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5 A Century of British Market Interest Rates, 1874–1975

5.1 Introduction

Henry Thornton left a spare account—best described by the Latin phrase, *multum in parvo,* much in little—of his thoughts about the British monetary system during the Napoleonic era. That spare account is an incredibly rich source both of the elements of monetary theory and of instruction on the proper conduct of monetary policy. Any one of a dozen different insights recorded in Thornton's work could serve as the subject of this lecture. He understood:

the fallacy of the real-bills doctrine,
the distinction between the first-round and ultimate effects of monetary change,
the lag in effect of monetary change,
the problem market participants faced in distinguishing relative from general price changes,
the distinction between internal and external gold drains,
the factors influencing the foreign exchanges including the role of purchasing power parity,
how to bring inflation under control,
the relation of the Bank of England to other English banks,
types of effects of monetary disturbances on interest rates,
the distinction between the market rate and the natural rate of interest and between nominal and real rates of interest.

From this impressive list of ideas, I have chosen as my point of departure what Henry Thornton had to say about nominal and real interest rates. I shall then turn to a review of the behavior of market interest rates in Britain in the century from 1874 to 1975, with some reference also to the differences between the British and American

record. The historical material is drawn from a study, now nearing completion, of monetary trends in the United States and the United Kingdom, on which I have collaborated with Professor Milton Friedman.

Henry Thornton was among the first to call attention to the distinction between the nominal and real rate of interest. He explained the difference by the anticipated rate of inflation. On this view, when inflation comes to be anticipated, lenders demand and borrowers are willing to pay higher interest rates to compensate for the expected decline in the purchasing power of the principal of and interest on the loan. The nominal interest rate is then a sum of the real rate of interest and the expected percentage change in the price level. The Usury Laws in force when Thornton lived made the permitted maximum interest rate in Britain 5%. To describe the price anticipations effect on interest rates, Thornton had to cite a case other than an English one. He wrote:

> Accordingly, in countries in which the currency was in a rapid course of depreciation, supposing that there were no usury laws, the current rate of interest was often . . . proportionably augmented. Thus, for example, at Petersburgh, at this time [1811], the current interest was 20 or 25 per cent, which he conceived to be partly compensation for an expected increase of the depreciation of the currency.

Much later in the nineteenth century, Irving Fisher expressed the same idea, which he subsequently elaborated in mathematical form. The question I propose to examine is the extent to which Thornton's and later Irving Fisher's views are confirmed by the empirical behavior of interest rates in Britain during the century from 1874 to 1975. I shall first report on the behavior of average nominal yields on three categories of assets: short-term nominal assets, long-term nominal assets, and physical assets, specifically, the short-term rate on three-month bankers' bills; the long-term rate on consols; and a proxy yield on physical assets, namely, the rate of change of nominal income. I shall then discuss the behavior of average real yields on these categories of assets. Finally, I shall discuss the relation between nominal interest rates and the rate of price change.

In the study from which this evidence is drawn, we express the data as an average over a business expansion from cyclical trough to cyclical peak or a business contraction from cyclical peak to cyclical trough, sometimes referred to as half-cycles. In all, there are thirty-five such half-cycles for Britain during the period we cover. I shall also report the averages over peacetime half-cycles and over various subperiods.

5.2 Average Nominal Yields

Over the century the several average nominal yields display a relation consistent with expectations. The short-term yield averaged 3.5%, the long-term yield 4.2%, the difference of 77 basis points presumably reflecting a liquidity premium which studies of the term structure of interest rates have shown to exist.

The proxy for the nominal yield on physical assets is nearly identical with the nominal yield on long-term assets, as if arbitrage operated to equate the yields over the century. The equality does not, however, hold for subperiods, and the difference between nominal yields on nominal assets and on physical assets turns out to be a sensitive index of economic conditions.

A comparison of nominal yields in the United States with those in Britain over the period as a whole shows US yields to be about one-half of one percentage point higher. However, the yields for the two countries are not directly comparable because of changes in the exchange rate. The price of the pound in dollars at the end of our period was lower than at the beginning, the rate of decline averaging 0.9% per year. Hence, a hypothetical long-lived Englishman who had purchased US assets at the beginning of the period, held them throughout the period, and converted them back to pounds at the end of the period would have earned in pounds 0.9 percentage points more than the nominal US yields. Alternatively, an American who did the same with British assets would have earned in dollars 0.9 percentage points less the nominal British yields. The difference between the yields in the two countries in comparable terms is therefore roughly 1.4 percentage points rather than one-half of one percentage point. This difference is consistent with the net outflow of capital from Britain to the United States for much of the period, offset not by a private return flow induced by interest rate differentials but by UK government repatriation of capital during World Wars I and II.

5.3 Ex-Post Real Yields

We calculate the *ex-post* real yield by subtracting the rate of change of prices from the nominal yield for all three categories of assets. Henry Thornton's description of the relationship between nominal and *ex-post* real yields is apt:

> . . . if, for example, a man borrowed of the Bank £1000 in 1800, and paid it back in 1810, having obtained it by means of successive loans through that period, he paid back that which had become worth less by 20 or 30 per cent than it was worth when he first received it. He would have paid an interest of £50 per annum for the use of this

money; but if from this interest were deducted the £20 or £30 per annum, which he had gained by the fall in the value of money, he would find that he had borrowed at 2 or 3 per cent, and not at 5 per cent, as he appeared to do.

The relation among the *ex-post* real yields on our three categories of assets over the century we cover is the same as the relation among the nominal yields. However, as between the United States and Britain, the real yields are directly comparable. No further adjustment for exchange rate changes is required because all yields are, as it were, expressed in the prices, and hence exchange rate, of a given base date, in this study, 1929.

The real yield, that is the excess of the nominal yield over the average rate of inflation, averaged about 1¼% for Britain, about 3% for the United States. The reason the US yield exceeded the UK yield more for real than for nominal yields is that British prices rose on the average more rapidly than American prices, a difference that was reflected in the average behavior of the exchange rate.

5.4 Yields in Peace-Time Cyclical Phases

When war-time phases are excluded from the averages, it is no longer true that the proxy measure of the yield on physical assets approximates the yield on long-term nominal assets. It is decidedly lower than yields on either short- or long-term nominal assets. The excluded war-time phases are inflationary phases, when yields on physical assets have tended to be higher than yields on nominal assets. In addition, governmental policy of holding down interest rates on nominal assets in World War II also contributed to the change in the differential return on nominal and physical assets in war and nonwar phases.

The assets that differ most in real yields between peace-time and all phases, however, are nominal, not physical, assets. The proxy for the nominal return on physical assets is higher for all phases than for peace-time phases by only a trifle less than the differential rate of inflation, so that the real return on physical assets is only slightly lower for all phases than for peace-time phases only. By contrast, the nominal return on nominal assets is about the same for all phases as for peace-time phases, so that the real return is appreciably less for all phases. The war-time periods highlight a point to which I shall revert in discussing other periods, namely yields on nominal assets for the most part behave as if price changes were unanticipated.

We distinguish between nominal yields on nominal assets and nominal yields on physical assets. There is no comparable explicit distinction in Henry Thornton's writings, but he does make the distinction

implicitly. The man who borrowed £1000 in 1800 used the proceeds, he tells us, "by investing his money either in land or in successive commercial undertakings . . . and then finally selling his land or his commodities in the year 1810." At the sale, the man "would find the produce amount[ed] to £200 or £300 above the £1000 which he had borrowed," that is by the extent of the price rise over the decade, as estimated by Thornton.

The point of the distinction is that nominal yields on nominal assets are contracted in advance, reflecting anticipated price changes, but not unanticipated price changes. The borrower of the £1000 knew in advance that he would have to pay £50 a year in interest. The *ex-post* real yield on the loan reflected in full the unanticipated price change. The real yield on the £1000 loan made at 5% was only 2 or 3% because of unanticipated inflation.

For physical assets, on the other hand, neither the nominal nor the real yield, as measured, is contracted in advance. The investor in land or in successive commercial undertakings did not know in advance what either the nominal or real yield would be at the time of sale. What is clear from Thornton's example is the reflection in the sale price of the estimated rate of price rise in Britain from 1800 to 1810. There is, as it were, a measure of automatic indexing of yields on physical assets.

Reflecting this difference in the characteristics of nominal assets and physical assets, nominal yields on nominal assets are consistently less variable than the real yields on nominal assets, whereas the reverse is true for yields on physical assets. The real yield on physical assets tends to be less variable than the nominal yield.

5.5 Yields during Sub-Periods

We subdivide the century we cover into sub-periods, by separating the pre–World War I period into the period before 1896, when prices were generally falling, and the subsequent period, when prices were generally rising, separating out the war periods, and treating the interwar period as one unit, because of the paucity of phase observations, even though the behavior of prices varied greatly during the nearly two decades covered. On the average, however, the interwar period was certainly a period of falling prices. The postwar period requires no subdivision. It clearly is a period of generally rising prices.

We therefore have two periods of generally falling prices (before 1896, and interwar), two war-time periods of rising prices, and two peace-time periods of rising prices (1896–1914, post–World War II). Using the division into periods, we can supplement the conclusions for the period as a whole with respect to, first, the differences between Britain and the United States; second, the effect of price experience on the

differential between the yields on nominal and on physical assets. We confine the comparisons for the subperiods to the short rate and the proxy yield on physical assets, omitting long rates.

5.6 US–UK Differential Yields

If the differential of the short rate as between the United States and Britain is examined over the six subperiods, it shows a steady decline from period to period, with a particularly sharp decline from the pre-1896 to the 1896 to World War I period. In the pre-1896 period, the short rate was 2.5 percentage points higher in the United States than in Britain. In the post–World War II period, the short rate was 1.5 percentage points lower in the United States than in Britain.

Different factors played a role in different sub-periods in contributing to the decline in the differential yield. The most interesting episode in the decline of the differential occurred in the pre-1896 period, when the differential averaged one percentage point higher than in the subsequent period to World War I. A substantial increase in the degree of financial sophistication in the United States relative to that in Britain as between the two pre–World War I periods could have produced a decline in the market rate of interest on nominal assets like commercial paper that was traded in active US financial markets. However, a detailed examination of the US–UK differential year by year contradicts this interpretation. There was no gradual reduction in the differential such as might be expected from a gradual growth in financial sophistication. The differential rather shows an abrupt drop from one level from 1874 though 1896, to another level from 1897 to 1914, with sizable year-to-year fluctuations about those levels. The extreme values for 1893 and 1896 suggest an explanation for the drop in level. The extreme value in 1893 reflects the banking panic of that year in the United States, which led after July to a restriction of cash payments by banks and to a market premium on currency, which was equivalent to a depreciation of the US dollar vis-à-vis the British pound. The 1896 extreme value of the US–UK differential reflects the capital flight of that year produced by William Jennings Bryan's nomination for president, exacerbating fears that the United States would abandon the gold standard. In both cases, fear of devaluation was a deterrent to the flow of British short-term capital to the US market except at a substantial premium. The election of William McKinley in 1896 changed the outlook. It made US adherence to the gold standard secure for the time being and the subsequent flood of gold from South Africa, Alaska, and Colorado removed all doubts.

The fear that the United States would abandon the gold standard was equivalent to a fear that the United States would inflate at a faster

rate than Britain or deflate at a slower rate. The fear of inflation also animated the opponents of free silver, the endemic political issue of the pre-1896 period. The paradoxical effect was to produce deflation—or more rapid deflation than would otherwise have occurred. The paradox shows up to the full in interest rates. Before 1896, US prices were falling at a 1 percentage point per year faster rate than in Britain. That alone should have produced an appreciation of the US dollar by 1% a year and a 1 percentage point *lower* interest rate. But the fear of inflation more than countered the fact of deflation; kept the currency in danger of being devalued; and made interest rates in the United States 1 percentage point higher relative to those in Britain than they were after the fear was resolved.

The contrast between fact and belief continued after 1896. In the subsequent eighteen years, prices rose in the United States by something over 1 percentage point more per year than in Britain. The fact of inflation by itself should have produced a depreciation of the US dollar and a 1 percentage point higher interest rate in the United States. But the altered attitudes and the elimination of the silver issue meant that the exchange value of the dollar was never threatened and US interest rates, while higher than in Britain, were 1 percentage point less so than they were before 1896. The facts would have justified a 2 percentage point rise in the differential US–UK rate on nominal assets from before to after 1896. The beliefs about inflation produced a 1 percentage point decline!

There was a further 1 percentage point decline in the differential on nominal assets in the United States over that in Britain from the average of the two pre–World War I periods to the interwar period. That decline is matched by a decline of 1 percentage point in the differential real yield on physical assets over the corresponding period, which may be regarded as largely accounting for the decline in the differential on nominal assets.

The final decline of 2 percentage points in the US–UK differential from the interwar to the postwar period corresponds to the 2.4 percentage point decline in the rate of price rise in the United States relative to that in Britain. This differential rate of price decline was reflected in the depreciation of the British pound relative to the US dollar.

To summarize: the decline in the US–UK differential for the nominal short rate from before to after 1896 reflects the resolution of fears that the United States would inflate and the US dollar would be devalued; the further decline from pre–World War I to the interwar period reflects a decline in the real yield on physical capital in the United States relative to that in Britain; and the further decline from the interwar period to

the post–World War II period reflects greater inflation in Britain than in the United States and an accompanying depreciation of the pound.

5.7 Differential Yields on Nominal vs. Physical Assets

If in each subperiod arbitrage had worked as well as it did for the period as a whole, the yields on nominal and physical assets would be equal or differ by a constant reflecting the average preference for physical versus nominal assets or the reverse. For peace-time periods, however, as I indicated earlier, the equality did not hold, so arbitrage clearly did not work as well in each subperiod as in the period as a whole.

In the two periods of falling prices, the yield on nominal assets was decidedly higher for both countries than our proxy for the yield on physical assets. Deflation was not anticipated. Lenders did well. Borrowers did poorly. Since in the main, entrepreneurs borrow in nominal terms to acquire physical assets, *rentiers* did well, entrepreneurs badly, which would seem to support the widely believed generalization that a period of unanticipated deflation is adverse to enterprise and growth. That generalization is belied, however, for the pre-1896 period of falling prices in both Britain and the United States, since real output grew at the rate of 2.2% and 3.3% per year in each country, respectively.

With the exception of Britain from 1897 to World War I, during periods of inflation our proxy for the yield on physical assets was higher than the yield on nominal assets. Apparently inflation too was not anticipated. Entrepreneurs did well, *rentiers* did poorly; capital was transferred from savers to borrowers, which would seem to support the widely believed generalization that unanticipated inflation is favorable to enterprise and growth. Yet that generalization is also belied for the 1897–World War I period of rising prices in both Britain and the United States, since real growth was greater during the pre-1896 period of falling prices than during the post-1896 period of rising prices. But the public perception at the time was clearly the reverse. Alfred Marshall referred to this phenomenon in 1886, when he wrote, "I think there is much less difference than is generally supposed between the net benefits of rising and falling prices."

Henry Thornton was aware that holders of physical assets appeared to do better than holders of nominal assets during an inflation. He observed:

> It was true, that men did not generally perceive, that, during a fall in the price of money [the value of money], they borrowed at this advantageous rate of interest; they felt, however, the advantage of being borrowers. The temptation to borrow operated on their minds,

> as he believed, in the following manner: . . . they balanced their books once a year, and, on estimating the value of those commodities in which they had invested their borrowed money, they found that value to be continually increasing, so that there was an apparent profit over and above the natural and ordinary profit on mercantile transactions.

One way to examine the effect of the rate of price change on the difference between the yields on nominal and physical assets is to array the subperiods by the rate of price change, disregarding both chronology and country. If the price change had been fully anticipated, and the real yield had been independent of the rate of price change, the nominal yields on nominal assets would rise as the rate of price change increased, and the real yields on physical assets would stay constant. In fact, the nominal yields fluctuated about a roughly constant level, so that the effect of inflation produced a sharp decline in the real yield on nominal assets as the rate of price change increased. The hypothetical pattern of yields for a fully anticipated inflation came close to being realized for physical assets. Their nominal yield rose with inflation and their real yield fluctuated about a more or less constant level. However, this pattern does not reflect anticipations so much as the physical character of the assets and their real yields.

For nominal assets, investors fix rates in nominal terms and contract for a period ahead; prescience is therefore required if these rates are to reflect future price behavior. For physical assets, investors may fix no rates, and certainly not in nominal terms, and generally make no contracts about either real or nominal yields for a period ahead. The yield is generated out of the economic activity in which the asset is employed. It requires no prescience for the nominal yield on physical assets to reflect current price behavior, only that the physical asset participate along with other assets in the nominal income and spending flows.

The excess of the yield on physical assets over that on nominal assets is sharply negative for deflation, sharply positive for inflation. If inflations were fully anticipated, the differences between yields on physical and nominal assets might be expected to be roughly a constant, reflecting any preference among asset holders for one category or other of assets. For peacetime periods, there is no indication of such constancy. If inflation were wholly unanticipated, and there were no preference for one or the other category of assets, *ex-post,* the nominal yield on physical assets would reflect the actual rate of inflation, whereas the *ex-ante* nominal yield on nominal assets would not. This seems to describe the facts, with some indication that there was a 1 percentage point preference for physical over nominal assets, that is a willingness

to accept that much less in yield in order to hold a physical rather than a nominal asset.

This description of the pattern that would be produced by wholly unanticipated inflations does not apply accurately to both US war-time episodes and especially World War I for Britain. There appears to be rough constancy in these three episodes in the excess of the yield on physical assets over that on nominal assets, as if they corresponded to anticipated inflations. But interpreting these episodes in this way implies a very great preference—about 8 percentage points—for nominal assets during war-time periods over physical assets—which seems most implausible. Possibly the war-time estimates are an aberration rather than an indication of correct anticipation of war-time inflation.

These results are inconsistent with the hypothesis that the *ex-ante* nominal yields on nominal assets incorporate correctly anticipated rates of inflation—which merely confirms what has long been known, that the public has not in fact been able over long periods, at least, until possibly very recently, to make correct anticipations of inflation. We can, however, examine the observations within the subperiods to determine whether there is evidence of a gradual recognition of and adjustment to inflation or deflation.

5.8 Relations between Yields on Nominal and Physical Assets

Our proxy for the real return on physical assets varied in the six subperiods, ranging for Britain from -2.6 to $+2.2\%$ per year, but the variation was far less than for the *ex-post* real yield on nominal assets, which ranged from -10.8 to $+4.8\%$ per year. Moreover, one extreme item accounts for most of the British range for our proxy for the real return on physical assets. Omitting World War I leaves five observations, ranging from 1.3 to 2.2% per year. No remotely comparable reduction in the range can be achieved for the real yield on nominal assets by omitting the most discrepant observation.

We can adopt Irving Fisher's view that the *ex-post* real return on physical assets can be taken to be roughly constant on the average over time—though at a higher level in the United States than in Britain. Then the wide variation among subperiods in the difference between the returns on nominal and physical assets reflects primarily the failure of nominal yields on nominal assets to adjust to the actual rate of inflation. As a result, *ex-post* real returns on nominal assets vary widely. The implication of rough constancy of real returns on physical assets is that the variation in *ex-post* real returns on nominal assets reflects primarily unanticipated changes in inflation.

In Irving Fisher's analysis, nominal yields adjust not to the actual rate of inflation but to the anticipated rate of inflation, which in turn

adjusts to actual inflation after a considerable lag. In line with his analysis, we would expect to find that, shortly after a change from, say, falling to rising prices, the yield on physical assets would exceed substantially the yield on nominal assets, reflecting the incorporation in the yield on nominal assets of the lagged anticipations of falling prices. As prices continued to rise, the differential would decline and approach the equilibrium difference, reflecting (inversely) any general preference for physical over nominal assets (or conversely).

For the pre–World War I period, there is evidence of a response by nominal yields to price anticipations. During the pre-1896 period of falling prices, the nominal short-term yield fell as if it were adjusting to anticipations of deflation. During the subsequent period of rising prices, the nominal short-term yield rose as if it were adjusting to anticipations of inflation. This pattern is not visible in the US data. Since the British financial market before 1914 was more sophisticated than the US market, it is not implausible that yields were more responsive to anticipations of price change in Britain.

The only other subperiod that shows evidence of a response by nominal yields to price anticipations is the post–World War II period. The nominal short-term yield rises steadily throughout the period; the *ex-post* real yield on nominal assets rises sharply in the early part of the period and then fluctuates about a more or less constant trend; and our proxy for the real yield on physical assets shows no steady trend.

5.9 Nominal Yields and Rates of Change of Prices

These results led us to examine more closely the relation between nominal yields on short-term nominal assets and the rate of change of prices. A chart reveals an apparent connection for two widely separated periods: the period before World War I, and the period after 1970.

One feature of the relationship is the much wider variability of price change than of the rate of interest. This may reflect greater measurement error in the series on price change than in the series on interest rates, but a more plausible explanation is economic: the wider variation in prices reflects the existence of monetary and other disturbances that were random and could not be readily anticipated. In the relatively stable decades before World War I, in Britain, it was possible to identify the tides through the much smaller waves; in the post-1970 decade, variability was great, but attributable to policy, not change.

If the short-term rate and the rate of price change are correlated for phases of our individual sub-periods, the only significant correlation is for the post–World War II period. The indication that there may have been a change in the relation between interest rates and the rate of change of prices in the 1970s made it desirable to exploit data for shorter time units than cyclical phases. We plotted beginning in 1915 monthly

averages of the rate of change—averaged over six-month intervals to reduce extreme variability—of the cost-of-living index, which the retail price index superseded in 1956, against the monthly three-month bankers' bill series. There is evident a lack of any short-term systematic relation between interest rates and the recorded rate of price change, and much wider short-period fluctuations in price change than in interest rates. There is a drastic reduction in the variability of recorded price change in Britain after the mid-1950s, presumably reflecting the comprehensive statistical revision of the price index in 1956. It may well be that a large part of the recorded fluctuations in prices before this date consisted of measurement error. Hence, the possibility cannot be ruled out that the statistical noise in the recorded price series drowns out a systematic relation between interest rates and the "true" rate of price change.

The UK monthly results from 1956 to the early 1970s rather argue against this conclusion. Despite the lesser amplitude of price fluctuations, this period, like earlier periods, shows essentially no relation between the rate on three-month bankers' bills and the rate of price change.

The monthly figures also reveal that the rate on three-month bankers' bills was often sticky, calling into question the extent to which the rate was truly market determined. The problem is by no means limited to the commercial bill market. Other short-term rates are also sticky. With the introduction of Competition and Credit Control in May 1971, the three-month bankers' bill rate for some years exhibited a reduction in rigidity. In the past few years, that is less evident.

One further feature of the relation deserves mention. The current rate on three-month bankers' bills since 1965 has been more highly correlated with the six-month price change average six months in the future than with the current six-month average. Interest rates apparently are forecasting price change over the next half year. This would suggest that lenders and borrowers have become better able to protect themselves against price changes than they were earlier in the postwar period.

The explanation may be that market participants have belatedly recognized the drastic change in the character of the monetary system from a largely specie standard to a fiduciary standard. The change altered the information relevant to predicting the future course of prices. There is less short-term but more long-term variability in rates of inflation and much higher levels of inflation than had been experienced in peace-time over the past century. As a result, market participants have a greater incentive to seek to allow for future price movements.

In Britain, the indication that interest rates and price change move symmetrically has lasted for a brief period only. The apparent shift may prove temporary. Whether it does, or whether it is carried farther,

may well depend on whether future rates of inflation remain as high and as variable as in the past decade (or even higher and more variable) or whether rates of inflation return to earlier peacetime levels.

5.10 Conclusion

Two themes of this lecture—the relation between yields on nominal and on physical assets, and the relation between rates of change of prices and interest rates in Britain over the past century—examine empirically an idea that Henry Thornton presented in his speech on 7 May 1811, in the debate in the House of Commons on the Report of the Bullion Committee. He observed that nominal interest rates were relatively high when prices were rising because lenders and borrowers anticipated price movements and allowed for them in the interest rates they charged or paid.

The empirical evidence suggests that for much of the past century an effect in this direction has been very much damped. In recent years, however, nominal interest rates have begun to track the rate of price change more closely than at any earlier time in the century from 1874. Nominal rates of interest have become more variable than real rates of interest, as Irving Fisher believed them to be, and nominal returns on nominal assets have become as variable as nominal returns on physical assets. The shift to a fiduciary monetary standard in the postwar period and the increased long-term variability of prices that ensued have driven lenders and borrowers to seek to predict price changes more accurately, and to adjust the terms of lending and borrowing accordingly.