Historical Averages and The "Real Rate" of Interest

by

Christopher C. Pflaum,
Steven S. Duncan
and Eric C. Frye

Spectrum Economics, Inc.
10300 W 103 St, Suite 201
Overland Park, Kansas 66214

(913) 492-8788

March 12, 1997

Abstract

Forensic economists are unique among other economists and practitioners in government and business in their use of unadjusted, historical averages to forecast interest rates. Recent studies of the real rate of interest and its determination are reviewed and implications for historical average forecasts are considered. A comparison of the forecast performance of historical averages and professional forecasts relative to a benchmark is presented. Finally, the market's estimate of the real rate of interest as reflected in Treasury Inflation Protection Securities (TIPS) rates are considered. The authors conclude that the use of unadjusted, historical averages to forecast interest rates is not defensible from economic theory or as a simple alternative to the more generally accepted economic forecasting techniques.

Historical Averages and The "Real Rate" of Interest

Introduction

Interest rate forecasts are widely used by economists in the business community, government and forensic applications. Forensic economists practicing in the area of personal injury analysis, however, are as a group unique in their use of unadjusted, long-term averages as the basis for forecasts of future rates.[1] This is both surprising and troubling in that such a forecasting procedure is neither taught in Universities[2] nor accepted by the profession at large.

The use of this forecasting methodology relies upon the acceptance of one or both of two assumptions: the real interest rate is a constant quantity and, therefore, a statistical average is an unbiased estimator; or that a simple historical average provides as accurate an estimate as other, more generally accepted, macro economic forecasting techniques. If these assumptions are untrue, then current widespread practices in forensic economics are error prone.

In this paper, we first review historical and recent studies of the real rate of interest and its prediction. These studies refute the hypothesis that the real rate is a constant and provide forecast equations which are both accurate and well founded in economic theory.

We then use statistical findings regarding the macroeconomic determinants of the real interest rate to "backcast" the future economic climate implied by forecasts derived from historical averages. Next, we compare the historical accuracy of forecasts using historical averaging techniques to those of the Blue Chip Panel consensus. Finally, we compare current forecasts of the real rate of interest by the Blue Chip Panel to the rate of interest on Treasury Inflation Protection Securities, so-called indexed bonds or TIPS.

We find that the future economic conditions implied by real interest rate forecasts based on historical averages are unlikely and probably not defensible. We also find that the use of the Blue Chip consensus forecast has historically outperformed the historical average method by a significant margin and that the forecasts of future real interest rates implicit in the current Blue Chip Consensus are consistent with the level of real returns available

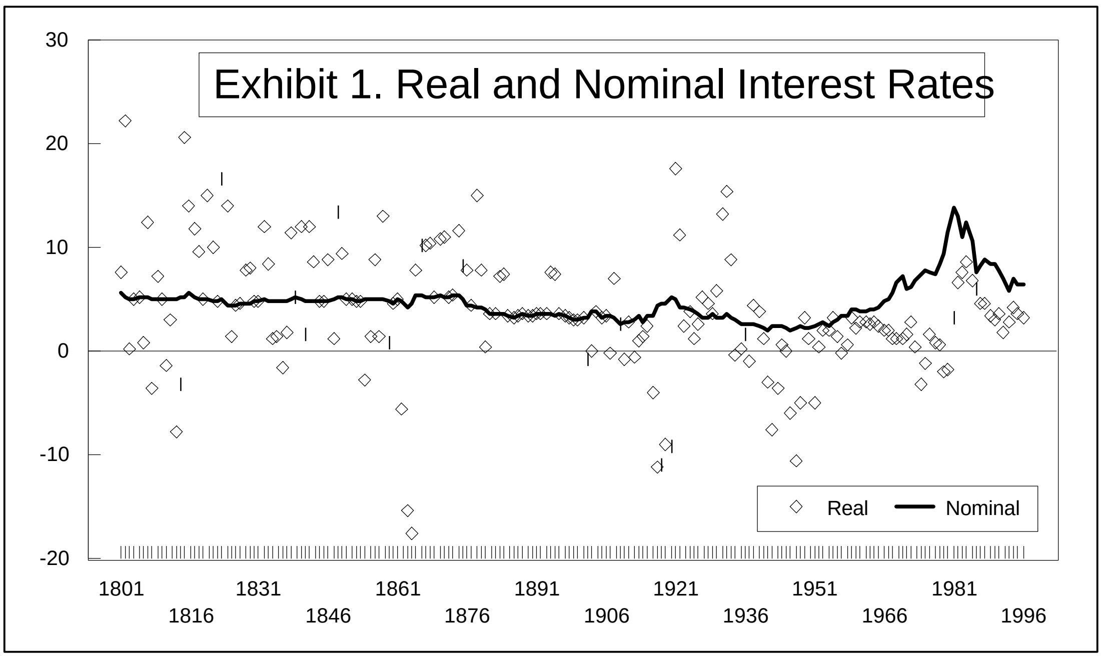
[1] See surveys such as that found in Brookshire and Slesnick (1993) for methods utilized by forensic economists.

[2] Hanke (1984) presents results of a survey of business schools on forecasting methods taught. Notably absent from the list are judgement and unadjusted historical averages.

from TIPS. We conclude that current practice of the majority of forensic economists in personal injury cannot be objectively justified.

Studies of The Real Rate:

The real rate of interest has not been historically a matter of great concern. As illustrated in Exhibit 1, for most of American history the nominal rate of interest was stable while inflation varied substantially. For example, for the period 1800 to 1930, nominal rates of interest were relatively stable in the range of 3 - 6%, averaging 4.5% with a standard deviation of 0.7%. The geometric average inflation rate, in contrast, was -0.02% and the arithmetic average 0.16% with a 6.1% standard deviation.[3]



According to Homer and Sylla (1991), the explanation for this stability in interest rates

[3]The interest rate series was developed by tying together New England (1801-1900), Railroad (1901-1918), Treasury (1919-1962) and 10-year Treasury (1963-1996) bond rates. Bond rates were very close to one another at the switch-over points in the series with one exception. The railroad bond rate began a steady rise starting in about 1910 and the Treasury series did not start until 1919. Therefore, the increase in the average 1907-1918 period railroad rates over the average 1895-1906 period railroad rates was used to adjust downward the 1907-1918 railroad rates. This provided a smooth transition in rates to the Treasury rate in 1919. The inflation series, the CPI for all items, is from Speiser and Maher (1995) for 1801-1994 and from *Economic Report of the President* (1997) for 1995-96.

likely lies in currency convertibility and an economic climate in which deflation and inflation were equally likely and largely unforecastable. Inflation was generally associated with wars and deflation followed every major war prior to World War II. In any case, the empirical conclusion is irrefutable -- prior to 1930 the real rate of interest in the United States was characterized by a great deal of variability.

This situation changed in the aftermath of the Great Depression and World War II as the Treasury and the Federal Reserve "managed" the U.S. economy to avoid deflation and the associated depressions. With the exception of post price-control inflation immediately following WW II and the Korean conflict, the U.S. economy generally experienced low, predictable inflation and interest rates for most of the 1950's and 1960's.

In the late 1960's inflation rates rose as fiscal discipline eroded and the currency was debased. With secular inflation as a backdrop, the nature of the real rate of interest became of more than passing academic interest as investors became increasingly concerned with the erosion of capital by inflation. Logic would suggest that investors would focus on real returns in such a climate. It does not follow, however, that awareness of real returns implies a Wicksellian natural rate of interest.

With the notable exception of Fama's 1975 finding, subsequently retracted in 1982, modern scholars have generally rejected the hypothesis of a stable real rate. For example Walsh (1987) and Rose (1988) tested whether the real rate is stationary (constant) or nonstationary (random walk) for the U.S. and other countries. They failed to reject the hypothesis that real rates are not stationary, implying that interest rates do not have a tendency to return to a long run average value.

In a recent article, Garcia and Perron (1996) consider regime shifts in the real interest rate. Their extensive testing confirmed three such periods since 1961: 1961 to 1973; 1973 to mid 1981; and mid 1981 to the end of the sample period, 1986. Garcia and Perron find that the real rate is constant within a regime but that when the entire period from 1961-1986 is considered, the series is not stationary due to the regime shifts, thus explaining the results of Walsh and Rose.

Determinants of the Real Interest Rate

Economists generally agree that the real rate of interest depends upon the rate of return on physical capital, which in turn depends on the value of the services that flow from physical capital. Economists also agree that the real rate of return on physical capital is affected by technological progress as well as competing and complementary factors of production such as labor. Other economic factors such as the changes in the tax code, inflation and recessions also affect the rate of return on physical capital and in turn affect the real rate of interest.

As a practical matter, economists use four major methods to forecast interest rates. Perhaps the simplest method is based on the shape of the yield curve, the curve formed by plotting the yield to maturity for a security type at various maturities. Analysts consider the shape and recent changes in the yield curve to predict changes in inflation and interest rates. Perhaps the most complex method for forecasting interest rates is based on multi-equation statistical models that capture the generation of interest rates and other economic variables in the economy. These models are typically built and maintained by large economic forecasting firms and by government and universities.

The third method for forecasting interest rates is based on single-equation statistical models. The single equation captures the important variables that drive or explain interest rate movements. This method of forecasting can be used to explain past regime shifts and to forecast future regime shifts. The model presented by Spiro (1989) is an example of this type of analysis. Spiro found that short-term real interest rates are negatively related to expected inflation, increases in money supply, and the savings rate and positively related to stock prices and cyclically adjusted government debt as a percentage of GNP. Spiro found that long-term real interest rates are positively related to short term interest rates as finance theory predicts, positively to inflation expectations and negatively to the cyclically adjusted deficit as a percentage of GNP.

The third method for forecasting interest rates is univariate time series analysis. Complicated time series models such as ARIMA are used to state current interest rates as a function of past values or past errors. The study of regime shifts by Garcia and Perron provides an example of the complexity of these models.

Spiro's results can explain the regime shifts identified by Garcia and Perron. For example, Garcia and Perron identified one regime shift in 1973 about the time of the energy crisis. The oil price shock increased inflation and government deficits were relatively low. Both of these factors tend to lower real interest rates according to the Spiro's model. Garcia and Perron identified another regime shift in 1981. At that time, the Federal Reserve brought inflation down and the Reagan federal budget deficit grew quickly. Both of these factors tend to increase real interest rates.

Economists who use unadjusted historical averages as their forecast of interest rate should be able to use the results of Spiro to explain why their real interest rate forecasts are quite low. The economic climate implied by forecasts of historically low real rates of interest is one of a low level of national debt relative to GNP and a rate of inflation in excess of five percent. Given the structural budget problems imposed by an aging population and the ability and propensity of the capital markets to punish any attempt by the central bank to reflate, such an economic outlook is not well supported. Yet, only such a combination of conditions is reasonably associated with the results of historical averages.

Forecast Comparison:

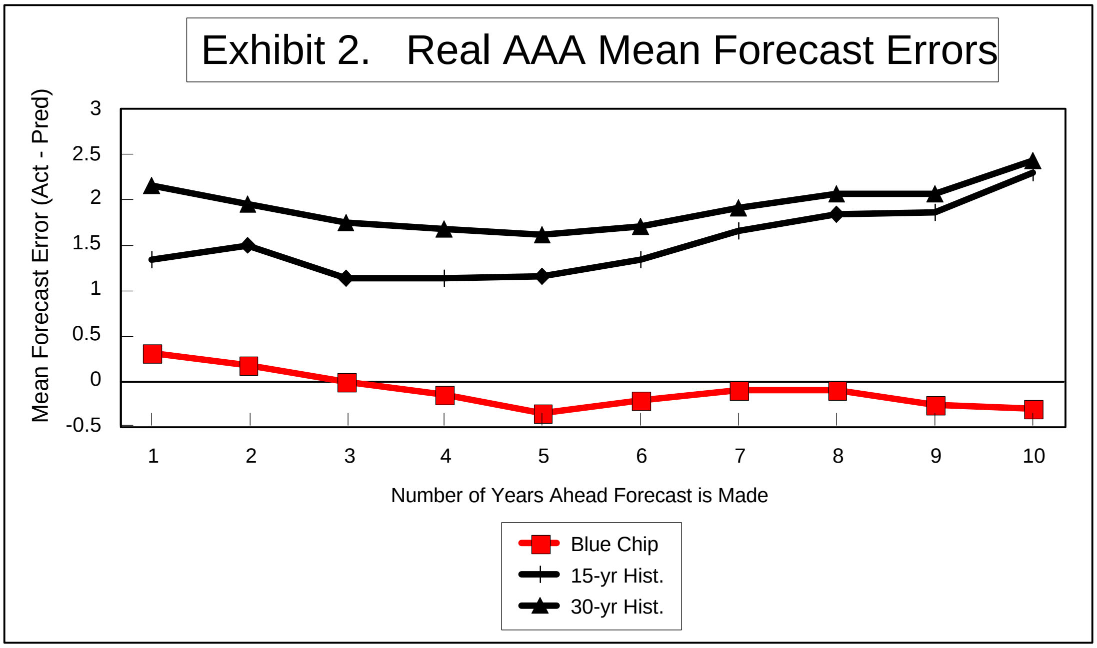
The most compelling question, however, is how well do historical averages perform as a forecast of future real rates. Since the use of historical averages to forecast interest rates cannot be justified on the basis of economic theory or practice, only a "result-oriented" explanation remains as to why personal injury economists use historical averages to forecast real interest rates. The question then is the relative accuracy of historical average forecasts and those of professional forecasters such as reported in Blue Chip Economic Indicators.

Twice each year, the publication Blue Chip Economic Indicators presents the long range forecasts of the professional forecasters it surveys on important economic variables such as inflation rate, Treasury bond rate, and AAA corporate bond rate. The forecasts made by individual professional forecasters as well as the consensus are provided in the reports. Forecasts for individual years are available for the next 6 years and five year forecasts are available beyond that.

In our experience, personal injury economists typically use historical averages over 15 to 30 year periods. The averaging period used is ad hoc since there are no economic theories or empirical studies to guide their choices. These two historical periods are used to compare the accuracy of forecasts from historical averages and those from professional forecasters as represented by the Blue Chip consensus.

Blue Chip forecasts of 10-year Treasury bonds are not available for an extended historical period so the AAA-rated corporate bond rate is used instead to compare forecasting abilities. The forecasting performance for the real AAA rate begins with forecasts made in 1984 and extending through to 1995. The real rate is calculated as the geometric subtraction of the nominal interest rate and the inflation rate as measured by CPI.

We compare mean forecast errors of the forecasting methods in Exhibit 2. The forecast error is defined as the actual rate less the predicted rate. The horizontal axis provides the number of years ahead the particular forecast was made, ranging from just one year in the future to 10 years in the future. By way of example, consider the forecasting ability of the three methods three years in the future. The average forecast error for the Blue Chip consensus was one basis point high, while



the average for the 15-year historical average was about 113 basis points low and the 30-year historical average was about 176 basis points low.

The mean forecast errors for the Blue Chip consensus fall in a small range around zero, the sign of a well-performing forecast. The mean forecast errors for the 15-year and the 30-year historical averages are consistently negative and their average errors are quite large. Based on average forecasting error, the Blue Chip consensus forecast is clearly superior to historical averages.

Placing the forecasts in context provides another indicator of forecasting performance. Consider an individual with an annual loss of $20,000 (in 1984 dollars) for the eleven year period 1985-1995. Forecasts of the real rate over the eleven year period are made using information available in 1984. Since we know today what the actual AAA rates and the actual inflation rates were over this period of time, we can establish a benchmark by which to compare the professional and historical average forecasts. Note that the AAA corporate bond rate is used in this example because Blue Chip forecasts of Treasury Bond rates were not available as far back as 1984.

Actual and forecasted real interest rates and discounted loss are presented in Table 1. The 1984 Blue Chip Economic Indicators contained forecasts for individual years up through 1990 with a five year forecast for the years 1990-94. The forecast for 1995 was assumed to be the same as the forecast for the period 1990-94. The 15-year and 30-year historical averages using data through 1984 were 2.03% and 2.25%, respectively. Table 1 also contains the total discounted loss as calculated

Table 1
Actual Discounted Loss and Estimates Based on Real Rate Forecasts

Year	Annual Loss	Actual Real Rate	Disc. Loss	Blue Chip Est	Disc. Loss	15 Yr. Avg.	Disc. Loss	30 Yr. Avg.	Disc. Loss
1985	20,000	7.54%	18,598	7.71%	18,568	2.03%	19,603	2.25%	19,560
1986	20,000	7.03%	17,376	6.43%	17,477	2.03%	19,213	2.25%	19,130
1987	20,000	5.53%	16,466	5.98%	16,462	2.03%	18,831	2.25%	18,709
1988	20,000	5.35%	15,629	5.61%	15,588	2.03%	18,457	2.25%	18,298
1989	20,000	4.24%	14,994	5.80%	14,733	2.03%	18,090	2.25%	17,895
1990	20,000	3.72%	14,457	5.33%	13,988	2.03%	17,730	2.25%	17,501
1991	20,000	4.38%	13,850	5.33%	13,280	2.03%	17,378	2.25%	17,117
1992	20,000	4.98%	13,193	5.33%	12,608	2.03%	17,033	2.25%	16,740
1993	20,000	4.10%	12,673	5.33%	11,970	2.03%	16,694	2.25%	16,372
1994	20,000	5.27%	12,038	5.33%	11,364	2.03%	16,362	2.25%	16,012
1995	20,000	4.62%	11,506	5.33%	10,789	2.03%	16,037	2.25%	15,660

	Benchmark	Blue Chip	15 Yr. Avg.	30 Yr. Avg.
Total Discounted Loss	$160,781	$156,796	$195,429	$192,993
Dollar Overprediction of Loss		($3,985)	$34,647	$32,211
Percent Overprediction		-2.5%	21.5%	20.0%

using the benchmark interest rates, the over- or under- prediction of loss and the percent over- or under- prediction of loss for the competing forecasting methods.

The benchmark rates yielded a total discounted loss of $160,781 in 1984 dollars. The Blue Chip consensus forecast rates yielded a discounted loss 2.5% below the benchmark. Both historical average forecasts produced estimated losses that were approximately 20% high.

This analysis could be extended to include the wage-growth side of the equation by including professional forecasts and historical averages of the employment cost index of total compensation. If professional forecasts of compensation growth are superior to historical average forecasts, the error in predicting the total loss in the example could be even higher for the historical forecasts.

Due to limited data, the applied problem considered here can not be re-tested at substantially different time periods. Nevertheless, the results are quite clear about the bias imposed in the recent past when using historical averages as forecasts. This analysis indicates that those personal injury economists using historical averages will have difficulty making the claim that, though their forecasting method is not grounded in good economic theory or practice, it at least performs adequately. Historical averages did not perform adequately in this example and there is no reason to believe that historical averages would be a valid, consistent predictor of actual real interest rates. Clearly, not only are historical averages incapable of accounting for changes in relevant economic factors, they are not reasonable substitutes for professional forecasts.

Treasury Inflation Protection Securities:

The US Treasury recently issued its first inflation indexed bonds, TIPS. The principal of these bonds is adjusted every six months by the change in the consumer price index thereby maintaining the purchasing power of the investment. The rate on these bonds, therefore, is a real rate of interest and is guaranteed for the ten year term of the securities.

Since the rate on TIPS is the real rate available on a ten year investment, it provides a market-based comparison for forecasts of the real rate. Since an investor can actually purchase a ten year security which guarantees a set real rate of return, any forecast of the real rate which is significantly different than the market rate is, at best, at odds with the collective judgment of the securities markets.

At the time this article was written, the yield on TIPS was 3.3%. Since the issue was greatly oversubscribed, the price of these bonds will likely fall and their yields rise when more supply becomes available. The current Blue Chip consensus forecast ranges from 3.5% for 1997 to 3.2% for the 2003-07 period[4] and the historical 15 and 30 year averages are 4.77% and 2.73%, respectively. The Blue Chip forecast is consistent with market expectations whereas the historical averages are not and the two measures are inconsistent with each other. Since interest rates observed in the capital markets provide the implicit consensus forecast of investors, the spread between the historical average and the TIPS rate demonstrates that forensic economists using this method are at odds with the market consensus as well as that of their colleagues who specialize in macroeconomic forecasting.

[4] *Blue Chip Economic Indicators* (1997).

Conclusion

For many years a minority of economists working in forensics have criticized their colleagues for using methods not accepted by the profession at large. In this article we have demonstrated that one of the most widely used methods --unadjusted historical averages as forecasts-- is both bad science and inaccurate.

Bibliography

Blue Chip Economic Indicators, 22(March 10, 1997), pp.2-3, 15.

Brookshire, Michael and Frank Slesnick, "1993 Survey of NAFE Members: A Follow-Up Survey of Economic Methodology," *Journal of Forensic Economics* 7(1), 1993, pp. 25-46.

Fama, Eugene F., "Short-term Interest Rates as Predictors of Inflation," *American Economic Review* 65(1975), pp. 269-282.

Fama, Eugene F., and Michael R. Gibbons, "Inflation, Real Returns, and Capital Investment," *Journal of Monetary Economics* 9(1982), pp. 297-323.

Garcia, René and Pierre Perron, "An Analysis of the Real Interest Rate under Regime Shifts," *The Review of Economics and Statistics* 78(1996), pp. 111-125.

Hanke, John, "Forecasting in Business Schools: A Survey," *Journal of Forecasting*, 3(1984), pp.229-234.

Homer, Sidney and Richard Sylla, *A History of Interest Rates*, 3rd ed., New Brunswick: Rutgers University Press, 1991.

Rose, Andrew K., "Is the Real Interest Rate Stable?," *Journal of Finance* 43(1988), pp. 1095-1112.

Speiser, Stuart M. and John Maher, *Recovery for Wrongful Death and Injury: Economic Handbook*, 4th ed., Deerfield: Clark, Boardman, Callaghan, 1995, pp. 5-15 - 5-16.

Spiro, Peter S., *Real Interest Rates and Investment and Borrowing Strategy*, New York: Quorum Books, 1989.

Walsh, Carl E., "Three Questions Concerning Nominal and Real Interest Rates," *Economic Review Federal Reserve Bank of San Francisco*, No. 4(1987), pp. 5-20.