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基金經理人避險能力之評估

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ABSTRACT

Merton (1973) and Campbell (1993) have demonstrated that if an investor anticipates information shifts, he will adjust his portfolio choice today in an attempt to hedge these shifts. Exploiting these insights, we construct a new performance measure to evaluate fund managers' hedging ability. This new measure is different from two widely adopted performance evaluation measures: securities selectivity and market timing. Moreover, an econometric methodology is developed to simultaneously estimate the magnitudes of these three portfolio performance evaluation measures. The results show that mutual fund managers are on average with positive security selection and negative market timing ability. Furthermore, the mutual funds with investment style classified as "Asset Allocation" generally have positive hedging timing ability.

I. INTRODUCTION

Since the mutual fund has been a major investment vehicle in U.S. as well as other countries across the world, the evaluation of mutual fund's performance has attracted enormous attention from both practitioners and academics. The most widely used measure is Jensen's (1968,1969) α measure, which uses the security market line to evaluate a fund's performance. However, there are some problems associated with Jensen's α measure. One is that errors in inference may arise when the fund manager is a market timer. For instance, Jensen (1972) and Dybvig and Ross (1985) demonstrate that Jensen's α measure may assign a negative performance when the fund manager possesses and utilizes superior timing information.

Fama (1972) indicates that there are two ways for fund managers to obtain abnormal returns. The first one is security analysis, which is the ability of fund managers to identify the potential winning securities. The second one is market timing, which is the ability of portfolio managers to time market cycles and take advantage of this ability in trading securities. Several market timing and selectivity models have been developed in two lines. Treynor and Mazuy (1966) develop the first quadratic market-timing model to examine the market timing ability of fund managers. The intuition behind the model is that a fund manager with market timing ability is, on average, able to increase the stock portion of the managed portfolio when stock returns are high and reduce it when stock returns are low. A formal treatment of the quadratic markets timing model is found in Jensen (1972), who develops theoretical structures for the evaluation of market timing performance of fund managers. Bhattacharya and Pfliederer (1983) extend the work of the Jensen model by minimizing the variance of the forecasting error. Furthermore, Admati, Bhattacharya and Pfliederer (1986) use the portfolio approach and factor approach to assess the market timing ability of fund managers.

Henriksson and Merton (1981) initiate the second line of market timing research. They use a put option on the market portfolio with its exercise price equal to the risk-free rate. In their model, market timers forecast either that equities outperform bonds or vise versa. This implies that the probability of receiving an up or a down signal does not depend upon how far the market will be up or down. Henriksson (1984) employs the Henriksson and Merton's model to evaluate mutual fund performance. The empirical results did not support the hypothesis that fund managers are able to time the return on the market portfolio successfully. Jagannathan and Korajczyk (1986) offer explanations for apparent perverse timing involving possible option-like characteristics of mutual fund returns.

Numerous papers have employed different proxies for the benchmark portfolio in the CAPM framework to measure the performance of mutual funds. However, Roll (1977) argues that there is no appropriate benchmark portfolio to compute market beta. When inefficient market indices are used for the performance measure, any evaluation value can be assigned to a mutual fund. Therefore, Connor and Korajczyk (1986) develop a theory of portfolio performance measurement using the Arbitrage Pricing Theory (APT). Lehmann and Modest (1987) employ a variety of APT benchmarks to investigate the sensitivity of the chosen benchmark to measure normal performance. To address the observed dynamic behavior of returns, Ferson and Schadt (1996) have proposed a conditional performance evaluation in which the conditional expected return on an asset is related to the conditional expected return on the market portfolio with a conditional time-varying beta and conditional alphas. However, their approach is a conditional CAPM without theoretical foundation in dynamic economics.

In this paper, we develop a new performance measure that explores an equilibrium version of dynamic asset pricing model proposed by Campbell (1993) to measure mutual fund performance. It is often believed that if a fund manager anticipates information shifts, he will adjust his portfolio to hedge these shifts in a dynamic economy. We extend Campbell's framework to capture this hedging demand of mutual fund managers. In this model, hedging timing performance is developed to detect the timing ability of the hedging portfolio return as well as future return. Market timing performance is used to detect the timing ability of market return, and selectivity performance is constructed to detect the selectivity ability of mutual fund managers.

This paper contains several contributions. First, we extend the dynamic asset pricing model of Campbell to a multiple regression framework which argues that the realized excess returns on any portfolio can be represented as a linear function of its market risk premium and hedging risk premium. Second, we construct a new performance measure based on this multiple regression framework. This implies that our performance measure can explain the dynamic behavior of fund managers. Finally, we present an empirical examination of the selectivity, market timing, and hedging timing performance for a sample of U.S. mutual funds. The results suggest that mutual fund managers are on average better with selectivity ability than with market timing ability. We also find evidence for the hedging timing ability of the fund managers. This implies that these fund managers use the forecasts of the aggregate forward-looking factor in their hedging strategies.

The paper is organized as follows. Section II derives the linear multiple regression function of the dynamic asset pricing model by extending Campbell's equilibrium version of the dynamic asset pricing framework. In section III, we construct a new performance evaluation and derive its relationship to the general equilibrium structure of dynamic asset pricing model. Section IV describes empirical methodology. Section V reports the data and the main empirical evidences. The conclusion is presented in the last section.

II. DYNAMIC ASSET PRICING MODEL

The pricing model adopted in the paper is based on a competitive equilibrium version of the intertemporal asset pricing model derived in Campbell (1993)[1]. We first review the theory of non-expected utility proposed by Weil (1989) and Epstein and Zin (1991). Then, we use a log-linear approximation to the budget constraint to derive the asset pricing model used in the paper.

A. Non-expected utility

[1] Campbell (1993) uses a log-linear approximation to the budget constraint to derive an intertemporal asset pricing formula that makes no reference to consumption. The formula is a discrete-time version of Merton's (1973) continuous-time model but is much easier to implement empirically. Hence, we adopt this discrete-time model to derive a dynamic model of performance evaluation.

We consider a pure exchange economy in which a single, infinitely lived representative agent chooses consumption and portfolio composition to maximize utility. There is one good and N assets in the economy. The agent in this economy is assumed not to be indifferent to the timing of the resolution of uncertainty over temporal lotteries. The agent's preferences are assumed to be represented recursively by

$$V_t = W(C_t, E_t[\widetilde{V}_{t+1} \mid I_t]), \tag{1}$$

where W(.,.) is the aggregator function, C_t is the consumption level at time t, and E_t is the mathematical expectation conditional on the information set at time t. As shown by Kreps and Porteus (1978), the agent prefers early resolution of uncertainty over temporal lotteries if W(.,.) is convex in its second argument. Alternatively, if W(.,.) is concave in its second argument, the agent will prefer late resolution of uncertainty over temporal lotteries.

The aggregator function is further parameterized by

$$\begin{aligned} V_t &= [(1-\beta)C_t^{1-1/\sigma} + \beta(E\widetilde{V}_{t+1}^{1-\gamma})^{\frac{1-1/\sigma}{1-\gamma}}]^{\frac{1}{1-1/\sigma}} \\ &= \{(1-\beta)C_t^{(1-\gamma)/\theta} + \beta(\underset{t}{E}\widetilde{V}_{t+1}^{1-\gamma})^{1/\theta}\}^{\theta/(1-\gamma)} \end{aligned} \tag{2}$$

The parameter β is the agent's subjective time discount factor and γ can be interpreted as the Arrow-Pratt coefficient of relative risk aversion. It can also be shown that σ measures the elasticity of intertemporal substitution. In this parameterization, the agent's preference over the timing of the resolution of uncertainty is determined by the parameters γ and σ. For instance, if the agent's coefficient of relative risk aversion (γ) is greater than the reciprocal of his elasticity of intertemporal substitution (1/σ), then he prefers early resolution of uncertainty. Conversely, if the reciprocal of the agent's elasticity of intertemporal substitution is larger than his coefficient of relative risk aversion, he prefers late resolution of uncertainty. If γ is equal to 1/σ, the agent's utility becomes an isoelastic, von Neumann-Morgenstern utility and he is indifferent to the timing of the resolution of uncertainty. In this case, equation (2) becomes the von Newmann-Morgenstern expected utility

$$V_t = [(1-\beta) E_t \sum_{j=1}^{\infty} \beta^j \tilde{C}_{t+j}^{1-\gamma}]^{\frac{1}{1-\gamma}} \quad . \tag{3}$$

B. Log-linear budget constraint

We now turn to the characterization of the budget constraint of the representative investor who can invest his wealth in N assets. The gross rate of return on asset i held throughout period t is given by $R_{i,t+1}$. Let

$$R_{m,t+1} \equiv \sum_{i=1}^{N} \alpha_{i,t} R_{i,t+1} \tag{4}$$

denote the rate of return on the market portfolio, and $\alpha_{i,t}$ be the fraction of the investor's total wealth held in the i th asset in period t. There are only $N-1$ independent elements in $\alpha_{i,t}$ since the constraint

$$\sum_{i=1}^{N} \alpha_{i,t} = 1 \tag{5}$$

holds for all t. The representative agent's dynamic budget constraint can be given by

$$W_{t+1} = R_{m,t+1}(W_t - C_t), \tag{6}$$

where is the investor's wealth at time t. The budget constraint in equation(6) is nonlinear because of the interaction between subtraction and multiplication. The investor is able to affect future consumption flows by trading in the risky assets. Campbell linearizes the budget constraint by dividing equation(6) by W_t, taking the log, and then using a first-order Taylor expansion around the mean log consumption/wealth ratio, $\log\frac{C}{W}$. If we define the parameter $\rho = 1-\exp(c_t - w_t)$, the approximation to the intertemporal budget constraint is

$$\Delta w_{t+1} \cong r_{m,t+1} + k + (1-\frac{1}{\rho})(c_t - w_t) \;, \tag{7}$$

where the log form of the variable is indicated by lowercase letters and k is a constant.

Combining equation(7) with the following equality,

$$\Delta w_{t+1} = \Delta c_{t+1} + (c_t - w_t) - (c_{t+1} - w_{t+1}) \,, \tag{8}$$

we obtain a difference equation in the log consumption-wealth ratio, $c_t - w_t$. Campbell shows that if the log consumption-wealth ratio is stationary, i.e. $\lim_{j\to\infty}\rho^j (c_{t+j} - w_{t+j}) = 0$, then the approximation can be written as

$$c_{t+1} - \underset{t}{E}\, c_{t+1} = (\underset{t+1}{E} - \underset{t}{E})\sum_{j=0}^{\infty}\rho^j r_{m,t+1+j} - (\underset{t+1}{E} - \underset{t}{E})\sum_{j=1}^{\infty}\rho^j \Delta c_{t+1+j} \;. \tag{9}$$

Equation (9) can be used to express the fact that an upward surprise in consumption today is determined by an unexpected return on wealth today, or by news that future returns will be higher, or by a downward revision in expected future consumption growth.

C. Euler equations

In this setup, Epstein and Zin (1989) derive the following Euler equation for each asset:

$$1 = E_t[\{\beta(\frac{C_{t+1}}{C_t})^{-1/\sigma}\}^{\theta}\{\frac{1}{R_{m,t+1}}\}^{1-\theta} R_{i,t+1}] \ . \tag{10}$$

Assume for the present that asset prices and consumption are jointly lognormal or apply a second order Taylor expansion to the Euler equation. Then, the log version of the Euler equation (10) can be represented as

$$0 = \theta \log\beta - \frac{\theta}{\sigma} E_t \Delta c_{t+1} + (\theta-1) E_t r_{m,t+1} + E_t r_{i,t+1}$$
$$+ \frac{1}{2}[(\frac{\theta}{\sigma})^2 V_{cc} + (\theta-1)^2 V_{mm} + V_{ii} - \frac{2\theta}{\sigma}(\theta-1)V_{cm} - \frac{2\theta}{\sigma}V_{ci} + 2(\theta-1)V_{im}] \ , \tag{11}$$

where V_{cc} denotes $Var(c_{t+1})$, V_{jj} denotes $Var(r_{j,t+1}) \forall j = i,m$, V_{cj} denotes $Cov(c_{t+1}, r_{j,t+1}) \forall j = i,m$, and V_{im} denotes $Cov(r_{i,t+1}, r_{m,t+1})$.

Replacing asset i by the market portfolio and rearranging Equation (11), we obtain the relationship between expected consumption growth and the expected return on the market portfolio

$$E_t \Delta c_{t+1} = \sigma \log\beta + \frac{1}{2}[(\frac{\theta}{\sigma})V_{cc} + \theta\sigma V_{mm} - 2\theta V_{cm}] + \sigma E_t r_{m,t+1} \ . \tag{12}$$

When we subtract equation (11) for the risk-free asset from that for asset i, we obtain

$$E_t r_{i,t+1} - r_{f,t+1} = -\frac{V_{ii}}{2} + \theta\frac{V_{ic}}{\sigma} + (1-\theta)V_{im} \ , \tag{13}$$

where $r_{f,t+1}$ is a log riskless interest rate. Equation (13) expresses the expected excess log return on an asset (adjusted for the Jensen's inequality effect) as a weighted sum of two terms. The first term, with a weight θ, is the asset covariance with consumption divided by the intertemporal elasticity of substitution, σ. The second term, with a weight $1-\theta$, is the asset covariance with the return from the market portfolio.

D. Substituting consumption out of the asset pricing model

Now, we combine the log-linear Euler equation with the approximated log-linear budget constraint to get an intertemporal asset pricing model without consumption. Substituting equation(12) into equation(9), we obtain

$$c_{t+1} - \underset{t}{E}\, c_{t+1} = r_{m,t+1} - \underset{t}{E}\, r_{m,t+1} + (1-\sigma)(\underset{t+1}{E} - \underset{t}{E})\sum_{j=1}^{\infty}\rho^j r_{m,t+1+j} \;, \tag{14}$$

Equation (14) implies that unexpected consumption comes from an unexpected return on invested wealth today or expected future returns .

Based on equation (14), the conditional covariance of any asset return with consumption can be rewritten in terms of the covariance with the return on the market and revisions in expectations of future returns on the market which is given by

$$\mathrm{cov}_t(r_{i,t+1}, \Delta c_{t+1}) \equiv V_{ic} = V_{im} + (1-\sigma)V_{ih} \;, \tag{15}$$

where $V_{ih} = Cov_t\,(r_{i,t+1}, (\underset{t+1}{E} - \underset{t}{E})\sum_{j=1}^{\infty}\rho^j r_{m,t+1+j})$

Substituting equation (15) into equation (13), we obtain an asset pricing model that is not related to consumption:

$$\underset{t}{E}\, r_{i,t+1} - r_{f,t+1} = -\frac{V_{ii}}{2} + \gamma V_{im} + (\gamma - 1)V_{ih} \;. \tag{16}$$

Equation (16) states that the expected excess log return in an asset, adjusted for a Jensen's inequality effect, is a weighted average of two covariances : the covariance with the return from the market portfolio and the covariance with news about future returns on invested wealth. The intuition for equation (16) is that assets are priced using their covariances with the return on invested wealth and with news about future returns on invested wealth. In addition, we can explain $r_{h,t+1} = (\underset{t+1}{E} - \underset{t}{E})\sum_{j=1}^{\infty} \rho^j r_{m,t+1+j}$ as the hedging portfolio return, which is an analogue of Merton's (1973) continuous time model.

PROPOSITION: *If there exists a representative agent and his coefficient of relative risk aversion is constant across different assets, then intertemporal asset pricing model of (16) can be represented as*

$$\underset{t}{E} r_{i,t+1} - r_{f,t+1} + \frac{V_{ii}}{2} = \beta_{im}(\underset{t}{E} r_{m,t+1} - r_{f,t+1} + \frac{V_{mm}}{2}) + \beta_{ih}(\underset{t}{E} r_{h,t+1} - r_{f,t+1} + \frac{V_{hh}}{2}) \qquad (17)$$

where market beta, β_{im}, and hedging beta, β_{ih}, are also the coefficients of the multiple regression in equation (17).

Proof: See Appendix.

Equation (17) implies that in additional to market factor in the traditional CAPM, there exists another factor, the hedging factor, to explain expected asset return. The hedging factor is a portfolio that hedges the news about future returns on the market return.

III. A NEW PERFORMANCE EVALUATION MEASURE

In this section we outline the foundations of the performance evaluation analysis and its relationship to the general equilibrium structure of the asset pricing model derived in the last section. Let

$$\underset{t}{E}\, R_{i,t+1} = \underset{t}{E}\, r_{i,t+1} - r_{f,t+1} + \frac{V_{ii}}{2}, \tag{18}$$

$$\underset{t}{E}\, R_{m,t+1} = \underset{t}{E}\, r_{m,t+1} - r_{f,t+1} + \frac{V_{mm}}{2},$$

$$\underset{t}{E}\, R_{h,t+1} = \underset{t}{E}\, r_{h,t+1} - r_{f,t+1} + \frac{V_{hh}}{2}.$$

Then, equation (17) can be expressed as

$$\underset{t}{E}\, R_{i,t+1} = \beta_{im} \underset{t}{E}(R_{m,t+1}) + \beta_{ih} \underset{t}{E}(R_{h,t+1}) \tag{19}$$

and using the law of iterative expectations, we have

$$ER_{i,t+1} = \beta_{im} E(R_{m,t+1}) + \beta_{ih} E(R_{h,t+1}) \tag{20}$$

The formulation of dynamic market model is denoted as

$$R_{i,t+1} = \beta_{im} R_{m,t+1} + \beta_{ih} R_{h,t+1} + \varepsilon_{i,t+1} \tag{21}$$

Equation (21) denotes that the realized excess returns on any portfolio can be represented as a linear function of its market risk and hedging risk. The random error, $\varepsilon_{i,t+1}$, has an expected value of zero.

If the fund manager is an informed forecaster, he will tend to select securities that realize $\varepsilon_{i,t+1} > 0$. Hence, his fund will earn more than the normal risk premium for its level of risk. Allowing for the existence of a nonzero constant in equation (21), we have

$$R_{i,t+1} = \alpha_i + \beta_{im} R_{m,t+1} + \beta_{ih} R_{h,t+1} + e_{i,t+1} \tag{22}$$

The new error term, $e_{i,t+1}$, is assumed to have zero expectation and to be independent of $R_{m,t+1}$ and $R_{h,t+1}$. If the fund manager has the security selection ability, the intercept, α_i, will be positive. On the other hand, a passive strategy should be expected to yield a zero intercept.

Except for forecasts of price movements of selected individual stock, the fund manager will attempt to capitalize on any expectation he may have regarding the behavior of the market return in the next period and hedging portfolio return in the forward looking periods. That is, he should add his forecasts of the market factor and the hedging factor to maximize his utility. The forecasts based on the information set $I_{i,t}$, which is available to the manager *i* at time *t*, are

$$\pi^*_{m,t+1} = E(\pi_{m,t+1} \mid I_{i,t}) = E(R_{m,t+1} \mid I_{i,t}) - E(R_m) \tag{23}$$
$$\pi^*_{h,t+1} = E(\pi_{h,t+1} \mid I_{i,t}) = E(R_{h,t+1} \mid I_{i,t}) - E(R_h)$$

Bhattacharya and Pfleiderer (1983) assume that the manager observe a signal, $\pi_{t+1} + v_{t+1}$ at time t. It is easy to show that the optimal forecasts in our model are

$$\pi^*_{m,t+1} = \phi_m (\pi_{m,t+1} + u_{t+1}) \tag{24}$$
$$\pi^*_{h,t+1} = \phi_h (\pi_{h,t+1} + v_{t+1})$$

In equation (24), ϕ_m and ϕ_h can be used to measure the quality of the manager's market timing and hedging timing information, respectively.

THEOREM: *If fund manager's optimal forecasts of market return and hedging return are* $\pi^*_{m,t+1} = \phi_m(\pi_{m,t+1} + u_{t+1})$ *and* $\pi^*_{h,t+1} \quad \phi_h(\pi_{h,t+1} + v_{t+1})$ *, then we can rewrite (22) as*

$$R_{i,t+1} = \alpha_i + \beta_{im} R_{m,t+1} + \beta_{ih} R_{h,t+1} + e_{i,t+1} \tag{25}$$

$$= \eta_0 + \eta_1 R_{m,t+1} + \eta_2 R_{h,t+1} + \eta_3 R^2_{m,t+1} + \eta_4 R^2_{h,t+1} + \eta_5 R_{m,t+1} R_{h,t+1} + w_{t+1}$$

where $p\lim \eta_0 = \alpha_i$

$$p\lim \eta_1 = \kappa_1 E(R_m)(1-\phi_m) - \kappa_2 E(R_h)(1-\phi_h)$$

$$p\lim \eta_2 = \kappa_3 E(R_h)(1-\phi_h) - \kappa_2 E(R_m)(1-\phi_m)$$

$$p\lim \eta_3 = \kappa_1 \phi_m$$

$$p\lim \eta_4 = \kappa_3 \phi_h$$

$$p\lim \eta_5 = -\kappa_2(\phi_h + \phi_m)$$

Proof: See Appendix.

Equation (25) is similar to a quadratic market timing regression in the Treynor and Mazuy (1966) except for the hedging portfolio, hedging timing and interaction of market portfolio and hedging portfolio. The hedging portfolio in equation (25) reflects the prediction of news about future market return. Hedging timing term controls the manager's response of change to the hedging portfolio. In the dynamic model, there exists an interaction effect between market portfolio and hedging portfolio. For the completeness, we write down the special case used by Lee and Rahman (1990) when there is no hedging portfolio in the following corollary.

COROLLARY: If there is no hedging demand, then the security selection and market timing can be represented as follows:

$$R_{i,t+1} = \alpha_i + \beta_{im} R_{m,t+1} + e_{i,t+1} \tag{25'}$$

$$= \eta_0 + \eta_1 R_{m,t+1} + \eta_3 R^2_{m,t+1} + w_{t+1}$$

where $p\lim\eta_0 = \alpha_i$

$$p\lim\eta_1 = \kappa_1 E(R_m)(1-\phi_m)$$

$$p\lim\eta_3 = \kappa_1\phi_m$$

The disturbance term in equation (25) has the following expression:

$$w_{t+1} = (\kappa_1\phi_m R_{m,t+1} - \kappa_2\phi_m R_{h,t+1})u_{t+1} - (\kappa_2\phi_h R_{m,t+1} - \kappa_3\phi_h R_{h,t+1})v_{t+1} + e_{t+1} \qquad (26)$$

The first term in w_{t+1} contains the information needed to quantify the manager's market timing ability. However, the second term in w_{t+1} contains the information needed to quantify the manag(17060 ages hedging timing ability.

If the investment opportunity set changes over time, then the intertemporal CAPM instead of the traditional CAPM should be used to evaluate the performance of mutual fund. Therefore, equation (25) is a more appropriate equation for evaluating mutual fund performance.

IV. ECONOMETRIC METHODOLOGY

To implement an empirical investigation, we first construct a state variable system to estimate the hedging portfolio. We adopt the Vector Auto-Regressive (VAR) approach of Campbell (1991). We assume that the real market index return as the first element of a K-element state variable vector $\mathbf{z}_t$. The other elements of $\mathbf{z}_t$ are variables that are known to the market at the end of the period t and are related to forecasting future market return. In addition, we assume that the vector $\mathbf{z}_t$ follows a first order VAR

$$z_{t+1} = \Phi\, z_t + \xi_{t+1} \qquad (27)$$

where Φ is a $K \times K$ matrix which is known as the companion matrix of the VAR. We can use the first order VAR to generate simple multi-period forecasts of future returns as

$$\underset{t}{E} z_{t+1+i} = \Phi^{i+1} z_t \tag{28}$$

In addition, we define a K-element constant vector $e1$. The first element of $e1$ is one and the other elements are all zero. Therefore, we can write $r_{m,t}$ as $r_{m,t} = e1' z_t$ and $r_{m,t+1} - \underset{t}{E} r_{m,t+1} = e1' \xi_{t+1}$. It follows that the discounted sum of forecast revisions in market return of equation (16) can now be represented as

$$\begin{aligned}(\underset{t+1}{E} - \underset{t}{E}) \sum_{j=1}^{\infty} \rho^j r_{m,t+1+j} &= e1' \sum_{j=1}^{\infty} \rho^j \Phi^j \xi_{t+1} \\ &= e1' \rho\Phi (\mathrm{I} - \rho\Phi)^{-1} \xi_{t+1} \\ &= \lambda_h' \xi_{t+1}\end{aligned} \tag{29}$$

where λ_h' is defined as $e1' \rho\Phi (\mathrm{I} - \rho\Phi)^{-1}$ which measure the importance of each state variable in forecasting future returns on the world market.

To obtain efficient and consistent estimates of parameters, a Quasi-Maximum Likelihood (QML) procedure with heteroscedasticity is used. We assume that the variance of the error term in equation (25) is as follows.

$$H_{t+1} = (\theta_1 \phi_m R_{m,t+1} - \theta_2 \phi_m R_{h,t+1})^2 \sigma_u^2 + (\theta_2 \phi_h R_{m,t+1} - \theta_3 \phi_h R_{h,t+1})^2 \sigma_v^2 + \sigma_e^2 \tag{30}$$

where H_{t+1}, σ_u^2, σ_v^2, and σ_e^2 are variance of w_{t+1}, u_{t+1}, v_{t+1}, and e_{t+1}

We use equations (25) and (30) as the benchmark model. Under the assumption of conditional normality, the log-likelihood function can be written as

$$\ln L(\psi) = -\frac{TN}{2}\ln 2\pi - \frac{1}{2}\sum_{t=1}^{T}\ln|H_t(\psi)| - \frac{1}{2}\sum_{t=1}^{T} w_t(\psi)' H_t(\psi)^{-1} w_t(\psi) \quad (31)$$

where ψ are the unknown parametterin the model.

Since the normality assumption is often violated in the financial time series, this paper estimates the model and computes all tests using the QML approach proposed by Bollerslev and Wooldridge (1992). QML with heteroscadasticity estimation provides efficient and consistent estimates of the population parameters of interest. The standard errors for the estimated coefficients that are calculated under the normal assumption need not be corrected if the true data are non-normal.

V. DATA AND EMPIRICAL RESULTS

To detect selection ability and timing ability of a mutual fund manager, monthly returns from January 1980 to September 1996 (201 months) for a sample of 65 U.S. mutual funds are used in this study. The MorningStar Company provides the random sample of mutual funds. The MorningStar Company segregates mutual funds into four basic investment styles on the basis of the manager's portfolio characteristics. Our sample consists of eight Asset Allocation, 14 Aggressive Growth, 10 Equity Income, 16 Growth, and 17 Growth Income mutual funds. The monthly returns on the S&P 500 Index were used for market return. Monthly observations of the 30-day Treasury bill rate were used as a proxy for the risk-free rate.

Table I contains summary statistics for returns of the equity funds. All values are computed in excess of the return on the U.S. T-bill closest to 30 days to maturity. Panel A in Table I contains mean, standard deviation, maximum, and minimum. Each investment style average shows that the asset allocation style has the smallest expected return and it also has the smallest standard deviation. However, the aggressive growth style has the largest maximum return but it also has the smallest minimum return and the largest standard deviation. In other words, the more aggressive the funds are, the more volatile the fund returns will be. Panel B is the abbreviation of investment style index.

Brown et al. (1992) and Hendricks et al. (1997) present the effect of survival bias in fund performance measure. Since the funds in our samples contain only survival funds, it may exist survival bias. However, our empirical results show that compared to traditional performance measures, selectivity and market timing become poorer; but the additional hedging timing is important in the dynamic performance measure. These results cannot seemly b7060 bexplained by survivor bias.

Descriptive statistics for the state variables are reported in the Table II. We select a set of instruments that have been widely used in the asset pricing literature. The instruments include the month to month change in the U.S. term premium which is equal to rate on the U.S. Treasury note in excess of the three-month T-bill rate; the dividend yield (DIV) which is the monthly S&P dividend yield, and the U.S. one month T-bill rate (TB). The term premium (TERM) follows De Santis and Gerard (1997) and others. Dividend yield (DIV) is a component of the return of stocks and hence it is a good forecasting variable for capturing predictions of stock returns. Campbell (1996) finds that the dividend yield has some predictive power for future stock returns. The short-term bill rate (TB) which has been used by Fama and Schwert (1977), Ferson (1989), and Ferson and Harvey (1991) is capable of predicting monthly returns of bonds and stocks.

We start our investigation by constructing the dynamic behavior of the state variables. Table III reports the coefficients in a one lag VAR. The matrix of coefficients in the VAR companion matrix is denoted by Φ in equation (27). The first row of Table I shows that the monthly forecasting equation for the excess log return of market portfolio, $r_{m,t} - r_{f,t}$. There is a minimal serial correlation in monthly market log return, but the coefficient on lagged $r_{m,t} - r_{f,t}$ is significant. However, the dividend yield in S&P, DIV, has a positive coefficient. Term premium, TERM, and the U.S. one month T-bill rate, TB have negative signs. The remaining rows of Table II reports the monthly dynamics of the forecasting variables. To a first approximation, TERM, DIV, and TB behave like persistent AR(1) process with coefficients of 0.82, 0.87, and 0.94, respectively.

After constructing the VAR system, we can use Table III to calculate long-run forecasts of future market return. Revisions in these forecasts are linear combinations of shocks to the state variables. The combinations that are defined by the vector λ_h in equation (29). Thus, we can derive a hedging portfolio return, $r_{h,t+1} = (\underset{t+1}{E} - \underset{t}{E})\sum_{j=1}^{\infty}\rho^j r_{m,t+1+j} = \lambda_h' \xi_{t+1}$, to proceed our empirical implementation. Figure 1 reports the relationships between market portfolio return and hedging portfolio return. The graph shows that there is a negative correlation between the hedging portfolio return and market portfolio return. Particularly, the plots also indicate that there is an increasing negative relationship between hedging portfolio return and market portfolio return during the time periods of severe market declines.

Table IV reports the estimates of security selectivity, market timing and hedging timing for our dynamic model. In order to compare our results to those in the previous studies, a traditional model without hedging timing is also estimated. The results are shown in Table V. The marketing timing coefficients in the traditional model indicate 7 funds have significantly negative ϕ_m at the 10 percent level and 10 funds have significantly negative ϕ_m at the 10 percent level. But, we find a different picture in our dynamic model. Of the 65 estimates of the market timing coefficient, there is only one significantly positive and six significantly negative at the 10 percent level. Therefore, in the presence of hedging timing, the market timing becomes less significant. This may be due to the fact that the hedging timing captures part of the importance of the traditional market timing.

Regarding security selectivity, it can be seen that the number of funds which are significantly positive at five percent level are reduced from 40 to 30 when we include the hedging timing to the traditional model. In addition there are 10 funds that have a significantly positive hedging timing, ϕ_m. This implies that some fund managers use the expected information to implement their hedging strategy and hence the effect of the market timing is partly absorbed into the effect of the hedging timing.

For each different style of investment, the Asset Allocation funds generally have a significant positive hedging timing coefficient (50 percent at the 0.1 significant level). The Equity Income funds have a significant positive hedging timing coefficient (30 percent at the 0.10 significant level). The Aggressive Growth funds have a significant positive hedging timing coefficient (14 percent at the 0.05 significant level). The Growth funds have a significant positive hedging timing coefficient (six percent at the 0.05 siggnicant level). However, the Growth Income funds have no significant positive hedging timing coefficient. This empirical evidence is consistent with the facts that the managers of Asset Allocation funds focus more on forecasting the future investment opportunity as well as adjusting their hedging strategy than other styles of funds. The less aggressive funds are, the more hedging strategy fund managers will do.

VI. CONCLUSION

In this paper, we identify a hedging factor in the equilibrium asset pricing model and use this benchmark to construct a new performance measure. Based on this measure, we are able to evaluate fund managers hedging timing ability in addition to more traditional security selectivity and market timing. While security selectivity performance involves forecasts of price movements of selected individual stock, market timing measures the forecasts of next period realizations of the market portfolio. However, hedging timing refers to forecasts of future realizations of the hedging portfolio.

Our approach can be contrasted with Ferson and Schadt (1996), who empirically employed a conditional CAPM to capture dynamic behavior of fund managers. However, ours is a theoretical dynamic asset model. Exploiting the insights of the dynamic behaviors of returns in our framework, we are able to construct a hedging timing, which is different from the traditional security selection and market timing.

The empirical evidence in the paper indicates that the selectivity measure is positive on average and the market timing measure is negative on average. However, the hedging timing measure is positive on average. Moreover, mutual funds with Asset Allocation and Equity Income styles show significantly positive hedging timing. This result is consistent with the facts that the funds classified as Asset Allocation style are more concerned with hedging demand than those classified as other kinds of investment style.

Table I

Summary Statistics for Excess Returns of the Mutual Funds

The monthly returns (in percentage) for a sample of 65 U.S. mutual funds are from Morningstar Company. The sample period is from January 1980 to September 1996

Panel A

Fund Name	Investment Style	Mean	Standard Deviation	Maximum	Minimum
GENERAL SECURITIES	Aa	0.477	5.084	15.389	-17.151
FRANKLIN ASSET ALLOCATION	Aa	0.407	3.743	10.424	-19.506
SELIGMAN INCOME A	Aa	0.394	2.414	8.474	-7.324
USAA INCOME	Aa	0.316	2.024	9.381	-5.362
VALLEY FORGE	Aa	0.293	1.803	9.980	-5.573
INCOME FUND OF AMERICA	Aa	0.566	2.552	9.166	-8.836
FBL GROWTH COMMON STOCK	Aa	0.273	3.599	10.466	-24.088
MATHERS	Aa	0.220	3.910	14.405	-14.750
Asset Allocation Average	Aa	0.391	2.550	8.962	-9.464
AMERICAN HERITAGE	Ag	-0.905	6.446	28.976	-33.101
ALLIANCE QUASAR A	Ag	0.644	6.547	15.747	-39.250
KEYSTONE SMALL CO GRTH (S-4)	Ag	0.433	7.053	19.250	-38.516
KEYSTONE OMEGA A	Ag	0.473	6.112	18.873	-33.240
INVESCO DYNAMICS	Ag	0.510	6.009	17.378	-37.496
SECURITY ULTRA A	Ag	0.222	6.940	16.297	-43.468
PUTNAM VOYAGER A	Ag	0.808	5.781	17.179	-29.425
STEIN ROE CAPITAL OPPORT	Ag	0.578	6.783	17.263	-32.135
VALUE LINE SPEC SITUATIONS	Ag	0.145	6.240	13.532	-37.496
VALUE LINE LEVERAGED GR INV	Ag	0.601	4.970	14.617	-29.025
WPG TUDOR	Ag	0.726	6.010	14.749	-33.658
WINTHROP AGGRESSIVE GROWTH A	Ag	0.476	5.596	17.012	-34.921
DELAWARE TREND A	Ag	0.787	6.536	14.571	-42.397
FOUNDERS SPECIAL	Ag	0.564	5.900	12.905	-31.861
Aggressive Growth Average	Ag	0.459	5.814	13.142	-35.335

SMITH BARNEY EQUITY INCOME A	Ei	0.601	3.270	7.813	-18.782
VAN KAMPEN AM CAP EQTY-INC A	Ei	0.510	3.530	12.292	-22.579
VALUE LINE INCOME	Ei	0.423	3.357	9.311	-18.242
UNITED INCOME A	Ei	0.714	4.037	11.852	-13.743
OPPENHEIMER EQUITY-INCOME A	Ei	0.555	3.422	10.071	-16.524
FIDELITY EQUITY-INCOME	Ei	0.706	3.612	10.608	-19.627
DELAWARE DECATUR INCOME A	Ei	0.547	3.615	10.269	-20.235
INVESCO INDUSTRIAL INCOME	Ei	0.601	3.705	9.349	-20.235
OLD DOMINION INVESTORS'	Ei	0.360	3.699	11.498	-21.092
EVERGREEN TOTAL RETURN Y	Ei	0.508	3.220	8.074	-13.857
Equity Income Average	Ei	0.527	3.238	9.094	-18.718
GUARDIAN PARK AVENUE A	G	0.740	4.391	11.321	-27.965
FOUNDERS GROWTH	G	0.718	4.986	13.055	-25.108
FORTIS GROWTH A	G	0.724	5.983	14.520	-30.771
FRANKLIN GROWTH I	G	0.570	4.050	12.907	-11.706
FORTIS CAPITAL A	G	0.682	4.791	12.818	-21.585
GROWTH FUND OF AMERICA	G	0.625	4.722	12.226	-23.962
HANCOCK GROWTH A	G	0.484	5.381	15.708	-25.236
FRANKLIN EQUITY I	G	0.469	5.156	12.818	-32.135
NATIONWIDE GROWTH	G	0.598	4.370	11.444	-27.570
NEUBERGER&BERMAN FOCUS	G	0.434	4.366	12.187	-25.108
MSB	G	0.517	4.665	13.452	-31.178
NEUBERGER&BERMAN PARTNERS	G	0.661	3.612	9.311	-19.385
NEUBERGER&BERMAN MANHATTAN	G	0.606	5.095	11.574	-30.500
NICHOLAS	G	0.710	4.067	10.125	-19.385
OPPENHEIMER A	G	0.225	5.234	11.321	-31.451
NEW ENGLAND GROWTH A	G	0.727	5.802	19.120	-37.207
Growth Average	G	0.608	4.505	11.121	-26.081
PIONEER II A	Gi	0.517	4.386	10.912	-29.693
PILGRIM AMERICA MAGNACAP A	Gi	0.611	3.949	10.843	-22.704
PIONEER	Gi	0.410	4.339	12.293	-28.361
PHILADELPHIA	Gi	0.244	4.004	11.074	-23.457
PENN SQUARE MUTUAL A	Gi	0.504	3.907	11.852	-20.724
OPPENHEIMER TOTAL RETURN A	Gi	0.507	4.451	13.861	-22.829

VANGUARD/WINDSOR	Gi	0.726	4.078	10.746	-18.542
VAN KAMPEN AM CAP GR & INC A	Gi	0.570	4.781	15.349	-32.135
VAN KAMPEN AM CAP COMSTOCK A	Gi	0.5999	4.539	13.167	-34.921
WINTHROP GROWTH & INCOME A	Gi	0.430	3.987	10.717	-24.088
WASHINGTON MUTUAL INVESTORS	Gi	0.723	3.882	11.409	-20.113
SAFECO EQUITY	Gi	0.587	4.797	14.263	-31.042
SELIGMAN COMMON STOCK A	Gi	0.553	4.224	11.785	-23.331
SALOMON BROS INVESTORS O	Gi	0.583	4.194	11.785	-24.980
SECURITY GROWTH & INCOME A	Gi	0.233	3.825	10.161	-19.674
SELECTED AMERICAN	Gi	0.650	3.969	13.142	-19.385
PUTNAM FUND FOR GRTH & INC A	Gi	0.637	3.540	8.456	-22.081
Growth Income Average	Gi	0.544	3.940	10.380	-24.469

Panel B

Classifications	Investment Style
Aa	Asset allocation
Ag	Aggressive growth
Ei	Equity income
G	Growth
Gi	Growth income

Table II

Summary Statistics of Instrument Variables

Summary statistics for state variables (in percentages per month) for period 1980:1-1996-9. The state variables include the U.S. term premium (TERM) which is equal to yield on 10-year U.S. T-notes in excess of the yield of the 3-month U.S. T-bill, ththe 001 ividend yield (DIV) is monthly D&P dividend yield, and the 30-day U.S. T-bill return (TB).

	Mean	Std. Dev.	Maximum	Minimum
TERM	0.1653	0.1055	0.3658	-0.1591
DIV	0.3142	0.0848	0.5266	0.1833
TB	0.5732	0.2578	1.4050	0.2250

Table III

Estimates of VAR

We adopt the Vector Auto-Regressive (VAR) approach of Campbell (1991). We assume that the real market index return as the first element of a K-element state variable vector $\mathbf{z}_t$. The other element of $\mathbf{z}_t$ are variables that are known to the market at the end of the period t and are related to forecasting future m ma et return. In addition, we assume that the vector $\mathbf{z}_t$ follows a first order VAR

$$z_{t+1} = \Phi z_t + u_{t+1}$$

Dep. Variable. \ Regressors	$r_{m,t-1} - r_{f,t-1}$	TERM	DIV	TB
$r_{m,t} - r_{f,t}$	0.2138	-13.1686	28.8475	-12.6126
	(0.0657)	(3.4079)	(5.5284)	(2.2553)
TERM	-0.0020	0.8227	0.1090	-0.0484
	(0.0010)	(0.0532)	(0.0864)	(0.0352)
DIV	-0.0008	0.0410	0.8753	0.0477
	(0.0002)	(0.0124)	(0.0201)	(0.0082)
TB	0.0061	-0.0026	0.0667	0.9479
	(0.0016)	(0.0838)	(0.1360)	(0.0554)

Standard errors are in parentheses.

Table IV
Estimates of Selectivity, Market Timing and Hedging Timing

$$R_{i,t+1} = \alpha_i + \beta_{im} R_{m,t+1} + \beta_{ih} R_{h,t+} + e_{i,t+1}$$

$$= \eta_0 + \eta_1 R_{m,t+1} + \eta_2 R_{h,t+1} + \eta_3 R^2_{m,t+1} + \eta_4 R^2_{h,t+1} + \eta_5 R_{m,t+1} R_{h,t+1} + w_{t+1}$$

where $p\lim \eta_0 = \alpha_i$

$$p\lim \eta_1 = \kappa_1 E(R_m)(1-\phi_m) - \kappa_2 E(R_h)(1-\phi_h)$$

$$p\lim \eta_2 = \kappa_3 E(R_h)(1-\phi_h) - \kappa_2 E(R_m)(1-\phi_m)$$

$$p\lim \eta_3 = \kappa_1 \phi_m$$

$$p\lim \eta_4 = \kappa_3 \phi_h$$

$$p\lim \eta_5 = -\kappa_2 (\phi_h + \phi_m)$$

Fund Name	Investment Style	Selectivity α	Market Timing ϕ_m	Hedging Timing ϕ_h
GENERAL SECURITIES	Aa	-0.0016	0.0200**	2.9833
FRANKLIN ASSET ALLOCATION	Aa	0.0010	-0.0056	3.0258*
SELIGMAN INCOME A	Aa	0.0008	-0.0000	0.0348*
USAA INCOME	Aa	0.0020*	-0.0005	1.0737
VALLEY FORGE	Aa	0.0012*	0.0000	0.0697**
INCOME FUND OF AMERICA	Aa	0.0039**	-0.0051	0.0071
FBL GROWTH COMMON STOCK	Aa	0.0017	-0.0008	0.9670**
MATHERS	Aa	-0.0030*	-0.0005	5.2469
AMERICAN HERITAGE	Ag	-0.0130**	-0.0001	-0.1811
ALLIANCE QUASAR A	Ag	0.0039	-0.0000	1.7905
KEYSTONE SMALL CO GRTH (S-4)	Ag	0.0022	-0.0000	0.3931
KEYSTONE OMEGA A	Ag	0.0036	-0.0000	1.3998
INVESCO DYNAMICS	Ag	0.0033	-0.0001	11.5533**
SECURITY ULTRA A	Ag	0.0021	-0.0000	0.1640
PUTNAM VOYAGER A	Ag	0.0052*	-0.0001	0.2948
STEIN ROE CAPITAL OPPORT	Ag	0.0049	-0.0092*	0.0054
VALUE LINE SPEC SITUATIONS	Ag	-0.0019	-0.0001	-0.0000
VALUE LINE LEVERAGED GR INV	Ag	0.0053**	-0.0000	0.0374
WPG TUDOR	Ag	0.0050*	-0.0000	2.6563**

WINTHROP AGGRESSIVE GROWTH A	Ag	0.0030	0.0000	0.1682
DELAWARE TREND A	Ag	0.0069**	-0.0001**	11.4132
FOUNDERS SPECIAL	Ag	0.0031	-0.0000	8.9994
SMITH BARNEY EQUITY INCOME A	Ei	0.0057**	-0.0096	0.0412
VAN KAMPEN AM CAP EQTY-INC A	Ei	0.0049**	-0.0106	0.1417**
VALUE LINE INCOME	Ei	0.0033*	-0.0130**	-0.3991
UNITED INCOME A	Ei	0.0058**	-0.0034	0.0429*
OPPENHEIMER EQUITY-INCOME A	Ei	0.0049**	-0.0091	0.0037
FIDELITY EQUITY-INCOME	Ei	0.0059**	-0.0075	0.0320
DELAWARE DECATUR INCOME A	Ei	0.0048**	-0.0067	0.0856**
INVESCO INDUSTRIAL INCOME	Ei	0.0056**	-0.0118*	-0.2267
OLD DOMINION INVESTORS'	Ei	0.0028	-0.0047	0.3276
EVERGREEN TOTAL RETURN Y	Ei	0.0035**	-0.0114**	-1.8007
GUARDIAN PARK AVENUE A	G	0.0063**	0.0000	0.1559
FOUNDERS GROWTH	G	0.0053*	-0.0000	0.0270
FORTIS GROWTH A	G	0.0055*	-0.0000	3.0069
FRANKLIN GROWTH I	G	0.0039*	0.0001	6.7099
FORTIS CAPITAL A	G	0.0046**	0.0001	0.0018
GROWTH FUND OF AMERICA	G	0.0046**	-0.0000	0.0334
HANCOCK GROWTH A	G	0.0027	-0.0000	1.7042
FRANKLIN EQUITY I	G	0.0042*	-0.0000	5.0368
NATIONWIDE GROWTH	G	0.0053**	0.0000	0.0661
NEUBERGER&BERMAN FOCUS	G	0.0025	-0.0000	0.7693
MSB	G	0.0037*	-0.0001	0.0825
NEUBERGER&BERMAN PARTNERS	G	0.0044**	-0.0001	1.2095
NEUBERGER&BERMAN MANHATTAN	G	0.0045*	-0.0000	0.2221
NICHOLAS	G	0.0048**	-0.0001	0.0010
OPPENHEIMER A	G	0.0013	-0.0000	6.4330
NEW ENGLAND GROWTH A	G	0.0048*	-0.0002	0.8900**
PIONEER II A	Gi	0.0046**	-0.0054	0.0114
PILGRIM AMERICA MAGNACAP A	Gi	0.0063**	-0.0082*	0.0135
PIONEER	Gi	0.0030	-0.0005	0.0858
PHILADELPHIA	Gi	0.0016	-0.0047	0.0046
PENN SQUARE MUTUAL A	Gi	0.0043**	0.0009	0.0291
OPPENHEIMER TOTAL RETURN A	Gi	0.0045	-0.0015	0.1079
VANGUARD/WINDSOR	Gi	0.0065**	-0.0033	0.0135
VAN KAMPEN AM CAP GR & INC A	Gi	0.0021	-0.0036	-30.5100
VAN KAMPEN AM CAP COMSTOCK A	Gi	0.0041**	-0.0000	-34.1823

WINTHROP GROWTH & INCOME A	Gi	0.0040**	-0.0034	0.0414
WASHINGTON MUTUAL INVESTORS	Gi	0.0067**	-0.0035	0.0091
SAFECO EQUITY	Gi	0.0059**	-0.0044	0.0305
SELIGMAN COMMON STOCK A	Gi	0.0042**	-0.0032	0.0017
SALOMON BROS INVESTORS O	Gi	0.0047**	-0.0016	0.0160
SECURITY GROWTH & INCOME A	Gi	0.0005	-0.0013	1.9871
SELECTED AMERICAN	Gi	0.0057**	-0.0050	0.0070
PUTNAM FUND FOR GRTH & INC A	Gi	0.0057**	-0.0064	0.0006

** Significant at the 0.05 level
* Significant at the 0.10 level

Table V
Estimates of Selectivity and Market Timing in the Traditional Model

$$R_{i,t+1} = \alpha_i + \beta_{im} R_{m,t+1} + e_{i,t+1}$$
$$= \eta_0 + \eta_1 R_{m,t+1} + \eta_3 R^2_{m,t+1} + w_{t+1}$$

where $p\lim \eta_0 = \alpha_i$

$$p\lim \eta_1 = \kappa_1 E(R_m)(1-\phi_m)$$
$$p\lim \eta_3 = \kappa_1 \phi_m$$

Fund Name	Investment Style	Selectivity α	Market Timing ϕ_m
GENERAL SECURITIES	Aa	0.0034	-0.0010
FRANKLIN ASSET ALLOCATION	Aa	0.0028*	0.0000
SELIGMAN INCOME A	Aa	0.0026**	0.0000
USAA INCOME	Aa	0.0024*	0.0119
VALLEY FORGE	Aa	0.0025**	-0.0057
INCOME FUND OF AMERICA	Aa	0.0043**	0.0000
FBL GROWTH COMMON STOCK	Aa	0.0012	0.0001*
MATHERS	Aa	0.0005	-0.0003
	Ag	-0.0114**	0.0004
ALLIANCE QUASAR A	Ag	0.0047*	0.0001**
KEYSTONE SMALL CO GRTH (S-4)	Ag	0.0040	-0.0063
KEYSTONE OMEGA A	Ag	0.0037	0.0001
INVESCO DYNAMICS	Ag	0.0037	0.0001
SECURITY ULTRA A	Ag	0.0025	0.0001**
PUTNAM VOYAGER A	Ag	0.0070**	-0.0045
STEIN ROE CAPITAL OPPORT	Ag	0.0059*	-0.0079
VALUE LINE SPEC SITUATIONS	Ag	0.0012	-0.0071
VALUE LINE LEVERAGED GR INV	Ag	0.0047**	0.0000
WPG TUDOR	Ag	0.0074**	-0.0082
WINTHROP AGGRESSIVE GROWTH A	Ag	0.0022	0.0001
DELAWARE TREND A	Ag	0.0096**	-0.0125*
FOUNDERS SPECIAL	Ag	0.0035	0.0000**
SMITH BARNEY EQUITY INCOME A	Ei	0.0058**	-0.0097*

VAN KAMPEN AM CAP EQTY-INC A	Ei	0.0042**	0.0001
VALUE LINE INCOME	Ei	0.0046**	-0.0129*
UNITED INCOME A	Ei	0.0063**	-0.0054
OPPENHEIMER EQUITY-INCOME A	Ei	0.0051**	-0.0080
FIDELITY EQUITY-INCOME	Ei	0.0066**	-0.0080
DELAWARE DECATUR INCOME A	Ei	0.0054**	-0.0099*
INVESCO INDUSTRIAL INCOME	Ei	0.0060**	-0.0103
OLD DOMINION INVESTORS'	Ei	0.0034*	-0.0093
EVERGREEN TOTAL RETURN Y	Ei	0.0049**	-0.0098*
GUARDIAN PARK AVENUE A	G	0.0053**	0.0000*
FOUNDERS GROWTH	G	0.0069**	-0.0081
FORTIS GROWTH A	G	0.0052*	0.0001
FRANKLIN GROWTH I	G	0.0038**	0.0000
FORTIS CAPITAL A	G	0.0048**	0.0000
GROWTH FUND OF AMERICA	G	0.0045**	0.0000**
HANCOCK GROWTH A	G	0.0043	-0.0065
FRANKLIN EQUITY I	G	0.0043*	-0.0078
NATIONWIDE GROWTH	G	0.0051**	-0.0061
NEUBERGER&BERMAN FOCUS	G	0.0056**	-0.0155**
MSB	G	0.0031*	0.0001
NEUBERGER&BERMAN PARTNERS	G	0.0061**	-0.0078
NEUBERGER&BERMAN MANHATTAN	G	0.0043*	0.0000*
NICHOLAS	G	0.0064**	-0.0075
OPPENHEIMER A	G	0.0028	-0.0110*
NEW ENGLAND GROWTH A	G	0.0058**	0.0001
PIONEER II A	Gi	0.0038**	0.0000
PILGRIM AMERICA MAGNACAP A	Gi	0.0068**	-0.0132**
PIONEER	Gi	0.0038*	-0.0087
PHILADELPHIA	Gi	0.0026	-0.0107
PENN SQUARE MUTUAL A	Gi	0.0047**	-0.0085
OPPENHEIMER TOTAL RETURN A	Gi	0.0033	0.0000
VANGUARD/WINDSOR	Gi	0.0068**	-0.0075
VAN KAMPEN AM CAP GR & INC A	Gi	0.0044**	0.0001
VAN KAMPEN AM CAP COMSTOCK A	Gi	0.0051**	0.0001
WINTHROP GROWTH & INCOME A	Gi	0.0043**	-0.0103*
WASHINGTON MUTUAL INVESTORS	Gi	0.0058**	0.0001**
SAFECO EQUITY	Gi	0.0044**	0.0000
SELIGMAN COMMON STOCK A	Gi	0.0052**	-0.0086

SALOMON BROS INVESTORS O	Gi	0.0052**	-0.0072
SECURITY GROWTH & INCOME A	Gi	0.0005	0.0000
SELECTED AMERICAN	Gi	0.0062**	-0.0086
PUTNAM FUND FOR GRTH & INC A	Gi	0.0068**	-0.0128**

** Significant at the 0.05 level

* Significant at the 0.10 level

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APPRNDIX

Proof of PROPOSITION:

Following equation (16), the asset return under consideration is a market return $r_{m,t+1}$, we can obtain the following expected market return pricing formula

$$\underset{t}{E} r_{m,t+1} - r_{f,t+1} + \frac{V_{mm}}{2} = \gamma V_{mm} + (\gamma - 1) V_{mh} \tag{A1}$$

Similarly, the hedging return can be represented as

$$\underset{t}{E} r_{h,t+1} - r_{f,t+1} + \frac{V_{hh}}{2} = \gamma V_{hm} + (\gamma - 1) V_{hh} \tag{A2}$$

Combining equations (16), (A1) and (A2), we can obtain

$$\gamma = \frac{(Er_i - r_f + \frac{V_{ii}}{2}) + V_{ih}}{V_{im} + V_{ih}} = \frac{(Er_m - r_f + \frac{V_{mm}}{2}) + V_{mh}}{V_{mm} + V_{mh}} = \frac{(Er_h - r_f + \frac{V_{hh}}{2}) + V_{hh}}{V_{hm} + V_{hh}} \tag{A3}$$

Using the third equality of equation (A3), expected market return can be represented as

$$Er_m - r_f + \frac{V_{mm}}{2} = (\frac{V_{mm} + V_{mh}}{V_{hm} + V_{hh}})[(Er_h - r_f + \frac{V_{hh}}{2}) + V_{hh}] - V_{mh} \tag{A4}$$

Notice that we can define the coefficient of relative risk aversion as

$$\gamma = \frac{1}{V_{mm} - V_{mh} V_{hh}^{-1} V_{hm}} (Er_m - r_f + \frac{V_{mm}}{2}) - \frac{V_{hm} V_{mm}^{-1}}{V_{hh} - V_{hm} V_{mm}^{-1} V_{mh}} (Er_h - r_f + \frac{V_{hh}}{2}) \tag{A5}$$

$$\gamma - 1 = -\frac{V_{mh}V_{hh}^{-1}}{V_{mm} - V_{mh}V_{hh}^{-1}V_{hm}}(Er_m - r_f + \frac{V_{mm}}{2}) + \frac{1}{V_{hh} - V_{hm}V_{mm}^{-1}V_{mh}}(Er_h - r_f + \frac{V_{hh}}{2}) \qquad \text{(A6)}$$

After substituting equations (A5) and (A6) into equation (16), we obtain

$$\underset{t}{E}\, r_{i,t+1} - r_{f,t+1} + \frac{V_{ii}}{2}$$

$$= \frac{V_{mi} - V_{mh}V_{hh}^{-1}V_{hi}}{V_{mm} - V_{mh}V_{hh}^{-1}V_{hm}}(\underset{t}{E}\, r_{m,t+1} - r_{f,t+1} + \frac{V_{mm}}{2}) + \frac{V_{hi} - V_{hm}V_{mm}^{-1}V_{mi}}{V_{hh} - V_{hm}V_{mm}^{-1}V_{mh}}(\underset{t}{E}\, r_{h,t+1} - r_{f,t+1} + \frac{V_{hh}}{2})$$

$$= \beta_{im}(\underset{t}{E}\, r_{m,t+1} - r_{f,t+1} + \frac{V_{mm}}{2}) + \beta_{ih}(\underset{t}{E}\, r_{h,t+1} - r_{f,t+1} + \frac{V_{hh}}{2}) \qquad \text{(A7)}$$

where market beta, β_{im}, and hedging beta, β_{ih}, are also the coefficients of the multiple regression in equation (A7). That is to say, expected rates of return on risky assets are related to rates of returns on market portfolio and hedging portfolio in a linear way.

Proof of <u>THEOREM</u>:

We denote the conditional variances of the market factor and the hedging factor as

$$\sigma_i^2(\pi_{m,t+1}) = Var(\pi_{m,t+1} \mid I_{i,t})$$

$$\sigma_i^2(\pi_{h,t+1}) = Var(\pi_{h,t+1} \mid I_{i,t}) \qquad \text{(A8)}$$

Let $\delta_{m,t}$ be the fraction invested in the market portfolio, $\delta_{h,t}$ be the fraction invested in the hedging portfolio, and $1 - \delta_{m,t} - \delta_{h,t}$ the fraction invested in the risk-free asset at time t. The expected excess return and variance of return on the portfolio are

$$E(R_{i,t+1}) = \delta_{m,t}[E(R_m) + \pi_{m,t+1}^*] + \delta_{h,t}[E(R_h) + \pi_{m,t+1}^*] \qquad \text{(A9)}$$

$$V(R_{i,t+1}) = \delta_{m,t}^2\sigma_i^2(\pi_{m,t+1}) + \delta_{h,t}^2\sigma_i^2(\pi_{h,t+1}) + 2\delta_{m,t}\delta_{h,t}\sigma_i(\pi_{m,t+1}, \pi_{h,t+1})$$

It can be seen that the fund manager's maximization problem is as follows.

$$\max_{\delta_{m,t}\delta_{h,t}} U[E(R_{i,t+1}), V(R_{i,t+1})] \qquad \text{(A10)}$$

$$= \max_{\delta_{m,t}\delta_{h,t}} U[\delta_{mt}[E(R_m)+\pi^*_{mt+1}]+\delta_{ht}[E(R_h)+\pi^*_{ht+1}], \delta^2_{mt}\sigma^2_m+\delta^2_{mt}\sigma^2_m+2\delta_{mt}\delta_{ht}\sigma_{mh}]$$

where σ^2_m, σ^2_h, and σ_{mh} denote $Var(\pi_{m,t+1} \mid I_{i,t})$, $Var(\pi_{h,t+1} \mid I_{i,t})$, and $Cov(\pi_{m,t+1}, \pi_{h,t+1} \mid I_{i,t})$, respectively.

The solution to this problem can be obtained as

$$\delta_{mt} = \frac{1}{2(\sigma^2_m\sigma^2_h - \sigma^2_{mh})}\frac{dV(R_{i,t+1})}{dE(R_{i,t+1})}\{[E(R_m)+\pi^*_{mt+1}]\sigma^2_h - [E(R_h)+\pi^*_{ht+1}]\sigma_{mh}\} \qquad \text{(A11)}$$

$$\delta_{ht} = \frac{1}{2(\sigma^2_m\sigma^2_h - \sigma^2_{mh})}\frac{dV(R_{i,t+1})}{dE(R_{i,t+1})}\{[E(R_h)+\pi^*_{ht+1}]\sigma^2_m - [E(R_m)+\pi^*_{mt+1}]\sigma_{mh}\}$$

where $\dfrac{dV(R_{i,t+1})}{dE(R_{i,t+1})} = -\dfrac{\partial U / \partial E(R_{i,t+1})}{\partial U / \partial V(R_{i,t+1})} > 0$.

Since $\beta_{im,t} = \delta_{mt}$ and $\beta_{ih,t} = \delta_{ht}$, the manager's optimal choices of market risk and hedging risk for the portfolio are given by

$$\beta_{im,t} = \mu_{i,t}[\sigma^2_h E(R_m) - \sigma_{mh}E(R_h)] + \mu_{i,t}[\sigma^2_h \pi^*_{mt+1} - \sigma_{mh}\pi^*_{ht+1}] \qquad \text{(A12)}$$

$$\beta_{ih,t} = \mu_{i,t}[\sigma^2_m E(R_h) - \sigma_{mh}E(R_m)] + \mu_{i,t}[\sigma^2_m \pi^*_{ht+1} - \sigma_{mh}\pi^*_{mt+1}]$$

where $\mu_{i,t} = (1/2)*[1/(\sigma^2_m\sigma^2_h - \sigma^2_{mh})]*[dV(R_{i,t+1})/dE(R_{i,t+1})]$.

Given the objective of the manager and assumption that the conditional distribution of $\pi_{m,t+1}$ and $\pi_{h,t+1}$ is a bivariate normal distribution, and following the lines of Jensen (1972), it can be shown that

$$\beta_{im,t} = \beta_{imT} + [\kappa_1 \pi^*_{mt+1} - \kappa_2 \pi^*_{ht+1}] \quad \text{(A13)}$$

$$\beta_{ih,t} = \beta_{ihT} + [\kappa_3 \pi^*_{ht+1} - \kappa_2 \pi^*_{mt+1}]$$

where $\kappa_1 = \mu_{i,t}\sigma_h^2$, $\kappa_2 = \mu_{i,t}\sigma_{mh}$, $\kappa_3 = \mu_{i,t}\sigma_m^2$, and

$\beta_{imT} = \mu_{i,t}[\sigma_h^2 E(R_m) - \sigma_{mh}E(R_h)]$ as well as $\beta_{ihT} = \mu_{i,t}[\sigma_m^2 E(R_h) - \sigma_{mh}E(R_m)]$ can be considered as fund manager's "target" risk level, given the unconditional expected returns on the market portfolio and hedging portfolio.

After substituting equations (23) and (A13) into equation (21), we obtain equation (25).

Figure1: Graph of Rm and Rh