The Inflation-Hedging Effectiveness of Real Estate

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Abstract. **Inflation has become one of the predominant financial concerns of the late twentieth century. In the late 1970s, public opinion polls ranked inflation as the number one problem in the United States. While the rate of inflation has slowed since the late 1970s, inflation is still present and many investors expect a resurgence of inflation to higher levels in the near to immediate future. This continued concern about inflation has led to an increased search and evaluation of investments that will protect investors from inflation. Assets that have the ability to protect investors from the effects of inflation are generally labelled inflation hedges. Real estate has been regarded as one of the best inflation hedges of past years. While there has been research in the past evaluating this possibility and some recent research using only business real estate, no current research on residential real estate or farmland as inflation hedges exists. This study examines the inflation-hedging effectiveness of residential real estate, farmland and busines real estate (with a different data set) as individual assets and in a portfolio context for 1960-86.**

Introduction

One objective of holding an investment portfolio is to provide an investor with a positive real rate-of-return. During periods of inflation, certain financial instruments not only do not protect the investor, but actually perform as a perverse hedge, i.e., decrease in value as inflation increases. Nelson [25], Jaffe and Mandelker [19], and Stulz [29], among others, have shown that common stock has served as a perverse hedge in the United States. Others, such as Gultekin [12], Mandelker and Tandon [22], and Peel and Pope [26] have noted such a relationship between common stocks and inflation on an international basis. Other work has examined the inflation-hedging effectiveness of various other investment media including gold (Ritter and Ulrich [27]), commodities (Bird [2]), futures (Bodie [3] and Herbst [15]), and collectibles such as diamonds and art/antiques (Ferris and Makhija [9]), stamps (Taylor [30]), coins (Kane [20]) and comic books (Ang, et al. [1]).

Given the importance of the results and the wide variety of potential investment media analyzed, the relative dearth of research on the inflation-hedging effectiveness of real estate is surprising. Only studies by Fama and Schwert [8], Fogler, et al. [11], and Hartzell, et al. [13] have rigorously examined the effectiveness of real estate as an inflation hedge.

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Date Revised—May 1989; Accepted—July 1989.

The purpose of this study is to examine the inflation-hedging effectiveness of three types of real estate (residential, business and farmland) as individual assets and as portions of mean/variance efficient portfolios. Further, the asset returns will be divided into the appreciation and income components as an expositional aid. All return measures will be regressed against actual, expected and unexpected inflation. By dividing inflation into the two return components, the hedging effectiveness can be better examined.

The next section will review the relevant literature. The third section discusses the data and develops the model used to test hedging effectiveness. The fourth section presents the results for individual assets as well as the portfolios. The final section contains the summary, conclusions and implications.

Literature Review

Fama and Schwert [8] test the hedging effectiveness of Treasury bills, government bonds, residential real estate, corporate bonds, labor income and common stocks against expected and unexpected inflation. Treasury bill rates are used as a measure of expected inflation. The return used for residential real estate is the rate of inflation of the Home Purchase Price component of the CPI. They conclude that private residential real estate is a complete hedge against both expected and unexpected inflation.

However, there are several problems with the Fama and Schwert residential real estate data. First, only appreciation returns are considered. Second, the sample includes only FHA-insured homes. Third, there is a one-month lag between when the FHA collects the data and when it appears in the CPI. A final criticism is that, as discussed by Fama [7] and Kaul [21], the results are due to a spurious correlation between the asset returns and the inflation rate. That is, the expected real rate of interest is not independent of the expected inflation rate.

Fogler, et al. [11] examine two possible explanations for the positive relationship between real estate returns and inflation. The first examines if it is the result of a true high correlation between the two factors. The second examines the result of changing investor expectations concerning the effectiveness of real estate as an inflation hedge. They find limited support for the first explanation, but not enough to reject the second. The data set used by Fogler, et al. is the Census Bureau quarterly price index of new single-family homes sold. The data is of limited value, since it only considers gains in appreciation and new home sales. Thus, it omits income returns and the stock of existing residential real estate.

Hartzell, et al. [13] perform two tests to examine the hedging effectiveness of a commingled real estate fund (CREF) from 1973 to 1983 that contains business real estate. Both tests involve using Treasury bill rates as the basis for expected inflation. One test is based upon Fama and Schwert [8], while the other involves using a nonconstant real rate that moves according to an integrated moving average process. Further, they construct portfolios consisting of real estate and government bonds to examine the benefits of including real estate in inflation-hedging portfolios. They find that commercial real estate acts as a complete hedge against both expected and unexpected inflation.

This study compliments and extends these previous research efforts by updating the time period examined and including farmland in addition to residential and business real estate. Furthermore, we not only test total returns, but also the appreciation and income components of the returns. This division of the return stream helps ascertain the portion of the total return that determines the hedging effectiveness of the asset. Finally, mean/variance

efficient portfolios are constructed to determine the additional hedging benefit accrued from including real estate in a portfolio.

Development of the Model and Sources of the Data

Fisher [10] noted that the nominal rate of interest is comprised of an appropriate equilibrium real interest rate and an expected inflation premium. In efficient markets, the nominal rate-of-return on an asset incorporates the best possible estimate of expected future inflation. Fama and Schwert [8] test for hedging effectiveness of various financial assets against both expected and unexpected inflation. Assuming that Treasury bills are perfectly liquid, they use the rate on T-bills as a proxy for the expected rate of inflation. Their measure of unexpected inflation is the difference between actual inflation and the bill rate, calculated ex post. This study uses the Livingston price expectations (LPE) series as a measure of expected inflation.

The LPE series is a semiannual forecast by business economists that is conducted by Joseph Livingston. In each survey, respondents are requested to make six- and twelve-month predictions of many macroeconomic variables including inflation, GNP, unemployment, and stock prices. The survey has been conducted since 1946 and is now handled by the Federal Reserve Bank of Philadelphia.

There is no consensus on the best method to estimate inflationary expectations. Both survey-based data (such as the Livingston data) and regression-generated data appear to be acceptable proxies for expected inflation. The merits of each approach have been well developed in studies by Menil and Bhalla [23], Carlson and Parkin [5], Carlson [4] and Mullineaux [24]. In order to use as much ex-ante data as possible, the Livingston forecasts were used in this study.

The returns for the real and financial assets examined in this paper were obtained from Ibbotson and others [17, 18] and personal communications from Ibbotson and Associates for updates. For the business real estate returns, Ibbotson and Seigel [17] provide a detailed description of the data. The financial data composition is described in Ibbotson and Associates [16, 18].

Residential appreciation returns were calculated as the annual change in the home purchase component of the CPI. Residential income returns are net of operating expenses and were taken from Sprinkel and Genetski [28]. Business real estate returns were obtained from the First National Bank of Chicago CREF. The properties in the CREF are unleveraged, which makes these returns comparable to the unleveraged financial asset returns. Finally, the CREF returns are weighted, based upon census tract data, to reduce geographic bias. Farmland appreciation and income returns were taken from U.S. Department of Agriculture data for the annual percentage change per farmland acre and annual net farm operating income as a percentage of value, respectively.

Annual returns for the three types of real estate, S&P 500 and small capitalization stocks, government and corporate bonds, and Treasury bills from December 1960 through December 1986 were used. Furthermore, the appreciation and income component returns for the real estate, common stocks and government bonds were also included in the analysis. The component returns for the other asset types were not available.

The returns were then expressed as the log of 1 plus the return, as suggested by Fama and Schwert [8]. Actual inflation was taken from the Consumer Price Index data given by Ibbotson Associates [18] and also expressed as the log of 1 plus the inflation rate. Expected infla-

tion data for each observation was defined as the log of 1 plus the Livingston observation. Unexpected inflation was defined as the log of 1 plus the difference between the CPI and expected inflation.

To test the effect of actual, expected and unexpected inflation on the asset returns, regression equations were estimated using the Cochran-Orcutt method to control for autoregressive disturbances. For the three inflation types and for each of the assets, the following equations were estimated:

For actual inflation:

$$FA_{jt} = a_o + b_1 CPI_t + e_t \quad (1)$$

For expected inflation:

$$FA_{jt} = a_o + b_2 LIV_{jt} + e_t \quad (2)$$

For unexpected inflation:

$$FA_{jt} = a_o + b_3(CPI_t - LIV_{jt}) + e_t \quad (3)$$

where:

FA_{jt} = nominal return on asset j from time $t - 1$ to t,
CPI_t = actual inflation rate as measured by the Consumer Price Index at time t, and
LIV_{jt} = expected inflation rate as estimated by the Livingston survey from $t - 1$ to t.

Empirical Results

Exhibit 1 presents the means and standard deviations of the annual nominal rates-of-return for the assets examined, as well as actual, expected and unexpected inflation rates. Component returns are also included and show that most of the variation in the asset return resulted from the appreciation portion of the return.

All total return measures provided a positive real rate-of-return. Furthermore, the market was fairly accurate in its assessment of inflation over the entire time period. Eighty-six percent of actual inflation was incorporated in the expected inflation estimates (.0411/.0476). However, as Exhibit 2 shows, the quality of the estimate of future inflation varied considerably over the time period examined. Unexpected inflation, the difference between the CPI and the Livingston data, shows that inflation was generally underestimated throughout the 1960s and 1970s, but overestimated in recent years.

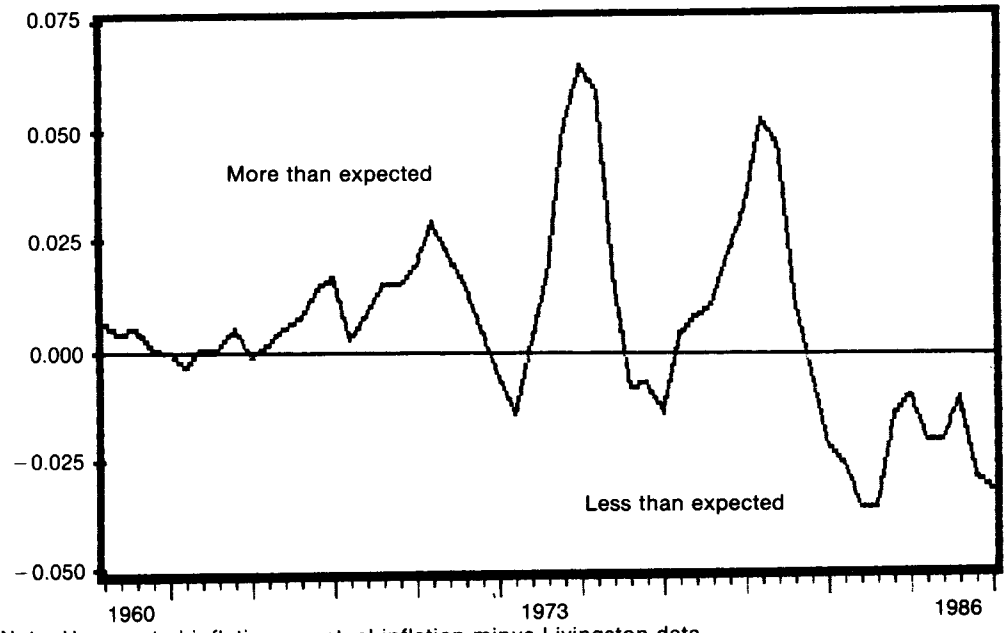
Exhibits 3 through 5 show the results of the regression estimates for each type of inflation against the asset returns. Hedging effectiveness varied with the type of inflation. As implied by equations (1) through (3), the following definitions apply:

- A *complete positive hedge* against inflation is obtained when a positively-signed beta coefficient of an asset is not statistically different from positive one.
- A *complete negative hedge* against inflation is obtained when a negatively-signed beta coefficient for an asset is not statistically different from negative one.
- A *partial positive hedge* against inflation is obtained when a positively-signed beta coefficient for an asset is significantly different from both positive one *and* zero.
- A *partial negative hedge* against inflation is obtained when a negatively-signed beta

Exhibit 1
Means and Standard Deviations of Annual Nominal Rates-of-Return: 1960-86

Return Type and Identifier	Mean (%)	Standard Deviation (%)
Treasury Bills Total Return (T Bills TR)	5.69	2.88
Government Bonds Total Return (G-Bonds TR)	5.88	9.83
Government Bonds Appreciation (G-Bonds App)	−0.94	8.19
Government Bonds Interest Yield (G-Bonds Div)	6.81	3.09
Corporate Bonds Total Return (C-Bonds TR)	5.66	11.29
S&P 500 Stocks Total Return (Com Stk TR)	8.78	12.55
S&P 500 Stocks Appreciation (Com Stk App)	4.76	12.01
S&P 500 Stocks Dividend Yield (Com Stk Div)	4.02	1.08
Small Stocks Total Returns (Sm Stk TR)	10.66	21.51
Residential Real Estate Total Return (Res TR)	8.44	3.78
Residential Real Estate Appreciation (Res App)	4.90	4.12
Residential Real Estate Income (Res Inc)	3.54	5.16
Business Real Estate Total Return (Bus TR)	8.43	4.03
Business Real Estate Appreciation (Bus App)	5.49	3.37
Business Real Estate Income (Bus Inc)	2.95	2.30
Farmland Total Return (Farm TR)	9.73	9.71
Farmland Appreciation (Farm App)	6.72	9.19
Farmland Income (Farm Inc)	3.01	2.11
Actual Inflation (Act Infl)	4.76	3.27
Expected Inflation (Exp Infl)	4.11	2.74
Unexpected Inflation (Unexp Infl)	0.65	2.24

Exhibit 2
US Unexpected Inflation 1960-86



Note: Unexpected inflation = actual inflation minus Livingston data

Exhibit 3
Hedging Effectiveness against Actual Inflation: 1960-86

Asset Type	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
T Bill TR	0.0401	0.4795	0.1228	0.84	Partial Positive
G-Bonds TR	0.0900	−0.6824	0.6552	0.06	Indeterminant
G-Bonds App	0.0327	−0.9402	0.4676	0.15	Complete Negative
G-Bonds Int	0.1258	0.0744	0.0787	0.92	Indeterminant
C-Bonds TR	0.1024	−1.0221	0.7331	0.08	Indeterminant
Com Stk TR	0.1294	−1.1363	0.8085	0.08	Indeterminant
Com Stk App	0.0970	−1.2556	0.9375	0.11	Indeterminant
Com Stk Div	0.0351	0.0903	0.0491	0.72	Indeterminant
Sm Stk TR	0.1850	−2.1718	1.7900	0.10	Indeterminant
Res TR	0.0485	0.7470	0.2294	0.48	Complete Positive
Res App	0.0107	0.8150	0.2675	0.52	Complete Positive
Res Inc	0.0367	−0.0426	0.3259	0.70	Indeterminant
Bus TR	0.0794	0.1240	0.3039	0.44	Indeterminant
Bus App	0.0288	0.0238	0.2934	0.21	Indeterminant
Bus Inc	0.0570	0.1192	0.0947	0.84	Indeterminant
Farm TR	0.0256	0.9165	0.6061	0.69	Indeterminant
Farm App	−0.0035	0.4454	0.5262	0.70	Indeterminant
Farm Inc	0.0350	0.1370	0.1720	0.29	Indeterminant

coefficient for an asset is significantly different from negative one *and* significantly different from zero.

- An *indeterminant hedge* against inflation is obtained when the beta coefficient is not statistically different from zero.

A 95% confidence interval was used to test whether a particular investment instrument is a complete, partial or indeterminant hedge.

As indicated by Ang, et al. [1], since expected real returns are treated as a constant, the models should not be expected to explain a large portion of the variation in the rates-of-return. This is because the purpose of the present study is to examine hedging effectiveness and, necessarily, does not deal with the possible large variations in rates-of-return among the individual assets. Thus, the level of the coefficients of determination do not hold their normal importance in testing the hypothesis.

The hedging effectiveness of the return measures against actual inflation is shown in Exhibit 3. As can be seen, different assets yield differing levels of protection against inflation. Only residential real estate is a complete hedge against actual inflation. Treasury bills are the only other asset exhibiting at least some hedging effectiveness. All other financial and real assets have standard errors so large that their hedging effectiveness is indeterminant. The component results show that the income portion provided most of the hedging effectiveness for the Treasury bills and the residential real estate.

Exhibit 4 examines asset hedging effectiveness against expected inflation, as measured by the Livingston survey data. As with the results for performance against actual inflation, the results vary across asset types, although a few more positive hedges exist. Only Treasury bills and business real estate provide a complete positive hedge against expected inflation. All long-term financial assets, farmland and residential real estate are categorized as indeterminant hedges. The component returns indicate that the appreciation portion of the financial assets performed poorly against expected inflation.

Exhibit 4
Hedging Effectiveness against Expected Inflation: 1960-86

Asset Type	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
T Bill TR	0.0218	0.8399	0.1643	0.81	Complete Positive
G-Bonds TR	0.0247	0.7716	0.7456	0.06	Indeterminant
G-Bonds App	−0.0068	−0.1109	0.2196	0.15	Indeterminant
G-Bonds Int	0.1369	0.4506	0.1164	0.95	Partial Positive
C-Bonds TR	0.0157	0.8961	0.8274	0.05	Indeterminant
Com Stk TR	0.0509	0.6003	0.9428	0.02	Indeterminant
Com Stk App	0.0247	−3.1772	0.9375	0.34	Complete Negative
Com Stk Div	0.0273	0.2578	0.0503	0.75	Partial Positive
Sm Stk TR	0.0210	1.4519	2.0050	0.07	Indeterminant
Res TR	0.0718	0.3090	0.4250	0.28	Indeterminant
Res App	0.0412	0.2249	0.5368	0.33	Indeterminant
Res Inc	0.0373	−0.0581	0.0613	0.69	Indeterminant
Bus TR	0.0477	0.8756	0.3031	0.51	Complete Positive
Bus App	0.0273	0.1093	0.3833	0.21	Indeterminant
Bus Inc	0.0390	0.4110	0.1643	0.41	Partial Positive
Farm TR	0.1171	−1.0848	1.2036	0.67	Indeterminant
Farm App	0.0300	−0.9534	1.0783	0.70	Indeterminant
Farm Inc	0.0507	−0.2189	0.2589	0.29	Indeterminant

As indicated in Exhibit 5, the results for hedging performance of the various financial and real assets against unexpected inflation are in direct contrast to the findings with respect to expected inflation. All stock and long-term bond total return measures were complete negative hedges. Only farmland and residential real estate provided complete positive hedges. Business real estate and Treasury bills are indeterminant hedges. As noted by Gultekin [12] and Hasbrouck [14] and confirmed here, the poor hedging performance of financial assets resulted from the unexpected portion of inflation.

Although the above results are of value to institutional real estate investors and selected others, most investors include real estate as only a portion of their portfolios. We address this mixed-asset portfolio consideration by creating four mean/variance efficient portfolios.

Portfolio 1 includes all five financial assets (S&P 500 stocks and small stocks, corporate and government bonds and Treasury bills) and farmland.
Portfolio 2 includes all five financial assets and business real estate.
Portfolio 3 includes all five financial assets and residential real estate.
Portfolio 4 includes all five financial assets and all three types of real estate.

Using a Markowitz variance/covariance model, we obtained the following vector of allocating fractions:

$$\textit{Portfolio 1} = \begin{bmatrix} \times \textit{ Common Stock} & = 5.54\% \\ \times \textit{ Small Stock} & = 1.34\% \\ \times \textit{ Government Bonds} & = 3.69\% \\ \times \textit{ Treasury Bills} & = 69.25\% \\ \times \textit{ Farmland} & = 20.17\% \end{bmatrix} \quad (4)$$

$$\textit{Portfolio 2} = \begin{bmatrix} \times \textit{ Common Stock} & = 5.56\% \\ \times \textit{ Treasury Bills} & = 49.25\% \\ \times \textit{ Business Real Estate} & = 45.19\% \end{bmatrix} \quad (5)$$

Exhibit 5
Hedging Effectiveness against Unexpected Inflation: 1960-86

Asset Type	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
T Bill TR	0.0660	0.2679	0.1435	0.75	Indeterminant
G-Bonds TR	0.0690	−2.3607	0.6444	0.33	Complete Negative
G-Bonds App	−0.0007	−1.9035	0.5740	0.30	Complete Negative
G-Bonds Int	−0.0487	−0.0128	0.0780	0.91	Indeterminant
C-Bonds TR	0.0692	−3.0476	0.6309	0.45	Complete Negative
Com Stk TR	0.0949	−3.1772	0.9375	0.34	Complete Negative
Com Stk App	0.0566	−3.0896	0.9300	0.33	Complete Negative
Com Stk Div	0.0401	0.0439	0.0512	0.69	Indeterminant
Sm Stk TR	0.1079	−4.5116	1.9809	0.23	Complete Negative
Res TR	0.0813	0.7674	0.3058	0.43	Complete Positive
Res App	0.0470	0.8082	0.3195	0.48	Complete Positive
Res Inc	0.0346	−0.0226	0.0302	0.68	Indeterminant
Bus TR	0.0864	−0.1392	0.3083	0.45	Indeterminant
Bus App	0.0301	−0.0477	0.3241	0.21	Indeterminant
Bus Inc	0.0642	0.0203	0.0951	0.83	Indeterminant
Farm TR	0.0763	1.2177	0.5085	0.72	Complete Positive
Farm App	0.0139	0.9133	0.4784	0.73	Indeterminant
Farm Inc	0.0406	0.2463	0.1765	0.33	Indeterminant

$$\textit{Portfolio 3} = \begin{bmatrix} \times \textit{Common Stock} & = 10.04\% \\ \times \textit{Government Bonds} & = 3.20\% \\ \times \textit{Treasury Bills} & = 32.44\% \\ \times \textit{Residential Real Estate} & = 54.32\% \end{bmatrix} \tag{6}$$

$$\textit{Portfolio 4} = \begin{bmatrix} \times \textit{Common Stock} & = 7.96\% \\ \times \textit{Government Bonds} & = 3.44\% \\ \times \textit{Treasury Bills} & = 51.20\% \\ \times \textit{Farmland} & = 13.87\% \\ \times \textit{Residential Real Estate} & = 23.53\% \end{bmatrix} \tag{7}$$

The portfolio mean returns, standard deviations and coefficients of variation are presented in Exhibit 6. The Markowitz algorithm allows the selection of the portfolios with the lowest coefficient of variation. These portfolios, of course, have lower CVs than any of the individual assets. The portfolios are then regressed against the three inflation types. These results are presented in Exhibit 7.

The farmland and "all three real estate types" portfolios (Portfolios 1 and 4) are partial hedges against actual and expected inflation. The business real estate portfolio (Portfolio 2) is a complete positive hedge against expected inflation. The residential real estate portfolio (Portfolio 3) is a partial positive hedge against actual inflation and a complete positive hedge against expected inflation. None of the portfolios provide statistically significant protection against unexpected inflation. Thus, these mixed-asset portfolios provide better hedging effectiveness than any of the long-term financial assets. Further, the benefits of including real estate in portfolios include not only lower risk per unit of return, but greater inflation protection.

Exhibit 6
Portfolio Characteristics: 1960-86

Portfolio	Mean	Standard Deviation	Coefficient of Variation
Financial Assets (FA) and Farmland (Portfolio 1)	6.75%	2.14%	0.3170
FA and Business Real Estate (Portfolio 2)	7.10%	3.09%	0.4352
FA and Residential Real Estate (Portfolio 3)	7.50%	2.54%	0.3387
FA and All Real Estate Types (Portfolio 4)	7.10%	3.09%	0.4352

Exhibit 7
Hedging Effectiveness of Mixed-Asset Portfolios against Various Inflation Types: 1960-86

		Actual Inflation			
Portfolio	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
Portfolio 1	0.0417	0.5514	0.0911	0.64	Positive Positive
Portfolio 2	0.0673	0.1571	0.1626	0.69	Indeterminant
Portfolio 3	0.0555	0.4031	0.1779	0.31	Partial Positive
Portfolio 4	0.0449	0.5577	0.0923	0.60	Partial Positive
		Expected Inflation			
Portfolio	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
Portfolio 1	0.0412	0.6133	0.1601	0.60	Partial Positive
Portfolio 2	0.0390	0.7415	0.2189	0.73	Complete Positive
Portfolio 3	0.0389	0.8208	0.1424	0.54	Complete Positive
Portfolio 4	0.0417	0.6889	0.1203	0.63	Partial Positive
		Unexpected Inflation			
Portfolio	Constant	Beta Coefficient	Standard Error	*R* Squared	Type of Hedge
Portfolio 1	0.0682	0.1379	0.1550	0.52	Indeterminant
Portfolio 2	0.0753	0.0241	0.1659	0.68	Indeterminant
Portfolio 3	0.0762	−0.0936	0.2569	0.27	Indeterminant
Portfolio 4	0.0726	0.0870	0.1688	0.47	Indeterminant

Conclusions

The purpose of this paper has been to test the hedging effectiveness of various financial and real assets against actual, expected and unexpected inflation. In addition, mean/variance efficient portfolios were derived and tested for hedging effectiveness against the various types of inflation. The results varied across both asset and inflation type for both individual assets and portfolios. The poor performance of the financial instruments against inflation was largely because of the unexpected, not the expected component of inflation.

The results obtained have several implications for investors. These results can be useful when used for personal forecasts of expected inflation—that is, to invest in asset types that provide at least some protection against inflation. In addition, as the returns are decomposed into the income and appreciation components, the hedging effectiveness differs using asset total returns versus the asset's income and appreciation returns. Use of stripped stock securities to at least hedge for the short term could be accomplished, although it would require constant portfolio revisions. Finally, the portfolio results also can be beneficial when considering types of assets to include in portfolios, when the investor is faced with a volatile inflationary environment.

References

[1] J. Ang, J. Chua and W. Reinhart. Monetary Appreciation and Inflation-Hedging Characteristics of Comic Books. *Financial Review* 18 (May 1983), 196-205.
[2] P. Bird. Commodities as a Hedge Against Inflation. *Applied Economics* 16 (December 1984), 855-67.
[3] Z. Bodie. Commodity Futures as a Hedge Against Inflation. *Journal of Portfolio Management* 10 (Spring 1983), 12-17.
[4] J. Carlson. A Study of Price Forecasts. *Annals of Economic and Social Measurement* 6 (Winter 1977), 27-56.
[5] ——— and M. Parkin. Inflationary Expectations. *Economica* 42 (May 1975), 115-49.
[6] D. Cochrane and G. Orcutt. Application of Least Squares Regression to Relationships Containing Autocorrelated Error Terms. *Journal of the American Statistical Association* (1949), 32-61.
[7] E. Fama. Stock Returns, Real Activity, Inflation, and Money. *American Economic Review* 71 (1981), 545-65.
[8] ——— and G. Schwert. Asset Returns and Inflation. *Journal of Financial Economics* 5 (November 1977), 115-46.
[9] S. Ferris and A. Makhija. Tangible Assets as Investments: A Risk and Return Analysis. *Akron Business and Economic Journal* 18 (Fall 1987), 115-28.
[10] I. Fisher. *The Theory of Interest*. New York: MacMillan, 1930.
[11] R. Fogler, M. R. Granito and L. R. Smith. A Theoretical Analysis of Real Estate Returns. *The Journal of Finance* 40 (July 1985), 711-21.
[12] N. Gultekin. Stock Market Returns and Inflation Forecasts. *Journal of Finance* 38 (June 1983), 663-74.
[13] D. Hartzell, J. Heckman and M. Miles. Real Estate Returns and Inflation. *AREUEA Journal* 15 (Spring 1987), 617-37.
[14] J. Hasbrouck. Stock Returns, Inflation, and Economic Activity: The Survey Evidence. *The Journal of Finance* 39 (December 1983), 1293-1310.
[15] A. Herbst. Hedging Against Price Index Inflation with Futures Contracts. *Journal of Futures Markets* 5 (Winter 1985), 489-504.
[16] R. Ibbotson and L. Seigel. The World Market Wealth Portfolio. *Journal of Portfolio Management* 10 (1983), 5-17.
[17] ———. Real Estate Returns. A Comparison With Other Investments. *AREUEA Journal* 12 (1984), 219-44.
[18] Ibbotson and Associates. *Stocks, Bonds, Bills and Inflation: 1987 Year-book*. Chicago: Ibbotson Associates, 1987.
[19] J. Jaffe and G. Mandelker. The 'Fisher Effect' for Risky Assets: An Empirical Investigation. *Journal of Finance* 31 (May 1976), 447-58.
[20] A. Kane. Coins: Anatomy of a Fad Asset. *Journal of Portfolio Management* 10 (Winter 1984), 44-51.
[21] G. Kaul. Stock Returns and Inflation: The Role of the Monetary Sector. *Journal of Financial Economics* 18 (1987), 253-76.
[22] G. Mandelker and K. Tandon. Common Stock Returns, Real Activity, Money and Inflation: Some International Evidence. *Journal of International Money and Finance* 4 (June 1985), 267-86.
[23] G. Menil and S. Bhalla. Direct Measurement of Popular Price Expectations. *American Economic Review* 70 (May 1975), 178-79.

[24] D. Mullineaux. Inflationary Expectations and Money Growth in the U.S. *American Economic Review* 70 (March 1980), 158-59.
[25] C. Nelson. Inflation and Rates of Return on Common Stock. *Journal of Finance* 31 (May 1976), 471-83.
[26] D. Peel and P. Pope. Testing the Fisherian Hypothesis: Some Methodological Issues and Further Evidence for the UK. *Journal of Business, Finance and Accounting* 12 (Summer 1985), 297-311.
[27] L. Ritter and T. Ulrich. *The Role of Gold in Consumer Investment Portfolios.* Monograph Series in Finance and Economics. New York: Salomon Brothers, 1984.
[28] B. Sprinkel and R. Genetski. *Winning with Money.* Homewood, Ill.: Dow Jones-Irwin, 1977.
[29] R. Stulz. Asset Pricing and Expected Inflation. *Journal of Finance* 41 (March 1986), 209-24.
[30] W. Taylor. The Estimation of Quality-Adjusted Rates of Return in Stamp Auctions. *Journal of Finance* 38 (September 1983), 1095-1110.