An Asset Allocation Puzzle

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ABSTRACT

This paper examines popular advice on portfolio allocation among cash, bonds, and stocks. It documents that this advice is inconsistent with the mutual-fund separation theorem, which states that all investors should hold the same composition of risky assets. In contrast to the theorem, popular advisors recommend that aggressive investors hold a lower ratio of bonds to stocks than conservative investors. The paper explores various possible explanations of this puzzle. It concludes that the portfolio recommendations can be explained if popular advisors base their advice on the unconditional distribution of nominal returns. It also finds that the cost of this money illusion is small, as measured by the distance of the recommended portfolios from the mean-variance efficient frontier.

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1. Introduction

How should an investor's attitude toward risk influence the composition of his portfolio? A simple and elegant answer to this question comes from the mutual-fund separation theorem. This theorem, a building block of the most basic Capital Asset Pricing Model, is taught regularly to undergraduates and business students. According to the theorem, more risk averse investors should hold more of their portfolio in the riskless asset. The composition of risky assets, however, should be the same for all investors.

Popular financial advisors appear not to follow the mutual-fund separation theorem. When these advisors are asked to allocate portfolios among stocks, bonds, and cash, they recommend more complicated strategies than indicated by the theorem. Moreover, these strategies differ from the theorem in a systematic way. According to these advisors, more risk averse investors should hold a higher ratio of bonds to stocks. This advice contradicts the conclusion that all investors should hold risky assets in the same proportion.

The purpose of this paper is to document this popular advice on portfolio allocation and to attempt to explain it. We begin in Section 2 by reviewing the basic mutual-fund separation theorem. We consider the conditions under which all investors should hold stocks and bonds in the same proportion. We also present a numerical example of the optimal mutual fund based on the historical distribution of stock and bond returns.

In Section 3 we document the nature of popular financial advice regarding portfolio allocation. We show that this advice contrasts starkly with the predictions of the mutual-fund separation theorem. Moreover, the deviations from the theorem are systematic. In the rest of the paper we take this popular advice on portfolio allocation as the "data" to be explained.

In Section 4 we consider whether such advice might be optimal. We consider various deviations from the assumptions that underlie the basic mutual-fund separation theorem. In particular, we consider the absence of a riskless asset; preferences that depend on more than the mean and variance of returns; portfolio choice in dynamic settings; and the existence of non-tradable assets. Although we cannot rule out that popular advice is consistent with some model of rational behavior, we have so far been unable to find such a model.

Having failed to explain popular advice within the usual range of economic theory, we turn to non-rational explanations in Section 5. We show that popular advice resembles optimal portfolio choice if investors care about the unconditional distribution of nominal returns. That is, popular financial advice is appropriate for investors who want a time-invariant portfolio allocation and who suffer from money illusion.

The conclusion that popular advice is based on money illusion suggests that investors (or investment advisors) are not fully rational. But how far from full rationality are the recommended portfolios? In Section 6 we examine the costs from holding non-optimal portfolios. We show that these portfolios are not far from the mean-variance efficient frontier. That is, even though money illusion leads to portfolios quite different from optimal portfolios, the costs of such deviations are small. For the purposes of portfolio allocation, money illusion is "near rational."

Section 7 summarizes our findings and offers concluding comments.

2. Theoretical Background

The textbook Capital Asset Pricing Model (CAPM) is based on the work of Sharpe (1964), Lintner (1965), and Mossin (1966). This model shows how rational investors should combine risky assets with a given distribution of returns. It rests on the following important assumptions:

1. All assets can be freely traded.
2. Investors operate over a one-period planning horizon.
3. Investors are indifferent between any two portfolios with identical means and variances.

The third assumption can be replaced with the somewhat more primitive assumption that investors' objective functions are quadratic. Alternatively, it can be replaced with the assumption that asset returns are normal, so that the mean and variance fully characterize the distribution of returns.

These three assumptions yield a powerful conclusion: regardless of the number of assets in the economy, two mutual funds span the set of efficient portfolios. This result becomes even stronger if we add another assumption:

4. A riskless asset exists.

In this case, the riskless asset and a single mutual fund of risky assets are sufficient to generate all efficient portfolios. Under these conditions, all investors hold risky assets in the same proportions. In particular, every investor holds the same ratio of bonds to stocks. To achieve the desired balance of risk and return, investors simply vary the fraction of their portfolios made up of the riskless asset.

To illustrate this principle, consider a world with three assets: an index fund of stocks, an index fund of bonds, and riskless cash. Suppose the means and variance-covariance matrix of annual real returns for bonds and stocks from 1926 to 1992 represent distribution of future returns. In addition, suppose that cash offers a riskless real return equal to the mean real return on Treasury bills over the same period. Straightforward calculations show that, under these assumptions, all mean-variance efficient portfolios hold bonds and stocks with a ratio of .33 to one. For example, the portfolio composed of 60 percent stocks, 20 percent bonds, and 20 percent cash is mean-variance efficient; there is some quadratic objective function for which this portfolio is optimal. Other investors will hold other portfolios, depending on their preferences toward risk. But all investors will hold portfolios with a 0.33:1 ratio of bonds to stocks.

3. Popular Advice on Portfolio Allocation

It is easy to find advice on portfolio allocation being offered to the general public. Table 1 shows the recommendations of four financial advisors. The recommendations in part A come from a newsletter sent by Fidelity Investments, a large mutual-fund company. Those in part B come from a book promoted by Merrill Lynch, a large brokerage firm. Those in part C come from a book by Jane Bryant Quinn, a prominent journalist who writes on personal financial planning. Those in part D come from an article in the "Your Money" section of The New York Times.

Each of the advisors presents a recommended allocation among stocks, bonds, and cash for three investors with different preferences toward risk. (Here "cash" is interpreted as short-term money-market instruments, not currency.) In the last column we present the ratio of bonds to stocks, which we use to measure the composition of risky assets. The consistency of the advice is striking. For all of the advisors, the recommended ratio of bonds to stocks falls as the investor becomes more willing to take on risk.

Figure 1 illustrates the recommended portfolios in a type of diagram that we use throughout this paper. The horizontal axis shows the fraction of the portfolio made up of stocks. In all the settings we examine, this fraction is a good proxy for tolerance toward risk. The vertical axis shows the ratio of bonds to stocks. The set of optimal portfolios according to the mutual-fund separation theorem is simply a horizontal line. By contrast, the set of points representing the portfolios recommended by the popular advisors slopes downward. The inconsistency of these "data" with the celebrated mutual-fund separation theorem has not, to our knowledge, been previously noted. This figure suggests that textbook theory does not well describe the behavior of actual investors (or at least investment advisors).

One might argue that this failure of the mutual-fund separation theorem is not surprising, because various studies have shown that the CAPM does not fit the data on asset returns. It is important to note, however, that the validity of the mutual-fund separation theorem does not depend on the CAPM being the right model of asset returns. Empirical tests of the CAPM--such as examinations of whether beta is related to mean returns--are premised upon the assumption that all investors act according to the model. Even if this condition is false, a particular set of investors could still choose portfolios on the mean-variance efficient frontier. Thus, the fact that the CAPM has often been rejected as a model of asset returns should not preclude an investment advisor from recommending portfolios that satisfy the mutual-fund separation theorem.

One might also argue the mutual-fund separation theorem is obviously false because, in the world, we observe thousands of mutual funds rather than one single mutual fund. The existence of many mutual funds, however, can be explained by differences in expectations. If different people have different subjective distributions over future returns, then they will combine risky assets in different proportions. One virtue of studying the advice of popular advisors is that each advisor gives three portfolio allocations for investors with different risk tolerance. Presumably, the advisor's subjective distribution of returns is being held constant across the three recommended portfolios. Thus, although different expectations can explain the diversity of mutual funds in the world, it cannot explain the popular advice we document in Table 1.

4. Is the Advice Optimal?

As the title of this paper suggests, we view popular advice on asset allocation as a puzzle. In some circumstances, economists should not expect people to act exactly according to theory, because theory often predicts complicated behavior. But the mutual-fund separation theorem indicates that optimal behavior is exceedingly simple. What is surprising about popular advice on portfolio allocation is that it is both systematic and more complicated than indicated by textbook theory.

It is possible, of course, that popular financial advice on portfolio allocation is simply wrong. Such a conclusion would be troubling, however. Economists routinely assume that people act optimally. When confronted with the observation that people do not have the tools to perform formal optimization, economists often argue that people follow rules of thumb that allow them to act "as if" they were optimizing. Popular advice, such as that documented in Table 1, would seems to be an ideal device for allowing people to act optimally in an environment where formal optimization is difficult. The fact that such advice is widely disseminated suggests that it affects behavior. If this popular advice is wrong, then it would constitute *prima facie* evidence that people do not optimize.

An alternative to concluding that people do not optimize is to argue that popular advice is not wrong but that the economic model it contradicts is lacking. Indeed, this seems like a natural presumption. Since the popular advice is so systematic, perhaps there is good reason for it. If so, academic financial economists may be able to learn from popular advisors.

Like all conclusions from theory, the mutual-fund separation theorem rests on assumptions. In this section, we discuss the four key assumptions listed above, in reverse order. Our goal is to see if relaxing these assumptions can explain the disparity between the portfolios dictated by theory and those recommended by popular advisors.

The approach we take is necessarily numerical rather than analytic. Most deviations from the mutual-fund separation theorem will yield predictions conditional on the distribution of returns. Therefore, as we relax assumptions, we calculate optimal portfolios based on the historical distribution of returns from 1926 to 1992. Table 2 shows the means, standard deviations, and correlations of annual real returns for this period. (The underlying data are from Ibbotson Associates, 1993). Below we also consider the possibility that the advisors' subjective distribution might differ from this historical distribution.

4.1 Absence of a Riskless Asset

The most obvious assumption to relax is the existence of a riskless asset. Although U.S. Treasury bills are riskless in nominal terms, inflation makes their return uncertain in real terms. If we retain the other assumptions of the CAPM but allow for the absence of a riskless asset, two-fund separation continues to apply, but now both funds include risky assets. Without a riskless asset, optimal portfolios need not contain the same relative proportions of risky assets.

Figure 2 shows the set of mean-variance efficient portfolios given the historical distribution of returns. This figure is generated using a hill-climbing algorithm to identify the portfolio that achieves the lowest variance for each given mean return. By repeating this process for a range of mean returns, we derive the set of asset allocations that correspond to points on the mean-variance efficient frontier.

The result of relaxing the riskless-asset assumption is to raise the disparity between optimal and recommended portfolios. Financial advisors tell their clients to create riskier portfolios by *decreasing* the ratio of bonds to stocks. Yet calculations of mean-variance efficient portfolios suggests very different advice. According to these calculations, as an investor creates a riskier portfolio, he should allocate more assets to both stocks and bonds but should *increase* the ratio of bonds to stocks. Thus, allowing cash to be risky only deepens the asset allocation puzzle.

The intuition for this result comes from noting that the real returns on cash and bonds are highly correlated. For a low-risk investor, bonds are quite unattractive as a risky investment, since this investor holds a high proportion of his portfolio in cash. Thus, the ratio of bonds to stocks will be low. Indeed, the investor may even take a short position in bonds in order to hedge the risk inherent in his large cash holdings. As the investor takes on more risk, the cash proportion of his portfolio falls, and so the high correlation between cash and bond returns is not as problematic. Thus, the ratio of bonds to stocks rises.

4.2 Beyond the Mean-Variance Objective Function

Rational investors care about only the mean and variance of portfolio returns if returns are normal or if utility is quadratic. In practice, neither of these conditions is likely to hold. Various studies have documented that stock returns are skewed and kurtotic. (See Campbell, 1992, for example.) Moreover, quadratic utility is generally considered an unappealing assumption, as it implies decreasing absolute risk aversion. That is, under quadratic utility, a person's willingness to accept a risk of fixed size declines as wealth increases. This behavior is intuitively implausible.

A natural alternative to quadratic utility is the Constant Relative Risk Aversion (CRRA) utility function: $U(W)=W^{1-A}/(1-A)$. With this utility function, investors will care about more than the mean and variance of returns. That is, holding constant the mean and variance of returns, changing the skewness or kurtosis will affect investors' expected utility. We now consider optimal portfolios given the historical distribution of returns and CRRA utility.

To generate a set of optimal portfolios for investors with objective functions of this form, we use a hill-climbing algorithm to choose the portfolio that maximizes expected utility for various values of the risk aversion parameter. Expected utility is computed based on the historical distribution of returns. In particular, each realization of annual returns from 1926 to 1992 is taken to be equally likely. This approach assumes that all the moments of the subjective distribution of future returns exactly match the moments of the historical distribution.

Figure 3 depicts the set of optimal portfolios for investors with CRRA objective functions. We allow coefficient of relative risk aversion A to range from one to twelve. Notice that the set of optimal portfolios looks qualitatively similar for CRRA utility and for quadratic utility. In both cases, the ratio of bonds to stocks declines as the proportion of stock rises. It seems that CRRA objective functions cannot resolve our asset allocation puzzle.

4.3 A Digression: Subjective versus Historical Distributions

The optimal portfolios shown in Figures 2 and 3 depend on the particular distribution of returns used in the calculations. We used the historical distribution of real returns from 1926 to 1992. In doing this, we assumed that the historical distribution is a good proxy for the popular advisors' subjective distributions. To the extent that the historical and subjective distributions differ, optimal portfolios as we calculate them can differ from those recommended by popular advisors. There are two plausible ways in which this might occur.

First, it is possible that the distribution of returns has changed. In particular, the data from the volatile 1930s could in principle be having an excessive effect on the results. One might argue that the Great Depression is given too much weight when using the entire sample because the Depression was an unusual event that popular advisors believe will not be repeated. Similarly, one might argue that more recent data are more relevant for future returns simply because they are more recent. To investigate this issue, we recalculated the optimal portfolios using returns since 1946. We found that the optimal quantity of bonds is lower using data only from this recent period. Nonetheless, across efficient portfolios, the ratio of bonds to stocks rises as the proportion in stocks increases. Thus, the inconsistency of recommended and efficient portfolios shown in Figures 2 and 3 cannot be resolved simply by excluding data from the Great Depression.

Second, even if the subjective distribution of returns is the same as the distribution that generated the data, the subjective and historical distributions could differ because of sampling error. To investigate this possibility, we followed a bootstrap procedure. We generated 2000 artificial samples of the same size as our actual sample by drawing from the historical distribution with replacement. For each of the 2000 replications, we calculated how the optimal ratio of bonds to stocks varies with risk aversion. In over 95 percent of the replications, the ratio of bonds to stocks rose as the investor became more willing to take on risk. This was true whether or not we used data from the Great Depression. Thus, the key result illustrated in Figures 2 and 3 cannot be explained by sampling error.

4.4 Dynamic Portfolio Allocation

Although the CAPM assumes that investors face a one-period planning problem, actual investors make decisions over many periods. If the set of investment opportunities were the same each period--that is, if asset returns were independently distributed over time--then the dynamic problem would be essentially the same as the one-period problem. Yet this condition does not hold. The real interest rate (the return on cash) is serially correlated. Moreover, stock returns are serially heteroskedastic: high volatility in one period predicts high volatility in future periods. Hence, the set of investment opportunities is not constant over time.

In a world in which the distribution of asset returns changes, investors should attempt to hedge their portfolios against adverse shifts in the asset-return distribution. For instance, Merton (1973) considers the case in which the riskless rate is the single state variable determining the distribution of asset returns. In this case, rational investors should hedge movements in the riskless rate. Covariance with the riskless rate enters into the equilibrium prices of assets in a manner parallel to that of covariance with the market.

Can intertemporal hedging reconcile popular investment advice and financial theory? At this point we cannot offer a definitive answer. Yet intertemporal hedging of the sort discussed by Merton would seem to point in the right direction. More risk-averse investors should hedge their portfolios against adverse movements in mean asset returns to a greater extent than do their more aggressive counterparts. Because downward shifts in real interest rates both worsen the investment opportunity set and lead to positive returns for bondholders, intertemporal considerations provide a reason for more risk-averse investors to hold a greater proportion of their portfolio in bonds. The magnitude of this effect is not evident *a priori.*

Unfortunately, the empirical literature on intertemporal hedging lags far behind the theoretical literature. There are substantial obstacles to developing a simple model to test this potential explanation for our puzzle. Second moments as well as first moments of asset returns appear to change over time, and these changes are not simply functions of the riskless rate. To develop an empirically realistic model of intertemporal hedging, one would need to identify a small number of state variables that determine the distribution of asset returns. Yet Campbell's (1987) results suggest that identifying such a set of variables is difficult. We therefore offer intertemporal hedging as a theoretical consideration and a direction for further research.

We do, however, try to take a small step in the direction of incorporating the dynamics of asset returns. Following Fischer (1983), we suppose that the investor faces a one-period problem but that the investor's time horizon exceeds one year. If asset returns were independently distributed over time, the time horizon would not affect the composition of the optimal portfolio. In fact, however, varying the time horizon changes the variance-covariance matrix of returns and, therefore, the optimal portfolio implied by the CAPM. In particular, since bill returns are positively serially correlated, cash looks relatively more risky over longer time horizons.

To see how the time horizon matters, we calculated the mean-variance efficient portfolios based on the distribution of returns for one, five, and ten year returns. These are shown in Figure 4. Varying the time horizon does indeed affect the composition of optimal portfolios. Nonetheless, over each horizon the ratio of bonds to stocks *increases* with the overall riskiness of the portfolio. Thus, given the historical distribution of returns, it is impossible to reconcile the advice of financial advisors with the textbook CAPM for any time horizon.

4.5 Non-Traded Assets: Human Capital

The mutual-fund separation theorem is based on the assumption that all assets are traded. Yet much wealth is not traded as readily as stocks and bonds. Human capital--the present value of future labor earnings--is probably the most important non-traded asset. If investors hold non-traded assets and care about their total return, the optimal quantities of traded assets will reflect their covariances with non-traded assets.

The existence of human capital can potentially explain popular advice on portfolio allocation. The key condition is that human capital be more similar to stocks than to bonds. To see why, consider a simple example. Imagine that every investor holds a certain amount of human capital. Also imagine that human capital has exactly the same return as stocks. In this case, human capital is just another name for stock. For all investors to hold risky assets in the same proportion, as the mutual-fund separation theorem dictates, the following ratio must be constant:

$$\frac{\text{BONDS}}{\text{HUMAN CAPITAL + STOCKS}}$$

Investors who are more willing to take on risk would reduce their cash position and increase the numerator and denominator of this expression by the same proportion. But, since the amount of human capital is fixed, the amount of stock must rise proportionately more than the amount of bonds. The ratio BONDS/STOCKS would, therefore, be lower for these investors.

To evaluate whether human capital can in fact explain popular advice on portfolio allocation, one would need to measure the return on human capital and compute the covariance with other assets. Moreover, if preferences are not quadratic, one would need to take into account that each person's human capital generates a large amount of idiosyncratic risk that cannot be diversified through markets. Such an exercise is beyond the scope of this paper.

Yet we are skeptical that the existence of human capital can explain popular advice on portfolio allocation, for two reasons. First, it is not obvious that human capital is similar to stock. Labor earnings--the aggregate dividends on human capital--are almost perfectly correlated with measures of the business cycle, such as real GDP and unemployment. Both interest rates and stock prices have some predictive value for the business cycle. Therefore, the implicit return on human capital is probably correlated with both stock and bond returns.

Second, if human capital were an important consideration behind popular advice, a natural conclusion would be that individuals who hold more human capital--the young--should hold a smaller fraction of their traded portfolio in the form of stocks. Yet this is exactly the opposite of conventional wisdom among popular financial advisors. Young people, because of their long investment horizons, are counselled to hold a higher fraction of stocks than are the elderly.

4.6 Non-Traded Assets: Nominal Debts

Another important non-traded asset for many investors is debt, such as mortgages and student loans. These debts are often long-term and nominal. Therefore, they represent a short position in bonds. If these debts are taken into account, then the investor should hold the following ratio constant to satisfy the mutual-fund separation theorem:

$$\frac{\text{BONDS - DEBT}}{\text{STOCKS}}$$

Investors more willing to accept risk would proportionately increase both the numerator and denominator of this expression. If DEBT is held constant, then BONDS/STOCKS would be lower. Thus, the existence of nominal debts can potentially explain popular advice.

Yet we are skeptical that this explanation is the right one. First, it cannot explain the advice that the young hold more equity than the old. Since the young have more debts, the opposite should be true. Second, if the existence of nominal debts were important for popular advice, the advice should be different for homeowners and renters, as well as for those with fixed-rate mortgages and adjustable-rate mortgages. (Adjustable-rate mortgages are more like a short position in cash.) Yet popular advice does not seem to take account of these differences among investors.

5. Money Illusion

Consider the problem faced by an author of a book on financial planning. In the chapter on portfolio allocation, the author wants to give advice on portfolio allocations to stocks, bonds, and cash. The author believes that the CAPM is the right model, but she also believes that readers care about nominal rather than real returns.

In this case, the mutual-fund separation theorem should hold. There is certainly a riskless asset in nominal terms: Treasury bills. Thus, the proportion of risky assets--stocks and bonds--should not depend on the risk preferences of the investor.

Yet the author faces another difficulty: when writing the book, she does not know what interest rates will be when the advice is taken. That is, even though interest rates are known at the time of the investment, they are not known to the author giving the advice. Moreover, the author might view advice contingent on the interest rate as too complicated for her intended audience.

Thus, the author faces a problem with three risky assets: stocks, bonds, and cash. When determining the allocation among these three assets, she views the return on each of them as unknown. In her book, she wants to present several mean-variance efficient portfolios given the unconditional distribution of nominal returns. Table 3 presents summary statistics on nominal returns for the period 1926 to 1992.

Figure 5 shows the set of optimal portfolios given quadratic utility and CRRA utility. The figure shows that using nominal returns does seem to do a good job in fitting advice actually given. In all cases, the ratio of stocks to bonds falls monotonically as the fraction of the portfolio devoted to stock increases. The magnitude of the decline is greater for CRRA utility than for quadratic utility.

The greatest discrepancy between the optimal and recommended portfolios occurs when the proportion of stock is high. In particular, when the proportion of stock is above 70 percent, the popular advisors recommend much lower ratios of bonds to stocks than is optimal for this problem. This discrepancy can perhaps be explained by constraints on borrowing. The optimal portfolios in this range include a short position in cash. Since actual investors cannot borrow at the Treasury bill rate, one might want to impose a higher rate on borrowing than lending. In this case, the optimal portfolios would more closely resemble the recommended portfolios.

The overall conclusion from this figure, therefore, is that if one is willing to accept the assumption of money illusion, popular advice on portfolio allocation is easier to explain. The reason is that the variance-covariance matrix is different for nominal and real returns. Comparing Figures 2 and 5, one can see that the greatest differences come in the low-risk portfolios. Optimal low-risk portfolios computed with real returns have low holdings of bonds relative to stocks. By contrast, optimal low-risk portfolios computed with nominal returns have high holdings of bonds relative to stocks.

To gain some intuition about why real and nominal returns imply such different behavior, consider the portfolio of a highly risk averse investor. Such an investor will hold a high proportion of his portfolio in cash, which is the least risky asset. Comparing Tables 2 and 3, one can see that cash and bonds are much more highly correlated in real terms than in nominal terms. This difference affects the usefulness of bonds to the highly risk-averse investor. If he cares about the real return on his portfolio, he will take a short position in bonds in order to hedge his holdings of cash. Yet if he cares about the nominal return on his portfolio, he will take a long position in bonds in order to diversify out of cash.

To illustrate this, we computed the extreme case of the minimum-variance portfolio. For real returns, this portfolio includes 3.2 percent stocks, -15.3 percent bonds, and 112.1 percent cash; for nominal returns, it includes 2.6 percent stocks, 4.4 percent bonds, and 93.0 percent cash. Thus, for the infinitely risk-averse investor, the ratio of bonds to stocks should be negative if he thinks in real terms, but it should be positive and large if he thinks in nominal terms. Since popular advisors recommend a high ratio of bonds to stocks for conservative investors, explaining their advice is easier using nominal returns.

Because the distinction between nominal and real returns matters so much, one might suspect that measurement error in inflation could be potentially important. It is certainly true that changes in the level of prices are measured less accurately than (nominal) asset returns. Yet we doubt that such measurement error is important in this context. The most natural assumption is that measurement error is uncorrelated with asset returns. If this is the case, then measurement error will not change the set of mean-variance efficient portfolios measured in real terms, for it will merely add the same irreducible noise to the returns on all assets. Thus, unless one has some reason to believe that measurement error in inflation is correlated with asset returns, it cannot help explain the apparent success of the money-illusion hypothesis.

At this point, we should admit that some readers may view the assumption of money illusion as *ad hoc*. In its defense, one might point out that this assumption has been used to explain various other phenomena that otherwise would be puzzling. For example, Modigliani and Cohn (1979) have argued that a confusion between real and nominal interest rates explains why the stock market was so depressed during high inflation of the 1970s. Shafir, Diamond, and Tversky (1993) discuss a variety of experimental evidence that people suffer from money illusion. Thus, the assumption of money illusion may be unpalatable, but it is not *ad hoc* in the true meaning of the term.

Moreover, there is reason to believe that money illusion plays a role in investors' thinking about portfolio choice. The public can now make investment decisions with the help of portfolio-allocation software. Two well-known examples are Retirement Planner developed by The Vanguard Group (the large mutual fund company) and Wealth Builder developed by Money Magazine. These software programs aim to help the user determine the optimal allocations among cash, bonds, and stocks by presenting the historical risk and return of alternative portfolios. It is noteworthy that both of these programs show risk-return tradeoffs using nominal returns. The existence of these programs provides some circumstantial evidence that money illusion plays a role in portfolio allocation.

6. The Costs of Non-Optimization

An assumption that underlies almost all models in economics, including the CAPM, is that people optimize perfectly. That is, people are assumed to choose the exact values of the variables under their control that maximize their objective function. Yet, as Akerlof and Yellen (1985) emphasize, small deviations from optimal settings result in only second-order losses. Therefore, one should not be surprised to see behavior that is only "near rational." In this section, we ask whether near rationality can help explain the observed discrepancy between the prediction of the mutual-fund separation theorem and popular advice on portfolio allocation.

Near rationality on the part of investors can take two forms: selection of a portfolio that is off the mean-variance efficient frontier and selection of a portfolio that is at the wrong point on the frontier. An observer who does not know the investor's preferences toward risk can only detect the first type of error. Here we assume that the CAPM applied to real returns is the right model and ask how far the recommended portfolios are from the efficient frontier.

In Figure 6, we compare the means and variances of the recommended portfolios to the mean-variance efficient frontier. Although some of the recommended portfolios look quite different from efficient portfolios, the cost of non-optimization seems small. For example, the most inefficient recommended portfolio is conservative portfolio of Fidelity and Jane Bryant Quinn. Yet even this portfolio is only 22 basis points, or 0.22 percent, off the efficient frontier. Thus, even if the portfolio recommendations of popular advisors are not fully rational, they appear nearly rational.

To gauge the magnitude of this deviation from the efficient frontier, one can compare it to investors' other costs. One such cost is the annual expenses associated with mutual funds. As Bogle (1994) reports, the average stock mutual fund has annual expenses of 150 basis points. Moreover, the difference in expenses between high-cost and low-cost mutual funds is over 150 basis points. Thus, relative to the other costs facing investors, the cost of being away from the efficient frontier is small.

One might be tempted to conclude that since the recommended portfolios are close to optimal, there was never any puzzle to be explained. Yet, for several reasons, this conclusion is not satisfying. First, although near rationality might explain why an investor would not bother to rebalance a portfolio that is off the efficient frontier, it cannot explain the recommendations of popular advisors who assume that investors begin with a clean slate. Second, if popular advisors recommended some rule of thumb that was almost optimal, one might conclude that they were optimizing subject to the constraint that their advice be simple. But popular advice is in fact less simple the advice given by the mutual-fund separation theorem. Third, popular advice differs from theory in a consistent way. Appealing to near rationality does not explain why the deviation from full optimality is so systematic.

Near rationality combined with money illusion, however, does seem to provide a parsimonious resolution to our puzzle. It is often pointed out that money is the yardstick with which people measure economic transactions. In other words, it is simpler for people to think in terms of the unit of account rather than in inflation-adjusted terms. Thus, although living standards depend on real returns, popular investment advisors offer menus of portfolios that are efficient in nominal returns. The cost of this form of irrationality is very small, so the advisors never have a strong incentive to alter their behavior.

7. Conclusion

In this paper we have treated the recommended portfolios of financial advisors as data that any theory of portfolio allocation must confront. These data exhibit a pronounced regularity: those portfolios with a high proportion of stocks have a small ratio of bonds to stocks. This regularity is noteworthy, because it contradicts the predictions of the textbook mutual-fund separation theorem.

The purpose of this paper has been both to document this regularity of popular advice on portfolio allocation and to explain it. Our attempts to explain it have led us to three conclusions. First, it appears difficult to explain popular advice using models of fully rational investors. Second, the advice can be explained if one assumes that investors care about nominal rather than real returns. Third, the loss from the apparent failure of optimization is not very great. In particular, although popular advice on portfolio allocation is below the efficient frontier measured in real terms, investors who follow the advice lose at most 22 basis points of return.

Although we have not been able to explain popular advice within a rational model, it is possible that others will succeed where we have failed. Our results here indicate that the absence of a riskless asset and deviations from mean-variance preferences are unlikely to help resolve the puzzle. By contrast, it harder to evaluate the roles of intertemporal hedging and non-traded assets. Developing portfolio models that include these features and that are simple enough to implement empirically remains a challenge for future research.

Table 1

Asset Allocations Recommended By Financial Advisors

Advisor and Investor Type	Percent of Portfolio Cash	Bonds	Stocks	Ratio of Bonds to Stocks
A. Fidelity				
Conservative	50	30	20	1.50
Moderate	20	40	40	1.00
Aggressive	5	30	65	0.46
B. Merrill Lynch				
Conservative	20	35	45	0.78
Moderate	5	40	55	0.73
Aggressive	5	20	75	0.27
C. Jane Bryant Quinn				
Conservative	50	30	20	1.50
Moderate	10	40	50	0.80
Aggressive	0	0	100	0.00
D. The New York Times				
Conservative	20	40	40	1.00
Moderate	10	30	60	0.50
Aggressive	0	20	80	0.25

Sources:

A. Larry Mark, "Asset Allocation: Finding the Right Mix," Fidelity Focus: The Magazine for Fidelity Investors, Winter 1993, page 11.

B. Don Underwood and Paul B. Brown, Grow Rich Slowly: The Merrill Lynch Guide to Retirement Planning, New York: Viking, 1993, page 257.

C. Jane Bryant Quinn, Making the Most of Your Money, New York: Simon and Schuster, 1991, page 489.

D. Mary Rowland, "Seven Steps to Handling an Inheritance," The New York Times, Saturday, February 5, 1994, page 34.

Table 2

The Distribution of Annual Real Returns: 1926-1992

Asset	Arithmetic Mean Return	Standard Deviation	Correlation with Bonds	Correlation with Stocks
Treasury Bills	0.6 %	4.3 %	.63	.09
Long-term Government Bonds	2.1	10.1	1.00	.23
Common Stock	9.0	20.8	.23	1.00

Table 3

The Distribution of Annual Nominal Returns: 1926-1992

Asset	Arithmetic Mean Return	Standard Deviation	Correlation with Bonds	Correlation with Stocks
Treasury Bills	3.8 %	3.3 %	.25	-.05
Long-term Government Bonds	5.2	8.6	1.00	.14
Common Stock	12.4	20.6	.14	1.00

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Figure 1.

Optimal and Recommended Portfolios

CAPM Assumptions

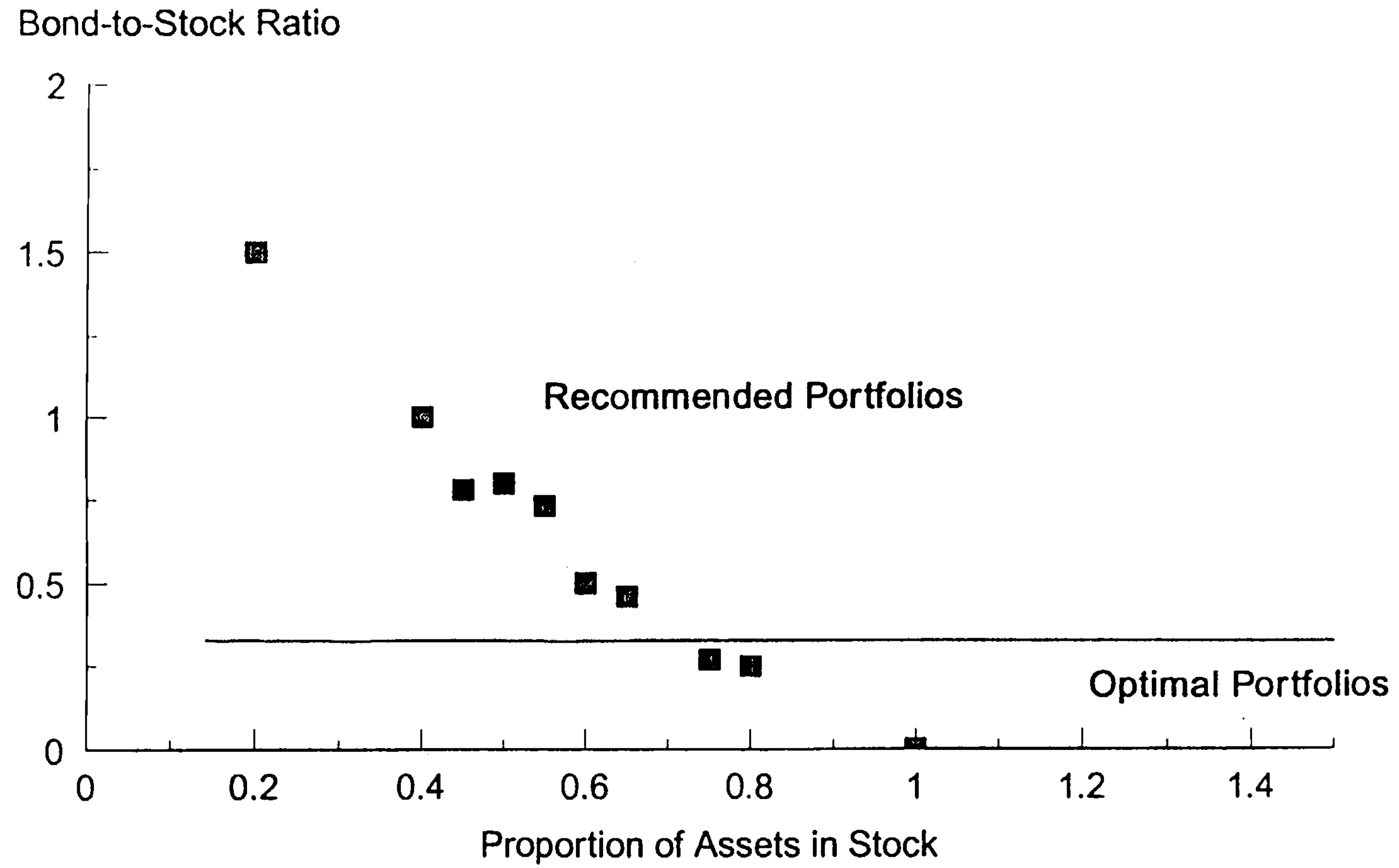

Figure 2.

Optimal and Recommended Portfolios

No Riskless Asset

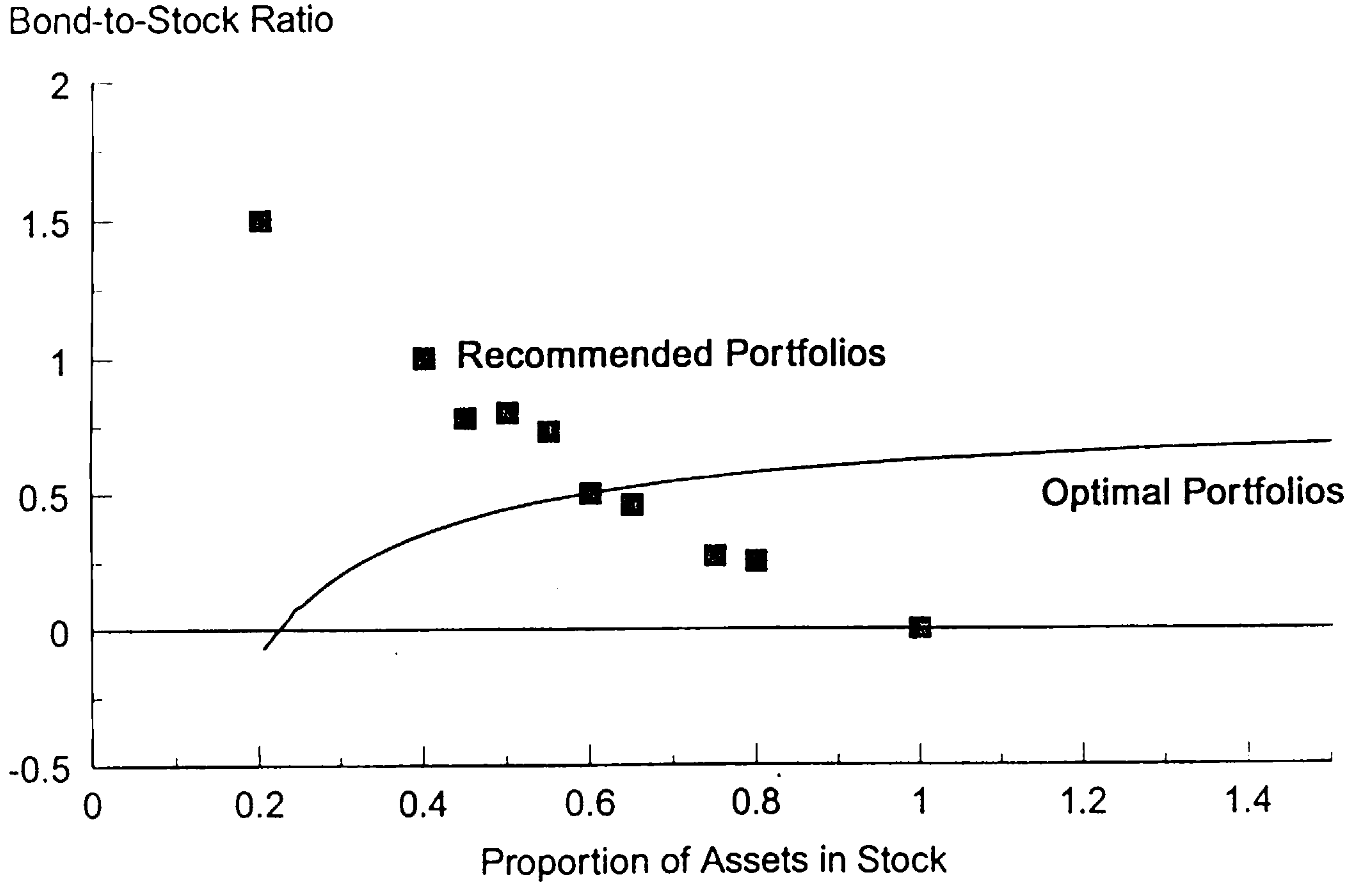

Figure 3.

Optimal and Recommended Portfolios

CRRA and Quadratic Objective Functions

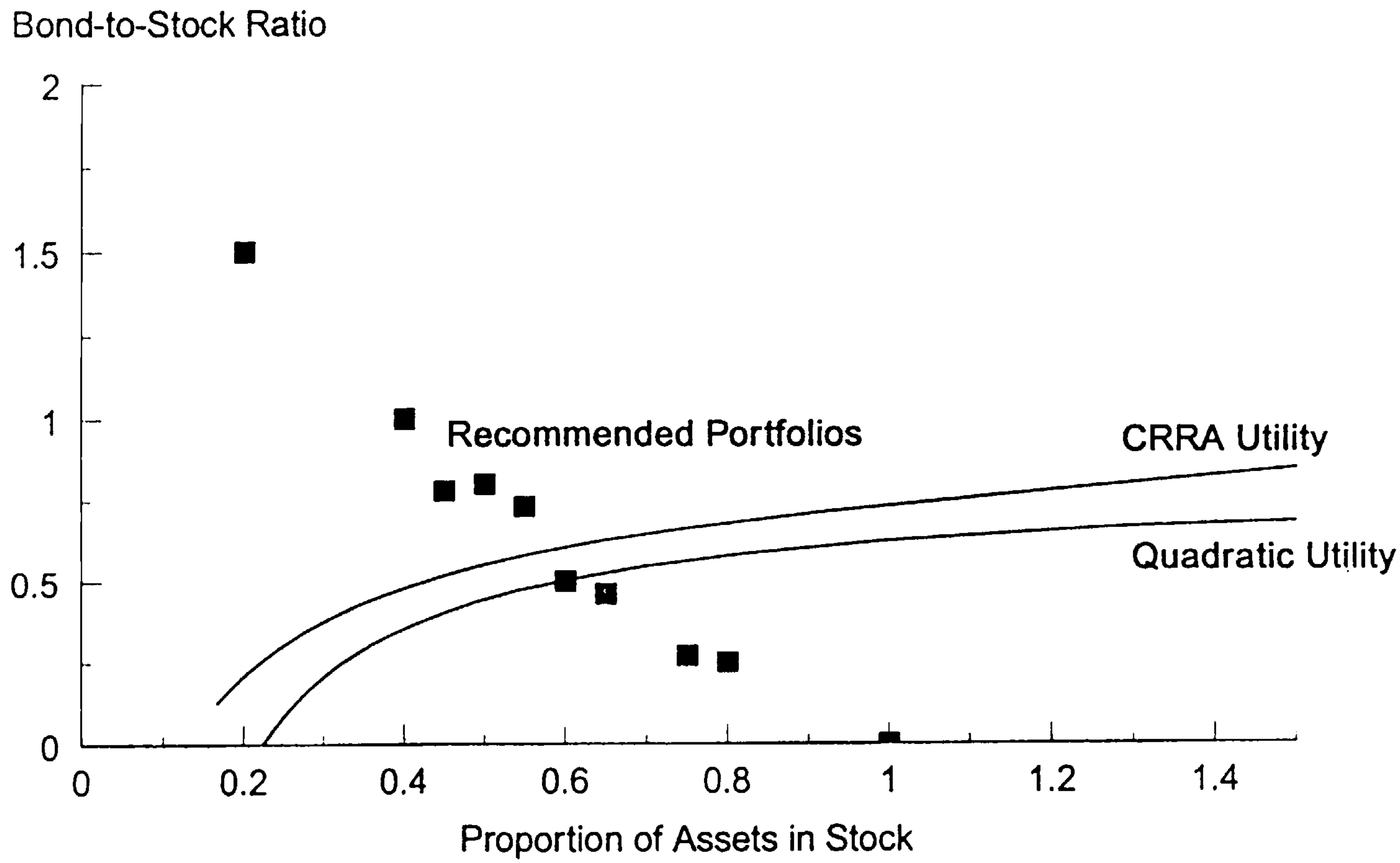

Figure 4.

Optimal and Recommended Portfolios

One, Five, and Ten-Year Horizons

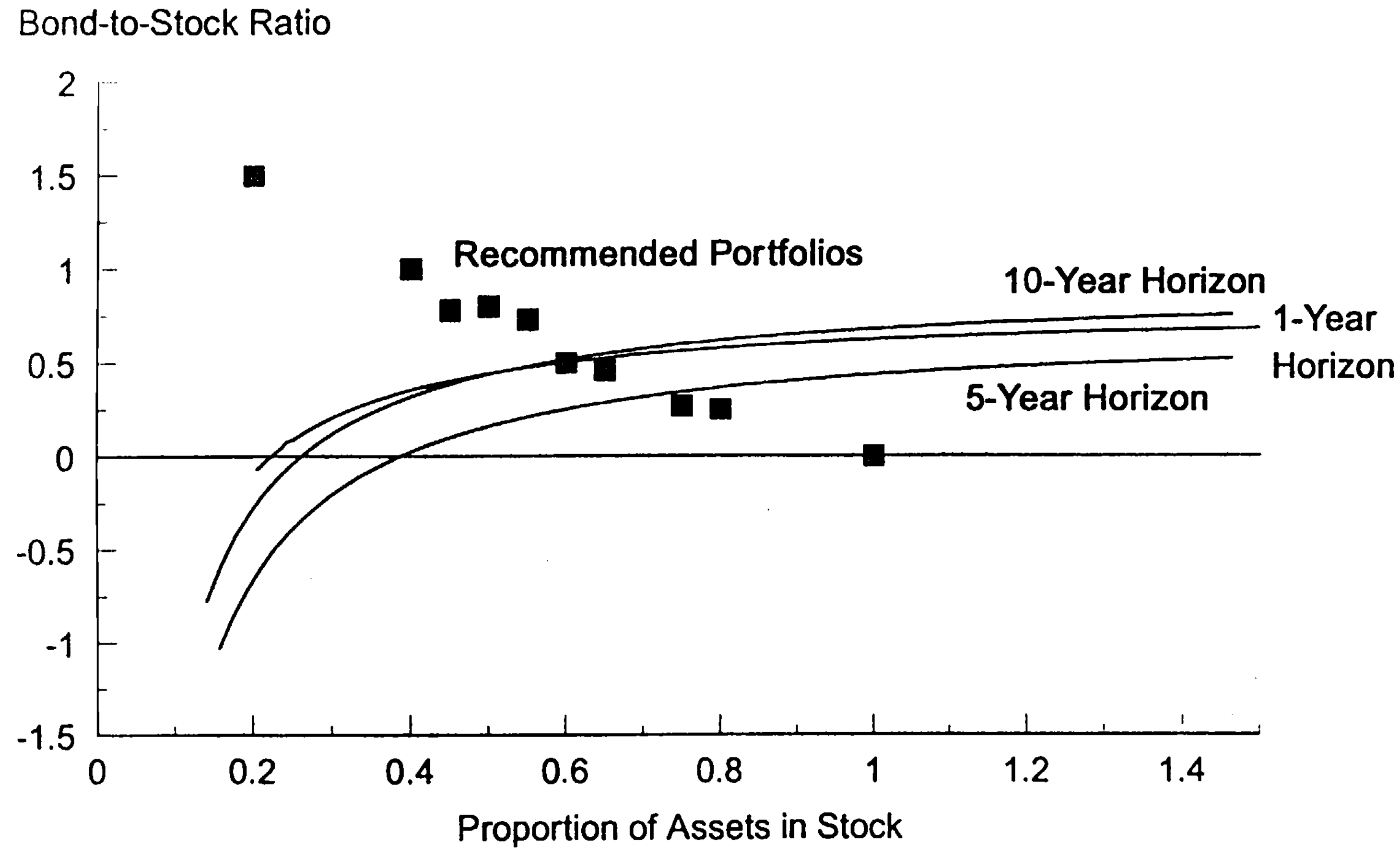

Figure 5.

Optimal and Recommended Portfolios

Nominal Returns

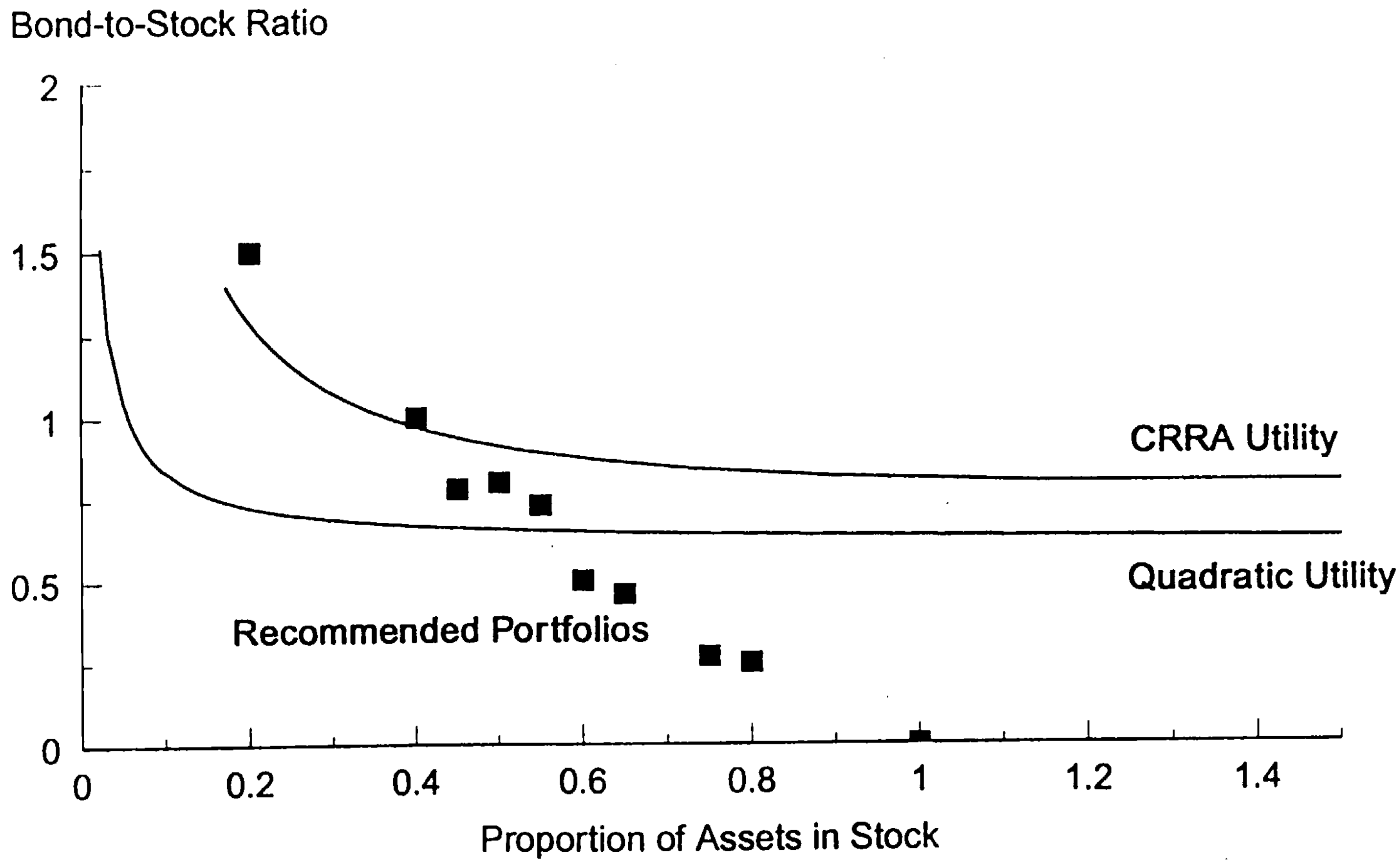

Figure 6.

Mean-Variance Efficient Frontier