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THE NATURE OF INDIVIDUAL INVESTORS' HETEROGENEOUS EXPECTATIONS *

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This article investigates whether heterogeneity in investors' perceptions of the risk/return characteristics of a particular stock and the stock market can be explained in terms of these investors' demographic characteristics (sex, age, income and education). Results indicate that these specific demographic characteristics are not particularly useful in differentiating among investors holding divergent opinions. But findings confirm previous results that investors' risk perceptions vary systematically and do not result simply from measurement error.

Expectations play an important role in finance. In the original version of the Capital Asset Pricing Model (CAPM) expectations were assumed to be homogeneous (Sharpe 1964). But few, if any, believed that investors really held homogeneous expectations. Several recent studies (Bart 1978; Bart and Masse 1981; Miller 1977; Peterson and Peterson 1982a; Peterson and Peterson 1982b; Swidler and Vanderheiden 1983) have argued that divergence of opinion (i.e., heterogeneous expectations) is important in the determination of asset prices and portfolio composition. Other studies (Gonedes 1976; Jarrow 1980; Lintner 1965;

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Lintner 1969; Rabinovitch and Owen 1978; Williams 1977) have investigated analytically how heterogeneous expectations in general, or of specific types, affect the implications of the CAPM.

Despite the importance of expectations in financial models, there has been very little empirical investigation of the nature of investors' heterogeneous expectations. But a related area, multidimensionality of risk, has received some attention (Baker and Haslem 1974; Cooley 1977; Friend et al. 1978; Gooding 1975; Gooding 1978; McInish 1982). Researchers have generally concluded that risk is multidimensional and that various types of risk "go together". Since risk is related to uncertainty concerning expectations for the future, this research also implies that expectations are, at least in part, systematic. Thus, differences in individual investors' assessments of various types of risk do not result simply from measurement error, but instead must be related through some common underlying mechanism.

This study extends previous work by investigating the nature of heterogeneous expectations among the stockholders of a single firm. Expectations both for the stock of this firm and the market (Dow-Jones Industrial Average-DJIA) are examined. Evidence is presented that perceptions of various measures of risk (beta, standard deviation and skewness; each measure is discussed in the next section) for each investor are biased in the same direction. This finding confirms previous work showing that risk perceptions vary systematically.

The possibility that these systematic differences in expectations can be explained in terms of investors' demographic characteristics is also explored. The specific demographic characteristics examined (sex, age, income and education) were chosen because previous literature has shown these characteristics to be related to attitudes toward risk. Blume and Friend (1978) found that male, less educated, richer and younger investors were less risk averse. Baker and Haslem (1977) found that males demonstrated a propensity to accept more financial risk. McInish (1982) found age and assets (an alternative to income as a measure of wealth) to be significantly related to the risk levels of common stocks owned. Since expectations influence behavior, this study investigates whether these findings concerning actual portfolio behavior also apply to investors' perceptions. This represents one of the first efforts to explain investors' expectations in terms of their demographic characteristics. Unfortunately, the evidence indicates that most of the specific demographic characteristics considered (other than education) do not

explain systematic differences in investors' risk perceptions.

This paper is divided into four parts. In the first, several articles dealing with investors' expectations are described. The second section describes the data and methodology. Then, the results are presented. The final section provides a summary and conclusions.

Investor expectations

A major result of the Capital Asset Pricing Model (CAPM), the most extensively tested financial model of the last decade, is that there is a positive relationship between expected stock returns and systematic risk. Systematic risk, measured by "beta", is the risk a security or portfolio shares (has in common) with the market. A security or portfolio which has more, the same and less systematic risk than the market would have a beta larger, the same or less than unity, respectively. In practice, beta is obtained by regressing the expected return on a security against the market return. According to the CAPM, given expected market returns, beta is the only relevant measure of risk in an efficiency diversified portfolio (Fama 1976).

But, if a portfolio is not efficiently diversified or if a security is held alone, other measures of risk become relevant. For example, Kraus and Litzenberger (1976) show that investors have a preference for lower standard deviations and higher (positive) skewness of returns. Others (Cooley 1977) have proposed kurtosis of returns as an additional measure of risk.

While the objective measures of risk (beta, standard deviation, skewness and kurtosis) have often been used in *ex post* tests of financial models based on aggregate data, applications based on *ex ante* individual investor data have been limited. The remainder of this section reviews articles dealing with individual investors' expectations.

Using a mail survey, Baker and Haslem (1974) collected data on thirty-four variables used by 851 individuals in making investment decisions. Socioeconomic and behavioral data for these individuals were also collected. Results indicated that investors' analysis of common stocks was a multidimensional process. Using factor analysis, three factors important in individual investment decisions were identified – dividends, future expectations and financial stability. The divided factor was found to be positively correlated with investors who sought

high dividend income and who were older, female and service workers. These individuals had low family income, were willing to accept only low financial risk and had little interest in capital appreciation. Future expectations were important for investors who sought large capital gains, owned a moderate amount of stock, and sought little dividend income. Financial stability was associated with being older, female, having little education and expecting a relatively high annual return.

Using a mail survey, Gooding (1975) collected data on risk perceptions from portfolio managers, investments professors and individual investors. Two different survey instruments were used; each was sent to one-half of the sample. The first instrument asked respondents to rank-order nine common stocks with respect to perceived risk, expected return and growth. The second questionnaire asked respondents to rate each possible pair of the nine stocks on a scale from similar to different. The three groups' perceptions were found to be highly intercorrelated and highly related to *ex post* risk measures. Perceptions of nonprofessionals were also found to be significantly more heterogeneous than those of professionals.

Gooding (1978) conducted a second survey (again consisting of two separate questionnaires, each sent to one-half of the sample) addressed exclusively to portfolio managers. About 135 responses were received for a response rate of 19%. The first questionnaire asked portfolio managers to rank eleven stocks with respect to seven attributes including expected risk, expected total return, beta, standard deviation and downside risk. The second instrument asked investors to rate each possible pair of the eleven securities on a nine-point scale from similar to different. Using multidimensional scaling, three interpretable perceptual dimensions were obtained: company risk, beta and perceived variability. Expectation of return was also found to be significantly correlated with multidimensional risk perceptions.

Cooley (1977) analyzed the risk perceptions of fifty-six portfolio managers. Nine distributions of potential returns, differing in terms of variance, skewness and kurtosis were presented to each manager. Subjects were asked to rate each possible pair of these distributions $((n(n-1)/2) = 36)$ on a nine-point scale in terms of perceived overall similarity. In addition, each distribution was rated individually on a nine-point scale in terms of perceived risk. Responses were analyzed using multidimensional scaling. Results indicated that variance captures a major part of what was viewed as risk by most investors. But a

substantial number of investors also associated increased risk with greater negative skewness and less kurtosis. The portfolio manager's age, experience, position, dollar amount managed, and type of firm with which affiliated were not significantly related to risk perceptions.

The surveys reviewed above have some drawbacks. First, if an experimental approach is used to create choice alternatives with varying risk (e.g., Cooley 1977), even though one may establish that individuals prefer alternatives with lower standard deviation, higher skewness and lower kurtosis, the external validity of these findings is questionable (do individuals hold variance and skewness expectations for stocks?). Second, if individuals are asked to evaluate some stocks that they do not own or are less familiar with (e.g., Gooding 1975), then heterogeneity in expectations is not surprising. This study alleviates these drawbacks by obtaining distributional expectations and then computing expected return, standard deviation, skewness and beta (rather than specifying them) and restricting these measures to a single stock owned by all the respondents.

Data and methodology

The data for this study were collected during March 1980 through a mail survey of a random sample of 300 common stockholders in a small manufacturing company located in the northeastern United States. Ninety-five responses (including 20 unusable) were obtained for a response rate of 32% overall (25% usable). This response rate is consistent with those of other mail surveys which are typically in the 20 - 30 percent range. Although a comparison of early (first one-third) versus late (last one-third) respondents revealed no systematic differences on either demographic or perceptual variables, the possibility of non-response bias cannot be ruled out.

Investors were asked to indicate their expectations for the performance of the stock (Appendix, question 1) and the DJIA (Appendix, question 2) during the remainder of 1980. The expected value, standard deviation and skewness of returns for the stock and the market (DJIA) were obtained from these distributional expectations. Investors were also asked to indicate their expectations for the performance of the stock if the DJIA were at each of ten specified values at the end of 1980 (Appendix, question 3). Data from this question were used to calculate

a beta for the company's stock for each individual (by regressing the stock expectations against (specific) market performance).

In addition to the data regarding expectations for the stock and the market, data were collected on each investor's sex, age, income and education.

While the questionnaire data are not perfect, the authors believe that they are adequate. The DJIA was chosen to represent the market because it was learned through focus group interviews that this was the best-known and most widely followed index. Investors were asked to indicate their expectations "to the nearest 5%" because a pretest indicated that greater accuracy would not be feasible. The range of 500–1200 was chosen for the DJIA because the pretest indicated that investors were virtually certain that the DJIA would be within this range at the end of 1980. The mean response in the pretest sample was about 800. While some investors would have expectations beyond the specified range, the small probabilities associated with extreme values would not appreciably bias the mean expectation.

Respondents were provided the initial values of the DJIA and the stock and also instructions on how the probabilities should appear. Despite the considerable "guidance" which this entailed, possible biases which might be introduced were believed to be offset by increased reliability of the responses. Note that to the extent that it is in the same direction for all respondents, any bias will not substantially affect the result of the study – unless there was considerable variation among individuals as to the extent of the bias due to "guidance".

Results

Table 1, part (a), shows the correlation between *ex ante* return, beta, the standard deviation and skewness of the returns for the individual stock. Results show that these correlations, except between skewness and standard deviation of stock returns, are all significant at the 0.05 level or better; this confirms the findings of previous researches that risk is multidimensional. Further, investors' perceptions of risk for an individual stock are shown to vary systematically. The correlations between *ex ante* risk measures for the DJIA (standard deviation and skewness of market return) are, with one exception, also significant at the 0.05 level (see table 1, part (b)). These results for the DJIA further reinforce the

view that the observed variation in investors' perceptions are systematic and not exclusively due to measurement error. The correlations in table 1 (parts (a) and (b) are not in disharmony with results obtained by Bart and Masse (1981). For example, higher expected returns for the stock are associated with greater risk (higher beta and standard deviation and lower skewness).

For both the individual stock and the market, results of regressions of return, standard deviation and skewness against sex, age, income and education are presented. Results of a similar regression with the stock's beta as the dependent variable are also presented. Because each of the seven dependent variables are measured on different scales, standardized regression coefficients are reported in table 2. In two of the seven regressions, none of the F-statistics for the coefficients of the demographic variables is significant. In the regression with the beta of the individual stock as the dependent variable, the coefficient of age is significant at the 0.05 level. Older individuals see lower betas. Similarly, in the regression equation with standard deviation of market returns as the dependent variable, the coefficient for income is positive and significant at the 0.05 level. More educated individuals expect significantly lower returns on the stock and market, but see greater skewness in the stock returns, as well as, a lower beta for the stock. That is, the more educated respondents were more pessimistic about both the stock

Table 1

	1	2	3	4
(a) Correlations between risk and return measures for stock				
1. Return on stock				
2. Beta of stock	0.374 [a]	-		
3. Standard deviation of stock returns	0.544 [a]	0.261 [b]	-	
4. Skewness of stock returns	−0.515 [a]	−0.245 [b]	−0.069	-
(b) Correlations between risk and return measures for market				
1. Return on market	-			
2. Standard deviation of market returns	0.187 [b]	-		
3. Skewness of market returns	0.119	0.302 [b]	-	

[a] Significant at the 0.01 level
[b] Significant at the 0.05 level

Table 2
Regression of return and risk measures for individual stock and market (DJIA) against demographic characteristics [a].

	Dependent variables						
	Return on stock	Beta of stock	Stand. dev. of stock returns	Skewness of stock returns	Return on market	Stand. dev. of market returns	Skewness of market returns
Independent variables							
Sex	−0.1396	−0.2304	−0.0719	0.0446	−0.1845	−0.1767	0.1635
	(1.22)	(3.39)	(0.31)	(0.12)	(2.11)	(1.94)	(1.58)
Age	0.0953	−0.2303	−0.0777	−0.0261	0.0947	0.0997	0.1174
	(0.67)	(4.00)	(0.43)	(0.05)	(0.66)	(0.73)	(0.96)
Income	0.0229	−0.0366	0.2282	0.0602	0.0464	0.2652	0.0218
	(0.04)	(0.76)	(3.42)	(0.24)	(0.14)	(4.78) [b]	(0.03)
Education	−0.3342	−0.3075	−0.2038	0.2782	−0.3120	−0.1299	0.0357
	(6.52) [b]	(5.62) [b]	(2.32)	(4.42) [b]	(5.63) [b]	(0.98)	(0.00)
Adjusted R^2	0.0545	0.0709	0.0655	0.0333	0.0438	0.0474	0.0000

[a] Standardized regression coefficients (F-ratio, with 1 and 70 degrees of freedom, in parentheses)
[b] Significant at $\alpha \leq 0.05$

and market performance and attached lower risk (lower beta, higher skewness) to this particular stock. Cooley (1977) has also shown that increases in skewness are associated with decreases in perceived risk. Overall, there is little evidence that systematic differences in investors' perceptions are associated with the demographic characteristics examined here since the only variable which is significant with any consistency is education.

Table 3 presents the results of the regression of the return on the stock against the return on the market, beta, the stock's standard deviation and skewness of return, as well as, the demographic characteristics previously considered. Both ordinary and standardized regression coefficients are reported in table 3 since each predictor variable is measured on a different scale. For each independent variable, the square of the standardized regression coefficient may be used as a measure of the relative contribution of that variable to the explained variance. The coefficient of return on the market is significant at the 0.05 level. That is, individuals relatively optimistic regarding stock performance are also relatively optimistic regarding the market performance. Contrary to the prediction of the CAPM, the coefficient of beta

Table 3
Results of regression of return on stock against return on market, risk measures and demographic characteristics

Independent variables	Regression coefficient	Standardized regression coefficient	F-ratio
Return on market	1.5582	0.3861	25.44 [a]
Risk measures			
Beta	0.0578	0.0981	1.57
Standard deviation of stock return	0.2903	0.4728	40.80 [a]
Skewness of return on stock	−0.1328	−0.3319	19.33 [a]
Demographic characteristics			
Sex	0.0020	0.0029	0.00
Age	0.0133	0.0358	0.23
Income	−0.0140	−0.0791	1.08
Education	0.0016	0.0051	0.00
Constant	−0.2258		0.06

[a] Significant at $\alpha \leq 0.01$
Adjusted $R^2 = 0.6458$

is not significant while the coefficient of standard deviation and skewness are significant at the 0.05 level. These results are consistent with the earlier findings that perceptions vary systematically. But the coefficients of sex, age, income, and education are not significant at the 0.05 level. While education was negatively related to both the stock and market returns (table 2) in a univariate sense, when controlling for market returns, it is no longer significantly related to stock returns. Hence, the demographic characteristics examined here do not explain systematic differences in investors' stock return expectations when the effect of expected market return and risk perceptions are statistically controlled.

Summary and conclusions

This study investigated the multidimensionality of investors' perceptions of the return and risk of a particular stock and of the market. Investors' *ex ante* risk perceptions for the stock (return, beta, standard deviation and skewness) and for the market (return, standard deviation and skewness of the DJIA average), respectively, were found to be significantly correlated. This evidence indicates that investors' perceptions vary systematically and do not result simply from measurement error.

Next, the question of whether these systematic differences in investors' perceptions could be explained by investors' demographic characteristics was examined. The stock's return, beta, standard deviation and skewness and the market's return, standard deviation and skewness were regressed against sex, age, income and education. Only six coefficients out of twenty-eight (7 regressions times 4 variables) were significant at the 0.05 lever or better. Hence, the observed differences in investors' perceptions could not be explained by these demographic variables.

Systematic differences in investors' perceptions clearly exist, but the question of what determines these differences remains. The authors conjecture that differing perceptions result from investors' differential learning, attitudes and psychological characteristics. The examination of these factors represents an area for future research.

Appendix: Excerpts from stock market perceptions questionnaire

This questionnaire is designed to measure your expectations regarding the performance of the stock market and the common stock of XYZ Corporation. At the beginning of March 1, 1980, the Dow Jones Industrial Average (DJIA) was 863 and the bid price of the common stock of XYZ Corporation (XYZ) was \$3 $\frac{1}{4}$ per share.

(Q1) We first want you to indicate the approximate probability (say to the nearest 5 percent) that the DJIA will be greater than the figures provided (see below) at the end of December 31, 1980. For example, if you are 95 percent sure that the DJIA will be greater than 600 at the end of 1980, enter "95" in the blank space next to the value "600" for DJIA. Similarly if you are only 10 percent sure that the DJIA will be greater than 900 at the end of 1980, enter "10" in the blank space adjacent to the value "900" for DJIA. Please fill in *all* the spaces adjacent to the values of DJIA. Remember, as the DJIA value increases, you should be *less* sure that it will be exceeded at the end of 1980. Consequently, your precent figures should decline with increases in the DJIA values.

Dow Jones Industrial Average	Probability that the Dow Jones Industrial Average will be Greater Than the Figure to the Left at the End of December 31, 1980
500	_____
600	_____
700	_____
750	_____
800	_____
850	_____
900	_____
1000	_____
1100	_____
1200	_____

(Q2) Similarly, we would like to obtain your opinions regarding the probability that the bid price of the common stock of XYZ Corporation will exceed the values provided at the end of December 31, 1980. Remember, as with the DJIA, as the stated value in the left hand column increases, the *probability* that the bid price of the XYZ common stock at the end of December 31, 1980 will exceed this value should decrease.

Price Per Share of XYZ Corporation	Probability that the Bid Price of XYZ Common Stock will be Greater Than the Figure to the Left at the end of December 31, 1980
$1	
$2	
$3	
$4	
$5	
$6	
$7	
$8	
$9	
$10	

(Q3) Next, we would like you to indicate your expectation of the approximate bid price (say to the nearest quarter ($\frac{1}{4}$) dollar) of the XYZ Corporation common stock at the end of December 31, 1980 if the various DJIA levels (given below) were to occur. For example, if at the end of 1980 the DJIA were 700, and you expect that corresponding to that level of market performance the bid price of the XYZ common stock would be 3\frac{1}{4}$ then you would write "$3\frac{1}{4}$" in column 2 (below) directly across from 700. Please fill in all blank spaces in column 2 (below).

Possible Dow Jones Industrial Averages at the End of December 31, 1980	Bid Price of XYZ Corporation Common Stock Corresponding to Possible Levels of DJIA Provided in Column to the Left
500	
600	
700	
750	
800	
850	
900	
1000	
1100	
1200	

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