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## *Low Interest Rates and High Asset Prices: An Interpretation in Terms of Changing Popular Economic Models*

MANY HAVE NOTED THAT we appear to be living in an era of low long-term interest rates and high asset prices. Although long-term rates have been increasing in the last few years, rates so far in the twenty-first century are still commonly described as low, in both nominal and real terms, compared with historical averages or with a decade or two ago. Meanwhile stock prices, home prices, commercial real estate prices, land prices, and even oil and other commodity prices are said to be very high.<sup>1</sup> The two phenomena appear to be connected: elementary finance theory states that if the long-term real interest rate is low, the rate of discount used to determine present values will also be low, and hence present values should be high. This pair of phenomena, connected through the present-value relation, is often described as one of the most powerful forces operating on the world economy today.

In this paper I will critique this common view about interest rates and asset prices. I will question the accuracy and robustness of the “low long rates, high asset prices” description of the world. I will also evaluate a popular interpretation of this situation, namely, that it is due to a worldwide regime of easy money. I will argue instead that changes in both long-term interest rates and asset prices seem to have been tied up with important changes in the public’s ways of thinking about the economy. Rational expectations theorists like to assume that everyone agrees on the model of the economy, which never changes, and that only some truly exogenous factor,

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1. See also Shiller (2007) on real estate prices, written concurrently with this paper.

like monetary policy or technological shocks, moves economic variables. Economists then have the convenience of analyzing the world from a stable framework that describes consistent thinking on the public's part. But an odd contradiction here is rarely pointed out: the economists who propose these rational expectations models are themselves regularly changing their models of the economy. Is it reasonable to suppose that the public is stably and consistently behind the latest incarnation of the rational expectations model?

I propose that the public itself, largely independently of economists, changes its thinking about the economy over time, and indeed that these changes in popular economic models have been dramatic. I further propose that these changes in popular thinking have driven both long-term rates and asset prices and should be central to our understanding of the large asset price movements we have seen.<sup>2</sup>

I will begin by presenting some stylized facts about the level of interest rates (both nominal and real) and the level of asset prices in the world. Next I will consider some aspects of the public's understanding of the economy, including common understandings of liquidity, the significance of inflation, and real interest rates, and how these have impacted both asset prices and interest rates. This will lead me to conclude that the relation between asset prices and either nominal or real interest rates is very tenuous, and clouded from definitive econometric analysis by this continual change in difficult-to-observe popular models.

### **Changes in Decade-Long Trends in Long-Term Interest Rates**

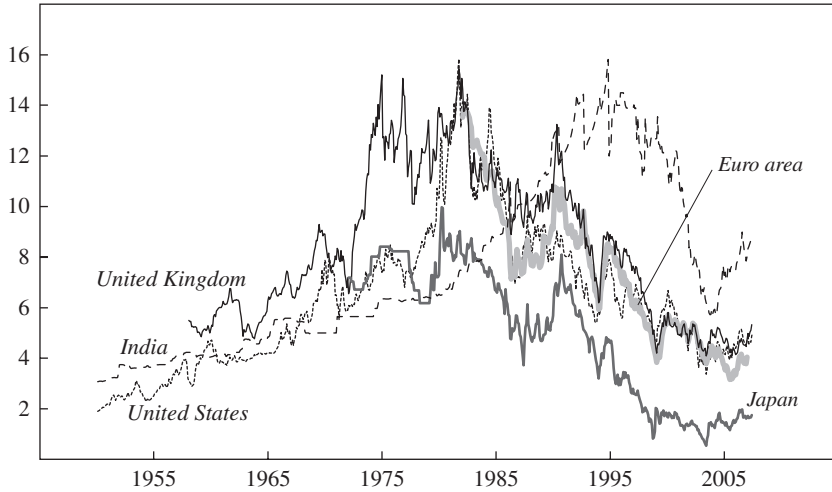
Figure 1 plots nominal long-term (roughly ten-year) interest rates on government bonds for four countries and the euro area since 1950.<sup>3</sup> With the exception of India, an example of an emerging economy, rates in all of these countries have been on a massive downtrend since the early 1980s, and even in India rates have been falling since the mid-1990s. The low point for long-term rates over this period appears to have been around 2003, but, broadly speaking, the upward movement since then has been small.

2. The concept of a popular economic model is discussed in Shiller (1990).

3. The long-term government interest rate series used here is an update of the series I spliced together for my book *Irrational Exuberance* (Shiller, 2005), from Sydney Homer's *A History of Interest Rates* (for 1871 to 1952) and the ten-year Treasury bond series from the Federal Reserve (from 1953 on).

**Figure 1. Nominal Long-Term Bond Yields in Selected Countries, 1950–2007<sup>a</sup>**

Percent a year



Source: Global Financial Data.

a. Data are monthly and refer to yields on government securities of approximately ten years' maturity.

Certainly one can say that the world is still in a period of low long-term rates relative to much of the last half century.<sup>4</sup>

Economic theory has widely been interpreted as implying that the discount rate used to capitalize today's dividends or today's rents into today's asset prices should be the real, not the nominal, interest rate, because dividends and rents can be broadly expected to grow at the rate of inflation. However, as Franco Modigliani and Richard Cohn argued nearly thirty years ago,<sup>5</sup> it may be, because of a popular model related to money illusion, the nominal rate that is used in the market to convert today's dividend into a price.

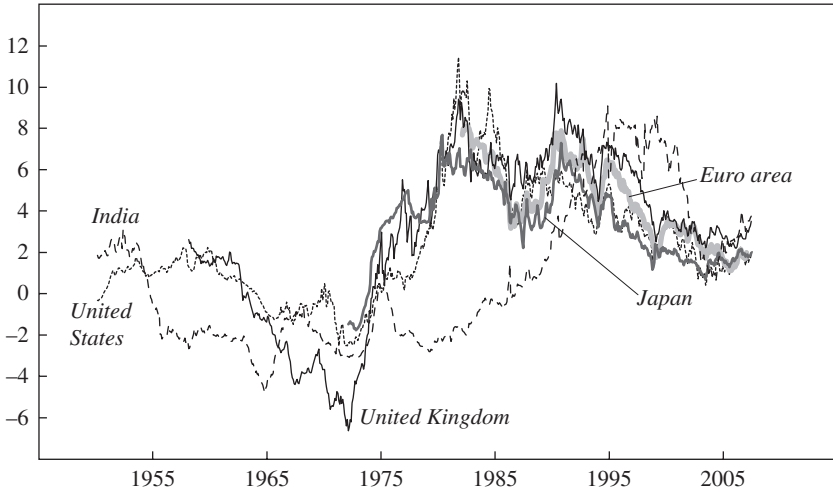
The downtrend in nominal rates since the early 1980s is certainly tied up with a downtrend in inflation rates over much of the world since the

4. Long-term rates are not any lower now than they were in the 1950s, but the high rates of the middle part of the period are gone. In the United States, long-term rates are actually above their 1871–2007 historical average of 4.72 percent a year. The best one can say from this very long term perspective is that U.S. long-term rates are not especially high now.

5. Modigliani and Cohn (1979). The authors also stressed that reported corporate earnings need to be corrected for the inflation-induced depreciation of their nominal liabilities, and investors do not make these corrections properly.

**Figure 2. Ex Post Real Long-Term Bond Yields in Selected Countries, 1950–2007<sup>a</sup>**

Percent a year



Source: Author's calculations using data from Global Financial Data.

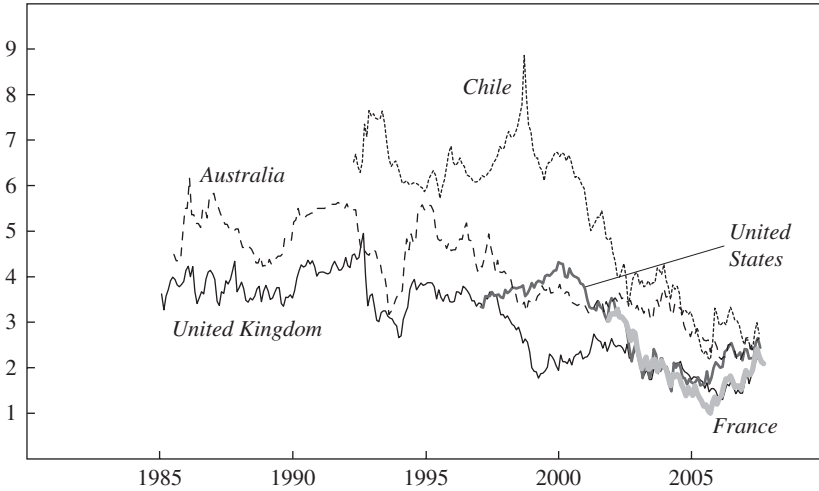
a. Data are monthly and refer to yields on government securities of approximately ten years' maturity.

early 1980s. Figure 2 shows real ex post long-term interest rates on bonds with a ten-year maturity in the same countries depicted in figure 1. The annual inflation rate that actually transpired over the subsequent ten years has been used to correct the nominal yield. (For dates since 1997, the entire ten-year subsequent inflation is not yet known, and so the missing future inflation rates have been replaced with the historical average for the last ten years.) Note that there has been a strong downtrend in ex post real interest rates over the period since the early 1980s as well. Indeed, this trend is nearly as striking as that for nominal rates. Ex post real long-term rates in some countries were remarkably close to zero in 2003. And just as with nominal rates, real rates have picked up since then.<sup>6</sup>

6. The ex post real annual yield on U.S. long-term government bonds has averaged 2.40 percent over 1871–1997, which is below their yield in 1997 (the last year this yield can be computed without making assumptions about the future). Even today, using the latest inflation rate as a forecast, U.S. real long-term interest rates are not obviously low compared with this long-run average. The best one can say for the popular view that long-term interest rates are low today is that they remain relatively low compared with twenty or thirty years ago.

**Figure 3. Yield on Ten-Year Inflation-Indexed Bonds in the United States, the United Kingdom, Australia, Chile, and France, 1985–2007<sup>a</sup>**

Percent a year



Source: Global Financial Data.

a. Data are monthly, beginning in January 1985 for the United Kingdom, July 1985 for Australia, April 1992 for Chile, January 1997 for the United States, and September 1997 for Sweden, and ending in July 2007 for all.

However, ex post real interest rates may not correspond to ex ante, or expected, rates. It seems unlikely that investors expected the negative real long-term rates that, in the 1970s, afflicted every major country except stable-inflation Germany. It is equally unlikely that they expected the high real long-term rates of the 1980s. After the very high inflation of the 1970s and the beginning of the 1980s, inflation in the United States and elsewhere came crashing down. It may be that people did not believe that inflation could come down so quickly and stay down over the life of these long-term bonds.

Market real interest rates, that is, inflation-indexed bond yields (shown in figure 3), have a shorter history in the major countries than do ex post real rates. In the United Kingdom, where available data on inflation-indexed bonds begin in 1985, market real rates showed no distinct downtrend between 1985 and 1997, the period when most of the decline in nominal interest rates occurred. However, they do show a downtrend from 1997 to 2006. In the United States market real interest rates are unavailable over most of the period since 1980 over which long-term interest rates have

declined. Since 1997, when indexed bonds were first created in the United States, the path has been irregular, but the general direction has been downward. There has been a similar downtrend in all the countries shown in the figure since the late 1990s.

This seems to confirm in a very rough sense that the downtrend in ex post real interest rates might also be a downtrend in ex ante rates since the late 1990s, if not before.<sup>7</sup> But markets in inflation-indexed bonds are still small and are not central factors in the economy, and their yields may reflect inessential features of the participants in these markets. (Most of these bonds are still held by institutions, not individuals.) Moreover, the paths of real long-term interest rates are substantially different across the United States and the United Kingdom since 1997, even though their asset price movements are fairly similar, as I will show below.

### **Changes in Popular Economic Models Associated with Trend Changes in Interest Rates**

In trying to pin down what people thought about long-term nominal and real interest rates in recent decades, one is confronted with the fact of a historic change in monetary policy regimes around the late 1970s to 1980. It is important to understand how the public perceived this regime change and how that perception changed over time. And understanding that involves understanding the beliefs of opinion leaders and their impact on thinking.

Marvin Goodfriend and Robert King have argued that the public was rational in not believing in the 1980s that the lower inflation would continue.<sup>8</sup> They point out that the Federal Reserve under Chairman Paul Volcker (who served from 1979 until Alan Greenspan took over in 1987) announced its radical new economic policy to combat inflation in 1979, and then promptly blew its credibility at the time of the early-1980 recession. U.S. inflation in terms of the consumer price index (CPI) reached an annual rate of 17.7 percent in the first quarter of 1980, and the Federal Reserve's

7. In August 2007 the annual yield on U.S. inflation-indexed bonds, at 2.44 percent, was almost exactly at the 1871–1997 average of ex post real long-term yields on U.S. government bonds, noted above.

8. Goodfriend and King (2005).

policy had the effect of reducing CPI inflation to 6.3 percent by the third quarter of that year. The central bank must have given the impression that the recession had blunted its resolve to combat inflation, because annualized CPI inflation rose quickly back up to 11.0 percent in the fourth quarter of 1980. Given that efforts by the Federal Reserve to tame inflation before 1980 had been followed within a number of years with yet higher inflation, a rational public would likely have assumed that inflation would soon head back up again. Hence expected long-term real interest rates were almost certainly not as high in the early 1980s as figure 2 would suggest. Goodfriend and King point out that, at the time, Paul Volcker himself regarded the nominal long-term rate as an indicator of inflationary expectations, and so he implicitly assumed that the expected long-term real rate was essentially constant.<sup>9</sup>

A look at international inflation rates suggests that Goodfriend and King's focus on Paul Volcker as the stimulus for change in the worldwide policy stance toward inflation may be misplaced. On a worldwide basis, the major turning point toward lower inflation looks more like 1975 than 1981, before Volcker's term as chairman began. What, then, did bring about the change in policy?

The *Brookings Papers on Economic Activity* certainly played a major role during the 1970s in the change in thinking among authorities on monetary policy. The very first article in the very first issue, by Robert Gordon,<sup>10</sup> was about the costs of monetary policy aimed at reducing inflation. In the early 1970s, how to deal with the rising inflation without imposing excessive costs on the economy seemed to be the leading topic in the *Brookings Papers*, where some of the most authoritative new thinking about this problem appeared. Although the tenor of most of these articles does not seem to have been hawkish on monetary policy, it seems likely that it was the combined effect of such scholarship and discourse that changed thinking on inflation policy than that Paul Volcker single-handedly led the world into a new policy regime.

Other opinion leaders at the time appealed directly to the broad public to support strong policies to deal with inflation. Irving S. Friedman, a former chief economist at the International Monetary Fund and then, at the behest of Robert McNamara, professor in residence at the World Bank, wrote a

9. Goodfriend and King (2005).

10. Gordon (1970).

book in 1973 titled *Inflation: A Growing World-Wide Disaster*, which may be representative of the kind of thought leadership that brought down inflation. He wrote:

The social scientist no longer enjoys the luxury and leisure to theorize and ruminate about society, economics, institutions and interpersonal relations. He is being called to act as he was during the Great Depression of the 1930s. . . . The inflation is clearly eroding the fabric of modern societies.<sup>11</sup>

Another Friedman, however, was probably far more influential in arguing, in effect, for consistently tighter monetary policy. Milton Friedman made a career out of criticizing monetary policy and arguing that the growth rate of the money stock should be targeted, no matter what the consequences for interest rates or any other economic variable. It was a plausible-sounding, although radical, recipe for stopping inflation. Friedman won the Nobel Prize in economics in 1976 and chose to give his Nobel lecture on the inflation problem, which was published as *Inflation and Unemployment: The New Dimension of Politics* in 1977. There he said that

On this analysis, the present situation cannot last. It will either degenerate into hyperinflation and radical change; or institutions will adjust to a situation of chronic inflation; or governments will adopt policies that will produce a low rate of inflation and less government intervention into the fixing of prices.<sup>12</sup>

It is plausible that Milton Friedman was, of all these people, the most important thought leader who led the historic break to lower inflation. His views on inflation had real worldwide resonance. When the Federal Reserve under Volcker made its momentous announcement of a new monetary policy regime on October 6, 1979, the Federal Open Market Committee described this as

A change in method used to conduct monetary policy to support the objective of containing growth in the monetary aggregates. . . . This action involves placing greater emphasis in day-to-day operations on the supply of bank reserves and less emphasis on confining short-term fluctuations in the federal funds rate.<sup>13</sup>

11. Friedman (1975, pp. ix and xi).

12. Friedman (1976; 1977, p. 284).

13. Board of Governors of the Federal Reserve System, press release, October 6, 1979.



These words clearly have the sound, if not fully the substance, of an acceptance of the Friedman formula and a willingness to accept the consequences of following it.

Friedman left behind an important change in the popular model of the economy. He created an association in the public mind between, on the one hand, a belief in monetary policy that tolerates large swings in interest rates to preserve monetary targeting and low inflation, and on the other, a general belief in the importance of free markets, even though there is no logically necessary connection between the two. By tying the belief that long-run price stability is the paramount objective for monetary policy with the emerging worldwide faith in free markets, he increased the probability that *this time* the effort to control inflation would not fail.

Perhaps it was thought leaders like these, now sometimes forgotten, who, by arguing persuasively enough that inflation could be controlled by monetary policy, gave Volcker and other central bankers the political power to take important steps to do so. The view, as enunciated by Arthur Okun in 1978, had been that reducing inflation by monetary policy alone entails a “very costly short-run tradeoff” in increased unemployment and lost output.<sup>14</sup> But the rise of inflation led to a sense of alarm, and the failure of other measures to control inflation led to an increasingly widespread conventional view that the nations of the world had no choice but to tighten monetary policy considerably.

However, the change in thinking that influenced policymakers may not have been so clearly palpable to the public as to bring down their inflationary expectations. Thus, *ex post* real rates may have shot up very high even though *ex ante* real rates did not. From this analysis of changing popular thinking about monetary policy, one is left in some doubt about the public’s appreciation of the relation between interest rates and inflation, and their understanding of real long-term interest rates.

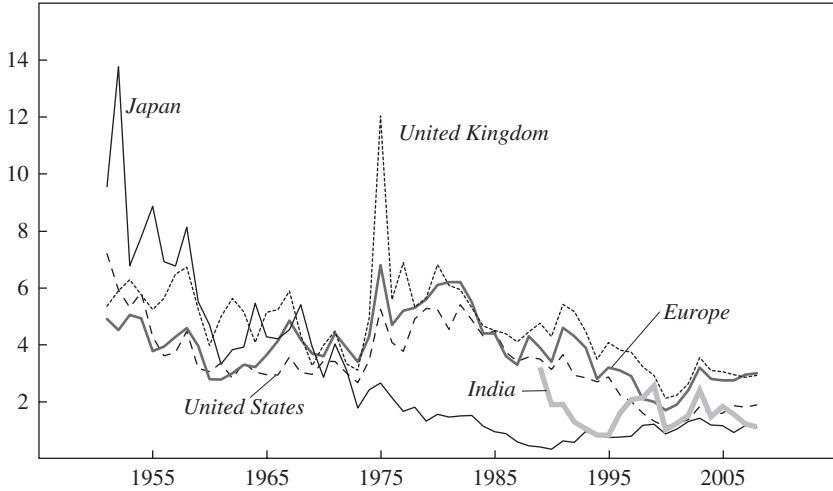
### **Long-Term Interest Rates and Asset Prices**

Figure 4 shows real dividend yields on stock price indices for the countries depicted in figures 1 and 2. The period around 1980, when nominal long-term interest rates were highest, was a period of relatively low stock prices, as indicated by high dividend yields. In most countries dividend

14. Okun (1978, p. 348).

**Figure 4. Stock Dividend Yields in Selected Countries, 1950 to 2007<sup>a</sup>**

Percent a year



Source: Global Financial Data.

a. Data are for the following national or regional stock market indexes: United States, S&P 500; United Kingdom, FT-Actuaries; Europe, Global Financial Data SYEURYM series; India, Nifty; Japan, Tokyo Stock Exchange.

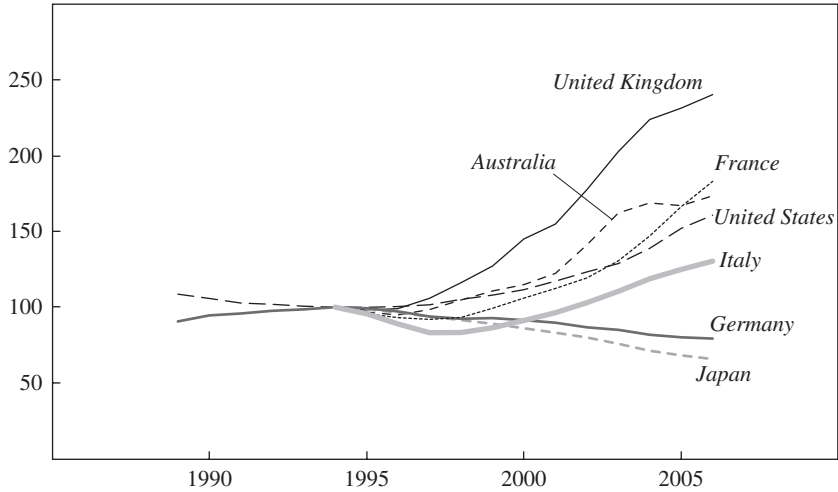
yields have been on a major downtrend since the peak in long-term rates, although not exactly in phase with the decline in those rates.

There was, however, a major upward correction in dividend yields (a downward correction in stock prices) between 2000 and 2003 that is unexplained by any rise in long-term interest rates. In the United States, real stock prices fell by half from peak to trough. A good part of the downward correction has been reversed since 2003, even though over this period long-term rates have generally risen, not fallen. Hence one could say that the simple story that long-term rates should move in the opposite direction from stock prices is consistent with these data, but only in a very rough sense. Stock prices were abnormally low just when long-term rates recorded their enormous peak in the early 1980s, but shorter-run movements in the series do not match up well.

A remarkable boom in home prices has appeared since the early-1980s peak in long-term rates. Figure 5 shows real (inflation-corrected) home prices for seven major industrial countries. Five of the seven have experienced home-price booms. In the United States as a whole, the boom is the

**Figure 5. Real Home Prices in Selected Industrial Countries, 1989–2006**

1994 = 100

Source: *OECD Economic Outlook 2007*, Statistical Annex, table 59.

largest since 1890.<sup>15</sup> Previous booms seem to have been relatively contained geographically (for example, to Florida or California). The fact that the boom has become so pervasive leads one to suspect that it is indeed tied up with the trend in interest rates. However, the uptrend in home prices clearly does not begin until the late 1990s, after most of the downtrend in nominal interest rates had passed. Although there might seem at first to be a substantial negative correlation historically between asset prices and interest rates, this correlation is actually very weak. However, popular perception that there is such a relationship may have an influence on the market, in that it may help frame today's home prices as justifiably high.<sup>16</sup>

15. See Shiller (2005, particularly figure 2.1, p. 13).

16. Figure 3 does show a mysterious sharp drop in the yield on Treasury inflation-protected securities (TIPS) yield after 1999, but it is hard to imagine that this market, of which the general public is hardly aware, was driving the housing market. The TIPS yield was very high in its early years, much higher than historical real interest rates or index-linked yields in the United Kingdom, as the U.S. Treasury tried to entice a highly skeptical public to buy these innovative securities. The downward correction in the TIPS yield since then only reflects a normalization of this market.

### The Dynamic Gordon Model and Dividend Yields

The model most often mentioned in connection with the level of asset prices is the Gordon model:<sup>17</sup>

$$P = \frac{D}{R - g},$$

where  $P$  is the asset price,  $D$  is the dividend per share of stock (or, more generally, the flow return on the asset),  $R$  is the long-term interest rate, and  $g$  is the expected long-term growth rate of dividends. This relation can also be expressed as

$$\frac{D}{P} = R - g.$$

$R$  and  $g$  in either version can be either both nominal or both real. Of course, nominal interest rates are most commonly used, but the idea that  $g$  is expected to be constant might be better justified if it is taken to be a real growth rate.

Myron Gordon himself derived this equation as a steady-state relation and did not use time subscripts, but it is common today to assume that the model holds at each point in time. John Campbell and I proposed a dynamic Gordon model, based on a log-linearization of the present value relation.<sup>18</sup> In an efficient market as we defined it, the dividend yield should be given by

$$\delta_t = \sum_{j=0}^{\infty} \rho^j E_t [r_{t+j} - \Delta d_{t+j}] + c,$$

where  $\delta_t$  is the logarithm of the dividend-price ratio at time  $t$ ,  $\rho$  is the discount factor implicit in the linearization,  $r_{t+j}$  is the one-period real interest rate at time  $t + j$ ,  $d_{t+j}$  is the log real dividend per share at time  $t + j$ , and  $c$  is a constant term. Note that this equation is essentially the same as the original Gordon model, except that instead of using long-term interest rates and growth rates, we used the present value of one-period interest rates and

17. Gordon (1962).

18. Campbell and Shiller (1988).

one-period growth rates of future dividends. This is a useful model in that it allows some interesting predictions about the changes through time in the dividend-price ratio as it relates to the expected time path of future interest rates and dividend growth rates. But using a vector autoregressive model for  $\delta_t$ ,  $\Delta d_t - r_t$ , and the earnings-price ratio, and assuming rational expectations, we found with U.S. data for 1871–1987 that the correlation between the theoretical log dividend-price ratio and the actual was only 0.309, and the ratio of the standard deviation of the theoretical dividend-price ratio to the actual dividend-price ratio was only 0.58. (The latter finding suggests excess volatility of stock prices but is not a proper measure of this, since real dividends show some short-run volatility.)

As figure 4 shows, the very high real interest rates in the late 1970s to early 1980s do seem to correspond somewhat to high dividend yields, at least when compared with recent years. But the correspondence with interest rates is not very tight and seems to apply only in comparisons with the relatively brief period of anomalously high interest rates and inflation in the late 1970s to early 1980s. In addition, the high dividend yields then were not as high as interest rates at the time would suggest. In the United States, for example, dividend yields in the early 1980s were at about the same level as in the early 1950s. This fact was noted by Olivier Blanchard and Lawrence Summers, who in their 1984 Brookings Paper wrote,

One would expect that a sharp increase in real interest rates at long maturities, caused by fiscal and monetary policies, would depress stock prices significantly. Yet in all major countries, real stock prices have been surprisingly strong. Dividend-price ratios have in no way followed real rates on long-term bonds.<sup>19</sup>

### **The Real Interest Rate in the Public Mind**

The discussion of changing popular economic models to this point has helped toward an understanding of trends in interest rates and inflation rates, but it has not made clear what the public thought about real long-term interest rates, nor has it led to a consistent picture of the relation between interest rates and asset prices. A problem is that the public does not seem to have clarity about the concept of real interest rates.

19. Blanchard and Summers (1984, p. 274).

Standard economic theory presumes that real interest rates are a natural concept to use to describe decisions in the marketplace. In fact, the real interest rate is not a concept that many people use to frame their decision-making when they think about asset prices.

The concept of the real interest rate dates back to 1895, when it was introduced by Columbia University economics professor John Bates Clark, whose name is memorialized in the prestigious economics medal that the American Economic Association awards today. In describing the concept, Clark seemed to regard it as a strikingly original idea that he needed to explain at some length. He wrote about a widespread confusion, which he discerned in the then-current debate about bimetallism, in the interpretation of interest rates. Discussing the example of a debtor in an environment with 1 percent deflation, Clark noted that “If he pays a nominal rate of five percent in interest, he may pay a real rate of six.”<sup>20</sup> The following year, Yale University’s Irving Fisher wrote about the same popular confusion, although he did not use the term “real interest rate” but instead referred to “virtual interest in commodities.” He also noted the lack of public understanding of the basic concept: “It is an astonishing fact that the connection between the rate of interest and appreciation has been almost completely overlooked, both in economic theory and in its bearing upon the bimetallic controversy.”<sup>21</sup> He was right to be astonished, for indeed the significance of any interest rate depends critically on the inflation rate, so that referring to nominal interest rates alone may be regarded as almost meaningless.<sup>22</sup>

Clark’s long discourse on the elementary concept of real interest rates and Fisher’s astonishment at the lack of public understanding of the concept reflect their recognition of the importance of what today are classified as behavioral biases in popular economic thinking. In this case the bias was “money illusion,” to use a term popularized by Fisher much later, in 1928. But rather than an “illusion,” failure to think in terms of real rather than nominal interest rates is perhaps better described as simply an abject failure to understand the concept. A century after Clark and Fisher first discussed it, the concept of the real interest rate remains totally absent from the popular model of the economy. Indeed, as I demonstrate below, the term itself

20. Clark (1895, p. 391).

21. Fisher (1896, p. 4).

22. In his 1898 book *Geldzins und Güterpreise*, Knut Wicksell spoke of the related concept of the “natural rate of interest.”

did not enter the language outside the economics profession until much later. Yet people need to understand the concept of the real interest rate if they are to make the dynamic Gordon model work. If they cannot grasp the concept, it is hard to see how they will immunize themselves from the money illusion described by Modigliani and Cohn.

Of course, if people had clearly in mind the nominal growth rate of dividends, the  $g$  in the Gordon formula above, and framed it, as well as the  $R$  in  $R - g$ , in nominal terms, there would be no error. But I have not been able to find any popular discussions about adjusting the projected growth rate of dividends for changes in projected inflation, and it appears quite unlikely that most people do so.

Also of course, if the pricing of financial assets were exclusively the domain of a small group of sophisticated investors (the so-called marginal investor), it would not matter that the general public was making such a fundamental mistake. However, as I argued in my 1984 Brookings Paper, and as Andrei Shleifer and Robert Vishny have also argued,<sup>23</sup> there are many reasons to think that this “smart money” cannot rectify long-term mispricings of major asset classes.

Modigliani and Cohn made it part of their argument in 1979 that stock prices are determined by nominal, not real rates, and that few news media or businesspeople ever refer to the concept of real interest rates for purposes of discounting future corporate cash flows, or to the correction that must be made to corporate earnings for the real value of the interest owed by the corporation:

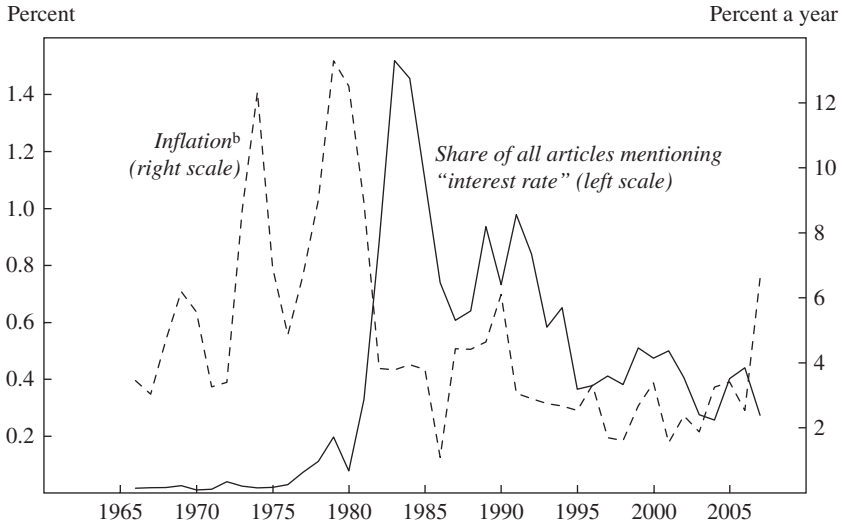
... the financial press kept asserting that earnings-price ratios had to be compared with nominal interest rates, while not even mentioning the fact that profits of firms with large debts should be adjusted for the inflation premium. To be sure, the financial press may not be the best source of information about how investors value equities. We therefore endeavored to secure recent memoranda from large brokerage firms advising institutional investors; in virtually every case, it was clear that analysts did not add back to earnings the gain on debt, and that they also relied at least partly on the capitalization of earnings at a nominal rate.<sup>24</sup>

With modern-day search technology, one can do a more thorough job of discovering how often nominal interest rates are corrected for inflation. In

23. Shiller (1984); Shleifer and Vishny (1997).

24. Modigliani and Cohn (1979, p. 35).

**Figure 6. Newspaper Articles Mentioning “Real Interest Rate,” and Inflation Rate, 1966–2007<sup>a</sup>**



Source: Author's calculations using ProQuest historical database, 1966–88, and ProQuest newspapers database, 1989–2007; U.S. Bureau of Labor Statistics.

a. Annual data.

b. Change in consumer price index for all urban consumers (CPI-U) from December to December, except for 2007, which is the annualized change for the first six months.

a ProQuest search of major newspapers, I found that the term “real interest rate” was first used in the popular press in the modern meaning in 1946, fifty years after the concept was established in professional economics journals.<sup>25</sup> The words “real interest rate” were occasionally used before that but referred to other things (for example, in criticizing bad lending practices that calculated interest rates from a fictitious base).

Figure 6 shows the incidence of articles using the term “real interest rate” (in its modern meaning), as a share of all articles mentioning “interest rate,” in U.S. newspapers in the ProQuest major newspapers databases (historical and modern) since 1960. Between 1890 and 1960 there was only one reference to real interest rates (the 1946 case noted above). Since then the annual frequency of references to real interest rates has been extremely

25. “‘Real Return’ on Saving Found 43 P.C. below 1939,” *Christian Science Monitor*, November 26, 1946, p. 15, quoting an Institute of Life Insurance study.



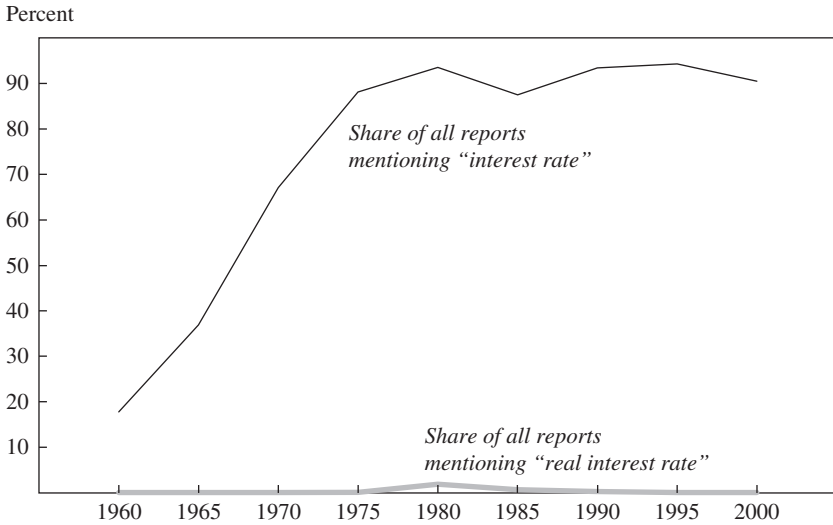
low, never more than about 1½ percent of all references to interest rates, and dropping off precipitously after a peak in the early 1980s. The concept of the real interest rate appears to have had its day and is dying. The frequency of the term did pick up with the inflation of the 1970s, but that can hardly be explained as an automatic response to high inflation, since earlier high-inflation periods witnessed no use of the term.

It could be that “real interest rate” has merely been replaced over time by “interest rate adjusted for inflation” and similar phrases, so that figure 6 understates the actual use of the concept. I therefore searched newspapers in the ProQuest modern newspapers database for “interest rate adjusted for inflation” or “inflation-adjusted interest rate” or “inflation-indexed interest rate.” The combined incidence of these three terms is, however, much less than that of “real interest rate,” and articles that mentioned any of these terms never amounted to 0.25 percent of all articles mentioning “interest rate.” Moreover, the pattern of usage of these terms is much the same as that in figure 6, with a decline in recent years, although their usage as a fraction of usage of “interest rate” peaked somewhat later, in 1990.

Figure 7 shows the use of “real interest rate” in the ProQuest database of corporations’ annual reports by five-year period. The same 1980–84 spike in usage evident in the newspapers database appears in these reports. Remarkably, not a single annual report used the term “real interest rate” (or any of the alternative phrases listed above) in 1995–99 or in 2000–04, among over 2,000 annual reports in the database in both of those five-year intervals. The number of annual reports using the term “real interest rate” peaked in the 1980–84 period at only 1.8 percent of all annual reports using the term “interest rate”—a figure comparable to that for newspaper articles. (Note that the incidence of the words “interest rate” grew dramatically over the sample period, from 17.7 percent of annual reports in 1960–64 to 93.5 percent in 1980–84, and has stayed at around 90 percent ever since.) The 1980 interest rate peak seems to have had an effect on the use of both “real interest rate” and “interest rate,” but the effect was permanent only on the latter.

The real interest rate concept still seems highly relevant in judging the high asset prices observed today, but evidently the public is not buying it. I know this from personal experience, when I talk with news reporters and attempt to refer to the concept. They listen patiently and then change the subject, and sometimes even volunteer that their readers do not relate to such a concept.

**Figure 7. Corporate Annual Reports Mentioning “Interest Rates” and “Real Interest Rates,” 1960–2004<sup>a</sup>**



Source: Author's calculations using ProQuest annual report database, September 9, 2007, revision.  
 a. Counts are for five-year intervals beginning with the indicated year.

The Treasury inflation-protected securities (TIPS) market started in the United States in 1997. The term “real interest rate” did not take off with the development of this market. Indeed, the Treasury itself does not use the term in its marketing of TIPS, but instead refers only to the TIPS “yield.” The stark reality and central importance suggested by John Bates Clark’s term are never even suggested. Part of the reason for the relative lack of popularity of TIPS (they account for only 8 percent of federal debt) is that they have not been marketed as solving fundamental problems or providing important price discovery.<sup>26</sup>

In my 2003 book I argued that governments around the world should adopt new units of measure for real values—indexed units of account, like

26. According to the *Treasury Bulletin*, federal debt securities held by the public first passed \$5 trillion in February 2007 (table FD-1), and in that month TIPS outstanding amounted to \$411 billion (table FD-2). Table B100 of the Federal Reserve Flow of Funds Accounts shows household net worth at \$56.7 trillion in the first quarter of 2007; hence TIPS amount to well under 1 percent of net worth, and even that is held largely by institutions and foreigners.

Chile's *unidad de fomento*, adopted in 1967—and educate their publics to use these units in contracts instead of currency. I proposed that the units be called “baskets” so that people can appreciate that, by trading in them, they are trading in the market baskets that underlie the CPI. Only a major step like this could eliminate money illusion.

### **Liquidity in the Public Mind**

If one looks at what people actually say—the concepts that come naturally to them rather than those attributed to them by economic theorists—one discovers that they typically frame the level of asset prices in entirely different terms. For example, the idea that the world is “awash with liquidity” is part of the popular market lore recently. In a Lexis-Nexis search of this phrase in English language newspapers, I found that its use soared during the stock market boom of the late 1990s, and then soared even higher during the housing boom, starting in 2004. The term was also used rather frequently in the mid-1980s, just before the stock market crash of 1987.

My clear impression from reading some of the many recent newspaper accounts of this supposed phenomenon is that some writers are confused about some of the most basic principles of economics. It definitely seems that, in the popular model, when people buy stocks their money goes “into” the stock market and sits there, and so higher stock prices mean that there must be more money (liquidity) around to pay for them.

An example of this kind of thinking appears in a recent *Wall Street Journal* article:

Lenders have been doling out increasingly large sums of money and accepting increasingly crummy conditions and meager returns on their loans. Remember those “low-doc” loans that got subprime home buyers in trouble—the ones that required minimal proof of ability to repay? These are their corporate cousins.

Waves of money are coming at the markets from investors around the world. Bond and loan buyers have to put this money to work, even if the deals are shoddy.<sup>27</sup>

27. Dennis K. Berman, “Sketchy Loans Abound: With Capital Plentiful, Debt Buyers Take Subprime-Type Risks,” *Wall Street Journal*, March 27, 2007, p. C1.

This passage indicates a sort of popular habit of thinking that is miles away from the idea that low long-term interest rates are fed into present-value formulas to justify high asset prices.<sup>28</sup>

## **Conclusion**

I have shown that the big movements in stock prices and real estate prices of the last decade or so do not line up with movements in long-term interest rates over the same period. This appears to confirm the 1988 results of Campbell and Shiller that stock prices relative to dividends or earnings are not well explainable in terms of present-value models with time-varying interest rates. Yet if one is doing very broad comparisons of the present with another time—for example, the early 1980s, when interest rates were very high—one might say that lower nominal interest rates are indeed a factor in today's relatively higher asset prices.

The money illusion theory, that low nominal interest rates help propel real asset prices upward in a time of declining inflation, may seem a little unsatisfactory, since it describes people as understanding inflation well enough to push nominal rates down when inflation is falling, but not well enough to realize that these lower nominal rates should not be used to discount today's dividend into a higher price. It hardly seems like a sound approach to economic theorizing to assume that people understand some applications of a concept and not others.

But, as shown above, laypeople do not even talk about the concept of real interest rates today, and so it certainly stands as plausible that they would be vulnerable to error in handling all ramifications of the concept equally well. The natural framing of stock market reports involves dividend-price ratios and earnings-price ratios, which are already framed so that they can easily be compared with nominal interest rates. Moreover, public understanding about a world "awash with liquidity" may be reinforced by their perception of an era of low nominal rates, and may help reinforce

28. Some economists have tried to give a more sensible interpretation of what these writers might be saying. Adrian and Shin (2007) argue that those who use these terms might be interpreted as saying that there is a feedback mechanism operating within investment banks, and to a lesser extent commercial banks, that causes them to demand more investments when asset inflation has raised the net value of their balance sheets, so that, through this mechanism, higher asset prices tend to create yet higher asset prices.

errors in pricing. Behavioral economics has always had to confront the public's partial understanding of economic concepts, of mental compartments, of framing effects that distort judgment.

This paper has discussed one simple explanation of the asset booms since the mid-1990s, namely, that they are a direct consequence of falling long-term interest rates. I concluded that changes in popular economic models should be viewed as more central to our understanding of these high asset prices. I have not offered a complete theory of today's high asset prices. Presumably, as I discussed in *Irrational Exuberance*, many factors, including among other things speculative feedback and social epidemics, have contributed to this phenomenon.

### References

- Adrian, Tobias, and Hyun Song Shin. 2007. "Liquidity and Financial Cycles." Paper presented at the 6th BIS Symposium "Financial System and Macroeconomic Resilience," Brunnen, Switzerland, June 18.
- Blanchard, Olivier J., and Lawrence H. Summers. 1984. "Perspectives on High World Real Interest Rates," *BPEA*, no. 2: 273–324.
- Campbell, John Y., and Robert J. Shiller. 1988. "Stock Prices, Earnings, and Expected Dividends." *Journal of Finance* 43, no. 3: 661–76.
- Clark, John B. 1895. "The Gold Standard of Currency in the Light of Recent Theory." *Political Science Quarterly* 10, no. 3 (September): 389–403.
- Fisher, Irving. 1896. "Appreciation and Interest." *Publications of the American Economic Association* 11, no. 4 (July): 1–98.
- \_\_\_\_\_. 1928. *The Money Illusion*. New York: Adelphi.
- Friedman, Irving S. 1975. *Inflation: A Growing World-Wide Disaster*. Garden City, N.Y.: Anchor Books.
- Friedman, Milton. 1976. "Inflation and Unemployment." Nobel Memorial Lecture (nobelprize.org/nobel\_prizes/economics/laureates/1976/friedman-lecture.pdf).
- \_\_\_\_\_. 1977. *Inflation and Unemployment: The New Dimension of Politics*. New York: Transatlantic Arts.
- Goodfriend, Marvin, and Robert King. 2005. "The Incredible Volcker Disinflation." Working Paper 11562. Cambridge, Mass.: National Bureau of Economic Research (August).
- Gordon, Myron J. 1962. *The Investment, Financing and Valuation of the Corporation*. Homewood, Ill.: Irwin.
- Gordon, Robert J. 1970. "The Recent Acceleration of Inflation and Its Lessons for the Future." *BPEA*, no. 1: 8–41.

- Modigliani, Franco, and Richard A. Cohn. 1979. "Inflation, Rational Valuation, and the Market." *Financial Analysts Journal* 35, no 2 (March–April): 22–44.
- Okun, Arthur M. 1978. "Efficient Disinflation Policies." *American Economic Review* 68, no. 2 (May): 348–52.
- Shiller, Robert J. 1984. "Stock Prices and Social Dynamics." *BPEA*, no. 2: 457–98.
- \_\_\_\_\_. 1990. "Speculative Prices and Popular Models." *Journal of Economic Perspectives* 4, no. 2 (Spring): 55–65.
- \_\_\_\_\_. 2005. *Irrational Exuberance*, 2nd ed. Princeton University Press.
- \_\_\_\_\_. 2007. "Understanding Recent Trends in House Prices and Home Ownership." Paper presented at the Federal Reserve Bank of Kansas City Symposium, Jackson Hole, Wyo., August 31–September 1.
- Shleifer, Andrei, and Robert W. Vishny. 1997. "The Limits of Arbitrage." *Journal of Finance* 52, no. 1 (March): 35–55.
- Wicksell, Knut. 1898. *Geldzins und Güterpreise*. Jena.

## *General Discussion*

Several participants argued that people do understand and act upon the idea of a real interest rate, even if they do not use that term. In particular, Martin Feldstein noted that people often use the term “inflation-adjusted interest rate” to mean the real interest rate.

Feldstein also stated, however, that the importance of real interest rates was slow to take hold at the Federal Reserve. As Alan Meltzer noted in his *History of the Federal Reserve*, decisionmakers at the central bank before the 1980s tended to think about monetary policy in terms of nominal interest rates. As a result, when the Federal Reserve responded to an increase in inflation by raising nominal rates, policymakers believed that policy had become more restrictive—even if nominal rates had not been increased as much as inflation, so that real rates remained below their starting values and policy had actually been eased.

