

Core and Satellite Portfolio Structure: *Investment and Tax Considerations*

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There are three primary sources of investment risk and return: interest rate risk, equity market risk, and active risk. Interest rate risk and equity market risk are associated with the variable returns to bond and stock markets. Active risk includes the pursuit of additional returns from active portfolio management. This covers a wide range of activities including market timing, security selection, and tactical asset allocation. Litterman [2003] discussed the role of active risk in overall portfolio construction.

The *Traditional* approach to portfolio structure involves hiring active portfolio managers to implement allocations to stock or bond markets. Active management is bundled with market exposure (beta). The *Core and Satellite* approach involves separating active management from ownership of an asset class. Exhibit 1 describes a continuum of strategies, moving from pure market exposure to pure active risk.

Traditional investors tend to gain exposure to the equity market with the use of diversified active equity strategies. These are managers who tend to remain fully invested in the market at all times and maintain modest tracking error relative to their benchmark. In other words, they combine a lot of beta with a small amount of active risk.

There are various implementations of Core and Satellite logic. Core and Satellite investors combine index funds with some combination of the four strategies on the right side of the continuum. The index funds can be

simple index funds or they can be portfolios enhanced with tax management to improve after-tax return.

This is the first of two articles that focus on the Core and Satellite concept. This article will examine the investment and tax considerations relevant to the choice of portfolio structure. The second article will explore issues that arise in the implementation of the Core and Satellite concept.

This article's key recommendation is to encourage investors to consider active risk as a key element of portfolio organization. Investors should explicitly consider how much to allocate to active risk and how to construct a portfolio of active risk strategies. Some findings are:

- An appropriately weighted combination of index funds and market neutral hedge funds may yield risk and return characteristics similar to an actively managed equity portfolio.
- Hedge fund managers have a broader opportunity set and fewer constraints than long-only equity portfolio managers. It is reasonable to assume that they can generate a higher gross return per unit of active risk. This must be balanced against the illiquidity and lack of transparency of hedge funds.
- Tax considerations cut both ways but, on balance, favor the Core and Satellite strategy. In particular, an investor who expects to dispose of significant assets

EXHIBIT 1

Combinations of Beta and Active Risk

100% Market Risk, No Active Risk			100% Active Risk, No Market Risk		
Index Fund	Diversified Active Equity	Concentrated Active Equity	Private Equity	Market Directional Hedge Fund	Market Neutral Hedge Fund

through charitable giving or death can enhance expected net transfers. The separation may also allow investors to better use the tax advantages of entities such as retirement accounts, insurance policies, and some estate planning entities.

A combination of index funds and market-neutral hedge funds achieves complete separation of active risk from market exposure. Growth in hedge fund assets alongside growth in assets of index funds suggests many investors are adopting this strategy. Viewed in isolation, the growth of hedge fund assets implies a huge increase in allocation to active risk strategies. However, there is a parallel trend towards increased indexing of equity assets. *Institutional Investor* recently reported that, for the first time ever, index and enhanced-index managers have topped their list of the largest money managers. When the growth in equity indexing is considered alongside the growth in hedge funds, it is not clear how large is the net increased allocation to active risk. What does seem clear is that there is growing acceptance of the Core and Satellite concept. This means that a larger share of the dollars allocated to active risk may be used to pursue opportunities throughout global financial markets rather than focusing primarily on large-cap equity markets.

SEPARATING ACTIVE RISK FROM MARKET RISK

Consider an equity portfolio that is managed relative to the S&P 500. We will assume the portfolio has an estimated tracking error to the benchmark of 5%. This would be a fairly typical actively-managed diversified large-cap portfolio. We distinguish between absolute and relative risk. Absolute risk is the uncertainty in the return of the portfolio. In this case, most of the absolute risk comes from beta, the exposure to the stock market. Relative risk is the uncertainty of the return of the portfolio

relative to the return of the benchmark. In this case, relative risk is another name for active risk. We use tracking error as the measure of active risk. If this were an equity index portfolio, there would be no relative risk and the tracking error would be zero. The estimated tracking error of an actively managed equity portfolio refers to the distribution of expected portfolio returns relative to the bench-

mark's return. Tracking error is the standard deviation of this distribution. In a market-neutral hedge fund, tracking error is more commonly called volatility and represents the dispersion of expected portfolio returns relative to the risk-free rate. In each case, it is a measure of the amount of active risk created by the portfolio manager. The portfolio's total return is the combination of the market's return plus relative return. Relative return is the return to active management.

Relative risk from active management is derived from the overweights and underweights of the portfolio relative to the composition of the S&P 500. The relative return of this portfolio will be driven by these weightings, which represent the impact of active portfolio management. Imagine that we combined this portfolio with a short position on an S&P 500 index future. This eliminates the underlying exposure to the stock market, and leaves only the impact of active management, i.e., relative risk and relative return. We have created a market-neutral portfolio. The combined portfolio will only have equity market exposure if the active manager had a beta different from one. The pricing of index futures reflects the spot price of the index plus the risk-free rate. Thus, the expected gross return of the combined position is approximately the risk-free rate plus the return to active management. The expected volatility of the return is 5%, which comes from the estimated tracking error of the actively managed portfolio.

In the example above, we have isolated active management and created something that looks like a market-neutral hedge fund. Next, in order to regain our exposure to the equity market, we will borrow money to purchase an equity index fund. If the cost of borrowing is offset by the risk-free rate embedded in the futures pricing, the expected return of this combined portfolio is identical to the expected return of the original actively managed equity portfolio. The expected return is the return of the market plus the return to active management. Exhibit 2 demon-

EXHIBIT 2 Decomposition of Risk in an Active Equity Portfolio

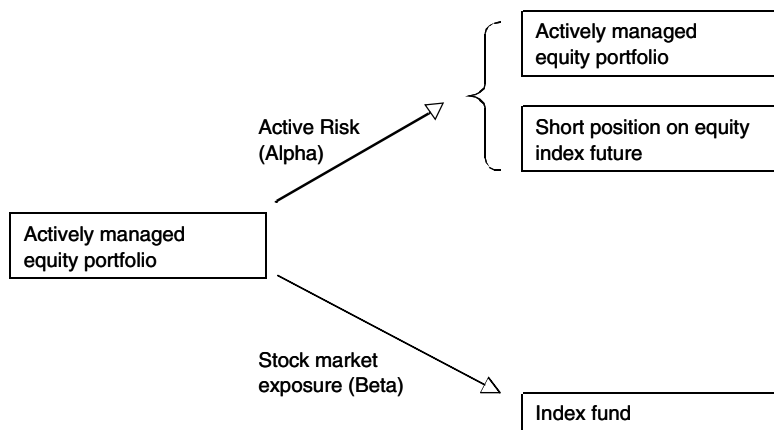
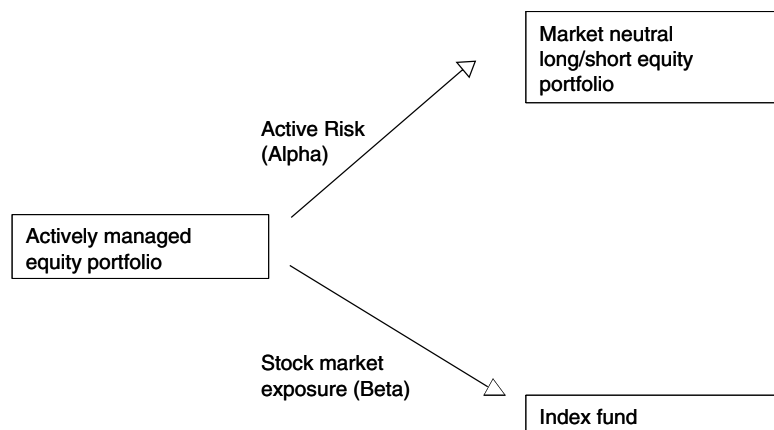


EXHIBIT 3 Separation of Active Risk from Beta



strates this synthetic position.

This exercise demonstrated that the conventional actively managed equity portfolio could be viewed as a combination of an index fund and a market-neutral hedge fund. Owning both an index fund and a short position on an index future will serve only to generate transaction costs. Now let us consider a more practical approach.

The portfolio manager for the original equity portfolio was given two assignments. First, create diversified

exposure to the equity market. Second, enhance the return through active management. In most cases, the portfolio manager will be “long-only” constrained. He or she may own stocks, but may not short stocks. This means that negative views can be expressed only by being underweight a stock. Further, since the manager will be measured relative to the S&P 500, it is likely the manager will feel constrained to maintain some exposure to all industries and sectors. Let’s lighten the manager’s load by eliminating the first requirement. We will only ask the manager to run a market-neutral portfolio that consists of both long and short positions, in roughly equal amounts. This eliminates the need for the short position on the equity index future, and yields the arrangement shown in Exhibit 3.

The left side of Exhibit 3 is the Traditional approach. Exposure to active management is intertwined with exposure to the stock market. The right side is the Core and Satellite approach. Active management is found in a market-neutral hedge fund while equity market exposure comes from an index fund.

The Core and Satellite strategy requires the investor to own two separate portfolios. The return to the market-neutral fund is approximately short-term LIBOR plus the return to active management. The Core and Satellite investor can pay for the hedge fund either by reducing holdings of cash or borrowing at short-term rates. This is illustrated later in Exhibits 11 and 12.

Conclusion #1. *Investors allocate among three primary sources of risk: equity, interest rate, and active. Active risk is portable and an investor can build a diversified portfolio of active risk strategies much like investors build diversified portfolios of stocks or bonds. There is a range of investment strategies that mix exposure to asset class with exposure to active risk in varying proportions. These are the building blocks for the construction of an overall portfolio.*

INVESTMENT CONSIDERATIONS

The expected returns to active management come only from the ability of a portfolio manager to find inefficiencies in the market or to anticipate market trends.

EXHIBIT 4

Distribution of S&P 500 by Index Weight

Number of stocks greater than 1.00% weight	15
Number of stocks between 0.50% and 1.00%	27
Number of stocks between 0.25% and 0.50%	39
Number of stocks between 0.10% and 0.25%	130
Number of stocks less than 0.10%	289
	<hr/>
	500
Average weight	0.20%
Median weight	0.09%

Source: Goldman, Sachs & Co. Data as of Sept. 24, 2003.

Successful active management requires that a portfolio manager has valuable insights *and* has the ability to implement those insights.

Traditional equity managers are constrained by the need to accomplish two things at once. While trying to add value through stock selection, they must also remain invested in the equity market. The hedge fund manager is less constrained and:

1. may short securities.
2. can pursue opportunities throughout the full range of global financial markets.
3. does not need to track a benchmark.
4. may employ leverage.

As a result, the hedge fund manager has greater flexibility to pursue active returns.

Benefits of Greater Flexibility

Short Selling

Traditional equity managers generally operate with a long-only constraint while most hedge fund managers opt for the right to both purchase and sell short. Finn, Fuller, and Kling [1999] reviewed the impact of a long-only constraint in the equity market. Their analysis suggested that the opportunities to add value by shorting stocks were more than twice as lucrative as opportunities on the long side. They theorized that because most equity managers operate with a long-only constraint, they tend to bid up the price of stocks that appear attractive on common valuation metrics, quickly eliminating opportunities. Long-only managers generally do not spend time looking for overvalued stocks. The long-only constraint limits the return a portfolio manager can derive from identifying overvalued stocks.

Kahn [2002] demonstrated that the long-only constraint prevents managers from fully implementing some of their views. The impact of the long-only constraint becomes greater as the target tracking error increases, i.e., as the portfolio manager takes more active risk. Long-only portfolio managers can implement negative views only by underweighting a stock relative to its benchmark weight. However, large-cap benchmarks consist of a small number of very large capitalization stocks plus a large number of stocks that have only a small weight in the benchmark. As of September, 2003, there were only 15 stocks in the S&P 500 with a benchmark weight greater than 1.00%. Microsoft (MSFT) was the largest with a 3.29% weight. The median weight was only 0.09%. Exhibit 4 provides information on the S&P 500. For strategies with small amounts of active risk such as enhanced index portfolios, most negative views can be fully implemented merely by underweighting the desired stock. However, the long-only constraint becomes more binding as target tracking error increases. For example, if a portfolio manager has a negative view on MSFT and builds a capitalization-weighted portfolio of 499 stocks, excluding only MSFT, the portfolio will have an estimated tracking error of about 0.97% to the S&P 500 benchmark. This portfolio should have meaningful excess return if MSFT underperforms the market. Now, assume the manager has a similarly negative view on Lucent (LU) a volatile stock with the median weight of 0.09% in the benchmark. Building a portfolio, as described above, with a zero weight in LU will have only 0.09% estimated tracking error. Without going short, a portfolio manager can only be 0.09% underweight in LU. Even if the manager correctly anticipated poor performance in LU, it will have minimal impact on the portfolio's return. For all but a few stocks in the benchmark universe, a Traditional equity portfolio manager can derive little benefit from negative views. With a long-only constraint, there is simply no way to meaningfully express the view.

Kahn suggested a situation where a portfolio manager's views on the stocks within the relevant universe were normally distributed. There were a few stocks for which the portfolio manager had extremely positive or negative views and a few more for which the manager had moderately positive or negative views. The manager had fairly neutral views on most stocks. Exhibit 5 illustrates this distribution of views and contains a vertical line. Views to the left of this line generally cannot be fully implemented in a long-only portfolio. The position of the line moves towards the right as the amount of active

EXHIBIT 5

Distribution of Portfolio Manager's Stock Views

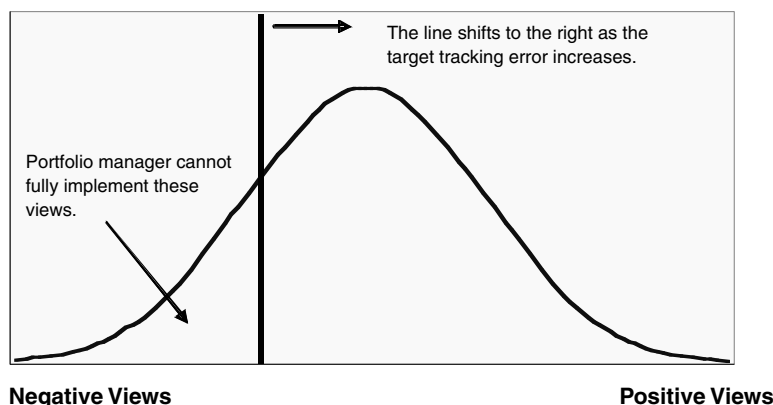


EXHIBIT 6

Hedge Fund Industry

Category	Total Assets
Equity Market Neutral	27,982
Convertible Arbitrage	30,511
Event Driven	59,583
Multi-Strategy / Other	32,185
Global Macro	35,610
Long/Short Equity	140,375
Fixed Income Arbitrage	32,652
Managed Futures	17,513
Emerging Markets	11,325
Dedicated Short Bias	1,401

Total assets in \$ millions, 2nd Quarter, 2003.
Source: TASS Asset Flows Report.

risk increases, meaning that a larger portion of the manager's views cannot be fully implemented because of the long-only constraint. Alford, Jones, and Winkelmann [2002] had similar observations. Their research supported Kahn's view by demonstrating that, among successful long-only equity portfolio managers, the value added per unit of relative risk declines as the realized relative risk increases. This is consistent with a long-only constraint becoming more binding at higher levels of tracking error.

Opportunity Set

Global markets in stocks, bonds, currencies, and derivatives present a broad opportunity set for active management. A manager of a long-only U.S. equity portfolio has access to only a small part of this opportunity set. Many people believe the market for U.S. large-cap stocks is the world's most efficient market.

Hedge fund managers seek market inefficiencies. Incentive fee arrangements provide rich rewards for success. If we assume that hedge fund managers are free to design guidelines in a way that maximizes their chances for success, then it should be instructive to see what strategies they pursue and in what markets they choose to operate. Exhibit 6 lists a typical classification of hedge funds. The universe of hedge funds covers the range of asset classes and also includes funds devoted to particular strategies such as convertible arbitrage. The diversity of this list should not be surprising. Hedge fund managers seek to operate in less efficient markets. An investor who is making an explicit allocation to active management would want the portfolio manager to go to where the

opportunities are greatest. But, when active management is employed as a secondary consideration within a long-only mandate, the portfolio manager is constrained to operate only in the relevant market segment.

An investor who uses the Core and Satellite approach may be able to build a more diversified portfolio of active risk strategies. This can be accomplished by investing in several different hedge funds that pursue different investment strategies, or by utilizing a "fund of funds" that offers professional management of a diversified set of hedge funds.

Benchmark

Clarke, de Silva, and Thorley [2002] investigated how portfolio constraints reduce the expected return from active portfolio management. They created a set of views that replicated the insights of an equity portfolio manager. They identified the optimal portfolio that best expressed these views. The portfolio was optimal in that it derived the most expected return for a given level of relative risk. Next, they introduced a series of portfolio constraints that are commonly imposed on Traditional equity portfolio managers. These included the long-only constraint, a market cap neutral constraint that required the weighted average market cap of the portfolio to be equal to the benchmark, a similar constraint regarding sector weights, and a turnover constraint. With the addition of each constraint, they rebuilt the optimal portfolio, and then compared it to the unconstrained optimal portfolio. It was clear that the constraints meaningfully altered the composition of the portfolio and reduced the expected excess return. They noted that the long-only constraint was the most

costly, with the largest reduction in expected return.

Leverage

For any portfolio manager with a set of views, there is some portfolio that optimally implements those views. Optimal is defined as the best excess return to risk ratio (Sharpe ratio). The optimal portfolio often is a low-risk portfolio. Increasing portfolio risk will reduce the Sharpe ratio. But what if the optimal portfolio does not generate sufficient risk to meet the investor's return objectives? In order to increase risk, a market-neutral hedge fund manager can 1) use leverage to buy more of the optimal portfolio, or 2) move to a less optimal but riskier portfolio. If leverage were costless, the ideal solution would be to leverage the optimal portfolio enough to reach the desired risk level. Leverage is not costless, of course, and so a hedge fund manager would likely do some of each, weighing the costs of borrowing against the deterioration of expected portfolio return in order to identify the combination that had the best expected net return for the target level or risk. A long-only portfolio manager usually cannot borrow and so does not have this flexibility. The long-only manager will try to obtain the highest expected return for the target risk level, but must accept whatever is the decline in expected Sharpe ratio versus the optimal portfolio's Sharpe ratio.

Disadvantages of Hedge Funds

It is clear that the hedge fund manager has greater flexibility than the equity portfolio manager. This flexibility may allow the hedge fund manager to create more return per unit of active risk. What benefits might an investor derive from imposing these constraints on a portfolio manager? Benefits might include control, transparency, liquidity, and risk management.

Control

The opportunity set and benchmark constraints keep the equity portfolio manager focused on the task for which the investor hired the manager. An investor would be very surprised, and likely disappointed, to learn that their equity portfolio manager was speculating on gold. The requirement that the portfolio manager must buy only benchmark stocks and diversify across industries and sectors means that the investor will achieve the primary goal, which is ownership of a broadly diversified equity port-

folio. We earlier described a continuum of combinations of active risk and market exposure. The index fund provides the highest degree of control. Next would be diversified active equity followed by concentrated active equity. This progression is marked by giving the active portfolio manager greater freedom to deviate from the benchmark. At the other end of the spectrum is the hedge fund manager. Hedge fund managers generally have wide latitude in choosing where and how to invest. Clients have little control over the manager's day-to-day investing activity.

Transparency

Hedge funds are often organized as limited partnerships. Reporting on investment results and portfolio holdings is infrequent and often involves a considerable time lag. Investors have little real-time information regarding portfolio holdings or transactions. In comparison, equity portfolios are able to report results more frequently. Many investors have online access to their portfolios and so they can see exactly what the portfolio manager is doing and what their portfolio is worth.

Liquidity

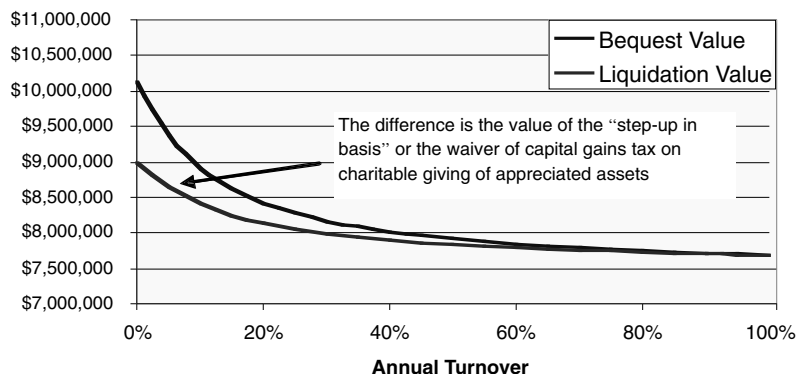
Hedge funds usually require investors to remain in the fund for a minimum period of time, such as one year. Thereafter, opportunities to withdraw funds are limited. Quarterly liquidity with 30 days advance notice is a common requirement. Even then, a small portion of the withdrawal proceeds may be withheld pending final determination of the fund's net asset value. These liquidity restrictions are much more severe than what is typical of an actively managed equity portfolio. Mutual funds offer daily liquidity and separately managed accounts can often be liquidated with a few days notice.

Risk Management

We demonstrated that an actively managed equity portfolio could be replicated with a combination of a market-neutral hedge fund and an index fund. Total active risk would be the same if the expected volatility of the hedge fund was equal to the estimated tracking error of the actively managed portfolio. Hedge funds may have greater potential downside because some of their strategies have unlimited losses. Shorting stock is one example where the potential loss is unlimited. The use of leverage can also magnify losses and can wipe out capital in extreme

EXHIBIT 7

Compound Value Versus Annual Portfolio Turnover



\$1 million initial value; 25 year holding period; 10% annual return which consists of 8% appreciation and 2% dividend. Realized gains and dividends subject to 15% tax.

situations. Finally, hedge fund risk estimates are often based on unstable correlation assumptions. Adverse market movements combined with correlation surprises can lead to negative returns much greater than implied by the original risk estimates.

Conclusion #2. *Market-neutral hedge funds may be the least constrained form of active management and thus may offer the highest expected return per unit of risk. However, hedge funds are illiquid, less transparent, and may have more potential for negative surprises. An investor should probably demand some return premium when comparing hedge funds to active risk embedded in traditional long-only active management.*

TAX CONSIDERATIONS

We will look at four ways in which tax considerations impact the comparison between the Traditional and the Core and Satellite approaches.

1. The portfolio turnover in the Traditional approach accelerates the taxation of equity market returns. This taxation could be deferred and even avoided with index strategies.
2. The Core and Satellite approach allows for the use of systematic tax-loss harvesting strategies on the equity portfolio. These strategies can meaningfully increase the after-tax return from equity market exposure.
3. The Core and Satellite approach consists of tax-inefficient hedge funds and tax-efficient index strategies. Traditional equity strategies are somewhere in between, generally producing more long-term than

short-term realized gains.

4. The Core and Satellite strategy allows greater flexibility in asset location strategies, in which tax-inefficient investment strategies are placed in tax-advantaged retirement or estate planning entities. This can enhance the net transfer of wealth to heirs and charities.

Taxation of Beta

Compounding returns contributes to the long-term growth of wealth. A brief anecdote will highlight this fact. Legend has it that the Dutch paid the Native Americans \$24 for Manhattan Island in 1626. Had they invested this sum at 6% interest, the current value would

be \$83 billion, sufficient to buy back much of the island including its buildings. Now, suppose that the money had been invested to earn 8%. The Native Americans would today have \$95 trillion and could buy much of the United States. The difference between 6% and 8% might be thought of as the difference between pre- and after-tax returns. Deferring and minimizing taxes contributes to the growth of wealth by allowing returns to compound closer to a pre-tax basis.

While most of us do not operate with a 377-year time horizon, the impact of tax deferral is still very impressive over more realistic time frames, such as 25 years. Exhibit 7 demonstrates this effect. In constructing this chart, we varied the annual portfolio turnover and assumed that it was applied to the stocks with the average amount of appreciation within the portfolio. At the end of the 25-year period, the portfolios will have unrealized gains. The *Liquidation* value assumes the portfolio will be sold and the appreciation subject to capital gains tax. The *Bequest* value assumes the portfolio will be disposed of through death or gifting, both of which generally eliminate capital gains taxation. The data is consistent with the findings of Jeffrey and Arnott [1993]:

- Portfolio turnover that accelerates the realization of taxable gains reduces the accumulation of wealth.
- The relationship to turnover is not linear; 80% of the tax damage is inflicted by the first 20% of turnover.

Since few active portfolio managers have turnover less than 20%, active management almost always has mean-

EXHIBIT 8

Example of Tax-Loss Harvesting

	Loss Harvesting Portfolio	SPDR
Initial value	10,000,000.00	10,000,000.00
Ending pre-tax market value	9,535,169.00	9,481,010.00
Ending cost basis	7,838,052.00	10,197,466.00
Dividends earned	221,413.00	197,466.00
Realized short-term losses	-2,257,588.00	0.00
Realized long-term losses	-125,773.00	0.00
Taxes due		
Tax on dividends (15%)	-33,211.95	-29,619.90
Tax savings from short-term losses*	790,155.80	0.00
Tax savings from long-term losses	18,865.95	0.00
Contingent tax liability		
Tax on unrealized gains (15%)	324,292.20	-29,619.90
Ending after-tax value		
Bequest mode	10,310,978.80	9,451,390.10
Liquidation mode	9,986,686.60	9,481,010.00
Pre-tax return	-4.65%	-5.19%
After-tax return		
Bequest mode	3.11%	-5.49%
Liquidation mode	-0.13%	-5.19%

* Assumes investor has short-term gains from other sources, such as hedge funds. June 1999 through March 2001. For illustrative purposes only.
Source: Goldman, Sachs & Co.

ingful adverse tax consequences relative to an index strategy. This chart may understate the adverse tax consequences of active management because it assumes that all gains are long-term. Managers with high turnover probably generate significant short-term gains as well. Subjecting some of the gains to 35% tax rather than 15% tax would further reduce the long-term accumulation of wealth.

Many wealthy investors consume only a portion of their wealth. Their financial goals are often focused on the expected transfer of wealth to heirs and charities. The step-up in basis eliminates capital gains taxes on the assets of a deceased person. Appreciated assets given to charity are not subject to capital gains tax. The government's waiver of capital gains tax in these two instances is a valuable option that can enhance long-term wealth transfer. Active equity portfolio management generally squanders this option by regularly realizing gains. This is demonstrated by the convergence of the two lines in Exhibit 7. The surplus of the Bequest value over the Liquidation value is the value of the tax option. Turnover in excess of 25% reduces the option's value to almost zero.

Jeffrey and Arnott observed the unavoidable tax con-

sequences of active management within an equity portfolio. In order to generate an after-tax return greater than the after-tax return of an index strategy, an equity portfolio manager must generate enough excess pre-tax return to more than offset the adverse tax consequences. They called this the "tax hurdle" of active management. Jeffrey and Arnott estimated that the tax hurdle for most active managers is between 1.50% and 2.50% per year. The tax hurdle is largely a function of market return because it is due to the taxation of appreciation. If there is no market appreciation, there is little or no tax hurdle. Jeffrey and Arnott's calculations assumed 6% annual market appreciation. An active equity portfolio manager must beat the market by more than the tax hurdle on a pre-tax basis in order to produce an after-tax return superior to indexing. Even then, the investor's net benefit is only the excess return above the tax hurdle. In a follow-up study, Arnott, Berkin, and Ye [2000] examined empirical evidence to demonstrate the impact of the tax hurdle. They observed that fewer managers are able to beat the market on an after-tax basis than on a pre-tax basis.

Their data covered all equity-oriented mutual funds with more than \$100 million over a 20-year period ending in 1998. Twenty-two percent of the funds beat the Vanguard 500 index fund on a pre-tax basis, but only 14% on an after-tax basis.

Portfolio returns of equity strategies consist of the market return of equities plus or minus the returns to active management. In most situations, the majority of the return has come from the market, not the active management. For example, if the market is up 10% and the actively managed portfolio is up 11%, then 91% of the return comes from the market. Entangling the two activities means that both sources of return are subject to taxation. This eliminates the opportunity for long-term pre-tax compounding of equity market appreciation. The tax hurdle is the direct result of the intertwining of market exposure with active management. The Core and Satellite strategy avoids the tax hurdle. An index fund would allow the investor to enjoy pre-tax compounding on most equity market appreciation. The returns from active management will come from a hedge fund and will be subject to tax, but only if the hedge fund manager generates

positive returns. This last point is subtle but important. In a Traditional equity strategy, the investor will regularly pay capital gains taxes on market appreciation regardless of whether the portfolio manager actually adds any value. It is the portfolio manager's turnover that creates the tax liability.

Tax-Loss Harvesting

Investors are generally free to decide when, and if, to sell stocks that they own. Further, they have the flexibility to designate which lots of their stock holdings are relieved when part of a position is sold. Tax-loss harvesting strategies involve systematically selling stocks that have declined in value in order to recognize a tax loss, while continuing to hold those that have appreciated. If realized losses can be netted against realized gains from other sources, the investor can defer and possibly avoid some capital gains tax liability. In the Core and Satellite strategy, a tax-loss harvesting strategy applied to the indexed equity portfolios could generate short- and long-term realized losses that could be netted against gains from hedge funds. Exhibit 8 gives an example of the results of an actual tax-loss harvesting strategy, managed for 18 months, and compares the results to passive ownership of an exchange-traded fund. The pre-tax return of the loss-harvesting portfolio was about the same as that of the index. The modest excess pre-tax return was random. But the substantial improvement in after-tax return was due to accelerating the recognition of short- and long-term losses while allowing gains to compound pre-tax.

The value of a tax-loss harvesting strategy is best appreciated in the context of long-term transfer of wealth. If the investor eventually disposes of the equity portfolio through charitable giving, the unrealized appreciation will not be subject to capital gains tax. Likewise, if the portfolio is held until death, the step-up in basis eliminates the capital gains tax liability. In these two cases, tax-loss harvesting did more than just defer tax; it reduced total tax liability over time. It allows the investor to take greater advantage of the tax code's waiver of capital gains tax in these two situations. This increases the wealth that can be transferred to heirs or charities.

Most investors have some source of capital gains tax liability. Sale of low-basis stock, private equity funds, and hedge funds all generate realized gains. Thus, most investors can benefit from tax-loss harvesting. A tax-loss harvesting strategy has two elements, a willingness to sell stocks that have declined in price, and a willingness to indefinitely

hold stocks that have appreciated. This is incompatible with Traditional active management where portfolios are turned over on a regular basis. Active portfolio managers are often unwilling to sell a stock in order to realize a loss because they feel the stock is even more attractively valued than when they first purchased it. The inability to properly implement a tax-loss harvesting program is an addition to the "tax hurdle" concept discussed earlier. The tax hurdle comes from the fact that active managers sell stocks that would be held indefinitely in an index portfolio. Arnott and Jeffrey calculated the cost of the tax hurdle by comparing active management to passive. The true cost of the tax hurdle is even greater because active management is generally incompatible with a tax-loss harvesting strategy.

Return Character

The impact of taxes on investment returns varies greatly depending upon the character of the return. Ordinary income and short-term realized gains are currently taxed at a maximum federal ordinary rate of 35%. Long-term realized gains and most dividends are taxed at maximum federal long-term rates of 15%. Unrealized gains can compound on a pre-tax basis. If these gains are eventually subject to long-term tax rates, the effective rate is less than 15% and declines with the length of deferral. For example, if 8% return is compounded on a pre-tax basis for 25 years, and all unrealized gains are then subject to 15% tax, the annualized after-tax return is 7.41%. This is 92.6% of the pre-tax return, implying an effective tax rate of only 7.4%. Unrealized gains can avoid capital gains taxation if they are disposed of through charitable giving or the step-up in basis at death.

Most hedge funds produce much of their return in the form of income or short-term gains and thus are inherently tax-inefficient. Active equity portfolio management can produce a large portion of the return in the form of realized long-term gains. For example, 40% turnover implies an average holding period of 2.5 years. The tax efficiency of equity portfolio managers can vary a great deal based on style, capitalization, investment process, and market conditions. The expected mix between short-term and long-term gains can vary a great deal from one manager to the next based on the manager's sensitivity to tax issues. An equity manager *who is sensitive to taxes* should be able to produce much of the total return in the form of realized long-term gains or dividends.

Equity index strategies tend to be very tax efficient. Large-cap and broad market index funds distribute divi-

dends and small amounts of long-term realized gains. Most price appreciation is allowed to compound on a pre-tax basis. Small-cap index funds are less tax efficient because there is high turnover in the underlying benchmark. Passive index strategies in separate account form allow for the application of tax-loss harvesting, which further improves after-tax results.

The Traditional strategy will produce returns that, for the most part, will be subject to ongoing taxation at long-term tax rates. The Core and Satellite strategy separates active management from ownership of equities. The returns to active management are potentially subject to higher ordinary tax rates while the returns to ownership of equities can compound on a pre-tax basis. Which approach enjoys the advantage? The answer depends on several factors:

1. The expected returns to active risk and equity risk.
2. Plans for the eventual disposal of the equity portfolio, i.e., will capital gains taxes be deferred or avoided?
3. Is the investor in a position to use retirement accounts, insurance vehicles, or trust entities to avoid, defer, or mitigate taxation?

Asset Location

The Core and Satellite strategy can provide greater flexibility to implement additional tax strategies. Asset location strategies focus on positioning tax-inefficient strategies within tax-advantaged entities such as retirement accounts, grantor trusts, and foundations. Most investors can benefit from asset location strategies. For example, any investor who has part of his or her financial assets in a retirement account must first decide on an overall asset allocation mix, and then decide which investments will be held within the retirement account and which will be held within the directly-taxed personal account. Wealthy individuals and families often have complex estate structures that are designed to enhance the transfer of after-tax wealth to heirs and charities. There are many types of entities, such as retirement accounts, charitable remainder trusts, charitable lead trusts, grantor trusts, foundation, etc. Each has unique income and transfer tax characteristics. Asset location strategies seek to position investments among the various entities in order to maximize the expected net transfer to heirs and charities for a given level of risk. Federal income tax rates are currently as high as 35%. Estate tax rates are fluctuating but have recently been as high as 55%.* Successful asset

location strategies can meaningfully enhance wealth transfer by reducing exposure to these taxes. The Core and Satellite approach separates tax-inefficient trading activities from tax-efficient equity index strategies. This separation allows for more effective asset location strategies. Tax-inefficient strategies can be positioned within entities that defer, avoid, or somehow mitigate tax liability. Equity index strategies can be positioned within entities and with generations that are more likely to benefit from the step-up in basis or the waiver of capital gains tax on appreciated assets given to charity. Mulvihill [2003] demonstrated that asset location strategies can meaningfully increase the expected net transfer of wealth to heirs and charities.

Conclusion #3. *Each approach has tax issues. The tax code penalizes the Traditional approach because turnover accelerates the taxation of equity market returns. It diminishes the potential to pass appreciated assets through charitable giving or the step-up in basis. This can meaningfully reduce the after-tax benefit of active management. In order to add any value on an after-tax basis, the Traditional portfolio manager must add significant value on a pre-tax basis. The Core and Satellite strategy avoids this tax hurdle by allowing market returns to compound on a pre-tax basis. It also allows for further enhancement of after-tax return through tax-loss harvesting strategies in the core portfolio. However, the returns to active management in the Core and Satellite strategy are often more heavily taxed. A large portion of most hedge fund returns are subject to ordinary tax rates. In some cases, this can be mitigated through asset location strategies.*

EXAMPLE

We will now create an example to illustrate these points. We will begin with assumptions regarding market returns, volatilities, and correlations. These are found in Exhibits 9 and 10.

EXHIBIT 9 Expected Returns and Volatilities

Asset Class	Expected Return	Volatility
Large Cap Growth	7.0%	21.0%
Large Cap Value	7.0%	16.0%
Small Cap	7.0%	21.0%
Intermediate Municipal Bonds	3.0%	3.5%
Money Market Fund	2.0%	1.0%

EXHIBIT 10

Assumed Correlations

	Large Cap Growth	Large Cap Value	Small Cap	Intermediate Municipal Bonds	Money Market Fund
Large Cap Growth	1.00				
Large Cap Value	0.76	1.00			
Small Cap	0.78	0.71	1.00		
Intermediate Municipal Bonds	-0.07	-0.04	-0.04	1.00	
Money Market Fund	0.06	0.03	-0.03	0.27	1.00

Step 1: Gross Pre-Tax Returns

Exhibit 11 describes a portfolio organized using the Traditional approach. Active management is employed as part of the equity strategy, with specialist managers employed for separate allocations to large-cap growth, large-cap value, and small-cap. We have weighted these roughly in line with market capitalization. We will assume the two large-cap managers have 5% tracking errors to their respective benchmarks, while the small-cap manager has 8% tracking error. We will assume each has an information ratio of 0.33, and that the returns to active man-

agement of the three managers are uncorrelated. We define information ratio (IR) as the return to active risk divided by the tracking error of active risk. For the Traditional equity managers, it will be (portfolio return – benchmark return) / tracking error. For hedge fund managers, it will be (portfolio return – risk-free rate) / volatility. Three-month LIBOR is a good estimate of the risk-free rate.

Exhibit 12 describes a Core and Satellite approach. The three equity portfolios have been replaced with a single broad market index fund. Its return and volatility matches the weighted combination of the three equity benchmarks. We have created a multi-strategy hedge fund that employs three managers, each with an IR of 0.33. The returns of the three managers are uncorrelated. The weightings and risk of the managers are identical to those of the three active managers in the Traditional approach. We used 4× leverage to increase the riskiness of the hedge fund. We assumed the cost of borrowing is equal to the return on money markets. Thus, the expected return of this hedge fund is the money market rate plus

EXHIBIT 11

Traditional Portfolio Structure

	Weight	Asset Class		Active Management			Total	
		Expected Return	Volatility	Alpha	Tracking Error	Information Ratio	Expected Return	Volatility
Large Cap Growth	20.0%	7.0%	21.0%	2.0%	6.0%	0.33	9.0%	21.8%
Large Cap Value	20.0%	7.0%	16.0%	2.0%	6.0%	0.33	9.0%	17.1%
Small Cap	10.0%	7.0%	21.0%	3.0%	8.0%	0.38	10.0%	22.5%
Intermediate Municipal Bonds	30.0%	3.0%	3.5%				3.0%	3.5%
Money Market Fund	20.0%	2.0%	1.0%				2.0%	1.0%
	100.0%							
Total portfolio risk								8.9%
Total portfolio return								5.9%

EXHIBIT 12

Core and Satellite Portfolio Structure

	Weight	Asset Class		Active Management			Total	
		Expected Return	Volatility	Alpha	Tracking Error	Information Ratio	Expected Return	Volatility
Broad Market Index Fund	50.0%	7.0%	17.4%				7.0%	17.4%
Intermediate Municipal Bonds	30.0%	3.0%	3.5%				3.0%	3.5%
Money Market Fund	7.5%	2.0%	1.0%				2.0%	1.0%
Multi Strategy Hedge Fund	12.5%	2.0%	1.0%	8.8%	15.0%	0.59	10.8%	15.0%
	100.0%							
Total portfolio risk								8.9%
Total portfolio return								5.9%

EXHIBIT 13

Fees

	Weight	Base Fee	Incentive Fee	Total Fee
Traditional				
Large Cap Growth	20.0%	1.10%		1.10%
Large Cap Value	20.0%	1.10%		1.10%
Small Cap	10.0%	1.23%		1.23%
Municipal Bonds	30.0%	0.64%		0.64%
Money Market Fund	20.0%	0.50%		0.50%
	100.0%	0.86%		0.86%
Core and Satellite				
Broad Market Index	50.0%	0.15%		0.15%
Municipal Bonds	30.0%	0.64%		0.64%
Money Market Fund	7.5%	0.50%		0.50%
Hedge Fund	12.5%	1.50%	1.86%	3.36%
	100.0%	0.49%		0.72%

*Note: The hedge fund incentive fee is 20% of the expected return net of the base management fee.
Source for fees: Investment Company Institute.*

the return to active management.

Given our assumptions, it is not surprising that the overall portfolios have identical expected return and risk. As described in Exhibit 3, all we have done is isolated active management, separated it from exposure to the equity market, and concentrated it in a hedge fund. In choosing between these approaches, an investor might consider two questions:

1. Is it reasonable to assume the long-only equity managers can achieve the same IR as the hedge fund managers? To say yes is to assert that the various constraints placed on the traditional equity manager have no costs.
2. Can the hedge fund managers generate enough additional active return, relative to the long-only equity managers, to justify the reduction of liquidity, control, and transparency?

Step 2: Fees

Index funds have very low fees while hedge funds have high fees. Active equity management generally falls somewhere in between. Hedge fund fees include incentive fees that, while steep, are only imposed when the manager has added value. The premium that active equity managers charge above index fees is usually fixed and thus due regardless of whether the active manager's return exceeds the benchmark. What are the total overall fees of the two approaches, and how does that vary with man-

ager's success? Exhibit 13 provides an estimate of the total fees that might typically be charged. Fees for actively managed portfolios are based on the average of all mutual funds in the given asset class, as reported by the Investment Company Institute. Total fees under the two scenarios are similar. The fees in the hedge fund are quite high, but the investor is getting a lot of active management. The fee is more than offset by the savings from using an index fund for equity exposure. In other words, the price paid for active management in the two scenarios is about equal with a slight advantage to the Core and Satellite strategy. One benefit of the hedge fund fee arrangement is that the high fees are due only if the manager creates value. If active management produces no added value, the total Traditional fee remains at 0.85% while the Core and Satellite fee declines to 0.49%.

Conclusion #4. *Hedge fund fees seem high but the cost per unit of active risk may be comparable to fees paid for active management embedded in long-only equity portfolios. Total fees paid in the Core and Satellite strategy may be comparable to total fees paid in the Traditional strategy and will decline when active management returns are poor.*

Step 3: Taxes

The impact of taxes varies a great deal based on client-specific factors. Taxes are a significant drag on investment returns and so the difficulty of modeling taxes should not lead investors to overlook tax considerations. We modeled the simple situation in which all of the investor's assets are in a personal account subject to immediate taxation. The full set of assumptions is described in the appendix. They basically follow the expected returns, correlations, and fees described in the preceding sections with a 25-year horizon. Exhibit 14 shows the results. The gross pre-tax returns are equal because the two portfolios have equal asset class allocations, equal allocations to active risk, and equal IRs on the active strategies. Fees are also similar and in line with the estimates in Exhibit 13. After-tax results are different. The Core and Satellite structure enjoys a meaningful tax advantage. The benefits of deferring taxation on equity market returns are greater than the costs of having a larger portion of the returns to active risk characterized as short-term. The tax benefits of indexing overwhelm the tax inefficiency of the hedge funds.

The low turnover of index funds gradually creates a meaningful unrealized gain in the portfolio. This creates a contingent tax liability. Investors who transfer their assets to heirs or charities can avoid this tax. We describe

EXHIBIT 14

Pre- and After-Tax Returns

	Traditional	Core and Satellite	Difference
Gross pre-tax return	5.49%	5.49%	0.00%
After-tax return: Bequest	3.82%	4.39%	-0.58%
After-tax return: Liquidation	3.79%	4.27%	-0.48%
Average annual fees	0.85%	0.72%	0.13%
Average annual taxes	0.87%	0.40%	0.47%

Note: Annual taxes based on Bequest mode analysis.

these as “Bequest” investors and ignore the contingent tax liability at the end of the simulation. We refer to those who expect to liquidate the portfolio as “Liquidation” investors. Indexing defers taxation and allows for the compounding of pre-tax returns. The disadvantage of the Traditional approach is directly related to market returns. If we assume zero equity market appreciation, the disadvantage would largely disappear.

Assuming positive equity market appreciation, Traditional equity managers will have to have a higher gross return to active management in order to produce a similar net after-tax return. We can estimate the required additional return. In Bequest mode, the after-tax return gap is 0.58%. Using a blend of 75% long-term and 25% short-term, the effective tax rate on appreciation in the Traditional equity portfolio is 20%. Equities make up one-half of the total portfolio. Thus, the break-even additional return is

$$(0.58\% / (1-20\%)) / 0.5 = 1.44\%$$

The Traditional equity managers would have to earn an additional 1.44% pre-tax return in order to match the net after-tax return of the Core and Satellite structure. We can convert the 1.44% additional return into an IR. Our original assumption was an IR of 0.33. To achieve the required additional return, the Traditional long-only active managers would have to produce an IR of 0.56 while the hedge fund managers produced only 0.33. Given the greater constraints placed upon the long-only managers, it is difficult to justify an expectation of a higher IR.

This simple model understates the tax advantages of Core and Satellite structure for two reasons. First, we assumed a passive index fund as the core equity holding. Applying tax loss harvesting to the index portfolio would enhance after-tax returns. This is particularly relevant to investors focused on future transfers to heirs and charities. Second, we assumed that all returns were subject to

immediate taxation. Most investors have a tax-deferring retirement account. Wealthy investors may have tax-advantaged trusts or insurance policies as part of their estate planning. The isolation and concentration of active management in hedge funds may allow for more effective asset location strategies that can defer or reduce taxation of active risk strategies.

Conclusion #5. *Traditional active managers will have to earn a higher pre-tax information ratio in order to match the net after-tax return of the Core and Satellite strategy. The required additional return varies based on equity market appreciation as well as client-specific tax considerations. It is difficult to reconcile the expectations of a higher information ratio with the impact of investment constraints placed upon the long-only Traditional manager.*

CONCLUSIONS

We began by demonstrating that actively managed long-only portfolios could be decomposed into market exposure and active risk. We then examined the investment and tax issues that arise when comparing a Core and Satellite portfolio structure to a Traditional long-only equity portfolio structure. We developed an example to illustrate some of these issues. Finally, we looked at how tax considerations relevant to the level of active risk that might be combined with market risk in a long-only equity portfolio. There were five conclusions noted throughout the article.

1. Investors allocate among three primary sources of risk: equity, interest rate, and active. Active risk is portable and an investor can build a diversified portfolio of active risk strategies much like investors build diversified portfolios of stocks or bonds. There is a range of investment strategies that mix exposure to asset class with exposure to active risk in varying proportions. These are the building blocks for the construction of an overall portfolio.
2. Market-neutral hedge funds may be the least constrained form of active management and thus may offer the highest expected return per unit of risk. However, hedge funds are illiquid, less transparent, and may have more potential for negative surprises. An investor should probably demand some return premium when comparing hedge funds to active risk embedded in traditional long-only active management.
3. Each approach has tax issues. The tax code penal-

izes the Traditional approach because turnover accelerates the taxation of equity market returns. It diminishes the potential to pass appreciated assets through charitable giving or the step-up in basis. This can meaningfully reduce the after-tax benefit of active management. In order to add any value on an after-tax basis, the Traditional portfolio manager must add significant value on a pre-tax basis. The Core and Satellite strategy avoids this tax hurdle by allowing market returns to compound on a pre-tax basis. It also allows for further enhancement of after-tax return through tax-loss harvesting strategies in the core portfolio. However, the returns to active management in the Core and Satellite strategy are often more heavily taxed. A large portion of most hedge fund returns are subject to ordinary tax rates. In some cases, this can be mitigated through asset location strategies.

4. Hedge fund fees seem high but the cost per unit of active risk may be comparable to fees paid for active management embedded in long-only equity portfolios. Total fees paid in the Core and Satellite strategy may be comparable to total fees paid in the Traditional strategy and will decline when active returns are poor.
5. Traditional active managers will have to earn a higher pre-tax information ratio in order to match the net after-tax return of the Core and Satellite strategy. The required additional return varies based on equity market appreciation as well as client-specific tax considerations. It is difficult to reconcile the expectations of a higher information ratio with the impact of investment constraints placed upon the long-only Traditional manager.

Investors should explicitly consider how much to allocate to active risk, and how to construct a portfolio of active risk strategies. Investors usually have exposure to active risk. Many investors gain this exposure through ownership of one or more actively managed equity portfolios that offer exposure to equity market risk plus some amount of active risk. An alternative strategy, which we call Core and Satellite, involves separating ownership of equities from active risk. Tax-efficient equity index funds joined with market-neutral hedge funds achieve complete separation of active risk from beta. A less rigorous implementation could involve a tax-efficient core portfolio plus some combination of concentrated active equity strategies, private equity strategies, and market-direc-

tional hedge funds. A taxable investor should evaluate each of these alternatives in terms of their impact on expected overall portfolio risk and return. Building a diversified portfolio of active risk strategies could involve various combinations of these strategies.

We believe investors are likely to build better portfolios if they first distinguish exposure to active risk from exposure to equity markets. The investor should then consider the range of opportunities to pursue returns from active management and evaluate each in terms of expected impact on overall portfolio after-tax risk and return.

We will explore issues related to implementation of the Core and Satellite concept in a subsequent article.

APPENDIX

Modeling Assumptions

Taxes and incentive fees vary with absolute and relative returns. Taxes tend to be risk reducing because the government demands a higher tax payment on successful investments. We used Monte Carlo analysis to investigate the net impact of taxes and fees on the two portfolio structures.

Assumptions

- 25-year investment horizon.
- Expected gross returns, volatilities, and correlations as described in Exhibits 9 and 10.
- Active management in each structure earns a gross pre-tax information ratio of 0.33.
- Dividend yields are 1% for large-cap growth and small-cap, 2.5% for large-cap value, and 1.6% for the broad market index fund.
- Equity turnover is applied to the average appreciation in the portfolio.
- Index fund turnover is 5% per year, all taxable at long-term rates.
- Active equity turnover is 40% per year, with 75% of gains taxable at long-term rates, 25% at ordinary rates.
- Hedge fund turnover exceeds 100%. All returns are taxed in the year earned, with 75% subject to ordinary rates, 25% at long-term rates.
- Tax rates are the current federal maximum of 35% ordinary and 15% long-term. We ignored the impact of state and local taxes, although including them would reinforce our findings.
- Fees and taxes are paid at end of the year. Fees for each asset class are as described in Exhibit 13.
- Reinvestment of dividends and income.
- Annual rebalancing in order to maintain target allocation.

ENDNOTES

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*The maximum estate tax rate for 2004 was 48%. This is currently scheduled to decline in steps to 45% in 2009, go to zero in 2010, and then revert back to 55% in 2011. Most observers expect Congress will alter this peculiar arrangement some time prior to 2010.

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