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Table of Contents

- Global Tactical Asset Allocation (GTAA) Strategy
  - Multi-asset multi-country universe
  - Methodology

- Modeling
  - Factors
  - Portfolio construction
  - Results analysis

- Summary
GTAA Strategy

- Strategy Overview
  - Multi-factor based, relative value model across asset classes and countries
  - Capital allocation to generate alpha from deviations from the equilibrium
  - Systematic approach based on fundamental and technical information
Investment Universe and Model Structure

- Core Universe:
  - 7 countries: US, JP, DE, UK, AU, CA, CH
  - 3 asset classes: government bonds, stock indices, and FX

- 5 Sub-Models:
  - Within each country, across asset classes
  - Within each asset class, across countries

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**Modeling**

- **Modeling Process**
  - Data collection/update
  - Calculate factors
  - Generate views
  - Implementation
Stock-Stock Model: Factor Definition

- **Valuation:**
  - Earning yield (E/P ratio) as a valuation proxy
  - Prefer relatively cheap stock market

- **Growth:**
  - Earning revision \((\text{Up} - \text{Down})/(\text{Up + Down})\) as a country equity growth factor
  - Favor countries that have more upward revisions than the opposite

- **Momentum:**
  - Performance between \((-8M, -2M)\)
  - Prefer the market with positive price momentum and avoid potential near-term price reversal

- **FX Impact:**
  - Weaker currency helps export and earning growth
  - Favor stock market with recently depreciating currency
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Views Generation

- Blend 77 views to create expected returns on 20 assets:

- Discretionary views can be added

<table>
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<th>Security 2</th>
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<th>Forecast Error</th>
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Bayesian Blending of Views

- Automatically tilt expected returns towards views with higher confidence levels

The conditional expected return of each asset $^*$:

$$E(R) = [(\bar{\Sigma})^{-1} + P^T \Omega^{-1} P]^{-1} \cdot [(\bar{\Sigma})^{-1} \Pi + P^T \Omega^{-1} V]$$

- If views were 100% certain, 
  $\Omega^{-1} \rightarrow \text{Inf.}, \ E(R) \ become \ the \ views$
- If views were extremely uncertain, 
  $\Omega^{-1} \rightarrow 0, \ E(R) = \Pi$

- $E(R)$: Expected returns of each asset
- $\Sigma$: Covariance of returns
- $P, V$: View expression – $P \cdot E(R) = V$
- $\Omega$: Covariance of views
- $\Pi$: Equilibrium return / Market return vector

Portfolio Construction

- **Portfolio Optimization:**
  - Combine mean-variance optimization with investor constraints
  - Variance/covariance matrix: DCC (Dynamic Conditional Correlation) model

- **Investor Constraints:**
  - Net market exposure (Market Neutral vs. Directional)
  - Gross market exposure (Leverage)
  - Single asset bounds

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Development Environment

- Toolbox
  - Financial Toolbox
  - Database Toolbox
  - Econometrics Toolbox
  - Statistics Toolbox
  - Optimization Toolbox

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Performance Analyses

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<td>7.0%</td>
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<td>19.6%</td>
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<td>18.4%</td>
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<td>Std.</td>
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<td>7.9%</td>
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<td>Sharpe</td>
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<td>0.75</td>
<td>1.72</td>
<td>(0.42)</td>
<td>(1.72)</td>
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<td>0.06</td>
<td>0.43</td>
<td>(0.30)</td>
<td>(0.57)</td>
<td>1.33</td>
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</table>

Note: Unconstrained. 5-10% target volatility. No transaction costs.

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Correlation with Major Assets

**Equity**

- GTAA: 0.35
- MXWO: 0.22
- GlbAgg: 1

**Correlation**

<table>
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<th>GTAA</th>
<th>MXWO</th>
<th>GlbAgg</th>
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<tr>
<td>GlbAgg</td>
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</table>

*Note: Based on monthly returns between 1997 and 2012*

Past performance is not indicative of future results. Total return assumes the reinvestment of income.

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GTAA Summary

- Uncorrelated alpha product
  - Provide a source of alpha diversification

- Active quantitative investment strategy
  - Seek alpha across borders and across asset classes

- Long term tested performance
  - Target Sharpe Ratio

- Style scorecard

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The following is an example of the effect of compounded advisory fees over a period of time on the value of a client’s portfolio: A portfolio with a beginning value of $100 million, gaining an annual return of 10% per annum would grow to $259 million after 10 years, assuming no fees have been paid out. Conversely, a portfolio with a beginning value of $100 million, gaining an annual return of 10% per annum, but paying a fee of 1% per annum, would only grow to $235 million after 10 years. The annualized returns over the 10 year time period are 10.00% (gross of fees) and 8.91% (net of fees). If the fee in the above example was 0.25% per annum, the portfolio would grow to $253 million after 10 years and return 9.73% net of fees. The fees were calculated on a monthly basis, which shows the maximum effect of compounding.

3-month Libor USD and HFRIMI Index are used as benchmark in this material. 3-month Libor USD is 3-month London Interbank Offered Rate for US dollar. HFRIMI Index tracks performance of investment managers which trade using a broad range of strategies in which the investment process is predicted on movements in underlying economic variables and the impact these have on equity, fixed income, hard currency and commodity markets. For more information please visit:

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