Utility comparison between security selectors, asset allocators and equally weighted portfolios within a selected ETF universe

Received (in revised form): 19th October, 2007

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Abstract We examine the *ex ante* utility of a portfolio from a universe of exchange-traded funds (ETFs) selected according to three criteria in order to see if asset allocation is as relevant as BSB found. *Ex ante* utility is maximised for stock selector portfolio based on mean variance efficiency. Investors would be willing to surrender significant wealth to migrate from both an asset allocation and an equally weighted portfolio to the stock selector portfolio.

Journal of Asset Management (2008) **9,** 67–72. doi:10.1057/jam.2008.5

Keywords: *asset allocation, ETF, asset management*

Introduction

We examine the relative importance of asset allocation as compared with active portfolio management from an *ex ante* perspective. The portfolios we will be examining are closed end funds, specifically exchange-traded funds (ETFs) sold by Merrill Lynch as Holding Company Depositary Receipts (HOLDRs). HOLDRs underlying portfolios are determined by market capitalisation of selected securities. HOLDRs do not constantly rebalance the portfolio after inception as more common ETFs. The holdings' weights are changed by returns on the underlying securities weighting the HOLDRs more toward the better performing equities over time performing like an index. The nine HOLDRs used in this study are sector-specific.

Asset allocation has been found by some researchers to be more important than security selection. The most notable and often cited paper by Brinson *et al.* (1991) showed that over 91 per cent of pension fund portfolio variance was explained by asset allocation. Ibbotson and Kaplan (2000) found that BSB's conclusion of high R^2 for asset allocation may have been a statistical

artefact. IK found that policy (asset allocation) explained 87.6 per cent of median mutual fund returns and 90.7 per cent of median pension fund returns. Had they stopped here, they would have reinforced BSB. Looking further they found that 75.2 and 81.95 per cent of those same respective returns were explained by an underlying index of equities. It appeared that simply being invested in the market explained most of the variability. Asset allocation was also a poor explanatory variable for differentiating performance among fund managers explaining just 40 per cent of variability.

Hensel *et al.* (1991) point out that when the alternative portfolio is cash, as was the case in the BSB study, asset allocation appears to explain more than 90 per cent of variability. Explanatory ability is dramatically reduced when the benchmark portfolio is a market-weighted portfolio. The BSB study focused on explaining quarterly variance rather than long-term return (Jahnke, 1997, Ibbotson and Kaplan, 2000).

Hlawitschka and Tucker (2006) demonstrated that explaining variance did not necessarily mean that portfolios emphasising asset allocation provided greater expected returns than stock selection. It is the *ex ante* perspective and not *ex post* that investors have available prior to committing to an investment. HT concluded that moderately risk averse investors would be willing to pay a substantial fee for the additional expected gains in a managed portfolio compared to a portfolio selected based on asset allocation. Furthermore, the additional fee investors would pay to move from a naïve portfolio of equally weighted stocks and bonds to a portfolio of allocated assets was quite small.

Investor choice occurs *ex ante* with the decision being an attempt to optimise utility as defined by von Neumann and Morgenstern (1947). While this does not predict that in fact the *ex ante* optimal portfolio will end up being the portfolio with the highest return, it may explain why investors do not uniformly select index funds but instead invest considerable funds in managed portfolios. Utility theory also can demonstrate the relative utility of different portfolios *ex ante* and, as we will show below, investors may be willing to pay a premium to move from one portfolio to another to obtain increments in utility.

Indexation has plenty of adherents. ETFs alone have garnered a growing following as Figure 1 shows. Growth in assets for the prior year ending in April 2006 was over 50 per cent. Most of these funds are index funds based on market capitalisation of market indices, countries, sectors or industries. Indexation provides diversification and asset allocation within a specific investment universe.

Markowitz (1952) demonstrated that allocating assets among indices was superior *ex post*. Similarly, Burton Malkiel (2003) reviewed many studies that demonstrated stock picking *ex post* was inferior to indexation even prior to accounting for the

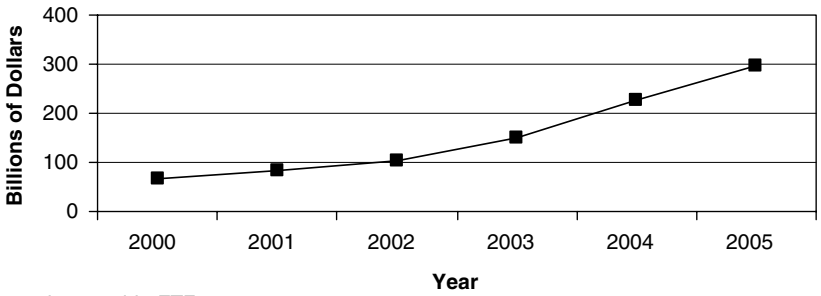

Figure 1 Assets invested in ETFs (Investment Company Institute (2006)).

cost of hiring the stock picker. Still, Markowitz recognises that investors' decision point is *ex ante*, making the selection of an optimal portfolio the key decision. Using Markowitz's mean/variance efficient portfolio it is possible to *ex ante* select an optimal portfolio of assets from a specific asset universe. The M/V efficient portfolio is our portfolio of choice as a proxy for a managed portfolio. Of course we recognise, as has been discussed elsewhere (Green and Hollifield, 1992), that M/V efficient portfolios are typically concentrated in limited numbers of assets. Nevertheless, they do make for optimal *ex ante* portfolios. The question we will address is how much superior *ex ante* is such a portfolio consisting of a selection from the same universe of assets as those that are in the nine HOLDRs portfolios. We expect that the fees investors would be willing to pay for managed portfolios based on an already limited selection of equities will be comparable to the fees calculated in Hlawitschka and Tucker (2006), where the opportunity set from which the M/V efficient portfolio was drawn was much larger, particularly compared to HOLDRs. HOLDRs initially consist of 20 equities, which may be reduced by mergers and acquisitions, privatisation or bankruptcy. Since no rebalancing occurs other than changes in market valuation, mergers and acquisitions and bankruptcies, the number of assets can be well below the initial 20 originally included.

Method

In order to keep computations manageable, we needed to limit the universe of securities to about 100. We focused, therefore, on ETFs whose holdings were concentrated in their top ten holdings. We considered ETFs that invested a minimum of 90 per cent of the fund in the top ten holdings and then used the top ten holdings as a proxy for the entire fund. The top ten holdings in each ETF as of 1st July, 2006 as obtained from Bloomberg are used to represent the assets in the ETF. Table 1 shows the nine ETFs used, all Merrill Lynch HOLDR funds. At least 92 per cent of assets were held in the top ten holdings. Weekly returns were obtained from CRSP for all 90 securities as well as weekly returns on the ETFs themselves for three years (1/1/2002−12/31/2005).

The first calculation we use with the equity data maximises the mean variance utility function

$$E[U(\tilde{W})] = \mu - \frac{1}{2}\alpha(\sigma)^2 \tag{1}$$

to determine the optimal portfolio weights from within the 90 equity universe extracted from the nine ETFs. $E[U(\tilde{W})]$ is the expected utility of end-of-period wealth, μ the mean end-of-period-wealth, σ^2 the variance of end-of-period wealth and α the relative risk aversion. Expected wealth is calculated as:

$$\tilde{W} = W_0 \sum_{i=1}^{I} x_i \tilde{r}_i \tag{2}$$

Table 1 Summary statistics on ETFs (HOLDRS)

ETF symbol	ETF	Percentage in top ten securities (%)	Mean weekly return	Std dev
TTH	ML TELECOM HOLDR	96.9	0.0009	0.0233
IIH	ML INFRASTR HLDR	100.0	0.0087	0.0492
PPH	ML PHARMA HOLDR	92.1	0.0002	0.0202
WMH	ML HOLDRS	92.2	0.0047	0.0253
SWH	ML SFTWARE HLDR	99.3	0.0035	0.0267
IAH	ML INETARCH HLDR	97.9	0.0033	0.0269
BBH	ML BIOTECH HLDR	97.6	0.0080	0.0346
BDH	ML BRDBND HLDR	93.6	0.0071	0.0358
HHH	ML INTERNET HLDR	99.1	0.0077	0.0354

which differs under different equity weights and is dependent on the sum of mean weighted (x_i) asset returns ($r_i = 1 + \text{return}_i$) of each asset times the initial wealth. W_0 is normalised to be 1. Short sales were not allowed, but reflecting the ability of investors to borrow, borrowing at a 6 per cent rate of interest was permitted up to a maximum of 50 per cent of portfolio securities holdings. Investors could also choose to invest up to 50 per cent of assets in the 6 per cent risk-free rate.

An augmented Lagrangian method (Pierre and Lowe, 1975) is used to iteratively solve for the portfolio weights that maximise utility for investors in Equation (1) with different degrees of relative risk aversion using mean/variance criteria. This program can also determine the percentage of return or wealth an investor would forgo in order to switch from a portfolio of ETFs to a managed fund with the same assets held in the ETFs.

Three portfolios are constructed. The expected utility of the M/V portfolio is maximised across the 90 equities held in the nine ETFs to which we will refer as the Security Selector (SS) portfolio. The second portfolio is another M/V efficiency portfolio across the nine ETFs with weights selected to maximise utility, which we will refer to as the Asset Allocator (AA) portfolio. The third portfolio is a naïve portfolio in which each of the nine ETFs is equally weighted (EW). For AA and EW portfolios, returns for the nine HOLDRs were adjusted to reflect the returns for the top ten holdings.

Results and discussion

The utility of each of the three portfolios is measured for different levels of relative risk aversion (Figure 2). SS is superior at all levels of RRA but that superiority declines as RRA increases. AA is somewhat superior in utility to EW but the gains to investors from asset allocation alone are not as robust as the gains to investors who select equities. Both AA and SS borrow the maximum amount of funds through RRA = 7 before borrowing

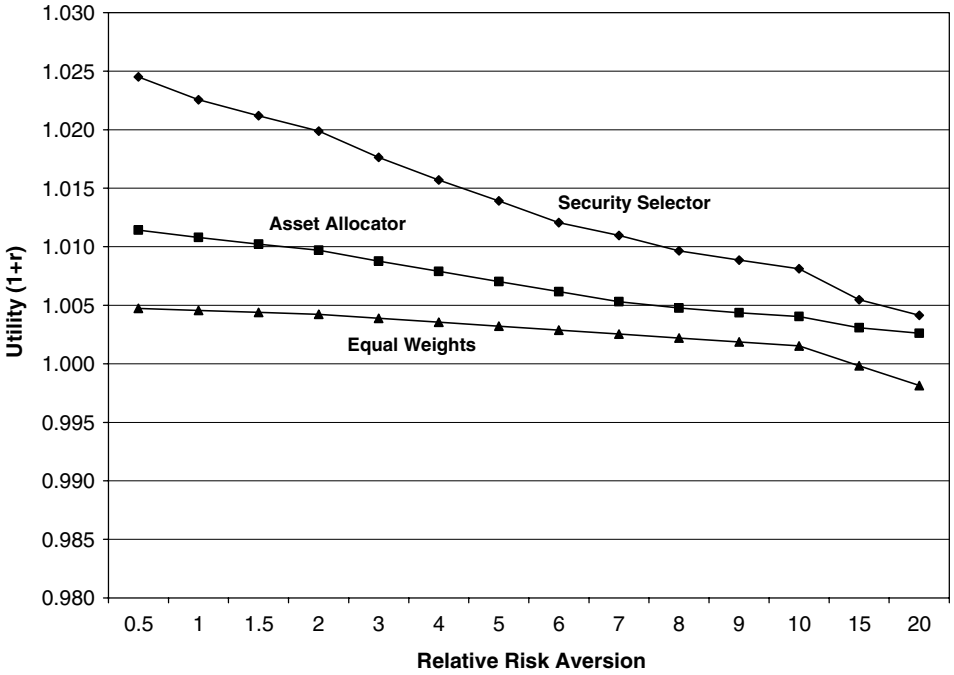

Figure 2 Utility for SS, AA, EW at different RRA

begins to fall off. At the most risk averse, RRA = 20, 30 per cent of the SS portfolio and 47 per cent of the AA portfolio are invested in the risk-free asset. The EW portfolio is fixed with all weights equal at 1/91 or 0.010989. At outlying levels of RRA, the difference between the three portfolios' utility diminishes perhaps partially due to the elimination of leverage replaced by instead ever greater portions of the portfolio invested in the risk-free rate, effectively dampening return and variance.

We measure the amount of wealth investors would be willing to surrender in order to improve their utility to that of the SS portfolio, the best performing portfolio. This is solved iteratively by reducing initial wealth by subtracting a percentage of wealth until the expected utility of end-of-period wealth of the portfolio is equal to the expected utility of the portfolio from which an investor wishes to migrate

$$E\left[U\left(\sum_{i=1}^{I} x_i^* \tilde{r} - \text{FEE}\right)\right] = E\left[U\left(W_0 \sum_{i=1}^{I} x_i^b \tilde{r}\right)\right] \quad (3)$$

where x_i^* are the weights for the improved portfolio and x_i^b are the weights of the initial portfolio. Fee is a percentage of wealth. The resulting fee in this calculation is the maximum an investor would pay for the SS portfolio.

Since weekly returns data were used, the maximum fees an investor would pay are for one period, that is one week. Figure 3 shows that investors with low levels of RRA are willing to pay considerably higher fees than more risk averse investors. This corresponds to the declining differential in utility with increasing RRA. Since these fees are maximum fees, they may be considerably greater than fees investors pay to Security Selectors. EW investors are willing to pay higher fees because they have more utility to gain than AA investors. The difference between AA fees and EW fees is the fee that EW investors would be willing to pay to move from EW to an AA portfolio. Even these fees are substantial on an annual basis. Willingness to pay such maximum fees to achieve comparable utility is to some degree reflected in high fees charged by hedge funds. While the 1–2 per cent fees for asset management are a base, hedge funds may then charge 20 per cent of *ex post* profits.

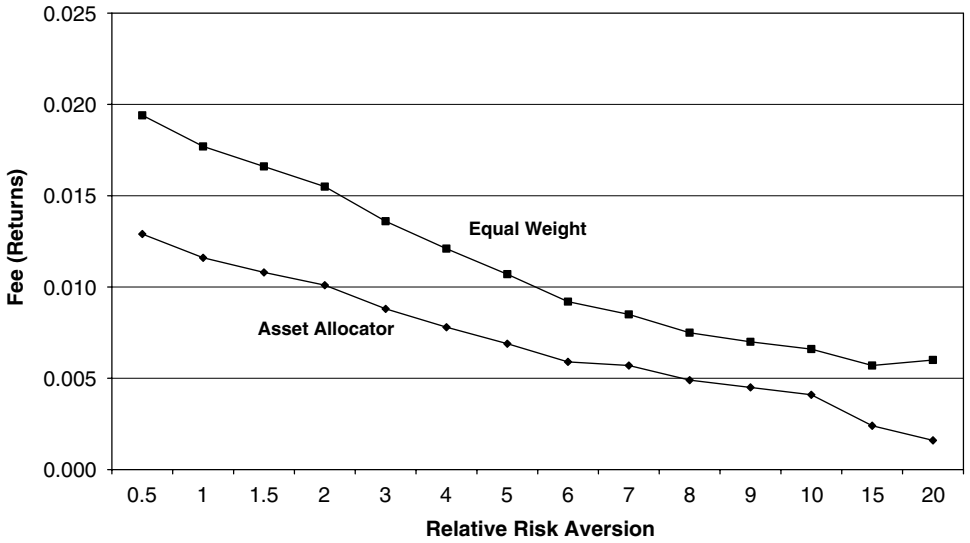

Figure 3 Maximum fees paid by asset allocators and equally weighted portfolio holders at different levels of relative risk aversion

Conclusion

As Hensel *et al.* (1991) noted when criticising an earlier BHB (1986) study, the explanatory power of asset allocation is greatly reduced when the benchmark used is a market-weighted portfolio. Here we find that *ex ante* utility of asset allocation is similarly less than stellar compared to an equally weighted portfolio and in fact is well below that of an SS portfolio. As Jahnke (1997) and Ibbotson and Kaplan (2000) pointed out, BSB (1991) explains variance and not *ex post* returns. This study, in a somewhat different approach to examining the relative importance of asset allocation, looks at investing from an *ex ante* perspective. Observing the superior *ex ante* utility of security selection, we can explain why investors are willing to pay hedge funds and other security selectors comparatively high fees.

As most prospectuses warn, however, historical performance is no guarantee of future success. Although we set up our SS portfolio to position it to produce the best returns relative to risk, this does not mean that it accurately predicts either risk or return that ensues. What the SS portfolio does is position the investor *ex ante* to reap the largest rewards for risk about to be taken. Since we set up the investment criteria to position maximising a mean/variance efficient portfolio, it is a foregone conclusion that this would be the superior portfolio. Just how superior it would be to both AA and EW portfolios was the issue addressed by the study. Measuring superiority as a willingness to pay a fee to migrate from either the AA or EW portfolio to the SS portfolio shows that this superiority is rather outsized and clearly capable of explaining investor *ex ante* predilection for managed portfolios.

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