Dynamic Portfolio Analysis for Endowments and Foundations

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Asset Liability Management (ALM) studies can address the specific objectives of Endowment and Foundation (E&F) investors by defining cash flow obligations as a series of “liabilities.” These liabilities include proposed changes to spending policies, projected expenses as well as non-recurring capital expenditures. A cash flow centric asset allocation strategy directly addresses these client-specific objectives in the creation of recommended portfolios.

Given the volatility of the securities market over arguably the last twenty years, as well as the current interest rate environment, asset allocation strategies should be adaptive or “dynamic” in nature and also provide investors with a range of potential outcomes. Ideally, the efficacy of proposed allocation strategies should be expressed in terms of an E&F investor e.g., efforts to maximize asset values, principal levels or spending amounts while counterbalanced by minimizing account volatility and spending shortfalls. Specific “carve out” dynamic de-risking strategies for capital expenditures serve as a logical complement to the ongoing asset management of an endowment or foundation.

PNC Institutional Asset Management<sup>SM</sup> Approach to Establishing Asset Allocations for Endowments and Foundations

We believe asset allocation strategies should be cash flow-centric in nature based upon the organization’s specific objectives and operations. Defining cash outflow obligations as a series of “liabilities” facilitates an ALM framework where client-specific assets and liabilities can be analyzed simultaneously. This sets the stage for comprehensive and personalized asset allocation analyses and recommendations. Traditionally, ALM studies have been used for insurance companies and pension plans, but the concept can be readily applied to an Endowment or Foundation’s asset base and cash flow obligations, be they contractual or aspirational in nature.
Advantages of Cash Flow Centric Approach to Asset Allocation

Unprecedented volatility of the securities markets in recent years, reductions in external donations, and the resulting need to rely more on investment income has prompted many Endowments and Foundations to reevaluate their asset allocation strategies. Active risk management, adopting more realistic asset allocation assumptions, and careful planning of large capital expenditures have come to the forefront. These objectives are central tenets of a cash flow centric methodology:

- Cash flow centric asset allocation is designed to maximize portfolio value subject to cash flow payment requirements, such as spending amounts, expenses, capital expenditure, etc. Asset-only asset allocation modeling (e.g., mean-variance optimization) ignores these considerations.
- Cash flow centric asset allocation utilizes Monte Carlo simulation, incorporating several thousand future asset return scenarios derived from real world experience. This approach results in a probabilistic set of outcomes and results. Asset-only modeling is typically based on mean-variance optimization which may not include simulations and is based on a static or singular return assumption. Correspondingly, investors are unable to easily evaluate the impact of realized rates of return that vary from the single rate assumption.
- Cash flow centric asset allocation is optimized based on future cash flow requirements over the entire projection horizon, which is typically 10 or more years. Efficient frontier portfolios need to incorporate this multi-year horizon and should be dynamic in nature to reflect the evolving objectives of an E&F investor. An efficient frontier based upon mean-variance optimization is, again, static in nature and does not reflect an E&F investor’s specific cash flow requirements.
- Client-specific ALM studies are uniquely designed to create optimized asset allocations, analyze a range of other strategies, and compare the impact of different spending requirements, expenses, gift expectations, capital expenditure, etc. to an investment portfolio. ALM studies are particularly well-suited for cash flow centric methodologies, but can be also be incorporated into asset-only approaches as well (e.g., mean-variance optimization).
- Advanced capital market assumptions and simulation models are used, and therefore avoid unrealistic static assumptions for returns and volatility. The focus is modeling more realistic outcomes i.e., higher probabilities of negative returns and market cycle (“regime”) sensitive volatilities and correlations.

TRADITIONAL MEAN-VARIANCE ANALYSIS

To clarify, cash flow centric asset allocation analysis does start with traditional mean-variance optimization. Long term capital market assumptions for returns, volatilities, and correlations are used to create an efficient frontier and display all asset classes as well as the current portfolio. Alternative portfolios, based upon potentially higher returns or lower volatility are also considered. To ensure client relevance, a customized approach must address:

- Asset classes permitted and/or required by each E&F
- Investment constraints specifically imposed by each E&F
- Client-specific time horizon
- E&F approved capital market assumptions and simulation models

Upon the completion of a traditional mean-variance optimization and the analysis of the resultant recommended portfolio, the focus can shift to an ALM study.
Even though ALM studies can be used for asset-only approaches, these studies are particularly beneficial for cash flow centric methodologies since they explicitly take into account spending policies, investment constraints, gift expectations, expenses, etc.

An ALM study based on a cash flow centric approach incorporates client-specific guidelines and is evaluated on a probabilistic time-varying (“stochastic”) basis. Typically, 10,000 or more paths over a 10-year or longer horizon are simulated based on forward looking capital market assumptions in order to project a range of path-dependent future values for each asset class. Correspondingly, E&F total portfolio returns as well as client spending policies, gift expectations, expenses, and other variables specific to each E&F are modeled along each path. The result is a fully customized assessment based upon E&F-specific portfolio requirements.

Investment objectives and associated cash flows are unique to each client. An ALM study captures these distinctions and will adapt over time as investment objectives evolve and realized investment returns are incorporated into investment projections and modeling.

- Asset allocation strategies based on ALM studies are fully customized to the operations of each Endowment and Foundation, since they explicitly take into account spending policies, investment constraints, gift expectations, expenses, etc.
- ALM studies can utilize virtually any realistic distribution of asset returns that matches empirical (realized) data, while a traditional mean-variance optimization approach is typically based on simplified and arguably unrealistic assumptions such as the use of normal distributions.
- ALM studies typically create asset allocations based on the entire projection horizon, normally in excess of ten years, while traditional mean-variance optimization is usually based on a singular “snapshot” efficient frontier.
- ALM studies can readily incorporate dynamic capital market assumptions and simulation models which allow for “stochastic” or time varying expected returns, volatilities, and correlations. Traditional mean-variance analysis on the other hand is based on static or unchanging over time capital market assumptions, which underestimated downside risks during the recent financial crisis.

Once simulations are completed and all variables are determined for each path, results are grouped in percentiles, and typically reported as “candle stick” bar charts, illustrating 1st, 5th, 25th, 50th, 75th, 95th, and 99th percentiles, as shown below:

![Illustration of Projected Paths](Source: PNC Capital Advisors, LLC)
Given its flexible nature, an ALM study can readily evaluate the efficacy of proposed alternative asset allocation strategies. Perhaps more importantly, an ALM study can explicitly reflect any changes in (liability-related) spending policies and gift expectations as well as any revisions to (asset-related) investment constraints and objectives, and any other limitations and constraints specific to each E&F.

PNC Institutional Asset Management can help E&Fs evaluate asset allocation alternatives. Central to this evaluation are the use of realistic return distribution assumptions and the incorporation of any future cash flow requirements. For illustration purposes, the following chart provides comparison of three hypothetical asset allocations based on projected portfolio values:

1) Baseline asset allocation (left),
2) Aggressive asset allocation (middle), and
3) Defensive asset allocation (right).

Another important advantage of ALM studies is the ability to evaluate contemplated changes to cash spending policies. We believe this to be one of the greatest strengths of our philosophy and methodology. PNC Institutional Asset Management can help E&Fs analyze virtually any spending policy through the use of our flexible framework.

The adjacent chart presents projected market values over time based on baseline asset allocation as well as the following spending policies:

- 7% flat spending policy (left),
- 5% Statutory Minimum spending policy with additional non-recurring large capital expenses in 2015 and 2020 (middle), and
- Flat dollar amount of $80K adjusted by 3% assumed inflation spending policy subject to 5% Statutory Minimum (right).

Different spending policies can be analyzed based on the same asset allocation strategy as illustrated in the above chart, or based on varying spending policy and asset allocation decisions. To help evaluate trade-offs, pairs of distinct spending policy/asset allocation recommendations are evaluated in the spirit of identifying the optimal combination of spending policy and asset allocation.
ALM STUDY: OPTIMIZED ASSET ALLOCATION AND CASH FLOW CENTRIC EFFICIENT FRONTIER

We realize that every E&F investor may have a unique investment objective as well as a specific definition of success. Our flexible ALM framework provides a variety of customization alternatives:

- Objective function can be determined such as maximizing asset values, principal levels, spending amounts, etc., or minimizing account volatility, spending shortfall, etc.
- Constraints can be selected related to asset classes, industries, social responsible investing, etc. or designed to govern asset allocations over time as certain events occur such as gains and losses, capital expenditure prefunding, etc.

Once the objective function and constraints are established, a “Cash Flow Centric Efficient Frontier” is created as shown on the following chart. Unlike the mean-variance process, a “Cash Flow Centric Efficient Frontier” is based on E&F cash flows and explicitly reflects any E&F specific spending requirements, expenses, gift expectations, capital expenditure, etc. It also reflects more realistic capital market assumptions and simulation models that are incorporated over the entire projection horizon.

- “Cash Flow Centric Efficient Frontier” is based on projected future values in 2022.
- Return is defined as 50th percentile/median of projected values in 2022.
- Risk is defined as 5th percentile of projected values in 2022.

A differentiating factor of this framework is the ability to determine an optimal “dynamic” asset allocation strategy, represented by the “Cash Flow Centric Efficient Frontier” above. This efficient frontier incorporates cash flow requirements over the entire projection horizon and, consistent with a “traditional” mean-variance efficient frontier, allows the investor to focus on an appropriate risk/return combination. Let’s clarify and further define the concept of a dynamic asset allocation strategy.

Source: PNC Capital Advisors, LLC
ALM STUDY: **CAPITAL EXPENDITURES AND DYNAMIC ASSET ALLOCATIONS**

Endowments and Foundations may have capital expenditures that require prefunding or accumulation of funds over time due to the size of such expenditure. Dynamic Asset Allocation, commonly referred to as a “glidepath” methodology, can help Endowments and Foundations protect funds as they get closer to an expenditure date.

In particular, Dynamic Asset Allocation methodologically de-risks a portfolio when gains occur and capital expenditure prefunding levels increase. Rule sets include:

- When investment gains are realized and capital expenditure prefunding levels increase over time, glidepath schedules call for automatic **de-risking** of asset allocations to a more conservative level.
- Once capital expenditure is 100% prefunded and the account is fully allocated, glidepath schedules call for automatic **re-risking** of asset allocations to a more aggressive level.

As a result, ALM studies can be used to create Dynamic Asset Allocation or glidepath schedules in order to plan for large future capital expenditures and dynamically change asset allocation before and after the date that the funds are due.

The accompanying chart presents a hypothetical Dynamic Asset Allocation schedule which requires alternating de-risking and re-risking schedules.

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**Conclusion**

The world of E&F investing is becoming more complex on both the asset and liability side of the ledger. The last twenty years have brought us unprecedented market volatility, economic crises, and ever increasing demand for E&F funding needs. An asset allocation strategy must reflect the realities of today. We believe a cash-flow centric ALM framework is a favorable alternative for E&F investors to align investment management decisions with their specific needs. On the asset side of the ledger, asset allocation models must be dynamic in nature and should provide insights on realistic ranges of outcomes as opposed to the limitations of simplified single rate of return assumptions.
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