LONG TERM INVESTMENT ALTERNATIVES FOR FIDUCIARIES:
An Analysis of Returns from Stocks, Bonds, Bills and Optioned Equities (1950-1974)

An intimate knowledge of the historical record and its long term implications is essential for all fiduciary investors.

Legislation has alerted fiduciaries to their obligation to become directly involved in the process of investment management. In particular, pension plan sponsors are expected to set feasible goals and to select, monitor, and evaluate investment managers. This requires an intimate knowledge of the historical record and its long term implications.

We present here a systematic examination of the returns from stocks, bonds, bills and optioned equities for the twenty five years ended December 1974.

Few managers, if any, consistently outperform the S&P 500 Stock Index.

Substantial evidence supports the hypothesis that the equities market suitable for fiduciary investments (the stocks of major U.S. Corporations) is 'efficient.' These stocks are widely held, highly visible, and subjected to intense analysis by diverse and large investors. There are few secrets concerning their prospects and their present prices almost always accurately reflect their future potential. This hypothesis is supported by the findings of most objective observers: few, if any, investment managers consistently exceed the returns achieved by a broadly diversified, unmanaged portfolios such as the S&P 500 Stock Index. The conclusion appears inevitable: plan sponsors and their investment managers must now be prepared to justify investment policies that deviate from the natural benchmark of a portfolio like the S&P 500 Stock Index. For most long term assets invested in common stocks we endorse this conclusion and the index fund approach to which it leads. But there are more promising paths by which some plan sponsors can reasonably expect to do better than the index fund approach. We now examine some of these paths.

The long term growth rate is a function of both the average return and its volatility.

For the plan sponsor, forming competent judgments about investment alternatives is only the first step. The sponsor must also clearly define investment goals that are rational and attainable. Only than can the sponsors judgments be transformed into an optimal portfolio meeting these goals. And only than can the sponsor evaluate the performance of the investment managers selected to implement policy.

Inadequately expressed goals may be destructive of the true needs of most plan assets. The basic inadequacy lies in the widespread tendency to focus solely on short term criteria such as average return, volatility, and the 'new' capital market measures of beta and alpha, without recognizing their long term implications. A stark but simple example illustrates how costly this neglect can be.

Suppose an accurate judgment is formed that investment 'A' will, with equally likely probability, either advance 100% or decline 50% each year. In one sense this is a very attractive investment-the odds are in its favor. If it were available year after year, the average return would be 25% per year. But there are other aspects of this investment that must be considered.

First, it is highly volatile. In any one year it is possible to lose a painful 50%. (The most extensively used measure of volatility is the standard deviation of return; the greater the standard deviation the greater the volatility. The standard deviation for this investment is 75%)

Second, over the long term this investment has an expected growth rate of zero! For example, if the returns alternate between +100% and -50% and all proceeds are always reinvested, a starting $1 investment will alternate between $2, $1, $2, $1, etc. Of course the pattern of returns need not have this regularity, but the 'final' outcome will be the same if half the returns are +100% and the other half are -50%.

Third, an investor can derive a more satisfactory outcome from this same investment 'A' by allocating only one-half of his assets to it in each period. Then his total assets will either increase 50% or decline 25% in any one period, for an average return per year of 12.5% and a standard deviation of 37.5%. Because of the reduced fluctuation in per period return, total assets will tend to grow at more than 6% per year compounded. (They will grow at an even higher compound annual rate if we calculate the earnings on the uncommitted half of his assets and assume them placed at interest in a riskless investment, e.g. U.S. Treasury Bills.) Giving up half the average return per period in exchange for reduced volatility enhances the long term growth rate of total assets from zero to over 6%.

It is appropriate to require the investment manager to maintain a portfolio that is less volatile than the S&P 500 but has a superior average return and long term growth rate.

To be effective, goals for long term assets should explicitly detail objective standards for both the short term criteria (average return and volatility) and their long term consequences (the growth rate). Failure to do so, as we have shown, may result in serious misallocation of assets or unacceptable risk levels. Also, long term needs and expectations may remain unsatisfied if the focus is exclusively on short term characteristics.

A well-constructed statement of investment goals encompasses both short and long term criteria. For example, a manager might be directed to maintain a portfolio that is less volatile than the S&P 500 but has a superior long term growth rate. These are clearly desirable goals. But are they attainable?

We show below that there are at least two paths to their attainment: (1) a portfolio of stocks and bills that used a quantitative approach to optimize its asset allocation and (2) a diversified optioned equity portfolio.

The S&P 500 is both a natural benchmark and a formidable taskmaster for investment managers.

This index reflects the aggregate value of the stocks of five hundred leading corporations. It represents a major fraction of the value of all outstanding equities. Percentage changes in this index thus accurately reflect the aggregate gains and losses experienced by common stock investors. This makes the index a natural benchmark to measure alternative investment strategies. Because the index is a proxy for the return on all common stocks, not every investor can experience a superior gain. For every investor whose gain exceeds this average, there must be an offsetting investor (or investors) whose gain falls short of the average. In fact, because of transaction and other costs, very few investors have been able to even match the gain indicated by this index over an extended period of time, making the S&P 500 a formidable taskmaster.

Figure 1 displays the 100 calendar quarter returns of the S&P 500. Each quarter's performance is calculated in this way:

$$\frac{100 \text{ x (ending price} - \text{starting price} + \text{cash dividend)}}{\text{starting price}}$$

The calculation assumes no transaction costs and includes both dividend income and capital appreciation.

The average of these 100 quarterly changes is 2.71%. The sequence of changes shown in Figure 1 appears to be independent of each other and exhibit no obvious pattern. Previous price changes appear to have no relation to the next price change. This property is at the heart of the efficient market hypothesis. The magnitudes and frequencies of these quarterly changes are shown in Figure 2.

An investor who bought and held the S&P 500 (or a well diversified portfolio) for this twenty five year period had an average return per calendar quarter of 2.71% and the standard deviation of this return was 7.22%. The growth rate of this passive strategy was 2.43% per calendar quarter.

A starting $1000 grew to $11,118 at the end of this 25 year period. (Note that the growth rate of 2.43% is less than the average return per quarter of 2.71% because of the significant quarterly fluctuations.)

Figure 3 charts the course of a starting $1000 investment with all dividends reinvested. The center line indicates the constant return of 2.41 % per quarter compounded.

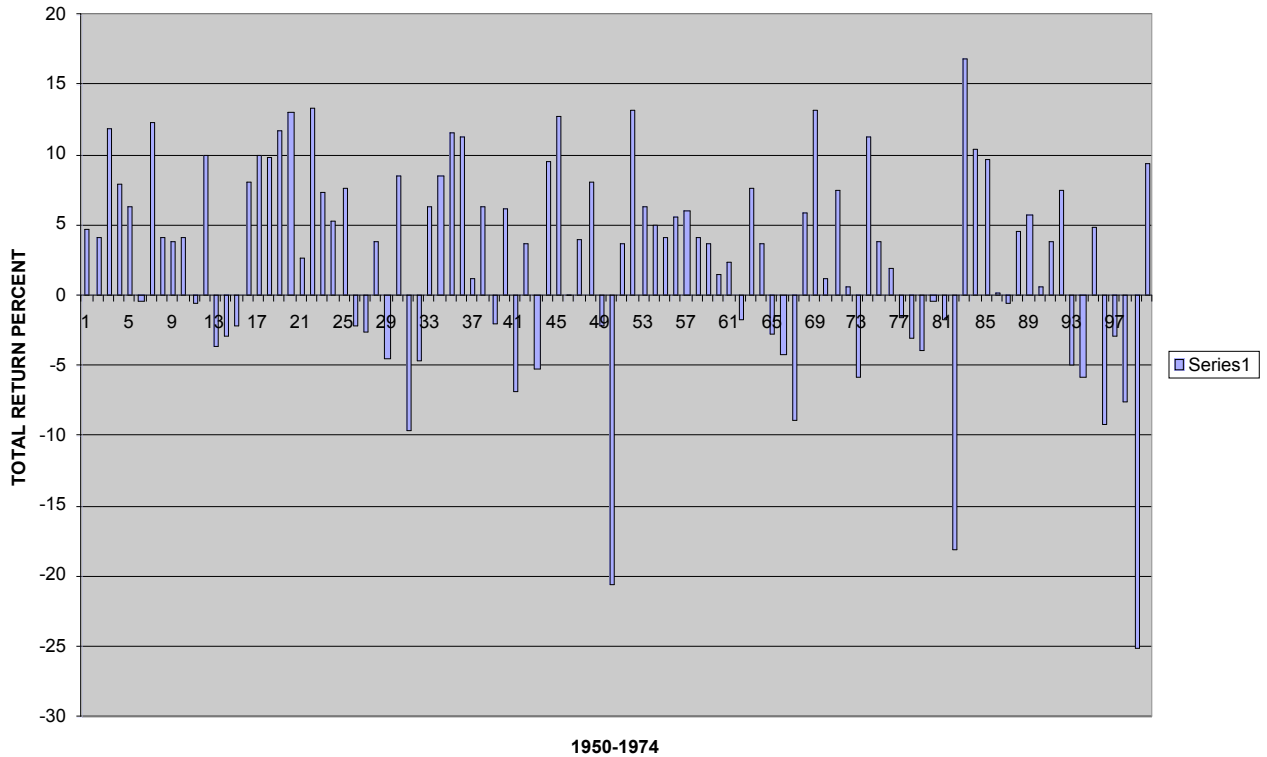**QUARTERLY RETURNS OF THE S&P 500 INDEX**

Figure 1. *S&P 500 Index Quarterly Percentage Returns. 1950-1974*

Stocks return more than bonds or bills but are substantially more volatile. Taming this volatility can produce superior returns.

Treasury bills are risk-less interest bearing assets with maturities of less than one tear. In this study, we examine 90 day bills that were available at the start of each calendar quarter for twenty five years. The average quarterly return was 0.9% and the standard deviation of return was 0.5%. Because the quarterly fluctuations were relatively small the growth rate was virtually the same as the average return per quarter. An investor who started with $1000 and reinvested his proceeds each quarter in new bills would have $2422 at the end of the twenty five years. His cumulative performance can be traced period by period in Figure 3. Annual yields ranged from less than 1% to over 8%. These yields were generally rising over the period of study. In the early 1950's they were artificially depressed by the accommodating posture of the monetary authorities reaching historic highs toward the latter part of the period in response to surging inflation.
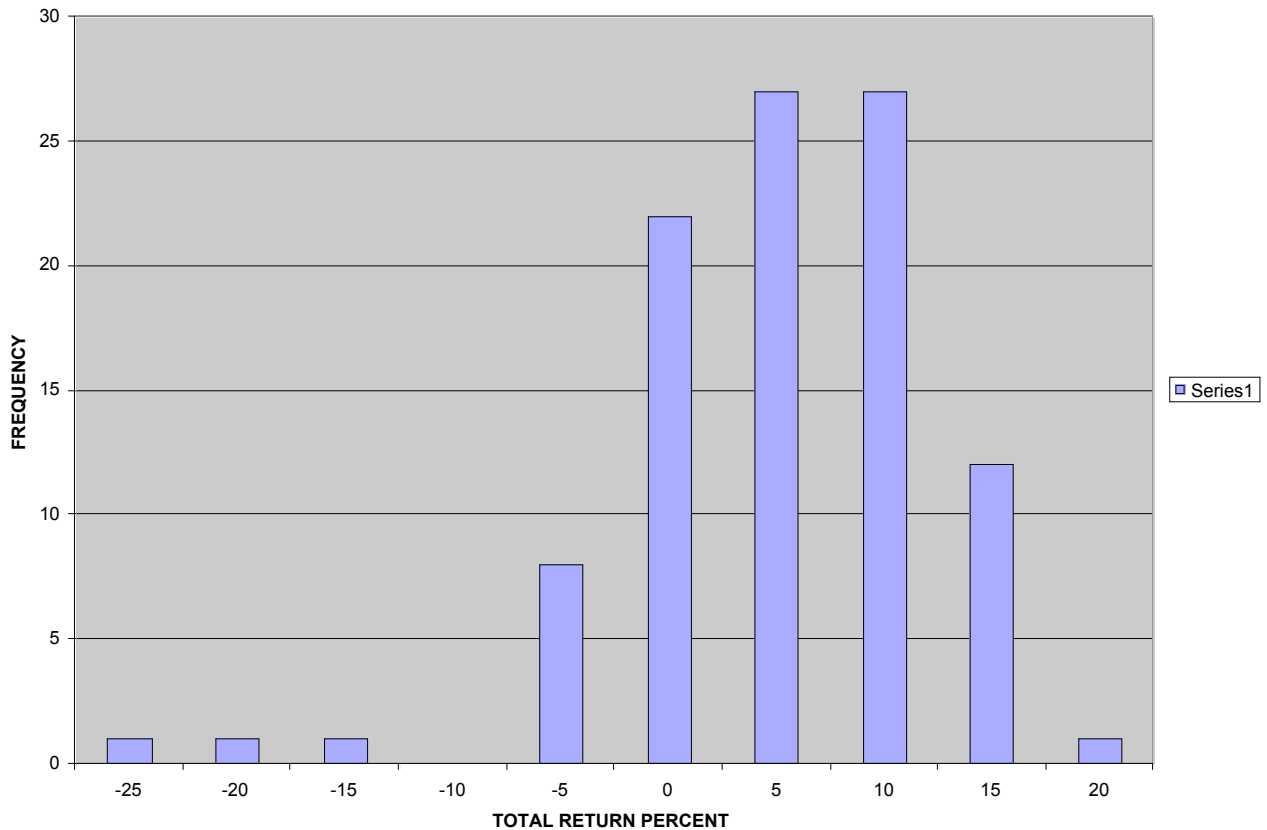
Figure 2. *S&P 500, Frequency and Magnitude of Quarterly Changes, 1950-1974*

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Corporate bonds range widely in investment characteristics. Some bonds are riskier than some stocks whereas others approach the safety of United States Government securities. In this study we measure the performance of the S&P 500 High Grade Corporate Bond Index. This index consists of AAA rated bonds with an average maturity of twenty years.

The performance of a bond portfolio can be calculated in a variety of ways. On a liquidation basis, changes in market value plus the interest received comprise the total return for each period. When it is certain that bonds will be held to maturity, interim changes in market value cancel out and the performance is sometimes measured by considering only the interest received per period. Our focus

here is on the long term portfolio so we adopt the latter valuation method. We assume the portfolio
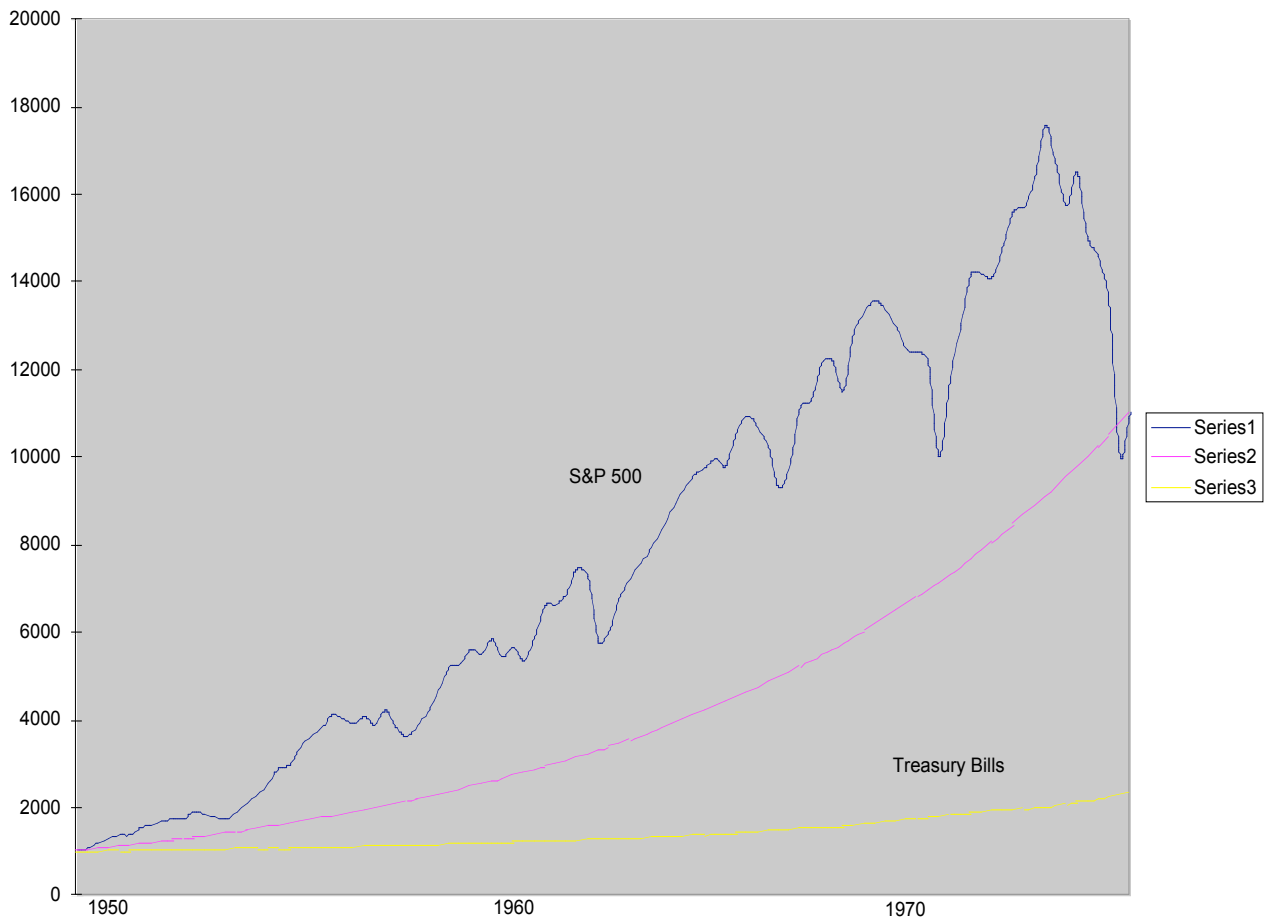

Figure 3. *S & P 500, 90 Day Treasury Bills*

is constructed and maintained in the following manner over this twenty five year period: at the start it consists of 20 year bonds represented by the S & P High Grade Bond Index. Each quarter for the next 20 years, an equivalent amount of 20 year bonds are added to the portfolio with no liquidation of prior purchases. At the end of twenty years, the portfolio has equal dollar amounts of bonds with maturities ranging from three months to twenty years, for an average maturity of ten years. This composition of maturities is then maintained for the five remaining years of our study. Every quarter, bonds purchased twenty years earlier will mature and be replaced with new twenty year bonds. During this total period default on high grade bonds was virtually non existent, justifying the neglect of interim price changes.

Our procedure differs from the one commonly employed which attempts to hold constant both the maturity and the quality of the portfolio. In practice, this requires the periodic sale of bonds and the need to take into account their interim market values. We don't believe this strategy is attempted by many investors, and for the 25 years considered here its total return was substantially less than that provided by Treasury Bills. We believe the portfolio we consider, buying and holding until maturity,

is a feasible strategy and closely reflects the experience of bond investors for this period. Calculated in this way, high grade bonds had an average quarterly return of .89%, a standard deviation of .36%, and an annual growth rate of 3.5%, and a starting value grew to $2431. The following table summarizes the characteristics of the three major investment categories.

1950-1974		S & P 500	AAA Bonds	U.S. Bills
Average quarterly return	%	2.71	0.89	0.89
Standard Deviation	%	7.22	0.36	0.48
Annual growth rate Compounded quarterly	%	9.75	3.57	3.55
Ending value of $1000 if all income and capital gains were reinvested		$11,044	2431	2422

These returns agree with the conventional wisdom: stocks return more than bonds or bills but are substantially more volatile. (Bonds have a smaller deviation than bills because we assume no change in bond prices from period to period.)

Determining the asset mix is a major portfolio decision. It needn't remain purely subjective.

A mixed portfolio that held stocks and bills, and adjusted its stock segment at the start of each quarter to the varying bill rate shown in Figure 4, had an annual growth rate of 11% versus 9.75% for the portfolio that only held stocks. Its stock segment ranged from 100% when the annual bill rate was near zero to 31% when the annual bill yield was 8%. A starting $1000 grew to $15.032 over the twenty five years. Its average return per quarter was 2.89% and its standard deviation was 5.43% compared to the S & P 500's 2.71% and 7.22% respectively. This simple mechanical strategy not only increased the growth rate, but also reduced the fluctuations in return. This results, in part, from the fact that bill yields and stock yields are negatively correlated. For this 25 year period, the correlation between stock and bill yields was -.39. We turn now to a strategy that is even more appealing: it increases substantially both the average return and the growth rate, and simultaneously reduces the standard deviation.

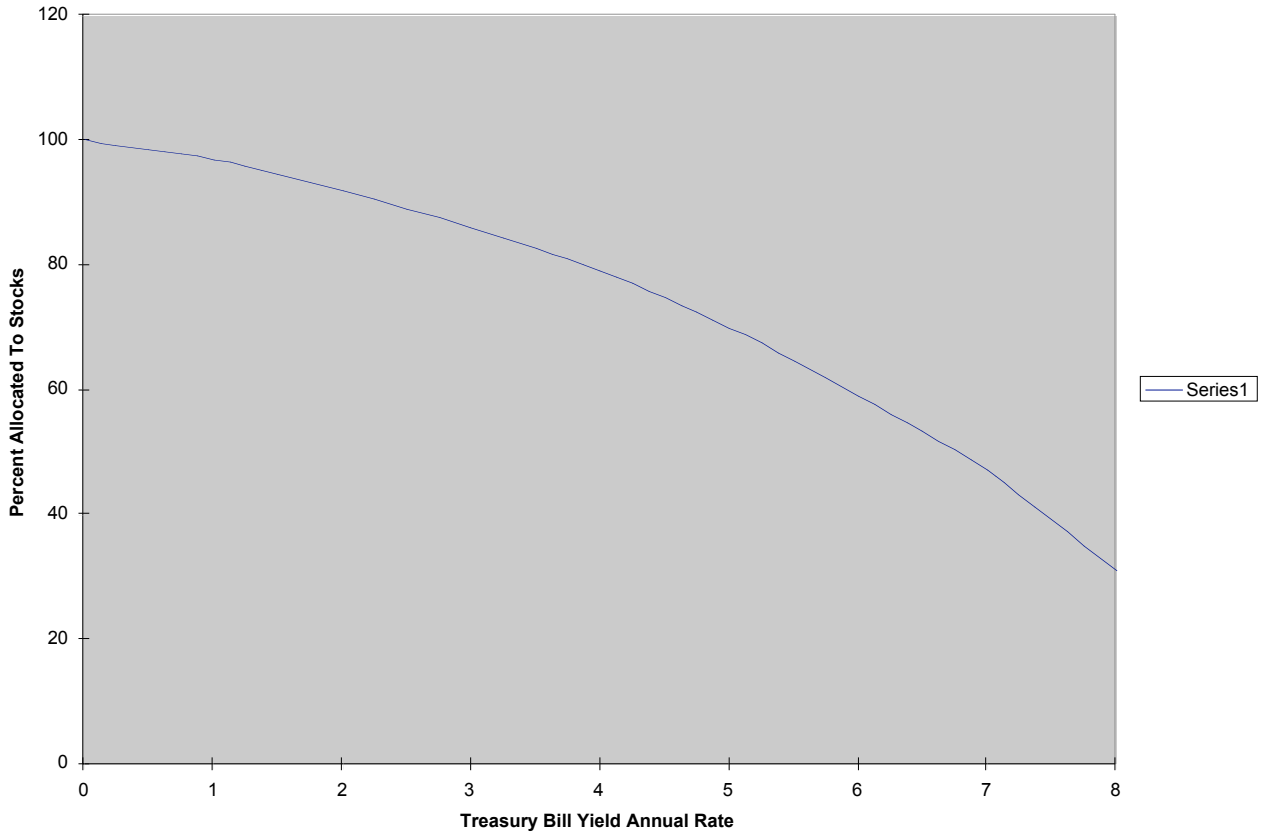*The Optioned Equity Portfolio. A new category of investment is now available to fiduciaries.*

Figure 4. *Optimal Allocation Between Treasury Bills and Common Stocks*

The sale of a call option against a holding of the underlying stock dramatically changes the distribution of expected returns. We examine here this distribution and its properties relative to the distribution of the conventional un-optioned equity portfolio.

The Dow Jones Industrial Stocks form the database of this study. The period under consideration consists of the 100 quarters ending January 31, 1975. Quarters ending January, April, July and October were used to avoid any possible seasonable effect and to accord with the option expiration dates originally established by the Chicago Board Options Exchange.

Figure 5 displays the frequency distribution of total return for these 30 stocks, assuming an equal dollar investment in each stock at the start of each quarter. Composed of only 30 stocks, the DJI Index behaved remarkably similar to the S&P 500 Index. The average quarterly return was 2.74% and the standard deviation was 6.74% as against 2.71% and 7.22% for the S&P 500. $1000 grew to $10,941 at the end of twenty five years if all dividends were reinvested and assuming transactions costs on reinvestment. This is an annual growth rate for the DJI of 9.69% compared to 9.75% for the S&P 500. Over this period the DJI has been an excellent proxy for the S&P 500, which in turn is an excellent proxy for all equities.
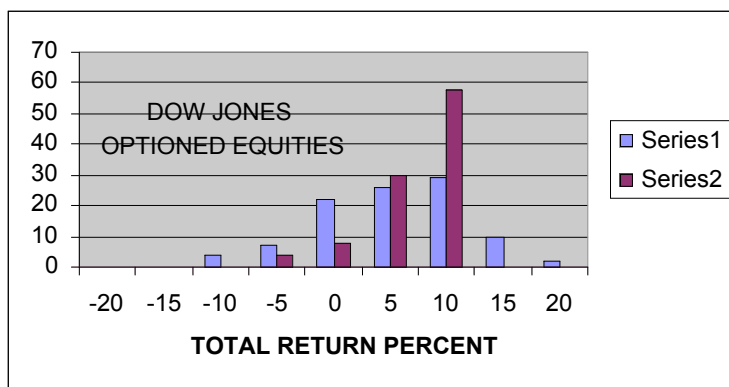
Figure 5. Frequency Distributions: Dow Jones Industrials
(series 1) and Optioned Equities. (series 2)

We now consider a portfolio of these same thirty stocks on which call options are sold: for every 100 shares held in the portfolio at the start of each quarter, a three month call option was sold. On the expiration date if the call was profitable it was repurchased at its intrinsic value plus transaction costs. If unprofitable we assumed it expired and was not repurchased. Cash dividends were treated in the manner of present day listed options: they are earned by the option seller and do not affect the striking price of the option. Unlike present day options, we assumed that the striking price of the option is equal to the market price of the stock on the day the option is sold. Premiums were assumed to be a constant percent of the stock price. These assumed premiums are shown in Table 1. These premiums were based upon an examination of over the counter premiums reported to the Securities and Exchange Commission, advertised prices in the New York Times, and our actual records. Of course these premiums were not always available and frequently they varied substantially from the constant premiums assumed in our study. At present, 26 of these 30 stocks have exchange listed options. It is interesting to note that the actual premiums available on these 26 stocks often exceed those we have assumed.

This hypothetical optioned equity portfolio had an average quarterly return of 4.2% and a standard deviation of 3.63%, and an annual growth rate of 16.54%. A starting $1000 grew to $57,452 in twenty five years. By every measure this optioned portfolio was clearly superior to the same 30 stocks un-optioned: its average quarterly return was 55% higher, the standard deviation was 45% lower, the annual growth rate was 75% higher. Figure 6 compares the cumulative performance of the optioned versus the un-optioned portfolio. Figure 5 contrasts their frequency distribution of quarterly returns. The optioned portfolio had a loss in only 12 quarters versus the 33 losses of the un-optioned portfolio. The optioned portfolio was restricted on the upside with a maximum gain of 8.98% in any one quarter versus a maximum gain of 18.91% in the un-optioned portfolio. The optioned portfolio

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achieved greater stability and enhanced return by forfeiting the possibility of extraordinary gains in
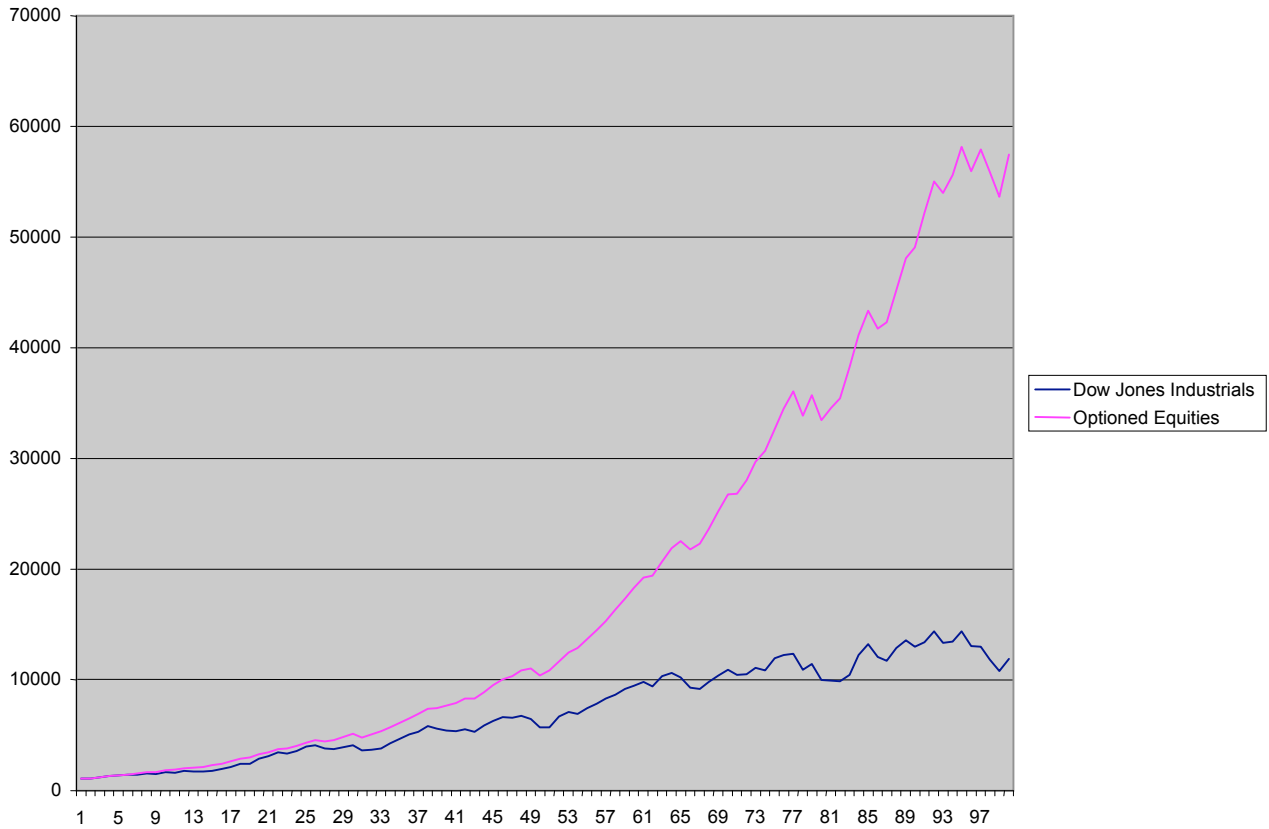a n y   o n e   q u

Figure 6. Dow Jones Industrials (bottom line), Optioned Equity Portfolio
(top line) 1950-1975

Allied Chemical	6.00	Good Year Tire	6.67	
Aluminum Company	6.67	International Harvester	6.67	
American Brands	5.33	International Nickel	6.67	Table 1. Assumed
American Can	5.33	International Paper	6.67	Premiums as a
American Telephone	4.00	Johns Manville	6.67	Percentage of Common
Anaconda	6.67	Owens Illinois	6.00	Stock Price for Three
Bethlehem Steel	6.67	Procter & Gamble	6.00	Month Call Options
Chrysler	8.00	Sears Roebuck	6.00	
Dupont	6.00	Standard Oil of California	6.67	
Eastman Kodak	6.67	Texaco	6.67	
Exxon	6.67	Union Carbide	6.67	
Esmark	6.67	United Technologies	8.00	
General Electric	6.00	United States Steel	6.67	
General Foods	5.33	Westinghouse	6.67	
General Motors	6.00	Woolworth	6.00	

Figure 7 displays the relative character of the optioned portfolio in still another way. The 100 points in the diagram plot the return of the optioned against the un-optioned portfolio. Except when the underlying stocks advanced more than 6.5% per quarter the optioned portfolio returned more than merely holding the stocks un-optioned. If, for example, in a three year period the average quarterly return of the S&P 500 is substantially less than that indicated by the distribution in figure 2, the optioned portfolio will also have returns smaller than those indicated by the experience of the twenty five years under study. However, even the short term, the optioned portfolio will be superior unless the general market advances at a rate in excess of 6.5% a quarter. In stable or declining markets the optioned portfolio must of necessity do better than the same portfolio un-optioned.

One of the crucial determinants of return for the optioned portfolio is the premium received for the sale of options. In this study the premiums assumed for 90 day call options averaged 6.36%. And it is worth repeating that actual premiums available for 90 day exchange listed call options during the three years of their existence have on average exceeded this 6.36%. Even when we reduced this average to only 4.77% the optioned continued to outperform the un-optioned

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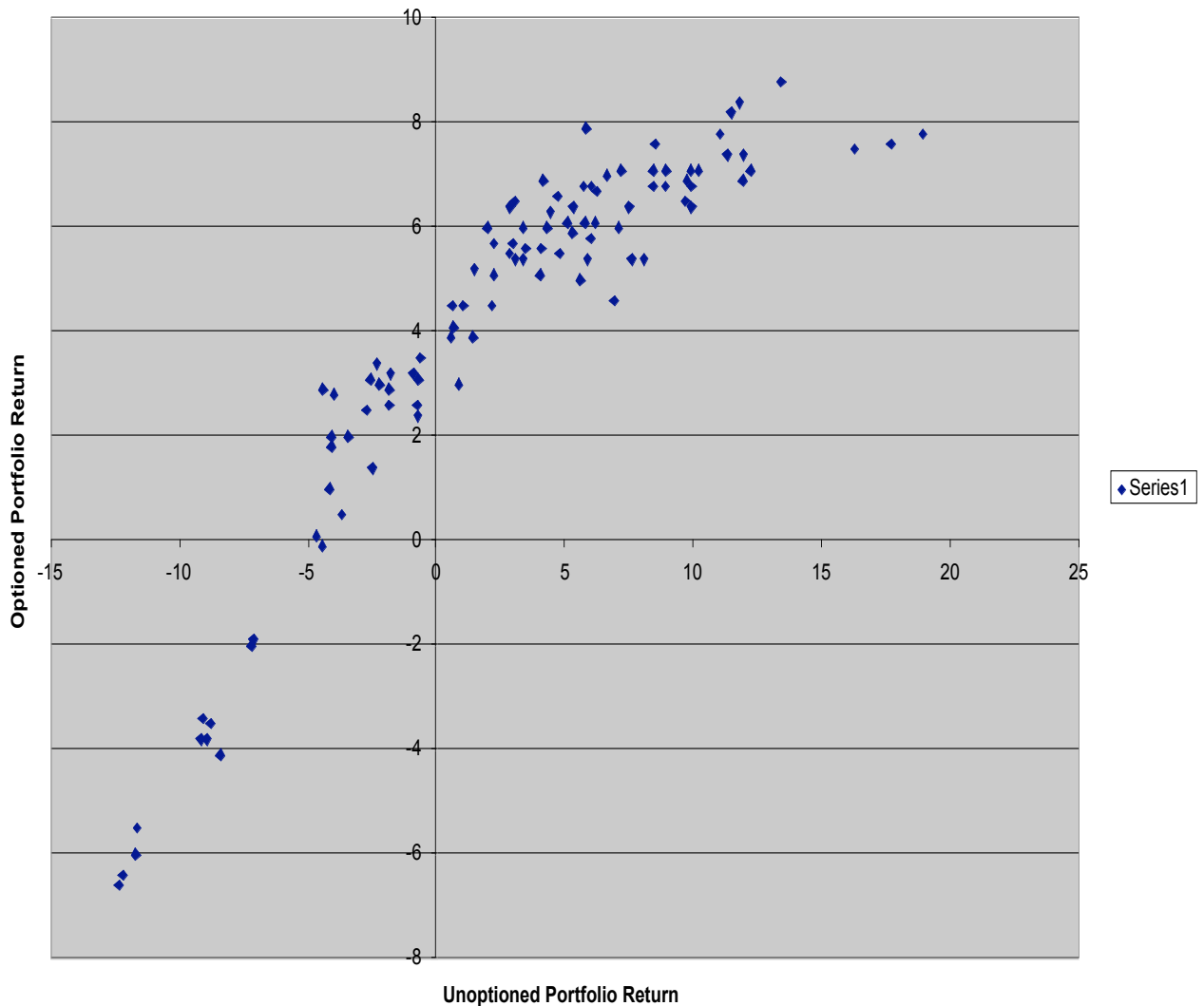
Figure 7. Optioned vs Un-optioned Quarterly Percentage Returns
Fiduciaries have a duty to develop an informed opinion about optioned equities-an admittedly complex but potentially valuable device for reducing volatility and increasing total return.

We have presented here a record of the past. Unlike a gambling casino, the odds in the future may not resemble those observed in the past, i.e., future quarterly returns for stock, bonds, and bills may not resemble those shown in figure 2. If political, social, or technological changes have now fundamentally altered our economy, perhaps the record shown here is of interest only to the historian. Investors always face this possibility. We believe this possibility is very small. Over the long term, we expect stocks to provide in the future what they have provided in the past, namely, greater returns with greater volatility than T bills and AAA bonds. We consider very unlikely that the compound rate of total return from stocks will be less than 6% or more than 14% over any period of ten or more years. And we expect optioned equity portfolios to better this return by 30% while simultaneously reducing the volatility of this return by 30%.

Almost every reason raised for discarding the past as a guide to future investment returns, e.g., growing international competition, internal and external political turmoil, the growing "burden" of public expenditures, the cartelization of the basic raw material producers, has an offsetting counterbalance which promises the possibility of even greater returns than experienced in the past, e.g., we are on the threshold of a computer revolution that will be no less dramatic than the industrial revolution, international competition will act as a spur to our industry and reinforce our economic expansion, etc. The prediction of fundamental change, especially of an adverse nature, will always attract more attention than the evidence warrants. We believe it is more dangerous to assume a radical change in future investment returns than it is to proceed with the past as a relevant yardstick; and given this yardstick it is essential that fiduciaries try to improve upon expected returns by the judicious use of every available investment tool. To neglect the proper use of options is to forego an admittedly complex but potentially valuable device for reducing volatility and increasing total return, a combination of attributes seldom available simultaneously.