## Parametric Portfolio Associates

### Research Brief

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# Overlay Portfolio Management in a Multi-Manager Account

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New portfolio structures are changing the rules of the investment game. Multi-Manager Separate Accounts combine the separate skills of a number of managers in a single account, providing benefits to the investor, the plan sponsor and the manager. An effective multi-manager account requires what the investment industry is beginning to refer to as **Overlay Portfolio Management.** We describe the role of the overlay portfolio manager and simulate the value he may add through tax management. We show that an overlay manager is often able to add .30% to .60% or more each year in net after-tax return. The value we identify creates a compelling proposition for the separate account product industry, especially since significant additional non-quantified benefits also accrue.

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## 1. Introduction

New portfolio structures are changing the rules of the investment game. Multi-Manager Accounts (MMA's[1]) combine the unique skills of multiple managers in a single account to provide benefits to the investor, the advisor/sponsor and the manager.

Effective MMAs are focusing on what the investment industry is beginning to refer to as Overlay Portfolio Management. While MMA's can be operated without an overlay manager – for example through administrative software that processes trades from different sources within a single account – an overlay manager can improve performance and expenses. Essentially, the overlay manager customizes portfolio decisions to each investor. He coordinates tax-lot management, for example, by identifying the most appropriate tax lot for selling, and by policing wash sales. He may step away lightly and briefly from the managers' selections to realize tax losses. He coordinates account re-balancing when there are contributions and withdrawals or when managers are replaced. He coordinates security restrictions and social constraints. Frequently, he is able to reduce trading and custodial costs.

In this paper we describe the role of an overlay portfolio manager and attempt to quantify aspects of the value he may add. We focus on the value added by tax management. If a multi-manager separate account structure is implemented poorly, taxes can consume more than the before-tax excess return (alpha[2]) that the managers add; but, if implemented well, it is possible to coordinate taxable events. And, it is often possible to do this without significantly compromising the active managers' alpha. The value added by a tax overlay depends on the nature of the active sub-managers, their overlap, their concentration, and the manner in which the overlay is implemented. **Our research shows that an overlay manager is often able to add 0.30% to .60% or more in after-tax return each year for a ten-year period.**

The value we identify creates a compelling proposition for the MMA product industry since additional non-quantified benefits also accrue. Value may be added when rebalancing the portfolio, by coordinating client-directed contributions and withdrawals, by reducing trading and custody costs, and whenever earlier decisions change (e.g., when securities are transitioned into or out of the portfolio, managers are replaced, or the asset allocation shifts) by reducing implementation and tax costs.

It is not our intent to discuss here detailed issues related to sponsor implementation, portfolio management, or trading. Many of these are not trivial. We focus only on portfolios comprised of US equities; many of the ideas can be generalized to include global equities and fixed income. We also do not discuss reporting, a complex subject because of the need to attribute before- and after-tax performance to the market return, to the active managers, and to the overlay manager. While there are no industry standards for this reporting, the issues are quite solvable and we have developed a system for doing so.

## 2. Multi-Manager Accounts (MMA's)

Driven by the availability of technology for "mass customization," some financial industry participants are anticipating increasing popularity of separately managed accounts (see Cerulli [2002]). Separate accounts allow the smaller investor to gain access to "institutional-quality" portfolio managers as well as customization and tax-management.

There are issues associated with uncoordinated multi-managers, and Brunel [2002] discusses them in depth. Despite these issues, over the past few years the implementation of separately managed accounts has evolved from single or multiple uncoordinated separate accounts to single accounts containing multiple managers or styles (MMA's). Keefe [2002] discusses the evolution of MMA's from a single investment firm providing

[1] The term Multi-Manager Account (MMA) is by no means widely accepted. Others have used terms such as: a Multiple Style Portfolio (MSP), a Multi-Disciplinary Portfolio (MDP), or a similar "account," MSA or MDA. They are all fundamentally similar notions.

[2] We use the terms "alpha" and "excess return" interchangeably in this paper.

multiple styles in a single account (first and second generation MMA's[3]); to multiple independent specialists providing models to a sponsor organization that customizes and coordinates a single account (third generation). For us, an MMA is a separate account in which individual managers are combined into a unified account. Compared to investing in multiple separate accounts, MMA's have distinct efficiencies and benefits.

If implemented well, an MMA should have the following features:

- A structural design that expresses a clearly motivated investment philosophy and risk control
- Specialist manager lineup, organized with little duplication of effort
- Flexible manager diversification and re-allocation
- Unified reporting
- Disciplined rebalancing
- Mandate customization
- Tax customization
- Low trading and custodial costs

With his assets in a single MMA portfolio, the investor has the benefit of relative simplicity, convenience and a unified view of his portfolio. He seeks to obtain excellent managers, a diversified portfolio and excess after-tax performance. The sponsor is able to furnish this at lower custodial and trading cost, with lower portfolio minimums; he is able to simplify the re-balancing and allocation of assets to managers or investment styles. The sponsor adds value through his strategic design, through the discipline he imposes and through manager selection.

However, implementation slippage and inefficiencies creep into the management of multiple separate accounts or MMA's even when taxes are not relevant. An IBM pension-fund executive is known to have commonly complained that while all his managers beat their benchmarks, the aggregation performed poorly. An MMA sponsor needs to avoid a duplication of effort amongst the managers. He needs to coordinate the trading and tax management that can occur across multiple strategies. This coordination has been cost-effective in the past by institutional-sized investors, both by tax-exempt pension funds and by the wealthiest family offices. Coordination is cost effective when the assets under management are large, but it is now increasingly possible to bring this experience to smaller accounts.

How should this be done? It is the function of what we term the ***Overlay Portfolio Manager***.[4]

## 3. The Role of the Overlay Portfolio Manager (or, How to be a Tax-Management Quarterback)

In managing a set of highly customized portfolios, there are two types of decisions to be made: model decisions and client-specific decisions. Model decisions are those that are applicable to all accounts – an example is active stock selection. If the manager wants to replace IBM with MSFT, or to increase exposure to technology, he normally wants to do this across all his accounts. On the other hand, client-specific decisions are relevant just to individual accounts. If a particular investor will incur an unnecessarily expensive short-term capital gain when IBM is sold, or if he does not want to hold technology stocks, the decision needs to be customized for his account.

There is value in separating model and client-specific decisions and having each made by a specialist. The best active managers make active model decisions and are not always equipped to customize these down to client-specific requirements. It is more efficient for the active manager to concentrate on his model portfolio, and to have another specialist focus on client-specific issues for each individual investor.

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[3] Keefe differentiates first and second generation MMA's by the nature of product distribution – a first generation MMA is distributed through a captive or proprietary channel; second generation through distribution unaffiliated with the manager.

[4] Brunel [2002] refers to this as the "coach".

This specialist is the overlay portfolio manager. He receives the managers' model portfolios and constructs an aggregate *target portfolio* for each client account. He maintains this target over time, and manages the aggregate portfolio to track it closely. He honors individual investor restrictions.

A full service overlay manager customizes active stock-selection decisions to the individual investor and enables tax management in the aggregate portfolio. He may[5]:

1. Trade the portfolio
   - Avoid *de minimus* trades
   - Exchange stocks or tax lots among managers when appropriate
   - Absorb into and deliver stocks from a core (if one exists)
2. Coordinate and improve tax-lot management, e.g.
   - Maintain tax lot information
   - Sell the best lot if held by more than one manager
   - Harvest tax losses around the managers' holdings
   - Police wash sales
   - Defer gains from short-term to long-term[6]
   - Match losses with gains when required
3. Coordinate account re-balancing:
   - Allocate cash flows, contributions and withdrawals
   - Transition securities into or out of the portfolio
   - Transition holdings on manager replacement
   - Rebalance manager and asset-class weights
4. Manage and control Risks
   - Balance risks against tax-benefits and the cost of missing the target
   - Guard the whole within specified guidelines of the target
   - Guard the whole within specified guidelines of the market average

With a focus on the tax-lot details, he can choose to step away from the target and obtain a tax benefit for the investor. He is in a position to make the trade-off between tax benefits and tracking differences from the target, even if the target changes frequently (sometimes, because this target changes frequently). It is also natural to centralize risk-management with the overlay manager and so reduce the cost of active management.

Note that overlay management can be delivered along a continuum of functionality. In its most basic form overlay management is an administrative function that collects and implements trades and possibly offers rudimentary wash sale policing or tax lot management. In this form, the benefits of an MMA are largely confined to convenience, reduced minimums and reduced administration. At the other extreme, the overlay manager may provide the functions on the list above, and possibly more.

The overlay function is key within an MMA structure, yet to date active managers and MMA sponsors have focused mainly on selling stock selection. The overlay function cannot be accomplished from the sidelines or as an afterthought. It should be central. It takes focus, judgment, experience and cutting edge technology. It also requires investment operations that are integrated with the overlay process. It is a form of active management, not through stock selection, but rather through tax management and customized implementation. There are challenging implementation questions of how to optimize tax efficiency across the multiple managers, for example by inviting one manager to "waste" alpha in order to provide room for more tax-efficiency for another.

The question does remain: what is this worth to the investor if done well? The benefits of an overlay are complex and some of them are difficult to quantify[7]. In many cases trading and custodial costs can be reduced

[5] These overlay tasks may be implemented in practice either by the sponsor or by a specialist portfolio manager.
[6] I.e., avoid selling short-term gains when they are soon to mature to long-term.
[7] We are focused on quantifying general benefits. Client or account-specific benefits from some overlay activities are often clear and easy to quantify. As examples, investors and advisors can fairly easily estimate the benefits of tax-efficient coordination of withdrawals, portfolio transitions, and asset allocation changes compared to what would have happened in the absence of an overlay portfolio manager.

as security duplication and trade overlap is managed or eliminated. There is reduced duplication of effort among the managers, e.g., the paperwork at account set-up, and the reporting. The coordination of in-kind security flows, cash flows, and manager allocation changes leads to both performance advantages and large operational efficiencies.

Perhaps easiest to quantify is the benefit that comes from the ongoing integrated tax management, that of combining managers who are active with respect to security selection with a manager who is active with respect to tax management. We focus now on this subject.

## 4. Quantifying the Value of an Overlay Manager: The Model

We explore the performance benefits of a tax overlay manager with a simulated model. This allows us to quantify the benefits, to attribute them to their various sources, and to study design issues. We are also able to measure the risks being taken – risks of falling short on the managers' selections or of incurring additional market risk. As all models, ours is an approximation.

After-tax benefits depend on characteristics of the managers – the number of their holdings, their overlap, turnover, and tax efficiency – and on the diversification of the aggregation. The after-tax benefits also depend on the design and implementation of the overlay. Final performance certainly depends on the managers' success at attaining their alpha.

Our simulations are based on a fast but general portfolio re-balancing program similar in spirit to those described by Stein [1998, 1999], and Arnott et al [2001]. It enables us to follow actual and detailed portfolios over time as they are re-balanced to track a target each period and to realize capital losses if required. The target can be either an actively changing or a passive portfolio. One can explore numerous questions, including the value of loss harvesting in different environments and how it evolves over time; the value of short-term and long-term losses; the evolution of cost basis and portfolio lock-up[8]; the trade-off between tax benefit and tracking error; the trade-off between number of holdings and tracking error, etc. We can study how the portfolio deviates from its ideal target. Monte Carlo simulation is a powerful analytical tool for those of us who are mathematically challenged: it allows us to extend our intuition and *predict*. We can observe apparent inconsistencies, dig into the detail and often determine that what was inconsistent was not the model or the theory, but our intuition. The exercise described here has provided numerous such examples. Appendix 1 provides more detail on the simulation program.

In general, we can drive our simulations with either real (historical) or hypothetical data; in this paper we use hypothetical data. For each "scenario" our simulations require the before-tax price return, yield and weight of each security in the index. We then simulate managers who select securities from this index and observe how portfolios of these managers differ with or without an overlay manager.

To fix ideas, we start with a particular example. We discuss sensitivities to the parameters and assumptions later.

**The Example**
Following the methodology listed in Appendix 1, we simulate a set of six managers selecting stocks from a universe of 1000 stocks (think of the Russell 1000 stock universe, for example), first in individually partitioned separate accounts, and then in a combined MMA with an overlay manager.

Imagine six portfolio managers with characteristics as shown Table 1. There are two managers in each style, Growth, Value and Small Cap, and one of each is relatively diversified, the other relatively concentrated. Each manager incurs an expected tracking error relative to the market index, and has an information ratio (alpha/tracking error) of about .33. Each has a specified turnover, which determines the rate at which he realizes capital gains.

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[8] Portfolio lock-up occurs when the market value of a portfolio increases to be substantially larger than its cost basis. Portfolio rebalancing is then expensive.

These are good managers, perhaps better than most. Tax management is not a major part of their focus, but their turnover is below that of many typical managers. In constructing a portfolio of the six managers we weight them as shown in column 6 of Table 1; they provide a combined before-tax expected alpha of 1.9% above the index per year.

The simulated overlay manager tracks a *target portfolio,* the weighted aggregation of the individual manager portfolios.

We compare the following two cases:

*Case 1. Six Managers, Partitioned and Uncoordinated*

The managers each manage an account. Each manager has a target portfolio that evolves according to his stock selection; he re-balances each period perfectly to this target. The aggregate portfolio is the weighted combination of these portfolios.

*Case 2. Six Managers, with Overlay Management*

With the same aggregate target as in Case 1, we model a single portfolio which holds the stocks of the six managers. An overlay manager provides tax management and loss harvesting.

**Table 1: Partitioned Structure - Manager Characteristics and Weights**

| | Style | Holdings | Turnover | Tracking Error | Before-Tax Alpha | Partitioned Structure: Target Weight |
|---|---|---|---|---|---|---|
| **Manager 1** | Diversified Growth | 80 | 60% | 5.0% | 1.7% | 30% |
| **Manager 2** | Concentrated Growth | 30 | 80% | 7.0% | 2.5% | 10% |
| **Manager 3** | Diversified Value | 80 | 60% | 5.0% | 1.7% | 30% |
| **Manager 4** | Concentrated Value | 30 | 80% | 7.0% | 2.5% | 10% |
| **Manager 5** | Diversified Small | 80 | 80% | 5.0% | 1.7% | 15% |
| **Manager 6** | Concentrated Small | 30 | 80% | 7.0% | 2.5% | 5% |
| | Total Before-tax Alpha | | | | 1.9% | 100% |
| | Benchmark Index | 1000 | 4% | | | |

**Modeling the Active Managers**

The set of cap-weighted securities in the universe combine to form the index. Manager stocks are selected randomly within their style; they are initially equally weighted, but are not subsequently re-balanced. Each period, each manager recommendation is sold with a given probability and is replaced[9].

The managers have a before-tax stock selection alpha. Knowing which stocks a manager is holding at any time, we add the *certain* alpha each month to the stocks in his portfolio, and we re-normalize the returns of all stocks so that the aggregate index performance does not change. In this way, managers' portfolios outperform by their specified alpha; a stock that is not in a manager's portfolio is expected to under-perform the market average.

Each manager, therefore, is expert at selecting stocks. The stocks that he selects outperform by the specified alpha while, and only while, they are in his portfolio.

**Modeling the Overlay Manager**

We model the overlay as a single tax-managed portfolio that is managed to track the target portfolio over time while realizing capital losses and identifying tax lots. Constraining the exposures on individual securities around their target weights controls tracking error.

[9] This provides the managers with the *average* turnover specified, but individual months differ.

To limit the exposures, we start with the model portfolio of each manager and constrain its holdings to be positive and within .3% of that model's weights. The lower and upper bounds for the target are then the weighted aggregation of the managers' bounds for each security. These bounds define strict controls on security exposures. Certainly, in a live implementation and with information about manager conviction it is possible to design a more sensitive process.

The overlay manager may not always achieve the managers' alpha since he steps away from the target. In doing so, he incurs what we term an *alpha drag*. We measure drag quantitatively as the difference in performance before taxes and fees between an implementation without an overlay and one with an overlay. In practice, the drag will depend on the managers and the nature of their alphas.

**Base Parameters Summarized**

Here are our base parameters:

Universe: 1000 stocks with 4% turnover.
Market returns: lognormal distribution; expected total return: 8%; volatility: 16%.
Dividends: 1.5%
Average stock-specific volatility: 35%.
Horizon time: 10 years
Transaction fees (including market impact): .5% per 100% round-trip turnover.
Manager rebalancing: managers drift, there is no rebalancing over time.
Tax rates: 20% on long-tem capital gains; 38.6% on dividends and short-term gains.
Overlay bounds: .3% on active manager holdings.
Rebalance frequency: monthly
Loss harvesting frequency: quarterly
Monte-Carlo simulations: 1000 scenarios of stock-price movements.

In summary, our process for modeling the index and the managers works in the following order:

1. Generate the sequence of average before-tax index returns over the period.
2. Generate the sequence of before-tax excess returns for each stock.
3. Identify the securities held by the managers, add the alpha to these securities and re-normalize to get back to the average market return.
4. Determine the evolution of the index weights and managers' portfolio weights by drifting the security weights over time.
5. Simulate the alternative portfolio structures over time, identifying individual tax lots and before- and after-tax performance each period.

## 5. Quantifying the Value of an Overlay Manager: An Example

**Case 1: Six Managers, Partitioned and Uncoordinated**

Consider what happens with partitioned managers in separate accounts. Table 2 shows the before- and after-tax performance relative to both the target and the 1000-stock index. Recall that the target in this case is the aggregation of the individual manager portfolios. In this and the similar tables to follow, the values are all *annual* values, and expressed in *percent per year*. We are showing the *averages* of distributions of 1000 simulations.

**Table 2**
**Case 1: Six Managers, Partitioned and Uncoordinated**

| | Portfolio Return | Target Return | Difference from Target | Index Return | Difference from Index |
|---|---|---|---|---|---|
| **After-tax** | **7.36%** | **7.75%** | **-0.39%** | **7.45%** | **-0.09%** |
| **Before-tax** | **9.68%** | **10.08%** | **-0.40%** | **8.12%** | **1.56%** |
| **Tax Alpha** | | | **0.01%** | | **-1.65%** |
| **Tracking error** | | | **0.03%** | | **3.83%** |
| **Turnover** | **70%** | | | | |
| **No. Holdings** | **330** | | | | |

Following Stein [1999], we decompose after-tax alpha into two components, defining *tax management alpha* (or, tax alpha) as the portion of after-tax alpha that comes from tax management – tax management alpha measures the effect that tax management has on before-tax alpha:

*After-tax Alpha = (Before-tax Alpha) + (Tax Management Alpha)*

So that

*Tax Management Alpha = (After-tax Alpha) – (Before-tax Alpha)*

In this case, the average before-tax alpha is 1.56%; approximately .34% of the 1.9% alpha was lost due to transactions costs and fees. After-tax alpha is -.09%; the loss of 1.65%, a negative tax alpha, is the high cost of not paying attention to taxes, and has been documented previously[10].

The managers all track their targets precisely, and tracking error from the target (.01%) is close to zero pretax. The average tracking error of the portfolios from the 1000-stock index is 3.83%[11].

**Case 2: Six Managers with Overlay management**

Now consider how the six managers perform in an integrated account with overlay management. The parameters for the overlay manager are those described above.

**Table 3**
**Case 2: Six Managers with Overlay Management**

| | Portfolio Return | Target Return | Difference from Target | Index Return | Difference from Index |
|---|---|---|---|---|---|
| **After-tax** | **7.95%** | **7.75%** | **0.21%** | **7.45%** | **0.51%** |
| **Before-tax** | **9.45%** | **10.08%** | **-0.63%** | **8.12%** | **1.33%** |
| **Tax Alpha** | | | **.42%** | | **-0.83%** |
| **Tracking error** | | | **1.30%** | | **3.93%** |
| **Turnover** | **60%** | | | | |
| **No. Holdings** | **415** | | | | |

Compared with Case 1, there is a significant difference shown in Table 3.

1. Before-tax performance is slightly down – the reduction of .23% is attributable mainly to alpha drag, but it includes also the effect of trading.
2. After-tax performance improves by .60% to .51%. The tax alpha, i.e., the performance of the tax management, is now –.83%, substantially better than the –1.65% of Case 1. This improvement comes from a combination of managing tax losses and tax lots[12].
3. Tracking error to the index, at 3.93% is similar to that of Case 1.
4. Tracking error to the target is 1.30%. While the portfolio does not perfectly track the aggregation of the managers' portfolios, the deviations are limited.
5. Turnover – and therefore trading –reduces from 70% to 60% on average ( it starts at 70% but ends at roughly 50%). The number of holdings increases; this is due not to more trading but to small holdings that the overlay manager retains rather than selling.

It is important to note that the quantitative results here are sensitive to the characteristics of the managers and the implementation of the overlay. We discuss further aspects of this in the *sensitivity analysis* section below.

The alpha drag is not completely exposed in this example because the difference between the before-tax returns of the manager portfolios and the overlay combines the alpha drag, transaction costs and fees. A more

[10] Compare with Stein [1998] and Jeffrey and Arnott [1993] who address this loss of performance to taxes.
[11] Because of the distribution of capitalization size in the index, it turns out that the manager excess returns are positively correlated with one another and negatively correlated with the index.
[12] A more intricate analysis shows that the major portion of this benefit comes from managing tax losses rather than from identifying tax lots.

intricate analysis with zero transaction costs is able to isolate the alpha drag for Case 2 to .27%. That is, in this case, approximately 15% of before-tax alpha is lost to the overlay. In reviewing the portfolios that evolve, we find that the overlap in holdings between the manager portfolios and the overlay is about 87%.

Table 4 summarizes the after-tax alpha of Cases 1 and 2 together with an attribution to the active managers' alpha, to tax management and to trading costs[13]. The overlay increases after-tax performance by .60%.

**Table 4: Summary of Partitioned Structure**
**(Alpha measured relative to benchmark index)**

| | **Without Overlay Manager** | **With Overlay Manager** |
|---|---|---|
| **Partitioned Structure**<br>**(6 managers, diversified by style/size)** | **After-Tax Alpha -.09%**<br>Before-Tax Alpha 1.9%<br>Tax Management Alpha -1.65%<br>Transaction costs and fees -.34%<br><br>**Index Tracking 3.83%**<br>**Turnover 70%**<br>**Stocks 330**<br><br>**Target Tracking .03%** | **After-Tax Alpha .51%**<br>Before-Tax Alpha 1.9%<br>Tax Management Alpha -.83%<br>Transaction costs and fees -.30%<br>Alpha Drag -.27%<br><br>**Index Tracking 3.93%**<br>**Turnover 60%**<br>**Stocks 415**<br><br>**Target Tracking 1.3%** |

## 6. Sensitivity Analysis

The quantitative model we have presented makes numerous assumptions. We have attempted to provide what we think is a "typical" or realistic case. In developing this, we did not tweak parameters and assumptions with a goal in mind. With alternative assumptions it is possible for the value added by the overlay manager to be either higher or lower. Your own mileage, in particular, may vary. We briefly address the sensitivity of the results to our assumptions regarding: the simulation model; the choice of the managers and the nature of their out-performance; the portfolio structure; and to the implementation of the overlay manager. This topic is an extensive one, and can readily become the subject of another paper.

*6.1 The Simulation*

It should particularly be noted that our stochastic model of stock price movements is a very simple one: stocks move individually as the market plus normally distributed noise. With this stochastic process, in order to control risk it is enough to constrain only security exposures. Additionally, since real price returns suffer from fatter tails than the normal distribution, our estimates of tracking error may be overly optimistic. In a live implementation more care needs to be taken to control risk and reduce the likelihood of extreme deviations from the target.

We have not yet discussed the distribution of the performance of our set of 1000 Monte Carlo simulations. Of most interest is perhaps the difference in performance between Cases 1 and 2. Varying the number of rolling periods within and across the simulations, we find the probability of after-tax overlay out-performance to be that shown in Table 5[14].

[13] Small amounts of noise in the simulations (i.e., a failure for the index and managers to precisely hit the assumptions of index return and pre-tax alpha) prevent a perfect attribution between pre-tax alpha and post-tax alpha.

[14] Please note that Table 5 is not to be interpreted as a guarantee of performance. In our 1000 simulations we did not see a single case of a 10-year period where the overlay under performed.

**Table 5: Probability of Overlay Out-Performance In Rolling Periods**

| Rolling Period Length | Probability |
|---|---|
| 1 Year | 78.8% |
| 3 Year | 90.9% |
| 5 Year | 96.1% |
| 10 Year | 100.0% |

While industry convention is to report after-tax returns on a pre-liquidation basis, it is worth examining *post-liquidation* returns as well. If we liquidate the entire portfolio at the end of the 10-year period, we would expect the post-liquidation benefit of the overlay to decrease. The average post-liquidation alpha of the partitioned structure without an overlay is -.39% and with an overlay is -.05%. The overlay provides an average post-liquidation benefit of .34%.

The market return environment and the volatility of the securities in the index affect tax management through loss-harvesting. As in Stein [1999], the value of tax management – and therefore of the overlay – increases in weaker market environments and when the underlying securities are more volatile.

*6.2 The Managers*

Active portfolio managers differ widely with respect to the number of their holdings, their trading, tax efficiency, and risk. In addition, the sponsor choice of managers – their expected return, risk and overlap – will affect the results.

In thinking about the number of the manager stocks and their overlap the following holds. In general, the greater the number of unique stocks in the managers' portfolios, the larger is the benefit from tax management. Holding the number of unique stocks constant, the more overlap in holdings there is among the managers, the greater is the benefit from tax management. While the turnover of the managers affects performance too, (the higher the turnover, the greater the benefit), the after tax benefit of the overlay is less sensitive to this parameter. Note that this does *not* mean we would recommend a design with many overlapping active managers, each holding a large number of stocks.

The effect of the managers' before-tax alpha is relatively intuitive. If the managers' alpha is very high, then stepping away from it will be costly, and it is harder for the tax management overlay to overcome this cost. For low manager alpha, the value added by the overlay increases. For example, the after-tax alpha of Table 4 changes to the following as we increase the managers' before-tax information ratio (we use the same manager tracking error and increase alpha):

**Table 6: After-Tax Alpha as a Function of Manager Skill**

| Before-tax Information Ratio | Without Overlay | With Overlay | Difference |
|---|---|---|---|
| **.33** | -.09% | .51% | .60% |
| **.5** | .63% | 1.15% | .52% |
| **1** | 2.81% | 3.07% | .26% |
| **1.3** | 4.26% | 4.34% | .08% |

The *nature* of the managers' alpha is also relevant. We can imagine managers for whom the alpha drag model we have used is inappropriate. For example, imagine a manager who has certain foreknowledge when his holdings will drop in value for an extended time; holding onto his securities to avoid a capital gain would be inadvisable, and our model of drag would be unsuitable. On the other hand, if the overlay manager knows about this particular skill, he could use it to the advantage of the portfolio. Of course, some managers are not suitable for inclusion in a multi-manager account, e.g., managers who add value by identifying trading inefficiencies and trading frequently during each day.

The topic of using additional information from the active managers has large potential. We have assumed that the overlay manager knows nothing about the active selections except that they are in the managers' model portfolios. In general, a manager may be able to expresses a confidence in each stock, or to quantify his return expectation over a specified period. With this information, the overlay manager is in an even better position to balance the portfolio and to consider explicitly the tradeoff between return and tax cost for every stock and for the portfolio as a whole.

*6.3 Portfolio Structure*

The benefits of overlay management are closely intertwined with the portfolio *structure* (see Stein [2001]). By reducing tracking risk to the market and fees, a portfolio with a core/satellite structure – i.e., a portfolio with a tax-managed core and concentrated satellite active managers – can add value to an MMA either with or without an overlay manager. In Appendix 2 we extend Cases 1 and 2, and describe the benefit of adding overlay management to a core/satellite structure, showing that a core/satellite structure is able to provide after-tax performance and risk benefits. In this example, the extra benefit of the tax overlay is .30%. While this benefit is lower than the .60% benefit of Case 2 over Case 1[15], this Core/Satellite structure with overlay is more attractive than Case 2 in terms of both return and risk.

*6.4 The Overlay Design and Implementation*

Performance is sensitive to the implementation of the overlay, most notably the degree to which the overlay manager is able to diverge from the managers' holdings. In designing an overlay, the choice of the overlay bounds will depend on the confidence in the active managers' alpha and on the alpha drag that results.

For the model here, the overlay manager is permitted to step away from target weights to a limited extent, and the bounds are not symmetric: over-weights are in general larger than under-weights since the overlay does not short a manager's selection. Increasing these bounds increases the after-tax alpha, but at a decreasing rate. As we increase these bounds we take more tracking risk from the target and incur more alpha drag. Ultimately, the tax-management benefit levels off, as does the alpha drag.

**Table 7: After-Tax Alpha as a Function of Overlay Bounds**

| Overlay Bound | Without Overlay | With Overlay | Difference |
|---|---|---|---|
| **.1%** | -.09% | .22% | .31% |
| **.3%** | -.09% | .51% | .60% |
| **.5%** | -.09% | .88% | .97% |
| **1.0%** | -.09% | 1.48% | 1.57% |
| **1.5%** | -.09% | 1.71% | 1.80% |
| **2.0%** | -.09% | 1.84% | 1.92% |
| **2.5%** | -.09% | 1.91% | 2.00% |
| **3.0%** | -.09% | 1.94% | 2.03% |

A similar phenomenon occurs when we pursue loss harvesting more aggressively: harvesting losses too aggressively and frequently adds little value but increases trading costs and risk.

Transaction and market impact costs influence the result in several ways. These costs lower portfolio returns, but because the overlay requires less trading, it is relatively more attractive at higher transaction costs. Note that transaction costs can in practice be managed by the overlay manager: an effective loss-harvesting process requires that realized losses be more than enough to pay transaction costs; as costs increase, so would a hurdle for loss harvesting.

[15] An existing tax-managed core already provides tax management, and the added benefit from the overlay is less.

**Table 8: After-Tax Alpha as a Function of Transactions Costs**

| Transactions Costs | Without Overlay | With Overlay | Difference |
|---|---|---|---|
| **0** | 0.36% | 0.90% | .54% |
| **.25%** | 0.14% | 0.71% | .57% |
| **.50%** | -0.09% | 0.51% | .60% |
| **.75%** | -0.30% | 0.32% | .62% |
| **1.00%** | -0.52% | 0.13% | 0.65% |
| **1.50%** | -0.96% | -0.26% | 0.71% |

The design and implementation of the overlay requires a balance among numerous considerations. In practice, a design is often attractive with fewer active mangers, each taking a larger degree of risk, and enough core that the aggregation has the desired risk profile and that the tax losses generated by the core are enough to offset gains realized by the managers. The nature of the managers' alpha and the drag on their performance is central. A goal of offsetting managers' gains with tax management losses can never be precisely accomplished since the core will produce more capital losses in early years than in later years, and in upward markets active managers will often produce more capital gains in later years than in early years. Market conditions will affect tax management as well. The balancing between core and active, the choice of active managers, and the bounds on the tax-managed implementation will always be an art.

## 7. Conclusion

Overlay portfolio management in a multi-manager account moves the responsibility for customization away from the typical asset manager (who is often either not doing it or is losing money doing it) to a specialist, who acts as an agent for the sponsor, and who is a large step closer to the investor. The potential benefits of an overlay portfolio manager derive both from efficiencies in implementation and from account-specific after-tax performance. This is a powerful suggestion to the wrap and private client industry and has many benefits for the client, but may also have drawbacks for some constituents.

We have quantified the value added by overlay tax management to be anywhere from .3% to .6% and more, depending on the starting point and on the overall portfolio structure and design.

Our simulations allow us to explore overlay and structural design decisions. We recommend a core/satellite rather than a partitioned structure; for more active alpha the investor is best off with aggressive active managers or a hedge fund; and we recommend paying taxes from another account if possible to avoid an additional realization of capital gains. The balance between active and core depends on investor preferences for risk, on confidence in the managers' alpha, on their rate of realization of capital gains, and on market expectations which affect the rate of realization of capital losses in the core (see Quisenberry [2003]).

Our quantified estimates of added value here derive only from ongoing tax management within the portfolio. We have not quantified operational efficiencies, trading efficiencies, or benefits that can be garnered from in-kind transitions, manager allocation changes, manager replacement, coordination of cash and security flows, and others. Indeed, we believe that our quantified benefits can be dwarfed by the after-tax and operational benefits of these other activities.

While the benefits of an overlay portfolio manager can be substantial, it is not possible to do this well from the sidelines or as an afterthought. It should be central. It takes focus, judgment, experience and cutting edge technology. It is active portfolio management, not through stock selection, but rather through customized implementation and tax management.

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## Appendix 1: Portfolio Simulations

Our portfolio simulations are similar in spirit to the simulations described in Stein [1998] and Arnott et al. [2001]). As with all simulations, simplifying assumptions are necessary. For example, we re-balance at most monthly rather than daily.

The following are the principal parameters:

- Frequency of rebalancing – this may be monthly, quarterly, biannually or annually.
- Security bounds (these affect how tightly the portfolio tracks its target)
- Harvesting parameter (this affects aggressiveness of loss harvesting)
- Tax rates, both long-term and short-term cap gains
- Transaction costs and fees
- Cash flows
- Minimum trade size (this affects the number of holdings, trading and tracking)

A portfolio is defined at each point in time by the amount of each security and cash that it holds. Each security is comprised of tax lots, each with a purchase date and cost basis. A portfolio has an assigned target that it is designed to track. The target may in general incorporate active stock-selection ideas. At re-balancing, some securities are sold and others are purchased. Re-balancing is specified by parameters that maintain the portfolio close to the target, as specified by bounds on individual security weights, other risk factors and cash. The number of securities and the amount of trading in the portfolio is also governed by a minimum trade-size parameter. A loss-harvesting parameter and fees govern loss harvesting aggressiveness.

Security-level data is in three principal two-dimensional arrays, (i.e., for each security and at each time) -- price returns, dividend returns, and target weights (summing to 1 for each period). When using historical data, we also include information on corporate actions.

In this paper, price returns are chosen from a lognormal distribution with the specified mean and variance. To these we add the dividend return. We model the stocks as each having a return equal to the market return plus a stock-specific return each period. The stock-specific returns are generated from a Normal($0,\sigma$) distribution, where the standard deviation $\sigma$ is a parameter chosen to represent the volatility of stocks in the universe being modeled. Period returns are normalized so that the index return implied by the security returns and weights equals the market return for the period. Alpha is added, if it exists, by adding the desired alpha to each of the

manager stocks (the alpha is not certain due to stock-specific volatility), and rescaling the returns so that the return on the index is unchanged.

We harvest losses in tax lots when (Liquidation tax + fees / market value) $< -H$, where $H$ is a loss-harvesting parameter. The liquidation tax depends on the age of the lot -- short-term or long term. Lots are liquidated only down to their security-level bounds, and loss harvesting is constrained not to violate wash sales.

The capitalization distribution of the stocks affects the loss harvesting opportunity. In the case of the 1000-stock universe here, we use as initial capitalization distribution the distribution of RU1000 stocks at 3/31/2002. Then, knowing the stock returns over time, we compute how passive target weights evolve. To model index turnover, we force randomly chosen stocks to leave the universe and others to replace them.

Each simulation run starts with an initial cash amount (typically $100) and this is invested in a portfolio to match the target constituent weights at the start of the initial period. In general, we hold fractional shares and pay trading costs. At the end of each period we evaluate the portfolio. Security prices are adjusted using the security-level information on price return. Dividends received are paid into the portfolio as cash, as is any additional cash flow. If there are liquidating corporate actions, these securities are sold. For corporate takeovers, we exchange shares for shares in the acquiring company, maintaining cost basis. At the end of the period, too, there is a new target and we rebalance the portfolio: we sell securities to realize a capital loss subject to the loss harvesting and risk parameters, and we re-invest any cash in new securities so as to keep tracking low and to approach the target. We honor wash sale rules. Between re-balancing, the portfolio does not change and any risks remain for the full period. For example, if we harvest a loss and are under-weighted in a security, this exposure is incurred until the next rebalance.

In the simulations described in this paper, taxes are paid from another account, and before-tax values accumulate in the portfolio. But note that we **do** still measure these taxes, and they affect after-tax performance. We compute the performance of the portfolio, both before-tax and after-tax at the end of each period. This reporting is consistent with AIMR [2001]. We also compute the performance of two benchmarks, the target and the average market index. The after-tax performance for these benchmarks is modeled as a single-security shadow portfolio using the benchmark's actual turnover. The tracking error of a portfolio relative to a benchmark is evaluated as the annualized standard deviation of the difference in returns over the period.

In Monte Carlo simulations we simulate many scenarios each constituting a multi-period sequence of market and stock-price movements. For each scenario we obtain performance statistics, and the set of simulations gives us a *distribution* of performance statistics.

## Appendix 2. A Core/Satellite Example

We have mentioned that the value added by the overlay manager is closely intertwined with the benefits provided by a tax efficient manager who controls risks in a core/satellite structure. This appendix discusses this case using parameters that are the same as those in Section 5, unless specified otherwise.

In combining managers with a core, we use the three concentrated managers and 50% core, as shown in Table A1. Because there is a core, the portfolio does not need managers to diversify, and can seek high alpha managers with higher risk. In this case the managers provide a before-tax alpha of 1.25% per year. The core portfolio is tax managed: as time progresses, securities that incur a capital loss are sold and this loss is realized. The core manager also acts as the overlay manager. The target portfolio is the weighted aggregation of the active mangers' portfolios and the market index. We set overlay bounds to be .3% on active manager holdings as before, but we allow .5% bounds on the core holdings.

**Table A1: Core/Satellite Structure - Manager Characteristics and Weights**

| | Style | Holdings | Turnover | Tracking Error | Before-Tax Alpha | Partitioned Structure: Target Weight |
|---|---|---|---|---|---|---|
| **Manager 2** | Concentrated Growth | 30 | 80% | 7.0% | 2.5% | 20% |
| **Manager 4** | Concentrated Value | 30 | 80% | 7.0% | 2.5% | 20% |
| **Manager 6** | Concentrated Small | 30 | 80% | 7.0% | 2.5% | 10% |
| **Core Manager** | Diversified, Risk Controlled, Tax Managed | 300 | 30% | 1.6% | 0% | 50% |
| | Total Before-tax Alpha | | | | 1.25% | 100% |
| | Benchmark Index | 1000 | 4% | | | |

As before, we compare two cases:

*Case 3. Core/Satellite, Partitioned and Uncoordinated*

The three concentrated mangers and a tax-managed core portfolio are each in a separate account. As in case 1, the aggregate portfolio is the weighted aggregation of the individual separate portfolios.

*Case 4. Core/Satellite, with Overlay Management*

With the same target as Case 3, we model a Core/Satellite MMA portfolio with a tax management and loss harvesting overlay.

**Core Tax Managed Performance**

Before moving to a discussion of the added benefit from a core/satellite structure, we show in Table A2 the average performance of the core portfolio in same set of return environments.

**Table A2**
**Core Tax Managed**

| | Portfolio Return | Target Return | Difference from Target | Index Return | Difference from Index |
|---|---|---|---|---|---|
| **After-tax** | **8.56%** | **8.85%** | **-0.29%** | **7.45%** | **1.12%** |
| **Before-tax** | **7.82%** | **8.11%** | **-0.29%** | **8.12%** | **-0.29%** |
| **Tax Alpha** | | | **0%** | | **1.41%** |
| **Tracking error** | | | **1.61%** | | **1.61%** |
| **Turnover** | **40%** | | | | |
| **No. Holdings** | **200** | | | | |

In this case the portfolio on average behaves like its target, the index. Before-tax differences are due to transaction fees. With the .50% security bounds, it has a tracking error of 1.6%. Turnover is high initially but low in later years averaging 40%.[16] The value of tax management, assuming that losses can offset capital gains and have immediate value for the investor, is 1.41% per year.

**Case 3: Core and Satellite, Partitioned and Uncoordinated**

Table A3 shows the expected performance of a Core/Satellite structure without the tax overlay.

[16] This level of turnover is derived from the simulations. In actual implemented portfolios the level of turnover is usually substantially lower.

**Table A3**
**Case 3: Core and Satellite, Partitioned and Uncoordinated**

| | Portfolio Return | Target Return | Difference from Target | Index Return | Difference from Index |
|---|---|---|---|---|---|
| After-tax | 8.09% | 8.45% | 0.36% | 7.45% | 0.65% |
| Before-tax | 9.06% | 9.44% | -0.38% | 8.12% | 0.94% |
| Tax Alpha | | | 0.02% | | -0.30% |
| Tracking error | | | 0.56% | | 2.45% |
| Turnover | 65% | | | | |
| No. Holdings | 300 | | | | |

Compared to Cases 1 and 2, our first observation is that the portfolio tracks more tightly to the benchmark, at 2.45% it is a less risky portfolio. The tax losses generated by the core cover more than the taxes realized by the active managers, and the tax alpha is -.30%. The 1.25% before-tax alpha of the managers reduces to .94% due to transaction costs and fees, and to .65% after-tax.

This portfolio surpasses Case 1 both with respect to risk and with respect to after-tax return. It surpasses Case 2 with respect to risk. In terms of an information ratio, it dominates both. This is the added value of the tax-managed core.

**Case 4: Core and Satellite with Overlay Management**
Finally, we simulate the Core/Satellite structure with overlay management in Table A4. The security level bounds are the same as those of Case 2.

**Table A4**
**Case 4: Core and Satellite with Overlay Management**

| | Portfolio Return | Target Return | Difference from Target | Index Return | Difference from Index |
|---|---|---|---|---|---|
| After-tax | 8.40% | 8.45% | -.06% | 7.45% | 0.95% |
| Before-tax | 9.07% | 9.44% | -0.37% | 8.12% | 0.95% |
| Tax Alpha | | | .31% | | 0.00% |
| Tracking error | | | .93% | | 2.85% |
| Turnover | 50% | | | | |
| No. Holdings | 325 | | | | |

Some observations:

1. After-tax performance is higher than the previous three cases.
2. The risk (tracking error to index) is similar to Case 3, and lower than that of the partitioned structures of Cases 1 and 2.
3. The risk-adjusted return is the highest of any of the cases.
4. Tax management is improved relative to Case 3. In this case there is a zero tax alpha: it so happened that on average the capital losses generated just offset the gains realized by the managers over the investment period.

As before, we can show that the average alpha drag is .07%. Alpha drag results not only because of larger allowable deviations on the core holdings of the model but also because the loss harvesting may sell active manager positions and use the proceeds to shore-up core under-weights that have no alpha. However, this drag is far less than in the partitioned case because only half of the portfolio has a pre-tax alpha to lose. This portfolio realizes relatively little in net capital gains over its life. It retains over 90% of the before-tax alpha of the managers, and what it loses it gains through tax-management.

Table A5 summarizes the average after-tax alpha of Cases 3 and 4 together with an attribution to the active managers and to tax management. The improvement of Case 4 over Case 3 is .30%[17].

**Table A5: Summary of Core/Satellite Structure**
**(Alpha measured relative to benchmark index)**

| | Without Overlay Manager | With Overlay Manager |
|---|---|---|
| **Core/Satellite Structure**<br>(3 concentrated active managers and 50% tax-managed core) | **After-Tax Alpha .65%**<br>Before-Tax Alpha 1.25%<br>Tax Management Alpha -.30%<br>Transaction costs and fees -.30%<br><br>Index Tracking 2.45%<br>Turnover 65%<br>Stocks 300<br><br>Target Tracking .56% | **After-Tax Alpha .95%**<br>Before-Tax Alpha 1.25%<br>Tax Management Alpha 0%<br>Transaction costs and fees -.23%<br>Alpha Drag -.07%<br><br>Index Tracking 2.85%<br>Turnover 50%<br>Stocks 325<br><br>Target Tracking .93% |

[17] See footnote 12.