MSCI ANNUAL CONFERENCE ON
GLOBAL INVESTING AND
RISK MANAGEMENT
WORKSHOP

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One America Square
London, UK
CONSTRUCTING AND ANALYSING MULTI-ASSET CLASS PORTFOLIOS

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#MSCIconf
Overview of the wealth management Investment problem

Analytic framework for portfolio construction

Quantitative Portfolio construction workflow
  – Creating Discretionary portfolios
    • Measure drift of discretionary portfolios from benchmarks & model portfolios
    • Impact of market scenarios
    • Understand the drivers of Risk and Return
  – Create Advisory portfolios (FX Hedging and Alternative investing)
    • Understand the drivers of Risk and Return

Communicate investment outcomes and decisions with forward looking views of the market
In a complex supply chain, we focus on the following aspects:

- Strategy Formulation
- Product selection
- Risk Management
WEALTH MANAGEMENT INVESTMENT MODEL

Invest

Customize

Investor Relationship

Discretionary Portfolio
- Portfolio Construction
- Optimization
- Reporting

Advisory Portfolio
- Hedging
- Return Drivers

Portfolio Review
- Reporting on Custom portfolio
- Goals/Return Requirements

CLIENT GOALS
CONSTRUCT & EVALUATE MODEL PORTFOLIOS
WEALTH MANAGEMENT INVESTMENT

Invest
- Model Portfolio
  - Portfolio Construction
  - Optimization
- Reporting

Goal setting
- Custom Client Portfolio
  - Hedging
  - Return Drivers

Investor Relationship
- Portfolio Review
  - Reporting on Custom portfolio
  - Goals/Return Requirements
INVESTOR PERSONA: EUROPEAN WEALTH MANAGER

Type of Institution
• Long only wealth manager

Benchmark and peer group analysis
• Benchmark invests across the same asset classes, modelled with MSCI and 3rd party indices

Investment Principles/Guidelines
• Focus on multi-asset strategies
• Minimal active risk
• Avoid excessive issuer concentration

Investment Perspective-
• Do not take large bets on EM issuers, CTAs and hedge Funds
• Stay simple. Maintain reduced exposure to optionality (e.g. callables, step-ups, fixed-to-float).
INVESTOR STRATEGY

Use Case: Construct Multi-asset Class Model Portfolios

**Investment Insights**
- Political uncertainty (Brexit, US Elections)
- Policy uncertainty (Rate hikes, Populism, Protectionsim)
- Geopolitical uncertainty
- Exchange rate volatility

**Strategy Overview**
- Construct Global multi-asset class portfolios using ETFs and Mutual Funds
- Implemented via risk minimization framework

**MSCI Tools Utilized**
- Multi-asset class Risk model
- Performance Attribution
- Portfolio Optimizer
- Historical Stress Testing
- Macroeconomic Stress testing
STEPS IN PORTFOLIO CONSTRUCTION

• What asset classes should you include?
  • Equity, Fixed Income, Cash, Real Estate and FX derivatives

• How to represent the asset classes?
  • Mutual funds & ETFs

• How to select the Mutual funds and ETFs?

• How to generate detailed Exposures for Mutual funds and ETFs?

• How to make risk-return trade-offs?

• How to define Risk-levels?
CREATING AN ASSET UNIVERSE

What is my Investable Universe?

**Screen** universe of more than 270,000 natively covered mutual funds and 1,400 equity ETFs

**Filter** the mutual funds by regional focus and investment style

Within each investment style group **remove** highly correlated pairs

Final universe of 45 funds and ETFs

Next Step: Use the universe to create portfolios with different risk profiles
How do I model the active risk exposures of mutual funds without transparency about the underlying holdings?

- **The Barra Fund Model**: enhancing traditional returns-based style analysis
  - Users can incorporate all information available with confidence level (e.g. sector, style, asset allocation)

*Next Step: construct model portfolios by minimizing active risk*
How do I determine the risk - return tradeoff of my multi asset class model portfolios?

- **BarraOne Optimizer** is developed in-house resulting from over two decades of dedicated research
- Takes advantage of the special structure of *multi-factor risk* models employed by many portfolio managers
- Incorporates proprietary solvers with innovative, high-quality heuristic techniques to certain ill-behaved, complex portfolio optimization problems

**Next Step: Construct model portfolios with different risk profiles**
# DISCRETIONARY MODEL PORTFOLIOS

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Risk Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Risk</td>
</tr>
<tr>
<td>Equity</td>
<td>25%</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>60%</td>
</tr>
<tr>
<td>Liquidity/Cash and Cash Equivalents</td>
<td></td>
</tr>
</tbody>
</table>

- Domestic Equity limited to **40%** of equity investment
- Corporate Investment Grade to **50%** of Fixed Income investment

**Next Step:** execute the allocation strategy over the period: April 2016 through March 2017
PORTFOLIO CONSTRUCTION WORKFLOW

Initial Implementation

Cash (10 Billion Euros) → Optimization → Initial Model Portfolio (April 1 2016)

Starting Portfolio per risk profile: High, Medium and Low risk

Roll Forward and Optimize Quarterly

Trailing 1 year history for ex post analysis is accumulated

Rebalance Process
How stable are my allocations?

Rebalance dates

Equity Monthly Weight (%)  Fixed Income Monthly Weight (%)  Liquidity Monthly Weight
RISK AND RETURN ANALYSIS
ANALYZE AND EVALUATE THE PERFORMANCE OF THE MODEL PORTFOLIOS

Can I align the sources of risk with drivers of portfolio return?

INTEGRATED RISK AND PERFORMANCE ANALYSIS ACROSS ASSETS

Next Step: compare ex ante active risk with asset allocation strategy
# RISK ATTRIBUTION Aligned with Asset Allocation

## Model Portfolio

<table>
<thead>
<tr>
<th>Model Portfolio</th>
<th>Ex-Ante Tracking Error</th>
<th>Equity contribution</th>
<th>Fixed Income contribution</th>
<th>Liquidity Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk Profile</td>
<td>2.00</td>
<td>25%</td>
<td>73%</td>
<td>2%</td>
</tr>
<tr>
<td>Medium Risk Profile</td>
<td>2.72</td>
<td>61%</td>
<td>41%</td>
<td>-2%</td>
</tr>
<tr>
<td>High Risk Profile</td>
<td>5.10</td>
<td>75%</td>
<td>27%</td>
<td>-2%</td>
</tr>
</tbody>
</table>
Has my allocation strategy paid off?

**Cumulative Returns**

- High Risk Return (%)
- Medium Risk Return (%)
- Low Risk Return (%)

**Ex-Post Stats**

- Portfolio Volatility (%)
- Tracking Error (%)
- Maximum Drawdown (%)
- Information Ratio

Low Risk  | Medium Risk  | High Risk
# Return Attribution Aligned with Risk

Are my risk drivers contributing to portfolio return?

## Analysis Name

<table>
<thead>
<tr>
<th>Model Portfolio</th>
<th>Ex ante Tracking Error (%)</th>
<th>Equity contribution (%)</th>
<th>Fixed Income contribution (%)</th>
<th>Liquidity Contribution (%)</th>
<th>Equity return (%)</th>
<th>Fixed income return (%)</th>
<th>Liquidity return (%)</th>
<th>Active Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk Profile</td>
<td>2.00</td>
<td>25%</td>
<td>73%</td>
<td>2%</td>
<td>-0.66</td>
<td>-1.58</td>
<td>-0.21</td>
<td>-2.45</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>2.72</td>
<td>61%</td>
<td>41%</td>
<td>-2%</td>
<td>1.42</td>
<td>-0.98</td>
<td>-0.20</td>
<td>0.23</td>
</tr>
<tr>
<td>High Risk Profile</td>
<td>5.10</td>
<td>75%</td>
<td>27%</td>
<td>-2%</td>
<td>4.2</td>
<td>-0.18</td>
<td>-0.20</td>
<td>3.83</td>
</tr>
</tbody>
</table>

## Analysis Name

<table>
<thead>
<tr>
<th>Analysis Name</th>
<th>Ex post Tracking Error (%)</th>
<th>Equity return (%)</th>
<th>Fixed income return (%)</th>
<th>Liquidity return (%)</th>
<th>Active Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>1.82</td>
<td>-0.66</td>
<td>-1.58</td>
<td>-0.21</td>
<td>-2.45</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>1.97</td>
<td>1.42</td>
<td>-0.98</td>
<td>-0.20</td>
<td>0.23</td>
</tr>
<tr>
<td>High Risk</td>
<td>3.45</td>
<td>4.2</td>
<td>-0.18</td>
<td>-0.20</td>
<td>3.83</td>
</tr>
</tbody>
</table>
Are my risk drivers contributing to portfolio return?

<table>
<thead>
<tr>
<th>Medium risk: Performance Attribution</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Base Return</td>
<td>9.16%</td>
</tr>
<tr>
<td>Benchmark Base Return</td>
<td>8.93%</td>
</tr>
<tr>
<td>Active Model Base Return</td>
<td>0.23%</td>
</tr>
<tr>
<td><strong>Active Currency Return</strong></td>
<td><strong>-1.47%</strong></td>
</tr>
<tr>
<td>Active Local Return</td>
<td>1.70%</td>
</tr>
<tr>
<td><strong>Allocation</strong></td>
<td><strong>1.89%</strong></td>
</tr>
<tr>
<td>Selection</td>
<td>-0.19%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medium Risk: Risk Attribution</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Risk</td>
<td>6.79</td>
</tr>
<tr>
<td>Benchmark Risk</td>
<td>5.29</td>
</tr>
<tr>
<td>Active Risk</td>
<td>2.72</td>
</tr>
<tr>
<td>Active Currency Risk Contribution</td>
<td>0.44</td>
</tr>
<tr>
<td>Active Local Market Risk Contribution</td>
<td>2.29</td>
</tr>
<tr>
<td><strong>Allocation Risk Contribution</strong></td>
<td><strong>1.36</strong></td>
</tr>
<tr>
<td>Selection Risk Contribution</td>
<td>0.92</td>
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</table>

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equities</td>
<td>1.04</td>
</tr>
<tr>
<td>Fixed Income</td>
<td>-1.23</td>
</tr>
<tr>
<td>Liquidity</td>
<td>0.0</td>
</tr>
</tbody>
</table>
How can we enhance the performance of the model portfolio?
How can we hedge the currency exposures of my portfolio?
CREATE DISCRETIONARY CLIENT PORTFOLIOS
CLIENT SPECIFIC CUSTOMIZATION

Invest

Customize

Investor Relationship

Model Portfolio
- Portfolio Construction Optimization
- Reporting

Custom Portfolio
- Currency Hedging
- Alternatives

Portfolio Review
- Reporting on Custom portfolio
- Goals/Return Requirements

CLIENT GOALS
CURRENCY OVERLAY

Use Case: Client wants to remove currency exposures from the model portfolios.

- Medium Risk Portfolio
  - Trailing 1 year history for ex post analysis is accumulated
  - Identify - top currency risk contributors
  - Optimization: Min Risk by constructing a currency overlay strategy
  - Rebalance Quarterly

Trailing 1 year history for ex post analysis is accumulated
Identify - top currency risk contributors
Optimization: Min Risk by constructing a currency overlay strategy
Rebalance Quarterly
EX ANTE RISK COMPARISON: **RISK DELTA ANALYSIS**

### Risk Source Summary

<table>
<thead>
<tr>
<th>Risk Source</th>
<th>Active Risk with Overlay</th>
<th>Active Risk without overlay</th>
<th>Active Risk Change</th>
<th>Active Exposure</th>
<th>Active Volatility</th>
<th>Active Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Risk</td>
<td>2.46</td>
<td>2.72</td>
<td>-0.27</td>
<td>-0.26</td>
<td>0.02</td>
<td>-0.03</td>
</tr>
<tr>
<td>Local Market Risk</td>
<td>2.46</td>
<td>2.29</td>
<td>0.17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
</tr>
<tr>
<td>Currency Risk</td>
<td>0.00</td>
<td>0.44</td>
<td>-0.44</td>
<td>-0.26</td>
<td>0.02</td>
<td>-0.20</td>
</tr>
</tbody>
</table>

*Note: The green checkmark indicates a positive change.*

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**Currency Risk**

- **Active Risk with Overlay**: 0.00
- **Active Risk without Overlay**: 0.44
- **Active Risk Change**: -0.44
- **Active Exposure**: -0.26
- **Active Volatility**: 0.02
- **Active Correlation**: -0.20

**Medium Risk with Overlay**

- **Active Risk with Overlay**: 2.46
- **Active Risk without Overlay**: 2.72

**Medium Risk without Overlay**

- **Active Risk with Overlay**: 0.44
- **Active Risk without Overlay**: 2.72

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*Source: MSCI*
CURRENCY OVERLAY PORTFOLIO RETURN ATTRIBUTION

Active Base Return
+1.8% / 0.23%

Active Local Return
1.72% / 1.70%

Equity
2.32% / 2.3%

Fixed Income
-0.41% / -0.39%

Liquidity
-0.19% / -0.21%

Active Currency Return
0.08% / -1.47%

Medium risk with overlay
Medium risk without overlay
EXPOSURE TO PRIVATE REAL ESTATE PORTFOLIO
CONSTRUCTION WORKFLOW

Medium Risk Profile with Currency Overlay as of 2016

Use Case: Client wants to remove currency exposures from the model portfolios and have exposure to private Real Estate

Trailing 1 year history for ex post analysis is accumulated

Add 10% exposure to European Private Real Estate

Rebalance Quarterly

DEU Hotel Core
DEU Industrial Core
DEU Office Berlin Core
DEU Office Cologne Core
DEU Office Dusseldorf Core
DEU Office Frankfurt Core
EX POST COMPARISON OF PERFORMANCE

Active return vs Active Risk

<table>
<thead>
<tr>
<th>Statistic</th>
<th>medium risk</th>
<th>medium risk with overlay</th>
<th>medium risk with overlay and PRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Volatility (%)</td>
<td>4.65</td>
<td>4.47</td>
<td>4.53</td>
</tr>
<tr>
<td>Tracking Error (%)</td>
<td>2.0</td>
<td>2.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Active return</td>
<td>0.23</td>
<td>1.8</td>
<td>2.67</td>
</tr>
<tr>
<td>Sharpe Ratio</td>
<td>2.0</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Information Ratio</td>
<td>0.1</td>
<td>0.9</td>
<td>1.2</td>
</tr>
</tbody>
</table>
WHAT IF: A TWO STEP PROCESS

STATE OF THE WORLD

SCENARIO DEFINITION

SCENARIO PROPAGATION

PRICING THE PORTFOLIO (MANY RISK FACTORS)

STRESS TEST SCENARIO (A HANDFUL RISK FACTORS)

P&L FINANCIAL PORTFOLIO
We evaluated three forward looking macroeconomic scenarios:

- US Slowdown
- UK Slowdown
- EU Stagflation

Portfolio was evaluated against historical scenarios as well to highlight vulnerabilities.
FORWARD LOOKING STRESS TEST
CLOSING REMARKS
SUMMARY

✓ Analytic framework for portfolio construction
✓ Quantitative Portfolio construction workflow
  ✓ Creating Discretionary portfolios
    ✓ Measure drift of discretionary portfolios from benchmarks & model portfolios
    ✓ Impact of market scenarios
    ✓ Understand the drivers of Risk and Return
✓ Create Advisory portfolios (FX Hedging and Alternative investing)
  ✓ Understand the drivers of Risk and Return
✓ Communicate investment outcomes and decisions with forward looking views of the market
MODEL PORTFOLIO CONSTRUCTION

Source: Citi Business Advisory Services
AN INTEGRATED VIEW OF RISK AND PERFORMANCE

Single Security Analytics
- 100+ Pricing models
- Flexible analytics
- Granular risk drivers

Factor-Based Analytics
- Best-in-class
- Integrated MAC factors
- Flexible partitioning

Performance Analytics
- Accurate
- Granular Attribution
- Aligned to Client’s Investment Process

Portfolio Optimizer
- Mean/Variance Based
- Developed In-House
- Built from two decades of experience

The essential tools for ex-ante portfolio construction and ex-post performance evaluation
For more than 40 years, MSCI’s research-based indexes and analytics have helped the world’s leading investors build and manage better portfolios. Clients rely on our offerings for deeper insights into the drivers of performance and risk in their portfolios, broad asset class coverage and innovative research.

Our line of products and services includes indexes, analytical models, data, real estate benchmarks and ESG research.

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