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CONSTRUCTING INFLATION HEDGED PORTFOLIOS

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Numerous studies have found that a negative relationship exists between stock market returns and inflation. Studies published by John Lintner (11,4), Zvi Bodie (2,4), Charles Nelson (13,4), Hai Hong (9,4) and Eugene Fama and William Schwert (4,4) have supported this relationship.

Lintner (11,4) argued that firms rely more heavily on external financing the higher the inflation rate. This financing tendency occurs whether inflation is an anticipated or unanticipated event. Additional debt increases financial risk; and ultimately, reduces equity value.

Hong's article (9,4) held that this inverse relationship arose from the additional tax burden borne by firms since existing depreciation and inventory withdrawals are understated during inflationary periods. This view was lent additional support in Martin Feldstein's study (6,4).

Part I of this paper discusses the polynomial distribution lag model which was utilized in researching this issue. The results are examined in light of prior studies. Monthly data from July 1948 - June 1981 were utilized. Data sources and empirical findings are presented, and summary conclusions suggested.

Given evidence of the negative impact of inflation on stock prices Part II considers evidence regarding the existence of equity portfolios that represent viable hedges against unanticipated inflationary cycles. Procedures for developing common stock portfolios whose returns covary positively with unanticipated inflation will be considered. The objective of this hedge portfolio is to protect the investor against purchasing power risk.

PART I: IMPACT OF INFLATION ON STOCK PRICES

A hypothetical company's share price is heavily contingent upon past performance and expectations regarding future dividends, earnings per share, growth rate of earnings, overall market conditions, and expected and unexpected political-economic events. Stock market indexes also seem to be impacted by the general economic climate described by the various stages of the business cycle. Equity markets appear to be forward thinking. They frequently experience an upturn prior to measured advances in production.

Business cycles, sometimes referred to as political cycles, result from the type of economic stabilization policies being implemented. Such policies significantly impact upon the estimated money supply, degree of inflation experience, and ultimately, employment levels. Share price, as measured by the S&P index, reacts accordingly.

Table 1 (A) considers the direct and simple relationship between the dependent variable stock market price, and the independent variable inflation as measured by the consumer price index (CPI). The polynomial distribution lag model is specified as (15,4):

$$(1)\ Y_t = a_0CPI_t + a_1CPI_{t-1} + a_2CPI_{t-2} + a_3CPI_{t-3} + a_4CPI_{t-4} + a_5CPI_{t-5} + a_6CPI_{t-6} + \text{etc.}$$

TABLE 1 (A) IMPACT OF INFLATION ON STOCK PRICE: POLYNOMIAL DISTRIBUTION (S&P INDEX) (15,4)

	July 1948-June 1981	July 1970-June 1981
CPI_t	−206.4 (−6.083)	−81.16 (−3.535)
CPI_{t-1}	−231.8 (−6.018)	−91.30 (−3.505)
CPI_{t-2}	−137.4 (−5.818)	−54.35 (−3.412)
CPI_{t-3}	16.00 (15.35)	5.789 (6.638)
CPI_{t-4}	167.4 (6.572)	65.21 (3.758)
CPI_{t-5}	255.8 (6.395)	99.99 (3.678)
CPI_{t-6}	220.4 (6.334)	86.33 (3.650)
R^2	0.5878	0.3160
Adj R^2	0.5857	0.3053
F	279.55	29.57

EMPIRICAL FINDINGS:

The Time Series Programming Package was applied; and the explanatory variables were lagged up to six months. Table 1 (A) shows that for the entire period July 1948-June 1981, an increase in CPI in each of the most recent three months, was associated with a decrease in current stock market prices (15,4).

Increases in the CPI further in the past were associated with an increase in share price. Similar findings appear in subperiod: July 1970-June 1981. All regression coefficients were statistically significant at the 1% level.

Support for the findings herein reported can be found in the Nelson study (13,4). He regressed stock returns on individual leads and lags to the rate of inflation for time periods: 6/53-7/71, 6/53-6/74, 6/53-12/62 and 1/64-6/74. Table 1 (B) presents this study's results.

The results are uniformly negative with statistically significant results between inflation levels and rates of return. Lintner's regression results (11,4) for annual data similarly notes this negative correlation.

PART II: INFLATION HEDGED EQUITY PORTFOLIOS

Earlier attempts to identify portfolios that proved viable hedges against inflations are of two broad categorical types: (1) hedging strategies whose purpose is to highlight the risk of real returns on fixed income securities; and (2) attempts to verify the descriptive validity of the Capital Asset Pricing Model.

Bodie (2,4) sought portfolios whose returns covaried positively with unanticipated inflation. He demonstrated that a long position in a stock market portfolio could not in isolation be used to hedge against purchasing power risk. As noted in Part 1, he found that market indexes varied inversely with unexpected inflation. Bodie's research utilized commodity futures, and demonstrated that option contracts could offset the purchasing power risk which results from an inflationary cycle.

Schipper and Thompson (14,4) attempted to construct inflation hedged portfolios using the multi-period Capital Asset Pricing Model. Although these portfolios could be identified relatively easily on an ex-post basis, finding the appropriate combination ex-ante proved extremely difficult. Schipper and Thompson were able to construct a portfolio containing over 500 common stocks combining both long and short positions. The portfolio was successful about 50% of the time.

Bernard and Frecka (1,4) contend that an investor should assume a long position in stocks which covary positively with inflation. Short positions should be taken in stocks which are the "worse hedges," or those which react negatively to inflation. The portfolio needs to contain a sufficient number of stocks to ensure diversification, and keeping unsystematic risk to a minimum. The selected portfolio of stocks should yield a relatively high b-coefficient.

The Bernard and Frecka (1,4) model was tested in the context of the multi-period Capital Asset Pricing Model. The results were then compared

TABLE 1 (B)

Regressions of Monthly Market Returns on Monthly Changes in the Lag of the CPI (Slope Estimate, t-Ratio, and Correlation) for Individual Leads and Lags (13,4).

CPI Lead (+) or Lag (−)	June 1953-April 1971	June 1953-Feb. 1974	June 1953-Dec. 1963	Jan. 1964-Feb. 1974
+4	−1.14	−1.90	−2.64	−1.42
	(−.95)	(−2.22)	(−1.48)	(−1.14)
	−.06	−.14	−.14	−.10
+3	−2.76	−2.81	−3.17	−2.85
	(−2.31)	(−3.21)	(−1.91)	(−2.29)
	−.16	−.20	−.17	−.20
+2	−.95	−1.57	−.66	−1.67
	(−.79)	(−1.76)	(−.39)	(−1.29)
	−.05	−.11	−.03	−.12
+1	−3.88	−2.81	−5.57	−1.61
	(−3.29)	(3.18)	(−3.45)	(−1.25)
	−.22	−.20	−.30	−.11
0	−2.48	−2.89	−.58	−4.22
	(−2.06)	(−3.19)	(−.34)	(−3.29)
	−.14	−.20	−.03	−.29
−1	−3.56	−2.82	−4.18	−2.10
	(−3.00)	(−3.00)	(−2.54)	(−1.50)
	−.20	−.19	−.22	−.14
−2	−.90	−1.39	−.31	−1.51
	(−.74)	(−1.44)	(−.18)	(−1.05)
	−.05	−.09	−.02	−.10
−3	−2.80	−3.68	−3.16	−4.35
	(−2.34)	(−3.89)	(−1.90)	(−3.14)
	−.16	−.24	−.17	−.28
−4	−1.88	−1.46	−1.68	−.81
	(−1.57)	(−1.48)	(−1.00)	(−.56)
	−.11	−.09	−.09	−.05

to those reached by Schipper and Thompson. The potential for hedging exists only when there is a significantly positive relationship between the portfolio's return and unanticipated. The equations isolated were:

(2) $r_{ht} = a_0 + a_1 U_t + e_t$

(3) $r_{mt} = a_0 + a_1 r_{mt} + a_z U_t + e_t$

r_{ht} = real return on the hedged portfolio t period
r_{mt} = real return on market portfolio in t period
U_t = unexpected inflation rate in t period

TABLE 2

Regression Equations	Schipper & Thompson (14,4) (1954-1975)		Bernard & Frecka (1,4) (1974-1979)	
	(2)	(3)	(2)	(3)
a_1	—	−1.59	—	−.377
$t(a_1)$	—	−5.43	—	−2.16
a_2	1.25	.28	8.88^{xx}	6.49^{x}
$t(a_2)$	.65	.04	3.14^{xx}	2.30^{x}
R^2	.005	.29	.33	.46

x significant at .025 level using a one-tailed test
xx significant at .005 level using a one-tailed test

These studies utilized quarterly data and similar procedures, but the years under consideration differed. This may account for the better results generated by the B&F study.

The hedging methods considered above focus upon a portfolio that is purchased at a given point in time. Its value is then assessed through time. Properly hedged portfolios enables the securities to maintain, or yield a higher real return during inflationary periods than the market return. The models encourage trading; i.e., changing from long to short positions or trading options. They do not consider portfolio management strategies that require periodic purchases of equities over many years with dividend reinvestment. To the degree that inflation rates, dividend payments and stock prices fluctuate, through time managing a portfolio in this manner may prove to be a viable hedging strategy.

III. CONCLUSIONS

The Capital Asset Pricing Model (CAPM) distinguishes between two types of risk: unsystematic and systematic. Upon first blush the only type of risk an investor or financial manager can hope to abate is of the diversifiable variety. This view becomes questionable when a systematic variable, e.g. inflation rates, begins to take on characteristics of both classifications. Recapitalization, purchasing inventories, and cash cycles are matters of internal control; but additionally all are impacted by price level changes.

CPI increases result in a loss of purchasing power, and hence, lowers the real value of nominal income. This is particularly significant when the income stream analyzed is fixed in nature; and is not indexed to the CPI. Purchasing power loss becomes a matter of concern; and models that hedge this risk and/or turn it to the investor's advantage would prove financially beneficial.

Future studies could concentrate on the pros and cons of purchasing the newly introduced S&P market option contract, and holding a well diversified portfolio. This arrangement, at least it seems superficially, would reduce the downside risk associated with a well diversified portfolio brought about by inflation. Systematic risk in effect seems to be hedged. This new option alternative would eliminate the need for selectivity when forming the Bernard and Frecka optimally hedged portfolio. As the options market increases in breadth and depth the strategies available for hedging portfolios, by utilizing the Options Pricing Model, will become more varied and feasible. The myriad of moves that are increasingly becoming available in financial markets should prove fruitful to researchers.

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[15] Polynomial distribution lag models have been utilized by other researchers. Tseng's working paper employed this approach, and confirms the statistical results reported herein. His analysis included a model which utilized independent variables: Inflation, Interest Rates and Industrial Production. Several time periods and market indexes were utilized in his analysis.

Zvi Bodie's post Korean era, sample periods 1963-1972, 1963-67, 1968-1972 holding period analysis also lends support for the negative relationship, at least in the short run, between CPI changes and the stock market's reaction.

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