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CASE STUDY:
A Paradigm Shift – The AI-Driven Outsourced Investment Office (OCIO)
Plus, Lumenai vs. Alpha Nasdaq OCIO Indexes

October 2024

A Paradigm Shift – The AI-Driven Outsourced Investment Office

Empowering Professional Investors with AI-Driven Investment Strategies

Executive Summary

The traditional outsourced Chief Investment Officer (OCIO) model, while historically effective, is increasingly challenged by the demands of modern markets. OCIOs typically employ static asset allocation strategies and rely on third-party manager selection, which not only incurs additional fees but often lacks the transparency and flexibility needed to adapt to fast-changing market conditions. In contrast, AI-driven investment solutions can provide a more dynamic, cost-effective, transparent and efficient approach.

This white paper explores how AI enhances investment management, potentially offering a superior alternative to the traditional OCIO model by improving adaptability, precision, and cost efficiency. It also addresses the challenges AI overcomes in portfolio management and how it can be leveraged to create a customized and self-adapting OCIO portfolio that aligns with an investor's goals and values.

Lumenai AI Portfolios vs. OCIO Indexes

Performance Evaluation of Lumenai's GO vs. Alpha Nasdaq OCIO Indexes
Date: As of June 30, 2024
Prepared by: Lumenai Investments LLC

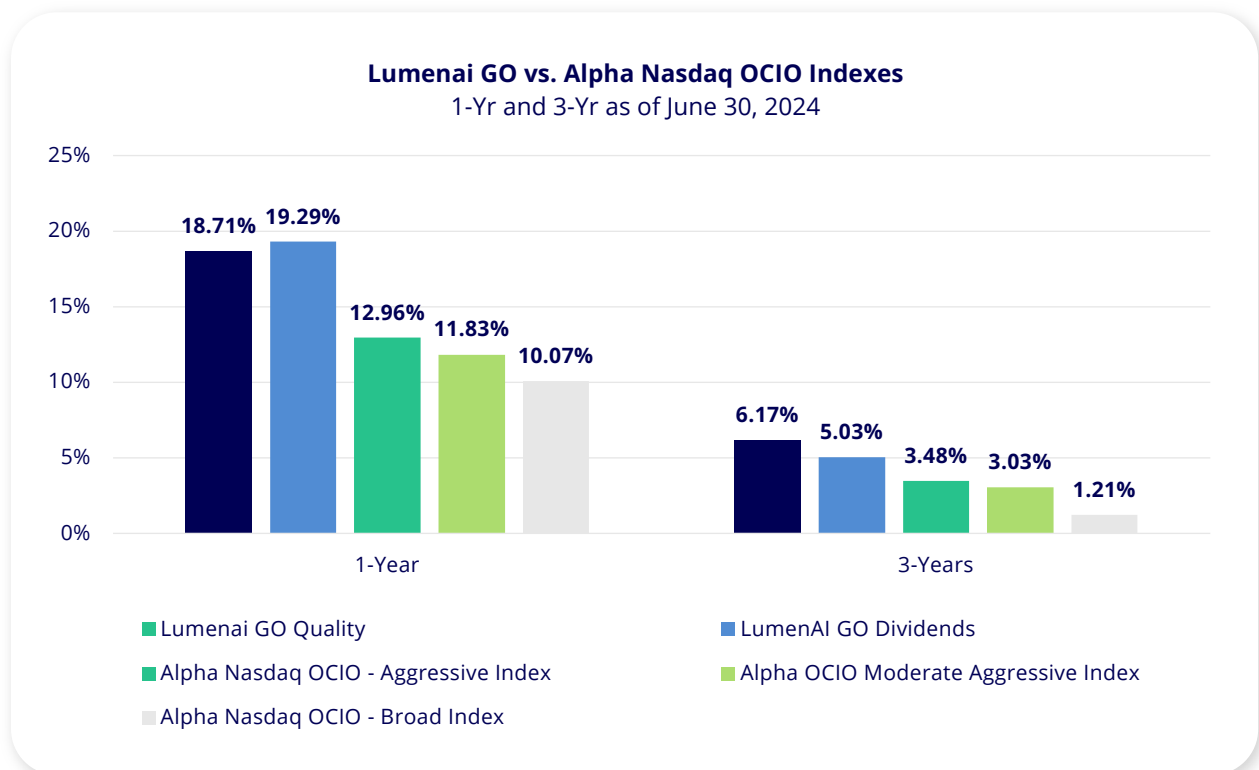### A Performance Review Versus the Alpha Nasdaq OCIO Indexes

This evaluation provides a comparative analysis of Lumenai's OCIO strategies—GO Quality and GO Dividends—against the Alpha Nasdaq OCIO Broad, Aggressive, and Moderately Aggressive indexes. These OCIO indexes capture the performance of the top 50 OCIO firms in the United States. The analysis focuses on performance and other relevant metrics for the period ending June 30, 2024. All results are net of fees, estimated, and subject to change.

Comparative Analysis

1. Performance

The GO Quality and GO Dividends portfolios have outperformed the Alpha Nasdaq OCIO indexes – Broad, Aggressive, and Moderately Aggressive - of the top fifty OCIO advisors in the United States on both a 1-year and 3-year basis.

Lumenai GO vs. Alpha Nasdaq OCIO Indexes
1-Yr and 3-Yr as of June 30, 2024

Legend:
- Lumenai GO Quality
- LumenAI GO Dividends
- Alpha Nasdaq OCIO - Aggressive Index
- Alpha OCIO Moderate Aggressive Index
- Alpha Nasdaq OCIO - Broad Index

Source: Lumenai estimates, net of fees, subject to change. Alpha Nasdaq OCIO Indexes: Alpha Nasdaq OCIO Indices - Alpha Capital Management (alphacapitalmgmt.com)

- Over the 1-year period, both Lumenai strategies generated outperformance, with GO Quality delivering a +18.7% return and GO Dividends providing a +19.3% return, surpassing their respective benchmarks and the Alpha Nasdaq OCIO Indexes.

- Over the 3-year period, both Lumenai strategies again generated outperformance, with GO Quality delivering a 6.2% annualized return and GO Dividends providing a 5.0% annualized return, versus 3.5% to 1.2% returns the Alpha Nasdaq OCIO Indexes.

Conclusion

Lumenai's OCIO strategies, GO Quality and GO Dividends, have outperformed their respective benchmarks and the Alpha Nasdaq OCIO Indexes across 1-year and 3-year timeframes, offering attractive risk-adjusted returns for sophisticated investors. The alpha generation and risk management of these strategies reinforce their potential as investment options within the OCIO space.

Comparing an AI-Driven OCIO to Traditional OCIOs

1. The Traditional OCIO Model: Structure and Limitations

Traditional outsourced chief investment officer (OCIO) services have long provided value to institutional investors, family offices, and high-net-worth individuals by handling portfolio construction, asset allocation, and manager selection. These services often aim to provide:

- **Strategic Asset Allocation:** Constructing a portfolio using historical asset correlations and expected long-term performance to balance risk and return.

- **Manager Selection:** Hiring specialized external managers across asset classes (equities, fixed income, alternatives) to optimize diversification.

- **Risk Management and Reporting:** Monitoring risk levels and providing regular reporting to ensure portfolios remain within set mandates and regulatory standards [10†source] [11†source]

However, the limitations of this model have become more apparent, particularly in volatile or rapidly changing market environments:

- **Static Allocations:** Traditional OCIOs typically rely on asset allocations that do not adjust frequently, limiting their ability to capitalize on emerging opportunities or quickly respond to market risks. This lag often results in missed alpha opportunities.

- **Additional Fee Layers:** Incorporating multiple external managers introduces an additional layer of fees—OCIO management fees plus the fees of underlying managers—which can significantly impact net returns.

- **Opaque Exposures:** Many managers and hedge funds offer limited, delayed, or no transparency into their holdings and risks, making it difficult for OCIOs to actively manage risk.

- **Illiquidity:** Many managers, especially hedge funds and private equity, limit liquidity via lockups, gates, and side pockets, potentially limiting your ability to rebalance and manage risk, and access needed capital.

- **Over-reliance on History:** Traditional OCIO approaches are often slow to adapt, relying heavily on historical data and performance correlations that may no longer be relevant as market conditions evolve [11†source]

2. AI-Driven OCIO: A Paradigm Shift

Artificial Intelligence (AI) represents a paradigm shift in investment management, offering a dynamic, data-driven, and efficient alternative to the traditional OCIO model. AI's ability to process vast amounts of daily data enables the construction of adaptable, personalized portfolios that can minimize costs while maximizing returns. By leveraging AI, investors can create their own OCIO portfolios tailored to their needs without the inefficiencies of static allocations, opaque risks, or additional fee layers.

AI-Enhanced Asset Allocation

Unlike traditional models that use historical asset correlations, AI systems analyze daily data to construct portfolios dynamically, optimizing allocation based on current market conditions. This approach offers several key benefits:

- **Real-Time Adaptability:** AI-driven models can adjust allocations swiftly based on an analysis of various data sources, including economic indicators, price trends, and even alternative data like social sentiment and geopolitical news. This enables portfolios to quickly shift into defensive assets (e.g., Treasury bonds or cash) during market downturns or pivot into higher-growth sectors when opportunities arise [12†source]

- **Precision Beyond Historical Correlations:** While traditional models depend on static historical relationships that may not persist, AI algorithms employ pattern recognition and machine learning to anticipate market movements and identify correlations as they emerge. This proactive approach allows portfolios to capture alpha in ways that are often missed by static allocation strategies.

AI-Driven Stock and Sector Selection

Traditional OCIOs often rely on a network of external managers to select securities, introducing both complexity and additional fees. In contrast, AI-driven models streamline this process:

- **Automated Security Selection:** AI algorithms evaluate individual securities and sectors based on a comprehensive analysis of fundamental, technical, and alternative data points. This allows the system to rank stocks and sectors according to their potential for outperformance, dynamically building portfolios that are not only diversified but also optimized for current conditions [12†source]

- **Reduced Cost Structure:** By eliminating the need for multiple layers of due diligence and manager fees, AI-driven portfolios provide a cost-efficient alternative. AI systems manage the entire process from stock selection to risk management, reducing operational overhead and allowing for more of the returns to be passed on to investors.

3. Challenges Solved by AI in Investment Management

AI technology addresses several challenges inherent in traditional OCIO models, particularly those related to adaptability, precision, and operational efficiency.

Overcoming the Limitations of Static Models

Traditional models rely on fixed asset allocations, making it difficult for them to react quickly to new market information or shifts. AI-driven portfolios are built to adapt:

- **Continuous Monitoring and Adjustment:** AI systems continuously monitor market conditions and recalibrate portfolios in real-time, ensuring that allocations remain aligned with market realities rather than static historical assumptions. For instance, if AI detects increasing volatility, it can automatically shift allocations to safer assets, protecting capital during market stress [11†source]

- **Active Alpha Generation:** AI focuses on real-time data analysis to generate alpha. By identifying trends as they develop, AI can dynamically overweight high-potential sectors or stocks and underweight or exit positions that exhibit risk factors.

Efficiency in Portfolio Management

AI's automation capabilities significantly improve the efficiency of portfolio management, addressing a major pain point for traditional OCIO models:

- **Reduced Time and Costs:** The AI-driven process automates many time-intensive tasks such as security selection, risk management, and compliance monitoring. This reduces the need for large investment teams and multiple third-party managers, cutting operational costs and improving net returns [12†source]

- **Scalability:** AI platforms scale easily, allowing investment offices to manage multiple portfolios with varying strategies simultaneously, without the complexity and resource requirements associated with traditional models. This scalability is crucial for sophisticated investors looking to manage bespoke portfolios efficiently.

4. AI-Driven OCIO: Advantages Over Traditional Approaches

While traditional OCIO models focus on diversification and long-term planning, AI-driven OCIO solutions provide a more proactive and cost-efficient approach that offers several advantages:

- **Enhanced Adaptability:** AI enables rapid adjustments in asset allocation, making portfolios more resilient to market shifts. Traditional OCIOs, with their slower, manual adjustment processes, may miss critical windows of opportunity [12†source]

- **Higher Cost Efficiency:** By eliminating the need for multiple layers of management fees, AI-driven solutions pass more returns directly to the investor. This streamlined approach is particularly advantageous for high-net-worth individuals and institutions seeking to maximize net returns [11†source]

- **Data-Driven Insights:** AI models continuously incorporate new data sources—including alternative and augmented data like social media sentiment and real-time macroeconomic indicators—providing a more comprehensive market view than traditional models that rely heavily on historical data [12†source]

- **Precision in Risk Management:** AI systems actively monitor for changes in market volatility and other risk factors, allowing portfolios to react immediately to adverse events. This contrasts with the often slower, reactive approach of traditional OCIOs, which may be constrained by rigid policy guidelines or periodic rebalancing schedules.

5. Challenges of Implementing AI in Investment Management

While AI offers numerous advantages, there are also challenges associated with its use:

- **Data Dependency: AI's** effectiveness is directly tied to the quality and timeliness of its data inputs. If data is inaccurate, incomplete, or delayed, it may result in suboptimal portfolio adjustments. To mitigate this, Lumenai's AI-driven portfolios utilize high-quality, cleaned, and verified data sources, ensuring the reliability of their models [12†source]

- **Complexity and Transparency:** Some investors may find AI-driven strategies less transparent compared to traditional OCIO models. Lumenai addresses this by providing detailed reporting and performance monitoring, allowing investors to see the portfolio, its holdings, adjustments, and risk metrics [12†source]

Conclusion: The Future of Investment Management with AI

We believe the AI-driven OCIO model represents a superior alternative to traditional outsourced investment offices. By leveraging advanced technology, AI can offer more dynamic, efficient, transparent, and cost-effective solutions that align closely with investor objectives while providing the flexibility to adapt to rapidly changing market conditions. As markets become more data-intensive and complex, we believe AI-driven strategies are poised to deliver superior risk-adjusted returns, enabling sophisticated investors and institutions to create their own OCIO portfolios with confidence and precision.

For more information on Lumenai and its AI-powered investment solutions, visit **Lumenai.net.**

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The NASDAQ Composite Total Return is a stock market index that includes almost all stocks listed on the Nasdaq stock Exchange. The 60% MSCI World / 40% Barclays Aggregate Blend, or 60/40, assumes a 60% percent investment in the MSCI World Index and a 40% investment in Bloomberg Barclays US Aggregate Index. The 70% MSCI All Country World Index / 30% Bloomberg Barclays Aggregate Index, or 70/30, assumes a 70% investments in the MSCI All Country World Index and a 40% investment in the Bloomberg Barclays US Aggregate Index. The 50% DJ Dividend / 50% Barclays Aggregate, or 50/50, assumes a 50% percent investment in the DJ Dividend Index and a 50% investment in Bloomberg Barclays US Aggregate Index. The S&P 500 is a market-capitalization-weighted index of 500 leading publicly traded companies in the U.S. The MSCI All Country World Price Index is a stock index that tracks nearly 3,000 stocks in 47 developed and emerging market countries. The Eurostoxx 50 is a blue-chip index designed to represent the 50 largest companies in the eurozone. The Ibex 35 is a benchmark for the BME Spanish Exchange of the 35 most liquid stocks traded on the Spanish stock market.

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Alpha - Alpha is a measure of the active return on an investment, the performance of that investment compared with a suitable market index. An alpha of 1% means the investment's return on investment over a selected period of time was 1% better than the market during that same period; a negative alpha means the investment underperformed the market. Alpha, along with beta, is one of two key coefficients in the capital asset pricing model (CAPM) used in Modern Portfolio Theory (MPT) and is closely related to other important quantities such as standard deviation, R-squared, and

the Sharpe Ratio. Alpha is a measure of investing skill or the "uniqueness" of ones returns – and is therefore very valuable to investors.

Annualized Return - An annualized rate of return is calculated as the equivalent annual return an investor receives over a given period.

Artificial Intelligence (AI) - Artificial intelligence (AI) refers to the simulation of human intelligence by software-coded heuristics. Nowadays this code is prevalent in everything from cloud-based, enterprise applications to consumer apps and even embedded firmware. The year 2022 brought AI into the mainstream through widespread familiarity with applications of Generative Pre-Training Transformer. The most popular application is OpenAI's ChatGPT. The widespread fascination with ChatGPT made it synonymous with AI in the minds of most consumers. However, it represents only a small portion of the ways that AI technology is being used today. The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal. A subset of artificial intelligence is machine learning (ML), which refers to the concept that computer programs can automatically learn from and adapt to new data without being assisted by humans. Deep learning techniques enable this automatic learning through the absorption of huge amounts of unstructured data such as text, images, or video.

Beta – In finance, the beta (β or beta coefficient) of an investment is a measure of the risk arising from exposure to general market movements as opposed to idiosyncratic factors. The market portfolio of all investable assets has a beta of exactly 1. A beta below 1 can indicate either an investment with lower volatility than the market, or a volatile investment whose price movements are not highly correlated with the market. An example of the first is a treasury bill: the price does not fluctuate significantly, so it has a low beta. An example of the second is gold. The price of gold fluctuates significantly, but not in the same direction or at the same time as the market. A beta greater than 1 generally means that the asset both is volatile and tends to move up and down with the market. An example is a stock in a big technology company.

Barclays Aggregate or Bloomberg Barclays US Aggregate - The Bloomberg Barclays US Aggregate Bond Index is a broad-based flagship benchmark that measures the investment grade, US dollar-denominated, fixed-rate, taxable bond market. The index includes Treasuries, government-related and corporate securities, fixed-rate agency MBS, ABS, and CMBS (agency and non-agency). The US Aggregate Index was created in 1986, with history backfilled to January 1, 1976.

Correlation – In statistics, correlation or dependence is any statistical relationship, whether causal or not, between two random variables. In the broadest sense correlation is any statistical association, though it commonly refers to the degree to which a pair of variables are linearly related. Familiar examples of dependent phenomena include the correlation between the physical statures of parents and their offspring, and the correlation between the price of a good and the quantity the consumers are willing to purchase, as it is depicted in the so-called demand curve. Correlations are useful because they can indicate a predictive relationship that can be exploited in practice. For example, an electrical utility may produce less power on a mild day based on the correlation between electricity demand and weather.

Drawdown or Maximum Drawdown - A drawdown is the measure of the decline from a historical peak in some variable (typically the total equity of a portfolio, fund, or a security), from its peak to its trough. The Maximum Drawdown is the largest drawdown a portfolio or fund experiences, from its high to low.

Excess Return – Excess returns are returns achieved above and beyond the return of a benchmark or proxy. Some of the most basic return comparisons include a riskless rate and benchmarks with similar levels of risk to the investment being analyzed.

iShares TBonds 1-3yrs – The iShares 1-3 Year Treasury Bond ETF (ticker "SHY") seeks to track the investment results of an index composed of U.S. Treasury bonds with remaining maturities between one and three years.

Maximum Drawdown – See Drawdown, above.

Machine Learning (ML) - Machine learning is the concept that a computer program can learn and adapt to new data without human intervention. Machine learning is a field of artificial intelligence (AI) that keeps a computer's built-in algorithms current regardless of changes in the worldwide economy.

MSCI ACWI Index is a commonly-used free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed and emerging markets. The MSCI ACWI consists of 46 country indexes comprising 23 developed and 23 emerging market country indexes. The developed market country indexes include: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States. The emerging market country indexes include: Brazil, China, India, Indonesia, Korea, Malaysia, Mexico, Poland, Russia, South Africa, Taiwan, Thailand, Turkey and UAE.

Nasdaq Composite – The NASDAQ Composite is a stock market index that includes almost all stocks listed on the Nasdaq stock exchange. Along with the Dow Jones Industrial Average and S&P 500, it is one of the three most-followed stock market indices in the United States. The composition of the NASDAQ Composite is heavily weighted towards companies in the information technology sector.

Nasdaq-100 Index - The Nasdaq-100 Index is a "modified capitalization-weighted" index designed to track the performance of the 100 largest and most actively traded non- financial domestic and international securities listed on The Nasdaq Stock Market. To be included in the Index, a stock must have a minimum average daily trading volume of 100,000 shares. Generally, companies on the Index also must have traded on Nasdaq, or been listed on another major exchange, for at least two years.

Quantitative Finance - Quantitative finance, also known as mathematical finance or simply "quant", is a field of mathematics, concerned with mathematical modelling of financial markets.

R-Squared - R2 is the proportion of the variance in the dependent variable that is predictable from the independent variable(s). It provides a measure of how well observed outcomes are replicated by the model, based on the proportion of total variation of outcomes explained by the model. So, if the R2 of a model is 0.50, then approximately half of the observed variation can be explained by the model's inputs.

S&P 500 Index - The Standard & Poor's 500 Index is a capitalization-weighted index of 500 stocks intended to be a representative sample of leading companies in leading industries within the U.S. economy. The S&P 500 Index features 500 leading U.S. publicly traded companies, with a primary emphasis on market capitalization. The S&P 500 Index was launched in 1957 by the credit rating agency Standard and Poor's. The S&P is a float-weighted index, meaning the market capitalizations of the companies in the index are adjusted by the number of shares available for public trading. Because of its depth and diversity, the S&P 500 is widely considered one of the best gauges of large U.S. stocks, and even the entire equities market. You can't directly invest in the S&P 500 because it's an index, but you can invest in one of the many funds that use it as a benchmark, tracking its composition and performance.

Sharpe Ratio – In finance, the Sharpe ratio measures the performance of an investment (e.g., a security or portfolio) compared to a risk-free asset, after adjusting for its risk. It measures the risk-adjusted returns of an investment. It is defined as the difference between the returns of the investment and the risk-free return, divided by the standard deviation of the investment (i.e., its volatility). It represents the additional amount of return that an investor receives per unit of increase in risk. It was named after William F. Sharpe, who developed it in 1966.

Sortino Ratio - The Sortino ratio is a variation of the Sharpe ratio that differentiates harmful volatility from total overall volatility by using the asset's standard deviation of negative portfolio returns—downside deviation—instead of the total standard deviation of portfolio returns. Because the Sortino ratio focuses only on the negative deviation of a portfolio's returns from the mean, it is thought to give a better view of a portfolio's risk-adjusted performance since positive volatility is a benefit. The Sortino ratio is a useful way for investors, analysts, and portfolio managers to evaluate an investment's return for a given level of bad risk.

Standard Deviation – In finance, standard deviation is often used as a measure of the risk associated with price-fluctuations of a given asset (stocks, bonds, property, etc.), or the risk of a portfolio of assets (actively managed mutual funds, index mutual funds, or ETFs). Risk is an important factor in determining how to efficiently manage a portfolio of investments because it determines the variation in returns on the asset and/or portfolio and gives investors a mathematical basis for investment decisions. The fundamental concept of risk is that as it increases, the expected return on an investment should increase as well, an increase known as the risk premium. In other words, investors should expect a higher return on an investment when that investment carries a higher level of risk or uncertainty. When evaluating investments, investors should estimate both the expected return and the uncertainty of future returns. Standard deviation provides a quantified estimate of the uncertainty of future returns.

Total Net Return - Total net return or cumulative net return, when measuring performance, is the actual rate of return of an investment or a pool of investments after fees since the inception of the investment. Total return accounts for two categories of return: income including interest paid by fixed-income investments, distributions, or dividends and capital appreciation, representing the change in the market price of an asset.

VaR 95% - Value at risk (VaR) is a statistic that tries to quantify the extent of 95% of the possible financial losses within a firm, portfolio, or position over a specific time frame. Its a way to estimate the risk of potential losses for an investment in most conditions.

Volatility – Volatility is a statistical measure of the dispersion of returns for a given security or market index. In most cases, the higher the volatility, the riskier the security. Volatility is often measured by the standard deviation of returns of a security or market index.