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THE CHICAGO BOARD OPTIONS EXCHANGE: THE BIRTH OF A NEW MARKET

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by

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I. Introduction and Statement of Objective

Trading on the Chicago Board Options Exchange commenced on April 26, 1973, thereby presenting a unique opportunity to investigate the origin of an active market for a financial security. The idea of an active market for trading a standardized security started in 1969, when the Chicago Board of Trade, the nations largest commodity exchange, decided to diversify into new markets. The Chicago Board Options Exchange options basically resemble call options which have long been purchased and sold in the over-the-counter market. However, they differ from the puts and calls previously traded in three ways: (1) the terms have been standardized, (2) the one-to-one relationship between the writer and the buyer, has been eliminated, thus the original writer of the option is not always obligated to the buyer of the option; and, (3) a continuous secondary market for options now exists.

A call option is a legal contract between the buyer and the writer under which the writer, for a premium, guarantees the buyer his right to exercise the privilege of buying or "calling" from the writer the option of 100 shares of a designated security at a predetermined ("striking") price within a specific time interval. The option is strictly an agreement between investors and represents no debt, equity, or other form of obligation on the part of the company whose common shares are involved.

The objective of this paper is to present a detailed look at the Chicago Board Options Exchange and its participants. Correlation and regression are the basic techniques used in evaluating the performance of the exchange in its first year-and-a-half, and in appraising the

strategy of the average market participant.

The study is presented as follows: A market index for the Chicago Board Options Exchange is constructed and evaluated in Section II; Section III deals with an analysis of the Chicago Board Options Exchange participants, and overall conclusions concerning the Chicago Board Options Exchange are presented in Section IV.

II. CBOE Market Index

This study covers the period from April 1973, when the CBOE opened, through December 1974. Initially sixteen companies were traded; this number increased to thirty-two by October 1973. The particular firms are listed in Table 1.

TABLE 1

FIRMS TRADED ON THE CBOE

American Telephone & Telegraph	Kresge Co.
Atlantic Richfield	Loew's Corp.
Avon Products, Inc.	Minnesota Mining & Mfg. Co.
Bethlehem Steel, Inc.	McDonald's Corp.
Brunswick Corp.	Merck & Co.
Eastman Kodak Co.	Monsanto Co.
Exxon	Northwest Airlines, Inc.
Ford Motor Co.	Pennzoil Corp.
Citicorp	Polaroid Corp.
Gulf & Western Industries, Inc.	RCA Corp.
Great Western Financial Corp.	Sears Roebuck & Co.
IBM	Sperry Rand Corp.
INA Corp.	Texas Instruments, Inc.
Int'l Telephone & Telegraph	Upjohn
International Harvester Co.	Weyerhaeuser Co.
Kerr-McGee Corp.	Xerox Corp.

For the data base of this study each firm was assigned an identification number. Then every Friday during the time span covered, the closing market price of the corporations' stock was recorded, along with the striking price of a particular option for a given maturity. Each firm had three different maturity ranges for a given striking price, so there were three option market prices--short maturities (1-3 months), long-term maturities (6-9 months). Since the option market price, striking price, and underlying security market price are affected by stock splits, the data was adjusted for those firms which had stock splits during the time period. A relative measure was required by which prices for the short-, intermediate-, and long-term options could be related to the options' "striking price" and to each other. It was hypothesized that the ratio of the option striking price to the market price of the

stock underlying the option should indicate a relationship between the associated short-, intermediate-, and long-term option prices. Quanitatively the hypothesized relationship can be expressed as follows:

$$f(SP/MKTP) = O_i / \sum_{n=1}^{3} O_n \qquad (1)$$

where: SP = Striking price of an option.
MKTP = Market price of the stock underlying the option.
O_i = Specific price of the option where i can take on the values of one to three, indicating the short-, intermediate-, and long-term option prices respectively.
f(SP/MKTP)= A function of the percentage (SP/MKTP).

Therefore, a test of this hypothesized relationship was performed using regression techniques to test the following null and alternative hypotheses:

H_o: The ratio of the option striking price to the market price of the stock underlying the option is significantly correlated with each of the three ratios for the maturities of the options.

H_1: The ratio of option striking price to market price of the stock underlying the option is not related to the ratios.

The criterion used to test these hypotheses was to accept H_o if the correlation coefficients between the percentage (SP/MKTP) and the three percentages, $O_n / \sum_{i=1}^{3} O_i$ (2), where n varies from one to three, were significant at the five percent level using the F-test. Otherwise, H_o was rejected and H_1 would be accepted. The actual meaning of SP/MKT is the intrinsic value that is attached to a given option. The smaller the percentage of SP/MKT the greater the value of the option. Conversely the larger the value of SP/MKT the less value the option has.

Any options not traded on a Friday for all three maturities were treated as missing data. This procedure decreased the number of observations to 3,237 which were stratified into groups based on the

ratio SP/MKTP. The grouping ranged from .625 to 2.487 incremented at one tenth of one percentage point. The specific method of arranging the data was to stratify by the SP/MKTP value all of those options which were within one-tenth of a given value. For each value of SP/MKTP there are various values, $O_n / \sum_{i=1}^{3} O_i$, associated with a given group. This averaging technique reduced the data's precision. Given the number of observations that remain (646) and the fact that the range over which the data varied was retained, however, this averaging technique should not destroy any useful information, particularly since it is the average relationships which are of interest.

Initial analysis of the indicated distribution of percentages indicated that the null hypothesis stated above should be accepted. The result of running a correlation of the variables is shown in Table 2.

TABLE 2

Correlation Matrix for SP/MKTP; 0_1; 0_2; and 0_3

N=646 DF=644 R@.95=.0771 R@.99=.1013

VARIABLE				
SP/MKTP	1.0000			
0_1	-.8041	1.0000		
0_2	-.5876	.3830	1.0000	
0_3	.8583	-.9511	-.6496	1.000
	SP/MKTP	0_1	0_2	0_3

where X = Short-term option price + intermediate-term option price + long-term option price

0_1 = Short term option price/X

0_2 = Intermediate term option price/X

0_3 = Long term option price/X

Note: The variable SP/MKTP is treated as the independent variable and 0_1, 0_2, and 0_3 are treated as the dependent variables in this study.

The highly significant correlation between SP/MKT and the three variables 0_1, 0_2, 0_3, indicated strong relationships which provide support for the acceptance of the null hypothesis. The variable SP/MKT was regressed and plotted separately against each of the variables 0_1, 0_2, and 0_3. Tables 3, 4 and 5 present the results of the regressions as well as the scatter plots of the data.

As is apparent in the regression results and the scatter plots, there is a uniquely identifiable relationship between the value of the option and its maturity.

Frequency histograms were plotted for SP/MKT and for each maturity. The distribution of SP/MKT is slightly skewed to the right; 0_1 is clearly bimodal; 0_2 is very closely centered around its mean, and 0_3 appears randomly dispersed. These distributions are presented in Tables 6-9.

An index of option exchange performance is necessary to facilitate comparison of the activity in the option market with that occuring in any stock market. Theoretically, it has been proposed by Black and Scholes[1] and Merton[2] that given the speculative nature of options, movement on the CBOE should not be related to movements of the stock market in general. The index used as a measure of the stock market was the Standard and Poors 500. In their book, Lorie and Hamilton[3] discuss

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[1]Fisher Black and Myron Scholes, "The Valuation of Option Contracts and a Test of Market Efficiency," Journal of Finance, "May 1972."

[2]Robert C. Merton, "Theory of Rational Option Pricing," The Bell Journal of Economics and Management Science, "Spring 1973."

[3]James W. Lorie and Mary T. Hamilton, The Stock Market: Theories and Evidence (Homewood, Ill.: Richard D. Irwin, 1973).

the various types of indices that are used to measure market activity. They indicate that Fisher's link-relative index is probably the best measure of market performance.[4] Basically Fisher proposed using percentage-first differences in order to measure the amount of movement on an exchange in relative terms. Following his suggestion, the method can be described mathematically as follows:

$$\text{Percentage Return for Week 1} = \frac{\text{Level of Market Week 2} - \text{Level of Market Week 1}}{\text{Level of Market Week 1}} \quad (3)$$

Because no measure of the CBOE performance exists, an index had to be constructed. Fisher's technique was once again employed to compute a weekly return for each optioned security. Each of the returns for the securities is then weighed by the market value of its outstanding equity, and a weighted average is then calculated for a given week.

This index format was selected for two reasons. First, this method would facilitate comparison of option performance with the performance of the stock market by transforming the Standard and Poors average to the percentage weekly return as indicated above. Comparisons would thus be meaningful since they would be made using the same relative units. Second, this method "detrends" the data very effectively. Since the Standard and Poors index had a definite downward trend during a large part of the period under study, this was a major consideration in selecting a measure.

Thus, based on the theoretical argument that movement in options should not foretell movement in the general market, a null and alternative hypothesis was established as follows:

H_0: Percentage increases and decreases in returns on the option exchange are not related to movement in the stock market as a whole.

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[4] Lawrence Fisher, "Some New Stock Market Indexes," Journal of Business, 39 (January 1966): 191-225.

H_1: Percentage increases and decreases in returns on the option exchange do relate to actual movements in the stock market.

The criteria used to evaluate these hypotheses were the correlation coefficients and coefficients of determination between the percentage returns of the Standard and Poors average by week and the option index percentage return by week. If the correlation coefficient is not significant at the five percent level as measured by the F-test, the null hypothesis was to be accepted. If statistical significance existed between the coefficients, the alternative hypothesis was to be selected.

In order to construct the index, a method of averaging the three maturities of options was needed. The index was calculated for an individual firm in the following manner:

$$AVG_{t,c} = \frac{A_{t,}\ it\ B_{t,}\ it\ C_{t,i}}{F_{T,i}} \left(\sqrt{SP/MKT)_{t,i} \right. \qquad (4)$$

where $AVG_{t,i}$ is the weighted-average option value for firm i during week t for a given striking price.

$A_{t,i}$ is the short-term option price for firm i during week t for a given striking price.

$B_{t,i}$ is the intermediate option price for firm i during week t for a given striking price.

$C_{t,i}$ is the long-term option price for firm i during week t for a given striking price.

$F_{T,i}$ is the number of option prices available for firm i during week t for a given striking price. It can take on the value 1, 2, or 3.

Multiplying by the square root of the variable SP/MKT normalizes the distribution of the variable SP/MKT. If this were not done, the skewness of the distribution for SP/MKT would tend to bias the ultimate value of the index upward because of extreme values. Clearly, a log transformation should be taken of SP/MKT to normalize its distribution by pulling in the right tail while the values at the left of the distribution are moved away from the mean. However, this adjustment caused problems in later calculations by creating negative numbers for those SP/MKT values less than one. A number of different transformations were performed on the distribution of SP/MKT, the square root being about as effective as that of the log transformation.

These averages were computed for each firm's striking prices during each week of the study. Then the weekly percentage-first difference for each firm was computed. These weekly rates of return for each firm's striking price were multiplied by a market weighting factor which consisted of the average number of shares outstanding for the firm during the entire period of study, multiplied by the market value of the firm's stock at the beginning of the period, dividend by the sum of the market values of all firms in the study. Equation (5) presents the algorithm that was used.

$$\frac{\text{Shares}_i \times \text{MKT Price}_i}{\sum \text{Shares}_i \times \text{MKT Price}_i} \quad (R_{i,t}) = \gamma_{i,t} \qquad (5)$$

i = all firms

where R_i is the weekly return for firm i during week t.

$\gamma_{i,t}$ is the market value weighted return for the ith firm during week t.

For each of these weekly returns, a link relative was calculated and a geometric average was taken for calculating the overall index using the following algorithm:

$$I_t = N\sqrt{\prod^{i}(1+\gamma_i)_t} - 1 \qquad (6)$$

i = all firms and all striking prices

where I_t is the weekly index of returns for all firms with CBOE options for week t.

Table 10 shows the time series plot of the S & P 500's weekly returns and the CBOE Index's weekly returns over the 85 weeks of the study.

The option index was regressed and correlated as the independent variable against the percentage returns computed from the Standard and Poors average. Initially, the entire time frame (87 weeks of data) was used. In this analysis no significant correlation at the five percent level existed. The option index was led and lagged one week, two weeks, three weeks, one month, two months, three months, and six months. In none of these cases did a regression coefficient exceed that which could have occurred by chance at the .5 percent significance level.

The first twenty-two weeks of the option series showed great variation because of the newness of option trading. To remove some of the problems of initiation and the variation on the option exchange from the data, we eliminated these twenty-two weeks of the series. The remaining index values were regressed against the Standard and Poors returns to find statistically significant correlation between the Standard and Poors percentage returns and the option index, with $R^2 = .29716$, $R = .54512$, standard error = 2.4313, F-Statistic computed to

be 26.213 and significant at the .0000 level with N = 64. These percentage returns are plotted in their time series in Table 11. Residuals of this data showed only random variation when plotted. Leading and lagging these observations for the time periods indicated above, proved to be insignificant except for leading the option index relative to the stock market index by one month. This resulted in an R^2 = .10178, R = .31903, and a standard error of 2.7852. The F-Statistic was computed to be 6.5721 and was significant at the .013 level. Although these two relationships are significant under the F-test, it is obvious that the regressions are of little predictive value given the high Standard Error terms relative to the data.

The evidence thus would support rejection of the null hypothesis. There is some relationship between the option market and the stock market; however, it should be remembered that the associations are weak at best.

III. CBOE Participants

The variable labeled (SP/MKTP) is, in theory, an indication of the present value of an option. As SP/MKT becomes larger, the value of the striking price of the option grows in relation to the market price of the stock underlying that option. If SP/MKT is less than one, the holder of the option can purchase the shares of stock underlying the option for less than the market price of the stock (not considering transaction costs). This privilege of purchasing the stock at less than its market value imputs value to the option. As SP/MKT increases above 1.0, the right to buy the stock for a price greater than the current market price of the stock has less value. Therefore, the only way the option will become valuable is if the price of the stock rises above the striking price of the option. The variables O_1, O_2, and O_3 can be viewed as the percentages of how a given investor would be willing to allocate his funds among the three option maturities, given the value of the options.

When SP/MKT is far less than one, there is no question that the option has value. From Tables 3, 4 ,and 5 it appears that the market participants are in agreement as to the worth of the option when SP/MKT is less than one. The variation in all three plots is much less and the relationship is approximately linear when the option has certain value. When the option has definite value, investors appear willing to allocate their funds approximately evenly between the three types of options, giving a small premium for options with longer maturities. At the lowest SP/MKT (.625), it appears that investors are willing to allocate their funds approximately 31 percent in the short-term, 33 percent in the intermediate-term, and 35 percent to the long-term options. This implies that investors seem to be indifferent to maturity when they are cetain about value.

The second implication from the data is that, as the option becomes valueless, investors shift their distribution of funds. The more SP/MKT increases above one, the more the market price of the stock underlying the option will have to increase in order to give the option value. Therefore, as SP/MKT increases, investors are unwilling to place much of their money in option contracts which will expire soon. They are willing to pay a high premium to gain a greater length of time before the option expires. Thus, the investor is willing to pay more to reduce the risk of losing his investment. This is indicated on the graphs by viewing the sharp drop in the percentage that investors are willing to invest in short-term options (Table 3), as opposed to long-term (Table 5), when the option striking price becomes large in relation to the market price of the stock. Investors allocate their funds approximately 15 percent-21 percent in short-term options, 32 percent-36 percent in intermediate-term options, and 45 percent-50 percent in long term options when SP/MKT equals one.

This transfer of funds to more long term maturities as SP/MKT increases in size is further brought out by the extremely high correlation coefficient between the O_1 and the O_3 variables (see Table 2). Given the data, it is uncertain whether the shift in these funds occurs directly from the short-term market to the long-term, or simply from the short-term to the intermediate accompanied by a movement from intermediate-term to long- term. The latter of these possibilities implies different types of investors. Further research on this question is required and is beyond the scope of this study.

Options have been used primarily in creating riskless portfolios. By combining long positions in the securities and writing or buying options, a return is guaranteed as long as the investor is able

to predict whether a particular security's price will move within a certain range. The use of a spread can be profitable if the investor feels that the price of the underlying security will remain in a predetermined trading range, or if the investor feels that the price will move above or below a predetermined range. For example an investor believes that security A will trade somewhere between 80 and 100. He can purchase call option's to buy the stock at 80 and 100. At the same time he can write two options to sell security A at 90. If the stock price moves to 80 or below, or to 100 or above the loss and gain on the buy and sell sides will simply offset each other. The investor will profit at any price between 81 and 99, his maximum profit occurring at a market price of 90 where the loss from the 100 option is offset by the gain from the 80 option. The premium earned by the investor for the two 90 options represents his profit. If the investor believes the price of the security will move outside of the 80 to 100 range, he can write options at 80 and 100 then buy two 90 options for similar results. Many other variations can be concocted to eliminate the risk caused by fluctuations in the prices of securities.

As more investors begin to take advantage of option trading and writing, interest in the CBOE and other proposed or actual markets will develop.

IV. Conclusion

The wide fluctuations in returns in the first weeks after the opening of the CBOE can be explained by the fact that it was an entirely new market and required a few months to stabilize. After stabilization took place, there was much less variation on an absolute percentage basis than there was in the stock market itself. However, on a relative basis the coefficient of variation for the option exchange was much greater than that of the Standard and Poors average, i.e., 6.40 for the option exchange as opposed to -4.05 for the stock market index (see Table 4). The cause of this difference is due to the extremely small mean of the option index.

TABLE 4

Coefficient of Variation

OPTION INDEX	V = .0206/.0032 = 6.40 = 640 percent
STND & POORS	V =2.8770/-.7097= -4.05 = 405 percent

Overall, it is rather surprising that the performance of options did not appear to lead the general market significantly. It was also significant that greater absolute percentage variation in the general return on options did not occur. This finding is especially apparent in light of the speculative nature of options. There are four possible explanations.

(1) The option market is composed of better trained, more financially mature investors than is the general stock market. Therefore, the herding effect which can occur in the general market is suppressed in the option market.

(2) The general stock market was in a downward trend for much of the study period; consequently, investors were performing very cautiously.

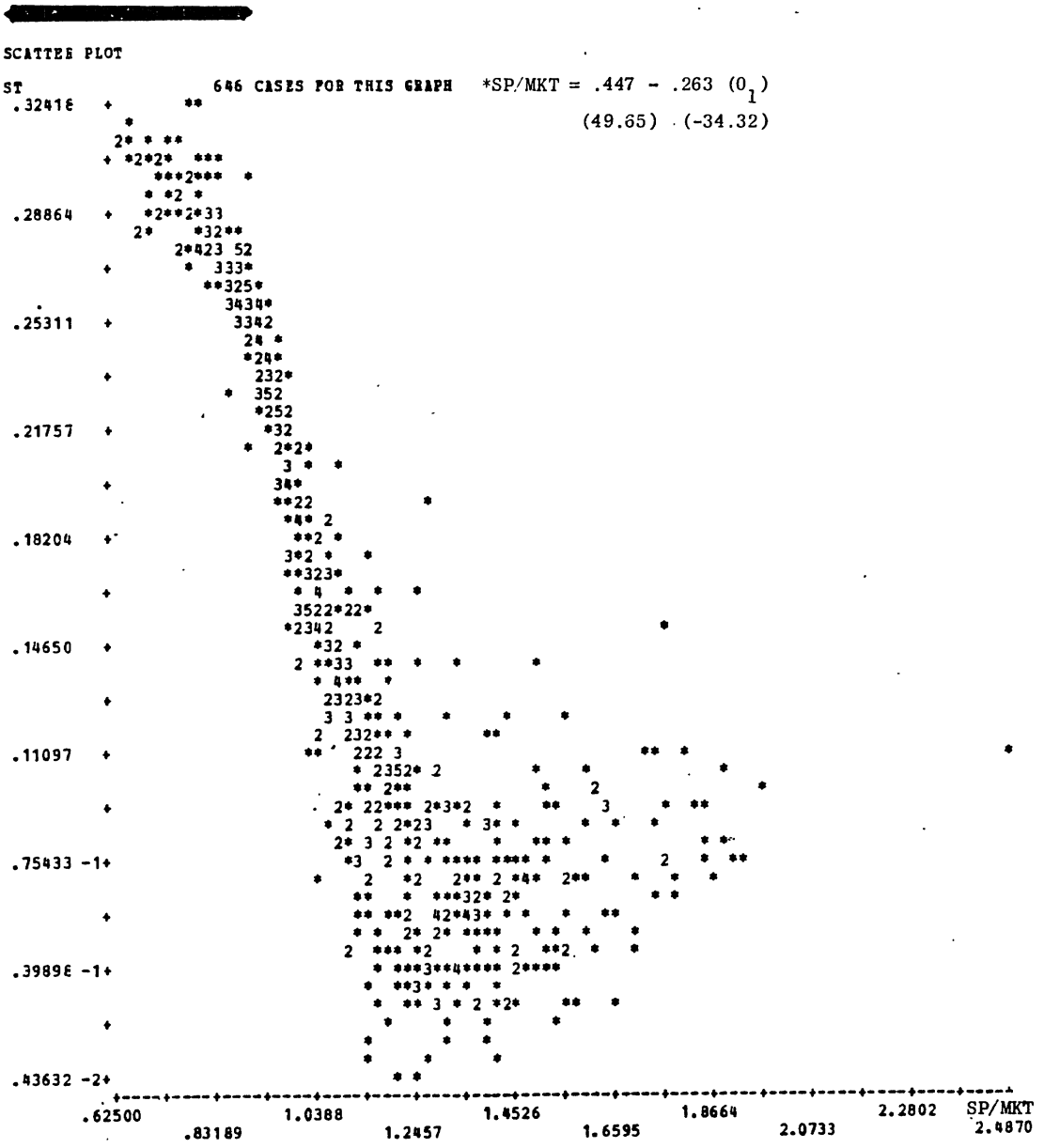
(3) The average returns of the option exchange may possibly lead the performance of the underlying stocks on a daily basis.

(4) The fluctuations in option returns may be of lower absolute percentage amounts because of the lower risk associated with the purchase of an option, as opposed to the purchase of stock. There is a much smaller risk of large losses associated with the purchase of an option as opposed to the purchase of stock because of the differences in the absolute amount of investment required.

These explanations are not implied to be the only possible causes, nor are they to be considered mutually exclusive. The actions and strategies of investors are as diverse as are the types of investors themselves. This study approaches the CBOE in a quantitative manner and attempts to define past relationships. It is apparent that more research is needed concerning the exchange before any final judgments can be made. It is hoped that this paper may stimulate further quantitative research in this area.

TABLE 3

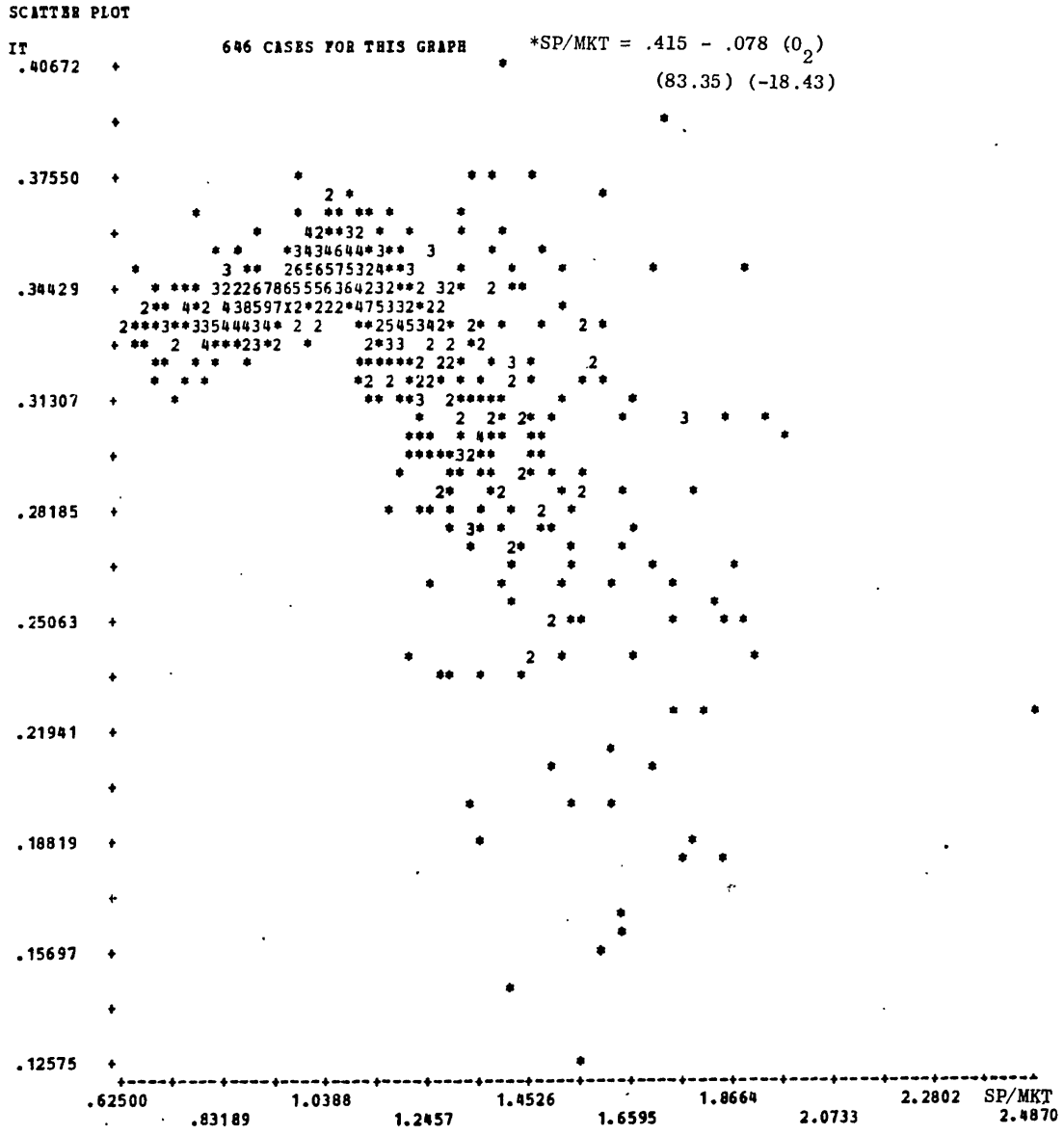
REGRESSION AND SCATTER PLOT FOR SHORT-TERM OPTIONS



*The numbers in parentheses are the T-Statistics which indicate that the α, B estimate significantly are not equal to zero.

TABLE 4

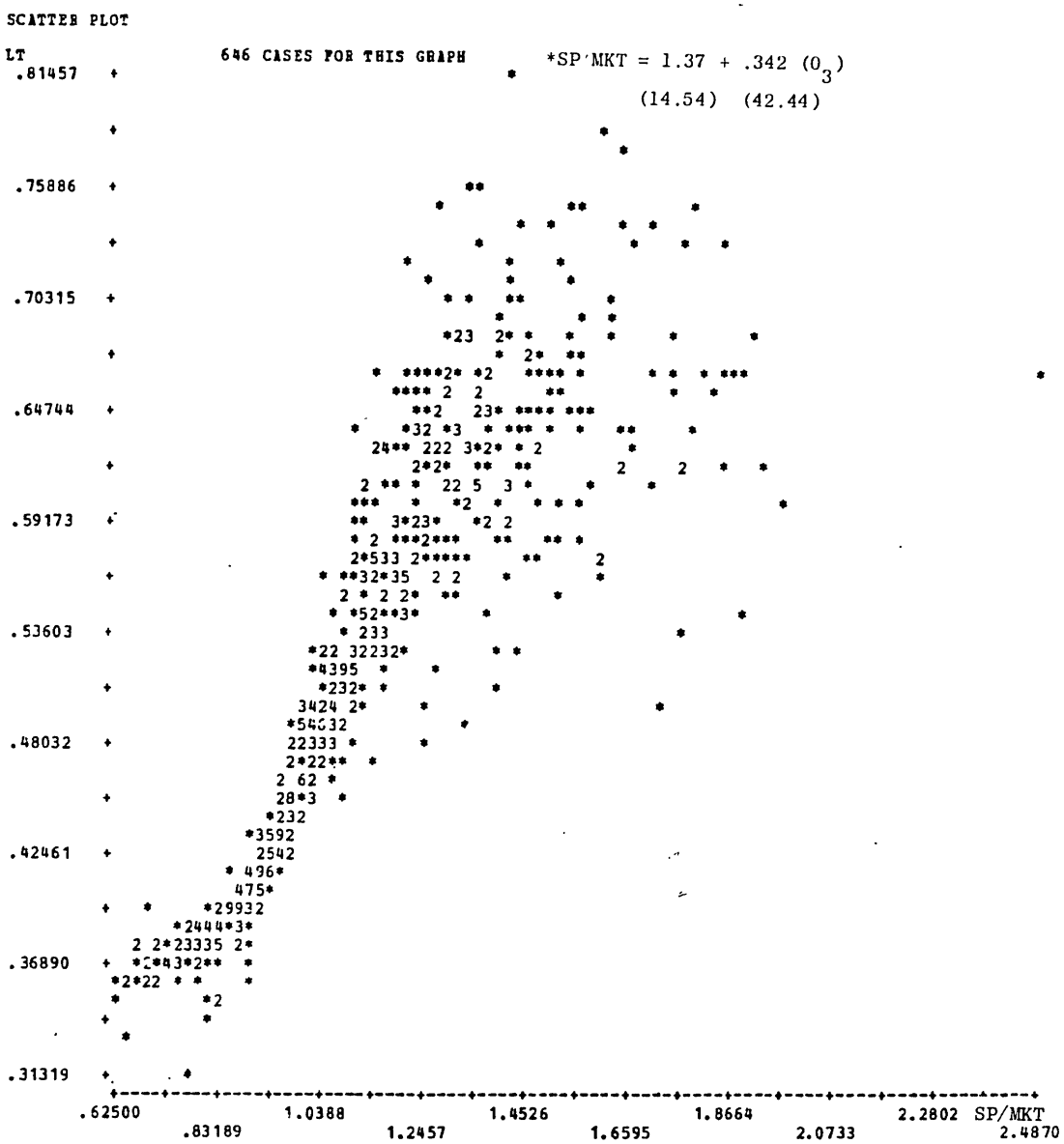
REGRESSION AND SCATTER PLOT FOR INTERMEDIATE TERM OPTIONS



*The numbers in parentheses are the T-Statistics which indicate that the α, B estimates significantly are not equal to zero.

TABLE 5

REGRESSION AND SCATTER PLOT FOR LONG-TERM OPTIONS



*The numbers in parentheses are the T-Statistics which indicate that the α, B estimates significantly are not equal to zero.

TABLE 6
FREQUENCY DISTRIBUTION OF SP/MKT

HISTOGRAM/FREQUENCIES

MIDPOINT	COUNT FOR SP/MKT (EACH X =1)	
.62500	6	+XXXXXX
.69948	17	+XXXXXXXXXXXXXXXXX
.77396	30	+XXXXXXXXXXXXXXXXXXXXXXXXXXXX
.84845	51	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.92293	70	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.99741	72	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.0719	74	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.1464	72	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.2209	61	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.2953	51	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.3698	41	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.4443	34	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
1.5188	21	+XXXXXXXXXXXXXXXXXXXXX
1.5933	14	+XXXXXXXXXXXXXX
1.6677	10	+XXXXXXXXXX
1.7422	9	+XXXXXXXXX
1.8167	6	+XXXXXX
1.8912	4	+XXXX
1.9657	2	+XX
2.0402	0	+
2.1146	0	+
2.1891	0	+
2.2636	0	+
2.3381	0	+
4126	0	+
4870	1	+X

MISSING	1304	
TOTAL	1950	(.74482 -1 = INTERVAL WIDTH)

TABLE 7
FREQUENCY DISTRIBUTION FOR SHORT-TERM

HISTOGRAM/FREQUENCIES

MIDPOINT	COUNT	FOR ST (EACH X =1)
.43632 -2	3	+XXX
.17156 -1	9	+XXXXXXXXX
.29948 -1	26	+XXXXXXXXXXXXXXXXXXXXXXXXXX
.42741 -1	41	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.55533 -1	43	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.68326 -1	45	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.81118 -1	52	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.93911 -1	42	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.10670	36	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.11950	28	+XXXXXXXXXXXXXXXXXXXXXXXXXXX
.13229	27	+XXXXXXXXXXXXXXXXXXXXXXXXXXX
.14508	23	+XXXXXXXXXXXXXXXXXXXXXXX
.15787	26	+XXXXXXXXXXXXXXXXXXXXXXXXXX
.17067	22	+XXXXXXXXXXXXXXXXXXXXXX
.18346	16	+XXXXXXXXXXXXXXXX
.19625	17	+XXXXXXXXXXXXXXXXX
.20904	13	+XXXXXXXXXXXXX
.22184	18	+XXXXXXXXXXXXXXXXXX
.23463	20	+XXXXXXXXXXXXXXXXXXXX
.24742	18	+XXXXXXXXXXXXXXXXXX
.26021	29	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.27301	31	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.28580	28	+XXXXXXXXXXXXXXXXXXXXXXXXXXXX
.29859	18	+XXXXXXXXXXXXXXXXXX
.31138	13	+XXXXXXXXXXXXX
.32418	2	+XX
MISSING	1304	
TOTAL	1950	(.12793 -1 = INTERVAL WIDTH)

TABLE 8

FREQUENCY DISTRIBUTION FOR INTERMEDIATE-TERM

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HISTOGRAM/FREQUENCIES

MIDPOINT     COUNT FOR IT          (EACH X =2)

 .12575        1 +X
 .13699        0 +
 .14823        1 +X
 .15947        2 +X
 .17070        1 +X
 .18194        2 +X
 .19318        2 +X
 .20442        3 +XX
 .21566        3 +XX
 .22690        3 +XX
 .23814       10 +XXXXX
 .24938        9 +XXXXX
 .26062        6 +XXX
 .27186       11 +XXXXXX
 .28310       25 +XXXXXXXXXXXXX
 .29433       26 +XXXXXXXXXXXXX
 .30557       30 +XXXXXXXXXXXXXXX
 .31681       43 +XXXXXXXXXXXXXXXXXXXXXX
 .32805       97 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 .33929      196 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 .35053      133 +XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 .36177       32 +XXXXXXXXXXXXXXXX
 .37301        8 +XXXX
 .38425        1 +X
 .39549        0 +
 .40672        1 +X

 MISSING     1304
 TOTAL       1950   ( .11239 -1 = INTERVAL WIDTH)
```

TABLE 9

FREQUENCY DISTRIBUTION FOR LONG-TERM

HISTOGRAM/FREQUENCIES

MIDPOINT	COUNT	FOR LT (EACH X =1)
.31319	1	+X
.33324	2	+XX
.35330	15	+XXXXXXXXXXXXXXX
.37335	42	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.39341	52	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.41346	35	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.43352	33	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.45358	29	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.47363	26	+XXXXXXXXXXXXXXXXXXXXXXXXXX
.49369	41	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.51374	38	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.53380	33	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.55385	37	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.57391	45	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.59396	32	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.61402	37	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.63407	50	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.65413	25	+XXXXXXXXXXXXXXXXXXXXXXXXX
.67419	35	+XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
.69424	14	+XXXXXXXXXXXXXX
.71430	7	+XXXXXXX
.73435	7	+XXXXXXX
.75441	7	+XXXXXXX
.77446	1	+X
.79452	1	+X
.81457	1	+X

MISSING	1304	
TOTAL	1950	(.20055 -1 = INTERVAL WIDTH)

TABLE 10
Standard and Poor's 500 and CBOE Index
April 1973 - December 1974

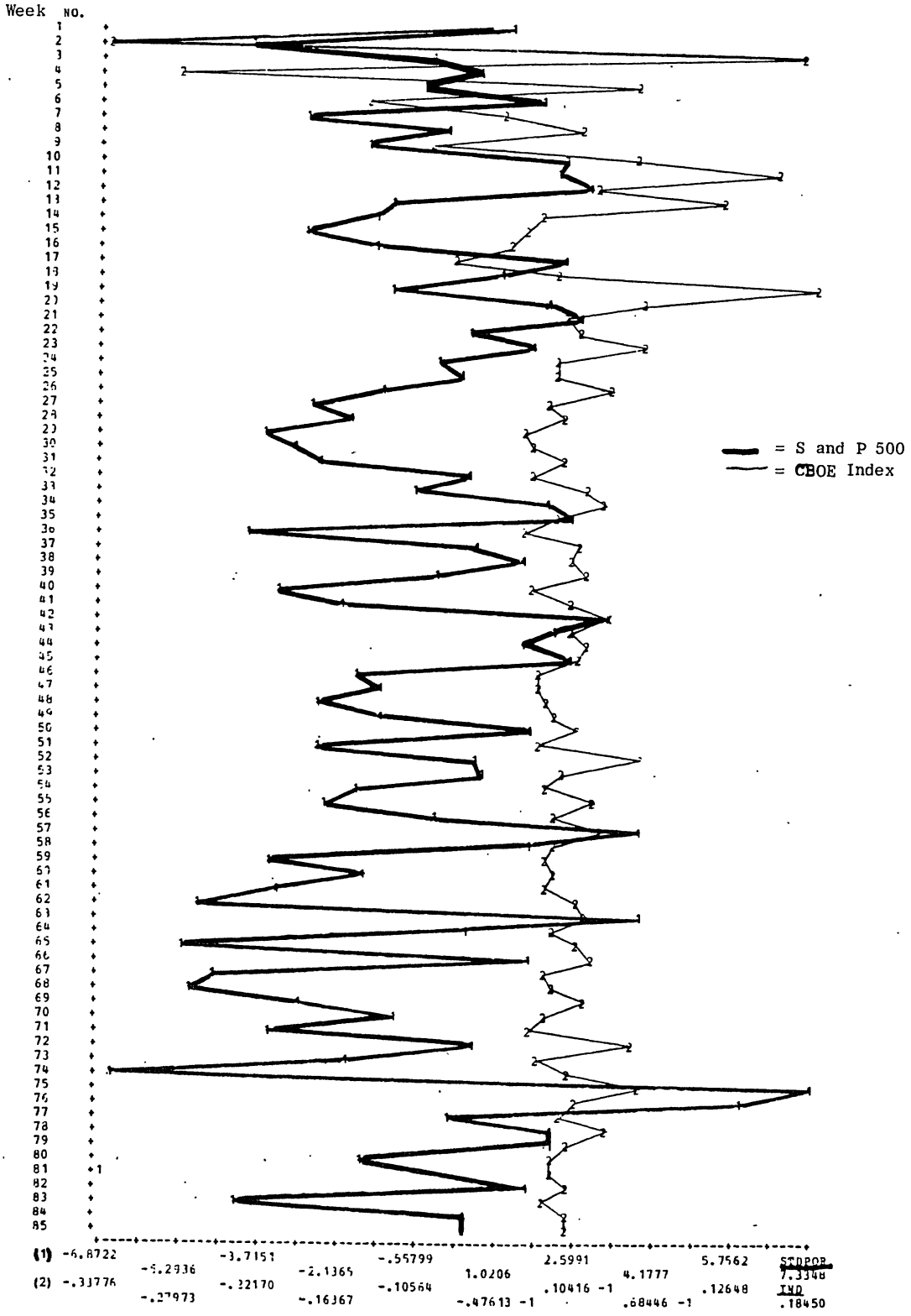

TABLE 11
The CBOE Index and the Standard and Poor's 500 for
October 73 - December 74