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Abbreviations

AMEX	American Stock Exchange
bpt	Basis point
BC	Brocato and Chandy (1994)
BGI	Barclay's Global Investor
CAL	Capital Allocation Line
CAPM	Capital Asset Pricing Model
CML	Capital Market Line
EAFE	Europe, Australasia, and Far East stock index
EMH	Efficient market hypothesis
ETF	Exchange-traded fund
FTSE	Financial Times and London Stock Exchange
MSCI	Morgan Stanley International
NYSE	New York Stock Exchange
S&P 500	Standard & Poor's 500
SML	Security market line
SPDRs	Standard & Poor's 500 Depository Receipts
VFINX	Vanguard 500 Index Fund
Wilshire 5000	Dow Jones Wilshire 500
WSP	Wagner, Shellans, and Paul (1992)

Standard Notation

α	alpha
β_i	beta of security i
Cov	covariance
ε_i	standard error
BR	breath
IC	information coefficient
IR	information ratio
P	number of period
r_i	return of security i
r_f	risk free return
r_m	return of market portfolio
R_A	active return
R_{bt}	return to the benchmark portfolio in period t
S_p^2	squared sharp ratio of portfolio p
S_M^2	squared sharp ratio of market portfolio
W^*	optimal weight
σ_A	active risk
$\sigma(e_A)$	nonsystematic standard deviation
σ_Δ^2	variance of return differential
σ_Δ	periodic tracking error
Δ_t	return differential in period t

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Zusammenfassung

In vergangenen zwanzig Jahren wurden wissenschaftliche Diskussionen über aktive und passive Portfolio-Management für Investmentfonds heftig und umfangreich durchgeführt. Passives Management wurde weltweit von den meisten der größten und bedeutenden Investoren als beliebteste Investment-Strategie eingesetzt. Aufgrund der niedrigeren Kosten des passiven Managements ist die Existenz des aktiven Managements wachsend gefährdet. Mit zunehmender Popularität der Investmentfonds macht sich der Vergleich beider unterschiedlichen Methoden ausgezahlt.

Das Ziel dieser Arbeit ist es, aktive und passive Portfolio-Managementstrategie kritisch einander gegenüber zu stellen. Dabei werden sowohl die Methoden, als auch die Performanceergebnisse miteinander verglichen.

Im zweiten Kapitel dieser Arbeit werden die beiden Strategie definiert bzw. Vor- und Nachteile des aktiven und passiven Portfolio-Managements erörtert. Um eine Investmententscheidung treffen zu können, ist es wichtig, Grundlagen der beiden Strategien zu kennen. Daher werden im dritten Kapitel die unterschiedliche quantitative Instrumente, die in beiden Strategien verwendet werden, diskutiert. Im vierten Kapitel wird das Potential der beiden Investitionsstile anhand eines Performancevergleiches beurteilt. Zum Schluss werden die Hauptunterschiede zwischen aktivem und passivem Portfolio-Management anhand einer Tabelle zusammengefasst.

1 Introduction

In a period of 20 years, the discussion about active versus passive portfolio management in the mutual fund literature has never stopped. Passive management has grown to a favored investment strategy for many worlds' largest and sophisticated investors. Passive approach threatens the potential existence of active approach in a large part due to its cost advantage. The increase of the popularity of mutual funds leads to the worth of a clear analysis of the merits of both approaches.

The purpose of this thesis is not to answer the question of which strategy is "better", but attempts to show a basic picture of what active and passive management offer by focusing on areas, namely, the pros and cons of both approaches, the strategies they used, and the empirical performance in the industry. However, the use of these characteristics represented by both approaches enables us to compare active and passive management.

The second section of this thesis uses the formal definitions of active and passive portfolio management to show the main characteristics of both strategies. An overview of pros and cons of active and passive strategies is given in this section. For making investment decisions it is important to know the active and passive strategies, so that section three focuses on some quantitative tools used in both strategies. Section four goes a further step examines several empirical results of mutual funds performances to show the potential of active and passive management. In the end, the main differences between active and passive portfolio management are summarized by using a table.

2 Defining Active- and Passive Portfolio Management

Portfolio management can be active or passive. These terms are worth clarifying at the beginning of this thesis. It seems easy to define active- and passive portfolio management with generally accepted definitions.

“Active management: The extent to which the investor attempts to ‘beat’ the market by hiring investment management firms that analyze and select individual securities or groups of securities expected to exceed the performance of specified benchmark... Passive management involves a long-term, buy-and-hold approach to investing. The investor selects an appropriate target and buys a portfolio designed to closely track the performance of that target.”¹

Before the mid-1960s, the concepts of passive management were still nonexistent. It was a relative newcomer compared to the active management. William F. Sharpe, a leading theoretician in the development of portfolio management classified investors as either active or passive. A passive investor holds every security with each represented in the same manner as in the benchmark and will hold the same percentage of the total outstanding amount of each security in the market. On the other hand, an active investor is not passive. He or she tends to trade fairly frequently by paying for more research and trading.²

In other words, active portfolio management as the traditional investment approach, attempts to find undervalued securities and profit from the market adjusting to the “true” value, or profit from asset selection by using market timing strategy. While passive management favored by most academics, researchers and many practitioners simply replicate its benchmark and buy the entire asset class (benchmark) without using either security selection or market timing.³

¹ Sharpe, Gordon, Bailey (1999), p13

² Sharpe, Gordon, Bailey (1991), p98

³ www.financialarchitectsllc.com

2.1 Active Portfolio Management

Although the line between active and passive management becomes increasingly fuzzy in recent years, there is a need to distinguish active and passive management on the basis of their characteristics. Let's start with the traditional approach.

Pioneers like Jensen, Sharpe, and Treynor introduced us the theory of CAPM which provides a framework for portfolio performance analysis. Short after the development of CAPM, studies of active managers' performance have begun.⁴

Many economists argue that actively managed portfolio can outperform the benchmarks because of the market inefficiency. The task of the active portfolio manager is to accurately forecast the future market. Charles D. Ellis believes that the only way beating the market is to discover and exploit other investors' mistakes.⁵ Alford, Jones, and Winkelmann (2003) also argue that a disciplined approach to active management is likely to be most effective for investors.

Elton and Gruber classified active management styles into three groups: market timers, sector selectors, and security selectors.

2.2 Pros and Cons of Active Portfolio Management

Active portfolio management offers expert analysis with a generally greater expense ratio, which impacts net returns.

Actively managed portfolios in the more efficient markets have had more difficulty outperforming the benchmarks than passively managed portfolio. This means that actively managed portfolios in the less efficient markets tend to have more opportunities beating the benchmark. As far as theory goes, active management (or investors) has some costs to overcome. That's due to the cost of paying forecasters, the cost of diversifiable risks, and the cost of higher transaction fees. It is said that mutual funds are notoriously tax-inefficient. For the taxable investors, there are still capital gains taxes to bear. Capital gains or losses are realized when the fund sells stocks. Because

⁴ Grinold, Kahn (2000), p560

⁵ Cohen, Zinbarg, Edward, Zeikel (1987), p587

of higher turnover of actively managed portfolios, even when the investors want to leave their money from the fund, capital gains taxes can be incurred.⁶ A research of Bernstein Journal estimated that the average active portfolio manager's annual turnover rate⁷ is at more than 90 percent. This higher turnover rate puts active portfolio management at a dramatic disadvantage.

Advantage of Active Management

Nevertheless, proponents of active management argue that average managers do outperform relevant

- *expert Analysis*
- *potential for higher-than-market returns*
- *ability to react to market conditions*

benchmarks. Ambachtsheer and Farrell point out, "It is not enough to know what ought to be done. Successful active

Disadvantage of Active Management

- *high cost*
- *tax inefficiency*
- *high turnover*

management requires that what ought to be done in theory actually be carried out in practice." It's not surprising that the active management has many additional abilities. Active managers offer expert analyses, such as forecasting, market timing or security selection. With these expert analyses, they can construct active efficient sets that exhibit the highest combination of expected active return per unit of active risk and the lowest active risk per unit of expected active return. Active manager who puts these abilities together to good use must have chance of outperforming the benchmark.

Source: cf. Americh, Sheree, Perkins, Pruitt (2007), p2

2.3 Passive Portfolio Management

As a newcomer, passive portfolio management is based on the efficient market hypothesis theory, which says that security prices reflect all available information in a strong-form. The purpose of this fastest growing product is not to "beat" the target index but to match or mimic its benchmark and not traded actively. Passive managers assume that the market does not misprice securities or managers are not able to take advantage of the mispricing in an efficient market. Passive investors usually use buy-and-hold strategy to invest. Once the portfolio is constructed, little additional trading occurs, because passive investors always chose a broad and diversified market index

⁶ Elton, Gruber (1995), p708

⁷ The percentage of stocks traded annually

(e.g. S&P 500) as the target. That's why passive management is commonly called as "Indexing".⁸ Index funds and ETF (exchange-traded funds) are popular ways for passive investments.

For passive portfolio managers, the portfolio selection or timing problem is trivial. They simply follow the buy-and-hold strategies and need make no references to the efficient set or to the risk-return preferences.⁹ Passive portfolio management usually creates well-diversified portfolios at predetermined risk levels and holds the portfolios relatively unchanged for the long run. It is characterized by low transaction costs, low turnover, and low levels of specific risks.¹⁰

2.4 Pros and Cons of Passive Portfolio Management

"Today's fad is index funds that track the Standard & Poor's 500. True, the average soundly beat most stock funds over the past decade. But is this an eternal truth or a transitory one?"

- Forbes

Passively managed portfolios typically have lower cost consumption than actively managed portfolios. Especially, using exchange traded funds can offer some additional tax advantage.

Advantage of Passive Management

- *low cost*
- *market efficiency*
- *tax efficiency*

Disadvantage of Passive Management

- *index replication is difficult*
- *focus on certain sector*

Passive investing was born Source: cf. Arnerich, Sheree, Perkins, Pruit(2007), p2 with the introduction of Stage Coach Fund in the early 1970s. At that time, stock and bond portfolios were 100 percent actively managed. Today they are only 60 percent actively managed. Since efficient market hypothesis holds more than ever, paying for active management makes no sense.¹¹ Passive portfolio management is now an important part of the investment industry.

⁸ Sharp, Gordon, Bailey (1999), p98

⁹ Sharp, Gordon, Bailey (1999), p188

¹⁰ Cohen, Zinbarg, Zeikel (1987) p587

¹¹ Ambachtsheer, Keith (1994), p90

Comparing to active strategies, choosing passive reflected in index funds will provide even larger advantage. Generally, index funds are the lowest-cost among all mutual funds and the safest way to assure market returns.¹² Index funds sell stocks usually only by entering or leaving the index they are replicating. That happens rarely, so capital-gains taxes' saving is another advantage that can be offered for taxable investors.¹³ Additionally, ETFs also offer some tax advantage by avoiding pass-through costs and using redemption-in-kind tax strategies.

Believing in the EMH, indexing has been argued to be the most efficient way to invest in the market. On the other hand, with passive management investors will lose some abilities to take offensive or defensive action in response to market conditions.¹⁴ Passive portfolio management is largely based on the efficient market hypothesis, which is debatable in modern portfolio theory. If efficient market hypothesis is not true, what would be done by passive manager?

Critics charge that the most index funds might not invest in all the stocks that make up the targeted index or may highly concentrated in a few large companies, since some indices are too large to replicate and indices, such as the S&P 500 and FTSE 110, are dominated by large company stocks.¹⁵

¹² Bogle (2001), p10

¹³ Bernstein journal (2003), p2

¹⁴ Arnerich, Sheree, Perkins, Pruit (2007), p2

¹⁵ Francis, Ibbotson (2002), p345

3 Strategies used in Portfolio Management

Having talked enough theories, let us turn to mathematics.

A good starting point for understanding the distinctions between active and passive portfolio management is to explore the tactics used in both approaches. The portfolio evaluation can be considered as the comparison of active and passive management. If a manager has above average skills in market timing and/or security selection (stock picking), he or she can choose active strategy. Conversely, if a manager is convinced that he or she is not able to beat the market, passive strategy, such as long term buy and hold, indexation, or portfolio rebalancing would be an optimal choice.

3.1 Active Strategies

“When we buy an actively managed fund, we are like gamblers in Vegas. We know it is likely to be a losing proposition, yet somehow we feel we are getting our money’s worth.”

- The Wall Street Journal, February 27, 2001

Active portfolio management uses market timing, security selection or both to do the average forecasts of the market. Market timing tells when to buy or sell and security selection tells what to buy or sell (which stocks).¹⁶ Fund managers’ skills have previously been decomposed into these two methods that will be explored respectively in this section.

Do not worry about transaction costs, turn over, or the taxes. Let us free ourselves from the clutter and look at active management from a strategic perspective.

3.1.1 Fundamental Law of Active Portfolio Management

Information ratio

In the fundamental law of active management, the expected value added is considered to be dependent on both the manager’s forecasting skill, represented by the information coefficient (*IC*), and the breadth of the strategy. *BR* is defined as the number of independent forecasts of exceptional return made per year. The form of the fundamental law articulated by Grinold is,

¹⁶ Cohen, Zinbarg, Zeikel (1987), p586

$$IR = IC \cdot \sqrt{BR} \quad (1)$$

Where IR is the information ratio, IC is the information coefficient and BR is the number of independent forecasts.¹⁷ IC measures the correlation between actual realized returns and predicted returns and gives a manager's forecasting ability. BR measures active decisions available per investment period – the more the better.¹⁸ The message given by the law is clear: the investors have to play often (high BR) and play well (high IC) to win a high IR . That means, the law will give them a guide in relating the choices to the value added when investors chose between strategies.¹⁹

The information ratio in the fundamental law of active management measures the opportunities of an investment manager. The fundamental law itself is not an operational tool; instead, it gives us insight into active management. The portfolio managers should know the trade-offs between BR and IC , that is, for increasing the BR of the strategy by covering more stocks in the portfolio or shortening the time horizons of the forecasts and improving IC (skill).²⁰

Let us use a straightforward example to clarify the law. In a gambling game, we take a red roulette and a black roulette, each of them has 18 red spots and 1 green spot. The expected return of \$1 bet is easy to be calculated: that is 1/37 either on red or black. The standard deviation of the return on the bet is then 99.9634%.

The information ratio equals to the expected percentage return (2.7027%) divided by the standard deviation (99.9634%), it is 0.027038, which is close to the result calculated by using formula 1, where we assume that skill (IC) is 1/37 and breath (BR) is one –

$$\left(\frac{1}{37}\right) \times \sqrt{1} = 0.027027 \quad 21$$

Let us use another example to provide some further intuition into the information coefficient (IC). When we want to forecast the direction of the market each quarter, we

¹⁷ Grinold, Kahn (2000), p148

¹⁸ Lee (2000), p27

¹⁹ Grinold, Kahn (1989), p34

²⁰ Grinold, Kahn (2000), p148

²¹ Grinold, Kahn (1999), p151

care about only the direction of forecasting. We assume that the market direction is $x(t) = \pm 1$ and our forecast is $y(t) = \pm 1$. As has been said before, the information coefficient is the correlation of each forecast with the actual outcomes, and then we can calculate the IC as following,

$$IC = Cov\{x(t), y(t)\} = \frac{1}{N} \cdot \sum_{t=1}^N x(t) \cdot y(t) \quad (2)$$

where N is the observed bets on market direction. If we correctly forecast market direction ($x=y$) by N_1 times, and incorrectly forecast ($x \neq y$) by $N - N_1$ times, then

$$IC = \frac{1}{N} \cdot [N_1 - (N - N_1)] = 2 \cdot \left(\frac{N_1}{N}\right) - 1 \quad (3)^{22}$$

The information ratio in the left hand site of the equation (1) is a measure of a manager's opportunities and can be taken as a squared form which indicates the ability to add value. All active managers seek the highest information ratios. Thus, the information ratio becomes to be a key concept in determining the value of an investment strategy.²³ The information ratio can be calculated in two ways: ex post- and ex ante information ratio. The ex post information ratio can be measured as the ratio of the realized return divided by the realized standard deviation, whereas, the ex ante information ratio is the expected return per unit of forecasting risk. Ex ante information ratios are usually positive because we all want to win in the game. The ex post information ratio can be used to selecting and evaluating managers or can be used by the managers to make sure that their expectations become close to the reality.²⁴

The formula (4) is always used to calculate the ex-post information ration,

$$IR \equiv E(R_A) / \sigma^A \quad (4)$$

Where R_A refers as the active return, σ_A is the active risk or the managed portfolio's tracking error.²⁵

²² Grinold, Kahn (1999), p153

²³ Grinold, Kahn (1999), p34

²⁴ Grinold, Kahn (1989), p31

²⁵ Clarke, Silva, Thorley (2001), p5

Alpha

The SML is essentially generated from the CAPM as,

$$E(r_i) - r_f = \beta_i [E(r_m) - r_f] \quad (5)$$

Individual asset risk premiums can be written as a function of asset risk. The SML is valid for efficient portfolios as well as for individual assets. Underpriced stocks lie above the SML, whereas overpriced stocks plot below the SML. The difference between the actually expected return and fair return is called the stock's alpha, which is showed in the graph by using the following example:

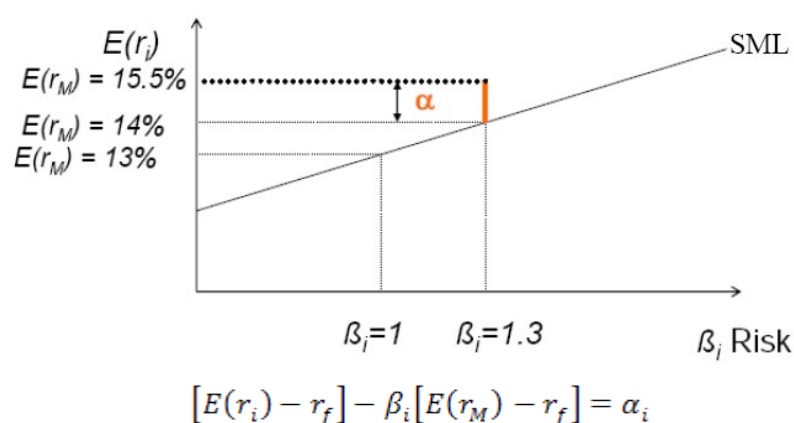


Figure 1: The SML defines the alpha of a security

Source: Dockner (2007)

In this example, the SML predicts an expected return of 14% with a beta of 1.3, and T-bill rate of 9.7%. If investors believed the stock would provide an expected return, say 15.5%, the alpha would be 1.5%.

Security analysis suggests that a passive market-index portfolio can be considered as the starting point of active portfolio management. It will be shown in a later section (Treynor-Black model) that active portfolio manager will then increase the weights of securities with positive alphas and decrease the weights of securities with negative alphas.²⁶

²⁶ Bodie, Kane, Marcus (2002), p291

Today's investors are engaged in alpha transport. Elton/Gruber (2004) refers portable alpha to the process of separating the alpha from the beta and then applying it to other portfolios without affecting the asset allocation of the portfolio. That is, in a beta-neutral portfolio, portable alpha strategy is implemented through a no cash overlay or by strategic asset allocation.

Portable alpha strategy has important implications for portfolio construct, risk control and added value. It is called "portable", because the alpha can come from any asset class without changing the market exposure or asset allocation of the overall portfolio. Portable alpha can be generated many different ways. Investment manager can purchase securities and use derivatives (e.g. future, swap) to supply market exposure. Alternatively, investors can use long-only strategy for implementing portable alpha.²⁷

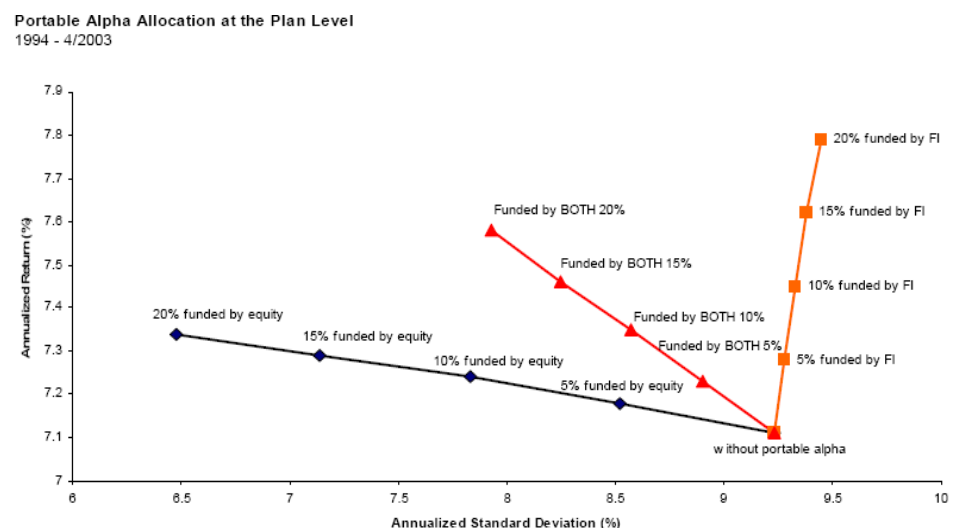


Figure 2: Portable alpha allocation

Source: Kung, Pohlman (2004), p5

Investors can use various funding allocation, such as reducing equity allocation, reducing fixed-income allocation or scaling down the overall allocation to fund portable alpha. Figure 2 illustrates these funding decisions and the impact of changing risk exposure. It shows that there is a significant reduction of overall risk of the portfolio with portable alpha funded by equity²⁸. While alpha funded by both (reducing equity allocation and reducing fixed-income) can reduce overall risk accordingly.²⁹

²⁷ Kohler (2004), p2

²⁸ Portable alpha strategy is essentially uncorrelated with other asset classes.

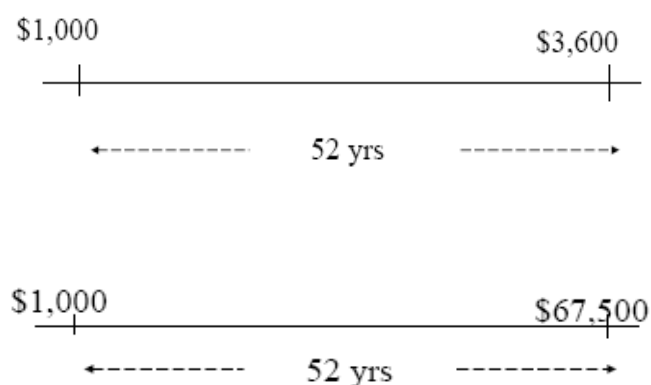
²⁹ Kung, Pohlman (2004), p5

Edward and Larry (2004) also pointed out the considerable benefits of transporting alpha. For example, portable alpha strategy enables investors to budget risk and to provide flexibility to rebalance portfolios with index futures etc.³⁰

Active managers aim to find two types of return, one comes from selection skill or alpha, and the other is generated from market exposure or beta. This active beta returns typically can be realized by market timing, while passive beta returns come from index fund exposure.

3.1.2 Market Timing

Let's start with a small example to illustrate market timing. Bodie/Kane/Marcus (2005) defined perfect market timing as the ability to tell (with certainty) at the beginning of each period which investment will outperform the other.



Source: Dockner (2007)

Assume two investors put the same amount of money, say \$1000, on January 1, 1927. Investor A rolled all into 30-day T-bills, and investor B put all in the NYSE index and reinvested all dividends in that portfolio. Both of them would have ended on December 31, 1978, but the results are totally different. As we can see, the ending value of investor A is only \$3600 and that of investor B is \$67500. Why would A invest in safe assets given few returns? It is clear that the reason is risk. Here, standard deviation of the perfect market timer is not an appropriate measure of risk. A perfect timer never does worse than either bills or the market. It is also said that the perfect market timer eliminates the left tail of the distribution.³¹

³⁰ Kung, Pohlman (2004), p50

³¹ Bodie, Kane, Marcus (2005), p985

Perfect foresight of timing ability is said to be equivalent to the possession of a call option on the market portfolio. The cost of the market timing can be determined using Black-Scholes option valuation, where the price of a call option will be employed to indicate the price for market timer. A perfect timer pays the market return in a bullish market (market return is more than the risk-free rate) and pays risk-free return in a bearish market. Similarly, a call option enables investor to earn the market return only when the market return exceeds the risk-free rate. This intuition is showed in figure 3.³²

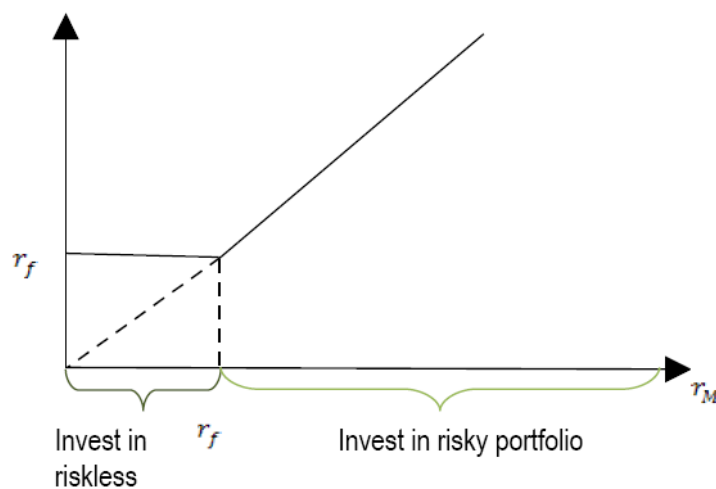


Figure 3: Rate of return of a perfect market timer

Source: cf. Bodie, Kane, Marcus (2005), p987

The market forecasting skill of the perfect timers remains in debate, and it is considered as luck rather than skill. Some others, however, strongly believe that the professional market timers can consistently avoid losses in down markets and capture most of gains in up markets.

A Study by Wagner, Shellans, and Paul (1992) recommends that market timing can be considered as a low-risk investment strategy. Larsen and Wozniak (1995) demonstrated that a timing algorithm could beat the S&P 500 over the evaluation periods studied. However Brocato and Chandy (1994) present their skeptic of optimistic results either in the WSP study or BC study.³³

³² Bodie, Kane, Marcus (2005), p986

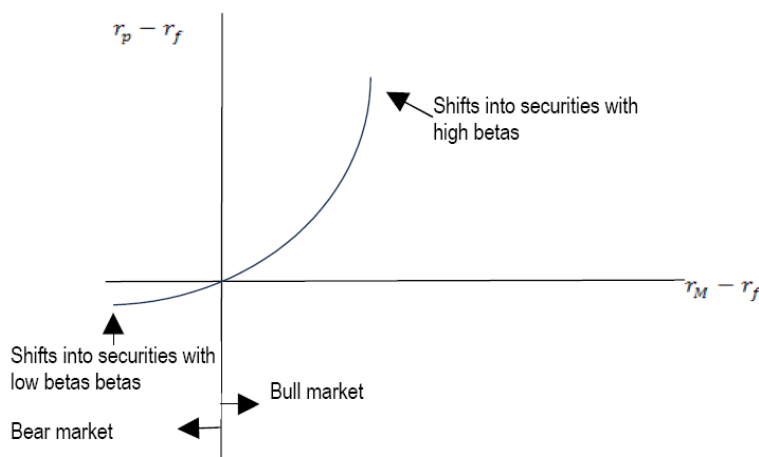
³³ Benning, Carl (1997), p56

In Fama's macroforecasting component, market timing refers to forecasts of future realization of the market portfolio. A market timer attempts to have appropriate expectations of the market return in the next period. The perfect timer will adjust his portfolio risk level in anticipation of market movements. For example, if the market return is expected to be up next period, managers can increase return on the portfolio by increasing its risk. In a converse situation, managers will be able to reduce losses by reducing the portfolio's risk level. In other word, the market timer must have the ability of forecasting price movements of the general stock market as a whole and the ability to switch from more risky to less risky securities.³⁴

To perform market timing evaluations Treynor and Mazuy were the first to add the characteristic line that can be estimated by adding a squared term (second-order) to the usual linear index model:

$$r_p - r_f = \alpha_i + \beta_1(r_M - r_f) + \beta_2(r_M - r_f)^2 + e_p \quad (7)$$

where β_1 is the beta coefficient for market returns, β_2 is the beta coefficient for squared market returns, r_p is the portfolio return. In this equation, when β_2 turns out to be positive, there will have evidence of timing ability which is shown in the figure 4.



An adapt market timer who has $\beta_2 > 0$ is illustrated. This market timer shifts the portfolio into high (low) beta securities as a bull (bear) market is beginning.

Figure 4: Curvilinear characteristic line for a portfolio manager who can often forecast the market's turning points

Source: cf. Jack. C. (2002), p496

³⁴ Lee, Rahman, Shafiqur (1991), p81

This figure shows that the investor is willing to shift more into the market when the market is about to go up. The slope of the characteristic line and the portfolio beta will tend to be higher if the market return is higher.³⁵

Perfect market timers strive to lose less in bad markets and win more in good market. The goal of market timing is not a higher rate of return, but reducing risk by reducing exposure to equity markets when a sharp decline is probable.³⁶

Grinold (1999) concludes that successful market timing is hard. He says forecasts of exceptional benchmark return lead to active beta positions and these active betas can be generated by using futures or stocks with betas different from 1. Market timing can diversify only serially, through frequent bets per year. That's why most institutional managers focus on stock selection.

3.1.3 Security Selection

Besides market timing, security selection is the other strategy of active portfolio management. As an active manager, exploiting security analysis to construct a well diversified portfolio of positive anticipated alphas is of most importance. The active manager strikes to identify over/under priced securities.

In Treynor and Black model, active portfolio management is to select the mispriced securities (active portfolios) which are then added to the passive market portfolio. The optimal combination of active and passive portfolios can be determined by using Sharpe's measure.³⁷

³⁵ Bodie, Kane and Marcus (2005), p879

³⁶ Vandell, Stevens (1989), p38

³⁷ Treynor, Black (1973), p66-86 / Bodie, Kane, Marcus (2005), p988

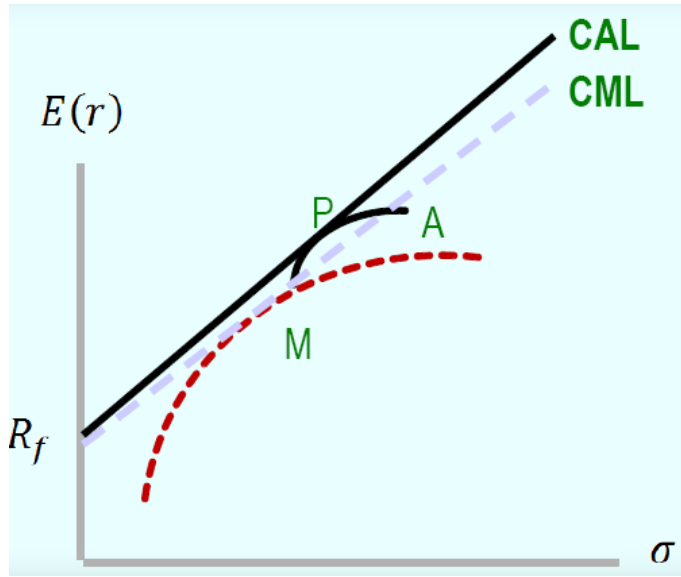


Figure 5: The optimization process with active and passive portfolios

Source: Bodie, Kane, Marcus (2005), p990

This Treynor-Black optimization figure shows us an optimal combination portfolio P, constructed by active portfolio A, which lies above the CML, and passive portfolio M, which is on the dashed efficient frontier (represents the universe of all securities assuming that they are all fairly priced) and is tangent to the CML. Here, the market-index portfolio M is viewed as inefficient and the active portfolio A is constructed from mispriced securities. The solid efficient frontier passes through M and A, and tangents the CAL at point P, which is considered as the optimal risky portfolio. The active portfolio A in this graph is not the ultimate efficient portfolio.

Treynor-Black model follows several steps. The first step is to identify mispriced securities for the active portfolio A and determine expected returns and expected abnormal return (alpha). The second step is to choose optimal weight in portfolio A, using

$$W^* = \frac{\alpha_A}{\alpha_A(1-\beta_A) + R_M \frac{\sigma^2(e_A)}{\sigma_M^2}} \quad (8)$$

Third step is to put a weight of $(1 - W^*)$ into the benchmark portfolio. The objective is to form an active portfolio A to be mixed with the index portfolio M. For each analyzed security k , the rate of return is written by,

$$r_k = r_f + \beta_k(r_M - r_f) + e_k + \alpha_k \quad (9)$$

Where α_k represents the extra expected return (or abnormal return) of mispriced security. All will be significant different from zero, some positive and some negative, because if all α_k are zero, that would make no sense to depart from the passive strategy and the index portfolio M.³⁸ The distinction between the active and passive components is important, that's why the Treynor-Black model has been used as a justification for dividing the management of a portfolio between an index fund and separate actively managed portfolios.³⁹

For getting an optimal weight of active and passive index portfolios, we must maximize the Sharpe ratio (the slope of the CAL). Sharpe ratio can be written by separating the contributions of the index and active portfolios as following:

$$S_P^2 = S_M^2 + \frac{\alpha_A^2}{\sigma^2(e_A)} = \left[\frac{R_M}{\sigma_M} \right]^2 + \left[\frac{\alpha_A}{\sigma(e_A)} \right]^2 \quad (10)$$

Because the passive component (market-index) is unchangeable, the square of Sharpe's measure is increased over the square of the passive portfolio by the amount of

$$\left[\frac{\alpha_A}{\sigma(e_A)} \right]^2$$

This is the ratio of mispricing α_A , divided by the nonsystematic standard deviation $\sigma(e_A)$, is thus a performance measure of the active risky portfolio. It is also called *IR* (information ratio), while $\frac{\alpha_A}{\sigma(e_A)}$ can be called appraisal ratio as well. When the active portfolio contains n analyzed securities, then it is,

$$\left[\frac{\alpha_A}{\sigma(e_A)} \right]^2 = \sum_{i=1}^n \left[\frac{\alpha_{A_i}}{\sigma(e_{A_i})} \right]^2 \quad (11)$$

³⁸ Bodie, Kane, Marcus (2005), p992

³⁹ Breale (1990), p7

3.2 Passive Strategies

"If I have noticed anything over these 60 years on Wall Street, it is that people do not succeed in forecasting what's going to happen to the stock market."

- Benjamin Graham, Security Analysis 1934

Active strategy is complicated and more costly than passive strategy, because a passive strategy avoids any direct or indirect security analysis. Passive investor needs only to select a diversified portfolio of stocks that mirrors a broad market index. The common passive approaches involve buy and hold strategy, indexation and rebalancing.

3.2.1 Indexation

The objective of indexation is to invest in a portfolio whose performance (closely) tracks that of the index, although in reality, indexing cannot be identical to the benchmark index, because it is difficult to replicate the returns of the target index due to market frictions faced by index managers. It is only calculated on the basis of holding a 'paper' portfolio of index securities. The pioneers of indexing used benchmark indices because they were available and cheap. Various benchmark indices are used, for example, Domestic U.S. equity, S&P 500; the Nasdaq composite index; and the Wilshire 5000. Russell 2000 is used for small capitalization stocks; for value- or growth-oriented stocks (Russell Growth index and the Russell Value index); and for numerous world regions (such as EAFE index).⁴⁰

Indexation strategy uses quantitative risk-control techniques to replicate the benchmark's return by minimizing expected tracking error and with no expected alpha, or excess return. People said that the best index is not necessarily the one that provides the highest return, but the one that most accurately measures the performance it is intended to track.⁴¹

Index tracking can be full replication, sampling and quadratic optimization or programming. Full replication ensures close tracking, but it is considered to be

⁴⁰ Reilly (2006), p608

⁴¹ Philips, Frank (2007), p3

suboptimal because of two reasons. First, full replicators purchase all the securities in the index according to their weights, thus buy all securities will increase transaction costs. Second, high commissions will be caused by the reinvestment of dividends.

Different from full replicator, the people who use sampling needs only to buy a representative sample of stocks that comprise the benchmark index. With fewer stocks to purchase, leads to lower commissions. Further, the reinvestment of dividend will be less problematic, but portfolio returns have small chance to track the returns for the benchmark index as closely as full replicator does.

With quadratic optimization (or programming), a computer program which is redacted to input historical information on price changes and correlation between securities, determines the composition of a portfolio that closely tracks the benchmark. There is a problem with this technique as well. If historical price changes and correlations change over time, the portfolio may have large differences from the benchmark.

3.2.2 Tracking Error

The success of forming a replicate portfolio lies not in the absolute returns, rather, in how closely its returns match the benchmark. Said differently, the goal of the passive management is to minimize the tracking error, the portfolio's return volatility relative to the benchmark. Tracking error is defined as the extent to which return fluctuations in the managed portfolio are not correlated with return fluctuations in the benchmark.⁴²

We define the period return to managed portfolio as

$$R_{pt} = \sum_{i=1}^N w_i R_{it} \quad (12)$$

Then, the period t return differential between the managed portfolio and the benchmark can be specified as,

$$\Delta_t = \sum_{i=1}^N w_i R_{it} - R_{bt} = R_{pt} - R_{bt} \quad (13)$$

Where, N is given for the number of assets in the managed portfolio,

⁴² Reily (2006), p610

w_i = investment weight of Asset i in the managed portfolio

R_{it} = return to Asset i in period t

R_{bt} = return to the benchmark portfolio in period t

For a sample of T return observations, the variance of return differential Δ can be calculated as

$$\sigma_{\Delta}^2 = \frac{\sum_{t=1}^T (\Delta_t - \bar{\Delta})^2}{(T-1)} \quad (14)$$

where $\bar{\Delta}$ = average Δ

Finally,

$$\sigma_{\Delta} = \sqrt{\sigma_{\Delta}^2} = \text{periodic tracking error}$$

And

$$TE = \sigma_{\Delta} \sqrt{P} = \text{annualized tracking error}$$

Here, P is the number of return periods in a year.

The formula of tracking error can also be written as follows:

$$TE = \sqrt{\frac{\sum_{i=1}^N (R_p - R_B)^2}{N-1}} \quad (15)$$

R_p = return of portfolio

R_B = return of Benchmark

N = number of return periods

Form the equation (15) we can see that there is an inverse relationship between tracking error and the sample size N (or expense of forming the managed portfolio). For example, full replication of the S&P 500 would have no tracking error. But, if smaller samples are used to replicate the index, T would decline and tracking error is likely to increase. Since transaction costs increase with the sample size, passive manager must balance the costs (larger tracking error) and the benefits of using smaller samples. That is the trade-off between tracking error and costs (number of samples).⁴³

⁴³ Reily (2006), p611

Alford, Jones, and Winkelmann (2003) have shown that money managers can be classified using the following table with regard to the tracking errors of their portfolios compared to the benchmark:

Investment Style	Tracking Error Range
Passive	Less than 1.0% (0.5% or lower is normal)
Structured	Between 1.0% and 3.0%
Active	Over 3.0% (5.0% to 15.0% is normal)

Table 1: Tracking error range

Source: Reily (2006), p611

In this table, structured portfolio managers are viewed as active managers with the tightest controls on the permissible level of their tracking errors.⁴⁴

Francis/Ibbotson (2002) used figure 6 to show the tradeoff between transaction costs and the tracking errors of their indexed portfolios. He said that a multibillion-dollar portfolio does not face such tradeoff, because it can buy all 500 stocks in the S&P500 and block trades charge lower commissions than round lot trades. In contrast, a small index fund would not be able to buy lots of 500 stocks. As a result, the small index fund would buy at high commission costs or omit some stock from the index. The figure 6 shows that if the number of stocks added to the replicating portfolio less than 500, the tracking error of the portfolio tends to increase as fewer issues are held. Meanwhile, the portfolio that holds fewer issues will obtain lower commission rates.

⁴⁴ Reily(2006), P610

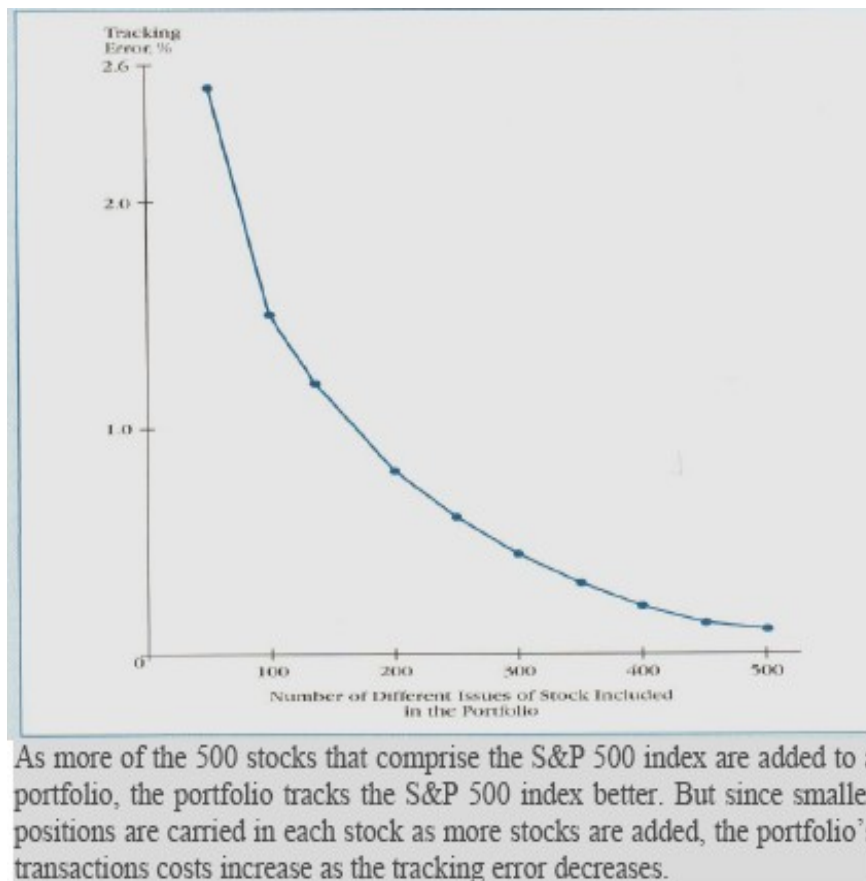


Figure 6: The trade-off between transaction costs and tracking error for a S&P 500 indexd portfolio

Source: Francis, Ibbotson (2002), p346

Index replicator strives to minimize tracking error, while sampling indexer enhancing returns.

Tracking Errors of Barclays and Vanguard against the S & P 500 1990-2000

Year	Tracking Errors (Percent per Year)			
	Barclays Before Expenses	Vanguard 500		
		Before Expenses	Expenses	After Expense
2000	0.00	0.23	0.18	0.05
1999	0.03	0.21	0.18	0.03
1998	0.04	0.22	0.18	0.04
1997	0.07	0.02	0.19	-0.17
1996	0.03	0.01	0.20	-0.19
1995	0.05	0.22	0.20	0.02
1994	0.01	0.06	0.19	-0.13
1993	0.04	0.09	0.19	-0.10
1992	-0.01	-0.06	0.19	-0.25
1991	0.01	-0.13	0.20	-0.33
1990	-0.03	0.07	0.22	-0.15
Simple Average	0.022	0.085		-0.107
Average Absolute Deviation	0.029	0.120		0.133
Standard Deviation	0.028	0.117		0.122
Assets under Management December 2000 (billions of dollars)	211.70			148.00

Table 2: Tracking errors of Barclays and Vanguard against the S&P

Source: Marchall, Roger (2004), p25

As can be seen in table 2, the tracking error of the largest indexer, Barclays Global, is averaged before management expenses at 2.2 basis points per year. Its annual tracking errors (column 2) are always close to zero. These dates show that Barclays enhanced its return over 1990-2000. In contrast, Vanguard, the third-largest S&P 500 indexer after State Street Global Advisors, and the largest indexer of mutual funds, has somewhat higher tracking errors than the Barclays tracking error. The average tracking error of Vanguard before expenses is 8.5 basis points per year. If we look at the last column of the table, we can find that the after expense from 1998 to 2000 turned around to be positive. This means that Vanguard has enhanced its return sufficiently to cover all its expenses. The higher Vanguard tracking error tells the fact that Vanguard deviates more than Barclays from an exact replication strategy. An indexer who wishes to get lower tracking errors like Barclays or Vanguard do should invest in an exact replication strategy.⁴⁵

3.2.3 Rebalancing

The optimal proportion of asset classes a passive investor selected does not maintain unless the portfolio is periodically rebalanced. To maintain a level of risk exposure consistent with the investor's objectives, the passive portfolio must be rebalanced periodically with a frequency which is influenced by market conditions, such as investment horizons, allocation weights, and transaction cost.

Basically, there are two strategies used for rebalancing a passive portfolio. One is calendar rebalancing, which provides for readjusting the allocation weights of the portfolio to the original levels at regular intervals such as quarterly, semiannually, or annually. Whereas, contingent rebalancing, the second strategy, rebalances the portfolio only when the weight of an asset class changed by a predetermined percentage. For example, if the weight of an asset class changed by 2.5 percent (2.5 percent more or 2.5 percent less) than the weight at the beginning of the period, the portfolio should be rebalanced to its original weights level.⁴⁶

⁴⁵ Marshall, Roger (2004), p25

⁴⁶ Stine, Lewis (1992), p80

Results of Alternative Rebalancing Strategies for 3-Year Investment Horizon						
Rebalancing Strategy	Holding Period Return	Average Number of Times Portfolio Rebalanced	Stock Weights			Average Commission Costs
			Average	Minimum	Maximum	
Buy & Hold	8.071%	0.00	42.8%	27.6%	59.5%	0.00
Annual	7.891%	3.00	41.1%	29.1%	49.8%	414.13
Semiannual	7.746%	6.00	40.6%	31.4%	47.7%	771.39
Quarterly	7.484%	12.00	40.4%	32.7%	44.8%	1,430.69
2.5%	7.664%	7.07	40.4%	32.7%	45.3%	926.75
5.0%	7.822%	4.01	40.6%	31.4%	46.0%	570.16
7.5%	7.900%	2.53	40.9%	31.2%	46.0%	376.74
10.0%	7.957%	1.83	41.0%	29.6%	47.5%	283.40
12.5%	7.968%	1.18	41.2%	28.7%	48.7%	188.71
15.0%	8.008%	0.88	41.4%	28.4%	49.5%	145.57

Table 3: Results of alternative rebalancing strategies for 3-year investment horizon

Source: Stine, Lewis (1992), p82

Table 3 provides a summary of both calendar and contingent rebalancing over a three-year investment horizon. It also compares with a buy-and-hold portfolio and shows a statistically significant benefit to rebalancing. Recall, the purpose of rebalancing is to maintain the original risk and return of the investor. If we look at the second column of the table, we can find that there is no statistical difference in the holding-period returns. Therefore we should compare the strategies on the basis of portfolio risk. Data in the three weights columns of stock are what we should focus on⁴⁷.

The first row of the table shows non rebalanced portfolios whose weights fluctuate between 27.6 percent and 59.5 percent. They are inconsistent with the original weight of 40 percent. If we observe the three stock weight columns for each strategy, the effect of rebalancing can be seen. As the data show, quarterly rebalancing strategy produces an average stock weight of 40.4 percent that is very close to the origin. But the cost of quarterly rebalancing is the highest among the other strategies. The last 6 rows in the table show the contingent strategies.⁴⁸

⁴⁷ Stine, Lewis (1992), p81

⁴⁸ Stine, Lewis (1992), p82

Bert Stine and John Lewis (1992) explained the results of this 3-year holding-period investigation. They pointed out that the frequent rebalancing required by the semiannual and quarterly strategies do not appear to be worth the extra expense when compared with annual rebalancing. As shown in the table, with large average commission costs for each semiannual 771.39 and quarterly 1,430.69 (last column), they did not generate better returns (7.746% and 7.484%) than that of annual strategy (7.891%). However, by following a contingent rebalancing strategy of between 7.5 to 12.5 percent, an investor can get same results like by annual rebalancing, even at a lower total cost (compare 376.47 with 414.13 in last column).

Continually, Bert Stine and Jon Lewis used empirical analysis of alternative rebalancing strategies over longer investment horizons, 5, 10, 15, and 20 years. Same results hold over all investment horizons of 3, 5, 10, 15, and 20 years. (relevant tables shown in Appendix 1). They concluded that in most cases, the investor would take the action of rebalancing only when the risk exposure exceeds a predetermined level rather than use calendar rebalancing strategy. Over all investment horizons, rebalancing when the stock weights vary 7.5 to 10 percent from their original position does better than annual rebalancing.⁴⁹

4 Performance Comparison of Active and Passive Management

"History shows that the long run a thought fully designed, diversified strategy of 'passive' funds typically beats all but a few active managers. It's not easy to structure and maintain such a strategy. It requires some initial research and discipline to stay the course. But it's much easier than predicting which active managers will randomly beat this approach."

- Eugene Fama, Jr.

While the mathematics used in strategies may be simple, the practice of implementation is far more challenging. Mutual funds⁵⁰ are the common name for the

⁴⁹ Stine, Lewis (1992), p84

⁵⁰ Close-end funds are traded in the secondary market; mutual funds (open-end funds are sold directly back to the investment company at the prevailing net asset value.

open-end investment companies⁵¹. They pool moneys from public and invest the proceeds in a diversified pool of securities, which are jointly owned by the funds' investors. By the end of 1940, the market for mutual funds totaled only \$0.45 billion with 296,000 shareholders. At the end of 2006, worldwide mutual funds have net assets of over \$21.7 billion. Today mutual funds accounts for roughly 90 percent of investment company assets. At the end of 2006, there were more than 60,000 mutual funds worldwide.⁵² Their growth in popularity is largely due to some factors: the ease of buying or selling fund; the availability of a large choice of investment objectives (such as capital appreciation, high current income, or money market income), etc.⁵³ But the mutual funds represent choices made by the mutual fund's managers, not really by the investors.

Index funds and ETF both belong to the mutual funds. For the purpose of this thesis, mutual funds are divided into three categories: active mutual fund, index fund and ETF.

4.1 Active Mutual Fund

There has been a long history that active manager performance was studied by finance academics. According to the strong form of efficient market hypothesis, active managers have no skill to outperform the market, because there is no superior information available. In reality, some active managers do outperform the benchmark either through luck or skill. The studies of active managed funds' performance have focused on some questions: Does the average active manager outperform the benchmark? Does positive performance consistent? etc.⁵⁴

Among academic researchers, Jensen (1968), Grinblatt and Titman (1989), and Malkiel (1995) are consistent in showing that actively managed funds do not outperform benchmarks. They all generated negative alphas as shown in the following table⁵⁵.

⁵¹ „Common shares of an open-end investment company are purchased directly from the fund in a primary market transaction. Purchases may be made through a properly licensed broker, or may be made directly from the fund (e.g., through a dividend re-investment plan).” Anderson (2005), p11

⁵² ICI worldwide mutual fund statistics

⁵³ Anderson (2005), p1

⁵⁴ Grinold, Kahn (2000), p481

⁵⁵ Anderson (2005), p14

Mutual fund performance					
Study	Sample Period	Sample size	Index Benchmark	Annualized alpha	T-ratio
Jensen (1968)	1945-64	115	S&P 500	-1.10%	-0,69
Grinblatt and Titmann (1989)	1974-84	157	CRSP EW	-0,03%	-0,09
Malkiel (1995)	1971-91	239	Wilshire 500	-0,93%	-1,78

Table 4: Mutual fund performance

Source: Anderson (2005), p15

To “pure” performance works, for example, Grinblatt and Titman (1992), Goetzmann and Ibbotson (1994), and Hendricks, Patel, and Zeckhauser (1993) find some evidence of persistence in active mutual funds. But other studies in Malkiel (1995), Wermers (1997), and Carhart (1997) attributed this persistence to either survival bias or benchmark errors.⁵⁶ However, the studies in table find no persistency of performance. In summary, some managers can beat the market only sometimes.⁵⁷

Do Winners Repeat?					
Study	Sample Period	Sample size		Successive Period Performance	
				Winners	Losers
Goetzmann and Ibbotson (1994)	1976-1988	728	Winners	62%	38%
			Losers	37%	63%
Brown and Goetzmann (1995)	1976-1988	2274	Winners	57%	44%
			Losers	44%	56%
Malkiel (1995)	1971-1991	1047	Winners	65%	35%
			Losers	35%	65%
Kahn and Rudd (1995)	1983-1993	150	Winners	41%	59%
			Losers	59%	41%

Table 5: Do winners repeat

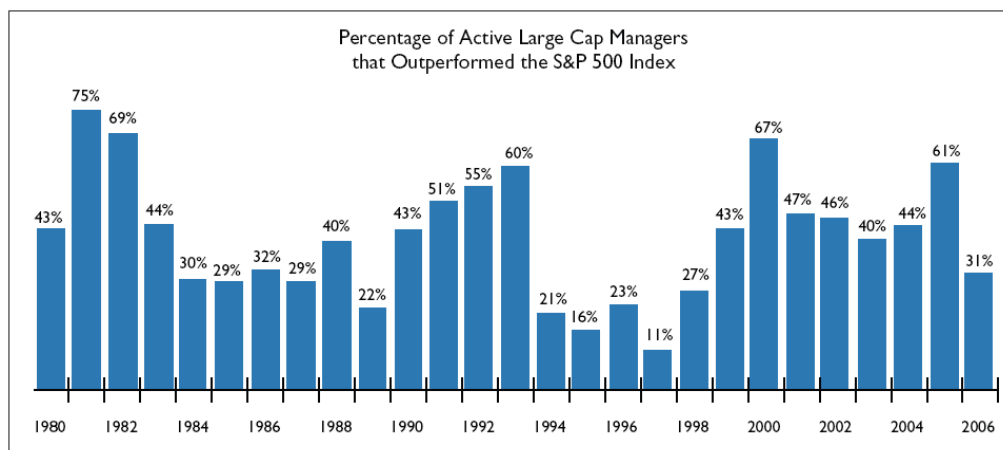
Source: Anderson (2005), p16

⁵⁶ Kent, Mark, Sheridan, Russ (1997), p1036

⁵⁷ Anderson (2005), p15

Fortunately, Grinold (1999) mentioned that the studies of active management's producing exceptional returns say nothing about the possibility of successful active management. He used the Marcus (1990) study, which shows very top funds do outperform, to defend the possibility of successful active management.⁵⁸

Although in overall actively managed mutual funds struggle to outperform the benchmarks, there is evidence, that the case for underperformance may be overstated.

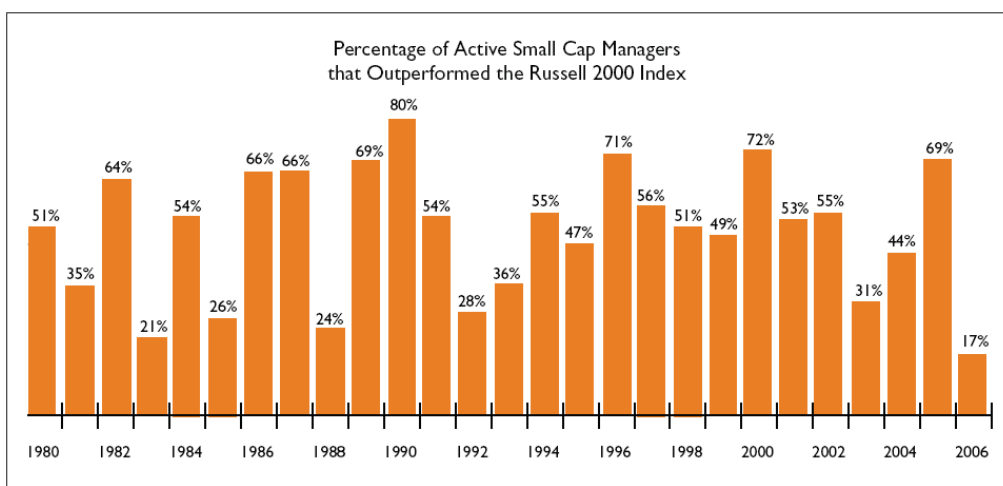


source: Morningstar

The large cap universe includes the growth, value, and blend styles as determined by Morningstar – this may include some aggressive allocation funds and sector specific funds. All share classes were used in the universe counts and calculations.

Figure 7: Percentage of active large cap managers that outperformed the S&P 500 Index

Source: Arnerich, Sheree, Perkins, Pruitt (2007), p4



source: Morningstar

The small cap universe includes the growth, value, and blend styles as determined by Morningstar – this may include some aggressive allocation funds and sector specific funds. All share classes were used in the universe counts and calculations.

Figure 8: Percentage of active small cap managers that outperformed the Russell 2000 Index

Source: Arnerich, Sheree, Perkins, Pruitt (2007), p5

⁵⁸ Grinold, Kahn (2000), p562

Figure 7 shows that during the boom of the later 90s, only between 11 percent (1997) and 27 percent (1998) of active managers outperformed the S&P 500 and that between the year 2000 and 2002, active managers beat the Index with 67 percent and nearly 50 percent in the following two years. During the recession period, large cap active

	managers provided greater value	
<i>"It appears that active fund management is better than investing in index funds when guiding portfolios through difficult times."</i>	over and above index returns. Other practitioners, such as Kosowski from INSEAD, Fortin and Michelson, also arrived at a similar conclusion.	<i>"Overall, our results show that U.S. domestic equity mutual funds perform better in recession than in expansion periods."</i>
<i>(Fortin, and Michelson, 2002)</i>		<i>(Kosowski, 2006)</i>

In the small cap universe, as shown in Figure 8, the same phenomenon is apparent. In 1990 active small cap managers outperformed the index by 80 percent, whereas in 2003 only 31 percent of active small cap managers showed outperformance. Clearly, active small cap managers outperformed index a majority of time and provide a greater return premium than in large cap.⁵⁹

4.2 Index Fund

Index funds are mutual funds created to match the performance of a broad market index. Such funds appeal to passive investors who want to track some market index because they believe in efficient market hypothesis and do not think it is possible to beat the market in the long run. A prominent example of an index fund is Vanguard 500 Index Fund (VFINX), which is designed to replicate the composition of the Standard & Poor's 500 stock price index. Because the S&P 500 is a value-weighted index, the fund buys shares in each S&P 500 company in proportion to the market value of outstanding equity. There are also numerous index funds who track very broad indices like the Dow Jones Wilshire 5000, broad foreign indices like the EAFE index, as well as nonstock indices including bond indices. Vanguard also offers a bond index fund and a real estate index fund.⁶⁰

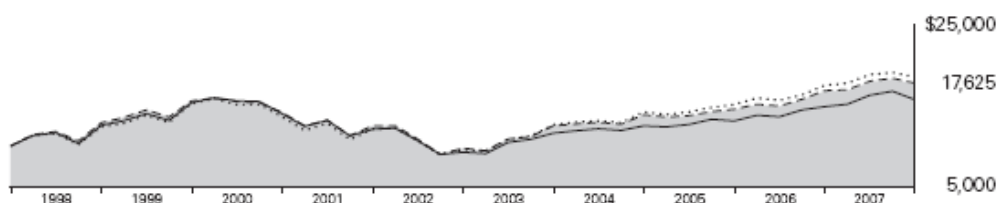
⁵⁹ Arnerich, Sheree, Perkins, Pruitt (2007), p3

⁶⁰ Bodie, Kane, Marcus (2002), p113

The task of index fund is not to beat the benchmark, but track the benchmark as close as possible. Vanguard 500 index Fund returned 5.4 percent for the investor shares by the end of 2007. The fund fulfilled its objective of closely matching S&P 500 index. (see figure 9)

Cumulative Performance: December 31, 1997–December 31, 2007

Initial Investment of \$10,000



	Average Annual Total Returns Periods Ended December 31, 2007			Final Value of a \$10,000 Investment
	One Year	Five Years	Ten Years	
500 Index Fund Investor Shares ¹	5.39%	12.69%	5.83%	\$17,625
Dow Jones Wilshire 5000 Index	5.73	14.07	6.34	18,492
S&P 500 Index	5.49	12.83	5.91	17,756
Average Large-Cap Core Fund ²	5.73	11.24	4.62	15,702

Figure 9: Vanguard 500 index fund

Source: Vanguard 500 index fund annual report 2007

By the end of 2002, indexed assets have grown to \$340.1 billion, or 5.6% of all mutual fund assets.⁶¹

	Periods Ended December 31, 2002		
	One Year	Three Years	Five Years
High	-21.74%	-14.33%	-0.33%
Low	-23.78	-15.99	-2.39
S&P 500 Index	-22.10	-14.55	-0.59

Table 6: Best and worst total returns for index mutual funds tracking the S&P 500 index

Source: Myths and Misconceptions About Indexing (2003), p3

Table 6 demonstrates the range of annualized returns for funds tracking the S&P 500 Index for the one-, three-, and five-year periods. It is shown that skilled managers can archive more than 200 basis points returns than the worst index manager. The variation in the five-years period is even greater.⁶²

⁶¹ Myths and Misconceptions About Indexing (2003), p1

⁶² Myths and Misconceptions About Indexing (2003), p3

*Redemption scenario analysis: Percentage of portfolio that could be redeemed before realization of net capital gains**

Fund	Market decline			
	0%	10%	20%	30%
Vanguard® 500 Index	6%	21%	44%	100%
Vanguard Extended Market Index	57	76	97	100
Vanguard Total Stock Market Index	41	64	94	100
Vanguard Mid-Cap Index	24	60	99	100
Vanguard Small-Cap Index	26	48	77	100

*Does not include tax-loss carry forwards.

Notes: This hypothetical analysis shows the percentage of a portfolio that could be redeemed in cash before the realization of net capital gains. There are other forms of redemption such as in-kind of securities that do not trigger distributable capital gains to fund shareholders. Each scenario assumes the portfolio starts with a net realized capital gain position of 0%, which is not necessarily indicative of the portfolio's actual tax status. Capital gains and losses realized by selling proportional slices of each stock held in the portfolio are then factored into the analysis. Because the analysis assumes highest-cost lots are sold first (consistent with the manner in which Vanguard administers each portfolio's tax-lot structure), net losses are typically realized from initial sales. Loss realization from successive sales accumulates until subsequent sales realize net capital gains. This table shows the percentage of each fund that can be sold in this fashion before realized net capital gains return to 0%. This analysis is based on each fund's then-current holdings and tax-lot structure as of the reference date of the analysis and does not consider the fund's realized net capital gains or losses. Actual realization of net capital gains and losses for each fund is detailed in the funds' respective annual reports. The analysis also assumes security prices as of the reference date. Because substantial shareholder redemption activity is normally associated with poor recent performance, results from sensitivity analyses that assume security price declines of 10%, 20%, and 30% are also provided.

Table 7: Index funds can withstand significant market declines

Source: Philips, Ambrosio (2007), p18

Table 7 shows that index funds can withstand significant market declines. The percentage of the portfolio that could be redeemed increases significantly with the increase of the severity of a market decline. This study concluded the fact that redemptions in a bear market can help index funds to remain tax-efficient, creating losses, not gains, for tax purposes.⁶³

⁶³ Philips, Ambrosio (2007), p18

4.3 ETF

Mutual funds in general and index fund in particular are only priced daily at the market and all transactions take place at that price. In response to this problem, in 1993 the AMEX⁶⁴ began trading an indexed ETF, which tied to the S&P 500. Unlike traditional mutual funds, ETF could be traded continuously like a share of stock. Other foreign and domestic indices including the Morgan Stanley Capital International (MSCI), which recreates indexed positions in several global developed and emerging equity markets; Standard & Poor's 500 Depository Receipts (SPDRs), which are based on a basket of all the securities held in that index; Barclay's Global Investor (BGI) have applied this concept of ETF.⁶⁵

The goal of ETFs and index funds is essentially the same: They are designed to track the performance of market returns by holding index securities. Because the exchange traded funds are traded on the market like stocks, so the price may fluctuate throughout the day. By the March of 2007, the number of ETFs has increased to 454.⁶⁶

Table 8 shows the most active ETFs in AMEX, in which SPDR S&P 500 is the world's largest ETF valued at \$ 81 billion. From the figure below we can see, the market value of ETFs worldwide exceeds \$600 billion at the end of 2007.

⁶⁴ American Stock Exchange

⁶⁵ Reily (2006), p88

⁶⁶ Americh, Sheree, Perkins, Pruitt (2007), p6

Product	Symbol	Last Sale	Volume
SPDR S&P 500	SPY	131.51	180,751,468
Select Sector SPDR-Financial	XLF	24.65	88,600,484
UltraShort QQQ ProShares	QID	49.96	30,013,575
Select Sector SPDR-Energy	XLE	73.40	17,524,520
UltraShort S&P500 ProShares	SDS	64.48	15,887,617

Table 8: Most active ETFs⁶⁷

Source: www.amex.com

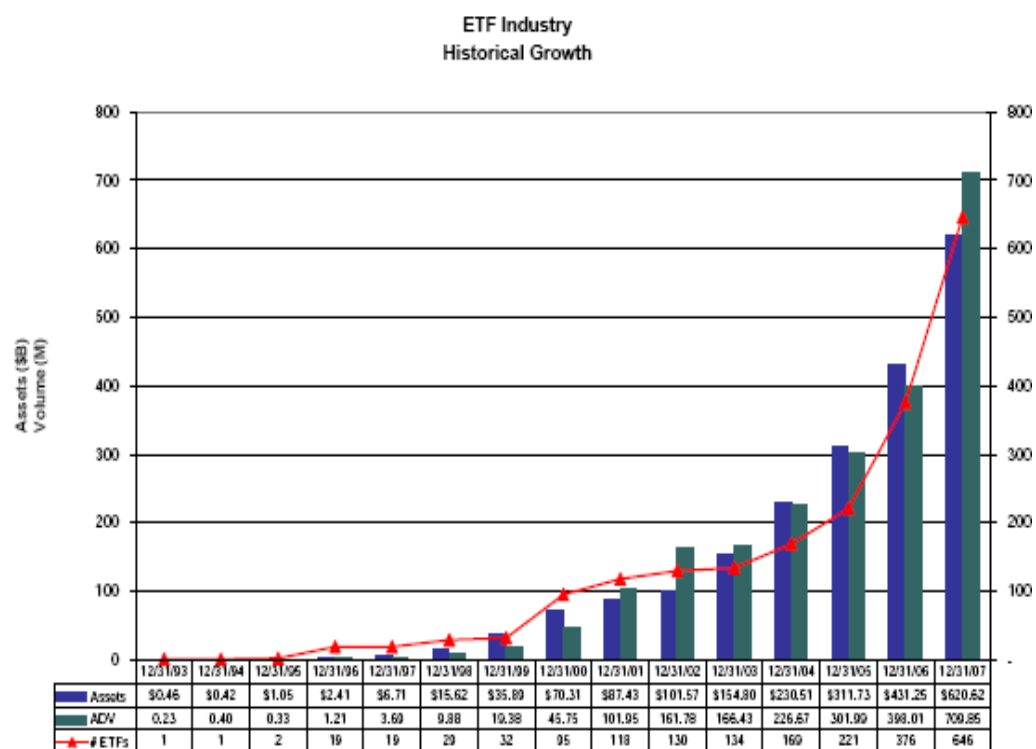


Figure 10: ETF historical growth in Amex

Source: Amex ETF Reference Guide, p10

⁶⁷ As of March 28, 2008

Since ETFs are traded on stock exchanges, they provide broad exposure to a pool of securities that represent a particular asset category.

The other advantages are: price information of ETFs is disclosed daily for investors; the purchase or sale of an ETF is less expensive than other investment products.⁶⁸

ETF Advantages:

- *Flexibility*
 - *Diversification*
 - *Transparency*
 - *Lower costs*
-

4.4 Index vs. Active Mutual Funds

"I tell investors to put a large portion of their stock investments in index funds."

- Mark Hulbert, The Pied Pipers of Wall Street

Historically over time, index funds have performed better than active funds. Of course, skilled active managers do exist. But the likelihood of outperformance by a majority of managers as the compounding of costs or taxable disadvantages seems to be small.

Before discussing particulars of index versus active mutual funds, let us think about the market as a whole, where zero-sum game works. In a particular market, for example European stock or bond market, if one investor's holding outperform the market, another investor's holding must underperform. The fact is that either in efficient markets or in inefficient markets, the dollar-weighted performance of all investors should sum to equal the market performance. It is a zero-sum game. Like gambling, the profits of all players sum to zero. Figure 11 uses a bell curve to represent the aggregation of all investor's returns, where the mean is market return. In the figure, blue curve represents the market and the vertical dashed blue curve represents the market return. Over any given period, the existence of costs such as management fees, bid-ask spreads and taxes reduce the realized returns. As a result, the curve will be shift to the left. Here, the adjustments of costs are represented in two separate moves: the gray curve represents the impact of transaction costs, and the brown curve represents

⁶⁸ AMEX information

the impact of taxes. From the figure we can see, although a small portion of after-cost performance (white region) still lies to the right of the market return, a much larger portion lies to the left of the blue dashed line. That means cost does matter to the distribution of market returns.⁶⁹

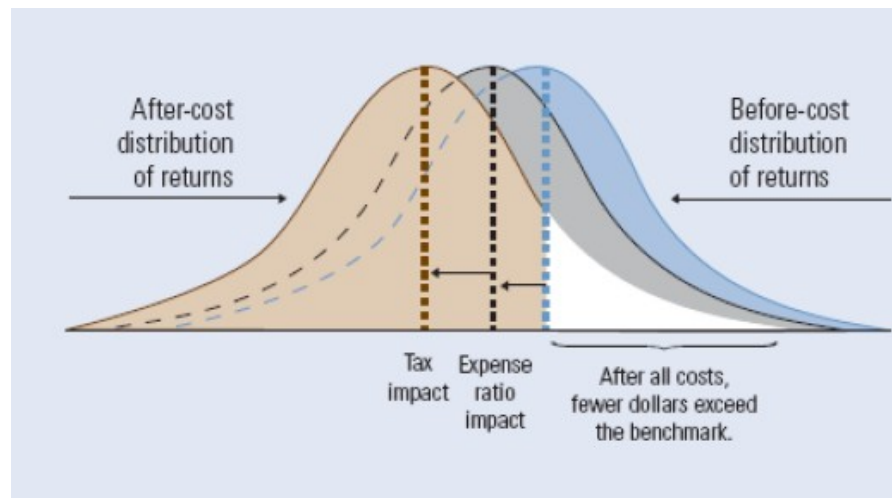


Figure 11: Impact of cost on distribution of market returns

Source: Philips, Ambrosio, p4

For long-term mutual fund performance, it is still can be shown that the long-term net returns of the active mutual fund shift to the left of the benchmark (see figure 12). The magnitude of dispersion in equity is much greater than that of fixed income securities. (see appendix 2, figure 15) From figure 11 and figure 12, we can see that as well as in long-term performance, the cost advantage of indexing has gained popularity over active mutual funds.⁷⁰

⁶⁹ Philips, Ambrosio (2007), p4

⁷⁰ Philips, Ambrosio (2007), p5

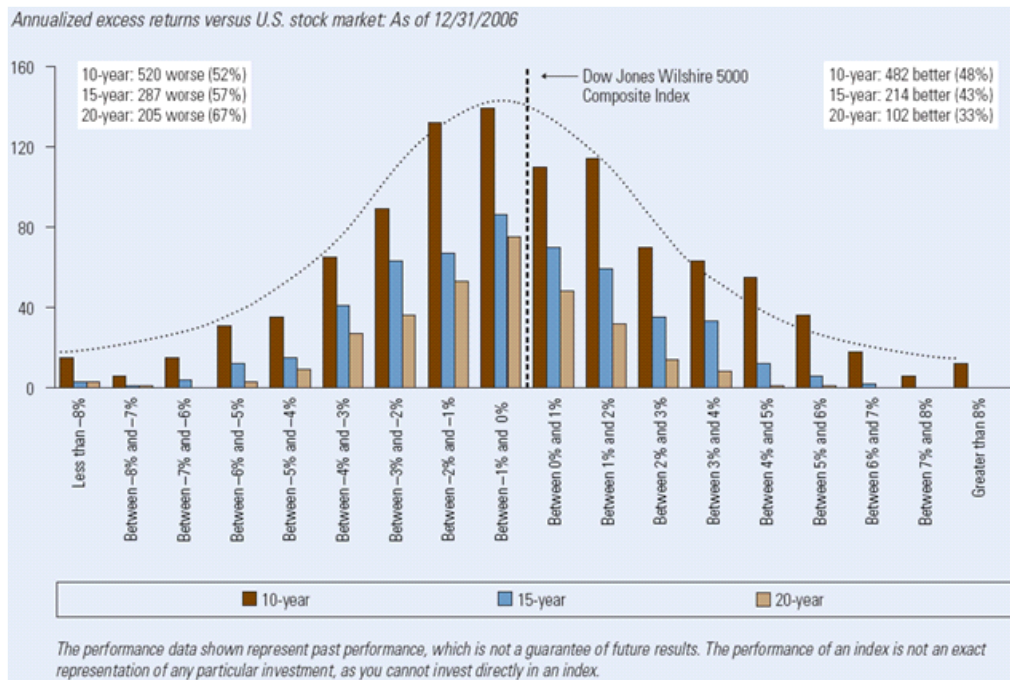


Figure 12: After-cost distribution of excess returns of U.S. active equity mutual funds

Source: Phillips, Ambrosio, p6

Active mutual funds typically have higher transaction costs. But higher costs do not correlate with higher returns. Every dollar paid for transaction costs should be a dollar less of total return. Figure 16 in appendix 2 uses expense ratio to show the inverse relationship between investments costs and returns.

Remember, a shareholder's net return equals the gross return less the expense ratio. Actively managed mutual funds typically have higher management fees, which are attributable to the higher turnover as active management attempts to outperform the market. Index funds derive low cost and lower turnover. These costs reduce total returns realized by the fund investors. The lower the cost, the greater the net return. Table 9 shows a large gap between asset-weighted expense ratios of active and index mutual funds. Generally, as of 2006, index funds operate with 60 bps lower costs annually than active funds. Since active fund's returns vary widely, costs may have light impact on funds' performance over shorter time frame (such as one, three, five, or even ten years).⁷¹

⁷¹ Phillips, Ambrosio (2007), p8

	Actively managed funds (bps)	Index funds (bps)	Difference (bps)
Large-cap U.S. equity	84	20	64
Mid-cap U.S. equity	100	30	70
Small-cap U.S. equity	112	34	78
U.S. sector funds	96	44	52
U.S. real estate funds	109	25	84
International developed markets	102	32	70
International emerging markets	134	42	92
U.S. fixed income funds	68	22	46

Note: bps, basis points.

Table 9: Asset-weighted expense ratios of active and index mutual funds (as of December 31, 2006)

Source: Philips, Ambrosio (2007), p9

Figure 13 shows the impact of costs in the short term (1- year) and the long term (10- year) by using excess returns⁷². As is shown, in short time costs are much volatile than that in 10-year frame. In a market with wide return dispersion, active managers can get benefit from the segment's outperformance. So the cost disadvantage could be diminished.⁷³

⁷² Excess returns were used to better correlate with costs, which were detracted directly from returns.

⁷³ Philips, Ambrosio (2007), p9

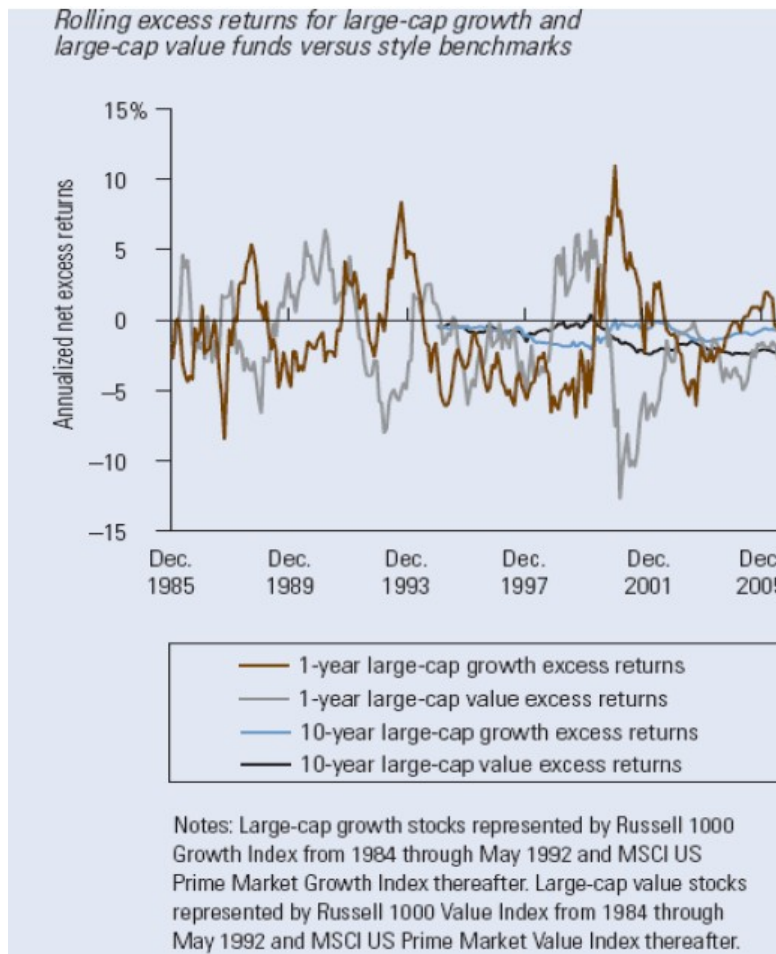


Figure 13: Manager costs matter less in short-term outperformance

Source: Phillips, Ambrosio (2007), p9

Costs matter to active funds, taxes are another. Bernstein has contributed its own research to the efficacy of active investing for taxable assets. An assumed S&P 500 index fund compounds at an annual rate of 9% was used as the benchmark. After 20 years, the returns of active managed funds after tax and associated transaction costs would trail the index fund at least by 99 bpt. The gap in returns is quite sharp.⁷⁴(see figure 14)

⁷⁴ Bernstein journal (2003), p2

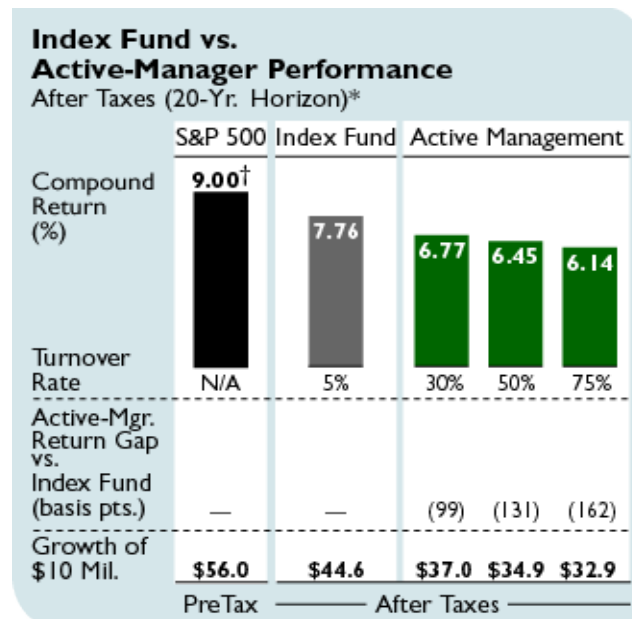


Figure 14: The case for indexing can appear compelling

Source: Bernstein journal (2003), p2

A recent article of financial planning journal finds that in general, index management outperformed active management in some asset class. The result in Mid-Cap, Small-Cap Blend and international Mid/Small-Cap Blend asset classes were mixed, with active funds outperforming index funds for most periods. (see table10 and appendix 3)⁷⁵ Similarly, some other study found out that there is some evidence of achieving positive alpha for active fund, but the probability is equivalent to a coin toss. The small-cap active fund manager possesses more luck than skill.⁷⁶

Index Management Outperforms Active Management	Active Management Outperforms Index Management
U.S. Large-Cap Blend	U.S. Mid-Cap Value
U.S. Large-Cap Value	
U.S. Large-Cap Growth	U.S. Small-Cap Blend
U.S. Mid-Cap Blend	
U.S. Mid-Cap Growth	International Mid/Small-Cap Blend
U.S. Small-Cap Value	
U.S. Small-Cap Growth	
International Large-Cap Blend	

Table 10: Index management versus active management

Source: Holmes (2007), p17

⁷⁵ Holmes (2007), p17

⁷⁶ Davis, Sheay, Tokat, Wicas (2007), p14

5 Summary: Active versus Passive Portfolio Management

"Plan sponsors, foundations, and endowments seeking to improve investment performance should view active and passive management as valuable complements rather than competing substitutes."

- Eugene Flood Jr and Narayan Ramachandran, *"Integrating active and passive management"*, Fall 2000

The aim of active portfolio management is to search for abnormal return of alpha and "beat" the market. Funds operated by skilled managers will have active efficient sets that generate the highest combination of expected active return per unit of active risk and the lowest risk per unit. Active mutual funds offer expert analysis and have potential to get higher than market returns. Of course, these are not free, skilled managers need to be paid, financial brokers need to eat. The costs of active mutual funds reduced the attractiveness for the investors, who search higher net return after costs and taxes. A large part of these costs comes from the higher turnover of actively managed funds. As maximizing information ratio need to play often for getting high breath and play well for getting higher information coefficient.

Since maximizing information ratio is to maximize alpha or minimizing stock-specific risk, portable alpha strategy was employed to separating the alpha from the beta without affecting portfolio's asset allocation.

The market forecasting skill depends on a good timing. A professional market timer should accurately adjust the portfolio risk level in anticipation of market movements. Although some practitioners are skeptical to the success of perfect timer, who is considered more lucky than skillful, market timing still works as a low-risk investment strategy.

Treynor-Black model combines active and passive portfolios by using Sharpe's measure. There should be such a positive appraisal alpha to be found like shown in the model, otherwise it would make no sense to depart from the passive strategy and market portfolio.

Historically, index funds have performed better than active, it is true. As a newcomer, passive management is in favor of most investors and theoretician. Using passive strategy is not only cheaper and tax efficient, but also simple. Passive investing is not to “beat” the market for highest return, but to track its benchmark as close as possible. Pure passively managed funds are well-diversified portfolio and stay almost unchanged for the long run, so that the low transaction costs are associated with the low turnover rates. Recently popular ETF have brought additional tax advantage to the whole index family. Passive management uses indexation to replicate the returns of the benchmark and minimize tracking error. Unlike in the case of active management that a tracking error measures an indication of benchmark risk, for passive indexation strategy, tracking error is used as an evaluation of the replicating strategy. If index fund manager wants to ensure close tracking, full replication would be suggested, though it may be not as optimal like sampling. Full replication should have no tracking error, but costly. There is a problem of tradeoff between transaction costs and the tracking errors, yet not in the case of large cap portfolio.

Rebalancing can be used by passive management to keep a consistent risk exposure annually, semiannually or contingently. While rebalancing when the risk exposure exceeds a predetermined level is more practical than calendar rebalancing.

Index funds, such as famous Vanguard 500 Index Fund has shown good tracking performance to S&P 500 in its history. Index management outperformed active management in many asset classes, even in most of the time. The new passively managed fund, exchange traded funds, which represents flexibility and more transparency, is growing larger rapidly.

Active mutual funds manager attempt to forecast the future market, discover other investor's mistakes using market timing and security selection strategies.

Summary		
	Active portfolio management	Passive portfolio management
Subject	Active mutual funds	Index funds and ETF
Objective	Achieve abnormal return	Track benchmark
Advantages	Expert analysis Potential high return react to the market condition	Low cost Low turnover Tax efficiency
Disadvantages	High cost High turnover Tax inefficiency	Replication is difficult Focus on certain sector
Strategies	Portable alpha Market timing Security selection	Buy and hold Indexation Rebalancing
Performance	Perform better in recession Perform well in Mid-Cap, Small-Cap funds	Generally outperform active funds

Table 11: Summary active vs. passive portfolio management

The black and white of active and passive portfolio management has grayed in recent years. Jack Treynor, former editor of The Financial Analysts Journal, has noted that most investors use both active and passive management strategies. The benefits of intentionally combining both active and passive strategies are considered to better control the risk-return adjustment.⁷⁷

The relationship of active management and passive management is symbiotic and they are related in some ways that are not commonly perceived. In practice, some success of passive investing is based on the research work performed by active strategies.⁷⁸ For example, passive managers not always hold all the securities of the benchmark. Passively managed portfolio may not be truly passive and actively

⁷⁷ Cohen, Zinbarg, Zeikel (1978), p600

⁷⁸ www.financialarchitectsllc.com

managed portfolio may not be fully active. Some index funds use sampling strategy, rather than fully replicate the benchmark. Some passively managed funds even charge as higher fees as those of active funds.⁷⁹ There remains much to the question of how to relate active and passive management in an efficient way.

If the ending question is that which approach wins another, I would say there is no clear answer, both approach works for its own way. Both strategies should continue to co-exist in the market. Most of the active managers can't beat the passive (index), that's true. Some active managers can, that's true too.⁸⁰ Conceptually, passive portfolio management must win, according to its low cost and tax advantages as in the first section of this thesis mentioned. Should we compare these two investment strategies after cost? Does cost really matter? For the investors the answer is yes. Despite the fact that there is little evidence that after costs active outperforms passive, most investors who hire active managers believe active funds will outperform index funds. Some portfolio constraints within active portfolio management must be mentioned. These constraints, such as no short positions, industry or sector concentrations, and other constraints, like market-cap and value/growth neutrality, limit the full transfer of information into active weights and reduce the investor's forecasting ability.⁸¹

In the end of this thesis, I want to say that there is a place for active management in the industry, in which most individuals have voted with their money for active management. Investment managers who feel that they are skilled enough to beat the indices can choose active approach. The success of active portfolio management depends on the markets failing to perform well. Since the market efficiency hypothesis is still debatable in the academic cycle and since there have been some signs in practice that psychological reasoning and irrationalities of investors behavior is taking place (e.g. small firm in January effect), active management do have chance to analyze the markets failing for performing well. From both theoretical and practical point of view, passive management works well in highly efficient market. Investors, who don't want to take potential risks, should choose passive investing.

⁷⁹ Sharpe (1991), p3

⁸⁰ Bogle (2001), p1

⁸¹ Roger, Harindra, Thorley (2001), p25

Conclusion

“...before cost, the return on the average actively managed dollar will equal the return on the average passively managed dollar and after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar.”

- William F. Sharpe, Financial
Analysis Journal

I don't want to repeat the opinion of this thesis. Again, I believe that there is a place in the industry for active portfolio management. Since both approaches have been co-existed in the industry for a long time, they would continue to keep their roles regardless of the historical performance. It is most important that funds managers work to make sure that their clients are matched with risk appropriate portfolios by qualifying and quantifying their risk capacities. Overall, both approaches have its strengths and weaknesses. Don't care about the past, look at the future. Investors who put these capabilities to good use will have an excellent chance of achieving their goals. Active and passive investing serves for different clients with different risk exposures. Both strategies could results in higher gains for investors. The development of the hybrid form of active and passive portfolio management may become more popular in the future.

Appendix 1 Rebalancing Strategies

Results of Alternative Rebalancing Strategies for 5-Year Investment Horizon						
Rebalancing Strategy	Holding Period Return	Average Number of Times Portfolio Rebalanced	Stock Weights			Average Commission Costs
			Average	Minimum	Maximum	
Buy & Hold	8.190%	0.00	44.5%	27.6%	66.2%	0.00
Annual	7.836%	5.00	41.1%	29.1%	49.8%	699.60
Semiannual	7.692%	10.00	40.6%	31.4%	47.7%	1,300.57
Quarterly	7.437%	20.00	40.4%	32.7%	44.8%	2,409.58
2.5%	7.609%	11.79	40.4%	32.7%	45.3%	1,566.87
5.0%	7.758%	6.79	40.6%	31.4%	46.0%	976.33
7.5%	7.840%	4.44	40.9%	31.2%	46.0%	669.44
10.0%	7.905%	3.08	41.1%	29.6%	47.5%	484.37
12.5%	7.898%	2.08	41.3%	28.7%	48.7%	335.99
15.0%	7.942%	1.57	41.5%	28.4%	49.8%	260.77

Table 12: Results of alternative rebalancing strategies for 5-year investment horizon

Source: Stine, Lewis (1992), p83

Results of Alternative Rebalancing Strategies for 10-Year Investment Horizon						
Rebalancing Strategy	Holding Period Return	Average Number of Times Portfolio Rebalanced	Stock Weights			Average Commission Costs
			Average	Minimum	Maximum	
Buy & Hold	7.840%	0.00	48.8%	27.6%	81.0%	0.00
Annual	7.197%	10.00	41.0%	29.1%	49.8%	1,436.45
Semiannual	7.073%	20.00	40.6%	31.4%	47.7%	2,664.04
Quarterly	6.840%	40.00	40.4%	32.7%	44.8%	4,934.16
2.5%	6.995%	23.52	40.4%	32.7%	45.3%	3,212.78
5.0%	7.127%	13.85	40.5%	31.4%	46.0%	2,040.80
7.5%	7.210%	9.39	40.8%	31.2%	46.0%	1,449.84
10.0%	7.258%	6.33	41.1%	29.6%	47.5%	1,018.51
12.5%	7.241%	4.30	41.4%	28.7%	48.7%	707.33
15.0%	7.300%	3.28	41.6%	28.4%	49.8%	560.96

Table 13: Results of alternative rebalancing strategies for 10-year investment horizon

Source: Stine, Lewis (1992), p83

Results of Alternative Rebalancing Strategies for 15-Year Investment Horizon						
Rebalancing Strategy	Holding Period Return	Average Number of Times Portfolio Rebalanced	Stock Weights			Average Commission Costs
			Average	Minimum	Maximum	
Buy & Hold	7.538%	0.00	52.2%	27.6%	85.3%	0.00
Annual	6.786%	15.00	40.9%	29.1%	49.8%	2,200.67
Semiannual	6.689%	30.00	40.5%	31.4%	47.7%	4,087.87
Quarterly	6.473%	60.00	40.4%	32.7%	44.8%	7,559.79
2.5%	6.616%	34.99	40.4%	32.7%	45.3%	4,900.54
5.0%	6.741%	21.13	40.5%	31.4%	46.0%	3,183.44
7.5%	6.826%	14.32	40.8%	31.2%	46.0%	2,263.99
10.0%	6.856%	9.62	41.1%	29.6%	47.3%	1,580.98
12.5%	6.831%	6.34	41.4%	28.7%	47.9%	1,063.25
15.0%	6.895%	5.00	41.5%	28.4%	48.9%	878.71

Table 14: Results of alternative rebalancing strategies for 15-year investment horizon

Source: Stine, Lewis (1992), p83

Results of Alternative Rebalancing Strategies for 20-Year Investment Horizon						
Rebalancing Strategy	Holding Period Return	Average Number of Times Portfolio Rebalanced	Stock Weights			Average Commission Costs
			Average	Minimum	Maximum	
Buy & Hold	7.389%	0.00	56.4%	28.2%	89.0%	0.00
Annual	6.555%	20.00	40.9%	29.1%	49.8%	2,997.17
Semiannual	6.468%	40.00	40.5%	31.4%	47.7%	5,570.49
Quarterly	6.268%	80.00	40.3%	32.7%	44.8%	10,282.38
2.5%	6.400%	46.18	40.4%	32.7%	45.3%	6,599.35
5.0%	6.523%	28.10	40.5%	32.7%	46.0%	4,327.60
7.5%	6.608%	19.13	40.8%	31.2%	46.0%	3,095.12
10.0%	6.629%	12.65	41.2%	31.0%	47.3%	2,135.94
12.5%	6.598%	8.25	41.5%	29.7%	47.7%	1,417.60
15.0%	6.661%	6.67	41.6%	29.0%	48.9%	1,207.47

Table 15: Results of alternative rebalancing strategies for 20-year investment horizon

Source: Stine, Lewis (1992), p84

Appendix 2 Index vs. Active Mutual Funds

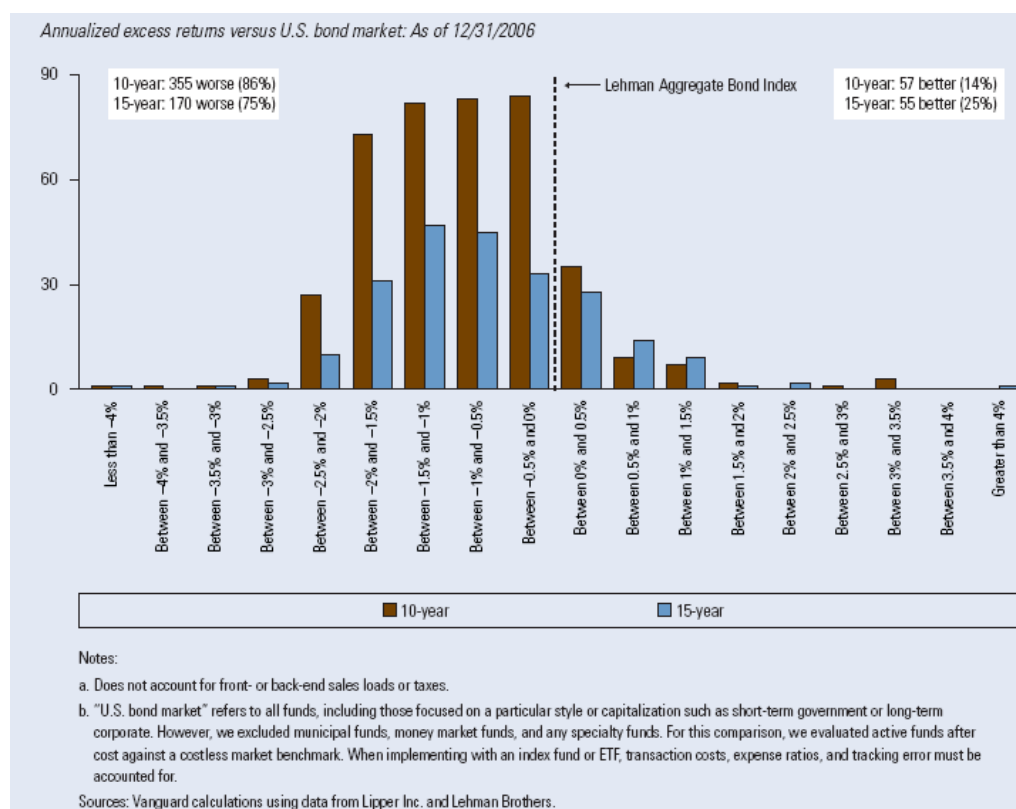


Figure 15: After-cost distribution of excess returns of U.S. fixed income mutual funds

Source: Philips, Ambrosio (2007), p7

	Large-cap funds		Mid-cap funds		Small-cap funds	
	Median expense ratio	Median return	Median expense ratio	Median return	Median expense ratio	Median return
Quartiles, sorted by expense ratio						
Quartile 1	0.75%	8.16%	0.90%	10.80%	0.96%	11.15%
Quartile 2	1.02	7.04	1.18	10.25	1.22	11.17
Quartile 3	1.33	6.69	1.48	8.86	1.47	10.54
Quartile 4	1.92	6.09	2.07	7.85	2.12	8.52
	Large-cap funds		Mid-cap funds		Small-cap funds	
	Russell 1000 Index	MSCI US Prime Market 750 Index	Russell Midcap Index	MSCI US Mid Cap 450 Index	Russell 2000 Index	MSCI US Small Cap 1750 Index
Benchmark total return	8.64%	8.57%	12.14%	12.14%	9.44%	11.88%

Notes: All returns are ten-year annualized. Data as of December 31, 2006.

MSCI started calculating and maintaining these equity indexes on December 2, 2002, with a base level of 1,000 as of November 29, 2002. The initial construction of these indexes used the market capitalization of November 25, 2002, and no buffer rules were applied to the size or style indexes. Although the indexes were not available until December 2, 2002, MSCI calculated daily price and total return index levels for all U.S. equity indexes from May 31, 1992, to November 29, 2002. The methodology used for the historical calculation shares most of the features of the ongoing methodology. The main difference is the use of full-market-capitalization weights for the historical indexes, as opposed to the free-float-adjusted market-capitalization weights for the ongoing indexes.

Sources: Vanguard calculations using data from Lipper Inc., Russell, and MSCI.

Figure 16: Higher costs correlate with lower returns: Lipper-category quartile rankings by expense ratio

Source: Philips, Ambrosio (2007), p8

Appendix 3 Index Management vs. Active Management

Pre-Tax Performance Comparison											
As of December 2004											
U.S. LARGE-CAP											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Large-Cap Blend Index	36.7%	22.6%	32.7%	28.0%	20.3%	-9.1%	-12.1%	-22.2%	27.6%	10.2%	11.6%
Large-Cap Blend Active	32.3%	21.3%	27.6%	22.5%	21.4%	-4.8%	-12.6%	-22.6%	25.8%	9.5%	10.4%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Large-Cap Value Index	37.0%	21.5%	30.9%	15.0%	18.2%	8.1%	-6.7%	-17.9%	28.4%	13.2%	13.5%
Large-Cap Value Active	33.2%	20.8%	28.1%	12.8%	4.9%	8.0%	-4.6%	-18.7%	27.7%	13.3%	11.5%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Large-Cap Growth Index	38.1%	23.7%	28.1%	28.1%	28.0%	-22.7%	-21.4%	-28.7%	32.9%	6.3%	8.2%
Large-Cap Growth Active	32.6%	19.4%	27.6%	32.4%	35.8%	-28.2%	-23.9%	-27.8%	28.1%	6.6%	6.9%
U.S. MID-CAP											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Mid-Cap Blend Index	30.0%	18.6%	31.5%	18.3%	17.4%	15.4%	-2.1%	-16.4%	38.7%	18.1%	15.9%
Mid-Cap Blend Active	32.0%	21.3%	27.8%	9.4%	23.1%	11.2%	0.3%	-16.6%	34.5%	16.0%	14.9%
Mid-Cap Blend Survivor Bias Minimized	29.2%	18.2%	22.0%	8.9%	38.7%	9.8%	-6.2%	-18.6%	36.6%	15.4%	13.9%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	6 Year
Mid-Cap Value Index	--	--	--	--	5.2%	11.0%	3.5%	-18.6%	37.8%	20.8%	8.6%
Mid-Cap Value Active	--	--	--	--	6.5%	26.2%	5.4%	-12.2%	37.3%	19.1%	12.6%
Mid-Cap Value Survivor Bias Minimized	--	--	--	--	7.7%	14.3%	7.0%	-13.5%	38.5%	19.1%	11.1%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	4 Year
Mid-Cap Growth Index	--	--	--	--	--	--	-8.2%	-23.0%	33.0%	13.9%	1.7%
Mid-Cap Growth Active	--	--	--	--	--	--	-20.1%	-28.4%	36.4%	12.8%	-3.1%
Mid-Cap Growth Survivor Bias Minimized	--	--	--	--	--	--	-21.7%	-28.6%	35.6%	12.3%	-3.9%
U.S. SMALL-CAP											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Small-Cap Blend Index	29.2%	17.7%	23.4%	-3.3%	15.0%	5.7%	4.3%	-17.2%	43.2%	19.9%	12.6%
Small-Cap Blend Active	27.2%	21.7%	26.2%	-4.4%	15.9%	15.4%	11.7%	-15.8%	40.6%	18.6%	14.6%
Sm-Cap Blend Survivor Bias Minimized	31.2%	19.5%	26.9%	-1.4%	26.3%	6.0%	6.4%	-18.5%	44.1%	18.5%	14.5%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	10 Year
Small-Cap Value Index	29.1%	22.2%	30.8%	-7.2%	9.1%	16.0%	16.3%	-13.0%	42.9%	21.8%	15.6%
Small-Cap Value Active	24.5%	22.0%	29.5%	-5.2%	6.3%	15.7%	14.6%	-9.5%	45.6%	20.0%	15.3%
Sm-Cap Value Survivor Bias Minimized	23.1%	22.5%	29.2%	-7.5%	5.4%	17.8%	16.2%	-11.4%	42.0%	21.0%	14.8%
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	6 Year
Small-Cap Growth Index	--	--	--	--	19.8%	1.6%	-3.2%	-19.4%	42.0%	17.6%	8.0%
Small-Cap Growth Active	--	--	--	--	69.4%	-6.5%	-10.8%	-30.5%	44.2%	10.2%	7.7%
Sm-Cap Growth Survivor Bias Minimized	--	--	--	--	57.7%	-7.8%	-11.5%	-29.6%	44.4%	10.7%	6.4%

Table 16: Results of Study on Index Management Versus Active Management

Source: Holmes (2007), p18

Performance Comparison—Return After Tax on Distribution and Sale				
As of December 2004				
U.S. LARGE-CAP				
	1 Year	3 Years	5 Years	10 Years
Large-Cap Blend Index	6.06%	2.11%	-2.50%	9.79%
Large-Cap Blend Active	4.94%	1.33%	-2.15%	7.84%
	1 Year	3 Years	5 Years	10 Years
Large-Cap Value Index	8.25%	4.47%	1.24%	9.68%
Large-Cap Value Active	7.46%	4.03%	2.73%	8.54%
	1 Year	3 Years	5 Years	10 Years
Large-Cap Growth Index	3.42%	-0.08%	-6.95%	7.02%
Large-Cap Growth Active	3.01%	-1.10%	-6.94%	4.22%
U.S. MID-CAP				
	1 Year	3 Years	5 Years	10 Years
Mid-Cap Blend Index	11.80%	9.21%	3.48%	11.12%
Mid-Cap Blend Active	9.69%	7.22%	4.55%	10.27%
	1 Year	3 Years	5 Years	10 Years
Mid-Cap Value Index	13.86%	8.50%	4.85%	---
Mid-Cap Value Active	11.85%	9.41%	10.37%	---
	1 Year	3 Years	5 Years	10 Years
Mid-Cap Growth Index	8.21%	4.38%	---	---
Mid-Cap Growth Active	7.04%	2.06%	---	---
U.S. SMALL-CAP				
	1 Year	3 Years	5 Years	10 Years
Small-Cap Blend Index	12.88%	10.54%	7.12%	9.13%
Small-Cap Blend Active	12.08%	9.52%	7.97%	10.59%
	1 Year	3 Years	5 Years	10 Years
Small-Cap Value Index	14.18%	12.98%	13.79%	15.20%
Small-Cap Value Active	13.10%	12.82%	12.36%	10.72%
	1 Year	3 Years	5 Years	10 Years
Small-Cap Growth Index	11.88%	8.10%	5.99%	---
Small-Cap Growth Active	5.63%	2.07%	-2.62%	---
INTERNATIONAL				
	1 Year	3 Years	5 Years	10 Years
Intl Large-Cap Blend Index	11.81%	8.41%	-2.40%	5.13%
Intl Large-Cap Blend Active	9.76%	7.10%	-3.22%	4.60%
	1 Year	3 Years	5 Years	10 Years
Intl Mid/Small-Cap Blend Index	20.56%	24.30%	10.20%	---
Intl Mid/Small-Cap Blend Active*	15.95%	17.38%	4.26%	---
*After-Tax returns in Intl Mid/Small-Cap Blend do not include 1999, which would have changed the results of this analysis. Data Source: Morningstar Sample Estimate Error with 95% Confidence in Appendix Index Mgmt outperforms Active Mgmt Active Mgmt outperforms Index Mgmt				

Table 17: Results of Study on Index Management Versus Active Management
Source: Holmes (2007), p19

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