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Purchasing Power Annuities

The obvious problems that inflation causes for financial planning are particularly acute in the case of saving for retirement. Indeed, conventional plans for saving for retirement are wholly inadequate in an inflationary environment because they entail substantial risk and uncertainty. In a new National Bureau study, **Purchasing Power Annuities: Financial Innovation for Stable Real Retirement Income in an Inflationary Environment**, *Working Paper No. 442*, Research Associate **Zvi Bodie** examines the shortcomings of existing retirement-savings schemes and proposes an alternative that could be created with existing financial instruments.

Most private pension plans and contractual-savings schemes are risky vehicles for providing retirement income because they offer fixed streams of dollar benefits, while a family's needs can only be surmised at uncertain future prices. Fixed-dollar benefits are satisfactory in an era of stable prices, but conventional plans become unsatisfactory for both accumulating savings and providing retirement benefits when prices are unstable or unpredictable.

Consider, for instance, a family that wants to accumulate \$100,000 worth of 1980 purchasing power for a retirement that will begin thirty years from now. At 8 percent inflation, the family will need \$1,006,266 at that time. If the family makes level contributions to a fixed annuity with a return of 8 percent—equal to the inflation rate, or a zero real return—it will have to set aside \$8,883 a year. That would be an unrealistically high portion of current income in the early years. If the family's income keeps pace with prices, the contribution will drop to a much smaller proportion of income in the last years. Moreover, the family has no assurance of meeting its goal. If the rate of inflation turns out to be 10 percent over the thirty years, the family's savings of over \$1 million will amount to only \$57,668 of 1980 purchasing power when the family enters retirement. On the other hand, if inflation turns out to be only 6

percent, then the family will have \$175,201 of 1980 purchasing power.

The uncertainty arising from inflation was one consideration behind the development of variable annuities during the 1950s. The returns on variable annuities depend on the performance of an underlying investment portfolio, usually common stocks. The thinking in the 1950s was that variable annuities were superior to fixed ones because common stocks were a good inflation hedge. The experience with variable annuities has been disappointing, but Bodie argues that their performance is not really surprising.

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Even if stocks were a perfect inflation hedge, they would be an imperfect retirement-savings vehicle because they carry a large component of business and financial risk. For example, if the long-run *real* rate of return on stocks averaged 4 percent, one would have to invest \$30,832 today to have \$100,000 of present-dollar purchasing power thirty years from now. But actual returns can deviate from the average over long periods of time. If the rate of return over the thirty years turns out to be 3 percent, the investor will end up with only \$74,837. Thus, someone who substitutes a variable annuity for a fixed one is trading the inflation risk of fixed-income securities for the market risks of stocks, and the pension buyer still faces the danger of missing his savings goal by a wide margin.

Many corporate pension plans overcome these problems by tying benefits to employees' earnings in the years just before retirement. However, even these plans pay out fixed-dollar benefits during retirement, when the problems posed by inflation are greater. Even if the inflation rate were predictable, fixed-dollar payouts would result in declining real benefits over the years. Of course a retiree does not have to spend all of the income he receives in the early years. But future inflation rates are uncertain, so the retiree does not know how much to save in the early years and runs the risk of either depriving himself of too much consumption now or having too little to spend in the future.

From the saver's point of view, the ideal retirement instrument would be default-free bonds linked to the cost of living. If such bonds offered a zero real return, like the fixed annuity in the example above, a family could contribute a constant \$3,333 a year—in real terms—to accumulate \$100,000 of purchasing power over thirty years. While the nominal contribution would rise with inflation, it would remain a constant proportion of the family's income if their income rose in step with prices. In addition, the ultimate purchasing power of amounts already saved would not be in doubt. Similarly, benefit payments in retirement could be fixed in real terms.

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There are no indications that the federal government or large corporations are about to issue bonds indexed to the price level. Bodie examines returns on existing financial instruments for the period from 1953 through 1978 to see whether a substitute for indexed bonds could be created. He concludes that the best available alternative would be short-term bonds or notes hedged against unanticipated inflation with a well-diversified portfolio of commodities futures contracts. The combination cannot provide returns that are completely free from inflation risk, but it can give a much more stable real rate of return than traditional savings instruments or pension assets.

Bodie finds that the mean real rate of return on one-month Treasury bills was 0.41 percent a year over the 1953-78 period. When 3.6 percent of the hypothetical portfolio was invested in commodity futures, the mean rate of return rose to 0.63 percent. During the high-inflation years of 1972 through 1978, the Treasury bills alone had a real rate of return of minus 1.62 percent. Treasury bills plus commodity futures did better, but

still had a disappointing rate of return of minus 0.98 percent.

Bodie concludes that insurance companies or corporations could offer purchasing power annuities with annual premiums and benefits adjusted to the actual rate of inflation. But given the low rate of return on a portfolio of Treasury bills and commodity futures since 1953, the real earnings rate used in pricing the annuities would be, at most, zero. AE

Dividends and Stock Prices

For many years, it has been accepted by investors and firms alike that the price of a share of stock is primarily a reflection of the dividends that the stock will pay. If a firm's prospects improve, signaling an increase in future dividends, then the stock will be worth more, and the price of a share will rise. Recently, though, this theory of share pricing has been challenged.

What accounts for movements in stock prices? Can they be explained by new information about anticipated future dividends? Not according to NBER Research Associate **Robert J. Shiller**, who finds that movements in dividends would have to have been much larger than those actually observed over the last century to explain the changes in stock prices during that period.

In *Working Paper No. 456, Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?*, Shiller compares actual stock prices with the “efficient markets model.” This model of movements in corporate common stock prices, used by many economists and market analysts, assumes that any sudden movement in a stock price index is due to new information about future dividends. In the model, stock prices are thought to equal the discounted value of expected future dividends.

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Shiller undertakes his study because there have been many recent objections that stock price indexes are too volatile—that is, that their movements are too large relative to subsequent dividend movements—to be realistically explained by new information on future dividends. His framework for the analysis is earlier work that he did on long-term bond yields in which he found that those yields appeared to be too volatile to

be explained in terms of new information about future short-term interest rates.

Shiller studies two sets of data, the Standard & Poor's Composite Stock Price Index for the period 1871-1979 and the Dow Jones Industrial Average for 1928-79. To illustrate his calculations, he constructs a graph for each on which he plots both the actual prices and the prices that are predicted by the efficient markets model. In both cases, the predictions of the model are much smoother and more stable than the actual series. That is, while actual stock prices fluctuated often and widely, the detrended real stock prices predicted by the model were almost constant (a straight line).

It is not difficult to understand why the predicted series is so smooth: real detrended dividends varied relatively little during the century, and the model incorporates a moving average of those dividends, smoothing the results even more. Even during the Great Depression, Shiller observes, "real dividends were substantially below trend (that is, 10-25 percent) ... only for a few years: 1933, 1934, 1935, and 1938. Clearly the stock market decline beginning in 1929 and ending in 1932 could not be rationalized in terms of subsequent dividends."

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In the efficient markets model, earnings are only relevant for stock prices as indicators of future dividends. Earnings are supposed to be one indicator of how well a company is doing. Shiller notes that "historically, earnings appear inaccurate and overstated in that retained earnings appear to earn far less than the discount rate and are a poor indicator of future dividends."

Some critics have claimed that stock prices ought to be determined by expected future earnings rather than expected dividends, since some firms pay out only a small fraction of their earnings and also attempt to stabilize their dividends. However, Shiller points out that even if the firm retains some proportion of its earnings, those retained earnings will eventually be reflected in dividends. Thus, price may be regarded as the present value of dividends. On theoretical grounds, this version of the efficient markets model is acceptable.

However, Shiller finds that the model simply does not describe actual movements in stock prices. In fact, the observed stock price movements were five to ten times larger than those that could have been explained by the model. While this paper does not explore other factors that might explain changes in stock prices, Shiller does conclude that "if movements in real interest rates are used to explain the high volatility of prices, then these movements would have to be very large."

Efficiency of Federal Deficits

Concern over whether federal spending is financed by taxes or debt has inspired proposals to balance the budget annually, regardless of circumstances. However, such proposals neglect the distortionary effect that changing the timing of taxes can have on the allocation of resources. According to a study by NBER Research Associate **Robert Barro**, past use of public debt has generally been an efficient response to business fluctuations, temporary increases in government spending, and variations in anticipated inflation. In **Federal Deficit Policy and the Effects of Public Shocks**, *Working Paper No. 443*, Barro also finds that only those uses of debt that do not conform to this typical pattern (that is, "debt shocks") have an effect on the business cycle, albeit a smaller one than unexpected changes in the money supply.

Taxes not only transfer resources from the private sector to the government, but also involve an excess burden due to the resources lost in administering and complying with the tax system and to the resources misallocated in order to avoid the tax. If tax rates varied substantially from one period to the next, the excess burden of raising an equivalent amount of revenue would be larger than if rates were stable. Costly rearrangements of work and other activities between low- and high-tax periods would worsen the loss of output per dollar of taxes raised.

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In order to minimize such distortions, Barro argues that people should not be able to predict future changes in tax rates. An implication of one such policy, keeping expected tax rates stable over time, is that temporarily high government spending would have to be financed mainly by issuing debt. Consistent with this, Barro observes that the ratio of public debt to GNP peaks during major wars and declines in peacetime.

If real government spending showed little cyclical variability, smoothing taxes over time would likewise entail deficits in recessions and surpluses in booms. Barro finds that federal deficits during recessions, even before the 1970s, have been larger than necessary to stabilize federal tax rates, perhaps offsetting instability in state and local taxes.

Smoothing taxes also implies that the nominal size of federal debt should keep pace with anticipated in-

flation, since real debt, real interest payments, and the related taxes would otherwise be affected in ways that people could anticipate. Barro, in fact, finds a one-to-one link between anticipated inflation and the growth rate of nominal debt. A variety of evidence, cited by Barro, suggests that inflation mainly increases the debt, rather than that increased debt is an important source of inflation.

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The author concludes that most major changes in federal debt can be seen as stabilizing anticipated tax rates during times in which there are temporary in-

creases in spending, cyclical swings in the economy, and changes in anticipated inflation. Such uses of debt have thus been consistent with economic efficiency.

Barro then attempts to isolate those movements in public debt that do not conform to this typical, systematic pattern—that is, debt shocks. This random, surprise element in deficit finance is shown to have an expansionary impact, increasing output and reducing unemployment with a one-year lag, although the effect is smaller than that of monetary shocks. For example, a debt shock in 1965 is estimated to have reduced the unemployment rate in 1966 by about three tenths of a percentage point. Furthermore, equations that omit the debt shock variable for 1975 underestimate the unemployment rate for 1976 by more than one percentage point, while inclusion of the debt shock brings the estimate quite close to the actual unemployment rate.

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