2) above can then be used to derive the implied yield for a two-year bond:

\[
R_{t}^{2} = R_{t}^{1} + S_{t}^{(2,1)v} = 3 + \frac{1}{2} = 3\frac{1}{2}
\]

In other words, the average annual return on holding a two year bond to maturity is equal to the average return available on holding two successive one year bonds. Also,

\[
S_{t}^{(1,1)v} = (1 - \frac{1}{2}) \times (4 - 3) + (1 - \frac{1}{2}) \times (5 - 4) = \frac{1}{2} \times 1 + \frac{1}{2} \times 1 = 1
\]

and again using Equation (2):

\[
R_{t}^{1} = R_{t}^{1} + S_{t}^{(1,1)v} = 3 + 1 = 4.
\]

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The average annual earnings on the three-year bond equal the average earnings obtained by rolling over three successive one-year bonds. From this it can be seen that the weights on the change in the short-period interest rate term decline in the outer years as a result of the averaging process.

Equation (4) can be tested by comparing the perfect foresight spread with the actual spread. This is done by calculating a set of perfect foresight spreads and testing them econometrically against the actual spreads observed in the market at the relevant points of time.

The different econometric techniques used mean that the results do not lend themselves to a tabular summary, but suffice it to say that although the results are somewhat mixed they are nevertheless more favourable to the expectations hypothesis when expressed in the form shown in Equation (4). Three recent studies based on United States data over the last 20 years or so suggest that the expectations hypothesis is only validated by the data when the long-bond being tested has a maturity of at least around three years. At shorter maturities the theory tends to predict the direction of change of short-term interest rates over time correctly, but typically the result is statistically uncertain. In addition, two studies based on UK Treasury bill and UK Treasury bond data appear to confirm the expectations hypothesis when tested in an Equation (4) format. As noted, the results based on data for the United States are moderately supportive of the expectations hypothesis. Equation (4) does not appear to be supported by the data over short periods, but its predictive power appears to increase when tested over a number of years, a somewhat surprising distinction. Also both Equations (3) and (4) are algebraic manipulations of the same Equations (1) and (2), but when tested, Equation (3) appears to suffer a nearly resounding rejection, yet Equation (4) appears to test reasonably well provided that it is tested over a number of years. Mathematically, this is entirely possible. If Equation (1) is valid for particular values of n and m, that does not mean that there is a mathematical paradox if Equation (1) is not valid for other values of n and m. However a combined implication of the two sets of tests in relation to Equations (3) and (4) is that the expectations hypothesis provides better forecasts over longer periods of time than it does for short periods of time, where its direction of change predictions are the exact opposite of movements actually observed in the data. This distinction does seem to be somewhat paradoxical.

One possible explanation for the superior performance of the hypothesis over longer periods of time relates to the existence of some evidence that the slope of the yield curve bears a systematic relationship with business cycles. Given that the general level of interest rates (as opposed to the slope of the yield curve) also bears a systematic relationship with the business cycle, it is possible that yield

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8 Mills (1991), which uses a methodology which precludes a comparison of the performance of the equation at short vis-a-vis long maturities. MacDonald and Speight (1988), which has not been sighted directly as part of this survey, apparently reaches the same conclusion.
curves could give reasonably good results in terms of the sum of a sequence of short-term interest rates, but only because of an averaging process through the length of the business cycle.

A further test of the expectations hypothesis is based on the way moving averages tend to smooth the data series averaged. In the case of Equation (1) we would expect a series of $R^{m}$ terms (ie. interest rates relating to long-term bonds) to be much smoother than a series of $E_{i} R^{m}$ terms (ie. interest rates relating to shorter-term bonds), provided, of course, that the difference of maturity lengths was large. Using Equation (1), and again making a rational expectations assumption, it is possible to derive precise limits on the fluctuations we would expect to observe in long-term interest rates based on observed fluctuations in short-term interest rates. However, in practice, long-term interest rates exceed these limits by a wide margin. This again suggests that there is some problem either with the rationality of expectations or with Equation (1).

**Time Varying Term Premia**

The evidence of an empirical rejection of the expectations hypothesis has led to a number of research studies focused on possible reasons for variations in term premia over time. This approach has had appeal because tests of Equations (3) and (4) are not strictly tests of the expectations hypothesis alone, but rather they are joint tests of three separate hypotheses, namely, the expectations hypothesis of the term structure of interest rates, the rational expectations hypothesis and the assumption that term premia may vary with maturity but not with respect to time.

Any one or all of these propositions may prove to be the cause of the empirical problems which have been discussed. Accordingly, any systematic explanation for ‘time varying term premia’ or, alternatively, any proof of the inadequacy of rational expectations hypothesis, leaves open the possibility that the expectations hypothesis itself remains valid as a description of financial market behaviour. It is useful to divide the work in this area into two groups, according to whether or not rational expectations are assumed.

**Time-varying Risk Premia Studies using Rational Expectations**

Before starting, it is useful to define some terms. ‘Spot’ interest rates are interest rates prevailing now, irrespective of whether they apply to short or long maturity financial instruments. Future spot interest rates are the spot interest rates that will prevail at some future date, and are to be distinguished from ‘forward’ interest rates. Forward interest rates relate to contracts entered into now to buy or sell securities of a defined maturity at some specified date in the future. Forward contracts allow people to lock in interest rates early, rather than waiting and accepting the spot interest rates that might prevail in the future.

With this as background, it can be seen that the differences between current forward interest rates and expectations of the equivalent future spot interest rates

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10 Shiller (1979) describes the seminal research on this topic. This paper was subsequently criticised for technical reasons, but these problems have been redressed and so-called ‘variance bounds violations’ remain as the conventional wisdom (see Le Roy (1989) for a review of the literature).
are what has been referred to as term premia. Term premia reflect the compensation people require in order to offset the uncertainty that comes with relying on forecasts of future spot interest rates, rather than locking in those interest rates through forward contracts. With the assumption of rational expectations, differences between forward and expected future spot rates can be indirectly measured, allowing term premia to be calculated. Rational expectations theory comes in because it allows the expectation of future spot interest rates to be proxied by the relevant actual spot interest rates revealed with the passage of time. In effect, this allows term premia to be measured indirectly as the difference between past forward interest rates and the equivalent current spot rate. Using tests along these lines there is reasonable agreement that implicitly term premia do vary especially for shorter maturity bonds.  

Of course, the conclusion that term premia do vary does little to advance understanding the term structure of interest rates. It may salvage the expectations hypothesis as a reasonable representation of financial market behaviour, but without some reliable explanation of how and why term premia vary, the level of knowledge is not much further ahead. Moreover, the expectations hypothesis can only be rationalised in terms of the results presented in Table 1 if term premia themselves rise as the slope of the yield curve becomes more positive.

One idea tested is that term premia rise as the general level of interest rates rises. However this possibility does not seem capable of explaining the results of Table 1. Moreover, the evidence on it is quite contradictory. Studies seem to be equally balanced in terms of the sign of the relationship between the level of interest rates and the slope of the yield curve, even when apparently very similar methodology is used.

Another construct tested starts with the proposition that term premia represent the additional compensation needed to offset the extra risks inherent in purchasing long-term bonds, given that a movement in yields affects the value of long bonds more than it affects the value of short maturity bonds. It is also asserted that the comparative risks of holding long bonds vis-a-vis short bonds are especially high when the yield curve is steeply sloped and also during periods when bond yields are especially volatile. However, when tested using the relevant data, this construct is also not convincing.

A third approach, which has received some attention in the literature on the term structure of interest rates follows from the ‘preferred habitat’ theory developed in the 1960s. This theory posits that borrowers and investors have defined needs in terms of maturities, and that they are reluctant to move to shorter or longer maturities. For example, purchasers of long-term assets will generally wish to finance their acquisitions with long-term borrowings in order to minimise the risk

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13 For example, Mankiw (1986) and Shiller, Campbell and Schoenholtz (1983).
14 This theory is usually attributed to Modigliani and Stulz (1966).
## TABLE 1
Regression Estimate of (n-m)/m Term from Equations 3 and 3'

<table>
<thead>
<tr>
<th></th>
<th>Maturity of Long Bond in Years</th>
<th>Sample Period</th>
<th>Holding Period in Months</th>
<th>Theoretical Coefficient</th>
<th>Actual Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shiller (1979)</td>
<td>&gt; 20</td>
<td>1966-67</td>
<td>3</td>
<td>1.0</td>
<td>-5.56</td>
<td>1.67</td>
</tr>
<tr>
<td>Shiller (1979)</td>
<td>&gt; 20</td>
<td>1919-58</td>
<td>12</td>
<td>1.0</td>
<td>-0.44</td>
<td>0.75</td>
</tr>
<tr>
<td>Shiller et al (1983)</td>
<td>30</td>
<td>1959-73</td>
<td>6</td>
<td>1.0</td>
<td>-1.46</td>
<td>1.79</td>
</tr>
<tr>
<td>Campbell and Shiller (1991)</td>
<td>10</td>
<td>1952-87</td>
<td>1</td>
<td>0.02</td>
<td>-5.02</td>
<td>2.32</td>
</tr>
<tr>
<td>Mankiw (1986) 2</td>
<td>10+</td>
<td>1961-84</td>
<td>3</td>
<td>0.02</td>
<td>-0.11</td>
<td>0.04</td>
</tr>
<tr>
<td>Mankiw and Summers (1984)</td>
<td>20</td>
<td>1963-83</td>
<td>3</td>
<td>0.02</td>
<td>-0.06</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Canada
Mankiw (1986) long bond 1961-84 3 0.02 -0.08 0.04

United Kingdom
Shiller (1979) 2 1956-77 3 1.0 -5.88 2.09
Mankiw (1986) 1961-84 3 0.02 -0.01 0.04

Germany
Mankiw (1986) long bond 1961-84 3 0.02 -0.03 0.03

New Zealand
Margaritis (1991) 5 1985-91 3 0.04 0.11 -

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1 Taken from Shiller (1990).
2 Mankiw (1986) page 80, cites similar results for Belgium, the Netherlands, Sweden and Switzerland.

That a shift in interest rates will damage their wealth. Within limits, investors and borrowers can be coaxed by better returns or cheaper borrowing to vary their maturity preferences, but not to the extent that term premia disappear. It follows, if this theory is correct, that the relative supply of short and long-term bonds is likely to affect term premia.

Although the literature appears not to address the issue explicitly, the preferred habitat concept is also capable of explaining the empirical evidence of positive yield curves being associated with falling long-bond yields. For example, if the yield curve were positive, lenders would (within limits) be encouraged to lend at longer maturities, while borrowers (again within limits) would tend to borrow at shorter-term maturities. However, many of those involved might only make a switch when their existing borrowing or investing position reached maturity.
which implies that any reduction in long-bond yields associated with changed supply and demand conditions in bond markets would only occur over a period of time. Yet again, though, the results are contradictory. This is true with respect to research undertaken in the period to the early 1980s, and it also appears to be true in relation to more recent empirical studies.

**Time-Varying Risk Premia Studies not using Rational Expectations**

The second and more recent approach used in the study of term premia dispenses with the need for a rational expectations assumption. Instead it concentrates on direct surveys to measure market participants’ interest rate expectations. These are used to examine alternative reasons why the interest spread seems to be unable to predict future interest rates in line with the expectations hypothesis: variable term premia or, alternatively, errors in the way markets formulate their expectations of future interest rates. The direct survey approach gives much more promising results.

Studies based on both US and UK data suggest that variable term premia for short maturity financial instruments account for much of the variation between spot interest rates and future interest rates on short-term financial instruments. It follows that there is not much expectational bias involved. In other words, the expectations hypothesis survives these tests, and for short maturity financial instruments, most of the bias in interest rate spread predictions can be attributed to time-varying term premia. However, for longer maturity financial instruments there is evidence that expectations in relation to long-bond yields are systematically biased at least for forecast periods of up to six months. This bias is sufficient by itself to explain the apparently perverse relationship between the spread and changes in long-bond yields. For longer maturity financial instruments, therefore, time-varying term premia form no part of the explanation.

A related study, which may also be significant, is based on surveys of inflation expectations for periods of around one year ahead. This suggests that investors, being somewhat sceptical about the impact of new information, judge future levels of inflation ‘adaptively’, in the sense that these markets only fully reflect new information relevant to future inflation levels after a passage of time sufficient to confirm the likely permanence of a changed inflation and interest rate environment. Adaptive expectations formation means slower incorporation of new information, which in turn may mean slow adjustments of interest rates within bond markets.

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15 See Dua (1991) which cites evidence each way.
17 For example the Goldsmith-Nuyens survey in the United States which each quarter asks financial market participants of their expectations concerning short and long-term interest rates three and six months ahead.
The bias identified in these studies would indeed be consistent with a process where long-term interest rates under-react to changes in short-term interest rates. This may be significant as it would explain the pattern of interest rate movements implicit in the empirical tests of Equation (3). For example, if long-term bond markets discounted a perceived reduction in inflation, perhaps because of the risk of a policy reversal or some other uncertainty, any full adjustment to the new low-inflation environment would only occur slowly in line with an evolving market conviction that the new environment was not likely to be reversed. Participants engaged at the short end of the market, however, would be more confident of the immediate relevance of the negative inflation surprise to their own circumstances. Accordingly, prices at the short end of the maturity spectrum would be likely to adjust relatively quickly. If this hypothesis were correct, short-term interest rates would reach the 'right' level before long-term interest rates had stopped adjusting, resulting in an association between falling long-bond yields and positively-sloped yield curves. The reverse would apply in the context of an unexpected arrival of a positive inflation shock.

**Future Research**

Turning to the future, it is, of course, not known where the research effort will focus. The empirical work undertaken so far started with the advent of the rational expectations hypothesis in the 1970s, which introduced a theoretical underpinning for testable propositions concerning expectations. In the subsequent 15 years or so, the research effort can be characterised as having raised more questions than it has provided answers. Indeed, as early as 1983 three prominent academics working in this area were prepared to write:\footnote{R. J. Shiller, J. Y. Campbell and K. L. Schoenholtz (1983).}

"The simple expectations theory, in combination with the hypothesis of rational expectations, has been rejected many times in careful econometric studies. But the theory seems to reappear perennially in policy discussions as if nothing had happened to it. It is uncanny how resistant superficially appealing theories in economics are to contrary evidence. We are reminded of the Tom and Jerry cartoons that precede feature films at movie theatres. The villain, Tom the cat, may be buried under a ton of boulders, blasted through a brick wall (leaving a cat-shaped hole), or flattened by a steamroller. Yet seconds later he is up again plotting his evil deeds."

If the frequency of subsequent citations of these comments is used as a guide, there are clearly many academic economists who do not find these sentiments exaggerated.

From the vantage point of the literature to date there is probably only a consensus on three main points: term premia do vary, especially for short maturity financial instruments; the yield curve does predict long-bond movements in a direction contrary to the expectations hypothesis; and the relative volatility of short and long-term interest yields is inconsistent with a rational expectations version of the expectations hypothesis.
Recent work suggesting that expectations adjust adaptively and, hence, relatively sluggishly does seem promising as it provides a reasonably believable explanation for the empirically observed connection between yield curve slopes and the direction of change in long-bond yields. However, this is a relatively recent development, and it is the inherent nature of research that these ideas will need to be tested and retested before they will be generally accepted or rejected. If the research effort does head in the latter direction, and if rational expectations are rejected as an accurate description of financial market behaviour, it is clear that the implications would extend well beyond the study of the term structure of interest rates, since rational expectations are a common feature of many of the various branches of economics.

Moreover any generally accepted introduction of a new expectations formation process into the study of the term structure of interest rates is likely to sharpen the focus on another questionable aspect of the established approach to the study of interest rates. This is the question of whether it is appropriate to study the relative yields between different maturity segments of the financial markets, while ignoring other important influences affecting financial markets. While there have been a number of attempts to embed the term structure within a more general framework, this work has not been in the mainstream of term structure studies. For example, attempts have been made to integrate the term structure of interest rates into the capital asset pricing model, one of the cornerstones of financial economics. Generally, though, these have not helped, apparently in part because of the complexity of the models studied, and hence because of the resulting difficulty in isolating fundamentally important underlying relationships.22

Be that as it may, an adequate explanation of financial market behaviour may well require a broader theory than one which concerns itself solely with the need to maintain consistency with respect to expected returns amongst the various maturity segments of the yield curve. At a minimum the study of the term structure of interest rates may need to be set within a framework where inflation expectations and real interest rates are treated in richer detail than hitherto. Beyond that, to the extent that regular and systematic biases in the expectations process are revealed by studies, the theory needs to explain why the accompanying potential profits available to be exploited by arbitragers and speculators do not apparently lead to behaviour that removes both the biases and the profit opportunities.

22 For a brief survey of this see Merino (1988).
References


