Mitigating Defined Benefit Investment Risk: Can We Lower Our Portfolio Volatility and Still Meet Our Equity Return Expectations?

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Summary

- **What?** A core equity strategy designed to deliver above-market results with less downside risk

- **Why?** Lowering your equity volatility will in turn reduce your funding volatility “win by not losing”

- **How?** Speak to your consultant about implementing a Low Volatility equity strategy in place of your passive or core allocation
Representative Client List

Over 50 Relationships
As of June 30, 2015

Financial Services
- 361 Capital, LLC
- Integra Capital, Ltd.
- John Hancock Advisers, LLC
- MacQuarie Capital Group
- Resona Bank, Ltd.
- SEI Investments
- Stitching Blue Sky
- Touchstone
- UBS PACE

Public
- Alaska Retirement Management Board
- CalSTRS
- Missouri Education Pension Trust
- Montana Board of Investments
- Teachers Retirement System of the City of New York

Insurance
- Alberta Workers’ Compensation Board
- Canadian Medical Protective Association
- Pacific Specialty Insurance Company

Multi-employer
Multi-employer
Central Pension Fund
Northwest Ironworkers Retirement Trust
Painting Industry of Hawaii

Corporate
- Pacific Gas & Electric Company
- Shands Healthcare
- United Technologies Corporation

Foundation/Endowment
- American Geophysical Union
- College of Saint Benedict
- Nicklaus Children’s Hospital
- Sisters of Providence
- Trustees of Donations

Superannuation/Sovereign Wealth Fund
- Fondo Latinoamericano de Reservas
- VicSuper
Relationship Between Risk and Return

Across Asset Classes

- Developed Markets
- Corporate Debt
- Sovereign Debt
- Emerging Markets
- Frontier Markets
- T-Bills

ANNUALIZED RETURN (%)

STANDARD DEVIATION (%)

Volatility Quintiles Within US Large Cap
(1968 - 2005)

AVERAGE ANNUAL RETURN

STANDARD DEVIATION

1For illustrative purposes only
Win by Not Losing – Preservation of Capital

"What have I learned in life? I have learned this: If you are down by 70%, then up by 70%, you have not broken even.”

Scenario 1
- Period I: -10%
- Period II: +10%
- Simple Average: 0%
- Volatility Drag: 0%
- Compounded Return: -1%

Scenario 2
- Period I: -50%
- Period II: +50%
- Simple Average: 0%
- Volatility Drag: 0%
- Compounded Return: -25%
Implication of a Significant Market Drawdown

For illustrative purposes only.
Performance by Beta Quintile – Persistently Negative Effects of Volatility 1997 – 2012

Copyright 2012, CFA Institute. Reproduced and republished from CFA Institute Conference Proceedings Quarterly (March 2012) "Exploiting the Volatility Anomaly in Financial Markets" (Harindra de Silva, President, Analytic Investors)

Average return is the arithmetic average. Portfolios were formed monthly based on Barra’s beta forecast.

Sources: Compustat and MSCI Barra.
Cumulative Return of ETFs

*May 2011 – February 2015*

<table>
<thead>
<tr>
<th>ETF/Index</th>
<th>Annualized Return</th>
<th>Standard Deviation</th>
<th>Beta</th>
<th>Volatility vs. S&amp;P 500</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;P Low Volatility</td>
<td>15.2%</td>
<td>11.9%</td>
<td>0.69</td>
<td>-24.0%</td>
<td>1.28</td>
</tr>
<tr>
<td>S&amp;P High Beta</td>
<td>11.2%</td>
<td>25.0%</td>
<td>1.49</td>
<td>+59.3%</td>
<td>0.44</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>15.2%</td>
<td>15.7%</td>
<td></td>
<td></td>
<td>0.97</td>
</tr>
</tbody>
</table>

Source: Bloomberg
Effective Portfolio Allocation – Lower Risk / Better Returns

Risk Budgeting
- 60% MSCI World Index
- 20% Minimum Variance
- 20% MSCI Emerging Markets Index

De-Risking
- 70% MSCI World Index
- 30% Minimum Variance

For illustrative purposes only
10-Year Portfolio Impact - $1B Plan

As of June 30, 2015

<table>
<thead>
<tr>
<th>Hypothetical Plan Value</th>
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<tbody>
<tr>
<td>$750,000</td>
</tr>
<tr>
<td>$1,000,000</td>
</tr>
<tr>
<td>$1,250,000</td>
</tr>
<tr>
<td>$1,500,000</td>
</tr>
<tr>
<td>$1,750,000</td>
</tr>
<tr>
<td>$2,000,000</td>
</tr>
<tr>
<td>$2,250,000</td>
</tr>
<tr>
<td>$2,500,000</td>
</tr>
</tbody>
</table>

- **70% Russell 100/ 30% Barclays US Agg**
- **60% MSCI USA Minimum Volatility/ 25% Russell 1000/ 15% Barclays US Agg**

<table>
<thead>
<tr>
<th>Year</th>
<th>Traditional - 70% Russell 100, 30% Barclays US Agg</th>
<th>Risk Budgeting - 60% Min Vol, 25% Russell 1000, 15% Barclays US Agg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return</td>
<td>7.57%</td>
<td>8.55%</td>
</tr>
<tr>
<td>Risk</td>
<td>10.56%</td>
<td>10.57%</td>
</tr>
</tbody>
</table>

$196M Increase
Analytic Global Low Volatility, MSCI World, & MSCI World Minimum Volatility Valuations

August 2006 - June 2015

Source: Factset
Start date reflects inception of strategy.
Analytic Global Low Volatility Equity Region Weights

August 2006 - June 2015

Source: Factset. Start date reflects inception of strategy.
Analytic Global Low Volatility Equity Relative Sector Weights

August 2006 - June 2015

Source: Factset. Start date reflects inception of strategy. For a complete list of relative sector weights, please contact info@aninvestor.com.
Low Volatility Benefits Take-Aways

- Riskier stocks do not pay a premium over less risky stocks over time

- Risk Reduction and Risk Re-allocation can be achieved by simple asset allocation decisions based on long-term proven results

- Talk to your fellow trustees, investment staff, and consultants about whether low volatility approaches are applicable to your plans to reduce risk without modifying total plan return expectations.
A History of Continuing Research

The Not-So-Well-Known Three-and-One-Half Factor Model
Clarke, de Silva, Thorley (2014)

Risk Parity, Maximum Diversification, and Minimum Variance: An Analytic Perspective
Clarke, de Silva, Thorley (2013)

Exploiting the Volatility Anomaly in Financial Markets
de Silva (2012)

Minimum-Variance Portfolio Composition
Clarke, de Silva, Thorley
BERNSTEIN FABOZZI/JACOBS LEVY AWARD 2012

Know Your VMS Exposure
Clarke, de Silva, Thorley (2010)

Minimum Variance Portfolios in the US Equity Market
Clarke, de Silva, Thorley
BERNSTEIN FABOZZI/JACOBS LEVY AWARD 2007

Performance Attribution and the Fundamental Law of Active Management
Clarke, de Silva, Thorley
GRAHAM & DODD SCROLL AWARD 2005

A Factor Approach to Asset Allocation
Clarke, de Silva, Murdock
BERNSTEIN FABOZZI/JACOBS LEVY AWARD 2005

Portfolio Constraints and the Fundamental Law of Active Management
Clarke, de Silva, Thorley
GRAHAM & DODD AWARD OF EXCELLENCE 2002