

Preserving a Portfolio's Real Value: Is There an Optimal Strategy?

Vanguard Investment Counseling & Research



Vanguard[®]

Executive summary

The primary purpose of an investment portfolio is to fund current and future liabilities. To adequately fund future liabilities, a portfolio's value should increase—through either contributions or investment returns—at a rate at least equal to the increase in the inflation-adjusted cost of the anticipated liability, plus any unexpected liabilities that may arise. While categories of liabilities may be similar for most policy portfolios—wages, benefits, charitable gifts, etc.—the characteristics of the liabilities are unique. Uncertainty about the amount and timing of liabilities frequently complicates the formation of a suitable real-return strategy. But are there assets that can counter the impact of inflation on these liabilities? And what are the risks and return characteristics of such investments? This paper critically examines the historical performance of various asset classes and real-return strategies, concluding that:

- There is no “one size fits all” solution for preserving purchasing power that is appropriate for all policy portfolios.
- If the inflation-adjusted value and timing of the liability are known, investments such as money market funds, short-term bonds, and inflation-indexed securities should produce a real return sufficient to maintain or modestly build the portfolio's purchasing power.
- Where the value and timing of the liability are less certain, or where meaningful growth of purchasing power is desired, a total-return (diversified asset) strategy seeking higher real returns may be preferable.
- For short-term liability planning, emphasis should be on preservation of principal, because inflationary impact is likely to be minor even if inflation is significantly underestimated.
- For long-term liability planning, a strategy emphasizing assets with historically higher real returns may produce growth sufficient for protection in case the inflation-adjusted value of the liability is underestimated.

Author

Donald G. Bennyhoff, CFA

Table 1. Classification of liabilities

Amount of outlay	Timing of outlay	Example
Known	Known	Fixed annual lease payment
Known	Uncertain	Standard life insurance policy
Uncertain	Known	Annual obligation with cost-of-living escalator
Uncertain	Uncertain	Employee health insurance benefits

Sources: Fixed Income Readings for the Chartered Financial Analyst® Program, Frank J. Fabozzi Associates, 2000, and Vanguard Investment Counseling & Research.

The challenge of countering inflation

Historically, no asset class has provided a hedge against inflation in the purest sense of the word. While some assets have produced returns closely correlated with changes in inflation, others have provided a higher real-return premium over longer periods. However, there have also been periods—short, intermediate, and long—in which many asset classes had negative real returns.

In setting portfolio strategy, the decision to include assets—such as stocks—that produce higher real returns involves a trade-off: To contend with the uncertainty of the future value of the liabilities, the portfolio must accept the uncertainty of the future value of the assets. The longer the time horizon and the more uncertain the liability, the more acceptable this trade-off may be. This is an important consideration, given that the intended investment horizon for many portfolios is perpetuity.

Diversification and asset allocation can help moderate the volatility of returns for a portfolio, but in some years principal may still need to be invaded to meet the liability stream. In addition, the investment decision-making process can exert significant influence: Policy shifts due to unexpected

short- to intermediate-term divergence from expected returns can complicate the long-term viability of a strategy. As a result, the policy portfolio's investment horizon and behavioral aspects of investment decision-making are critical considerations in deciding on a real-return strategy.

Development of a real-return investment strategy

To develop an investment strategy to contend with inflation, a number of questions must be answered:

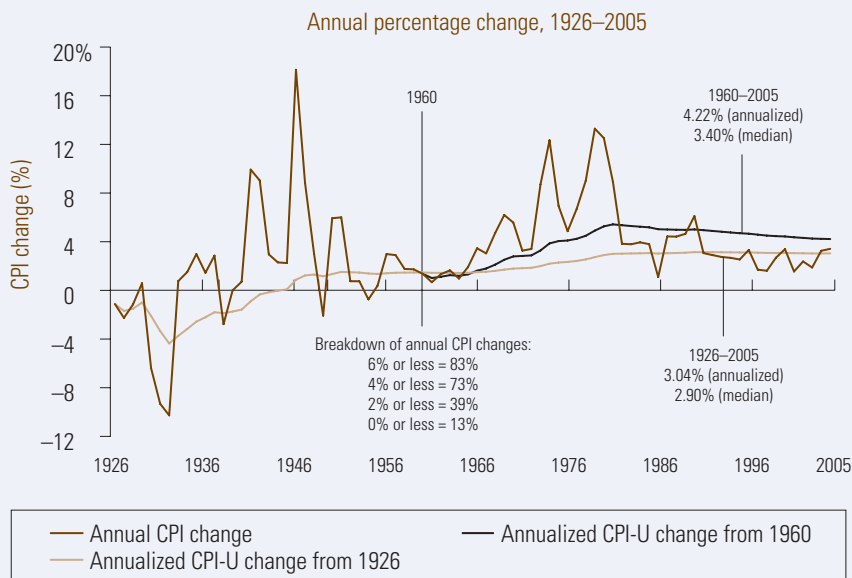
- How certain are the value and timing of liabilities faced by the portfolio?
- Is the goal to maintain the portfolio's existing purchasing power or to increase it?
- What are the real-return opportunities of available financial assets?

How certain are the value and timing of liabilities faced by the portfolio?

When planning for a future liability, two issues are paramount: the amount of the liability and the timing of the liability. Liabilities may be classified based on the certainty of these two factors, as outlined in Table 1. Clearly, the more one knows about a future liability, the better one can prepare for it. If both the amount and the timing are known, a U.S. Treasury note, bond, or inflation-indexed security may be purchased in an amount equal to the future outlay, discounted back to the present, to "immunize" the liability.

For many liabilities, however—one example being health benefits for employees—neither the amount nor the timing is certain. In these cases, the planning process must be flexible enough to contend with the reality that a larger-than-anticipated outlay may be required at a most inopportune time. Most liabilities involve at least some degree of uncertainty regarding amount or timing; in such cases, using nominal bonds or TIPS to immunize the liability is problematic.

Figure 1. Consumer Price Index for All Urban Consumers (CPI-U)



Source: Vanguard Investment Counseling & Research.

The Consumer Price Index

The Consumer Price Index (CPI) was instituted in 1919 by the U.S. Department of Labor’s Bureau of Labor Statistics as a means to calculate cost-of-living adjustments in wages. The bureau has modified the construction of the index many times over the years, but the raw data are still collected in much the same way as nearly a century ago. Then as now, the bureau periodically surveyed households and collected prices to reflect the relative importance of goods and services purchased by consumers.

Today, the CPI for All Urban Consumers (CPI-U) is the most widely reported series of inflation measures, incorporating prices of eight major categories of goods and services. Because two of these categories—food and energy—feature extremely volatile pricing, the CPI-U is also reported without them in a version called the “core CPI.” Together, the CPI-U and the core CPI are probably the most closely watched economic statistics in the markets. Changes in either measure—either actual or anticipated—can affect the price of securities.

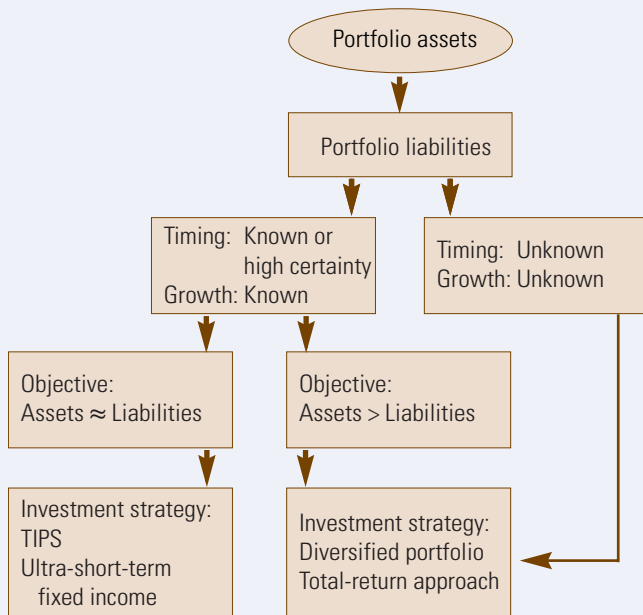
Figure 1 tracks the historical changes in CPI-U from 1926 through 2005. Over this period, the CPI-U increased by an average of approximately 3% each year. In any given year the index’s rate of change may be very different from the historical average; however—unless there is a very sound reason for assuming that a portfolio’s liabilities will grow at a rate distinctly different from CPI-U—the 3% figure is usually the most appropriate initial assumption for determining a real-return strategy. For purposes of stress-testing the policy portfolio’s asset allocation, other liability growth rate assumptions may be used for “what if” scenario analysis.

Many investors are not as concerned about inflation in general as they are about the risk of high inflation, which creates a challenging investing environment. In this regard, Figure 1 illustrates two points: First, over the past eight decades, periods of high inflation have been infrequent and usually

short-lived compared with periods of moderate (or even low) inflation. Second, periods of very high inflation were event-driven and anomalous in the historical framework. The infamous inflation of the 1970s resulted from two oil crises that wreaked havoc on the energy-dependent, inefficient U.S. manufacturing economy. The soaring inflation of the mid-1940s came about when consumers, after enduring years of rationing and price controls during World War II, released their pent-up demand, driving prices higher.

In determining a strategy for a long-term portfolio, it can be tempting to use inflation assumptions substantially above the long-term average in an effort to guard the portfolio against brief spells of unexpectedly high inflation in future. Such a tactic is likely to be counterproductive, however, as it will probably lead to unnecessarily high capital contributions and/or allocations to risky assets.

Figure 2. Process summary



Source: Vanguard Investment Counseling & Research.

Is the goal to maintain the existing purchasing power or to increase it?

Goal #1: Maintain purchasing power

At the heart of a discussion about inflation and purchasing power is the fundamental belief that a primary financial goal is to preserve the real value of the portfolio (at a minimum). In essence, assets are set aside to meet future liabilities, and the growth of these assets must keep pace with the growth of the liabilities through either investment gains or additional capital contributions.

In discussing investments, nominal returns are most often cited, but real returns are most important. A simple approximation of an investment's real return is its stated (nominal) return less the inflation

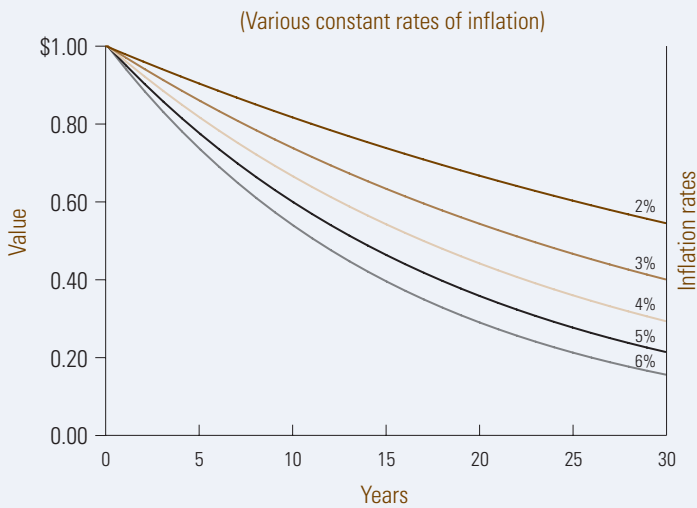
rate experienced during the term of the investment. Real returns are crucial to a portfolio because, if inflation makes the portfolio's liabilities grow faster than the return generated by its assets, then the liabilities will eventually exceed the assets set aside to provide for them.

To preserve purchasing power, the portfolio's assets must increase at least as much as its liabilities do—including the effects of inflation—during the investment period: $(\Delta A = \Delta L)$.

The change in assets (ΔA) is affected by both contributions and portfolio returns. The change in liabilities (ΔL) may be affected by new commitments and projects, as well as by systematic and unsystematic inflation rates. Inflation can contribute to higher values for both assets and liabilities, of course. However, a specific liability may increase at a different rate from an aggregate inflation measure such as CPI-U, whereas in the markets, asset prices incorporate inflation expectations that are commonly based on CPI-U. Given the uncertainty of both factors in the above equation, accurately predicting the inflation-adjusted future values of a portfolio's assets and liabilities is a challenging task.

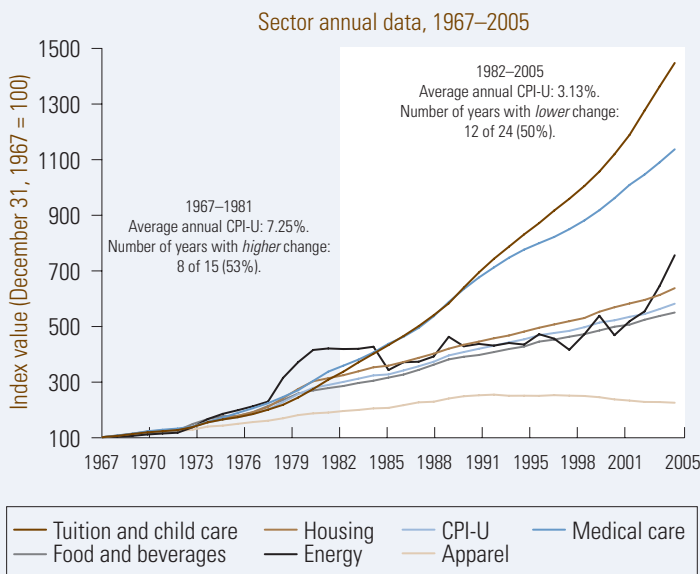
Because inflation's erosion of value is most significant over time, the longer the investment horizon, the more concerned one should be about the portfolio's future purchasing power. Over short investment periods, the effects of inflation are less pronounced. Even at unusually high inflation rates—6% per year in the example in Figure 3—the vast majority of the purchasing power remains intact over the first few years. As the time frame lengthens, however, compounding of the inflationary effect quickly erodes a portfolio's purchasing power. Based on the average inflation rate of about 3% (annualized CPI, 1926–2005), half of the portfolio's purchasing power would be lost in less than 25 years.

Figure 3. Erosion of purchasing power of \$1



Source: Vanguard Investment Counseling & Research.

Figure 4. Growth of CPI-U and certain sector components



Note: Tuition/child-care data series began in 1978; it was linked to CPI-U from 1968 through 1977.

Sources: U.S. Bureau of Labor Statistics, Vanguard Investment Counseling & Research.

An investment strategy designed simply to maintain a portfolio's purchasing power is likely to be different from one meant to produce meaningful growth of purchasing power. Many liabilities, such as wages and pension benefits, may (in aggregate) closely track or even be indexed to increases in CPI-U. If such liabilities represent the majority of those the portfolio must meet in future, then insulating against inflation may be made easier through the use of inflation-indexed bonds, such as Treasury Inflation-Protected Securities (known as TIPS). However, it would be common for a policy portfolio's liabilities to grow at a rate much different from the CPI-U rate.

If liability growth is in fact expected to vary from the "official" inflation rate, then the effectiveness of a TIPS strategy—particularly over long investment horizons—is doubtful. In such cases, especially when the liability is likely to grow faster than the CPI-U, the portfolio may need to incorporate assets that have historically produced higher real returns. (Figure 4 traces growth rates for the CPI-U and some of its largest components.) Depending on the expected difference between CPI-U change and the inflation rate of the liabilities, the allocation to assets—such as stocks—with higher prospective real returns may need to be considerable.

Goal #2: Meaningful growth of purchasing power

Building purchasing power usually requires a more significant allocation to riskier asset classes (such as stocks) than does a maintenance strategy assuming that contributions are constant. Some policy portfolios, however, may have minimum asset thresholds that prevent them from increasing their stock allocations unless the portfolio possesses a certain surplus of assets over estimated liabilities. In these cases, the willingness to pursue higher real-return strategies may be hampered by the portfolio's lack of ability to do so, a factor that needs to be considered in setting discretionary spending goals.

The timing of investment returns and liability outlays is another important factor in the overall success of the investment strategy. In the case of returns, timing is largely out of the control of the policy portfolio. If investment returns are poor early on, the additional burden from an ongoing liability payment can reduce the portfolio's ability to sustain a similar level of outlays in the future.

The trade-off between lower potential real returns from conservative investments and higher ones from riskier investments is a key factor in establishing a real-return strategy. Deciding on the level of real return to aim for is important in creating the investment policy statement, and it is essential to the process of asset allocation. However, accurately forecasting investment returns and inflation is problematic at best, and real returns have varied significantly over time, so care should be taken when incorporating *historical* asset class returns into *forward-looking* strategies.

Historically, stocks have provided higher real returns than bonds or T-bills. The three asset classes have had a similar frequency of negative annual returns, but the magnitude of those declines has been much greater for stocks. As we illustrated previously, inflation causes relatively little harm to assets in the short run. That makes principal risk a greater threat than inflation to portfolios with short time horizons, so an investment strategy designed to eliminate or substantially reduce the variability in returns may be more prudent for these portfolios. For longer-term mandates, however, an emphasis on higher real returns may be preferable.

What are the real-return opportunities of available financial assets?

To truly hedge inflation, an investment's return should increase at least as much as the CPI-U does, and the timing of these increases should coincide. The principal differences between a hedging strategy and a real-return strategy are the timing and the magnitude of the prospective return: With a hedging strategy, the real-return benefit should be received immediately (in the best case), rather than over longer time frames as with a real-return strategy. Stocks, for example, have historically had a negative correlation with inflation in the short term, a characteristic that would make them a generally poor hedge against near-term inflation. However, they also have posted high real returns over lengthy periods, a result that could help preserve a portfolio's purchasing power over the long term.

Asset prices are set by the market and reflect the aggregate dollars invested by market participants on the basis of expectations that include inflation. When new information is introduced that differs from the data already reflected in asset prices, rapid price changes occur. Recognizing investors' focus on interest rates and inflation, the Federal Reserve Board's Open Market Committee has attempted to improve its communications about monetary policy so as to reduce the gaps between expected and actual policy changes, which can create volatile asset repricing. As a result, returns today are more likely to be affected not by the actual level of inflation but by changes in the expected level of future inflation.

Table 2 divides the real returns of stocks, bonds, and T-bills from 1926 to 2005 on the basis of the *rate of change* in inflation that prevailed during each year. The returns were quintiled and ordered based on rate and direction of change, with the largest increases in inflation on top. It is notable that about 60% of the year-over-year inflation changes fell between +150 basis points and -200 basis points. In addition, first-

Table 2. Inflation-adjusted asset returns sorted by change in yearly inflation rates, 1926–2005

Annual inflation: Year-over-year basis point change	Stocks*			Long-term Treasury bonds**			Intermediate-term Treasury bonds**			T-bills		
	Total returns			Total returns			Total returns			Total returns		
	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
▲ 150 bps	-2.58	53.03	-36.25	-5.50	5.95	-15.42	-2.97	5.40	-14.49	-2.16	3.79	-15.01
▼ 150 bps and ▲ 20 bps	5.83	45.28	-36.54	2.31	16.33	-11.13	1.86	7.68	-6.53	0.85	5.22	-2.80
▼ 20 bps and ▲ -40 bps	10.94	33.31	-13.23	6.35	27.45	-10.05	3.71	13.83	-5.32	1.46	5.82	-4.15
▼ -40 bps and ▲ -200 bps	20.84	53.41	-12.33	3.24	30.22	-13.72	3.16	21.27	-6.52	1.51	12.45	-8.01
▼ -200 bps	9.95	34.49	-37.29	7.46	36.52	-10.53	5.68	20.38	-7.27	2.48	11.82	-7.57

Annual inflation: Year-over-year basis point change	Stocks*			Long-term Treasury bonds**			Intermediate-term Treasury bonds**			T-bills		
	Annual returns			Annual returns			Annual returns			Annual returns		
	Average	# Positive	# Negative	Average	# Positive	# Negative	Average	# Positive	# Negative	Average	# Positive	# Negative
▲ 150 bps	-2.58	6	9	-5.50	3	12	-2.97	4	11	-2.16	5	10
▼ 150 bps and ▲ 20 bps	5.83	9	8	2.31	10	7	1.86	10	7	0.85	11	6
▼ 20 bps and ▲ -40 bps	10.94	12	5	6.35	13	4	3.71	12	5	1.46	14	3
▼ -40 bps and ▲ -200 bps	20.84	14	2	3.24	12	4	3.16	11	5	1.51	11	5
▼ -200 bps	9.95	11	4	7.46	12	3	5.68	12	3	2.48	11	4

*Stock returns are based on the Standard & Poor's 500 Index from 1926 through 1970, the Dow Jones Wilshire 5000 Composite Index from 1971 through April 22, 2005, and the Morgan Stanley Capital International (MSCI) Broad Market Index thereafter.

**Treasury bond returns are represented by the Ibbotson Government series from 1926 through 1972 and the Lehman Treasury series thereafter.

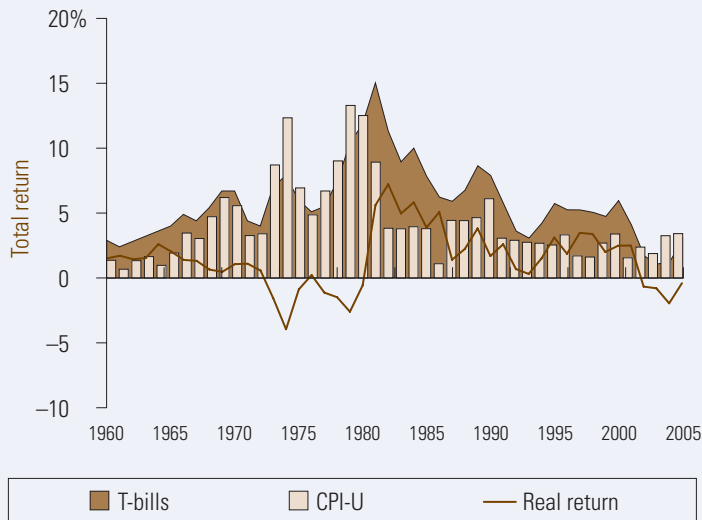
Sources: Vanguard Investment Counseling & Research, Ibbotson Associates, and Lehman Brothers.

quintile observations (inflation increases above 150 basis points) were older; the most recent was in 1987, the first year of Alan Greenspan's tenure as Federal Reserve Board chairman.

As seen in the top portion of the table, real returns for stocks, bonds, and cash have tended to be inversely related to inflation, with lower (or negative) average real returns occurring when the inflation rate was rising quickly. Stocks provided generally greater protection from negative real returns when the rate of change in inflation was higher than average. Because of the relationship between inflation and interest rates, sudden shifts in inflation expectations affect the total return of bonds much more than that of stocks. In fact, for

bonds (particularly Treasury bonds), inflation shocks are the primary factor affecting performance; for stocks, inflation is just one influence among many. Stock returns are not entirely independent of the inflationary environment, but, as can be seen in the table, some of their best and worst annual real returns have occurred whether inflation was rising or falling. For bonds, on the other hand, the best real returns tended to occur when inflation was falling rapidly, and the worst when it was speeding upward. Changes in inflation expectations tend to result in changes in interest rates, which affect prices of longer-duration bonds more than those of shorter-duration investments like T-bills. This pattern is apparent in the returns shown in Table 2.

Figure 5. Real returns of T-bills, 1960–2005



Source: Vanguard Investment Counseling & Research.

Assessing returns by asset class entails applying the same three questions to each.

- What has been the real return?
- What has been the variability of returns?
- What has been the short-term correlation with inflation? What about long-term?

The following review of traditional investment options (T-bills and money market funds, TIPS, nominal bonds, and equities) and often-discussed alternative options (commodities, real estate, and hedge funds) considers the risks and rewards of each.

T-bills/money market funds

The very short durations of T-bills and money market funds result in negligible principal risk, but commensurate with low risk are historically small nominal returns and even lower real returns. It is true that, as illustrated in Table 2 on page 7, the long-term nominal returns for T-bills have been positive. Positive nominal returns, however, do not guarantee positive real returns. Both T-bills and money market funds may have negative real results.

Because of their short maturities, these investments keep up well with modest increases in interest rates as individual securities are replaced by new ones at market yields. Rising interest rates are common in inflationary environments; this is why T-bills and money market funds can help mitigate near-term inflation. But while T-bill yields can be directly influenced by the market's inflation expectations and the Federal Reserve's activities, they may not always keep pace (see Figure 5).

Inflation-indexed securities

TIPS may be most appropriate for policy portfolios with well-known liability streams that are highly correlated with the CPI-U. If the cost of the liability in the future is higher than forecast, the real return of TIPS may not be sufficient to compensate for the shortfall.

Inflation-indexed securities are designed to deliver a positive real return, with the principal value (in the case of TIPS) or the income cash flow (for corporate inflation-protected notes) adjusted to keep pace with changes in CPI-U. Table 3 shows that over longer periods, TIPS have produced positive real returns. However, there have been shorter periods in which the nominal and/or real return of TIPS was negative. Although TIPS are insulated from inflation, they are still subject to price volatility resulting from unexpected changes in investor concerns about inflation.

The spread between the yields of an inflation-indexed bond and a nominal Treasury bond of comparable maturity is frequently called the “breakeven rate of inflation.” When investors become more worried about future inflation, the spread should widen, reflecting the higher nominal Treasury yields demanded by the market in return for assuming the added inflation risk. Conversely, when inflation concerns ebb, the spread should narrow as the perceived value of the TIPS inflation protection declines. However, the spread reflects not only estimates about the level of future inflation but also the inflation risk premium in the nominal Treasury yield. The value of this premium is hard to determine, but it has been estimated to be between 50 and 100 basis points (Campbell and Shiller, 1996).

While theoretically reasonable, the spread relationship between the yields of TIPS and Treasuries can sometimes be clouded by external factors that have nothing to do with inflation expectations:

- **Investor acceptance.** While the supply of TIPS in the markets remains modest, increased demand for these securities may result in higher prices (and lower real yields) than might be warranted by long-run inflation expectations.
- **Liquidity.** TIPS trade less frequently than nominal Treasuries. TIPS’ real yields therefore tend to include a small liquidity premium as compensation for this extra risk.
- **Investor preferences.** Changes in demand for nominal Treasuries—usually increasing during periods of global shocks or economic weakness and decreasing during economic expansions—may reflect investors’ attitudes toward risks (e.g., political, credit) other than inflation. As a result, prices may be more volatile than the inflation environment would imply.

Table 3. TIPS risk of loss: Monthly data, March 1997*–December 2005

Worst returns	Nominal	Real
Worst monthly return	–4.85%	–5.16%
Worst rolling 12-month return	1.67%	–1.35%
Worst rolling 36-month annualized return	3.27%	1.16%

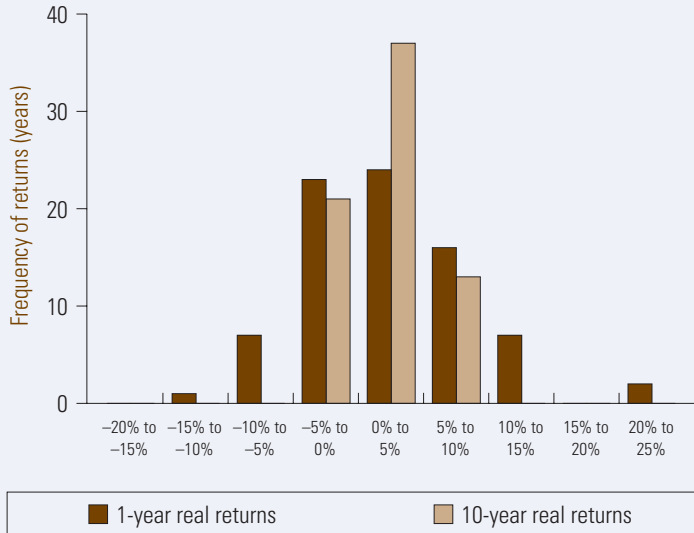
Best returns	Nominal	Real
Best monthly return	4.74%	4.92%
Best rolling 12-month return	19.32%	15.87%
Best rolling 36-month annualized return	13.65%	10.83%

*TIPS returns have existed only since March 1997 in the United States.
Sources: Vanguard Investment Counseling & Research and Lehman Brothers.

Nominal bonds

Nominal bonds may be used as part of short-, intermediate-, or long-term real-return strategies. At any point in a nominal bond’s existence, its yield is composed of a real yield, an expected inflation rate over the life of the bond, and an inflation risk premium that reflects the fallibility and difficulty of forecasting long-run inflation. Although the bond’s nominal return is locked in at purchase (assuming the bond is held to maturity), the *real return* depends on the inflation rate experienced over the investment horizon. If the actual inflation rate exceeds both the expected rate and the inflation risk premium that were built into the bond’s yield when purchased, then the real return will suffer.

**Figure 6. Intermediate-term Treasury bonds:
Distribution of returns, 1926–2005**



Source: Vanguard Investment Counseling & Research.

Historically, bonds have delivered positive real returns more often than not, as illustrated in the Treasury distribution chart in Figure 6. But it should also be obvious that bonds are not free of risk and can in fact deliver negative real returns. Table 4 reflects the fact that long-term bonds posted negative annualized real returns for four consecutive decades from the 1940s through the 1970s. But bonds are also less volatile than stocks, and given that the risk posed by inflation is less significant than that posed by capital losses over short periods, bonds should constitute the bulk of a portfolio with short-to-intermediate-term real returns in mind. For longer-term strategies, nominal bonds may be used primarily to temper the volatility of stocks, while still being expected to provide positive real returns.

Table 4. Nominal and real returns by decade compared with CPI-U

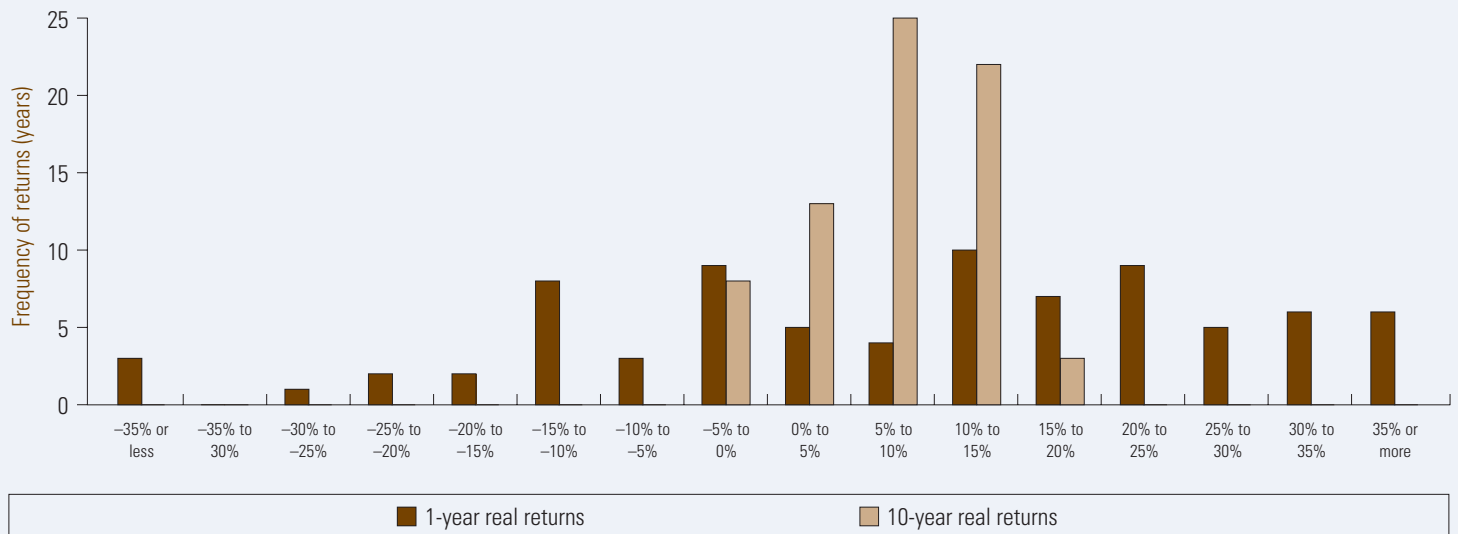
	CPI Annualized	Stocks*		Long-term Treasury**		Intermediate-term Treasury**		3-month T-bill	
		Annualized return	Real return	Annualized return	Real return	Annualized return	Real return	Annualized return	Real return
1930s	-2.04%	0.00%	2.08%	4.88%	7.06%	4.59%	6.76%	0.61%	2.70%
1940s	5.36%	9.07%	3.52%	3.24%	-2.01%	1.83%	-3.35%	0.47%	-4.64%
1950s	2.22%	19.25%	16.66%	-0.08%	-2.25%	1.34%	-0.86%	2.05%	-0.17%
1960s	2.52%	7.81%	5.16%	1.45%	-1.04%	3.48%	0.94%	4.02%	1.47%
1970s	7.36%	7.02%	-0.32%	5.88%	-1.37%	7.25%	-0.11%	6.42%	-0.88%
1980s	5.10%	16.64%	10.98%	12.81%	7.34%	11.75%	6.33%	9.22%	3.93%
1990s	2.93%	17.59%	14.24%	8.57%	5.48%	7.09%	4.05%	5.05%	2.06%
Average (1926–2005)	3.04%	10.39%	7.13%	5.48%	2.37%	5.24%	2.13%	3.89%	0.78%

*Stock returns are based on the S&P 500 Index from 1926 through 1970, the Dow Jones Wilshire 5000 Index from 1971 through April 22, 2005, and the MSCI Broad Market Index thereafter.

**Treasury bond returns are represented by the Ibbotson Government series from 1926 through 1972 and the Lehman Treasury series thereafter.

Sources: Vanguard Investment Counseling & Research, Ibbotson Associates, and Lehman Brothers.

Figure 7. S&P 500 Index: Distribution of returns, 1926–2005



Source: Vanguard Investment Counseling & Research.

Stocks

Stocks are not suitable for shorter-term strategies, regardless of their potentially significant real returns (see Figure 7). A longer-term strategy, however, may benefit from an allocation to stocks, with the historically sizable real return providing a cushion against unexpected or underestimated inflation trends or liability costs. This is not to imply that stocks will do well in inflationary periods, but they may perform better than bonds or cash.

It is generally well known that over longer time horizons, stocks have provided higher average real returns than either nominal bonds or cash, and this is a reasonable expectation for the future. However, in the short-to-intermediate term, returns on stocks have often been highly volatile, either decidedly positive or decidedly negative. This volatility should be recognized in the portfolio's asset allocation strategy, which should focus on risk as well as real return.

Table 5. Attributes of nominal and real returns, 1926–2005

a. Nominal

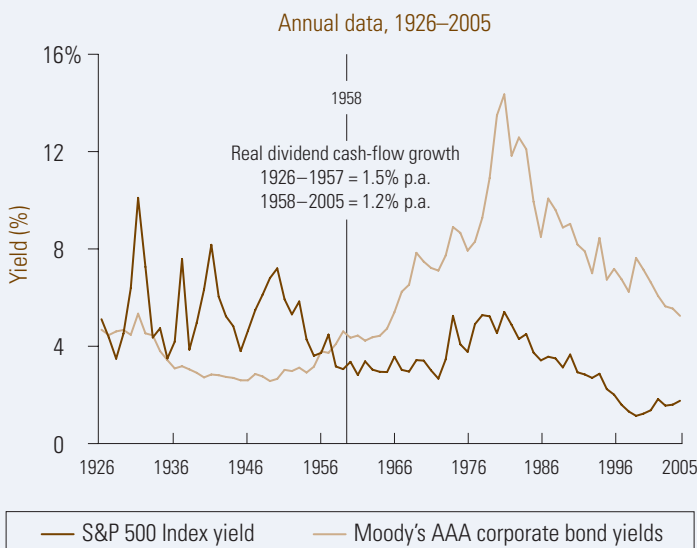
Nominal	Annual data			Annualized	
	Mean	Standard deviation	% Negative returns	Total return	Standard deviation
Stocks	12.35	20.32	30.00%	10.40%	19.44%
LT Treasury	5.85	9.15	25.00%	5.48%	7.65%
IT Treasury	5.36	5.03	8.75%	5.24%	3.63%
T-bills	3.89	3.18	0.00%	3.84%	0.88%

b. Real returns

Nominal	Annual data			Annualized	
	Mean	Standard deviation	% Negative returns	Total return	Standard deviation
Stocks	9.11	20.34	35.00%	7.14%	19.51%
LT Treasury	2.86	10.30	37.50%	2.37%	7.97%
IT Treasury	2.32	6.26	38.75%	2.13%	4.11%
T-bills	0.85	4.01	35.00%	0.77%	1.86%

Sources: Lehman Brothers, Ibbotson Associates, and Vanguard Investment Counseling & Research.

Figure 8. Stock yields versus bond yields



Sources: Global Financial Data, Vanguard Investment Counseling & Research.

As illustrated in Table 5, on a nominal return basis (top), stocks produced negative short-term returns more often than Treasuries and T-bills. On a real-return basis (bottom), the frequency of negative short-term events is similar among the three asset classes. For stocks, negative returns occurred with roughly similar frequency in both nominal and real-return bases; the same was not true for bonds or T-bills. This results from the pattern of annual stock returns over the time period: Nominal returns on stocks tended to be either very positive or very negative. Because bonds and T-bills typically had more modest nominal returns than stocks, even moderate inflation could turn those results into negative real returns.

From 1926 through 2005, dividends from companies in the Standard & Poor's 500 Index increased approximately 1.2% per year in real terms, on average. As a result, some portfolios with liabilities expected to grow very slowly in real terms may consider implementing a strategy using the dividends paid by stocks. This strategy poses a number of challenges, as neither the investment environment nor dividend policies have been static in the past.

Figure 8 compares the dividend yield of the S&P 500 Index with yields of high-quality corporate bonds over the 1926–2005 period. Before 1958, corporations paid higher yields on their stocks than on their bonds, generally speaking. In fact, it was argued that the inherently higher risks of stocks warranted better yields than those of high-quality bonds—a sentiment magnified by the 1929 stock market crash. During this period, investors' focus on dividends helped to keep the payouts growing in real terms, and dividends accounted for more than 60% of the total returns from the S&P 500 Index. After 1958, however, dividend yields fell below those of corporate bonds, a relationship that persists today. Much of the 1.2% average yearly growth in dividends over the 1926–2005 span is attributable to the period before 1958; to count on such a level of dividend payments in the future may be unrealistic.

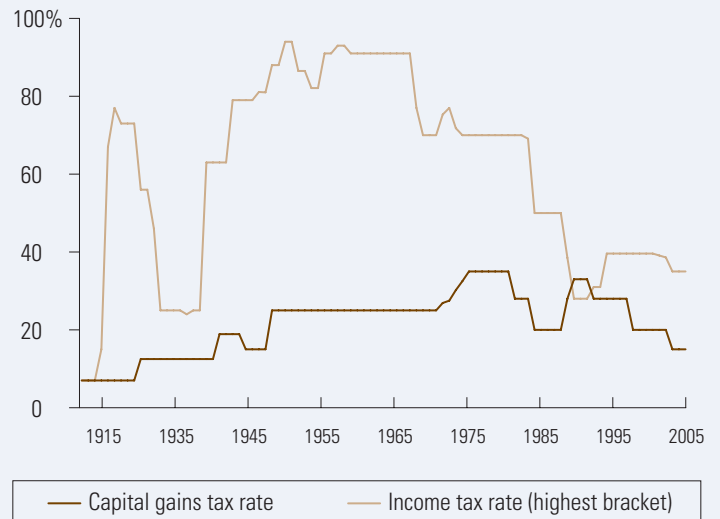
Certain other factors can play an important role in the dividend policy decision: for example, the tax environment. Currently, qualified dividends are taxed at the same rate (15%) as long-term capital gains. Historically, though, dividend income has been taxed like ordinary income, which may be considerably higher for many portfolios (see Figure 9). This is important because, according to the American Affluence Research Center, the wealthiest 10% of American households hold approximately 85% of all publicly traded stock and stock mutual fund assets.

Corporate dividend policies can and should change, because the factors that influence the dividend decision are dynamic. A company's decision to pay, or not to pay, a dividend is in the first place a capital budgeting decision, based on the company's ability to reinvest cash in positive net present-value projects. Conversely, without attractive reinvestment opportunities, shareholders may be better served if the company distributes the cash to them as a dividend, so that they can seek other, higher-returning investments.

Commodities

Conventional wisdom maintains that commodities, as an asset class, offer an effective hedge against inflation. Theoretically, changes in commodity prices should result in price changes for the goods and services that utilize the commodities. Practitioners often consider an asset class to be an inflation hedge if its monthly total returns are positively correlated with changes in the CPI-U. This commonly held view is based on contemporaneous correlations—that is, using data from corresponding time periods to calculate correlations—but the timing of the data can be modified, resulting in correlations that may be more revealing, as we show in the analysis that follows.

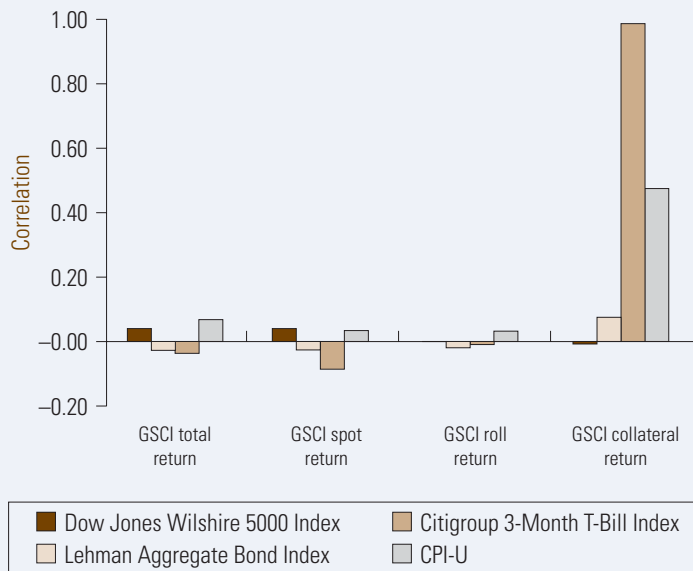
Figure 9. Income and capital gains tax rates, 1913–2005



Source: U.S. Congress Joint Committee on Taxation.

Judged solely by contemporaneous correlations, commodities have provided a slight hedge against inflation, rising in price when inflation increased. The first group of bars on the left in Figure 10, on page 14, shows a correlation of about +0.1 between the Goldman Sachs Commodities Index (GSCI) Total Return Index and the CPI-U. However, most of this modestly positive correlation has resulted from the performance of the collateral used in the futures contracts, rather than from changes in commodity prices. One explanation may be that structural differences between the GSCI Total Return Index and the CPI-U make for a less-than-ideal comparison. Another may be that the collateral—which consists of T-bills—is better correlated with CPI-U than are spot prices. A third may be that the returns from commodities do not coincide with the CPI-U, but are prone to lead or lag the inflation indicated when the CPI-U is reported.

Figure 10. Correlations of GSCI components with financial assets and CPI-U, 1976–2005



Based on monthly data from 1976 through 2005.

Sources: Thomson DataStream, Economy.com. Vanguard Investment Counseling & Research.

The composition of the GSCI Total Return Index is based on global production, which results in a dominant weighting (about 73% as of May 2006) for its energy component. As a result, the index is very sensitive to changes in energy prices, but it is less sensitive to price changes for many of its other commodity components. Looking back at Figure 4 on page 5, one can see that prices rose much faster for the CPI-U’s energy component than for other constituents from the late 1970s through the early 1980s. Thereafter, growth in energy prices was very modest compared with the rates for other CPI-U components (such as housing and tuition/child care). As of year-end 2005, energy represented about 10% of the CPI-U, roughly half the weighting of the food sector (U.S. Bureau of Labor Statistics, 2005).

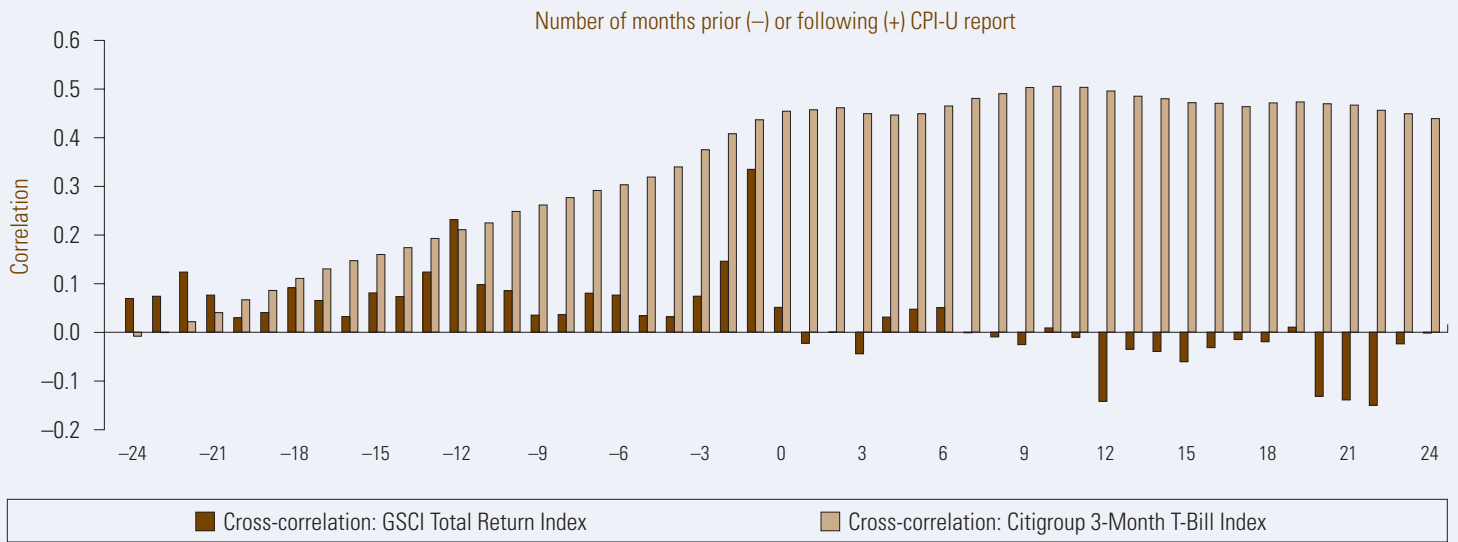
Deconstructing the components of commodity returns helps to distinguish the contemporaneous correlation of the components of the GSCI Total Return Index. As will be described in more detail in a forthcoming Vanguard IC&R paper, commodity futures contracts have three sources of return:

- *Spot*. Reflects changes in the future’s price.
- *Roll*. The gain or loss associated with rolling a futures contract forward.
- *Collateral*. A contract on the GSCI Total Return Index requires collateral equal to 100% of the contract’s value.

Figure 10 looks at how the components of the index’s return have correlated with financial assets and inflation. Two things stand out: First, the returns of the index itself are, for all intents and purposes, uncorrelated with those of stocks, bonds, T-bills, and inflation. Second, the collateral returns—but not the spot returns—have been strongly correlated with the CPI-U (and also very strongly correlated with the returns from T-bills, as one would expect).

The correlation of GSCI spot returns with the CPI-U was slightly positive, rather than strongly positive as one would hope when trying to hedge inflation. One likely reason for this unexpectedly weak correlation is that it takes time for higher raw-materials prices to flow through to the prices of the finished goods measured by the CPI-U. As a result, changes in commodities prices tend to be reflected in the GSCI Total Return Index before they are reflected in the CPI-U, and this distinction should be considered as a leading indicator for future inflationary changes.

Figure 11. CPI-U correlations with GSCI Total Return Index and Citigroup 3-Month T-Bill Index

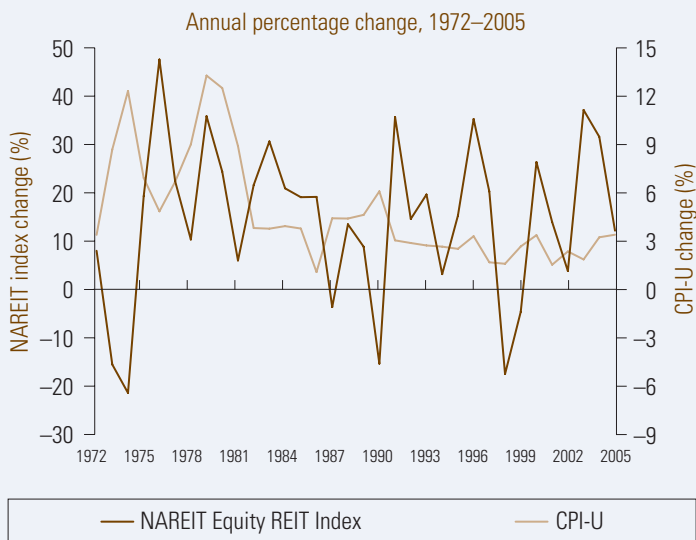


Based on monthly data from 1970 through 2005.
Sources: Thomson DataStream, Vanguard Investment Counseling & Research.

Figure 11 illustrates the correlation of the returns from the GSCI Total Return Index and T-bills with the CPI-U, adjusted for the leading performance of the commodities index. The correlation of the GSCI index's returns with inflation is low during the month that the CPI-U is reported (month 0), as illustrated previously. Where the returns of the commodities index are adjusted to reflect their tendency to precede changes in the CPI-U (months -24 through -1), higher correlations are generally indicated. However, applying the same logic to T-bill returns, we find that for the vast majority of

the analysis period—using either leading or lagged returns—the correlations of T-bills exceed those of the commodities index. It is important to note that although changes in commodities prices may indicate prospective changes in the rate of inflation, T-bills are more immediately and consistently responsive to changes in actual CPI-U. This would suggest that T-bills have been an equally good, if not better, source for the same inflation-hedging benefits provided by commodities in the past, and with less volatility.

Figure 12. NAREIT Equity REIT Index nominal return and CPI-U



Source: Vanguard Investment Counseling & Research.

Real estate (nonresidential)

The inflation-hedging ability of real estate varies with the form of the investment. There are two basic forms:

- Direct ownership of physical property (private equity real estate).
- Indirect ownership via real estate investment trusts, or REITs (public equity real estate).

Privately held real estate can offer a partial hedge against inflation, but the degree varies by property type. Owners of income-oriented properties—such as office buildings and apartments—may increase rents to compensate for inflation’s erosion of value, and thus obtain some hedge against inflation. However, inflation can affect not only rents but also property expenses.

Net operating income (NOI) from a property represents the return after expenses. Although current inflation may boost NOI because of increased rents, it may also reduce NOI by raising expenses.

For offices, warehouses, and apartments, current inflation typically lowers NOI, because the increase in rents does not fully compensate for the increase in expenses for the whole property (Fabozzi, Gordon, and Hudson-Wilson, 2003). However, in the retail market many expenses can be passed through to tenants, and NOI tends to increase with inflation and higher rents.

Like returns of common stocks, REIT returns tend to be negatively correlated with inflation (Froot, 1995), which limits their effectiveness as an inflation hedge. Figure 12 outlines the performance of the NAREIT Equity REIT Index since 1972. During the first half of the period, the rise in CPI-U averaged 6.6% a year, more than twice the average rate in the rest of the period. The annualized real return of the REIT index was greater in the lower-inflation environment than in the earlier, higher-inflation period. While REITs have historically delivered significant real returns, their performance does not seem to be substantially linked to inflation. This implies that REITs would make a poor hedge against inflation in a very conservative portfolio, but might be suitable for a diversified real-return strategy in less risk-averse portfolios.

Hedge funds

The ability of hedge funds to mitigate the effects of inflation on a portfolio varies by investment strategy. Because there is no single characteristic common to all hedge fund strategies, it is difficult to generalize about the inflation-countering properties of these investments. In fact, evaluation of hedge funds in aggregate is complicated by many biases and reporting characteristics, as described in a Vanguard IC&R report on the topic (Philips, 2006). Often, these biases result in artificially low volatility statistics and inflated “average” index returns, which may not be truly representative of the returns an average hedge fund investor can expect.

Table 6. Summary of correlations of select assets and CPI-U

Monthly correlations, 1976–2005	Consumer Price Index	Lehman Aggregate Bond Index	Dow Jones Wilshire 5000 Index	NAREIT Equity REIT Index	GSCI Total Return Index	Lehman TIPS Index (begins March 1997)	Citigroup 3-Month T-Bill Index
Consumer Price Index	1.0000						
Lehman Aggregate Bond Index	-0.1278	1.0000					
Dow Jones Wilshire 5000 Index	-0.1132	0.2377	1.0000				
NAREIT Equity REIT Index	-0.0794	0.1984	0.5405	1.0000			
GSCI Total Return Index	0.0678	-0.0276	0.0400	0.0166	1.0000		
Lehman TIPS Index (begins March 1997)	0.0861	0.7611	-0.1808	0.1592	0.1956	1.0000	
Citigroup 3-Month T-Bill	0.4713	0.0925	0.0049	-0.0442	-0.0368	-0.0397	1.0000

Annual correlations, 1976–2005	Consumer Price Index	Lehman Aggregate Bond Index	Dow Jones Wilshire 5000 Index	NAREIT Equity REIT Index	GSCI Total Return Index	Lehman TIPS Index (begins March 1997)	Citigroup 3-Month T-Bill Index
Consumer Price Index	1.0000						
Lehman Aggregate Bond Index	-0.2743	1.0000					
Dow Jones Wilshire 5000 Index	0.0568	0.2318	1.0000				
NAREIT Equity REIT Index	0.1229	0.1845	0.3816	1.0000			
GSCI Total Return Index	0.2029	-0.1807	-0.0385	0.0291	1.0000		
Lehman TIPS Index (begins 1997)	0.1841	0.5384	-0.7464	0.2750	0.3868	1.0000	
Citigroup 3-Month T-Bill	0.6503	0.2554	0.1228	-0.0293	-0.0496	-0.3346	1.0000

3-year correlations, nonoverlapping, 1926–2003	Consumer Price Index	Long-term Treasury Bonds*	Stocks**	Intermediate-term Treasury Bonds*	Citigroup 3-Month T-Bill Index
Consumer Price Index	1.0000				
Long-term Treasury**	0.0767	1.0000			
Equities*	0.0957	0.3069	1.0000		
Intermediate-term Treasury**	0.2525	0.8692	0.1102	1.0000	
Citigroup 3-Month T-Bill	0.4855	0.5133	0.1112	0.8084	1.0000

*Stock returns are based on the S&P 500 Index from 1926 through 1970, the Dow Jones Wilshire 5000 Index from 1971 through April 22, 2005, and the MSCI Broad Market Index thereafter.

**Treasury bond returns are represented by the Ibbotson Government series from 1926 through 1972 and the Lehman Treasury series thereafter.

Sources: Vanguard Investment Counseling & Research, Ibbotson Associates, and Lehman Brothers.

Conclusion

For a well-diversified, strategically managed portfolio—such as most policy portfolios today—research has shown that asset allocation is the primary determinant of risk and return. For these reasons, the asset allocation decision should be the highest priority.

If the goal is to maintain long-term purchasing power and the liability stream is expected to grow at a rate similar to CPI-U, then investing the portfolio entirely in TIPS or T-bills may be appropriate. In this regard, the investment process is simple: All new investments or distributions either go to or come from TIPS or T-bills, and the asset allocation is preserved. However, if the goal is to increase the real value of the portfolio or if the liability stream is less certain, assets with potentially higher real returns probably should be included in the asset allocation.

When investments or distributions are required, they should be made in a way that will rebalance the portfolio toward its strategic asset allocation. When this process is implemented, overweighted (outperforming) assets within the portfolio will be liquidated, and underweighted (underperforming) assets will be purchased. This will help moderate the volatility of returns and possibly increase real returns when changes in market leadership occur. The rebalancing process underscores the point that preserving purchasing power is the responsibility of the portfolio as a whole, rather than its components individually.

In conclusion, Vanguard believes there is no “one size fits all” solution for preserving purchasing power in a policy portfolio. If the inflation-adjusted value and timing of a liability are known, the real return from investments such as money market funds, short-term bonds, and inflation-indexed securities should be sufficient to maintain or modestly build the portfolio’s purchasing power. If the value and timing of a liability are less certain, or if meaningful growth of purchasing power is desired, a total-return (diversified asset) strategy seeking higher real returns may be preferable.

For short-term liability planning, emphasis should be on preservation of principal, because the impact of inflation is likely to be minor at worst and does not justify including assets that have historically provided higher risks as well as higher real returns. For long-term liability planning, a strategy emphasizing stocks provides potentially higher real returns that can help if the inflation-adjusted value of the liability is underestimated. Which policy is “best” depends on the goals and objectives for the portfolio.

References

American Affluence Research Center,
www.affluenceresearch.org.

Campbell, John Y., and Robert J. Shiller, 1996. A Scorecard for Indexed Government Debt. In *NBER Macroeconomics Annual, 1996*, Ben S. Bernanke and Julio Rotemberg (eds.). Cambridge, Mass.: MIT Press. pp. 155–97.

Fabozzi, Frank J., Jacques N. Gordon, and Susan Hudson-Wilson, 2003. Why Real Estate? An Expanding Role for Institutional Investors. *Journal of Portfolio Management* Special Real Estate Issue, (September): 19.

Froot, Kenneth, 1995. Hedging Portfolios with Real Assets. *Journal of Portfolio Management* 4(1):327–45.

Philips, Christopher B., 2006. *Understanding Alternative Investments: A Primer on Hedge Fund Evaluation*. Valley Forge, Pa.: Investment Counseling & Research, The Vanguard Group, 24 pp.

U.S. Bureau of Labor Statistics, 2004. Relative importance of components in the Consumer Price Indexes: U.S. city average, December 2004.
<http://www.bls.gov/cpi/cpiri2004.pdf>.



Vanguard Investment
Counseling & Research

P.O. Box 2600
Valley Forge, PA 19482-2600

Connect with Vanguard™ > www.vanguard.com > 800-523-1036

Vanguard Investment Counseling & Research

Ellen Rinaldi, J.D., LL.M./Principal/Department Head

Joseph H. Davis, Ph.D./Principal
Francis M. Kinniry Jr., CFA/Principal
Nelson W. Wicas, Ph.D./Principal

Frank J. Ambrosio, CFA
John Ameriks, Ph.D.
Donald G. Bennyhoff, CFA
Maria Bruno, CFP®
Scott J. Donaldson, CFA, CFP
Michael Hess
Julian Jackson
Colleen M. Jaconetti, CFP, CPA
Kushal Kshirsagar, Ph.D.
Christopher B. Philips
Glenn Sheay, CFA
Kimberly A. Stockton
Yesim Tokat, Ph.D.
David J. Walker, CFA

For more information about Vanguard funds, visit www.vanguard.com, or call 800-662-7447, to obtain a prospectus. Investment objectives, risks, charges, expenses, and other important information about a fund are contained in the prospectus; read and consider it carefully before investing.

Connect with Vanguard, Vanguard, and the ship logo are trademarks of The Vanguard Group, Inc. All other marks are the exclusive property of their respective owners.