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Core-and-Satellite Portfolios & Taxes

IN THE FINANCIAL SERVICES INDUSTRY, there is growing recognition that the design and structure of equity portfolios with multiple managers should be fundamentally different for a taxable investor than for the typical institutional investor. The presence of taxes, shorter time horizons, and higher trading costs are just a few of the factors that distinguish these investors. Many have observed that taxable investors can reap significant benefits by adopting a core-and-satellite portfolio structure rather than the typical style-bucket approach used for institutional investors.

A core-and-satellite structure usually consists of an index-like core manager surrounded by satellite managers who are seeking to add value, or alpha. The core manager anchors the portfolio to a target benchmark (perhaps the S&P 500), and the satellite managers have the freedom to take on added risk in their quest for alpha. In addition, a core manager who is actively managing taxes and opportunistically harvesting losses can reduce the tax burden of the satellite managers. If well designed, the core-and-satellite structure can increase after-tax returns, reduce risk, or both.

But how much should one allocate to the core and satellite components? The answer depends on the expected alpha of the satellite managers, the risk, and the taxes that they incur. We have studied this question in some depth (a more detailed analysis is soon to be published in *The Journal of Wealth Management*), and have found that many taxable investors would be well served by core allocations that exceed 50%.

Our study mathematically models a core-and-satellite portfolio. The goal is to find the allocation to the core that results in the best risk-adjusted after-tax return over a specified period. In the study, the core manager



Why taxable investors may need a new mind-set when constructing portfolios

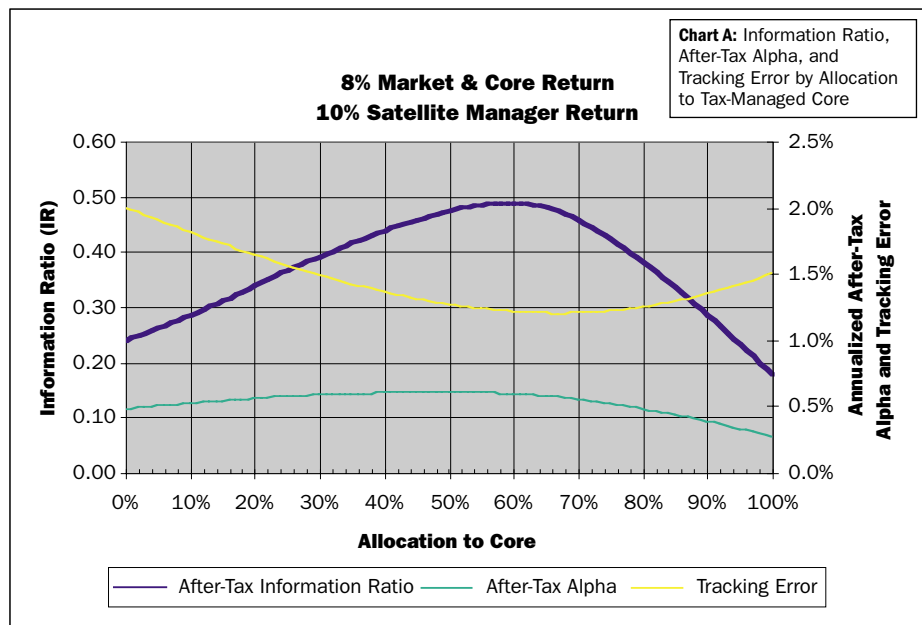
Any excess losses that the core produces are carried forward and ultimately lost if not used. The risk of the portfolio, as measured by tracking error, is modeled by combining the risks of the component managers.

Risk-adjusted performance is measured as the after-tax information ratio, i.e. after-tax alpha divided by tracking error. We seek the allocation to the core which maximizes this information ratio.

Below is a sample case (Chart A) using the following parameters (all are per year):

- The market return is 8%
- The time period is 20 years

shadows the pretax return of the market index while generating tax losses. The satellite managers have positive pretax alpha: They earn an annual return above the market index, but generate capital gains. Capital losses from the core (we estimate the amount of these from past experience and from detailed computer simulations) are used to offset the gains from the satellites.



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- The satellite alpha is 2%
- The tracking error of the core is 1.5% and that of the satellites is 2.0%
- The satellites realize capital gains based on annual turnover of 50%
- The short-term tax rate is 38.6%; the long-term tax rate is 20.0%

Chart A shows how the information ratio (left axis) changes as we increase the core allocation. The after-tax alpha and tracking error (right axis) are also plotted.

With no core, the satellite managers would see their pre-tax alpha of 2% drop to 0.5% after taxes. As the allocation to the core increases, the after-tax alpha increases because realized losses from the core absorb the tax costs of the satellites' realized gains. However, as the core allocation continues to increase, the satellite alpha is diluted. If we go too far, the value of the excess tax management becomes trivial and the alpha continues to decline.

Note that portfolio risk (tracking error) decreases as the core allocation rises. This is because of the more tightly tracking core. Ultimately the portfolio risk bottoms out and rises again because we have assumed that the excess performance of the portfolio components are uncorrelated—an allocation to both core and satellites increases diversification and helps reduce overall risk.

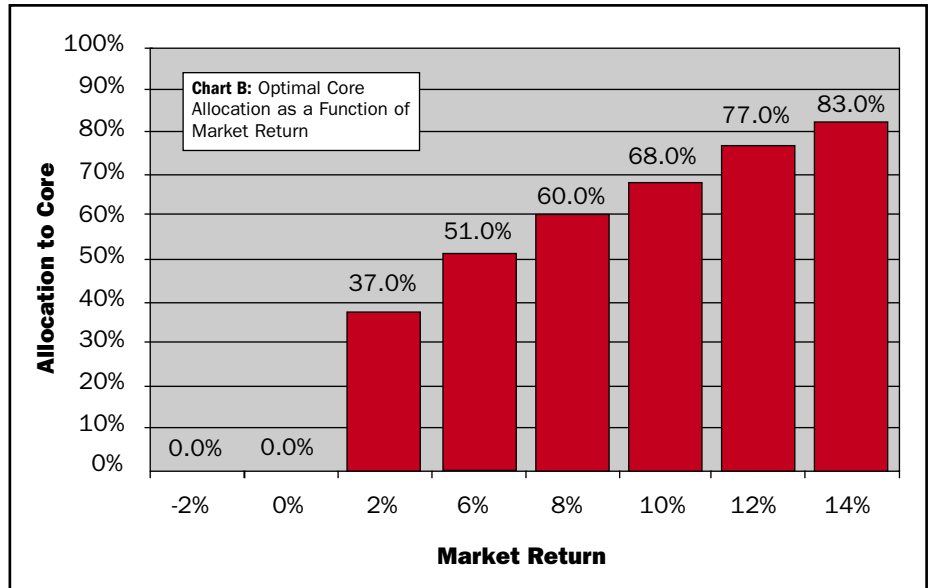
For this example, the optimal allocation to core is about 60%.

How, then, does this result change as we change our assumptions?

Chart B (above, right) shows how the market return affects the optimal core allocation (holding all other parameters constant). We find that the allocation to the core should increase if we expect higher market returns. While the tax-management benefit of the core is actually lower in higher-market environments, the tax cost of the satellites increases more rapidly and a higher core allocation is needed.

Suppose that the satellite managers are able to produce more alpha. The core dilutes this alpha, and it is no surprise that we then need less core (see Chart C, right). Interestingly, as we increase alpha, the core allocation declines quickly and then tapers off. Initially, a higher alpha means much less core is needed, but when the alpha is very high, the satellites realize even more gains and the core is needed to offset these.

Note again that we have assumed in this



analysis that any capital losses that are not used up by the active satellites are lost. If the investor has another source of capital gains, an even higher allocation to the core may be advisable.

The addition of a tax-managed core to a group of active managers provides two important benefits:

- The core reduces the risk of the overall portfolio by providing exposure to the broad equity market.
- It improves after-tax return by generating capital losses to offset realized gains.

The answer to the question of how much to allocate to the core depends on assumptions of market return, the pretax alpha of the satellites, and the rate of their gain realization.

With a model such as the one we have discussed here, advisors and consultants can be armed with a better understanding of the benefits of the core-and-satellite structure. More importantly, they will have quantitative information for addressing the question of how much to allocate to the core. IA

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