The Two Tier Stock Market--
Its Implications for Portfolio Management

by

Marshall E. Blume*

Working Paper No. 14-74

RODNEY L. WHITE CENTER
FOR FINANCIAL RESEARCH

University of Pennsylvania

The Wharton School

Philadelphia, Pa. 19174

The contents of this paper are solely the responsibility of the author.

I. Introduction

A large number of articles in the popular financial press have highlighted the substantial differences in the returns from equal-weighted and value-weighted indexes over the last several years. Thus, the equal-weighted Value Line Composite Index declined 64.8 percent from March 11, 1968, to September 30, 1974, while the value-weighted New York Stock Exchange (NYSE) Composite Index declined only 33.2 percent over this same period.

In trying to explain these differences, many observers have postulated the existence of two, or even more, tiers in the market place. According to these observers, different types of stockholders confine their investments to specific tiers. The argument goes on that in recent years institutions have been channeling their hugh amounts of new funds into a limited number of so-called favored stocks and thereby supporting their prices. Since these stocks, which constitute the upper tier, are generally stocks with larger market values, the recent differences in returns between equal-weighted and value-weighted indexes are said to be explained.

An alternative explanation, but not the only alternative, is that equal-weighted indexes are inherently more risky than value-weighted indexes and that the observed differences in returns on these two kinds of indexes in recent years are consistent with their differences in risk. The purpose of this paper is to analyze the risk and return characteristics of indexes of NYSE stocks under various weighting schemes starting in 1928. Following this analysis is a discussion of the implications for portfolio management.

two indexes were a more than value-weighted index and a less than equal-weighted index. The weights assigned to stocks in the more than value-weighted index were taken to be proportional to the square of the market values of the stocks, while the weights in the less than equal-weighted index were taken to be proportional to the reciprocal of the market values of the stocks.[3]

To provide a perspective of the actual weights assigned to specific stocks, the percentage of each index attributable to the top ten stocks by market value was determined as of June 30, 1972. For the less than equal-weighted index, the weight given to these top 10 stocks was 0.01 percent of the weight given to all stocks in the index; for the equal-weighted index, the weight was 1.05 percent; for the value-weighted, 31.53 percent; and for the more than value-weighted, 83.92 percent. Table 1 presents these percentages and similar percentages for IBM, the top 50 stocks and the top 100 stocks by market value.

One dollar invested in the less than equal-weighted index at the end of June, 1928 would have increased to $22.21 by June, 1973. In comparison, a dollar invested in an equal-weighted index or a value-weighted index would have increased to $52.34 or $53.94 respectively, while a dollar in a more than value-weighted index would have increased to $110.80. Thus, a dollar in a more than value-weighted index would have resulted in a terminal value over the forty-five year period of more than double that from a value-weighted or equal-weighted index and approximately five times that from a less than equal-weighted index.

Furthermore, the returns from the more than value-weighted index were larger than those from the other indexes in each half of this forty-five year period. In addition, the relative difference in the first half of the period ending in 1950 between the returns from the more than value-weighted index and those from the other indexes are much more important in explaining the higher returns from the more than value-weighted index in the overall period than the relative differences in the second half. Thus, one dollar invested in the more than value-weighted index from June, 1928 through December, 1950 would have yielded a terminal value 74 percent larger than if invested in the value-weighted index, while the difference would have been only 18 percent in the period from the end of 1950 through June, 1973.

The comparative returns on these four differently weighted indexes suggest the following conclusions: First, if the market place can be characterized as consisting of two tiers, the characterization is stronger prior to 1950 than after. Second, if there is a single reason for the larger returns on the more than value-weighted index, that reason cannot be the growth of institutions since institutions did not become an important force in the market place until sometime after 1950. It is, of course, possible that institutions caused a two-tier market after 1950 and something else was responsible for the two tiers, if there were indeed two tiers, prior to 1950. We leave it to

Table 2

Average Monthly Returns and Risk Characteristics of Various Indexes

Description	Kinds of Index			
	Less than Equal-Weight	Equal-Weight	Value-Weight	More than Value-Weight
A. July 1928 - June 1973				
Beta Coefficient[1]	1.64	1.26	1.00	0.88
Standard Deviation of Monthly Returns[1]	11.55%	7.10%	5.69%	5.52%
Ratio of Standard Deviation to Beta	7.04%	5.63%	5.69%	6.27%
Average Monthly Return[2]	1.14%	0.98%	0.90%	1.02%
Standard Deviation of the Average	0.50%	0.31%	0.25%	0.24%
B. July 1928 - December 1950				
Beta Coefficient	1.83	1.32	1.00	0.89
Standard Deviation of Monthly Rates	15.62%	9.11%	7.07%	6.84%
Ratio of Standard Deviation to Beta	8.54%	6.90%	7.07%	7.68%
Average Monthly Return	1.39%	0.98%	0.76%	0.95%
Standard Deviation of the Average	0.95%	0.55%	0.45%	0.42%
C. January 1951 - June 1973				
Beta Coefficient	1.14	1.10	1.00	0.87
Standard Deviation of Monthly Returns	4.65%	4.10%	3.67%	3.58%
Ratio of Standard Deviation to Beta	4.08%	3.72%	3.67%	4.11%
Average Monthly Return	0.91%	0.99%	1.04%	1.10%
Standard Deviation of the Average	0.28%	0.25%	0.22%	0.22%

[1]The beta coefficients and the standard deviations of monthly returns were estimated from the monthly returns over the same period used in calculating the average monthly returns. The index used in calculating the beta coefficients was taken to be the value-weighted index as constructed in this paper.

[2]The average monthly returns are arithmetic averages.

If these average returns and risk measures are taken at face value, most investors would undoubtedly prefer to follow the investment strategy inherent in the more than value-weighted index rather than that in the value-weighted index. In the overall period as well as in both halves, the average returns for the more than value-weighted index are larger than for the value-weighted index and the risks smaller, whether measured by beta or standard deviation. However, the past cannot be taken at face value. Indeed, the differences between the average rates of return on these two indexes calculated over the forty-five years ending in June 1973 or over either half of this period are not statistically significant.[5] Therefore, an investor should not assume that these differences would persist into the future.

In addition to finding no statistically significant difference between expected returns on the value-weighted and more than value-weighted index, the study found no statistically significant differences among the average returns of the four indexes.[6] This is particularly surprising in view of the obvious differences in risks as measured by betas or standard deviations.

From the risk measures in Table 2, it is clear that the value of a security is correlated with the risk of that security as measured by beta. The question is whether the size of an issue conveys information in addition to that contained in beta. As pointed out before, Blume and Friend[7] showed that the returns from equally weighted portfolios differed sometimes by large

III. The Implications

If for one reason or another[8], it can be concluded that there are at least two and perhaps many market-wide forces shaping the returns of individual securities, the one-factor models commonly used in most commercial applications of beta-related theory are inadequate. If so, these applications are suspect. For example, several financial institutions provide one--parameter measures of investment performance developed from capital asset pricing theory. These measures have an unambiguous meaning only if there is at most one market-wide factor. Likewise, the efficacy of beta as a sophisticated charting device to predict those stocks which will rise faster in a rising market or fall faster in a falling market requires that there be only one market-wide factor. Finally, the clear distinction between diversifiable and non-diversifiable risk hinges upon a one-factor model.

The remainder of this section will examine the theoretical implications of a multi-factor return generating model for efficently diversifying a portfolio. The discussion will be couched in terms of a two-factor model although it can easily be generalized to a multi-factor model.

Assume that the following two-factor model describes the manner by which returns of individual securities are generated:

The beta coefficient of security i, β_i, is given by:

$$(3)\quad \beta_i = \frac{\mathrm{Cor}(R_i, R_m)}{\mathrm{Var}(R_m)}$$

$$= \frac{b_{1i}\mathrm{Var}(\pi_1) + b_{2i}\mathrm{Var}(\pi_2) + x_{im}\mathrm{Var}\ (\varepsilon_i)}{\mathrm{Var}(\pi_1) + \mathrm{Var}(\pi_2) + \sum_{i=1}^{n} (x_{im})^2\mathrm{Var}(\varepsilon_i)}$$

If x_i represents the proportion of a specific portfolio invested in security i, the portfolio beta, β_p, will be $\Sigma x_i \beta_i$. According to the capital asset pricing model, the expected return on such a portfolio should be only a function of β_p. If an investor holds an efficiently diversified portfolio with a beta of β_p, the proportions invested in each security will be the same as the proportions in these same securities which minimize the variance of the return on this portfolio subject to the constraint that the average portfolio beta be β_p. Incorporating a Lagrange multiplier, the proportions x_i will be such as to minimize the function h:

$$(4)\quad h = (\Sigma x_i b_{1i})^2\mathrm{Var}(\pi_1) + (\Sigma x_i b_{2i})^2\ \mathrm{Var}(\pi_2)$$

$$+\Sigma x_i^2\ \ \mathrm{Var}(\varepsilon_i) - 2\lambda\mathrm{Var}(R_m)\ [\beta_p - \Sigma x_i \beta_i]$$

where γ_j is the ratio of $b_{2j}Var(\pi_2)$ to the sum of $b_{1j}Var(\pi_1)$ and $b_{2j}Var(\pi_2)$. Since γ_i would typically not equal γ_k, the only way equation (7) can hold in general is if b_1 equals b_2.

In words, we now have the fundamental result that in a diversified portfolio with a beta of β_p, the average response coefficient to each of the common market effects should be the same. Intuitively, the securities in the portfolio should be selected so as to minimize the maximum exposure to any specific market-wide risk. An immediate corollary is that a portfolio should be exposed equally to every and all risks. In this way, the return on a portfolio will be less subject to the extreme fluctuations associated with specific sectors of the economy. This argument follows from the assumption that the response coefficients in the market portfolio are all equal to 1.0.

The current state of knowledge provides very little insight into the mechanism by which returns of individual securities are generated except that a one-factor model is probably not adequate. In this case, how can an investor be sure that the average response coefficients to common market effects are identical? The answer is simple. The average response coefficients in the market portfolio are all equal. If an investor desires a less risky portfolio, he can combine the market portfolio with an investment in short-term risk-free assets. If he desires a more risky portfolio, he can lever the market portfolio with borrowed funds to a limited extent.

in conceptualizing the important elements in selecting a portfolio. A multi-factor model makes it quite rational for an investor who wishes to take advantage of superior security analysis to put a large part of his portfolio into a carefully selected set of correctly priced securities. Indeed, the selection of the securities to complement the risk characteristics of the undervalued securities may be fully as important in the investment process as finding those undervalued securities in the first place.

[5]This test is based upon the significance of the slope coefficient in the regression:

$$r_{it} = \alpha_o + \alpha_1 \delta_1 + \varepsilon_{it}$$

where r_{it} is the return on index i in month t, δ_1 is a dummy variable assuming the value of 1.0 for the first index and 0.0 for the second, α_o and α_1 are constants, and ε_{it} is a mean-zero normal disturbance independent of δ_1. This regression was estimated using generalized least squares and assuming that $Cov(\varepsilon_{it}, \varepsilon_{it'})$, $t \neq t'$, was zero, that $Cov(\varepsilon_{it}, \varepsilon_{jt})$, $i \neq j$ was proportional to the $Cov(r_{it}, r_{jt})$, and that $Var(\varepsilon_{it})$ was proportional to $Var(r_{it})$. Assuming that the weighted index was the first index, the t value of α_1 for the overall period was -1.71; for the first half, -1.52; and for the second half, -0.77. Thus, α_1 is not significant at the 5 percent level.

[6]A joint test of the equality of the average rates of return for all four indexes was performed by running a similar regression as in the previous footnote except with three dummy variables, δ_i, i=1,2,3, defined as 1.0 for index i and 0.0 otherwise. The regression was calculated using generalized least squares making similar assumptions about the structure of the variance-covariance matrix of the disturbances as in the previous footnote. The F-statistics, which test the hypotheses that the coefficients on the dummy variables are jointly zero, were all insignificant at the 5 percent level in the overall period and each half.

[7]Blume and Friend, <u>op. cit.</u>

[8]Cf. B. F. King, "Market and Industry Factors in Stock Price Behavior," <u>Journal of Business</u>, XXXIX (January, 1966), Part II, pp. 139-190; S. L. Meyers, "A Re-examination of Market and Industry Factors in Stock Price Behavior," <u>The Journal of Finance</u>, XXVIII, No. 3 (June, 1973), pp. 695-705; D. Rie, "Security Valuation Formulae: Their Relationship to Estimates of the Risk-Return Tradeoff," Working Paper No. 29-73, Rodney L. White Center for Financial Research, University of Pennsylvania, The Wharton School.