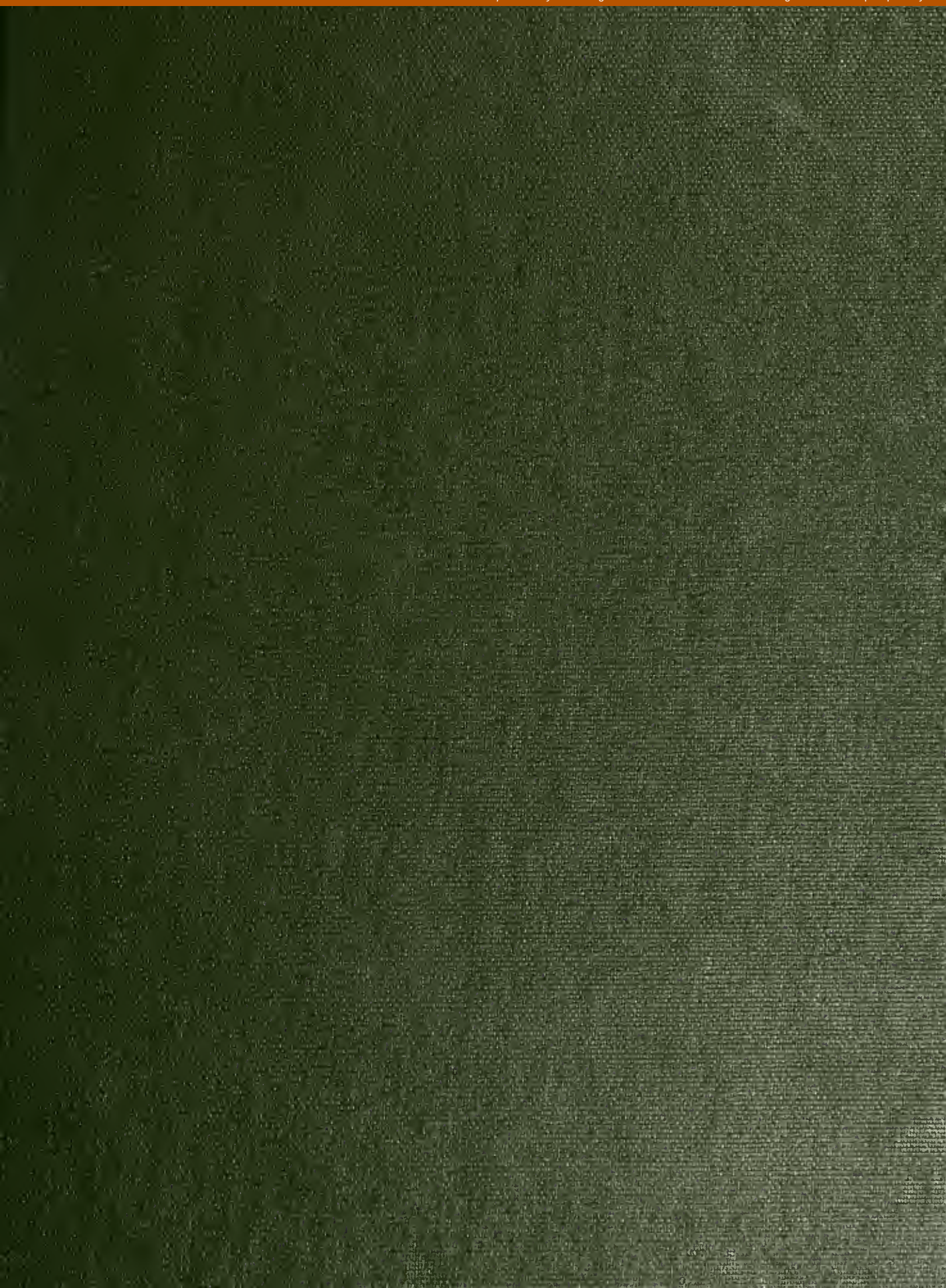

Faculty Working Papers

PENSION PLANS AND THE WRITING OF FULLY-COVERED EXCHANGE TRADED CALL OPTIONS

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Summary

A question now facing many pension fund managers is whether or not some type of fully-covered call option writing strategy should be pursued. This study was designed to help provide an answer to this question by comparing the risk and returns experienced by two buy-and-hold option portfolios to that of the underlying stocks and of the stock market as a whole for the period May 1973 through April 1977. The major conclusions are: 1) covered call option writing provides a way to reduce the risk associated with an equity portfolio, 2) no evidence was found to support the belief that a learning period favorable to option writing existed during the first year or two of CBOE existence, and 3) options are most likely to improve the risk-adjusted returns of an equity portfolio during periods when overall market prices are declining.

INTRODUCTION

With the passage of the Employee Retirement Income Security Act (ERISA) of 1974, investment managers and other fiduciaries of pension funds have found themselves subject to vague, but potentially strict standards of conduct. Among other requirements, ERISA provides that individuals in charge of pension assets must act "with the care, skill, prudence, and diligence under the circumstances then prevailing that a prudent man acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of a like character and with like aims" [29 U.S.C.A., sec. 404(a) (1974)]. After citing this requirement, some investment managers have suggested that pension plans should consider writing exchange-traded call options on some or all of the common stocks in their portfolios in order to derive additional income from the securities portfolio and obtain some protection against stock price declines.

Far from causing insurers and trust departments to rush to the options market to write call options for their pension business, however, ERISA's prudence requirement has usually been cited as a major reason for not writing options. Some of the specific fears associated with call writing by institutions have been: the absence of complete regulatory acceptance of such activity, the expenses associated with managing option portfolios, concerns over the alleged option trading abuses which led to the temporary expansion moratorium imposed by the Securities and Exchange Commission beginning in July 1977, the opportunity costs associated with writing calls when the underlying stocks experience large price increases, and the general unfamiliarity that many managers still feel with respect to options.

Based on regulations for clarifying ERISA's prudence requirement which were proposed by the Department of Labor in April 1978, it now appears that the prudence of an individual investment will be evaluated based on its role in the total portfolio, rather than on its ability to "stand alone" as a justifiable investment. That is, no individual investment vehicle should be considered imprudent, per se, if it can be shown that the total portfolio strategy fits the needs of a particular fund. Therefore, many of the aforementioned concerns about the propriety of pension funds engaging in option writing may be unimportant if it can be shown that the options play a viable role within a portfolio designed to meet the needs of a particular fund.

Unfortunately, much of the information available about the results of writing exchange-traded call options consists of one or two sentences describing the generally favorable results that various banks have achieved through pilot programs in option writing. Because only a few details usually are supplied, these reports are of little help to the manager of a pension fund seeking to determine the advisability of writing call options. Studies by Katz (1963), Boness (1964), and Malkiel and Quandt (1969) were completed before options began trading on organized exchanges. Although all three studies generally were consistent in demonstrating the undesirability of covered call writing, they are of little relevance currently because they deal with an investment environment that changed drastically with the opening of the Chicago Board Options Exchange (CBOE) in April 1973. The expected premiums and liquidity of call option contracts changed with the advent of exchange-traded calls, and the number of different types of options decreased because of contract

standardization. Finally, writers now retain all dividends, whereas dividends benefited option buyers before the CBOE began operation.

A simulation study by Pounds (1978) and the Merton, Scholes, and Gladstein work (1978) sought to help explain the expected risk and return patterns achievable through the use of options. However, both works mixed the results from before and after the opening of the CBOE,[1] thus detracting from their relevance for the current environment. Three studies have been done which restrict themselves to the period of interest (April 26, 1973 and beyond), but they also are of limited use for institutions seeking evidence about the risk and return patterns available through option writing. Roenfeldt, Cooley and Gombola (1976) examined all CBOE options traded from April 1973 to January 1976, finding that the returns from writing fully-covered calls were higher and the standard deviations of returns were lower than for the underlying stocks. However, by the end of the study period, 79 optionable common stocks were listed on the CBOE; it is doubtful that pension fund managers would have written options on all these securities, much less all the varieties of options on all the underlying stocks. Similarly, because the Galai (1977) study mixes the buying and writing of calls, it is not useful for institutions which in many cases are prohibited from buying options. Trennepohl (1977) included only 32 stocks in his study and restricted his time period to a period after the opening of the CBOE, but the study is oversimplified in that many unnecessary assumptions are made.

This study seeks to overcome these problems inherent in much of the previous empirical work concerning option writing, in order to generate evidence concerning the risk and returns associated with writing fully-

covered, exchange traded call options. The study is particularly geared to providing information useful to pension managers in judging whether it would be prudent to write call options against stocks in their portfolio.

DESIGN OF THE STUDY

The procedure used in this study was first to obtain a portfolio of stocks typically held in pension fund accounts. Then option-writing strategies were developed by identifying the percentage of the total investment portfolio composed of common stocks which underlied call option contracts. To illustrate, the 10 percent option strategy required that options be written against 10 percent of the market value of the stocks held in the portfolio. Both 10 and 30 percent strategies were examined.[2] Portfolios were reevaluated at the end of each month and when options expired, in order to make necessary changes to ensure that the particular percentage strategies were maintained. The decision rules and assumptions used in the study were chosen to reflect realism. Rules which were infeasible or impractical to follow in the business world were avoided in an attempt to develop results that are both meaningful and useful to pension portfolio managers.

Option Strategy Decision Rules

For both the 10 and 30 percent option portfolios, the investor was assumed to be a pension fund manager with $50 million to invest in an equity portfolio on May 1, 1973. This money was allocated through a market value weighting scheme designed to purchase a portfolio of Vickers Favorite Fifty stocks,[3] as reported for December 31, 1972. This listing

was the latest that would have been available at the time the stock portfolio was initiated. Table 1 shows the 50 stocks and the percent of the portfolio allocated to each one. It was assumed that only round lots of stock were purchased and that the minimum commission rates for New York Stock Exchange members in effect at that time were applicable. Given these assumptions, there was $188,026 of the original $50 million which was not allocated to purchase shares of common stock. This money was placed in a "residual fund" which was invested at the Treasury-bill interest rate until the fund was large enough to purchase a round lot of each of the 50 stocks in the portfolio.

In writing options against these stocks, a volume requirement was devised to avoid the unrealistic case in which several hundred contracts for one type of option were assumed to be sold on a day when only a few contracts actually were traded. Specifically, for any option that had a contract volume of X on a certain day, no more than X/3 of that particular contract were written that day. Given this volume requirement, stocks were chosen at random from the 50 held in the portfolio. To write options against a chosen stock, the following rules were derived for selecting strike prices and expiration dates for the contracts. The strike price closest to and exceeding the current stock price was noted. If the volume requirement was met, all options for the stock were written at this strike price. If the volume requirement was not met, as many options as possible were written at that price, and an attempt was made to write the remaining options at the closest strike price below the current market price. The procedure of writing options at the next highest strike price and then the next lowest was followed until the required number of contracts

for that particular stock were sold. For a given strike price, to the extent allowed by the volume requirement, options were written for the most distant expiration dates available.

The assumption was that the premium received upon writing an option was that quoted in the Wall Street Journal for the day of the sale. Transactions which occurred prior to May 1, 1975 were assumed to be executed at the minimum commission levels specified by the Options Clearing Corporation. All transactions which occurred after May 1, 1975 were charged a commission equal to two-thirds of the amount that would have been charged had the transaction occurred before that date. Income taxes were ignored throughout the study, because investment income generated by qualified pension funds usually is not taxable.

In the absence of dividend considerations, the assumption was that options generally would not be exercised, if exercised at all, until just before expiration. However, options sometimes were expected to be exercised during the period after a dividend had been declared but before the underlying stock was quoted ex-dividend. If, on any day during this period, the sum of the closing price of the stock and its dividend exceeded the strike price plus the applicable commission, the assumption was that the option would be exercised on the next trading day.

When the determination was made that an option would be exercised, the pension fund management was assumed to close out its position on the next trading day by purchasing the same option contract as an offset to the one previously sold. Contracts also were closed out whenever the premium for an outstanding option declined to a negligible level. A

negligible level was defined as an amount less than or equal to 10 percent of the premium received when the option was written, if the remaining life of the option was at least one month. New options were written when old ones expired, as long as the market values of the optioned stocks had not increased to levels that exceeded the percentage strategy used. The percentage strategies were reevaluated monthly. If, under the rules, more options could be written, an optionable stock was chosen at random and options were written. If too many options were in effect, optioned stocks were chosen at random and their contracts were closed out in amounts sufficient to maintain the desired percentage.

The residual fund used in connection with money left over after purchasing the 50 stocks also was used to accumulate money received as dividends and premiums for options sold. As stated, when sufficient money had been accumulated to buy 100 shares of each of the 50 stocks at the market prices then prevailing, the purchase was made. Because a potential cash requirement always existed for closing out options, an attempt was made to maintain the residual fund balance at no less than $400,000. Even with this minimum target, the residual fund was insufficient a few times to fund the necessary close outs. In these cases, money was borrowed on a short-term basis.

Stock Portfolio Decision Rules

The pure stock portfolio strategy was conducted similarly to the option strategies. Fifty million dollars was allocated among the same 50 stocks on a market-weighted basis on May 1, 1973. Dividends received from a stock were used to purchase as many shares of that particular stock as possible, with any excess placed into a residual fund similar to that

used with the option portfolios. Therefore, whereas only round lots were purchased in the option portfolios, odd lots were acceptable under the pure stock strategy. These few differences provided a benchmark for comparisons, with the pure stock strategy being as equity-oriented as possible at all times.

Market Portfolio Decision Rules

The S&P 500 strategy was used to relate the results of the other portfolios to market conditions during the study period. It was assumed that $50 million less commissions was invested at the index value on May 1, 1973. Monthly dividends reported for the index in Moody's Annual Dividend Record were assumed to be reinvested in the S&P 500. Although actual minimum commissions were used in the option and stock strategies, an arbitrary one percent commission was assumed prior to May 1, 1975 for the index strategy, with two-thirds of one percent assumed after that date, because actual commissions would not have been feasible.

ANALYSIS

Various summary statistics relating to risk and return were computed to help describe the results for each of the four alternative investment strategies.

Return

The return for month i (r_i) is calculated using the formula

$$r_i = \frac{P_i - P_{i-1}}{P_{i-1}},$$

where P_i is the value of the portfolio at the end of month i. The P_i values for the stock and option portfolios are the sums of the current

market values for the stocks and the residual funds. The mean returns for a particular n-month period were calculated using the formula

$$\bar{r} = \frac{\sum_{i=1}^{n} r_i}{n},$$

where r_i is the i^{th} monthly return.

Risk

Several different measures can be used to determine the riskiness of a portfolio. The standard deviation σ is estimated for an n-month period according to the formula

$$\sigma = \left[\frac{\sum_{i=1}^{n} (r_i - \bar{r})^2}{n - 1} \right]^{\frac{1}{2}}.$$

The results of some research efforts, including those by Mandelbrot (1963, 1967), indicate that stock price returns may not be normally distributed. When a distribution is not normal, the mean absolute deviation (MAD) has been suggested by Fama (1965) as the most suitable measure of risk. It does not weigh large deviations more heavily than small ones, as does the standard deviation, and has a higher degree of stability over time. The formula for computing the MAD for an n-month period is

$$MAD = \frac{\sum_{i=1}^{n} \left| r_i - \bar{r} \right|}{n}$$

Another measure of risk, the semi-standard deviation (SSD), is concerned only with deviations below a specified value, such as the mean, median, zero, or the risk-free rate of return. The usual value used in

the calculation is the mean. In this study the semi-standard deviation is calculated for an n-month period as follows:

$$SSD = \left[\sum_{i=1}^{n} \frac{X_i^2}{n} \right]^{\frac{1}{2}}$$

where $X_i = \begin{cases} r_i - \bar{r} \text{ if } r_i - \bar{r} < 0 \\ 0 \text{ if } r_i - \bar{r} \geq 0. \end{cases}$

The calculation of beta is another measure of the relative risk of the various portfolios. Beta is the β coefficient obtained in the regression

$$r_{i,p} = \alpha + \beta r_{i,S\&P} + e_i,$$

where $r_{i,p}$ = i^{th} return on portfolio p (p = stock, 10% option, or 30% option)

$r_{i,S\&P}$ = i^{th} return on the market (S&P 500) portfolio

e_i = error term

α and β = regression coefficients

One-Parameter Performance Measures

In order to assess the relative desirability of the four investment strategies, several one-parameter performance measures are computed. Three composite performance measures were developed by Jensen (1968), Treynor (1965), and Sharpe (1966). All of these measures are based on the Capital Asset Pricing Model (CAPM) and depend on the assumptions of that model for their validity.

Jensen's measure is the α in Sharpe's (1964) equation which is sometimes referred to as the Security Market Line:

$$E(r_i) - RFR = \alpha + \beta_i[E(r_m) - RFR], \qquad (1)$$

where $E(r_i)$ = expected return for a security or portfolio

$E(r_m)$ = expected market return

RFR = risk-free rate of return

α and β = regression coefficients.

Although Sharpe's equation (1) was developed for expected returns, it can be used to evaluate actual performance if β_i is constant over time. No problem is believed to be posed in this study by the assumption of a constant beta. Only portfolios are considered, and portfolio betas usually are more nearly stable than betas of individual securities [see Blume (1971)].

Equation (1) also can be rearranged to yield Treynor's T (1965) and Sharpe's measure S (1966) of portfolio desirability:

$$T = \frac{E(r_i) - RFR}{\beta_i}$$

$$S = \frac{E(r_i) - RFR}{\sigma_{r_i}}$$

T can be used to evaluate portfolios on an ex-post basis if both beta and the risk-free rate are assumed to be constant. The use of S for ex-post rankings requires the additional assumption that the standard deviation of market returns is constant during the period.

Conceptually, both S and T represent risk premiums per unit of risk. Based on this idea, two other one-parameter ranking methods can be devised using the mean absolute deviation and the semi-standard deviation

of returns as the risk measures [see Klemkosky (1973)]. These indices are calculated as:

$$\text{MAD Index} = \frac{\bar{r} - \text{RFR}}{\text{MAD}}$$

and

$$\text{SSD Index} = \frac{\bar{r} - \text{RFR}}{\text{SSD}}.$$

Some prior studies have questioned these one-parameter portfolio performance measures. Specifically, several authors have contended that they are biased. Friend and Blume (1970) found the Sharpe, Treynor, and Jensen composite performance measures to be inversely related to their risk measures, suggesting a bias against high-risk portfolios. Klemkosky (1973), on the other hand, found evidence of a positive relationship between these three measures and risk. He also investigated the bias of the MAD and SSD indices and found that these two measures were less biased than the Sharpe, Treynor, and Jensen measures, leading him to suggest that the MAD and SSD indices may be better risk-adjusted performance indices. The Jensen measure also has been criticized recently by Roll (1978) for possible ambiguities depending upon how securities are combined to form a portfolio. The current study constructed the original portfolio based on a market-weighting scheme, which is consistent with the theory behind the CAPM.

Even though the foregoing composite performance measures have been criticized, they are used in this study. Although biases may be present in some of the measures, the direction of the bias has not been established. Some studies have found biases against high-risk portfolios,

while some have found biases in favor of high-risk portfolios. In addition, at the present time no alternative performance measures have been devised to evaluate the risk and return of a portfolio. Therefore, due to a belief that returns should be viewed in relation to the risk assumed, the composite performance measures are used to help appraise the study results.

RESULTS

Full Period Results

The summary statistics are presented in Table 2 for the full four-year study period May 1973 through April 1977. The monthly risk-free rate of return used was .0053, which was the average annual yield for all newly issued three-month Treasury bills during this period (.0633) divided by 12 to estimate the average monthly return of .0053.

The results shown in Table 2 offer no support for a conclusion that covered call option writing is a desirable activity for managers of pension funds, since the risk-adjusted performance becomes poorer as more options are written. Further analysis of Table 2 indicates that the inferior risk-adjusted performance of the option strategies is primarily a result of the return components. The option portfolios generally had lower risk associated with them than did the stock portfolio (as gauged by the majority of risk measures). In addition, the 30 percent strategy produced a lower risk portfolio than did the 10 percent strategy. Thus, although writing options decreased the risk, the return also declined. This lower return was sufficient to cause inferior risk-adjusted returns for the option portfolios.

These results are in contrast with the generally favorable results for option writing on organized exchanges, as reported by Roenfeldt,

Cooley, and Gombola (1976), Pounds (1978), Trennepohl (1977), and the bank pilot programs. The results also conflict with the findings of Merton, Scholes, and Gladstein (MSG) (1978), who found that the risk-adjusted returns for their option strategies were better than those of the S&P 500, although their pure stock strategies performed best in most cases. The conflict, however, does not exist with respect to all the results. MSG and others found the option portfolios to have lower risk than the stock alternative, as is the result in the current study. The differences could be explained by the attempt to make the current study realistic by restricting the stock sample to institutional favorites and by limiting the study period to the time since the opening of the CBOE. The recognition of transaction costs probably is a major factor influencing the results; several of the previously discussed studies did not consider commissions.[4] Such expenses reduced the return component of the risk-adjusted measures, causing the options portfolios to perform poorly relative to the S&P 500 and the pure stock strategy for the study period.

Learning Period Effects

As noted, the opening of the CBOE in April 1973 changed the market for the buying and selling of call options. Given the innovations in call option trading that accompanied the opening, abnormal results were expected during the period required for investors to familiarize themselves with options and the CBOE. In particular, because many observers, such as Laing (1976), felt premium levels were much higher during the first year, it was anticipated that option results would be best for the first months of the study period, referred to here as the "learning period."

If a CBOE learning period of about a year influenced the overall results, that influence should be reflected in a comparison of the first year results (Table 3) with those for the final three years (Table 4). Most of the performance measures rated the market portfolio as the least desirable of the four strategies for the first year. However, the superior performance of the pure stock portfolio, compared to both options strategies, supports the tentative conclusion that writing options may not be beneficial. The failure of the 10 and 30 percent strategies to out-perform the underlying stocks during the first year was surprising given the claims that first-year returns from writing options should be good because premium levels were high and the market was not yet efficient. In contrast to the first-year results, the performance rankings for the final three-year period were almost identical to those for the full four-year period. Again the market portfolio performed best and the two option writing strategies performed worst on a risk-adjusted basis.

A review of the component parts of the performance measures shows that the first-year returns for the options strategies were no better, relative to the alternatives, than they were for the remaining three years. However, during this latter three-year period, the risk associated with the option portfolios generally was lower than that for the pure stock portfolio and the S&P 500. These two observations support the analysis of the combined performance measures. That is, there is no evidence of favorable option-writing results during a one-year learning period.

The results contained in Tables 5 and 6 can be compared for evidence of learning period effects for the first two years versus the remaining two years. A major difference between the two-year and the one-year learning period analysis is that the market portfolio was the best performer the first two years, whereas it was the least desirable portfolio strategy for the first year alone. The relative return performance of the option strategies was similar for the two periods. The risk component, however, was lower for the options portfolios in the final two-year period (relative to the alternatives) than in the first two years. These results are consistent with the analysis for a one-year learning period. There is no evidence that a two-year learning period was beneficial for an option writing strategy, since both options portfolios were generally inferior to the alternatives.

Results by Market Periods

The study by MSG (1978) found that a fully-covered option writing strategy performs best during stable market conditions. In order to analyze the effects of market conditions in the current study, the four-year period was divided into subperiods representing rising, declining, and stable market conditions. Based upon a study by Wachowicz (1978), which deals with the volatility of the S&P 500 on a daily basis, the following subperiods were chosen:

Type of Market	Subperiod Dates
Stable (#1)	May 1973-October 1973
Declining	November 1973-November 1974
Rising	December 1974-January 1976
Stable (#2)	February 1976-April 1977.

Stable Market Periods. Based upon the MSG work and the decision rules used in this study, the expectation was that the options portfolios

would perform best during periods when stock prices remained steady. During declining market periods, options were more likely to be closed out under the "low premium" rule, and when stock prices increased, options were more likely to be closed out to avoid losing the stock to satisfy an exercise notice and to retain the flow of dividends. But when stock prices remained stable, the option premiums were expected to increase the return for the option portfolios without an offsetting drain. Tables 7 and 8 present the results for Stable Market Period I (May 1973 through October 1973) and Stable Market Period II (February 1976 through April 1977).

The expectations were not fulfilled during Stable Market Period I and were only partially realized for Stable Market Period II. For the six months included in Stable Market Period I, the pure stock and market portfolios were ranked the highest on a risk-adjusted basis (the preferences between the pure stock and market portfolios varied by indices). This result was not expected based on the MSG study, but it is generally consistent with the previously reported rankings for other subperiods. Both a relatively higher risk component and lower return accounted for the differences among the rankings. Stable Market Period II included fifteen months and occurred after the options exchanges had achieved a greater degree of maturity. Thus, Stable Market Period II seems more representative of future results expected in steady markets. For this period, the market portfolio strategy was the least desirable, although the pure stock portfolio was ranked consistently ahead of both options strategies on a risk-adjusted basis. Although the findings of the MSG

study suggest that the option writing portfolios should have outperformed the buy-and-hold stock alternative during this period, the results of the present study did not support this expectation. Comparing the results for the stock and options portfolios only, the return component seems to be responsible for the inferior rankings of the options portfolios. As observed for some other subperiods, the options strategies generally had lower risk associated with them than did the stock alternative for Stable Market Period II.

Declining Market Period. The Katz (1963) and Trennepohl (1977) studies indicated that option writing may be most profitable during declining market periods. Table 9 presents the results associated with the declining market period (November 1973 through November 1974). The results are compatible with those of Katz and Trennepohl. Even though the S&P 500 strategy ranks highest on a risk-adjusted basis, the results provide some evidence that a program of option writing can improve results on a risk-adjusted basis. The portfolio performance indices consistently ranked the 30 percent options portfolio ahead of the 10 percent strategy, and both options portfolios were superior to the pure stock alternative. Such relative rankings are experienced in no other subperiod. It appears that the superior performance of the 30 percent strategy relative to the 10 percent and pure stock alternatives is due to the return component. The risk for the 10 percent and stock portfolios was less than that for the 30 percent strategy, but the relatively higher return component for the 30 percent strategy caused it to be superior in the composite sense.

Rising Market Period. The options portfolios were expected to perform worst, relative to the market and pure stock portfolios, during a rising market period. MSG believed that the unrealized stock price gains would cause option strategies to perform poorly relative to the underlying stocks in rising markets. Katz and Trennepohl both found some evidence to support this belief. As noted, the decision rules used in this study allowed for option closeouts to avoid losing the stock through an exercise notice (either just before expiration or during the life of the option if the exercise would be for dividend-related reasons). Both these types of closeouts are more likely during rising market periods. Thus, the return component for the options portfolios was expected to be adversely affected by the cost of buying back the option and by the additional commission charges.

The results for the rising market period (December 1974 through January 1976) are presented in Table 10. In constrast to the declining market results, the 30 percent strategy was the least desirable on a risk-adjusted basis during the rising market period. This result was due to its poor return, which offsets the fact that the 30 percent portfolio had the lowest risk during this period. The 10 percent portfolio was generally ranked above the pure stock alternative, although the rankings were not consistent. Notably, the market portfolio was superior to all other strategies. The reason for the inferior returns for the 30 percent strategy is that during a period of generally rising stock prices, the 30 percent options portfolio experienced more closeouts just before expiration than during stable or declining market conditions. In addition, closeouts due to dividends also were heavy during this rising market period.

CONCLUSIONS AND IMPLICATIONS

Unfortunately, the results of this study cannot be cited as clear evidence in favor of or against the strategy of writing covered call options for most pension plans. However, the investment goals of pension plans depend on the characteristics of the plans; therefore, the desirability of including any particular investment vehicle within the portfolio of a given plan can be judged only by considering the role of that vehicle within the total portfolio, always in the context of the overall fund objectives. In this sense, to make judgments about writing calls, information about the expected risk and return from writing options is necessary. This study was designed to provide such information. The specific conclusions of the study, along with their implications for pension managers, are as follows:

Risk

The principal conclusion of the study is that writing covered call options seems to provide a strategy for reducing the risk associated with an equity portfolio, compared to the alternative of holding only the underlying stocks. Furthermore, the risk of the portfolio typically declines when more options are written, although this observation was not true for the declining market period observed in this study. A comparison of the risk of option portfolios to the aggregate market risk indicates that covered option writing appears to be a lower risk strategy whenever the market is active--either upward or downward.

This conclusion regarding risk should be important to pension plan managers and sponsors concerned about the variability of contributions

to the plan. Reduced risk for the investment returns should improve the predictability of the periodic contributions required from the sponsoring firm. Those plans with relatively low risk objectives include plans which are not fully funded, plans sponsored by unprofitable firms, and plans that include a large percentage of older workers.

Return

The returns associated with the options portfolios generally were lower than the return for the underlying stocks, except during the declining market period. The returns also generally were lower than that for the market, except during one of the stable market periods. Pension portfolio managers interested in writing covered call options must expect generally lower returns than are possible with a portfolio of the underlying stocks only. Given the lower risk expectations, a lower expected return is not surprising. However, this conclusion indicates that plan sponsors who hope to use high investment returns to increase or improve plan benefits should not engage in covered call option writing.

Plan managers interested in writing options can modify some of the decision rules used in this study to improve the expected return. For example, a major drain on the option returns resulted from option close outs. Money was required to repurchase the contract and to pay the associated commissions. Many dividend-related close outs, as well as several which occurred at expiration, could be eliminated by writing only out-of-the-money options. In addition, returns would be increased by eliminating the close outs due to negligible premiums. A final suggestion for improving returns is to maintain

a larger balance in the 30 percent residual fund in order to eliminate the interest expense associated wilth borrowing money when the residual fund is insufficient to support necessary transactions. A minimum level of $900,000 appears to be more appropriate than the $400,000 level used in this study. However, if some of the close outs are eliminated through the preceding suggestions, a $400,000 level should not be a problem.

Learning Period

This study found no evidence to support the widely-held belief that the early period (one or two years, for example) of the CBOE existence was a learning period during which institutional option writers could have obtained much better results than were possible later. On a risk-adjusted basis, the results for the first one or two year period did not differ significantly from later results. Therefore, pension managers should not decide against option writing merely because of concerns over premium levels which are lower than those obtainable the first year.

Market Conditions

This study found that options are most likely to improve the risk-adjusted returns of an equity portfolio during periods when overall market prices are declining. The results during periods of stable and rising market conditions indicated that options generally were inferior to the alternatives, on a risk-adjusted basis. This conclusion about the relative desirability of writing options during various market periods is important for pension managers who vary investment strategies according to forecasted market conditions.

The principal contribution of this research is its provision of a meaningful "starting point" for pension fund managers debating the advisability of option writing. With respect to overall market conditions, managers should be able to use the results for the study period (May 1973 through April 1977) as an aid in forecasting the expected risks and returns available by writing options against stocks in their portfolio.

REFERENCES

Blume, Marshall E. 1971. On the Assessment of Risk. Journal of Finance 26 (March): 1-10.

Boness, A. James. 1964. Some Evidence of the Profitability of Trading in Put and Call Options. In The Random Character of Stock Market Prices, pp. 375-96. Edited by Paul H. Cootner. Cambridge: MIT Press.

Fama, Eugene F. 1965. The Behavior of Stock Market Prices. Journal of Business 38 (January): 39-105.

Friend, Irwin, and Blume, Marshall. 1970. Measurement of Portfolio Performance Under Uncertainty. American Economic Review 60 (September): 561-75.

Galai, Dan. 1977. Tests of Market Efficiency of the Chicago Board Options Exchange. Journal of Business 50 (April): 167-97.

Jensen, Michael. 1968. The Performance of Mutual Funds in the Period 1945-1964. Journal of Finance 23 (May): 389-416.

Katz, Richard C. 1963. The Profitability of Put and Call Option Writing. Industrial Management Review 5 (Fall): 55-69.

Klemkosky, Robert C. 1973. The Bias in Composite Performance Measures. Journal of Financial and Quantitative Analysis 8 (June): 505-14.

Laing, Jonathan R. 1976. Option Action; To Lift Their Returns, Institutional Investors Try Selling Stock Calls. Wall Street Journal, 1 December, pp. 1, 22.

Malkiel, Burton G., and Quandt, Richard E. 1969. Strategies and Rational Decisions in the Securities Options Market. Cambridge: MIT Press.

Mandelbrot, Benoit. 1963. The Variation of Certain Speculative Prices. Journal of Business 36 (October): 394-419.

Mandelbrot, Benoit. 1967. The Variation of Some Other Speculative Prices. Journal of Business 40 (October): 393-413.

Marcus, Bruce. 1978. A Vote for ERISA's 'Prudent Man.' New York Times, 14 May, sec 3, p. 14.

Merton, Robert C., Scholes, Myron S., and Gladstein, Mathew L. 1978. The Returns and Risk of Alternative Call Option Portfolio Investment Strategies. Journal of Business 51 (April): 183-242.

Pounds, Henry M. 1978. Covered Call Option Writing: Strategies and Results. Journal of Portfolio Management 4 (Winter): 31-42.

Roenfeldt, Rodney L., Cooley, Philip L., and Gombola, Michael J. 1976. Market Risk and Return Characteristics of CBOE Options. University of South Carolina. (Typewritten)

Roll, Richard. 1978. Ambiguity When Performance is Measured by the Securities Market Line. Journal of Finance 33 (September): 1051-69.

Sharpe, William F. 1964. Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. Journal of Finance 19 (September): 425-42.

Sharpe, William F. 1966. Mutual Fund Performance. Journal of Business 39 (January): 119-39.

Trennepohl, Gary L. 1977. Covered Options for Insurance Company Investment Departments. Journal of Insurance Issues and Practices 1 (March): 42-51.

Treynor, Jack L. 1965. How to Rate Management of Investment Funds. Harvard Business Review 43 (January/February): 63-75.

Wachowicz, John M., Jr. 1978. An Analysis of Changes in Aggregate Market Volatility. Ph.D. dissertation, University of Illinois.

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FOOTNOTES

[1]Pound's study period is from 1969 through 1976, while MSG look at the period from July 1963 through December 1975.

[2]Due to the low volume of options traded during the early months of CBOE operation, it was impossible to attain these percentages immediately. Therefore, as many options as possible were written on May 1, 1973, making the ratio of the market value of the optioned securities to the total value of all the stocks held only 3.7 percent. By continuing to write the maximum number of contracts allowable each day, this figure was increased to 10 percent by June 1, 1973. The 30 percent level was not attained until April 1, 1974.

[3]This group represents the 50 largest holdings of major bank trust departments, as compiled and reported by Vickers Associates, Inc.

[4]For the overall study period, the commissions paid at the time new options were written equalled .0201 of the gross premiums received for the 10 percent option strategy and .0197 of gross premiums for the 30 percent option portfolio. To estimate the effect of commissions paid when option contracts were closed out, May 1976 was chosen at random and the average commission costs were computed. During this month, the average commission paid per close-out transaction was $151.08, and the average commission per contract closed out was $5.83.

TABLE 1
STOCKS INCLUDED IN THE STUDY

	Stock	Percent of Portfolio Allocated
1.	IBM	14.8%
2.	GM	6.3
3.	Xerox	3.5
4.	Exxon	6.6
5.	Ford	1.9
6.	E. Kodak	6.7
7.	ATT	8.9
8.	Philip Morris	1.0
9.	GE	3.4
10.	Polaroid	1.3
11.	Burroughs	1.3
12.	ITT	1.0
13.	McDonald's	0.7
14.	Texaco	3.3
15.	Avon	2.3
16.	Kresge	1.4
17.	Mobil	2.1
18.	MGIC	0.4
19.	Sears	4.7
20.	DuPont	2.5
21.	Minn. Mining & Man.	2.7
22.	RCA	0.6
23.	Kerr-McGee	0.5
24.	Westinghouse	0.9
25.	Texas Instruments	0.6
26.	St. Oil of Calif.	2.2
27.	Atl. Richfield	1.1
28.	Continential Oil	0.5
29.	Travelers	0.4
30.	Chrysler	0.5
31.	Union Carbide	0.8
32.	Warner-Lambert	1.2
33.	Aetna	0.5
34.	First Nat'l City	1.3
35.	Northwest Airlines	0.2
36.	Sony	0.9
37.	Imperial Oil	1.5
38.	Union Pacific	0.4
39.	Gillette	0.5
40.	CBS	0.3
41.	Sperry Rand	0.4
42.	Delta	0.4
43.	Matsuchita	0.8
44.	Phillips Petr.	1.1
45.	Goodyear	0.6
46.	Deere & Co.	0.3
47.	Digital Equip.	0.3
48.	GTE	1.0
49.	Procter & Gamble	2.5
50.	Schering-Plough	1.1

TABLE 2

SUMMARY STATISTICS FOR PERIOD MAY 1973-APRIL 1977*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0013	.0010	.0010	.0028
Standard deviation	.0552	.0549	.0547	.0543
Beta	.9429	.9502	.9297	1.0000
MAD	.0415	.0417	.0409	.0401
SSD	.0383	.0378	.0375	.0354
Sharpe's index	-.0725	-.0783	-.0786	-.0460
Treynor's index	-.0042	-.0045	-.0046	-.0025
MAD index	-.0964	-.1031	-.1051	-.0623
SSD index	-.1044	-.1138	-.1146	-.0706
Jensen's measure	-.0017	-.0019	-.0020	0.0000

*The average RFR is .0053.

TABLE 3

SUMMARY STATISTICS FOR FIRST YEAR
(MAY 1973-APRIL 1974)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	-.0140	-.0141	-.0140	-.0114
Standard deviation	.0493	.0489	.0485	.0391
Beta	1.0954	1.1036	1.0951	1.0000
MAD	.0350	.0337	.0336	.0287
SSD	.0377	.0371	.0371	.0308
Sharpe's index	-.4138	-.4192	-.4206	-.4552
Treynor's index	-.0186	-.0186	-.0186	-.0178
MAD index	-.5829	-.6083	-.6071	-.6202
SSD index	-.5411	-.5525	-.5499	-.5779
Jensen's measure	-.0009	-.0009	-.0009	0.0000

*The average RFR is .0064.

TABLE 4

SUMMARY STATISTICS FOR LAST THREE YEARS
(MAY 1974-APRIL 1977)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0064	.0060	.0060	.0075
Standard deviation	.0562	.0559	.0557	.0577
Beta	.9160	.9236	.9009	1.0000
MAD	.0438	.0440	.0427	.0444
SSD	.0384	.0380	.0376	.0371
Sharpe's index	.0267	.0197	.0197	.0451
Treynor's index	.0016	.0012	.0012	.0026
MAD index	.0342	.0250	.0258	.0586
SSD index	.0391	.0289	.0293	.0701
Jensen's measure	-.009	-.0013	-.0013	0.0000

*The average RFR is .0049.

TABLE 5

SUMMARY STATISTICS FOR FIRST TWO YEARS
(MAY 197-APRIL 1975)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	-.0064	-.0063	-.0064	-.0035
Standard deviation	.0680	.0675	.0679	.0649
Beta	1.0056	1.0011	1.0080	1.0000
MAD	.0511	.0511	.0512	.0478
SSD	.0459	.0452	.0453	.0417
Sharpe's index	-.1853	-.1852	-.1856	-.1495
Treynor's index	-.0125	-.0125	-.0125	-.0097
MAD index	-.2466	-.2446	-.2461	-.2029
SSD index	-.2745	-.2765	-.2781	-.2326
Jensen's measure	-.0029	-.0028	-.0029	0.0000

*The average RFR is .0062.

TABLE 6

SUMMARY STATISTICS FOR LAST TWO YEARS
(MAY 1975-APRIL 1977)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0090	.0082	.0084	.0091
Standard deviation	.0369	.0370	.0354	.0399
Beta	.7626	.8052	.7096	1.0000
MAD	.0321	.0320	.0301	.0323
SSD	.0248	.0249	.0235	.0247
Sharpe's index	.1274	.1054	.1158	.1203
Treynor's index	.0062	.0048	.0058	.0048
MAD index	.1464	.1219	.1362	.1486
SSD index	.1895	.1566	.1745	.1943
Jensen's measure	.0010	.0001	.0006	0.0000

*The average RFR is .0043.

TABLE 7

SUMMARY STATISTICS FOR STABLE MARKET PERIOD I
(MAY 1973-OCTOBER 1973)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0012	-.0006	-.0003	.0031
Standard deviation	.0540	.0542	.0523	.0298
Beta	1.4642	1.5565	1.4915	1.0000
MAD	.0365	.0384	.0372	.0256
SSD	.0417	.0411	.0399	.0199
Sharpe's index	-.0963	-.1292	-.1281	-.1107
Treynor's index	-.0036	-.0045	-.0045	-.0033
MAD index	-.1425	-.1823	-.1801	-.1289
SSD index	-.1247	-.1703	-.1679	-.1658
Jensen's measure	-.0004	-.0019	-.0018	0.0000

*The average RFR is .0064.

TABLE 8

SUMMARY STATISTICS FOR STABLE MARKET PERIOD II
(FEBRUARY 1976-APRIL 1977)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0070	.0052	.0068	.0019
Standard deviation	.0299	.0295	.0283	.0261
Beta	.9774	1.0199	.9325	1.0000
MAD	.0262	.0257	.0245	.0205
SSD	.0189	.0191	.0181	.0162
Sharpe's index	.0970	.0373	.0954	-.0843
Treynor's index	.0030	.0011	.0029	-.0022
MAD index	.1107	.0428	.1102	-.1073
SSD index	.1534	.0576	.1492	-.1358
Jensen's measure	.0050	.0034	.0048	0.0000

*The average RFR is .0041.

TABLE 9

SUMMARY STATISTICS FOR DECLINING MARKET PERIOD
(NOVEMBER 1973-NOVEMBER 1974)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	-.0316	-.0307	-.0305	-.0272
Standard deviation	.0671	.0661	.0681	.0695
Beta	.9578	.9414	.9658	1.0000
MAD	.0479	.0482	.0492	.0480
SSD	.0403	.0396	.0405	.0402
Sharpe's index	-.5693	-.5643	-.5448	-.3558
Treynor's index	-.0399	-.0396	-.0384	-.0338
MAD index	-.7975	-.7739	-.7541	-.7042
SSD index	-.9479	-.9419	-.9160	-.8408
Jensen's measure	-.0058	-.0054	-.0045	0.0000

*The average RFR is .0066.

TABLE 10

SUMMARY STATISTICS FOR RISING MARKET PERIOD
(DECEMBER 1974-JANUARY 1976)*

Statistic	Portfolio			
	Stocks	10% Option	30% Option	S&P 500
Mean return	.0258	.0265	.0244	.0315
Standard deviation	.0493	.0499	.0491	.0533
Beta	.8231	.8535	.7960	1.0000
MAD	.0403	.0406	.0375	.0434
SSD	.0345	.0349	.0330	.0372
Sharpe's index	.4239	.4329	.3971	.4991
Treynor's index	.0254	.0253	.0245	.0266
MAD index	.5186	.5320	.5200	.6129
SSD index	.6058	.6189	.5909	.7151
Jensen's measure	-.0010	-.0011	-.0016	0.0000

*The average RFR is .0049.