Southern Business Review

Volume 10 | Issue 1 Article 6

April 1984

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# EVALUATION OF MUTUAL FUND PERFORMANCE AND RISK LEVELS UNDER DIFFERENT MARKET CONDITIONS, 1972-81

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Several studies on mutual funds have dealt with the market timing decisions [1, 3, 5, 9, 10, 13, 16, 17]. Treynor and Mazuy [16] as early as in 1966 analyzed the performance and sensitivity of 57 mutual funds to market using funds' characteristic lines. They found no evidence to support that mutual fund managers had the ability to alter risk or performance depending on market conditions. They suggested that the improvement in the fund's rate of return would be due to the fund manager's ability to identify stocks of underpriced industries and companies, rather than to any ability to outguess turns in the level of the market as a whole. Williamson [17] found no evidence of increased mutual fund volatility in bull markets or decreased volatility in bear markets. In 1977, Fabozzi and Francis [4] based on a sample of 700 NYSE stocks concluded that alpha and beta statistics were not significantly affected by the alternating forces of bull and bear markets. In 1979, Fabozzi and Francis [5] employed a similar model they used in their 1977 article to test for 85 mutual funds over the period December 1965 to December 1971 whether fund betas differed in bull and bear market periods. Three definitions of bull and bear markets were used for the empirical tests. The authors have used more discriminating methods than Treynor and Mazuy in their study and found similar evidence. The mutual fund managers did not shift their fund's beta to take advantage of market movements. Alexander and Stover [1] tested 49 mutual funds over the period of January 1966 to December 1971 using excess returns. They also used three definitions of bull and bear markets. Additionally, they redefined the dummy variable to allow for either leads or lags of up to three months in the changing of a fund's systematic risk level. They concluded that fund betas did not significantly increase when market conditions changed from bearish to bullish, whether coincidentally, leading, or lagging the change in market conditions [1, P. 224].

Kon and Jen [9, 10] and Miller and Gressis [13] examined mutual fund performance employing models of nonstationarity. Kon and Jen employed a switching regression model to test for stationarity of the risk level and concluded that there was evidence of substantial risk level nonstationarity as a result of market timing activities. If nonstationarity is present in the return-risk relationship and is ignored, the resulting estimates of alpha and beta may provide misleading information. Miller and Gressis present a partition regression model as a method of estimating the traditional CAPM when nonstationarity is present. Application of their procedure to weekly return data for the market and 28 mutual funds suggests the existence of a good deal of nonstationarity in the risk-return relationship.

Alexander, Benson and Eger [2] conducted recently a study to investigate both theoretically and empirically the appropriateness of describing the systematic risk of mutual funds with a different model of nonstationarity — a first-order Markov process. Empirical tests of the Markov model were conducted on a sample of 67 mutual funds over the period January 1965 through December 1973 using monthly returns. The results indicate that a significant number of mutual funds may have had betas that followed a first-order Markov process. They argue that beta nonstationarity cannot be a sufficient condition for identifying funds that actively engage in timing decisions. Chen [3] examined the risk-return trade off relationship in up-and-down market conditions, with allowance for beta nonstationarity. His empirical analysis covered the time period February 1965 to December 1977 using monthly returns of 360 firms. Although the time varying beta approach avoids the statistical problems of an earlier study [7] both indicate that the down-market mean beta measuring downside risk is a more appropriate measure of portfolio risk than the traditional single beta in a world with either constant or changing beta.

The present study examines the performance and risk level changes among 132 mutual funds relative to the general market between periods of up markets and down markets during January 1972 through December 1981. The paper also deals with the stability of fund betas and alphas by objective types over the bull and bear market conditions.

## DATA AND METHODS OF PROCEDURE

The methodology employed in this study is designed similar to that of Fabozzi and Francis [5] and Alexander and Stover [1]. The technique of using dummy variables has been widely adopted, and the result is the straightforward inclusion of qualitative variables in regression models.

$$1.\ R_{jt} - R_{ft} = \alpha_j + \alpha'_j D_t + \beta_j (R_{mt} - R_{ft}) + \beta'_j [D_t (R_{mt} - R_{ft})] + e_{jt}$$

Equation 1 is basically the Jensen's model [6] expanded to incorporate the effect of market conditions on performance ( $\alpha$ ) and risk ( $\beta$ ). The terms $R_{jt}$ and $R_{mt}$ stand for the quarterly rate of return on the fund and the market. The quarterly holding period returns for each fund were computed from the percentage change in net asset value per share adjusted for capital gains and dividend distributions. The quarterly data on mutual funds were obtained from *Barron's Quarterly Review of Mutual Funds*. The quarterly rate of return for the market was the dividend yield plus the change in the *Standard and Poor's 500 Stock Index*. The data on the S&P 500 average were obtained from the 1982 edition of the Standard and Poor's Statistical Service. $R_{ft}$ is the risk-free rate. The quarterly three-month treasury bill rate was used for

$R_{ft}$ to calculate the excess rate of return. The 90-day treasury bill rate was obtained from the *Federal Reserve Bulletins*. The 1982 edition of *Wiesenberger Investment Companies Service* provided the objective classification of the funds. The funds were grouped into maximum capital gain (MCG), growth (G), growth income (GI), income (I), and growth income stability (GIS).

In equation 1, the subscript t indicates the individual quarterly periods. $D_t$ is a dummy variable with value of zero if t is a bear market period and a value of one if t is a bull market period. Only one definition of bull and bear market periods was employed for analysis. A bull or up-market is identified as a period during which the holding period return for the market (S&P 500) exceeds the risk-free rate and a bear or down market is the period during which the market return is equal to or less than the risk-free rate. Fabozzi and Francis [5] used zero as the dividing line in each of their definitions of bull and bear markets. Mary Lindahl-Stevens suggested the use of risk-free rates as the dividing line [11, P. 77]. On the basis of this definition, 22 quarters were classified as bull market periods and 18 classified as bear market periods.

In the model, $e_{jt}$ is the jth fund residual term during period t. The model allows the intercept ( $\alpha$ ) and the slope ( $\beta$ ) to change with market conditions. This assumption is consistent with econometric theory depending on whether the model is or is not homoscedastic [8, P. 267, 421]. The interesting point about equation 1 is that the least squares estimators of the regression coefficients are exactly the same as those that would be obtained from two separate regressions of excess fund returns on excess market returns, one estimated for bull conditions and the other for bear conditions. Then, we would have:

$$2.\ R_{jt} - R_{ft} = (\alpha_j + \alpha'_j) + (\beta_j + \beta'_j)\,(Rmt - Rft) + e_{jt}\ (Bull)$$

$$3.\ R_{jt} - R_{ft} = \alpha_j + \beta_j\,(Rmt - Rft) + e_{jt}\ (Bear)$$

In order to test the hypothesis that the error terms are heteroscedastic, the separate regression functions were estimated for bull and bear observations. The mean error term for bull conditions was 5.9088 and for bear conditions 5.7289 and the minimum significant difference required was .8371 at the .05 level. An F test was performed to test for equality of the error variances. The calculated F value was .18 less than the table value of F at any confidence level. There was no significant difference between the error variances. In other words, the variance of the error term is the same in both bull and bear circumstances. Since the model being used is said to be homoscedastic, performance ( $\alpha$ ) and risk ( $\beta$ ) measures over the bull and bear market periods were reestimated for each fund with the dummy variable added allowing both $\alpha$ and $\beta$ to shift with the alternative forces of bull and bear markets. Subsequently, analysis of variance tests were performed to determine for differences in $\alpha$ values (performance measure) and $\beta$ values (systematic risk) between market conditions for all funds and each objective group.

**Systematic Risk ( $\beta$ )**

Table 1 presents the mean regression coefficients for bull and bear conditions. From casual observation of the betas for 132 sample funds from equation 1, one would notice that 78 of them or 59 percent of the funds had larger betas in bull markets than in bear markets. This may imply that betas indeed shift over the bull and bear market periods.

Analysis of reported F-values in Table 2 indicates that the average fund beta measured over the bull and bear market periods was not significantly different. This finding is consistent with that of Alexander and Stover. The average fund does not appear to alter beta with market conditions. Table 2 presents risk level differences by objective. Only growth income and income type funds experienced significant change in risk levels over bull and bear market periods. The maximum capital gain, growth and growth income stability funds were not able to increase beta significantly during the bull markets. The results for equation 1 were also analyzed using the T test. The average beta of each objective type is larger in bull market than in the bear market (see Table 1). The differences, however, are significant at the .05 level for only growth income and income funds. The average fund in these two objective types appears to alter beta differently with changes in market conditions. Alexander and Stover [1] report that maximum capital gain and long term growth funds at best had significantly different bull and bear market betas.

**Performance Measure ( $\alpha$ )**

Comparison of the average $\alpha$ values for all funds and for each Wiesenberger fund classification reflecting changes in market conditions is presented in Table 1. The average $\alpha$ value in the bull market is larger than in the bear market for all funds and for each objective type. Analysis of the F-statistics in Table 3 indictes that significant differences were found in performance measure comparisons between the bull and bear markets for all and each objective type except the growth income stability. The results were also analyzed using the T test. Except for growth income stability type the performance measure comparisons were statistically significant at the .05 level. The results presented here are somewhat opposed to the earlier works [1, 16] which observed that the average fund performance did not alter with market conditions.

The results of the 1972-81 market conditions point out that overall, the beta measure of the sample funds was relatively stationary and the fund performance measured in excess return form was significantly different between bull and bear market periods. Growth income and income type funds whose beta values were generally lower and shifted significantly over the bull and bear markets had the most negative alpha values in bear markets. Overall, the fund managers of these two objective classifications appear to be shifting their fund betas significantly to take advantage of market conditions with

**TABLE 1**
**Summary Analysis of Regression Coefficients for Equation 1**
**During the Period January 1972 - December 1981**

| Classification | Mean Systematic Risk | | | Mean Performance | | |
|---|---|---|---|---|---|---|
| | Bear | Bull | Difference | Bear | Bull | Difference |
| | $\beta_j$ | $\beta_j + \beta'_j$ | $\beta'_j$ | $a_j$ | $a_j + a'_j$ | $a'_j$ |
| All Funds (132) | .9625 | 1.0357 | .0732 | −.6585 | .9590 | 1.6175* |
| MCG (31) | 1.1789 | 1.3189 | .1400 | −.0821 | 1.4066 | 1.4887** |
| G (43) | .9751 | 1.0080 | .0329 | −.6362 | .9541 | 1.5903* |
| GI (33) | .7724 | .8940 | .1216** | −1.0967 | .7881 | 1.8848* |
| GIS (10) | .8542 | .9508 | .0966 | −.5155 | −.3063 | .2092 |
| I (15) | .6364 | .8440 | .2076** | −1.4820 | .4656 | 1.9476* |

*Significant at .01 level using the T Test
**Significant at .05 level using the T Test

## TABLE 2

### Analysis of Variance for Systematic Risk ( $\beta$ ) for Bull and Bear Market Change During 1972-81

| | | | | |
|---|---|---|---|---|
| **A.** | **ANOVA for All Funds** | | | |
| **SOURCE** | **DF** | **SS** | **MS** | **F** |
| Regression | 1 | 0.314 | 0.314 | |
| Residuals | 262 | 36.261 | 0.138 | 2.27 |
| **B.** | **ANOVA of Maximum Capital Gain Funds** | | | |
| Regression | 1 | 0.304 | 0.304 | |
| Residuals | 60 | 14.572 | 0.243 | 1.25 |
| **C.** | **ANOVA of Growth Funds** | | | |
| Regression | 1 | 0.023 | 0.023 | |
| Residuals | 84 | 6.811 | 0.081 | 0.29 |
| **D.** | **ANOVA of Growth Income Funds** | | | |
| Regression | 1 | 0.244 | 0.244 | |
| Residuals | 64 | 3.549 | 0.055 | 4.40** |
| **E.** | **ANOVA of Growth Income Stability Funds** | | | |
| Regression | 1 | 0.019 | 0.019 | |
| Residuals | 18 | 0.171 | 0.009 | 1.97 |
| **F.** | **ANOVA of Income Funds** | | | |
| Regression | 1 | 0.129 | 0.129 | |
| Residuals | 28 | 0.428 | 0.015 | 8.43** |

*Significant at .01 level
**Significant at .05 level

accompanying significant change in performance ( $\alpha$ values) between the bear and bull periods. The other objective types such as maximum capital gain and growth funds have shown no significant differences in beta values over the bull and bear markets but exhibited significant differences in performance levels. The findings also suggest that fund types with noticeable shifts in betas between bear and bull market periods were not necessarily the better performing during all 1972-81.

TABLE 3

**Analysis of Variance for Performance Measure ( $\alpha$ ) for Bull and Bear Market Change During 1972-81**

| A. | ANOVA for All Funds | | | |
|---|---|---|---|---|
| SOURCE | DF | SS | MS | F |
| Regression | 1 | 153.062 | 153.062 | |
| Residuals | 262 | 1195.602 | 4.563 | 33.54* |
| **B.** | **ANOVA for Maximum Capital Gain Funds** | | | |
| Regression | 1 | 34.352 | 34.352 | |
| Residuals | 60 | 469.311 | 7.021 | 4.39** |
| **C.** | **ANOVA for Growth Funds** | | | |
| Regression | 1 | 54.375 | 54.375 | |
| Residuals | 84 | 381.612 | 4.543 | 11.97* |
| **D.** | **ANOVA for Growth Income Funds** | | | |
| Regression | 1 | 58.615 | 58.615 | |
| Residuals | 64 | 144.198 | 2.253 | 26.02* |
| **E.** | **ANOVA for Growth Income Stability Funds** | | | |
| Regression | 1 | 0.087 | 0.087 | |
| Residuals | 18 | 67.980 | 3.777 | 0.02 |
| **F.** | **ANOVA for Income Funds** | | | |
| Regression | 1 | 11.379 | 11.379 | |
| Residuals | 28 | 14.199 | 0.507 | 22.44* |

*Significant at .01 level
**Significant at .05 level

## CONCLUSION

Performance ( $\alpha$ ) and risk ( $\beta$ ) measures for bull and bear markets were estimated through the use of separate estimating equations which allowed the variance of the error term to differ from bull to bear markets. Since the

variance of the error term was not found to be significantly different, $\alpha$ and $\beta$ measures over the bull and bear market periods were estimated with the addition of the dummy variable. Subsequently an analysis of variance tests was performed using the general linear models procedure to test for the differences in risk levels ($\beta_j$ and $\beta_j + \beta'_j$) and performance levels ($\alpha_j$ and $\alpha_j + \alpha'_j$) over the bull and bear market periods.

Growth income and income type funds were best at increasing beta during bull periods. Significant differences were found in performance measure comparisons between bull and bear market periods except for growth income stability funds. Funds with noticeable shifts in betas between bear and bull periods were not necessarily the better performing for all 1972-81. This study lends evidence for the possibility that fund managers do not necessarily attempt to alter the systematic risk ($\beta$) of the portfolio significantly over the bull and bear market periods. However, mutual funds during 1972-81 period were able to significantly improve their performance level when market conditions changed from bearish to bullish.

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