The development of a strategic asset allocation (SAA) for long-horizon institutional investors like university endowments raises special challenges. These include supporting spending policies while ensuring the long-term sustainability of the endowment and establishing optimal exposure to illiquid investment strategies in the context of a diversified portfolio.

Large university endowments typically have significant exposure to illiquid asset classes. The exposure to illiquid asset classes impacts the portfolio’s overall liquidity profile and requires a comprehensive liquidity management approach to ensure...
liquidity needs can be met in a timely fashion. In addition, capital market conditions and asset prices change, resulting in a need to change asset allocation exposures and/or rebalance the portfolio to maintain a profile close to the strategic asset allocation. Derivatives are often used by institutions to manage liquidity needs and implement asset allocation changes. The cash-efficient nature of derivatives and their high levels of liquidity in many markets make them suitable tools for portfolio rebalancing, tactical exposure changes, and satisfying short-term liquidity needs—all while maintaining desired portfolio exposures.

This case study explores these issues from the perspective of a large university endowment undertaking a review of its asset allocation and then implementing proposed allocation changes and a tactical overlay program. Rebalancing needs for the endowment arise as market moves result in drift of the endowment’s asset allocation.

The case is divided into two major sections. The first section addresses issues relating to asset allocation and liquidity management. The case introduces a framework to support management of liquidity and cash needs in an orderly and timely manner while avoiding disruption to underlying managers and potentially capturing an illiquidity premium. Such concepts as time-to-cash tables and liquidity budgets are explored in detail. Aspects relating to rebalancing and maintaining a risk profile similar to the portfolio’s strategic asset allocation over time are also covered.

The second section explores the use of derivatives in portfolio construction from a tactical asset allocation (TAA) overlay and rebalancing perspective. The suitability of futures, total return swaps, and exchange-traded funds (ETFs) is discussed based on their characteristics, associated costs, and desired portfolio objectives. The case also presents a cost–benefit analysis of derivatives and cash markets for implementing rebalancing decisions.

BACKGROUND: LIQUIDITY MANAGEMENT

For an institutional investor, such as an endowment or a pension fund, liquidity management refers to the set of policies and practices that ensure the portfolio complies with investment policy yet can meet cash outflow needs in a timely and orderly manner without incurring excessive costs. Optimal liquidity management helps ensure that distressed sales of illiquid assets are avoided, especially in weak market conditions, and that the portfolio can benefit from the expected illiquidity premium associated with long-term private market allocations.

The importance of liquidity management was emphasized in the 2008 global financial crisis when many institutional investors with significant allocations to illiquid asset classes and regular cash outflow requirements struggled to meet these outflows. During this time, public markets experienced significant losses, liquidity conditions deteriorated, and distributions from many private market investments stopped. For many university endowments, another source of liquidity—donations—also dropped significantly, further amplifying liquidity issues. In some cases, endowments were forced to liquidate securities at steep discounts, drastically cut funding for some programs dependent on endowment distributions, and/or borrow funds collateralized by the endowment, increasing leverage and the risk profile of the portfolio.

Institutional investors have several important “tools” at their disposal to manage a portfolio’s liquidity risk. These include:

- liquidity profiling and time-to-cash tables,

---

1 In this context, ‘liquidity’ refers to the ability to exchange assets into cash for an expected value within a known time frame.
rebalancing and commitment strategies,
stress testing analyses, and
derivatives.

2.1 Liquidity Profiling and Time-to-Cash

For any investor, the assessment of liquidity needs starts with identifying potential cash inflows and cash outflows for a defined investment horizon. In the case of endowments, cash outflows include distributions to the university and meeting capital call requirements for illiquid investments (e.g., real assets, private equity, hedge funds, and structured products). Once the sources and uses of cash have been identified, the institutional investor establishes the need for liquidity and the desired liquidity maturity profile for the overall portfolio. As part of this process, a liquidity classification schedule (time-to-cash table) is created and an overall liquidity budget is defined.2

The liquidity classification schedule defines portfolio categories (or “buckets”) based on the estimated time it would take in the normal course of business to convert assets in that particular category into cash. The liquidity budget assigns portfolio weights considered acceptable to each liquidity classification in the time-to-cash table and establishes a liquidity benchmark for the portfolio construction process.

An example of a time-to-cash table is provided in Exhibit 1. It defines liquidity classifications based on the time expected to liquidate an investment without liquidation having a significant impact on market conditions and the resulting sale price for the investment. The impact on market conditions is based on the expected market price immediately before and after trading if the sell order was executed. In the case of investments managed by third-party managers, the time-to-cash also depends on the contractual terms governing the type of investment vehicle used. Typically, private investments requiring more than one year to exit are viewed as illiquid. In the case of hedge funds, contractual terms (e.g., lockups, notification periods, withdrawal windows) vary based on the manager and underlying strategy. A manager's ability to deny withdrawal requests during stress periods (“to activate gates”) to protect fund investors and prevent forced liquidations will impact time-to-cash.

<table>
<thead>
<tr>
<th>Time to Cash</th>
<th>Liquidity Classification</th>
<th>Liquidity Budget (% of portfolio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 Week</td>
<td>Highly Liquid</td>
<td>At Least 10%</td>
</tr>
<tr>
<td>&lt; 1 Quarter</td>
<td>Liquid</td>
<td>At Least 35%</td>
</tr>
<tr>
<td>&lt; 1 Year</td>
<td>Semi-Liquid</td>
<td>At Least 50%</td>
</tr>
<tr>
<td>&gt; 1 Year</td>
<td>Illiquid</td>
<td>Up to 50%</td>
</tr>
</tbody>
</table>

The granularity of a time-to-cash table may vary to include monthly or semi-annual categories depending on the investor’s liquidity preferences, liquidity needs, and other circumstances. The core principle is to identify liquidity categories relevant to the types of cash outflows the investor will face and to match overall portfolio characteristics with liquidity needs through the design of the resulting asset allocation. The next step is to define an overall liquidity budget specifying portfolio allocations for the different

2 See also Russell Investments (2013).
time-to-cash buckets (as shown in the last column of Exhibit 1).\textsuperscript{3} In the case of highly liquid, liquid, and semi-liquid categories, minimum portfolio weights are identified. For the illiquid category, a maximum portfolio weight is identified.

The liquidity budget reflects the acceptable liquidity requirements that the portfolio must meet, even in a liquidity stress scenario. The results of stress test analyses are therefore important inputs in developing the liquidity budget.

To operationalize the concepts represented in the liquidity budget, the institutional investor does an analysis of the underlying liquidity characteristics of the portfolio investments and monitors these characteristics over time. The analysis should look through the broad definition of asset classes to the underlying investments used for exposure. Different investments within the same asset class (such as public equities) may have very different liquidity profiles. Commingled funds (funds that are pooled and managed together in a single account) may be less liquid than exchange-traded funds (ETFs) or mutual funds and may have different liquidity profiles than separate accounts. Furthermore, there could be differences in the liquidity profile of similar investment vehicles in the same asset class depending on the underlying strategy used by the investment manager. For example, a commingled fund following a concentrated, small-cap active strategy in emerging market equities may offer investors only quarterly liquidity as compared to a commingled fund investing in large-cap emerging market equities, which may offer monthly or weekly liquidity. For these reasons, it is appropriate to conduct liquidity analysis on a bottom-up basis for each investment, aggregate at the portfolio level, and monitor changes over time to keep the portfolio within liquidity budget parameters. An example of liquidity profiling for a portfolio’s underlying investments is shown in Exhibit 2. The portfolio example uses investments in separate accounts, commingled funds, futures, ETFs, and active managers to achieve its asset class exposure to both public and private markets.

\textbf{Exhibit 2  Liquidity Profiling for a Portfolio}

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Asset Class Allocation (% of portfolio)</th>
<th>Investment Allocation (% of overall portfolio)</th>
<th>Investment Vehicle</th>
<th>Liquidity Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>1%</td>
<td>1%</td>
<td>Separate Account</td>
<td>100% 0% 0% 0%</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>14%</td>
<td>5%</td>
<td>Separate Account</td>
<td>100% 0% 0% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8%</td>
<td>Commingled Fund</td>
<td>100% 0% 0% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1%</td>
<td>Futures</td>
<td>100% 0% 0% 0%</td>
</tr>
<tr>
<td>Domestic Equity</td>
<td>17%</td>
<td>8%</td>
<td>Commingled Fund</td>
<td>0% 50% 50% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8%</td>
<td>Separate Account</td>
<td>0% 100% 0% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1%</td>
<td>Futures</td>
<td>100% 0% 0% 0%</td>
</tr>
<tr>
<td>International</td>
<td>10%</td>
<td>6%</td>
<td>Commingled Fund</td>
<td>0% 50% 30% 20%</td>
</tr>
<tr>
<td>Developed Equity</td>
<td></td>
<td>4%</td>
<td>Separate Account</td>
<td>0% 80% 20% 0%</td>
</tr>
</tbody>
</table>

\textsuperscript{3} Mercer (2015).
### Exhibit 2 (Continued)

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Asset Class Allocation (% of portfolio)</th>
<th>Investment Allocation (% of overall portfolio)</th>
<th>Investment Vehicle</th>
<th>Liquidity Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Highly Liquid</td>
</tr>
<tr>
<td>Emerging Market Equity</td>
<td>12%</td>
<td>9%</td>
<td>Commingled Fund</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3%</td>
<td>ETF</td>
<td>100%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>18%</td>
<td>18%</td>
<td>Funds 1–85</td>
<td>0%</td>
</tr>
<tr>
<td>Real Assets</td>
<td>13%</td>
<td>4%</td>
<td>Funds 1–8</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6%</td>
<td>Funds 9–33</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3%</td>
<td>Funds 34–50</td>
<td>0%</td>
</tr>
<tr>
<td>Diversifying Strategies</td>
<td>15%</td>
<td>4%</td>
<td>Funds 1–5</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6%</td>
<td>Funds 6–11</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>Funds 12–19</td>
<td>0%</td>
</tr>
<tr>
<td>Overall Portfolio</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td>19%</td>
</tr>
</tbody>
</table>

### 2.2 Rebalancing, Commitments

The discussion so far has focused on liquidity management and the ability of an institutional portfolio to meet cash outflows in an orderly manner as they come due. Another consideration is the impact of changes in the liquidity profile on the overall risk of the investment portfolio and the ability to keep the portfolio close to desired risk targets. Illiquid assets carry extremely high rebalancing costs. Because asset liquidity tends to decrease in times of market stress, it is important to have sufficient liquid assets and rebalancing mechanisms in place. This will ensure the portfolio’s risk profile remains within acceptable risk targets and does not “drift” as the relative valuations of different asset classes fluctuate during stress periods. Rebalancing mechanisms include the following:

**Systematic rebalancing policies.** Rebalancing disciplines, such as calendar rebalancing and percent-range rebalancing, are intended to control risk relative to the strategic asset allocation. In these cases, pre-specified tolerance bands for asset class weights are used. The size or width of the bands should consider the underlying volatility of each investment category to minimize transaction costs. This means more-volatile investment categories should usually have wider rebalancing bands. Transaction costs, correlations between asset classes, and investor risk tolerance are other factors that may influence the size of the band selected.

**Automatic adjustment mechanisms.** These are mechanisms designed to maintain a stable risk profile when exposure drifts from targeted exposure. An example is using adjustments to a public market allocation that is correlated to a private market allocation to rebalance private market risk. This approach uses liquid public assets as a proxy for illiquid private assets. For example, assume private equity investments have an equity beta of 1. In a situation where the allocation to private equity increases by 1% versus the target, the allocation to public equities would automatically be adjusted down by 1% to maintain a stable systematic market risk profile. Note, however, that although systematic market risk is unchanged, illiquidity risk of
the portfolio is now higher. Alternatively, the adjustment could be further refined to maintain a constant equity beta, assuming private equity has a beta to public equities of greater than 1 (caused by leverage, for example). Similar public market proxies can be used to represent private real estate, infrastructure, or other illiquid instruments based on their underlying risk characteristics.

Multi-year funding strategies for private markets that incorporate a steady pace of commitments to reach a target allocation and/or to keep the allocation close to target over time are other means to ensure the portfolio remains consistent with desired risk objectives. Private market funds pose specific challenges for investors in maintaining a desired exposure over time as investors do not control the pace at which committed capital is drawn or the pace at which capital distributions are returned. Although unpredictable at an individual fund level, these patterns become more predictable within a portfolio of private market investments.

The objective of a multi-year funding strategy is to design a commitment-pacing strategy that will result in the desired portfolio exposure to the asset class over time. The commitment-pacing strategy translates into an annual level of commitments and is typically the result of a cash flow modeling exercise that takes into account expectations about the speed at which committed capital is drawn, the pace of distributions, the evolution in overall asset size, as well as other circumstances specific to the investor. The cash flow modeling exercise would project forward the expected asset class exposure (as a percentage of the overall portfolio) at various commitment levels, thus reducing the risk of overshooting the target allocation. Scenario analysis should also be used to consider the impact of different market stress conditions. The evolution of the asset allocation must be monitored over time with adjustments to the commitment pace made as necessary.

### 2.3 Stress Testing

A robust liquidity framework ensures that liquidity needs can be met in a timely fashion during periods of normal market and stress market conditions. Understanding how the portfolio’s liquidity profile may change in addition to how the liquidity needs of the institution may change during stress periods is therefore critical. Comprehensive stress testing exercises would seek to “stress” (i.e., presume extremely adverse market conditions for) both assets and liabilities simultaneously to understand how these may be impacted during stress conditions. With respect to assets, the stress test can cover distributional assumptions regarding prices (e.g., volatility, return), correlations across assets, as well as liquidity characteristics. Liability shocks can also be factored in, for example, by increasing expected endowment distributions to support the university during the stress periods. The design of the stress tests can be informed by historical events (e.g., the 2008 crisis), statistical models (e.g., extreme value theory), and/or by scenario analysis (e.g., analyzing the potential impact of a hypothetical scenario with respect to a set of variables on the overall portfolio).

### 2.4 Derivatives

Derivatives can be used to manage cash outflow needs and changing risk exposures. The cash-efficient nature of derivatives makes them desirable tools for rebalancing. A futures overlay program allows an institutional investor to rebalance exposures to public asset classes (for example, on a monthly or quarterly basis) while leaving allocations...
to external active managers unchanged. Derivatives can also be used to modify a portfolio’s liquidity profile through the use of leverage—for example, using futures contracts (long futures position) to gain economic exposure to US equities and then deploying the cash that is not required for posting margin into other investments with different liquidity profiles or to satisfy short-term liquidity needs. Derivatives can also be used to generate additional cash by employing leverage at the overall portfolio level.

2.5 Earning an Illiquidity Premium

An attractive feature for investors in illiquid investments, such as private equity or private real estate, is the expectation of extracting an illiquidity premium in addition to premiums associated with underlying market risk factor exposures in an illiquid strategy. The illiquidity premium (also called the liquidity premium) is the expected compensation for the additional risk of tying up capital for a potentially uncertain time period. Quantitative estimates for the illiquidity premium suggest evidence of a positive illiquidity premium in private equity and private real estate and of illiquidity premium size being positively correlated to the length of the illiquidity horizon.5

An alternative approach for estimating the illiquidity risk premium is based on the idea that the size of the discount an investor should receive in return for committing capital for an uncertain period of time can be represented by the value of a put option with an exercise price equal to the marketable price of the illiquid asset at the time of purchase. (The “marketable price” is a hypothetical price at which the illiquid asset could be sold if it were freely traded; it can be estimated by various means.) In this case, the price of the illiquid asset can be derived by subtracting the put price from the marketable price of the asset. If both the marketable price and the illiquid asset price are estimated or known, then the expected return for each can be calculated, with the difference in expected returns representing the illiquidity premium (in %). This approach was initially developed by Chaffe (1993) and later improved upon by Staub and Diermeier (2003). They also find there should be a positive correlation between the length of the illiquidity horizon and the size of the illiquidity premium.

A significant body of literature documents a positive relationship between lack of liquidity and expected returns in the case of public equity. For example, Pastor and Stambaugh (2001) find that expected returns are impacted by systematic liquidity risk and estimate a 3% return over the 1996–2003 period in the US for a zero-net investment portfolio that holds low-liquidity stocks long and high-liquidity stocks short.

Overall, though, it is difficult to isolate the illiquidity premium with precision and separate its effects from such other risk factors as the market, value, and size in the case of equity investments. Furthermore, estimates of the illiquidity premium are based on broad market indexes, yet an investor in these asset classes would typically invest in only a small subset of the universe with the result that individual investment experience could be very different and more susceptible to idiosyncratic factors.6 These challenges further emphasize the importance of liquidity budgeting in facilitating capture of the illiquidity premium while controlling for risk.

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5 see also Green (2015).
Quadrivium University (QU) is an independent liberal arts college located in a vibrant mid-sized city with a growing and diverse population. The university was founded in 1916 by James Greaves and Colin Healey, two entrepreneurs with a passion for astronomy and mathematics who settled in the area in the early 1900s. Over time, the university has built an outstanding reputation as one of the top schools in the country. Consistent with the founders’ interests, the programs in astronomy and mathematics are highly regarded, attracting applicants from all over the world.

The Quadrivium University endowment was established in 1936 through a $15 million donation from Mr. Healey, with the goal of providing financial aid to new undergraduate students. A quarter of new students receive Healey grants, and this percentage has increased steadily over time.

QU has an endowment of $8 billion as of the current fiscal year, of which $6 billion represents funds used for general unrestricted support and unrestricted funds functioning as endowment. The remaining funds have various donor-specified use restrictions. Although a significant portion of the endowment’s growth has been from investment returns, the endowment also benefits from a strong and deep alumni network that provides regular donations and access to highly regarded industry contacts and money managers. Exhibit 3 shows the market value of the endowment over recent years, and Exhibit 4 shows the realized investment returns over the same period.
QU has an annual operating budget of $583 million, and 70% of the operating budget is used to fund salaries and benefits for faculty and administrative staff. In addition, the budget is used to pay down debt associated with a major upgrade of the main campus facilities, pay expenses associated with the maintenance of physical infrastructure, and fund various research and financial aid programs.

Annual distributions from the endowment provide funding for approximately 60% of the university’s operating budget, including its financial aid programs. In absolute dollar terms, the size of annual distributions has increased steadily in the last five years as the size of the endowment fund has grown. Similarly, the percentage of the operating budget covered by distributions from the endowment has increased. The board of the university has recently expressed a preference for a predictable pattern of distributions to allow for better planning of resource deployment through its programs. Consistent with that preference, the spending policy of the endowment was changed following the 2008 global financial crisis. Pre-crisis, the university used a simple spending rule: Spending equaled the long-term desired spending rate of 5% multiplied by the market value of the endowment at the beginning of the fiscal year. Post-crisis, the university changed its spending rule to a geometric smoothing rule, sometimes called the Yale formula.

The current spending rule is designed to produce a 5% long-term spending rate in a way that shields annual distributions from fluctuations in the endowment’s market value. The endowment uses a weighted-average formula of the previous year’s spending amount and the endowment’s market value at the end of the previous fiscal year multiplied by the long-term desired spending rate:

\[
\text{Spending for current fiscal year} = (66\% \times \text{Spending for previous fiscal year}) + 34\% \times (5\% \times \text{Endowment market value at the end of previous fiscal year})
\]

For QU, the previous fiscal year’s spending was $358.1 million, while the endowment’s market value at the end of the previous fiscal year was $7,002.3 million. In this case, QU’s spending for the current fiscal year would be:

\[
\text{Spending for current fiscal year} = (66\% \times $358.1 \text{ million}) + 34\% \times (5\% \times $7,002.3 \text{ million}) = $355.4 \text{ million.}
\]

Consistent with the spending policy, the endowment’s investment objective is to achieve long-term returns that support the spending rate while preserving the value of the endowment in real terms over time (thus safeguarding the long-term sustainability of the program). For QU, a 5% spending rate per year, combined with long-term expected inflation for colleges and universities of 2–3% per year, and expected
donations of 1% per year, translates into an 8–9% nominal return per year objective over the long term. QU’s associated risk objective is 12–14% annualized return volatility (standard deviation of portfolio returns must be between 12–14%).

3.1 Quadrivium University Investment Company (QUINCO)

Quadrivium University is overseen by a board of trustees (“the Trustees”), generally consisting of prominent, wealthy alumni who are elected to the position. QUINCO is the university investment office, which manages QU’s endowment. The office was established in 1993 at a time when endowment assets were $1 billion. From a governance perspective, the office is organizationally distinct from the university, although it is not a separate legal entity. The president of the investment office, Aaron Winter, reports to the university president and to the QUINCO board of directors (“the Board”). The Board is comprised of 11 members appointed by the Trustees. The president of QUINCO, the university president, and the treasurer of the university serve as ex-officio members. The QUINCO Board is responsible for approving investment policy and guidelines and providing guidance on key policy matters. Implementation of the investment policy has been fully delegated to QUINCO staff, who are empowered to make changes to the portfolio within the parameters of the investment guidelines.

QUINCO has 13 investment professionals who are university employees. The investment model is one where the investment strategy is implemented through external investment managers. The Board has consistently reaffirmed its view that such a model provides greater flexibility for changing investment portfolio exposures when circumstances warrant while reducing internal staffing needs compared to an in-house investment management model. Internal investment staff are focused on asset allocation, risk management, and selecting, monitoring, and terminating external investment managers.

The following five investment categories are part of the current asset allocation: fixed income, public equities, private equity, real assets (composed of primarily private real estate and natural resources), and diversifying strategies (primarily hedge fund strategies targeting high absolute returns with low correlations to traditional asset classes like public equity and fixed income). Alternative investments are considered to be private equity, real assets, and diversifying strategies. Private equity and real assets are recognized as illiquid (alternative) investments. The investment team is organized by investment category, with a senior portfolio manager leading each area and supported by an analyst. In addition, the team includes a portfolio strategist in charge of asset allocation and risk management, also supported by an analyst, and the president of the office who acts as the chief investment officer (CIO). Senior portfolio managers have primary responsibility for investment decisions within their investment category, while the portfolio strategist has responsibility for ongoing endowment rebalancing decisions, overlays, and tactical asset allocation tilts. All external investment manager decisions and tactical asset allocation deviations are discussed and approved by the internal investment committee. Winter chairs the committee, which includes all senior portfolio managers and the portfolio strategist. The QUINCO Board is responsible for granting final approval of external investment managers.

3.2 Investment Strategy: Background and Evolution

QUINCO has distinguished itself as a steady and progressive institutional investor with a focus on long-term objectives; it is unlikely to make abrupt wholesale changes to its investment strategy. This strategy is, in part, driven by leadership stability, with the office having had the same president (Winter’s predecessor) for the first 25 years
of existence. Another important factor has been an established culture focused on maintaining best-in-class investment practices and institutionalizing that knowledge through robust processes and systems.

For the first years of existence, the endowment invested only in public markets, mostly equities and bonds. In its early days, the belief was that the limited size and investment resources of the endowment would present challenges in accessing, monitoring and properly managing complex, nontraditional investment strategies. Since the mid-1990s, as the size of the endowment grew, the QUINCO Board has embraced the belief that exposure to nontraditional, or alternative, asset categories is beneficial for the long-term prospects of the endowment—enhancing investment risk diversification and providing potentially higher risk-adjusted returns in a greater variety of market environments. To express this belief, the Board has supported an increase in internal investment expertise, hiring seasoned investment professionals, and expanding QUINCO’s investment staff. Over the next two decades, the endowment portfolio increased its exposure to such alternative investments as private equity, real assets, and hedge funds.

These investments have performed well for the endowment; in particular, private equity and real assets were very strong contributors to the portfolio return over that period, in line with expectations. In aggregate, however, exposure to alternatives in the portfolio is still below the average exposure of other large university endowments that are considered by the Board to be the endowment’s relevant peer universe.

The evolution of the endowment’s asset allocation is shown in Exhibit 5.

| Exhibit 5  Evolution of the Strategic Asset Allocation |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|            | Evolution of Investment Policy Targets |
| Cash       | 1%   | 1%   | 1%   | 1%   | 1%   | 1%   | 1%   | 1%   |
| Fixed Income | 29% | 24% | 24% | 19% | 16% | 16% | 14% | 14% |
| Domestic Equity | 40% | 35% | 26% | 24% | 23% | 21% | 20% | 17% |
| International Developed Equity | 24% | 24% | 20% | 17% | 15% | 15% | 12% | 10% |
| Emerging Market Equity | 0% | 3% | 10% | 15% | 15% | 12% | 12% | 12% |
| Private Equity | 3% | 5% | 8% | 10% | 12% | 14% | 16% | 18% |
| Real Assets | 3% | 5% | 6% | 7% | 9% | 11% | 12% | 13% |
| Diversifying Strategies | 0% | 3% | 5% | 7% | 9% | 10% | 13% | 15% |

The QUINCO Board oversees a comprehensive strategic asset allocation review every three years. The last review of the asset allocation occurred two years ago, and at that time, the Board approved a continued increase to alternative investments at the expense of developed market equities (both domestic and international).

3.2.1 Current Scenario

Winter, a QU alumnus who joined QUINCO five years ago, took over the role of president and CIO last year. This is the first time he will be overseeing an asset allocation review. The endowment’s current asset allocation is shown in Exhibit 6.
Based on discussions with the Board, Winter asks his portfolio strategy team—consisting of team lead, Julia Thompson, her asset allocation analyst, and the senior portfolio managers for fixed income and public equities—to address the following considerations during the review process:

- The desired liquidity profile for the endowment and corresponding framework for liquidity management.
- The investment outlook and efficiency of the strategic asset allocation. A long period of falling interest rates and rising asset prices in the developed world drove most traditional listed asset classes to the upper bounds of historical valuation ranges, lowering future expected returns in these markets.
- The role of tactical asset allocation (TAA) in QU endowment’s investment strategy. Given the long-term nature of the strategic asset allocation, some Board members are wondering whether a tactical asset allocation program might improve risk-adjusted returns for the portfolio.
- Endowment underperformance relative to a peer universe of large endowments. Although the QU endowment had better returns than most of those institutions during the 2008 global financial crisis, the portfolio has largely underperformed its peers since then.

### 3.3 Strategic Asset Allocation

Thompson and the strategy team have completed their analysis, including the considerations raised by Winter and the Board, and are now ready to present to the Board. As part of their work, Thompson updated the long-term, forward-looking capital market assumptions used for the mean–variance optimization process and asset allocation recommendations.

In developing their long-term capital market assumptions, Thompson and the strategy team considered and applied unsmoothing (or de-smoothing) techniques. These techniques were applied to illiquid investments to remove the impact of positive serial correlation on risk estimates caused by stale market pricing. From experience, Thompson knows that the uncertainty of risk and return estimates for illiquid assets is
amplified by such aspects as infrequent trading, associated leverage, and long investment horizons. In attempting to estimate risk for illiquid assets, the team's challenges include the availability, quality/reliability, and frequency of pricing data. Thompson knows these issues would result in stale pricing or a smoother pattern of reported returns because of fewer data points with lower observed return volatility. If used as an input in their mean–variance optimization models without adjustment, the artificially low volatility would make illiquid asset classes appear more attractive, resulting in higher allocations to illiquids in the “optimal” portfolio. To prevent this, Thompson and her team applied unsmoothing techniques to better reflect the underlying risk of illiquid asset classes. After applying unsmoothing techniques to private equity, resulting volatility ends up being significantly higher than volatility that is observed or experienced for these assets. Exhibits 7 and 8 show these updated assumptions.

### Exhibit 7  Long-Term Expected Return (Net of Fees) and Volatility Assumptions

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Expected Real Return (annual geometric mean, next 10 years)</th>
<th>Expected Nominal Return (annual geometric mean, next 10 years)</th>
<th>Standard Deviation of Returns (annual)</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>0.9%</td>
<td>3.4%</td>
<td>1.7%</td>
<td></td>
</tr>
<tr>
<td>Fixed Income</td>
<td>1.8%</td>
<td>4.3%</td>
<td>6.3%</td>
<td>0.14</td>
</tr>
<tr>
<td>Domestic Equity</td>
<td>5.0%</td>
<td>7.6%</td>
<td>18.1%</td>
<td>0.23</td>
</tr>
<tr>
<td>International Developed Equity</td>
<td>4.8%</td>
<td>7.4%</td>
<td>19.7%</td>
<td>0.20</td>
</tr>
<tr>
<td>Emerging Market Equity</td>
<td>6.0%</td>
<td>8.7%</td>
<td>26.6%</td>
<td>0.19</td>
</tr>
<tr>
<td>Private Equity</td>
<td>8.5%</td>
<td>11.2%</td>
<td>24.0%</td>
<td>0.32</td>
</tr>
<tr>
<td>Real Assets</td>
<td>4.5%</td>
<td>7.1%</td>
<td>13.3%</td>
<td>0.27</td>
</tr>
<tr>
<td>Diversifying Strategies</td>
<td>4.0%</td>
<td>6.6%</td>
<td>10.0%</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*Note: Inflation assumed to be 2.5% p.a.*

### Exhibit 8  Forward-Looking Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Cash</th>
<th>Fixed Income</th>
<th>Domestic Equity</th>
<th>International Developed Equity</th>
<th>Emerging Market Equity</th>
<th>Private Equity</th>
<th>Real Assets</th>
<th>Diversifying Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Income</td>
<td>0.11</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Equity</td>
<td>0.03</td>
<td>0.13</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Developed Equity</td>
<td>0.02</td>
<td>0.14</td>
<td>0.91</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emerging Market Equity</td>
<td>0.04</td>
<td>(0.18)</td>
<td>0.69</td>
<td>0.71</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Private Equity   | 0.02 | (0.11) | 0.68 | 0.65 | 0.59 | 1.00 | (continued)
Analysis by Thompson and her team uncovered the main reasons for peer underperformance since the 2008 crisis: a lower risk profile of the portfolio and a lower allocation to illiquid investments, in particular, private equity. As such, an important change being proposed by Thompson and the team is an increase in exposure to private markets. The change would increase the private equity allocation from 18% to 23% and the real assets allocation from 13% to 16%. To accommodate both increases, the allocations to public equities and fixed income would decrease. The proposed target allocations are presented in Exhibit 9.

In terms of implementation, Thompson and her team expect that the transition to the higher target allocations in private equity and real assets will occur gradually over the next two to three years.

Optimization results in Exhibit 10 are based on the team’s assumptions (Exhibits 7 and 8) and show that a higher allocation to private equity and real assets would improve the expected long-term risk–return profile of the endowment. The team also includes the results of Monte Carlo simulations that show the probability of an erosion in longer term purchasing power. Thompson notes that the resulting risk profile measured by the volatility is consistent with quantitative guidelines developed for the endowment’s risk tolerance. Based on interaction with the Board, the risk tolerance has been specified as a volatility range of 12% to 14% based on long-term measures of risk.
When asked to justify the proposed strategic asset allocation (SAA), including the higher allocation to private markets, Thompson highlights the optimization results from Exhibit 10 to the Board, noting that the primary driver of the proposed asset allocation changes is the expected improvement in the portfolio’s long-term risk/return profile.

Thompson is aware the proposed asset allocation implies a small increase in the overall risk profile of the endowment as measured by the volatility of portfolio returns (13.2% for the proposed SAA versus 12.5% for the current portfolio). She believes that the increase in risk is justified by:

- lower return expectations for all asset classes relative to past expectations due to higher current valuations. This implies that a higher level of risk must be taken to achieve the same level of returns. At the time of the last review, the then-current SAA had an expected return of 5.3% in real terms, although now it is expected to generate a 5.0% real return going forward. Lower return expectations can only be compensated in part by efficiency improvements in the asset allocation. Although the proposed SAA is slightly more efficient (higher Sharpe Ratio of 0.01), this efficiency improvement alone is not enough to generate a 5.3% expected real return for the same level of short-term risk/volatility as the current SAA;

- a portfolio risk profile that is currently more conservative when compared to other endowment peers;

- a lower expected Sharpe ratio (expected risk–return profile) for fixed income (compared with recent history), suggesting a lower allocation to these strategies may be warranted; and

- Monte-Carlo simulations, suggesting that the proposed asset allocation has a higher probability of achieving the real return target over a 20-year horizon while better preserving the purchasing power of the endowment with the current spending policy of 5%.

---

**Exhibit 10  Proposed vs. Current SAA: Expected Risk/Return Properties**

<table>
<thead>
<tr>
<th>Portfolio Characteristic</th>
<th>Proposed SAA</th>
<th>Current SAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected nominal return (annual average, geometric, next 10 years)</td>
<td>7.8%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Expected real return (annual average, geometric, next 10 years)</td>
<td>5.3%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Standard deviation of returns (annual)</td>
<td>13.2%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.34</td>
<td>0.33</td>
</tr>
<tr>
<td>Probability of 25% erosion in purchasing power over 20 years with 5% spending rate</td>
<td>30%</td>
<td>35%</td>
</tr>
</tbody>
</table>

*Note: The probability of erosion in purchasing power was derived based on a Monte-Carlo simulation with a 20-year investment horizon, assuming expected return and volatility characteristics will be the same as for the next 10 years.*
IN-TEXT QUESTIONS:

1. Discuss arguments in favor of increasing the endowment’s allocation to illiquid investments.

2. Using additional information provided in Exhibit 10, and your knowledge of illiquid investments from prior curriculum content, justify Thompson’s proposed asset allocation and explain the trade-offs involved in terms of portfolio volatility.

Guideline Answers:

1. In general, for a long-horizon institutional investor, the ability to tolerate illiquidity creates an opportunity to improve portfolio diversification and expected returns as well as access a broader set of investment strategies. In mean–variance optimization models, the inclusion of illiquid assets in the eligible investment universe may shift the efficient frontier upwards, theoretically resulting in more-efficient investment portfolios (i.e., portfolios with a higher expected return for a given level of risk).

Thompson and her team believe the above to be true in the case of QU’s endowment. In addition, there are further arguments in favor of increasing the allocation to illiquidity risk. Thompson believes the specific circumstances of the endowment continue to support an increase in exposure to illiquid investments. To date, the team’s historical experience with illiquid investments has been positive with strong realized returns. The endowment has been building exposure to these strategies over the last two decades in a gradual manner. As a result, the illiquid portfolios are now well-established, mature, and well-diversified in terms of fund managers, strategies, and vintages.

At the same time, the long presence in the market and the ability to access QU alumni networks have helped the endowment develop a strong network of connections in the industry and gain access to best-in-class managers in these spaces—building a reputation as a well-informed, patient, and reliable long-term investor. As revealed in the case text, the QU endowment has a lower exposure to illiquid investments than most institutional investor peers with similar risk profiles and objectives. Analysis by Thompson and her team has identified this as one of the reasons for the QU endowment’s underperformance in recent years relative to peers.

Thompson and the strategy team should also examine whether the allocation to private equity and real assets is exposed to idiosyncratic risk factors. Avoiding large allocations to a small number of funds helps ensure that idiosyncratic risk factors are largely diversified away.

2. As Thompson highlights to the Board, the primary driver of the proposed asset allocation is the expected improvement in the portfolio’s long-term risk/return profile. The proposed SAA has a higher expected real return compared to the current SAA (5.3% vs. 5.0% in real terms) and a slightly higher Sharpe Ratio (0.34 vs. 0.33).

The proposed asset allocation also has a higher probability of achieving the endowment’s return target over the long-term. One way to get a better sense of this is through Monte Carlo simulations. For example, using such simulations, the team concludes that there is a 70% chance of maintaining at least 75% of purchasing power over a 20-year horizon for the proposed SAA versus a 65% chance for the current SAA, assuming a 5% spending rate.

There is an implicit trade-off in this case between the short-term risk measure (volatility) and the long-term risk represented by the probability of purchasing power erosion over a 20-year horizon.

Tradeoff 1: Portfolio volatility
Thompson has considered the increase in overall risk profile for the endowment (portfolio return volatility increases from 12.5% to 13.2%) and believes the increase to be justified.
Thompson believes future returns will be lower for all asset classes. Lower return expectations imply that a higher level of risk must be taken to achieve the same level of returns. Although the proposed SAA is slightly more efficient, as indicated by its higher Sharpe ratio, this improvement in portfolio efficiency is not sufficient to generate the 5.3% expected real return for the same level of short term risk/volatility as the current SAA. Optimization results also suggest that the proposed asset allocation has a higher probability of achieving the real return target while preserving the purchasing power of the endowment given the current 5% spending policy. Finally, Thompson also considers that QU’s portfolio risk profile is still currently more conservative than its peers.

**Tradeoff 2: Implementation costs**

Thompson and her team analyzed the costs associated with implementing the proposed portfolio allocation changes. Private equity and private real estate strategies typically have higher investment management fees and performance fees than fixed-income and public equity strategies. By using “net of fees” return assumptions, Thompson and her team incorporated the impact of higher expected investment management fees arising from higher allocations to more-illiquid investments.

Before concluding that the QU endowment should adjust its asset allocation to illiquid investments, Thompson should confirm that the resulting risk profile (return volatility of 13.2% and the probability of erosion in purchasing power shown in Exhibit 10) is consistent with the endowment’s risk tolerance (willingness and capacity to bear risk). Thompson also should confirm that with the increased allocation to illiquid investments, the resulting asset allocation remains consistent with the liquidity budget.

### 3.4 Liquidity Management

Given the increasing complexity in the investment portfolio and the university’s reliance on regular distributions from the endowment, QUINCO needs a robust framework for managing liquidity. During her time at QUINCO, Thompson has worked to enhance QUINCO’s overall liquidity management framework. This includes improving the tools used in that process and taking a comprehensive, enterprise-wide approach. Using her approach, the expected cash outflows and inflows for the endowment portfolio are modeled over various time horizons both under normal circumstances and in periods of severe market stress.

Thompson is concerned that the portfolio’s liquidity characteristics will deteriorate in periods of severe market stress. She believes a deterioration in liquidity could potentially occur for the following reasons:

- **Capital calls in private markets exceeding capital distributions.** This would increase the allocation to private markets in the overall portfolio.

- **Activation of gates.** Some investment vehicles that provide quarterly or annual liquidity, like hedge funds or real estate funds, have provisions in their investment prospectuses allowing the investment manager to refuse investor withdrawal requests (activate gates) during stress periods to protect remaining investors in the fund. The inability to withdraw from funds leads to a more illiquid profile overall.

- **The smoothing effect.** Investments in private markets tend to incorporate market valuations with a lag that leads to a relative increase in their portfolio weighting during periods of market stress and a relative decrease in the portfolio weighting of more liquid assets. This does not reduce the effective liquidity
of the portfolio in dollar terms, but it does impact the percentage of assets in the overall portfolio that could be used to satisfy liquidity needs in periods of market stress.

To address her concerns, Thompson asks her team for an analysis of the current and proposed QU portfolios under normal and stress market conditions. The team's analysis of each portfolio's liquidity profile is shown in Exhibits 11 and 12. Exhibit 11 shows the current QU portfolio under normal and stress conditions.

Exhibit 11  QU Endowment Liquidity Profile: Current Portfolio (Normal and Stress Conditions)

A. Liquidity Profile - Normal Conditions

B. Liquidity Profile - Stress Conditions

Exhibit 12 shows the proposed QU strategic asset allocation portfolio under normal and stress conditions.
Exhibit 12 QU Endowment Liquidity Profile: Proposed Strategic Asset Allocation (Normal and Stress Conditions)

A. Liquidity Profile - Normal Conditions

- Highly Liquid, 14%
- Liquid, 24%
- Semi-Liquid, 23%
- Illiquid, 39%

B. Liquidity Profile - Stress Conditions

- Highly Liquid, 11%
- Liquid, 25%
- Semi-Liquid, 21%
- Illiquid, 43%

IN-TEXT QUESTIONS:

1. Explain how current spending policy might affect liquidity needs in a market downturn.
2. Describe various tools that QUINCO might use to manage its portfolio liquidity risk.
3. What impact will the proposed asset allocation changes have on the endowment’s liquidity profile?
Guideline Answers:

1. The design of the spending rate policy incorporates a smoothing, countercyclical element leading to spending rates below 5% in a period of sustained strong investment returns but higher than 5% in a protracted weak return environment. This design of the spending rate policy exacerbates the endowment’s liquidity needs in severe market downturns.

2. Among the tools QUINCO could use are cash flow-forecasting and commitment-pacing models, liquidity budgets, and stress test analyses. To begin, Thompson estimates expected cash outflows and inflows. For cash outflows, Thompson projects distributions from the endowment to the university. These uses of cash can then be factored into the estimation of expected outflows and inflows through the spending rate policy in which the university seeks to spend, on average, 5% annually of the endowment while preserving the endowment’s purchasing power over time.

   For the private equity and real estate portfolios, Thompson and her team can use cash flow-forecasting models and commitment-pacing models to project the expected increase in the allocation to private markets. These help the team project cash outflows needed for future investment commitments (committed but undrawn capital calls) in private markets. These flows could become particularly relevant in stress periods when distributions from prior investments in those markets might cease as general partners find it difficult to exit investments (because of depressed valuations and lack of transaction activity). Future investment commitments are legal obligations of the endowment, so the staff needs to ensure capital calls are met because the general partner may accelerate capital calls as opportunities arise in depressed markets. Thompson and her team should ensure diversification across fund vintage years to avoid overexposure to particular parts of the economic cycle and should also follow a strategy that commits capital on a steady and regular basis to minimize the need to make large allocation changes (or adjustments) with associated transaction costs. Avoiding large allocations to very few funds will help minimize idiosyncratic portfolio risk.

   At the same time, cash inflows into the endowment from donors will likely drop significantly during stress periods, further increasing liquidity needs. Liquidating risk assets or high-beta assets after periods of negative return is often not desirable from a valuation standpoint when future returns may be expected to be more attractive, particularly following periods of sharp drawdowns. Given her experience with these markets, Thompson should recognize the need for the team’s approach to be flexible. Access to the top private market managers is often highly competitive, and opportunities to invest with these managers may not be available at times when the portfolio is making allocation increases.

   Incorporating this information, Thompson can develop a liquidity budget for the endowment like that shown in Exhibit 1, which specifies minimum acceptable liquidity targets based on the expected time needed to convert portfolio holdings to cash. The liquidity budget should be monitored by Thompson and her team on a regular basis as part of the liquidity management framework in place at QUINCO. Thompson and her team can also do an analysis of the portfolio’s current liquidity characteristics under normal market conditions, like that shown in Exhibit 2.

   Thompson and her team should continue to undertake regular stress tests (such as the liquidity profile analysis done by her team) using historical and hypothetical scenarios to estimate how much the liquidity profile of the portfolio could drift under certain assumptions and to assess whether the minimum liquidity budget is still satisfied. The analysis can also be used to inform the team’s asset allocation and implementation decisions for investment vehicles and strategies.
Compared to the liquidity profile of the current portfolio, the proposed asset allocation implies a shift toward more-illiquid investments, as shown in the following table:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Liquid</td>
<td>19</td>
<td>15</td>
<td>-4</td>
<td>14</td>
<td>-3</td>
<td>-5</td>
<td>-4</td>
</tr>
<tr>
<td>Liquid</td>
<td>26</td>
<td>26</td>
<td>0</td>
<td>24</td>
<td>25</td>
<td>1</td>
<td>-2</td>
</tr>
<tr>
<td>Semi-Liquid</td>
<td>22</td>
<td>20</td>
<td>-2</td>
<td>23</td>
<td>21</td>
<td>-2</td>
<td>1</td>
</tr>
<tr>
<td>Illiquid</td>
<td>33</td>
<td>39</td>
<td>6</td>
<td>39</td>
<td>43</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

As a result, there will be a reduction in the highly liquid and liquid categories in the endowment’s liquidity profile and a commensurate increase in the semi-liquid and illiquid categories under both normal and stress conditions. The proposed allocation results in an increase in the overall illiquidity profile because a higher percentage of the portfolio will be invested in private equity and private real estate, which are the most illiquid asset classes in the portfolio.

Thompson needs to ensure that even under stress conditions the proposed allocation continues to comply with the liquidity budgeting framework in place for the fund, which satisfies the various liquidity needs of the portfolio for both cash outflows and rebalancing. From an ongoing management perspective, and particularly at times when the liquidity profile of the proposed allocation is closer to the minimum thresholds set through the liquidity budget, Thompson and her team should plan to closely monitor the portfolio’s liquidity profile and stress test it periodically to make sure portfolio liquidity remains adequate.

Based on this analysis, the QUINCO Board approves the proposed changes to the asset allocation and instructs the team to proceed with implementation. These changes are also presented to the Quadrivium Trustees as part of the university treasurer’s financial report at the Trustees’ next regular meeting.

3.5 Asset Manager Selection

It is now three months later, and Winter, Thompson, and the rest of the QUINCO team have begun implementing changes to the strategic asset allocation by seeking additional external managers. Winter is very pleased with their progress to date but has encountered a somewhat interesting situation.

Among the firms responding to QUINCO’s request for proposal (RFP) seeking a new private equity manager is Genex Venture Capital (GVC). GVC is proposing that QUINCO invest in its new “GVC Fund II” offering. GVC is a US-based venture capital fund operating in the biotech space. GVC would be a new relationship for QUINCO. The firm has adopted the CFA Institute Asset Manager Code of Conduct for its employees. The founder and managing partner at GVC is Virginia Hall, CFA, a prominent alumna of Quadrivium University, elected to the university’s board of trustees three years ago. Hall has made several generous donations to the university over the years, and the building that houses the school’s student center and main dining facility is named in her honor. Both the university president and university treasurer
have urged Winter to favorably consider GVC’s proposal given Hall’s importance to the university. Winter has suspicions that Hall has contacted the president and treasurer to advocate for her company.

The investment committee narrows the competition for the allocation of QUINCO’s private market assets to GVC and Beacher Venture Investments (Beacher). Beacher is another venture capital investment firm operating in the same space and is a direct competitor to GVC.

Both GVC and Beacher are invited to make a presentation to QUINCO’s investment committee. GVC’s presentation is led by Jason Allen, one of Winter’s former colleagues from the endowment they both worked for previously. Allen has joined GVC as a managing director as part of GVC’s efforts to build the team in preparation for Fund II. Although Allen’s presentation on behalf of GVC is thorough and well-documented, Winter is troubled by two aspects. The presentation is targeted to QUINCO but clearly incorporates information that is based on or could only have come from the university treasurer’s non-public reports to the Quadrivium board of trustees or another university source. In addition, the performance presentation of GVC’s historical returns shows substantially higher returns than performance reported by third-party performance databases.

Of the two finalists, Beacher has a longer track record and is a more established name in the industry; however, there are some concerns over the historical performance of its previous fund. At the same time, some investment committee members have expressed reservations over GVC’s short track record. Given the overlap in sector and strategy between the two firms, the investment committee asks Bud Davis, a CFA charterholder and senior portfolio manager on QUINCO’s private equity team, to return with a formal proposal to invest in one of the firms.

Davis presents an update on the fundraising efforts of each firm’s fund and notes that GVC is facing challenges in raising the desired fund amount of $300 million for Fund II. Potential investors are apparently concerned with the significant increase in funding size of the fund (Fund I had raised $100 million) and question whether GVC has the infrastructure to scale operations.

Davis makes a strong case for investing with GVC, highlighting confidence in the manager and their differentiated approach to sourcing and growing portfolio companies in the biotech space. Davis tells the investment committee that because of the longer-than-expected fundraising period, GVC is eager to secure QU’s commitment for Fund II; as a result, Davis has negotiated a discount on GVC’s investment management fee. Following that discussion, the investment committee approves the recommendation from the team to invest with GVC.

After the decision is made to hire GVC, Winter calls Allen to tell him the good news and offer his congratulations. During the conversation, Allen expresses his satisfaction in having QUINCO as one of the fund’s investors and praises Davis’s strong commitment and drive. Allen goes on to mention that Davis’ spouse, Andrea, is Hall’s daughter. Winter expresses his surprise at this fact and later asks Davis about his wife’s relationship to Hall. Davis responds that he believes this information is common knowledge and that he thought Winter and members of the QUINCO investment committee knew this information.

IN-TEXT QUESTION:
What ethical considerations arise regarding the actions and conduct of individuals involved in manager selection?
Guideline Answer:

Aaron Winter, QUINCO CIO

Winter faces several ethical dilemmas in this case. The main issue is the disclosure of a potential conflict of interest, Standard of Professional Conduct VI(A), regarding the hiring of an external investment manager with close ties to the university. Winter's independence and objectivity, Standard of Professional Conduct I(B), in making the hiring recommendation could be compromised by the implicit and explicit pressure he is receiving to hire GVC. He should disclose this conflict to the QUINCO Board as part of the hiring recommendation. He should also disclose that the managing director for GVC is a former colleague; that relationship could also be perceived as impairing his independence and objectivity, creating a conflict of interest. During the presentation, it appears that GVC has based their proposal on confidential information, Standard of Professional Conduct III(E), about the university, potentially obtained by Hall through her role as a Quadrivium Trustee or others at the university. As an employee of the University and QUINCO, Winter should make them aware of the possible breach of confidentiality. He also apparently has questions about the accuracy of the performance information, Standards of Professional Conduct I(C) and III(D), presented by GVC but fails to exercise appropriate diligence, Standard of Professional Conduct V(A), by following up with GVC or investigating further to determine the veracity of the information.

Virginia Hall, CFA, Quadrivium University Trustee and Managing Partner at GVC

Virginia Hall has a conflict of interest, Standard of Professional Conduct VI(A), if she is pressuring university staff and QUINCO employees to influence the external manager hiring process in her company's favor. Hall's personal/business interests with GVC pose a potential conflict of interest with her duties as a Trustee of the university board. She has a duty as a board member to act in the best interest of the university without regard to how it may benefit her, but she has an incentive to pressure the university to hire her company. She would be violating her duty of loyalty, Standard of Professional Conduct IV(A), to the university as a Trustee by putting her firm, and therefore her personal interest, ahead of the interests of the university. She should disclose her potential conflict and recuse herself from any part in the external manager hiring process. In addition, she has potentially gone further by sharing confidential information, Standard of Professional Conduct III(E), she has received as a trustee with GVC in an effort to assist GVC's response and boost the prospects of her company in being hired—another violation of her duty of loyalty as a Trustee. GVC neglected to disclose the relationship of one employee's relative (Hall's daughter, who is Davis' spouse) with QUINCO.

Quadrivium University President/Quadrivium University Treasurer

The university president and treasurer, as members of the QUINCO Board, have a duty to act in the best interest, Standard of Professional Conduct IV(A), of the university by hiring the external investment managers most appropriate for managing the private equity portion of the university's endowment. In pressuring Winter to hire GVC, they are clearly letting the outside consideration of maintaining good relations with a Trustee influence their hiring decision. It is also possible they provided confidential information, Standard of Professional Conduct III(E), to Hall or GVC to assist their bid to become an investment manager for QUINCO. They should disclose their conflict, Standard of Professional Conduct VI(A), and recuse themselves from decisions where their independence and objectivity, Standard of Professional Conduct I(B), are compromised. The university president and treasurer should also have in place a due diligence questionnaire/RFP to raise questions to new managers about potential conflicts of interest.

Jason Allen, Managing Director at GVC

Winter has noticed a discrepancy between the performance history of GVC in the presentation made by Allen and the performance record of the company as reported elsewhere. It is possible that Allen is inadvertently using inaccurate information or, worse, knowingly misrepresenting the performance record, Standards of Professional Conduct I(C) and III(D), of GVC.
3.6 Tactical Asset Allocation

As part of the investment strategy review, the Board decided to significantly increase the active risk budget assigned to the QUINCO team for use in a new tactical asset allocation (TAA) program. QUINCO’s active risk budget measures the deviation of the endowment’s portfolio from its investment policy targets and is expressed as an annual tracking error limit. The Board increased QUINCO’s active risk budget from 100 bps to 250 bps to allow the team to pursue greater excess returns versus the strategic asset allocation. By taking active risk relative to investment policy benchmarks through external managers in public asset classes as well as TAA positions, the QUINCO team hopes to add additional portfolio performance.

The implementation of the tactical asset allocation program and associated risk budget was fully delegated to Winter and his staff. At that time, the Board also informed that up to 150 bps (of the 250 bps) active risk budget could be used to implement the TAA program. One consideration the Board discussed was the use of leverage. The TAA program implementation could result in a levered position of the endowment portfolio (because derivatives are likely to be used in implementation and not every overweight exposure would be offset by a corresponding underweight in another asset), so the Board agreed to permit a modest leverage position for the overall portfolio of up to 5% of the portfolio’s value.

Winter believes that the tactical asset allocation program will accommodate two types of active decisions:

- Overweight and underweight positions in one or more of the asset classes included in the investment policy portfolio.
- Provide exposure to asset classes and/or investment strategies outside the policy portfolio benchmark universe but compliant with the investment policy (e.g., high yield, emerging market, fixed income).

Winter began implementing the TAA program by building on a framework and research by Thompson and the asset allocation team that was informed by external parties (e.g., investment consultants, external tactical asset allocation managers, investment research houses). Using concepts of fair value and mean reversion in financial markets, fair value models were developed for various financial assets. To do this, the framework incorporated economic and financial data that had exhibited predictive power for future returns and risk over an investment horizon of one to three years. Current market pricing was then compared with output from the valuation models to determine whether the deviation from ‘fair value’ was large enough to be exploited in a cost-efficient manner.

In extensive out-of-sample backtests, the methodology had produced encouraging results. One of the strongest signals suggested that large-cap US equities, characterized broadly by the S&P 500 Index, were significantly below fair value with mean reversion expected over the next year. Based on this information, Thompson decides to implement a 1% overweight to US equities through a passive exposure.
Thompson is now considering three options to implement her decision: a total return swap, equity futures, and ETFs. Her goal is to implement the overweight position as effectively as possible from a cost and cash usage perspective. Thompson asks her team to look at the associated costs for each option.

The team’s cost comparison analysis is shown in Exhibit 13.

**Exhibit 13 Cost Comparison Assuming a Fully-Funded Mandate**

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>ETF</th>
<th>Futures</th>
<th>Total Return Swap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commission (round trip)</td>
<td>4.00</td>
<td>2.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Management fee (annual)</td>
<td>9.50</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bid/offer spread (round trip)</td>
<td>2.50</td>
<td>2.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Price impact (round trip)</td>
<td>15.00</td>
<td>10.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Mispricing (tracking error, annual)</td>
<td>4.00</td>
<td>8.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Cost to roll the futures contract</td>
<td>0.00</td>
<td>20.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Funding cost</td>
<td>0.00</td>
<td>0.00</td>
<td>40.00</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>35.00</strong></td>
<td><strong>42.00</strong></td>
<td><strong>51.00</strong></td>
</tr>
</tbody>
</table>

*Notes:* The exhibit shows the team’s cost comparison for the three implementation options—ETFs, futures, and total return swaps—for an $80 million notional exposure to the S&P 500 Index (assuming a fully funded mandate) over a one-year investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

The comparison assumes no leverage for the ETF and that the entire mandate amount ($80 million) is deposited to earn the 3-month Libor rate for futures and the total return swap as to offset the 3-month Libor component of the implied financing rate (or the funding cost in the case of the swap).

After closely examining the cost comparison analysis, Thompson debates the pros and cons of each option with her team.

From a cash ‘usage’ perspective, ETFs would be least efficient as she would need to finance the full notional value of the ETF or use the margin features of the account. Even when using the margin, regulations would limit the margin to 50% of account value, implying a maximum of two times the leverage ratio. For example, for an $80 million ETF exposure, the minimum margin that would have to be held in cash would be $40 million. Thompson knows that using futures and total return swaps could generate a similar economic exposure to ETFs with a much lower capital commitment.

From a liquidity perspective, Thompson likes ETFs and futures, which appear efficient given their liquid trading and narrow bid–ask spreads. She also values the flexibility they offer to terminate exposure before intended maturity should the team’s views on the market change. Thompson is concerned about the operational implications of holding futures because they require daily monitoring of margin requirements. In addition, she also worries about interest rate risk and exposure of QU to counterparty credit risk.

**IN-TEXT QUESTION:**

Assuming a fully-funded position (no use of leverage), which implementation option should Thompson choose for the 1% tactical overweight to US equities?
Guideline Answer:

Expected Costs. In the case of the ETF, the most significant cost component is price impact—the expected impact on market price from entering into (buying) and exiting out of (selling) the ETF position. This is estimated to be approximately 15 bps. The second largest cost component is the management fee charged by the ETF manager, which is expected to be 9.5 bps.

In the case of futures, the largest cost component is expected to be the cost to roll the futures contract on a quarterly basis (5 bps quarterly or 20 bps annual cost). This is driven by the upward-sloping (contango) shape of the yield curve. In addition to the futures roll cost and the price impact, another significant futures cost is the mispricing or tracking error of expected futures performance relative to the underlying index performance. Expected tracking error on the futures contracts is 8 bps.

Finally, for the total return swap, the cost is dominated by the funding cost, which is expected to be 40 bps.

From a total cost perspective, at 35 bps the ETF offers the most cost-efficient vehicle to implement the tactical overlay, with relatively tight bid–ask spreads that are similar to futures.

Other Considerations. ETFs and futures are typically standardized products that trade on exchanges. Total return swaps are over-the-counter contracts that are negotiated and customizable in such features as maturity, leverage, and cost. ETFs are the least cash-efficient option requiring the largest cash outlay, and Thompson would be able to gain similar economic exposure with futures and swaps using significantly less cash.

A position in futures contracts would need to be rolled over each quarter to maintain exposure. Given Thompson’s concerns about the operational requirements for futures and the need for daily monitoring for margin requirements, a position in futures is likely less desirable to Thompson. For ETFs, ongoing management of the exposure is done by the ETF manager.

Futures and ETFs have associated tracking error versus the index intended to be replicated. For ETFs, the tracking error may result from premiums and discounts to net asset value, cash drag, or regulatory diversification requirements. For futures, tracking error arises because of liquidity (supply/demand conditions), dividend forecast errors, and interest rate differentials. For total return swaps, the replication is exact; Thompson would receive the total return of the index without incurring any tracking error to the benchmark S&P 500 Index because the swap counterparty is obligated to provide the index return.

However, Thompson is concerned about interest rate risk in the case of futures and swaps. She is also concerned about the counterparty credit risk that QUINCO would be exposed to through a swap, which would additionally create complexities in managing net exposures over the duration of the contract.

To implement the tactical overlay given Thompson’s considerations, the ETF provides the most cost-efficient vehicle, with adequate liquidity and relatively tight bid–ask spreads. ETFs also provide Thompson with the flexibility (noted as being important to her) to modify exposure before the end of the one-year horizon should her and her team’s investment views change.

After considering with her team, Thompson believes implementing with ETFs appears to be the best option.

Later that day after further discussion, Thompson and the management team decide to implement the overlay using leverage. Thompson asks her team to complete a cost comparison analysis assuming a permissible leverage level of 4 times for all three options (meaning that cash needed to support the position would be 25% of the overlay notional amount). The team’s work is shown in Exhibit 14.

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7 Although in the case of the ETF the leverage at the instrument level may be regulated to not exceed 2 times (50% margin requirement), for the purposes of this exercise assume that the endowment can generate leverage at the plan level for ETF usage.
Exhibit 14   Additional Information with Respect to Impact of Leverage

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>ETF</th>
<th>Futures</th>
<th>Total Return Swap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of obtaining leverage</td>
<td>187.50</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Additional financing/funding cost</td>
<td>0.00</td>
<td>150.00</td>
<td>150.00</td>
</tr>
<tr>
<td>Total additional cost</td>
<td>187.50</td>
<td>150.00</td>
<td>150.00</td>
</tr>
</tbody>
</table>

Notes: The additional cost components assume 4 times leverage over a one-year investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

The team’s assumptions for the analysis are as follows:

- The borrowing cost of obtaining leverage in the case of the ETF is assumed to be 3-month Libor + 50 bps.
- The 3-month Libor assumption used is 2% (opportunity costs).
- The same Libor rate was used to calculate the additional implied financing cost in the case of futures and the additional funding cost for the total return swap.
- The analysis focuses on the implementation cost of trade and does not consider the additional return earned by investing the cash that is not needed to support the transaction (75% of the overlay notional amount).

IN-TEXT QUESTION:

Assuming a permissible leverage level of 4 times for all three options, and using the information in Exhibit 14, would Thompson change her decision?

Guideline Answer:

As shown in Exhibit 14, the additional information changes the total cost estimates for the different implementation options. In the case of ETFs, to generate 4 times leverage, 75% of the desired nominal exposure would have to be borrowed to provide an overall exposure 4 times higher than the original capital. That is, for a desired nominal exposure of $80 million, borrowing $60 million (75% of $80 million) provides 4 times leverage to an original capital amount of $20 million.

The additional cost of obtaining leverage for each option would be as follows:

1. ETFs. ($80 million x 0.75 x 2.5%) / $80 million = 1.875%.
2. Futures. ($80 million x 0.75 x 2%) / $80 million = 1.50%. The additional financing cost for futures in this case (compared to the unlevered option) would occur because 75% of the amount would not be invested in 3-month Libor to offset the financing cost, thus increasing the overall cost for the futures.
3. Swaps. ($80 million x 0.75 x 2%) / $80 million = 1.50%. The additional financing cost for swaps in this case (compared to the unlevered option) would occur because 75% of the amount would not be invested in 3-month Libor to offset the financing cost, thus increasing the overall cost for the swaps.

Total costs for each option (in bps):

<table>
<thead>
<tr>
<th>Unlevered</th>
<th>ETF</th>
<th>Futures</th>
<th>Total Return Swap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental cost</td>
<td>187.50</td>
<td>150.00</td>
<td>150.00</td>
</tr>
<tr>
<td>Total</td>
<td>222.50</td>
<td>192.00</td>
<td>201.00</td>
</tr>
</tbody>
</table>
Looking at the data, total costs for futures appear to be the lowest cost alternative (192 bps) followed by the total return swap (201 bps). Given a permissible leverage level of 4 times for all three options, and based on the data in Exhibit 14, ETFs now look to be the most expensive option (222.50 bps).

Given the difference in costs, Thompson would consider implementation through futures. The main consideration between the use of ETFs and futures not captured in the comparative pricing analysis is the additional complexity and operational monitoring associated with a quarterly futures roll. If Thompson and the team can get comfortable with that risk, implementation through futures would be the more efficient option.

Looking at the data, and based on their desire to use leverage, Thompson believes that futures offer the more efficient alternative. She decides to establish a 1% long position to the S&P 500 Index using S&P 500 futures.

### 3.7 Asset Allocation Rebalancing

Three months have passed since Thompson and the team implemented the tactical overweight position to US equities. To date, the position has been performing well and in line with *ex ante* expectations. Global equity markets have rallied, reflecting a favorable global growth environment, and fixed-income markets have sold off as interest rates rose significantly in anticipation of higher inflationary pressures. As a result, the asset allocation of the endowment has drifted from policy targets.

QUINCO follows a calendar quarter rebalancing policy with a rebalancing corridor for each asset class. The allocation drift of the actual portfolio relative to the SAA is monitored monthly; however, to minimize transaction costs, short of extraordinary market circumstances, rebalancing decisions are implemented at the end of each quarter. For public asset classes, systematic rebalancing occurs when the allocation to these assets is outside the rebalancing corridor at quarter end. When the allocation moves outside the corridor, Thompson and her team do have discretion to rebalance back to the target allocation or to the edge of the corridor.

For illiquid asset classes, given high transaction costs and practical challenges in rebalancing the allocation, rebalancing is normally undertaken through the reinvestment/commitment strategy as allocations approach the upper or lower edges of the corridor. In these cases, the pace of commitments could be altered from the expected pace to gradually shift the overall allocation to illiquid assets over time. The SAA, width of the rebalancing corridor, and the current allocation for the various asset classes are shown in Exhibit 15:

<table>
<thead>
<tr>
<th>Target Allocation (SAA)</th>
<th>Corridor</th>
<th>Min/Max Target</th>
<th>Current Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>1% ±1%</td>
<td>0%–2%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>9% ±3%</td>
<td>6%–12%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Domestic Equity</td>
<td>15% ±2.5</td>
<td>12.5%–17.5%</td>
<td>17.3%</td>
</tr>
<tr>
<td>International Developed Equity</td>
<td>9% ±2%</td>
<td>7%–11%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Emerging Market Equity</td>
<td>12% ±2%</td>
<td>10%–14%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Private Equity</td>
<td>23% ±5%</td>
<td>18%–28%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Real Assets</td>
<td>16% ±3%</td>
<td>13%–19%</td>
<td>13.8%</td>
</tr>
</tbody>
</table>
Thompson observes that the allocation to international developed equity (11.50%) now exceeds the upper end of its corridor (9.00% + 2.00% = 11.00%) by 0.50%, while the allocation to fixed income (6.50%) is below target (9.00%) but still within its rebalancing corridor (6.00%–12.00%).

Current allocations to private equity (19.20%) and real assets (13.80%) are close to the lower ends of their rebalancing corridors of 18.00%–28.00% and 13.00%–19.00%, respectively, as the team works to move toward the new targets approved by the Board in Exhibit 9 (in the very short term, these allocations cannot be increased).

Based on the information in Exhibit 15, Thompson sees a need to decrease the international developed equity allocation and increase the fixed-income allocation by the same amount. She meets with the team to discuss whether they should execute the rebalancing through the cash or derivatives market.

During the discussion, Thompson and her team consider the following factors: transaction costs, tracking error of the implementation vehicle versus the desired index exposure, tracking error implied by the current and post-rebalancing deviations from the target SAA weights, opportunity cost/impact to active strategies due to manager withdrawals and reallocations, implementation speed, and time horizon of the rebalancing trade.

Thompson knows that executing through the cash markets takes longer to implement than executing in the derivatives markets. Still, allocating to, or reallocating from, external managers may be warranted in certain cases, such as when the adjustments are viewed as more permanent and/or more significant in nature (as compared to smaller, more temporary adjustments that may be reversed within a shorter time frame if investment views change).

After meeting with her team, Thompson decides to rebalance back to the upper edge of the corridor (11.00%), by reallocating 0.50% (50 bps) from international developed equities to fixed income. The team’s cost analysis is shown in Exhibit 16.
### Exhibit 16 (Continued)

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Cash Market</th>
<th>Futures (Equity/Fixed Income)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of rolling the futures contract</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total cost</td>
<td>30.00</td>
<td>24.00</td>
</tr>
</tbody>
</table>

**Notes:** This exhibit shows the costs of reallocating 0.5% from international developed equities to fixed income in the cash and futures markets. The analysis assumes a 3-month (one quarter) investment horizon because the expectation is that the change in portfolio allocation is for a relatively short time period. Given the length of the investment horizon, no rolling of futures occurs. All numbers are in basis points (bps) unless otherwise indicated.

### IN-TEXT QUESTIONS:

1. **Using Exhibit 16,** analyze the relative costs of the cash market and derivatives approaches to rebalancing.

2. **Explain how considerations of implementation speed and time horizon of the rebalancing trade could affect the implementation choice.**

### Guideline Answers:

1. **Looking at the data in Exhibit 16,** Thompson can see that the two options appear similar from a cost perspective. The main cost driver associated with rebalancing through the cash market is cash drag (approximately 20 bps) caused by timing delays and disruptions to active manager portfolios. Rebalancing through cash markets would involve withdrawing funds from international developed equity active managers and increasing funds to current fixed-income managers and/or adding a new fixed-income manager. These activities would generate transaction costs and cash drag because the liquidation process for the equity manager(s) and the investment process for the fixed-income manager(s) would likely not happen simultaneously.

   In the case of derivatives (short equity futures position and long fixed-income futures position), the biggest cost component is mispricing or tracking error. Creating a short exposure position for the MSCI EAFE Index (the benchmark for international ex USA and Canada developed-market equities) and a long fixed-income futures position would involve a higher tracking error (17 bps) compared to the tracking error of using one S&P 500 futures contract discussed previously (8 bps). In this case, using multiple futures instruments increases associated tracking error.

2. **An additional factor is speed of implementation.** In general, depending on the availability of derivatives for the asset classes involved, rebalancing using derivatives is likely to result in a shorter implementation time frame while leaving the active managers in place. Given high levels of liquidity in the equity futures that would be used for MSCI EAFE Index replication, implementing with derivatives could occur quickly.

   Another important aspect is rebalancing size and expected time horizon of the trade. The larger the rebalancing, the more likely the rebalance would represent a more permanent re-alignment as opposed to a temporary adjustment that could be reversed the next quarter.

   Based on the expected costs and considerations and the relatively small size of the adjustment, using derivatives to rebalance the portfolio appears to be the best option. Implementing with derivatives gives the
team the flexibility to tactically adjust exposure to international developed equities if desired and the ability to quickly reverse decisions in full or in part while leaving the current external managers in place.

After further discussion with her team, Thompson decides to instead rebalance the international developed equity allocation back to the target allocation by reallocating 2.5% from the international developed equity allocation into fixed income. The team’s current analysis is shown in Exhibit 17.

### Exhibit 17  Cost Information on Rebalancing Options

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Cash Market</th>
<th>Futures (Equity/Fixed Income)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bid/offer spread</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Price impact (total trades)</td>
<td>5.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Mispricing (tracking error, annual)</td>
<td>0.00</td>
<td>68.00</td>
</tr>
<tr>
<td>Cash drag (impact of timing delays and disruptions to active manager portfolios)</td>
<td>50.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Cost of rolling the futures contract</td>
<td>0.00</td>
<td>6.00</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>60.00</strong></td>
<td><strong>82.00</strong></td>
</tr>
</tbody>
</table>

**Notes:** This exhibit shows the costs of reallocating 2.5% from international developed equities to fixed income in the cash and futures markets. The analysis assumes a one-year investment horizon because the expectation is that the change in portfolio allocation is more permanent. Under normal market conditions, it would not be expected for these asset classes to move outside of the corridor again over that investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

**IN-TEXT QUESTION:**

What implementation option should Thompson use in this case?

**Guideline Answer:**

Based on relative expected costs, Thompson would likely decide to rebalance the portfolio in the cash markets by reallocating between international developed equity and fixed-income investment managers.

Exhibit 17 shows that the cost of rebalancing back to target allocation using derivatives is higher than implementing through the cash markets. Specifically, the implementation cost with derivatives is 82 bps, while the implementation cost for the cash markets is 60 bps. The higher derivatives cost is primarily caused by expected tracking error of the replication using derivatives, which is 68 bps on an annual basis. In general, the cost of rebalancing through futures is expected to increase with investment time horizon as mispricing or tracking risk increases. In this case, the impact of the cost of rolling the futures is not viewed as material given that the roll of the short equity futures position would likely offset most of the cost of holding the long fixed-income futures position. With respect to the cash market implementation, given the size of the rebalancing trade (2.5% of the overall portfolio), potential cash drag is expected to increase to 50 bps as compared to the previous scenario.
Other considerations besides expected cost may be relevant. A faster desired speed of implementation would favor implementation using derivatives, while the size of the planned rebalancing implies a longer time horizon for the trade and favors implementation through the cash market. Based on the facts given, Thompson would likely decide to rebalance the portfolio in the cash markets.

SUMMARY

The QU endowment case study covers important aspects of institutional portfolio management involving the illiquidity premium capture, liquidity management, asset allocation, and the use of derivatives versus the cash market for tactical asset allocation and portfolio rebalancing. In addition, the case examines potential ethical violations in manager selection that can arise in the course of business.

From an asset allocation perspective, the case highlights potential risk and rewards associated with increasing exposure to illiquidity risk through investments like private equity and private real estate. Although this exposure is expected to generate higher returns and more-efficient portfolios in the long-run, significant uncertainties are involved both from a modeling and implementation perspective.

REFERENCES


