

BOARD OF TRUSTEES
Cobb County Government Employees' Pension Plan Trust
Other Post Employment Benefits (OPEB) Trust
Meeting of June 14, 2023
2nd Floor BOC Meeting Room, 9:00 A.M. to 11:00 A.M.

Agenda

- I. Invitation for Public Comment
- II. Approval of Minutes – *Jim Harner*
- III. Invoice Payments Approval – *Bill Volckmann*
- IV. Managers Report
 - a. Fuller & Thaler – *Ed Stubbins*
- V. Actuary Report – Cavanaugh Macdonald
- VI. Asset Allocation Study - UBS
- VII. New Business
- VIII. Adjourn
- IX. Next Trustee Meeting – September 6th, 10:00am



Fuller & Thaler Asset Management, Inc.

‘Behavioral’ Equity Strategies

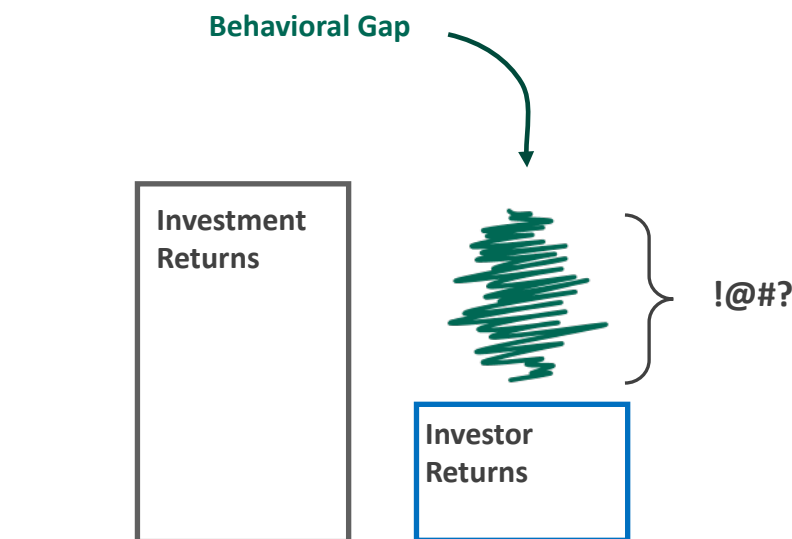
1Q-2023



The Behavioral Edge[®]

/ thə bæ'hāvɪərəl ej/
noun

1. The combination of cognitive psychological theory and conventional finance used in an effort to capitalize on predictable investor misbehavior.



The Behavioral Edge[®] is a registered trademark of Fuller & Thaler Asset Management, Inc.



Fuller & Thaler Asset Management, Inc.



Richard Thaler, PhD

- **Nobel Prize® winner in 2017 for Economics**
- Principal of Fuller & Thaler
- Professor at University of Chicago, Former Head of Center for Decision Research
- “Father” of Behavioral Finance



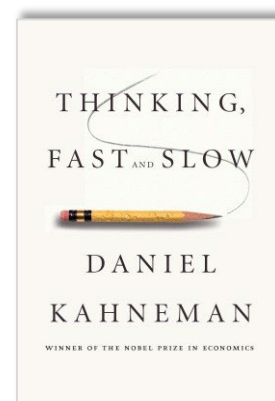
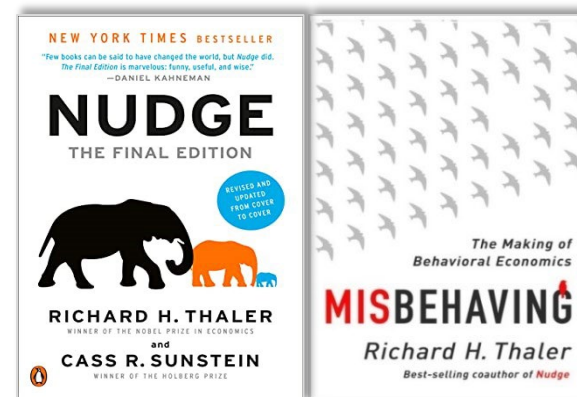
Russell Fuller, PhD, CFA

- Chairman and Founder, Fuller & Thaler
- Former Professor
- Involved in the creation of all firm strategies



Daniel Kahneman, PhD

- **Nobel Prize® winner in 2002 for Economics**
- Professor Emeritus at Princeton University
- Board Member Emeritus



Portfolio Management



Raife Giovinazzo, PhD, CFA

- Lead Portfolio Manager – Behavioral Small-Cap Equity Strategy
- Student of Dr. Daniel Kahneman (Princeton University) and Dr. Richard Thaler (University of Chicago)
- 28 Years Industry Experience



David Potter, CFA

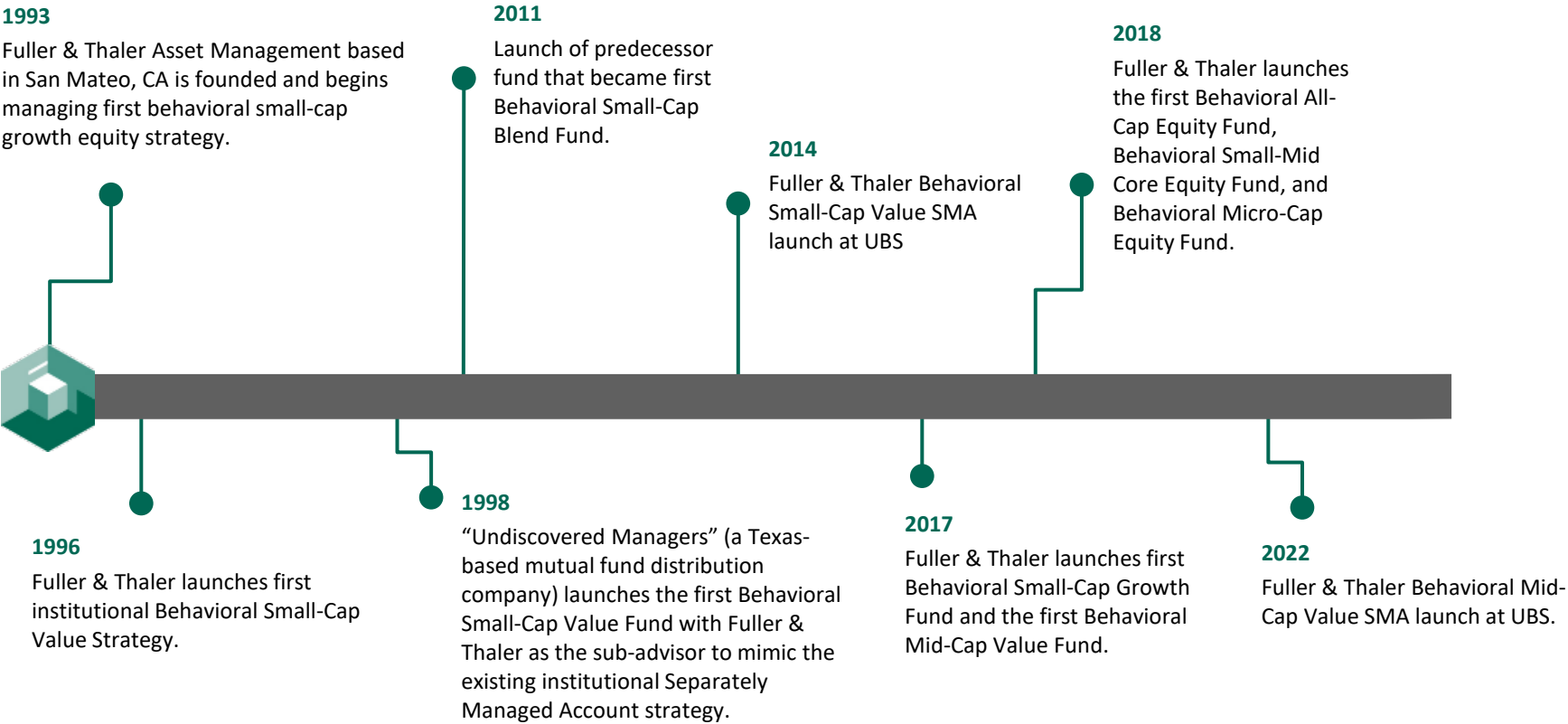
- Lead Portfolio Manager – Behavioral Small Cap Value Strategy
- Lead Portfolio Manager – Behavioral Mid-Cap Value Strategy
- 29 Years Industry Experience



Fred Stanske, CFA

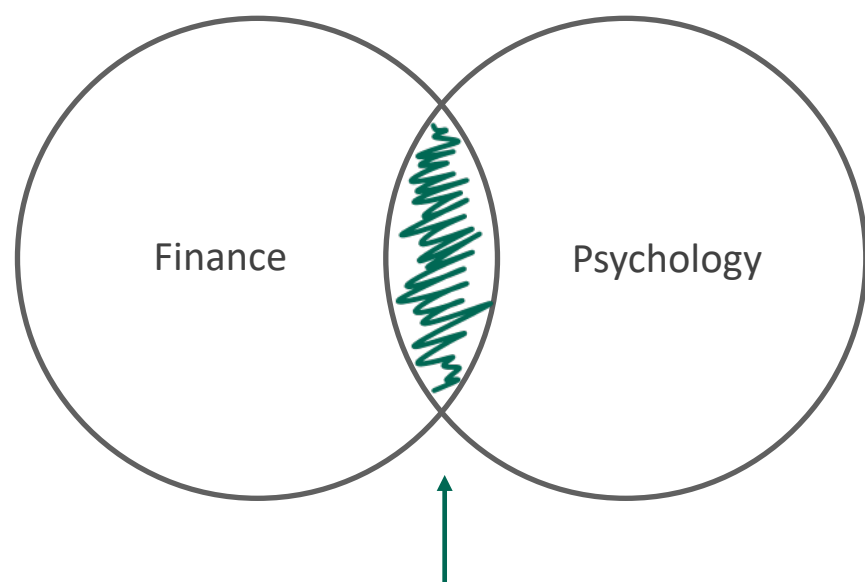
- Lead Portfolio Manager – Behavioral Small-Cap Growth Strategy
- 36 Years Industry Experience

History of Fuller & Thaler Behavioral Equity Strategies



UBS Financial Services Inc. and Fuller & Thaler Asset Management, Inc. are not affiliated. Fuller & Thaler® is a registered trademark of Fuller & Thaler Asset Management, Inc. These are the sole mutual fund clients of Fuller & Thaler in the following behavioral strategies: small-cap value, small-cap equity, small-cap growth, mid-cap value, small-mid core equity, micro-cap equity, and unconstrained equity strategies. Fuller & Thaler did not use performance-based criteria to determine which clients to include on the timeline. It is not known whether the referenced client approves or disapproves of Fuller & Thaler or the advisory services provided.

What is Behavioral Finance?



Behavioral Finance

Investors are human

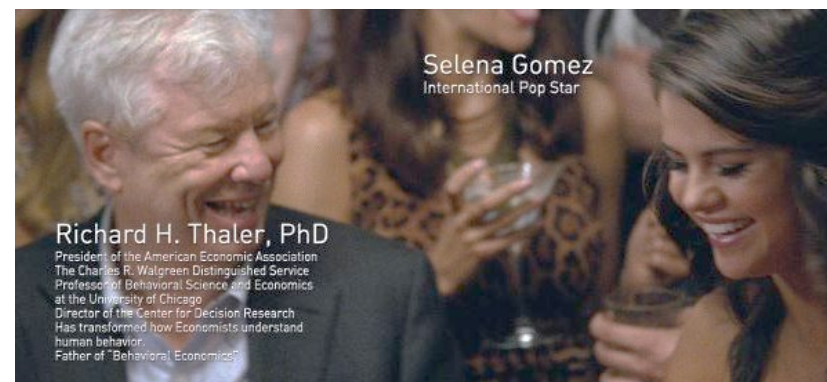
- ✓ Use imperfect rules of thumb
- ✓ Have emotions
- ✓ Make flawed assumptions

→ Investors are biased

“ **Selena Gomez:** crazy !@#\$ right?

Dr. Thaler: Not crazy, just human.
The crazy part is assuming humans
will act logically all the time ”

*The Big Short (2015)**



What is Behavioral Finance?

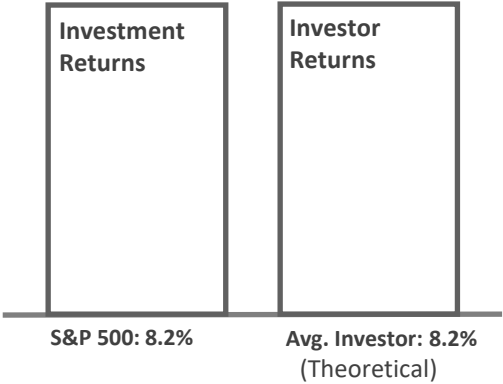
Traditional Finance

Investors are rational

- Accurate forecasting
- No emotions
- Unbiased judgment

→ Markets are efficient

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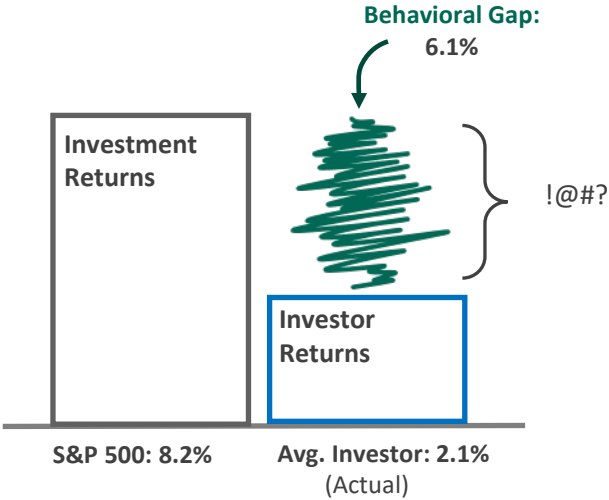
Behavioral Finance

Investors are human

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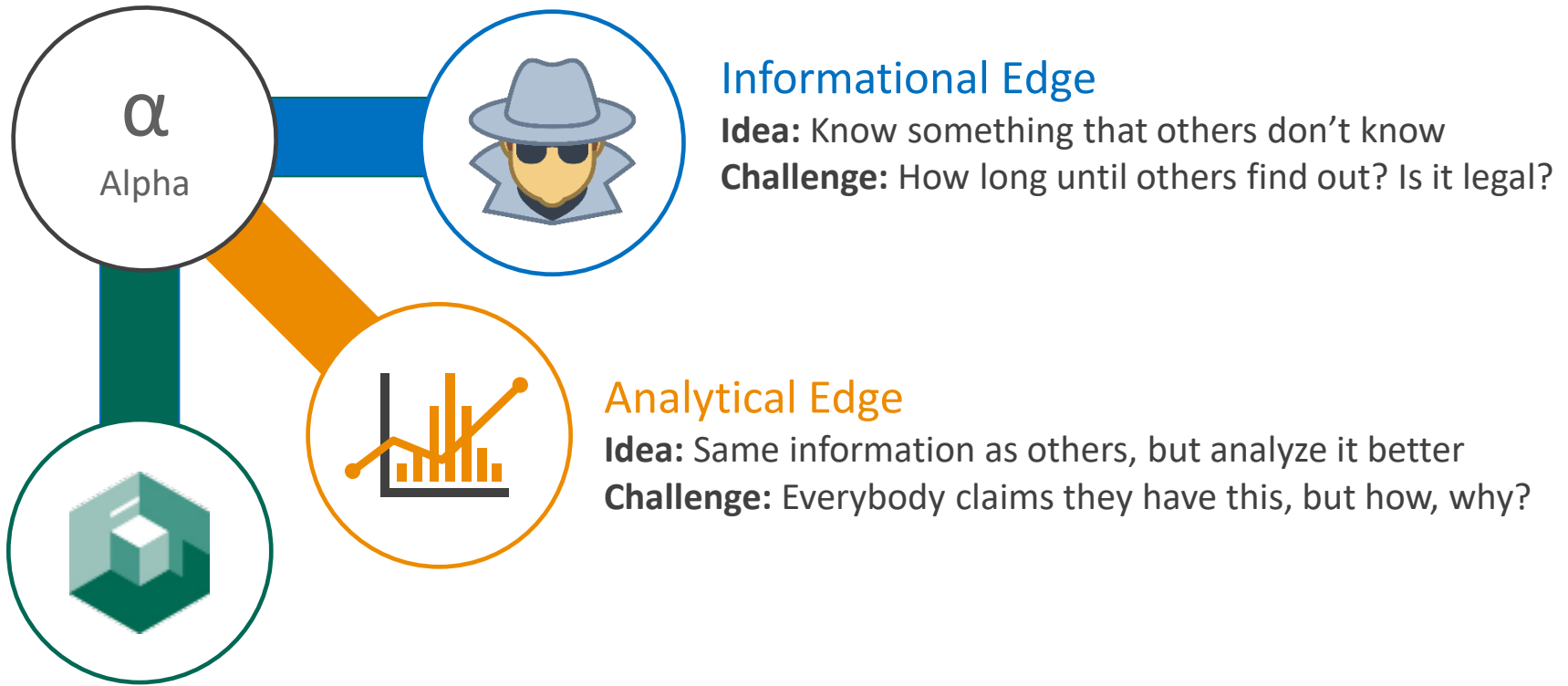
→ Investors are biased

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Source: DALBAR, Inc. Average investors returns are based on an analysis by DALBAR Inc., which utilizes the net aggregate of mutual fund sales, redemptions and exchanges each month as a measure of investor behavior. Returns are annualized (and total return where applicable) and represent the 20-year period ending 12/31/15.

Three Possible Sources of Alpha



The Behavioral Edge[®]

Idea: Understand how *other investors make mistakes* in analyzing information

Challenge: Finding the mistakes.

Philosophy

Investors make **mistakes**.
We look for them.



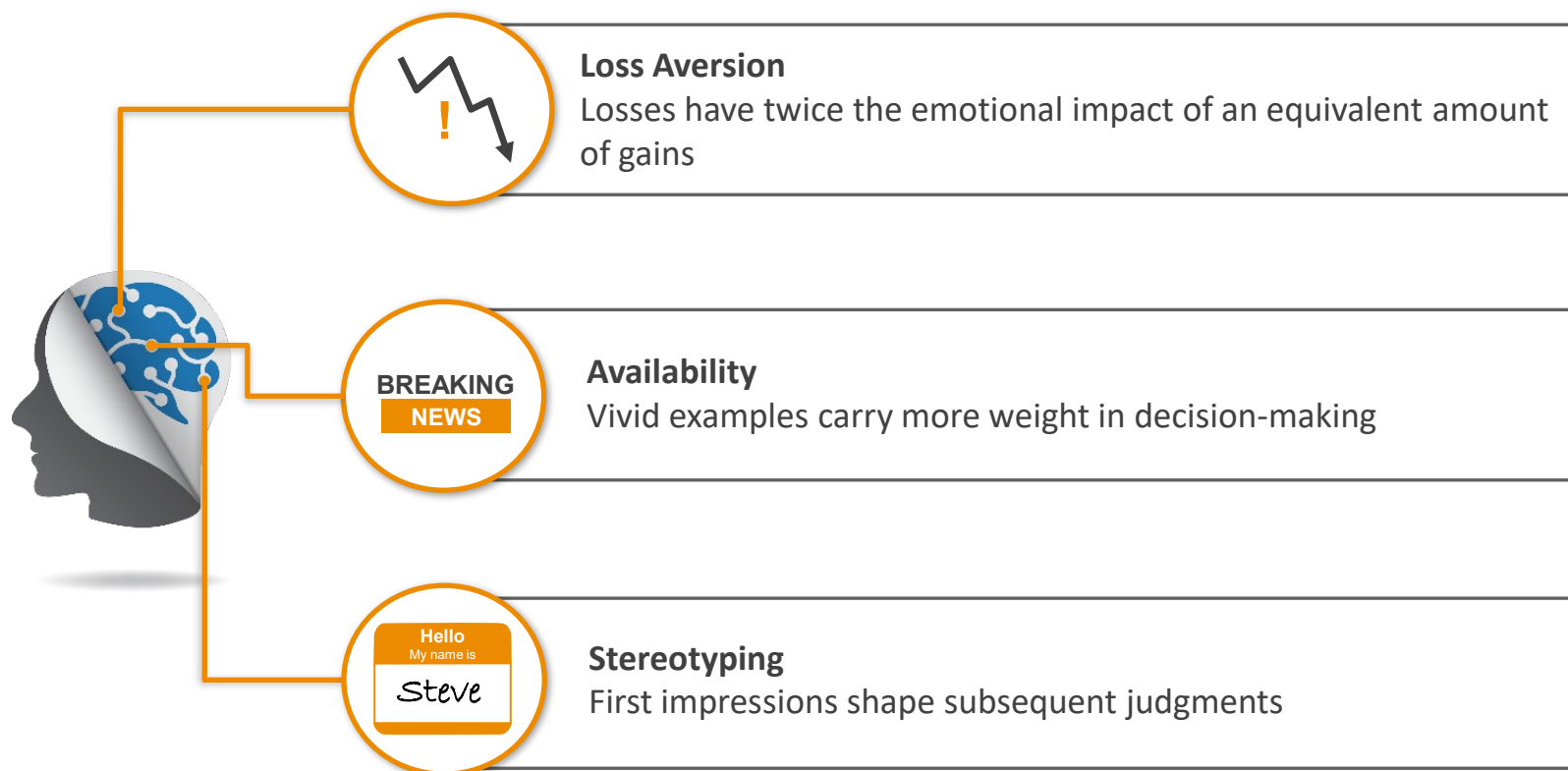
Over-react (e.g., panic)

Under-react (e.g., don't pay attention)

Investors Make Mistakes: Over-reaction

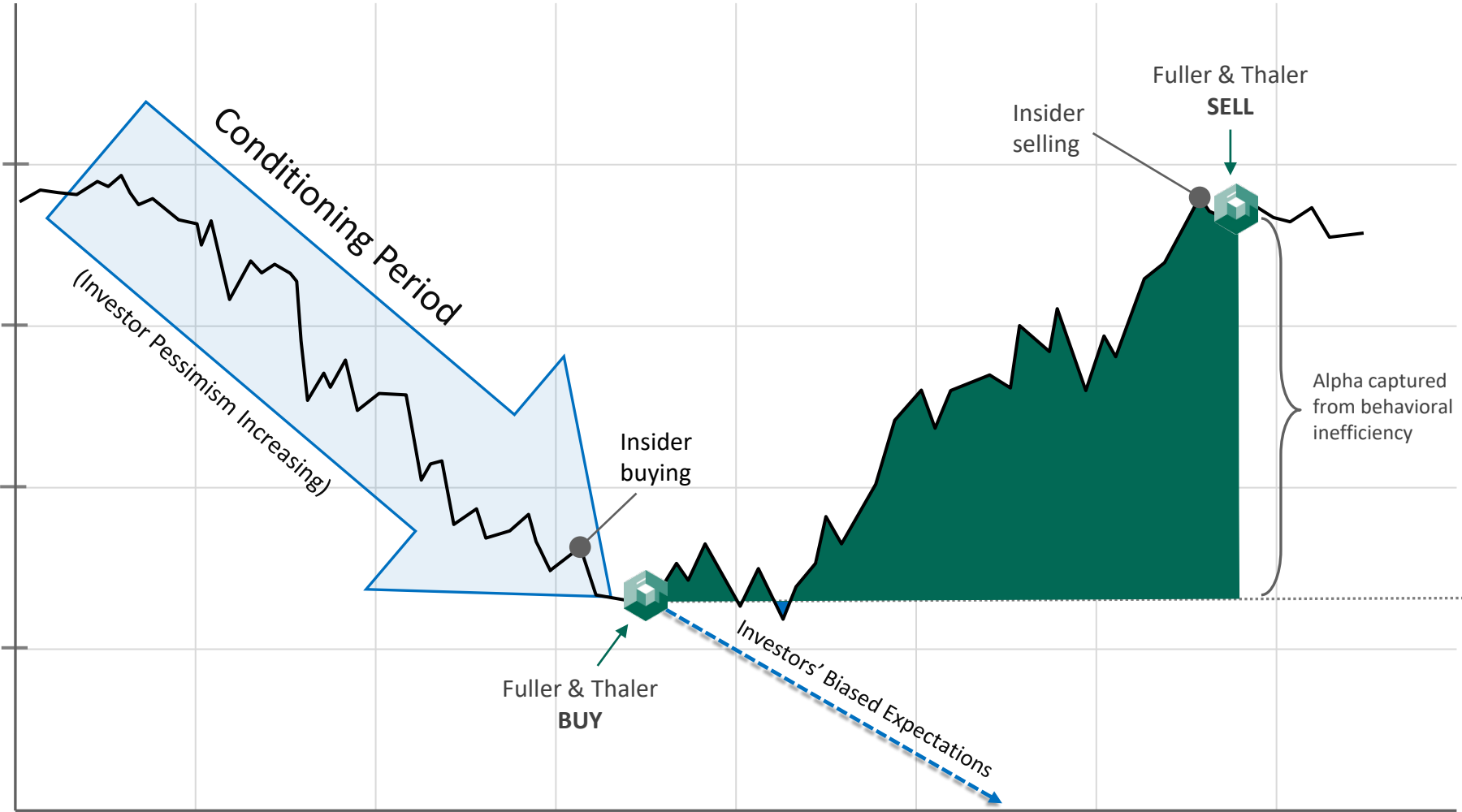
Over-react ...to vivid, emotional stories

e.g., losing money, and bad news



Over-reaction - “Value”

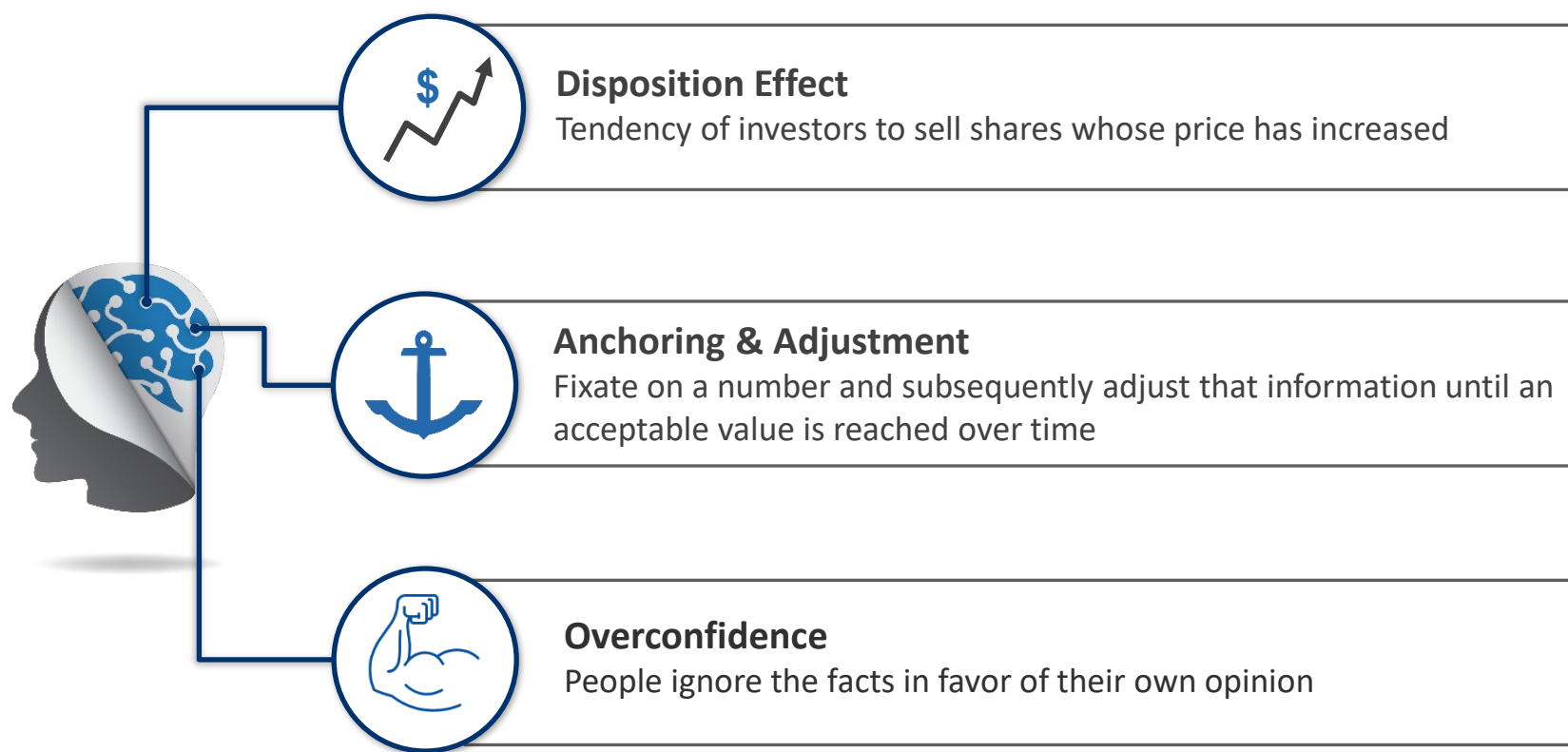
When conditioned by a history of bad news, investors often **over-react**.



Investors Make Mistakes: Under-reaction

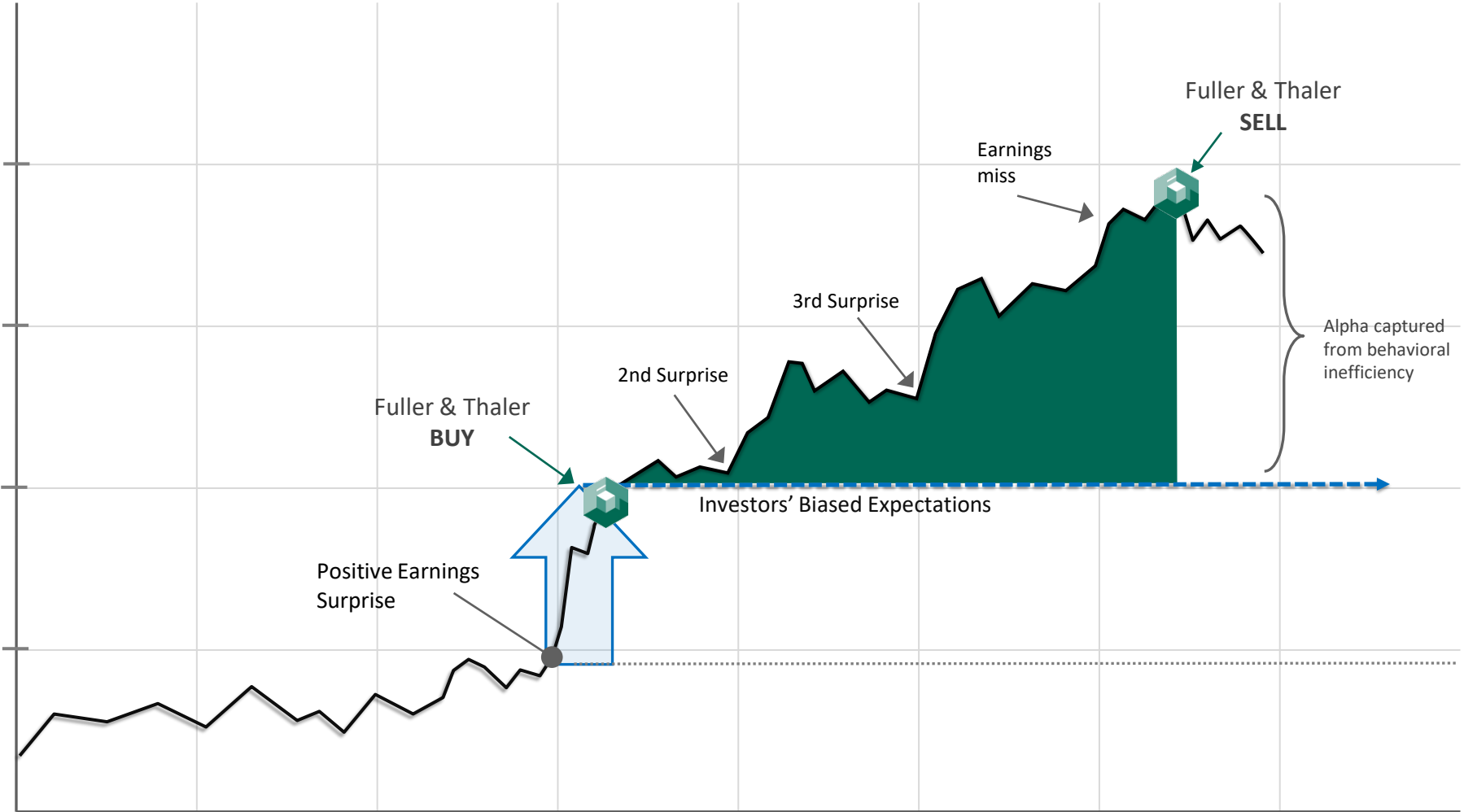
Under-react ...to dull or unexpected information

e.g., higher than expected earnings



Under-reaction – “Growth”

When anchored to old forecasts, investors **under-react** to higher-than-expected earnings.



All charts provided herein are for informational purposes and should not be relied upon when making any investment decision. Provided solely for illustrative purposes. Actual results may vary.

The Traditional Investment Process, Upside Down

Traditional Approach

1. Generate Ideas

(Informational Edge)

- Meet with Management
- Talk to “The Street”

2. Analyze Fundamentals

(Analytical Edge)

- Forecast Earnings
- Develop a Price Target

3. Check for Mistakes

- Does the company trade below the target price?

Potential Bias in Traditional Approach

- Over-react to management’s charm (or lack of charm)
- Overconfident Forecasts
- Anchor on Forecasts & Price-Targets



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1. Find Events

- Insider buying and share repurchases
OR
- Earnings surprise and upward revision

2. Analyze Investor Mistakes

(The Behavioral Edge®)

- Over-reaction (e.g., panic)
OR
- Under-reaction (e.g., not paying attention)

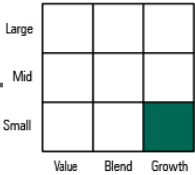
3. Credit/Fundamental Analysis

- Leverage / Bankruptcy risk
- Balance Sheet
- Business model
- Short interest outstanding

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Small-Growth

Behavioral Small-Cap Growth Strategy



	Fuller & Thaler Behavioral Small- Cap Growth Strategy	Russell 2000® Growth Index
Market capitalization (weighted average)	\$ 4.7 Bil	\$ 3.4 Bil
Active Share	91.8%	-
Holdings	51	1,096

Risk Management Strategy

- Daily Risk Monitoring
- Maximum Position Size: 7%
 - avoid stocks with significant bankruptcy risk
- Typical Cash: 0 - 10%

Top 10 Holdings (%)			
e.l.f. Beauty Inc	3.9	Freshpet Inc	2.6
Atkore Inc	3.5	Super Micro Computer Inc	2.5
Axcelis Technologies Inc	3.2	Acuity Brands Inc	2.5
Weatherford International	2.9	Lantheus Holdings Inc	2.5
Evolent Health Inc	2.7	Sanmina Corp	2.4

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Current and future portfolio holdings are subject to risk. References to specific securities and their issues are examples of securities held in the portfolio and are not intended to be, and should not be interpreted as an offer, solicitation or recommendation to purchase or sell any financial instrument. The Russell 2000® Growth Index measures the performance of those Russell 2000® companies with higher price/book ratios and higher forecasted growth values. Please see disclosure statement at the end of this presentation for important information.

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Mid-Value

Behavioral Mid-Cap Value Strategy



	Fuller & Thaler Behavioral Mid- Cap Value Strategy	Russell Midcap® Value Index
Market capitalization (weighted average)	\$ 24.5 Bil	\$ 20.3 Bil
Active Share	88.9%	-
Holdings	70	698

Risk Management Strategy

- Daily Risk Monitoring
- Maximum Position Size: 5%
 - avoid stocks with significant bankruptcy risk
- Typical Cash: 0 - 5%

Top 10 Holdings (%)			
Fidelity National Information	3.4	Wells Fargo & Co	2.4
Graphic Packaging Holding Co	3.2	Berry Global Group Inc	2.4
Global Payments Inc	2.7	KeyCorp	2.4
Celanese Corp	2.6	U-Haul Holding Co	2.4
Synchrony Financial	2.4	Olin Corp	2.2

Small-Value Behavioral Small-Cap Value Strategy



	Fuller & Thaler Behavioral Small-Cap Value Strategy	Russell 2000® Value Index
Market capitalization (weighted median)	\$ 3.6 Bil	\$ 888.5 Mil
Active Share	91.4%	-
Holdings	96	1,368

Risk Management Strategy

- Daily Risk Monitoring
- Maximum Position Size: 5%
 - avoid stocks with significant bankruptcy risk
- Typical Cash: 0 - 5%

Top 10 Holdings (%)			
Old National Bancorp	3.7	The Brink’s Co	2.2
F N B Corp	3.7	White Mountains Insurance	2.2
Graphic Packaging Holding	3.4	Portland General Electric Co	2.1
Berry Global Group Inc	2.9	Devon Energy Corp	1.9
Ensign Group Inc	2.4	Olin Corp	1.9

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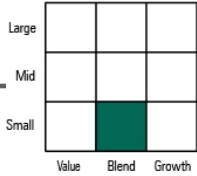
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Small-Blend

Behavioral Small-Cap Equity Strategy



	Fuller & Thaler Behavioral Small- Cap Equity Strategy	Russell 2000® Index
Market capitalization (weighted average)	\$ 5.2 Bil	\$ 2.7 Bil
Active Share	92.1%	-
Holdings	115	1,950

Risk Management Strategy

- Daily Risk Monitoring
- Maximum Position Size: 5%
 - avoid stocks with significant bankruptcy risk
- Typical Cash: 0 - 15%

Top 10 Holdings (%)			
Jabil Inc	3.4	Chord Energy Corp	2.4
Medpace Holdings Inc	3.1	Landstar System Inc	2.3
Bruker Corp	2.5	Murphy USA Inc	2.2
United Therapeutics Corp	2.4	EMCOR Group Inc	1.9
Deckers Outdoor Corp	2.4	Nexstar Media Group Inc	1.9

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FULLER & THALER

ASSET MANAGEMENT, INC.

Key Professional Biographies

Richard H. Thaler, PhD, Nobel Laureate, Principal – Dr. Thaler was awarded the 2017 Nobel Prize® for Economic Sciences and is a Founder and Principal at Fuller & Thaler Asset Management. He is actively involved in setting strategic direction and enhancing the research and investment processes at Fuller & Thaler. He has been affiliated with the firm since 1998 and has been in the financial industry since 1978. Dr. Thaler is the Charles R Walgreen Distinguished Service Professor of Behavioral Science, Economics and Finance at the Booth School of Business of the University of Chicago. He has also taught at Cornell and MIT and is considered one of the leading scholars in the field of behavioral finance and economics. Dr. Thaler’s published books on behavioral finance include *The Winner’s Curse: Paradoxes and Anomalies of Economic Life*, *Quasi-Rational Economics*, *Nudge: Improving Decisions About Health, Wealth, and Happiness*, and *Misbehaving: The Making of Behavioral Economics*. His awards include the Nicholas Moldovsky Award from the CFA Institute. Dr. Thaler received a BA from Case Western University, and an MA and PhD degrees in Finance from the University of Rochester. He is an owner of the firm and a member of the Board of Directors.

Russell J. Fuller, CFA, PhD, Chairman and Founder – Dr. Fuller is a Founder and Chairman of Fuller & Thaler and oversees its research and investment activities. He is a pioneer of behavioral finance and provides insights and advice on the behavioral investment processes at Fuller & Thaler. His five decades long experience spans academic research to investment management. Prior to establishing Fuller & Thaler, he worked at two investment management firms, and began his investment career as a security analyst with a brokerage firm that later merged with Paine Webber. In the academic field, his last position was Chairman of the Finance Department at Washington State University. He has also held positions at the University of British Columbia, Canada, and the University of Auckland, New Zealand. Dr. Fuller has published an investment textbook and numerous journal articles. He has served on the editorial board for the *Financial Analysts Journal* and is currently on the advisory board for the *Journal of Portfolio Management*. Dr. Fuller received the Graham & Dodd award from the Association for Investment Management and Research for his paper entitled “Predictability Bias.” He has served on the Board of Directors of the CFA Society of San Francisco and in 2006 was presented with their Distinguished Member Award in appreciation of his leadership and dedication to the financial community. Dr. Fuller received a BA, MBA and PhD (in finance) from the University of Nebraska, and he holds the Chartered Financial Analyst designation. He is an owner of the firm and Chairman of the Board of Directors.

Daniel Kahneman, PhD, Nobel Laureate, Board Member Emeritus – Dr. Kahneman was the Eugene Higgins Professor of Psychology and is Professor Emeritus of Psychology and Public Affairs at the Woodrow Wilson School, Princeton University. Dr. Kahneman has also taught at the University of California, Berkeley, the University of British Columbia, and the Hebrew University. His awards include the Distinguished Scientific Contribution Award and the Outstanding Lifetime Contribution Award of the American Psychological Association, the Warren Medal of the Society of Experimental Psychologists, the Hilgard Award for Career Contributions to General Psychology, the Presidential Medal of Freedom and the 2002 Nobel Prize® in Economic Sciences. Dr. Kahneman received his BA in psychology and mathematics from the Hebrew University, Jerusalem, and his PhD in psychology from the University of California, Berkeley.

Key Professional Biographies Continued

Raife Giovinnazzo, CFA, PhD, *Managing Partner and Lead Portfolio Manager* – Dr. Giovinnazzo is the lead portfolio manager of Behavioral Small-Cap Equity strategy, which includes the Fuller & Thaler Behavioral Small-Cap Equity Fund and has ultimate decision-making authority for all investment aspects of the Small-Cap Equity Fund. He is also responsible for research using market insights and behavioral finance to enhance the investment processes. Dr. Giovinnazzo has been in the financial industry since 1995. Prior to joining Fuller & Thaler, Dr. Giovinnazzo was a researcher and co-portfolio manager with Blackrock's Scientific Active Equity group (formerly Barclays Global Investors). His previous experience also includes investment and consulting work with Wellington Management, Marsh & McLennan, and Mercer Management Consulting (now Oliver Wyman). Dr. Giovinnazzo received his BA in sociology from Princeton, and his MBA in analytic finance, economics, and statistics, as well as a PhD in finance from the Booth School of Business at the University of Chicago. He wrote his undergraduate thesis for Dr. Kahneman (winner of the 2002 Nobel Prize in Economics) while at Princeton, and Dr. Thaler ("Father of Behavioral Finance" and winner of the 2017 Nobel Prize in Economics) was his dissertation co-chair at the University of Chicago. Dr. Giovinnazzo holds the Chartered Financial Analyst designation and is a member of the CFA Society of San Francisco. He is an owner of the firm and a member of the Board of Directors.

Frederick W. Stanske, CFA, *Partner and Lead Portfolio Manager* – Mr. Stanske is the lead portfolio manager of the Behavioral Small-Cap Growth strategy, including the Fuller & Thaler Behavioral Small-Cap Growth Fund, and the Behavioral Micro-Cap strategy, which includes the Fuller & Thaler Behavioral Micro-Cap Equity Fund and has ultimate decision-making authority for all investment aspects of his strategies. He has been with the firm since 1996 and has been in the financial industry since 1987. Prior to joining the firm, he spent over ten years as an analyst and portfolio manager at Farmers Insurance Group and then at Fisher Investments. Earlier in his career, Mr. Stanske worked in the corporate sector as an analyst. He received a BS from the University of Denver and an MBA from the University of Chicago. Mr. Stanske is a member of the CFA Institute and the CFA Society of San Francisco. He holds the Chartered Financial Analyst designation. Mr. Stanske is an owner of the firm and a member of the Board of Directors.

David M. Potter, CFA, *Partner and Lead Portfolio Manager* – Mr. Potter is the Lead Portfolio Manager responsible for the Behavioral Small-Cap Value (including the Undiscovered Managers Behavioral Value Fund* distributed by JP Morgan), and Behavioral Mid-Cap Value strategy, which includes the Fuller & Thaler Behavioral Mid-Cap Value Fund and has ultimate decision-making authority for all investment aspects of his strategies. He has been with the firm since 2005 and has been in the financial industry since 1994. Prior to joining Fuller & Thaler, he was a Vice President at Goldman Sachs. Previously, he was an Associate Director at Scotia Capital Markets. Mr. Potter received his BA (honors) in Economics and Finance from McGill University in Montreal and MBA (honors) in Finance from the University of Chicago. He holds the Chartered Financial Analyst designation and is a member of the CFA Society of San Francisco. Mr. Potter is an owner of the firm and a member of the Board of Directors.

G. Ed Stubbins, CFA, *Partner* – Mr. Stubbins is a partner and behavioral finance product specialist at Fuller & Thaler. He is responsible for the firm's behaviorally driven equity portfolios. Mr. Stubbins was the Director of Alternative Strategies for Symphony Asset Management, LLC in San Francisco, CA where he was responsible for the firm's hedge fund strategies. Prior to that, he was Vice President at Pacific Investment Management Company (PIMCO) in Newport Beach, CA. Mr. Stubbins was also a Director at Prudential Capital Group where he was responsible for managing a credit portfolio. He has also held positions with Merrill Lynch and Honeywell, Inc. Mr. Stubbins has industry experience since 1993 and is a CFA Charterholder. He holds a bachelor's degree in Chemical Engineering from North Carolina State University and an MBA in Analytical Finance and Accounting from the Kellogg School of Management at Northwestern University. He is also a member of the CFA Society of San Francisco. Mr. Stubbins is an owner of the firm and a member of the Board of Directors.

*Offered by JP Morgan Distribution Services, Inc. It is not known whether the referenced client approves or disapproves of Fuller & Thaler or the advisory services provided.

Disclosure Statement

UBS Financial Services Inc. and Fuller & Thaler Asset Management, Inc. are not affiliated.

This information is provided solely for general informational purposes and does not constitute an offer to sell or a solicitation of an offer to buy or sell any product or service to any person or in any jurisdiction where such offer or solicitation would be unlawful. Behavioral was added to the strategy name in January 2023 to be consistent with the other strategy names.

The Fuller & Thaler Behavioral Small-Cap Growth strategy is primarily invested in the equities of growth-oriented U.S. companies with market capitalizations generally in the range of companies included in the Russell 2000® Index or in the lowest 10% of US market capitalizations at time of purchase. Its benchmark is the Russell 2000® Growth Index.

The Fuller & Thaler Behavioral Small-Cap Equity strategy is primarily invested in the equities of value-oriented U.S. companies with market capitalizations generally in the range of companies included in its benchmark, the Russell 2000® Index or in the lowest 10% of US market capitalizations at time of purchase.

The Fuller & Thaler Behavioral Small-Cap Value strategy is primarily invested in the equities of value-oriented U.S. companies with market capitalizations generally in the range of companies included in the Russell 2000® Index. Its benchmark is the Russell 2000® Value Index.

The Fuller & Thaler Behavioral Mid-Cap Value strategy is primarily invested in the equities of value-oriented U.S. companies with market capitalizations generally between 3% and 40% of total US market capitalization or in the range of companies included in the Russell Midcap® Index at the time of purchase. The benchmark is the Russell Midcap® Value Index.

The *Russell 2000®* is an index of small-cap US stocks, approximately the 1001st to 3000th largest US stocks as calculated by Russell. The *Russell 2000® Value Index* measures the performance of small-cap value segment of the U.S. equity universe. It includes those Russell 2000® companies with lower price-to-book ratios and lower forecasted growth values. The *Russell 2000® Growth Index* measures the performance of those Russell 2000® companies with higher price/book ratios and higher forecasted growth values. The *Russell Midcap® Value Index* measures the performance of the midcap value segment of the US equity universe. It includes those Russell Midcap® Index companies with lower price-to-book ratios and lower forecasted growth values. It is not possible to invest directly in the index. The Russell Index related marks are owned by FTSE Russell.

Risk disclosure: Investing involves risk, including loss of principal. There is no guarantee that this or any investment strategy will be successful. Small-cap and mid-cap investing involve greater risk not associated with investing in more established companies, such as greater price volatility, business risk, less liquidity and increased competitive threat.

A complete list and description of Fuller & Thaler's composites are available upon request.

2023 Capital Market Assumptions Update

Contents

- 2 Capital Market Assumptions: The Basics
- 5 Why a CMA update was necessary
- 5 Changes to the major asset class CMAs
- 6 How we use CMAs
- 6 SAAs: No changes to allocations

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Senior Economist Americas

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At UBS, our Capital Market Assumptions (CMAs) and Strategic Asset Allocations (SAAs) are the fundamental underpinnings that inform our investment advice. The Chief Investment Office (CIO) and the Wealth Management USA (WM USA) Asset Allocation Committee (AAC) regularly review our CMAs and SAAs as asset class estimated returns and risks change over time. Our latest review determined that it is appropriate to update the CMAs, which last occurred in March 2022. The changes to our CMAs include changes to asset class compound returns, arithmetic returns, yields and risks. We did not make changes to the multi-asset House View SAAs, though there are minor changes to select Yield-Focused and international equity SAAs.

For the strategic CMAs, meant generally for one full business cycle, equity returns are slightly higher across markets than the prior CMAs, while fixed income returns have increased somewhat significantly in this update. Overall, these CMAs result in higher estimated returns over the cycle across all risk profile SAAs, but especially for more conservative SAAs. Our equilibrium CMA returns, which are applicable for a multi-business cycle horizon, are slightly higher for fixed income and for most equities. The risk CMAs are the same for both the strategic and equilibrium returns, and the risk estimates increased modestly for US equities, but were relatively unchanged in fixed income. Consequently, the impact on most SAAs' estimated total risk is positive but modest.

The following sections explain what the CMAs are, the differences between strategic and equilibrium CMAs as well as compound and arithmetic returns, the yield estimates, the economic assumptions driving the CMA update, and explanations for the major asset class CMAs. Following that is an explanation of SAAs and their objectives, and a review of the SAAs' new estimated returns and risks resulting from the CMA changes.

Capital Market Assumptions: The Basics

Prudent asset allocation decision-making starts with reasonable assumptions about the risk and return prospects for a range of asset classes. In total, we estimate CMAs for over 100 distinct asset classes, including stocks, bonds, hedge fund strategies, and private markets. The return assumptions represent the annualized estimated return we expect from a particular asset class based on our methodology. The risk assumptions include the volatilities, which measure our expected dispersion of returns, and correlations, which estimate how asset classes tend to move together over time. The risk assumptions do not incorporate other types of risks that may be commonly associated with actual products or investments, an example being liquidity risk. Our process of developing CMAs is based on fundamental building blocks for each asset class that we believe tend to drive returns. The building blocks consist of forecasts for economic growth and inflation, fiscal and monetary policy, corporate and workforce trends, historical performance and valuations. Our methodology combines both objective and subjective elements to use what we view as the most dependable aspects of a data-driven approach and enable us to overlay our expert judgment in the process where necessary.

Return assumptions represent the annual estimated return we expect from a particular asset class. They do not represent the return of any particular security or investment and are purely hypothetical; nor do they take into consideration costs or fees associated with any security, investment or strategy, including those that may be incurred when implementing an asset allocation. To derive our strategic returns, we explicitly model the asset class returns individually for the coming years. We also publish compound (or geometric) annualized growth rate (CAGR) returns over the forecast horizon. Arithmetic and compound returns are mathematically connected by the asset class's volatility, and reflect the exact same set of economic and market assumptions.

Our *volatility* (or risk) estimates seek to quantify the dispersion we expect in the asset class returns on a year-by-year basis. Of course, expected volatility for any particular asset class comes with a range of caveats. For example, a particular investment or product might be more or less volatile than the asset class as a whole depending on factors like the investment objective, manager style, or constraints. Additionally, we're also making an assumption that asset classes themselves will be diversified; one particular position within an asset class can certainly exhibit different risk and return characteristics than the asset class as a whole.

Finally, *correlation* measures the interaction of two asset classes over time. Positively correlated asset classes tend to increase or

decrease in value at the same time, whereas negatively correlated asset classes tend to move in opposite directions. Correlations fall on a range from -1 to 1 , where -1 indicates a perfectly negative correlation, 0 indicates no correlation, and 1 indicates a perfectly positive correlation between the asset classes.

The difference between the strategic and equilibrium return assumptions is their investment time horizons. Specifically:

Strategic returns reflect our expectation for the average annual total return for various asset classes over one full business cycle. This includes the recovery, expansion, slow-down, and recession stages of the cycle. The length of business cycles isn't fixed, though in advanced economies they have been getting longer on average. The starting points for estimating returns are typically current values, such as bond yields or equity price-to-earnings ratios, and then we project a future path for this return driver to a long-term sustainable level.

Equilibrium returns are our estimates for average annual returns over multiple business cycles. We assume that asset class return drivers eventually converge to their long-run level, which is the economy's sustainable steady state. The equilibrium return is calculated assuming return drivers and returns themselves are in equilibrium. By definition, equilibrium returns are not influenced by cyclical developments or current circumstances. Instead, they reflect structural assumptions about the economy, including the long-term potential growth rate and the neutral rate of interest.

The purpose of having two sets of CMA return assumptions is to distinguish the average annual return estimates for investors when their investment horizon changes from one to multiple business cycles. The strategic returns are applicable for short-to long-term investment horizons over a cycle, such as when constructing strategic asset allocations. In contrast, equilibrium returns are generally applicable for multi-cycle investment horizons and long term planning.

We have only one set of volatility and correlation assumptions. Unlike returns that can vary quite a bit depending on starting economic conditions and valuations, risk properties tend to be stable and mean-reverting over time, and are unlikely to change from one economic cycle to the next.

For the primary asset classes, Fig. 1 lists our updated strategic and equilibrium CMA arithmetic return assumptions and the updated risks, which represent the annualized standard deviation of returns. Fig. 2 lists the compound returns and risk for the same set of asset classes. The full set of CMAs can be found in Appendix 1. The updated strategic return CMAs are higher for

nearly all major fixed income, equity and private market segments. Since our last CMA update, US interest rates across the entire Treasury yield curve have risen well above pre-pandemic levels, thereby increasing our expectation for future fixed income returns. Within equities, valuations are lower than their pre-pandemic levels, which boosts our expectation for returns. This is partially offset by slightly more conservative earnings growth assumptions because the economic growth outlook has deteriorated for the initial stage of the forecast horizon.

Fig. 1

2023 Strategic and equilibrium arithmetic return CMAs

Asset Class	Strategic	Equilibrium	Ann'l risk
	Ann'l total return	Ann'l total return	
US Cash	2.6%	2.4%	0.2%
US Government Fixed Income	3.8%	4.0%	3.8%
US Government Fixed Income (short)	3.0%	2.9%	1.3%
US Government Fixed Income (int.)	3.7%	3.7%	2.9%
US Government Fixed Income (long)	3.6%	4.7%	10.1%
US Municipal Fixed Income	3.4%	2.9%	2.9%
US Corporate Investment Grade Fixed Income	4.6%	4.9%	5.9%
US Corporate High Yield Fixed Income	5.7%	6.4%	9.6%
International Developed Markets Fixed Income	3.3%	3.4%	7.6%
Emerging Markets Fixed Income (Blend)	5.4%	4.7%	10.2%
US Large-cap Equity	6.8%	8.4%	16.3%
US Large-cap Growth Equity	6.5%	8.2%	16.6%
US Large-cap Value Equity	7.4%	8.7%	16.6%
US Mid-cap Equity	7.9%	9.1%	18.5%
US Small-cap Equity	8.8%	10.2%	20.9%
International Developed Markets Equity	9.4%	8.2%	16.1%
Emerging Markets Equity	8.4%	9.1%	19.7%
Senior Loans	5.7%	6.4%	9.6%
Preferreds	5.9%	6.5%	11.6%
MLPs	14.0%	13.5%	30.0%
US Public Real Estate	9.8%	11.3%	24.5%
Commodities	7.7%	7.3%	17.4%
Hedge Funds	5.9%	6.1%	6.7%
US Private Equity	9.3%	10.9%	13.7%
Private Real Estate	7.9%	9.3%	10.5%

Note: These CMAs are not guaranteed, do not represent the return or risk of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from these CMAs.

See Important Information and Disclosures section, Wealth Management USA Asset Allocation Committee and the UBS Capital Market Assumptions and Strategic Asset Allocation Models, for more information.

Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

The equilibrium returns are generally higher than the strategic returns, with a few exceptions. For fixed income, the rise of interest rates during 2022 from very low levels have lifted the strategic return assumptions closer to the equilibrium returns, which are less sensitive to short-term changes in rates. The higher equilibrium returns reflect most US Treasury bond yields currently being above our estimate for their steady state values that are the basis for equilibrium estimated returns. To estimate the equilibrium returns for all other asset classes, we add an

Fig. 2

2023 Strategic and equilibrium compound return CMAs

Asset Class	Strategic	Equilibrium	Ann'l risk
	Ann'l total return	Ann'l total return	
US Cash	2.6%	2.4%	0.2%
US Government Fixed Income	3.4%	3.3%	3.8%
US Government Fixed Income (short)	2.9%	2.7%	1.3%
US Government Fixed Income (int.)	3.3%	3.4%	2.9%
US Government Fixed Income (long)	2.6%	3.6%	10.1%
US Municipal Fixed Income	3.4%	2.8%	2.9%
US Corporate Investment Grade Fixed Income	4.4%	4.7%	5.9%
US Corporate High Yield Fixed Income	5.2%	5.9%	9.6%
International Developed Markets Fixed Income	3.0%	3.1%	7.6%
Emerging Markets Fixed Income (Blend)	4.9%	4.2%	10.2%
US Large-cap Equity	5.4%	7.0%	16.3%
US Large-cap Growth Equity	5.0%	6.7%	16.6%
US Large-cap Value Equity	6.0%	7.2%	16.6%
US Mid-cap Equity	6.1%	7.3%	18.5%
US Small-cap Equity	6.5%	7.8%	20.9%
International Developed Markets Equity	8.0%	6.8%	16.1%
Emerging Markets Equity	6.3%	7.0%	19.7%
Senior Loans	5.2%	5.9%	9.6%
Preferreds	5.2%	5.7%	11.6%
MLPs	9.0%	8.5%	30.0%
US Public Real Estate	6.6%	8.0%	24.5%
Commodities	6.1%	5.7%	17.4%
Hedge Funds	5.7%	5.9%	6.7%
Private Equity	8.3%	9.9%	13.7%
Private Real Estate	7.3%	8.6%	10.5%

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Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

appropriate risk premium to the US Government fixed income equilibrium return assumptions, which results in higher equilibrium returns than strategic returns for almost all asset classes.

Yield estimates provide additional information about the estimated return composition, for both strategic and equilibrium horizons. They are estimates of the average annual income from the asset class over the entire investment horizon. The yield estimates for the main asset classes are listed in Fig. 3. Fixed income

Fig. 3

2023 Strategic and equilibrium arithmetic return and yield CMAs

Asset Class	Strategic		Equilibrium	
	Ann'l total return	Yield	Ann'l total return	Yield
US Cash	2.6%	2.6%	2.4%	2.4%
US Government Fixed Income	3.8%	2.5%	4.0%	3.0%
US Government Fixed Income (short)	3.0%	2.2%	2.9%	2.6%
US Government Fixed Income (int.)	3.7%	2.6%	3.7%	3.1%
US Government Fixed Income (long)	3.6%	3.1%	4.7%	3.4%
US Municipal Fixed Income	3.4%	3.9%	2.9%	4.3%
US Corporate Investment Grade Fixed Income	4.6%	3.9%	4.9%	4.6%
US Corporate High Yield Fixed Income	5.7%	6.2%	6.4%	6.7%
International Developed Markets Fixed Income	3.3%	2.4%	3.4%	3.6%
Emerging Markets Fixed Income (Blend)	5.4%	6.1%	4.7%	6.3%
US Large-cap Equity	6.8%	1.9%	8.4%	1.9%
US Large-cap Growth Equity	6.5%	1.4%	8.2%	1.4%
US Large-cap Value Equity	7.4%	2.5%	8.7%	2.5%
US Mid-cap Equity	7.9%	1.8%	9.1%	1.8%
US Small-cap Equity	8.8%	1.5%	10.2%	1.5%
International Developed Markets Equity	9.4%	3.1%	8.2%	3.1%
Emerging Markets Equity	8.4%	2.5%	9.1%	2.5%
Senior Loans	5.7%	6.2%	6.4%	6.7%
Preferreds	5.9%	6.0%	6.5%	6.3%
MLPs	14.0%	7.8%	13.5%	7.8%
US Public Real Estate	9.8%	7.8%	11.3%	9.0%
Commodities	7.7%	2.6%	7.3%	2.4%
Hedge Funds	5.9%	0.9%	6.1%	0.9%
Private Equity	9.3%	0.0%	10.9%	0.0%
Private Real Estate	7.9%	6.4%	9.3%	7.4%

Note: These CMAs are not guaranteed do not represent the return of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from these CMAs. See Important Information and Disclosures section, Wealth Management USA Asset Allocation Committee and the UBS Capital Market Assumptions and Strategic Asset Allocation Models, for more information.

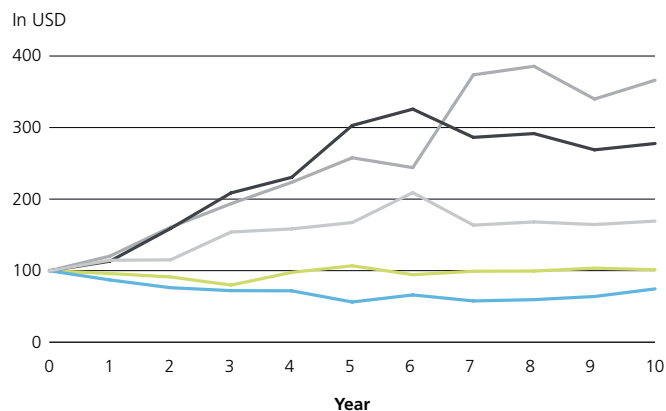
Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

yields are mostly below but close to the total return assumptions for both strategic and equilibrium horizons, as income constitutes the bulk of the total return over time. The incremental total return stems from price appreciation due to falling interest rates assumed over the strategic horizon and the rolldown price appreciation that investors earn when the Treasury yield curve is fixed and upward sloping, as is assumed for the equilibrium horizon. Most equity yields are near the historical average dividend yields for their respective regions and sizes, for both strategic and equilibrium horizons. Yields in the hedge fund and private equity asset classes are low or zero because most of the return is from price appreciation, while the opposite is true for the private real estate asset class.

Both the strategic and equilibrium returns are point estimates, but the actual annual returns can deviate quite a bit from these returns. An investment that increases in value by 20% one year might easily decline by 10% the following year. Combining the return and volatility estimates for an asset class helps provide a more realistic outlook for the potential range of returns. For example, based on our assumptions, US large-cap equity returns could reasonably fall between -9.5% (i.e., 6.8% - 16.3%) and 23.1% (i.e., 6.8% + 16.3%) over 12 months. This range of equity returns is illustrated in Fig. 4 with a number of simulated return paths for US large-cap equities over ten years.

Fig. 4

Simulated paths of USD 100 invested in large-cap US equities over 10 years



Note: For illustrative purposes only; this is not a guarantee of the minimum or maximum of losses or gains that can be incurred. Monte Carlo simulations are used to visualize the set of possible random returns for the US large cap equities asset class.

Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

Why a CMA update was necessary

The drivers behind our CMA changes stem from the significant evolution of the global economic and policy environment over the past year. Extraordinary policy stimulus during the pandemic, disruptions to global supply chains, and the Ukraine war all combined to produce the highest inflation in the US and other advanced economies in 40 years. In response, the Federal Reserve and other central banks raised interest rates at the fastest pace in 40 years. This economic and policy mix led to significantly negative returns for equities and fixed income in 2022. But doing so has also resulted in lower valuations for most asset classes, especially higher quality bonds, which are one of the key drivers of our estimated strategic returns.

Changes to the major asset class CMAs

In our strategic CMAs, most US fixed income arithmetic returns have increased between 120 and 240 basis points (bps), while equity returns have increased about 80bps (Fig.5). The increase in fixed income returns is due to the higher Treasury yields at the beginning of 2023 versus their levels in early 2022 when the current rate hiking cycle was just getting underway. Since the last update in March 2022, the Fed has raised policy rates by over 450bps. The biggest increase in estimated returns are in shorter maturity bonds, as they now have higher yields, with a

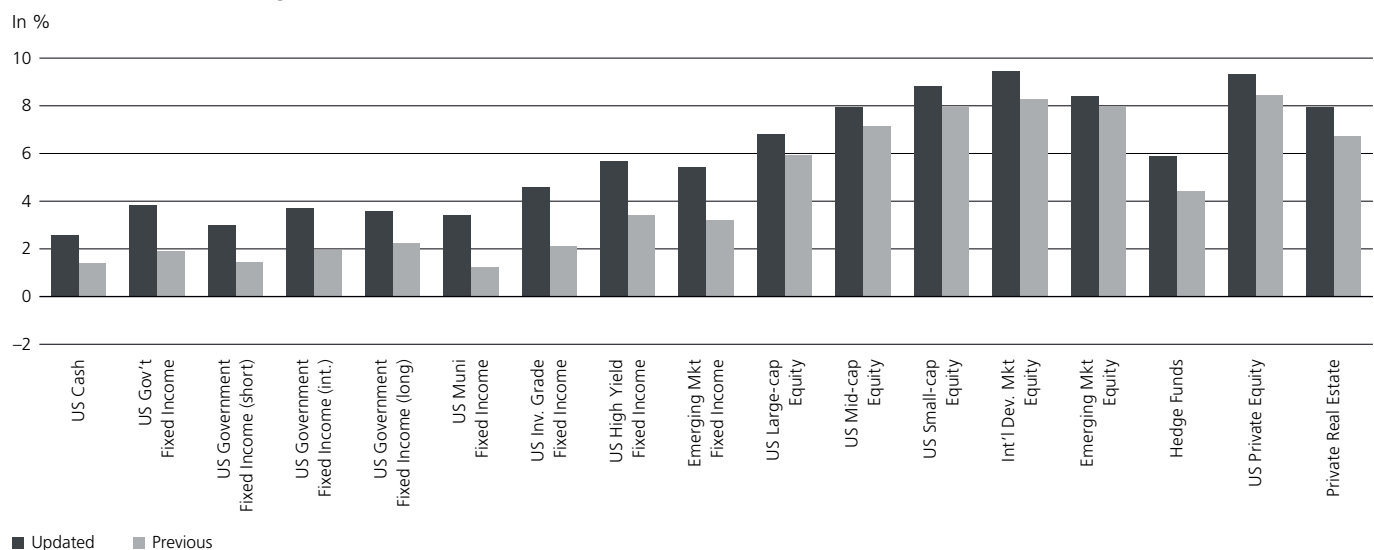
likely limited negative drag on price returns due to a further rise in yields. We also expect the Fed to begin cutting interest rates by 2024, with the policy rate returning to about 2.5% for the remainder of the strategic forecast horizon. Thus, lower expected yields beyond 2024 bring the estimated returns over the full forecast horizon below the current yields. We expect the yield curve to re-steepen by late 2023, and the higher yields for long versus short-maturity Treasuries contributes to higher estimated returns for intermediate and long maturity US government bonds.

With this update, investment grade and high yield corporate bond returns experience a larger increase than government bonds, in part due to relatively cheaper starting valuations. A similar dynamic accounts for the rise in emerging market bond returns. Equilibrium returns across almost all of fixed income rise by up to about 50bps, driven by the assumption that over very long horizons interest rates will be higher than they have been in the past.

The strategic US equity arithmetic returns increase by 70–80bps. US equity valuations dropped meaningfully throughout 2022 in response to the higher interest rate and inflation environment. Most valuations across sizes and styles are now roughly within long-term averages, with some above and others below, compared to uniformly elevated valuations a year ago. The lower valuations suggest forward-looking returns should be greater, all else equal.

Fig. 5

2023 vs. 2022 Strategic Arithmetic Return CMAs



Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

Developed market ex-US equity arithmetic returns are materially higher as these markets experienced sharper downturns, and have valuations that are generally at or below long-term averages. Emerging market equity return assumptions were slightly higher for similar reasons, led by the Chinese equity market's large weight in the asset class. While lower valuations boost return expectations, margins are likely to be squeezed more than previously assumed because of higher input costs and structural challenges.

Equilibrium returns increase very slightly for US equities, reflecting the higher risk free returns implied by the higher US government fixed income estimated returns, while the implicit equity risk premium is largely unchanged. Developed and emerging market equity equilibrium returns come down slightly as large implied equity risks decline more than risk free expected returns go up.

Our assumptions for private equity are up modestly for the strategic returns and up slightly for the equilibrium returns, similar to the increase in the US public equity risk premium. We continue to expect private equity to produce returns that are 2–3% higher than public market equities. We estimate hedge fund strategic returns to be in the 4–7% range and with continued relatively low volatility, while the equilibrium returns are slightly higher. For private real estate, our strategic expected return remains near 7% as a result of rental income that can rise with inflation and due to opportunistic and value-added strategies taking advantage of dislocations caused by the pandemic.

The estimated risks were also updated and they generally increased across most asset classes. The economic and policy environment is likely to remain uncertain and volatile as the global economy continues to fully normalize from the distortions caused by the pandemic, and central banks continue to focus on bringing inflation back close to their 2% target. In addition, geopolitical, energy security, and climate risks are likely to remain high and sources of additional market volatility. All of these factors are why we estimate the risks for equities have gone up 20–50bps and 10–30bps for fixed income, approximately.

How we use CMAs

Capital Market Assumptions can be used in a range of activities, including Strategic Asset Allocation, financial planning, wealth projections, risk monitoring, and portfolio analysis. The strategic and equilibrium CMAs were designed not only for different investment horizons, as discussed earlier, but also with different intended applications.

Our strategic CMAs form a core input for creating our Strategic Asset Allocations (SAAs). The SAAs are created to provide an attractive return-risk trade-off over the next full economic cycle.

In addition, since strategic arithmetic returns are the estimate for average 1-year return forecasts, they're essential for constructing SAAs as they set the midpoint for fluctuations due to volatility from year-to-year. We discuss Strategic Asset Allocation in greater depth later in this report.

Strategic CMAs can also be used as a starting point for portfolio customization, providing a baseline to help analytically customize portfolios based on an investor's particular situation or need.

Our equilibrium CMAs are intended for longer-term investment horizons. Long-term planning integrates asset modeling (the investment portfolio asset allocation) and liability modeling (the investor's spending needs, goals, and objectives) to develop a prudent strategy. Equilibrium CMAs play a vital role in that process.

Arithmetic returns serve to understand the expected midpoint of year-to-year returns without the impact of volatility. However, volatility tends to produce a drag on average returns over time, which is reflected in the compound return. The segregation return from volatility with arithmetic returns is a useful property to evaluate the trade-off between risk and return and is central to designing SAAs. On the other hand, the compound returns are intended to reflect the anticipated annualized growth rate of an asset class over multiple years. Compound returns are typically the more common language investors speak when discussing returns and can provide a consistent comparison to historical and forward-looking returns.

The yield estimates may enable deeper portfolio insights and construction on multiple topics. A better understanding of the drivers of returns enhances the analysis of potential tax impact since income and capital gains have different tax treatments; this could help target specific long-term income expectations to support future spending needs.

SAAs: No changes to allocations

Our Strategic Asset Allocations are diversified model allocations that seek to produce a reasonable risk and return trade-off over a full economic cycle. We design the SAAs to be efficient, and to pursue the highest estimated return for a target level of risk, based on the CMA strategic return and risk assumptions. We publish SAAs by investor risk profile, ranging from Conservative to Aggressive. These include allocations for taxable and non-taxable investors; investors that only want to use traditional, publicly traded liquid assets; and those who want to also include non-traditional assets classes such as hedge funds, private equity, and private real estate. These SAAs provide a reference point for tactical shifts based on short-term considerations, and can be a starting point for portfolio analysis.

While there were no changes to the SAAs, their estimated returns and risks are updated to reflect the new CMA return and risk assumptions

Fig. 6 shows the moderate risk SAAs, with and without non-traditional asset classes, and the updated SAA estimated returns and risks. Fig. 7 demonstrates the consequences of the CMA changes on the estimated return and risk for all five risk profiles of the SAAs with non-traditional asset classes. Across the five risk

Fig. 6

Moderate Risk Institutional SAAs

	With NTAs	Without NTAs
Cash	2.0%	2.0%
Fixed Income	30.0%	48.0%
US Fixed Income	28.0%	42.0%
US Gov't FI (short)	5.0%	5.0%
US Gov't FI (intermediate)	10.0%	10.0%
US Gov't FI (long)	4.0%	4.0%
US Municipal FI	0.0%	0.0%
US IG Corp FI	6.0%	17.0%
US HY Corp FI	3.0%	6.0%
Int'l Fixed Income	2.0%	6.0%
EM FI (Hard)	1.0%	4.0%
EM FI (Local)	1.0%	2.0%
Equity	38.0%	50.0%
US Equity	19.0%	28.0%
US Large cap growth	6.5%	10.0%
US Large cap value	6.5%	10.0%
US Mid cap	4.0%	5.0%
US Small cap	2.0%	3.0%
International Equity	19.0%	22.0%
Int'l Developed Markets	13.0%	16.0%
Emerging Markets	6.0%	6.0%
Non-traditional	30.0%	0.0%
Hedge Funds	8.0%	0.0%
Private Equity	17.0%	0.0%
Private Real Estate	5.0%	0.0%
Estimated compound return	6.40%	5.73%
Estimated arithmetic return	6.80%	6.17%
Estimated risk	8.67%	9.14%

Note: The estimated risk and returns of the allocations are provided for illustrative purposes only. The capital market assumptions used to estimate return and risk are not guaranteed, do not represent the return or risk of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from the results shown. Asset allocation does not assure profits or prevent against losses from an investment portfolio or accounts in a declining market.

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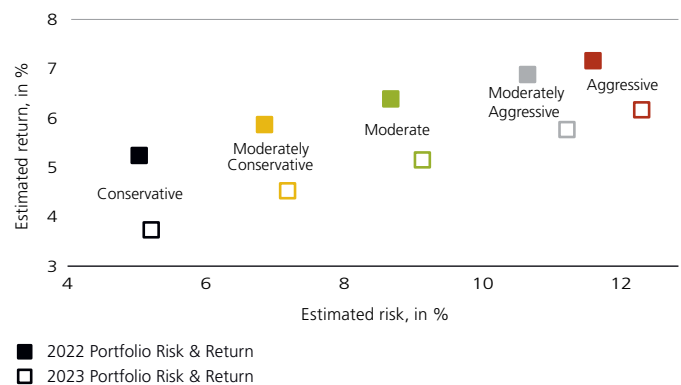
Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

profiles, SAA risk falls modestly by roughly 20-70bps. SAA returns increased considerably across risk profiles as the more conservative SAAs with higher allocations to fixed income benefit from the large increase in our estimated returns, while the more aggressive SAAs with higher equity allocations also benefit from the increase in our estimated equity returns. In short, the CMA changes moved the efficient frontier (which compares the risk-return trade-off of the allocations) largely up and slightly to the left.

Fig. 7

Institutional SAAs estimated risks and returns

SAAs with non-traditional assets, using updated strategic CMAs with compound returns



Note: The estimated risk and returns of the allocations are provided for illustrative purposes only. The capital market assumptions used to estimate return and risk are not guaranteed, do not represent the return or risk of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from the results shown.

Asset allocation does not assure profits or prevent against losses from an investment portfolio or accounts in a declining market.

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Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

Appendix 1: 2023 CMAs

Broad Asset Class	Asset Class	Subclass	Style	Capital Market Assumptions, in %						
				Strategic assumptions			Equilibrium assumptions			
				Compound return	Arithmetic return	Yield	Compound return	Arithmetic return	Yield	Risk
Cash	Cash	US	US Cash	2.6	2.6	2.6	2.4	2.4	2.4	0.2
		International	International Cash	3.2	3.5	3.5	0.4	0.6	0.6	7.1
Fixed Income	US	US Fixed Income	Core	3.8	3.8	3.1	3.9	4.0	3.7	3.8
			Short	3.0	3.0	2.3	2.9	2.9	2.8	1.3
			Intermediate	3.7	3.7	2.9	3.6	3.7	3.4	2.9
			Long	3.1	3.6	4.0	4.1	4.7	4.5	10.1
			Other	3.8	3.8	3.1	3.9	4.0	3.7	3.8
		Government	Core	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Short	2.9	2.9	2.2	2.7	2.7	2.6	1.3
			Intermediate	3.3	3.4	2.6	3.4	3.5	3.1	5.4
			Long	2.6	3.0	3.1	3.6	4.0	3.4	9.0
			Other	3.4	3.4	2.5	3.3	3.4	3.0	4.1
		Municipals	Core	3.4	3.4	3.9	2.8	2.9	4.3	2.9
			Short	2.0	2.0	4.0	2.6	2.6	4.4	0.9
			Intermediate	3.4	3.4	3.9	2.8	2.9	4.3	2.9
			Long	3.1	3.2	3.8	3.1	3.2	4.1	4.5
			High Yield	4.4	4.7	3.9	4.8	5.1	4.2	8.2
		Corporate Investment Grade Credit	Other	3.4	3.4	3.9	2.8	2.9	4.3	2.9
			Core	4.4	4.6	3.9	4.7	4.9	4.6	5.9
			Short	3.4	3.5	2.9	3.4	3.4	3.3	2.1
			Intermediate	4.3	4.4	3.4	4.3	4.4	4.1	4.2
			Long	3.8	4.4	4.7	4.9	5.5	5.3	10.6
			Other	4.4	4.6	3.9	4.7	4.9	4.6	5.9
		Corporate High Yield	Corporate High Yield	5.2	5.7	6.2	5.9	6.4	6.7	9.6
		Puerto Rico Municipals	Puerto Rico Municipals	3.4	3.4	3.9	2.8	2.9	4.3	2.9
		Preferred	Preferred	5.2	5.9	6.0	5.7	6.5	6.3	11.6
		Convertibles	Convertibles	5.0	6.0	3.1	4.8	5.8	3.4	13.6
	Global	Global	Global	3.6	3.8	2.7	3.9	4.1	3.7	5.6
	International	International	International	3.0	3.3	2.4	3.1	3.4	3.6	7.6
		Developed Markets	Developed Markets	3.0	3.3	2.4	3.1	3.4	3.6	7.6
		Emerging Markets	Emerging Markets	4.9	5.4	6.1	4.2	4.7	6.3	10.2
Equity	US	US Equity	Core	5.5	7.0	1.9	7.1	8.6	1.9	16.5
			Growth	5.1	6.6	1.4	6.8	8.4	1.4	16.9
			Value	6.1	7.6	2.4	7.3	8.9	2.4	16.8
			Master Limited Partnerships	9.0	14.0	7.8	8.5	13.5	7.8	30.0
			Public Real Estate	6.6	9.8	7.8	8.0	11.3	9.0	24.5
		Large Cap	Other	5.5	7.0	1.9	7.1	8.6	1.9	16.5
			Core	5.4	6.8	1.9	7.0	8.4	1.9	16.3
			Growth	5.0	6.5	1.4	6.7	8.2	1.4	16.6
			Value	6.0	7.4	2.5	7.2	8.7	2.5	16.6
			Master Limited Partnerships	9.0	14.0	7.8	8.5	13.5	7.8	30.0
		Mid Cap	Public Real Estate	6.6	9.8	7.8	8.0	11.3	9.0	24.5
			Other	5.4	6.8	1.9	7.0	8.4	1.9	16.3
			Core	6.1	7.9	1.8	7.3	9.1	1.8	18.5
			Growth	5.7	7.6	1.2	7.0	8.9	1.2	19.0
			Value	6.7	8.6	2.3	7.5	9.4	2.3	18.8
			Master Limited Partnerships	9.0	14.0	7.8	8.5	13.5	7.8	30.0
		SMid Cap	Public Real Estate	6.6	9.8	7.8	8.0	11.3	9.0	24.5
			Other	6.2	8.3	1.6	7.5	9.6	1.6	19.8
			Core	6.2	8.3	1.6	7.5	9.6	1.6	19.8
			Growth	5.7	8.0	0.9	7.1	9.4	0.9	20.4
			Value	6.8	9.0	2.2	7.8	9.9	2.2	19.8
		Small Cap	Master Limited Partnerships	9.0	14.0	7.8	8.5	13.5	7.8	30.0
			Public Real Estate	6.6	9.8	7.8	8.0	11.3	9.0	24.5
			Other	6.5	8.8	1.5	7.8	10.2	1.5	20.9
			Core	6.0	8.5	0.8	7.5	10.0	0.8	21.5
			Value	7.0	9.4	2.2	8.1	10.5	2.2	21.2
		Preferred	Master Limited Partnerships	9.0	14.0	7.8	8.5	13.5	7.8	30.0
			Public Real Estate	6.6	9.8	7.8	8.0	11.3	9.0	24.5
			Other	6.5	8.8	1.5	7.8	10.2	1.5	20.9
			Core	5.2	5.9	6.0	5.7	6.5	6.3	11.6
			Convertibles	5.0	6.0	3.1	4.8	5.8	3.4	13.6
	Global	Global	Core	6.3	7.5	2.3	7.2	8.4	2.3	15.2
			Growth	6.1	7.2	1.3	7.0	8.2	1.3	14.8
			Value	6.9	8.0	3.4	7.5	8.7	3.4	14.7
			Public Real Estate	8.1	10.3	8.2	8.7	11.0	8.8	20.2
			Other	6.3	7.5	2.3	7.2	8.4	2.3	15.2

Broad Asset Class	Asset Class	Subclass	Style	Capital Market Assumptions, in %						
				Strategic assumptions			Equilibrium assumptions			
				Compound return	Arithmetic return	Yield	Compound return	Arithmetic return	Yield	Risk
Equity	International	International	Core	7.6	9.0	2.9	7.0	8.4	2.9	16.3
			Growth	7.5	8.8	1.9	6.9	8.2	1.9	15.2
			Value	8.0	9.5	4.1	7.2	8.7	4.1	16.5
			Public Real Estate	8.0	10.1	8.1	8.7	10.8	8.6	19.6
			Other	7.6	9.0	2.9	7.0	8.4	2.9	16.3
		Developed Markets	Core	8.0	9.4	3.1	6.8	8.2	3.1	16.1
			Growth	7.9	9.2	2.0	6.6	8.0	2.0	15.7
			Value	8.2	9.8	4.2	6.8	8.5	4.2	17.5
			Other	8.0	9.4	3.1	6.8	8.2	3.1	16.1
		Emerging Markets	Core	6.3	8.4	2.5	7.0	9.1	2.5	19.7
			Growth	5.6	8.1	1.4	6.4	8.9	1.4	21.7
			Value	6.4	8.9	3.6	6.9	9.4	3.6	21.5
Commodities	Commodities	Commodities	Other	6.3	8.4	2.5	7.0	9.1	2.5	19.7
			Commodities	6.1	7.7	2.6	5.7	7.3	2.4	17.4
			Energy	4.5	8.4	2.6	4.6	8.6	2.4	27.2
			Agriculture	6.2	8.2	2.6	4.4	6.4	2.4	19.1
			Industrial Metals	4.1	6.4	2.6	4.9	7.3	2.4	20.9
			Precious Metals	5.6	7.5	2.6	2.4	4.3	2.4	19.0
Non-Traditional	Non-Traditional	Non-Traditional	Other	6.1	7.7	2.6	5.7	7.3	2.4	17.4
			Non-Traditional	7.3	7.7	2.4	8.3	8.8	2.8	8.9
			Multi Strategy	5.7	5.9	0.9	5.9	6.1	0.9	6.7
			Diversified Fund of Funds	4.7	4.9	0.7	4.6	4.8	0.7	5.7
			Global Macro	4.2	4.3	0.9	4.3	4.4	0.9	5.0
		Hedge Funds	Event Driven	5.8	6.3	0.9	5.9	6.4	1.0	10.1
			Relative Value	5.6	5.7	1.1	5.5	5.6	1.1	5.0
			Managed Futures	2.1	2.3	0.3	2.1	2.3	0.3	6.4
			Equity Long/Short	5.9	6.7	0.7	6.1	6.9	0.7	12.0
			Other	5.7	5.9	0.9	5.9	6.1	0.9	6.7
		Private Equity	US Private Equity	8.3	9.3	0.0	9.9	10.9	0.0	13.7
			Private Real Estate	7.3	7.9	6.4	8.6	9.3	7.4	10.5
Other	Other	Other	Other	5.2	5.6	2.5	5.8	6.2	3.0	8.9
			Balanced	5.2	5.6	2.5	5.8	6.2	3.0	8.9
		Insured Solutions	Insured Solutions	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Other	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Fixed	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Variable	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Immediate	3.4	3.4	2.5	3.3	3.4	3.0	4.1
		Insurance	Indexed	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Other	4.2	4.3	3.9	4.6	4.7	4.2	4.4
			Term Life	2.6	2.6	2.6	2.4	2.4	2.4	0.2
			Whole Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Survivorship Whole Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Universal Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Survivorship Universal Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Variable Universal Life	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Survivorship Variable Universal Life	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Indexed Universal Life	4.6	4.9	4.4	5.3	5.6	5.0	6.9
			Hybrid Universal Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			Hybrid Whole Life	3.4	3.4	2.5	3.3	3.4	3.0	4.1
			LTC	2.6	2.6	2.6	2.4	2.4	2.4	0.2
			Disability	2.6	2.6	2.6	2.4	2.4	2.4	0.2
Inflation	Inflation	Inflation	Inflation	2.7					2.4	

Note: The Capital Market Assumptions (CMAs) are UBS's estimated risk and return assumptions for various asset classes and are based on our proprietary methodology. These CMAs are not guaranteed, do not represent the return or risk of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from these CMAs.

Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

Appendix 2: Supplemental non-traditional CMAs

Broad Asset Class	Asset Class	Subclass	Style	Capital Market Assumptions, in %						
				Strategic assumptions			Equilibrium assumptions			
				Compound return	Arithmetic return	Yield	Compound return	Arithmetic return	Yield	Risk
Non-Traditional	Non-Traditional	Private Equity	Global Private Equity	8.9	9.9	0.0	9.8	10.8	0.0	13.8
			Buyout Private Equity	8.6	9.5	0.0	9.5	10.4	0.0	13.1
			Growth Private Equity	7.8	9.0	0.0	8.7	9.9	0.0	14.6
			Infrastructure Private Equity	4.3	4.6	0.0	7.6	8.0	0.0	8.2
			Venture Capital Private Equity	10.3	12.6	0.0	11.8	14.1	0.0	20.3
		Private Debt	Private Debt	7.8	8.0	6.4	8.4	8.6	6.9	5.9

Note: The Capital Market Assumptions (CMAs) are UBS's estimated risk and return assumptions for various asset classes and are based on our proprietary methodology. These CMAs are not guaranteed, do not represent the return or risk of a particular security, investment, portfolio or strategy, and do not take into consideration the fees, costs or charges associated with any particular product, investment, portfolio or strategy. Actual performance can differ, perhaps significantly, from these CMAs.

Source: UBS Wealth Management USA Asset Allocation Committee, as of 13 February 2023

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Wealth Management USA Asset Allocation Committee and the UBS Capital Market Assumptions and Strategic Asset Allocation Models

The capital market assumptions and strategic asset allocation models discussed in this publication were vetted and approved by the Wealth Management USA Asset Allocation Committee (WM USA AAC).

The capital market assumptions are estimates of forward-looking average annual returns for a particular asset class. **They are not guaranteed and do not represent the return of a particular security or investment. The actual performance of any particular security, investment or strategy can differ, perhaps significantly, from these CMA's.**

The strategic asset allocation models are intended to provide a general framework to assist our clients in making informed investment decisions. They are provided for illustrative purposes, and were designed by the WM USA AAC for hypothetical U.S. investors with a total return objective under five different investor risk profiles: conservative, moderate conservative, moderate, moderate aggressive and aggressive.

UBS Financial Services Inc. Institutional Consultant can help you determine how a strategic allocation could be applied or modified according to your risk profile and investment goals.

The CMAs and SAAs do not take into consideration the fees, costs or charges associated with any security, investment, or strategy, including those that may be incurred when implementing an asset allocation.

Asset allocation does not assure profits or prevent against losses from an investment portfolio or accounts in a declining market.

Please note that UBS has changed its capital market assumptions and strategic asset allocation models in the past and may do so in the future.

Index performance data

Index information is provided for illustrative purposes only. Indexes are not available for direct investment and represent an unmanaged universe of securities which does not take into account advisory or transaction fees, all of which will reduce overall return.

Investment Risks

Asset Class is a term that broadly defines a category of investments that share common investment characteristics. Typical broad asset classes include equities, fixed income securities, cash and cash alternatives. This section describes some of the asset classes used in this report and some of the general risk considerations. *All investments involve risks which you should carefully consider prior to implementing an investment strategy.*

Cash: Cash and cash alternatives typically include money market securities or three-month T-Bills. These securities have short maturity dates and they typically provide a stable investment value as compared to other investments and current interest income. These investments may be subject to credit risks and inflation risks. Treasuries also carry liquidity risks for sales prior to maturity. Investments in money market funds are neither insured nor guaranteed by the Federal Deposit Insurance Corporation (FDIC), the U.S. government or any other government agency. There can be no assurance that the funds will be able to maintain a stable net asset value at \$1.00 per share or unit.

Equities: Equity securities are subject to market risk and will undergo price fluctuations in which downward and upward trends may occur over short or extended periods. Historically, equities have shown greater growth potential than other types of securities, but they have also shown greater volatility. In addition to these risks, securities issued by small-cap companies may be relatively highly volatile because their earnings and business prospects typically fluctuate more than those of larger-cap companies. Securities issued by non-U.S. companies can have risks not typically associated with domestic securities, including risks associated with changes in currency values, economic, political and social conditions, loss of market liquidity, the regulatory environments of the respective countries and difficulties in receiving current or accurate information.

Fixed Income: Fixed Income represents debt issued by private corporations, governments or Federal agencies. Two main risks related to fixed income investing are interest rate risk and credit risk. Typically, when interest rates rise, there is a corresponding decline in the market value of bonds. Credit risk refers to the possibility that the issuer of the bond will not be able to make principal and interest payments. High yield investments are high yielding securities but may also carry more risk. A bond fund's yield and value of its portfolio fluctuate and can be affected by changes in interest rates, general market conditions and other political, social and economic developments.

Corporate Bonds: Fixed income securities are subject to market risk and interest rate risk. If sold in the secondary market prior to maturity, investors may experience a gain or loss depending on interest rates, market conditions and issuer credit quality.

Municipal Securities: Income from municipal bonds may be subject to state and local taxes based on residency of the investor and may be subject to the Alternative Minimum Tax. Call features may exist that can impact yield. If sold prior to maturity, investments in municipal securities are subject to gains/losses based on the level of interest rates, market conditions and credit quality of the issuer.

Foreign Exchange/Currency Risk: Investors in securities of issuers located outside of the United States should be aware that even for securities denominated in U.S. dollars, changes in the exchange rate between the U.S. dollar and the issuer's "home" currency can have unexpected effects on the market value and liquidity of those securities. Those securities may also be affected by other risks (such as political, economic or regulatory changes) that may not be readily known to a U.S. investor.

Emerging Markets: Investing in emerging market securities can pose some risks different from, and greater than, risks of investing in U.S. or developed markets securities. These risks include: a risk of loss due to political instability; exposure to economic structures that are generally less diverse and mature, and to political systems which may have less stability, than those of more developed countries; smaller market capitalization of securities markets, which may suffer periods of relative illiquidity; significant price volatility; restrictions on foreign investment; and possible repatriation of investment income and capital.

Non-Traditional Asset Classes: Non-traditional asset classes are alternative investments that include hedge funds, private equity, and private real estate, (collectively, alternative investments). Interests of alternative investment funds are sold only to qualified investors, and only by means of offering documents that include information about the risks, performance and expenses of alternative investment funds, and which clients are urged to read carefully before subscribing and retain. **An investment in an alternative investment fund is speculative and involves significant risks.** Specifically, these investments (1) are not mutual funds and are not subject to the same regulatory requirements as mutual funds; (2) may have performance that is volatile, and investors may lose all or a substantial amount of their investment; (3) may engage in leverage and other speculative investment practices that may increase the risk of investment loss; (4) are long-term, illiquid investments, there is generally no secondary market for the interests of a fund, and none is expected to develop; (5) interests of alternative investment funds typically will be illiquid and subject to restrictions on transfer; (6) may not be required to provide periodic pricing or valuation information to investors; (7) generally involve complex tax strategies and there may be delays in distributing tax information to investors; (8) are subject to high fees, including management fees and other fees and expenses, all of which will reduce profits.

Interests in alternative investment funds are not deposits or obligations of, or guaranteed or endorsed by, any bank or other insured depository institution, and are not federally insured by the Federal Deposit Insurance Corporation, the Federal Reserve Board, or any other governmental agency. Prospective investors should understand these risks and have the financial ability and willingness to accept them for an extended period of time before making an investment in an alternative investment fund and should consider an alternative investment fund as a supplement to an overall investment program.

In addition to the risks that apply to alternative investments generally, the following are additional risks related to an investment in these strategies:

- **Hedge Fund Risk:** There are risks specifically associated with investing in hedge funds, which may include risks associated with investing in short sales, options, small-cap stocks, "junk bonds," derivatives, distressed securities, non-US securities and illiquid investments.
- **Managed Futures:** There are risks specifically associated with investing in managed futures programs. For example, not all managers focus on all strategies at all times, and managed futures strategies may have material directional elements.
- **Real Estate:** There are risks specifically associated with investing in real estate products and real estate investment trusts. They involve risks associated with debt, adverse changes in general economic or local market conditions, changes in governmental, tax, real estate and zoning laws or regulations, risks associated with capital calls and, for some real estate products, the risks associated with the ability to qualify for favorable treatment under the federal tax laws.
- **Private Equity:** There are risks specifically associated with investing in private equity. Capital calls can be made on short notice, and the failure to meet capital calls can result in significant adverse consequences including, but not limited to, a total loss of investment.

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Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

Cobb County Government Employees Pension Plan & Retiree Health Benefit Plan (OPEB)

January 1, 2023 Valuation Results

June 14, 2023 Board Meeting

Ed Koebel, EA, FCA, MAAA – Chief Executive Officer
Alisa Bennett, FSA, EA, FCA, MAAA – President
Ben Mobley, ASA, FCA, MAAA – Consulting Actuary

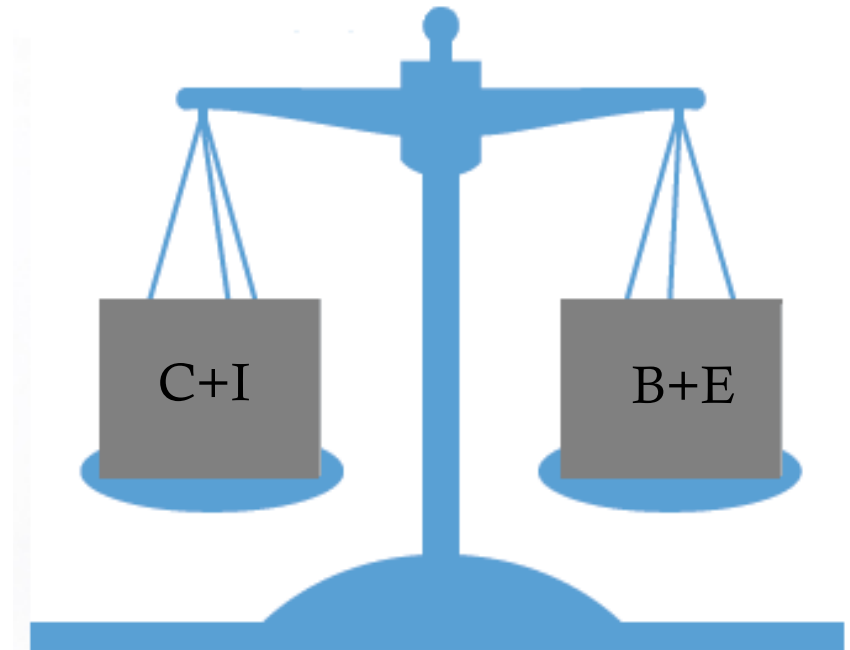




Basic Retirement Funding Formula

$$\text{C} + \text{I} = \text{B} + \text{E}$$

C = Contributions
I = Investment Income
B = Benefits Paid
E = Expenses



"Money In = Money Out"



Pension Plan Funding Results



Pension Valuation Experience

Asset Performance

- Market asset return for 2022 was (20.0)% vs 7.25% expected return
- Actuarial asset return for 2022 was 5.7% vs 7.25% expected return

Upcoming Asset Smoothing

- Year 1: \$ (5,235,130)
- Year 2: \$ (23,581,050)
- Year 3: \$ (40,816,913)
- Year 4: \$ (53,640,000)

Large Salary Increases

- Individual pay increases for those that were active for calendar year 2022 averaged 13.65% vs 3.32% expected
- Total valuation payroll increased 8.92%



Pension Valuation Results

Unfunded Actuarial Accrued Liability (UAAL)

- UAAL increased \$38.4M, and the funded ratio decreased by 0.4% from last year's valuation

Actuarially Determined Contribution (ADC)

- ADC **rate decreased** from last year's valuation due to large salary increases
- ADC **amount increased** approximately \$4.5M

Employee Contribution Rate

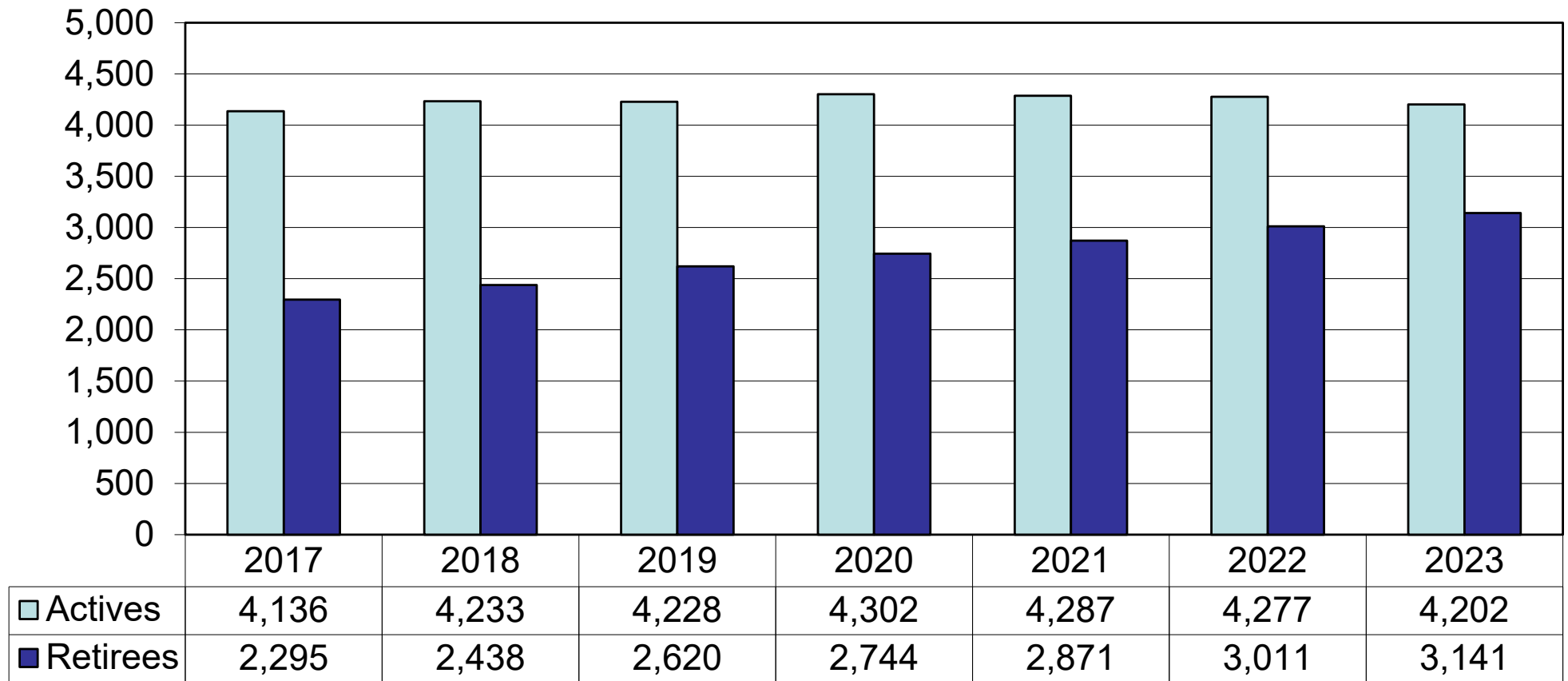
- Employee contribution rate for Traditional Participants increased from 8.50% to 8.75% in March 2023

Plan Liabilities

- Hybrid Participants make up 32.7% of total membership (64.6% of active membership)
- Traditional Participants account for approximately 97.9% of the total Actuarial Accrued Liability (AAL)



Active and Retired Membership



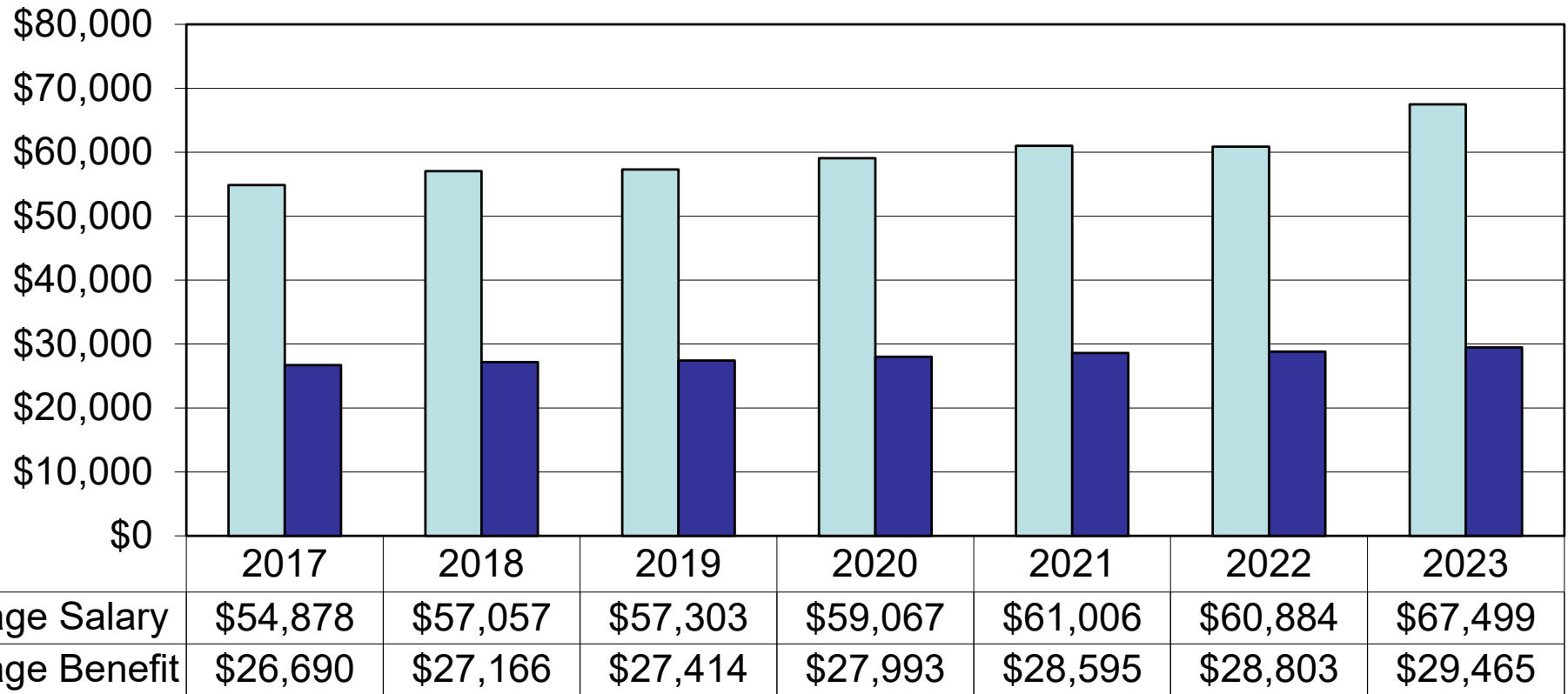
0.3% annual increase for active members since 2017; 1.8% decrease for 2023.

5.4% annual increase for retired members since 2017; 4.3% increase for 2023.

1.8 actives per retiree 6 years ago; 1.3 actives per retiree now.



Average Salary and Benefits



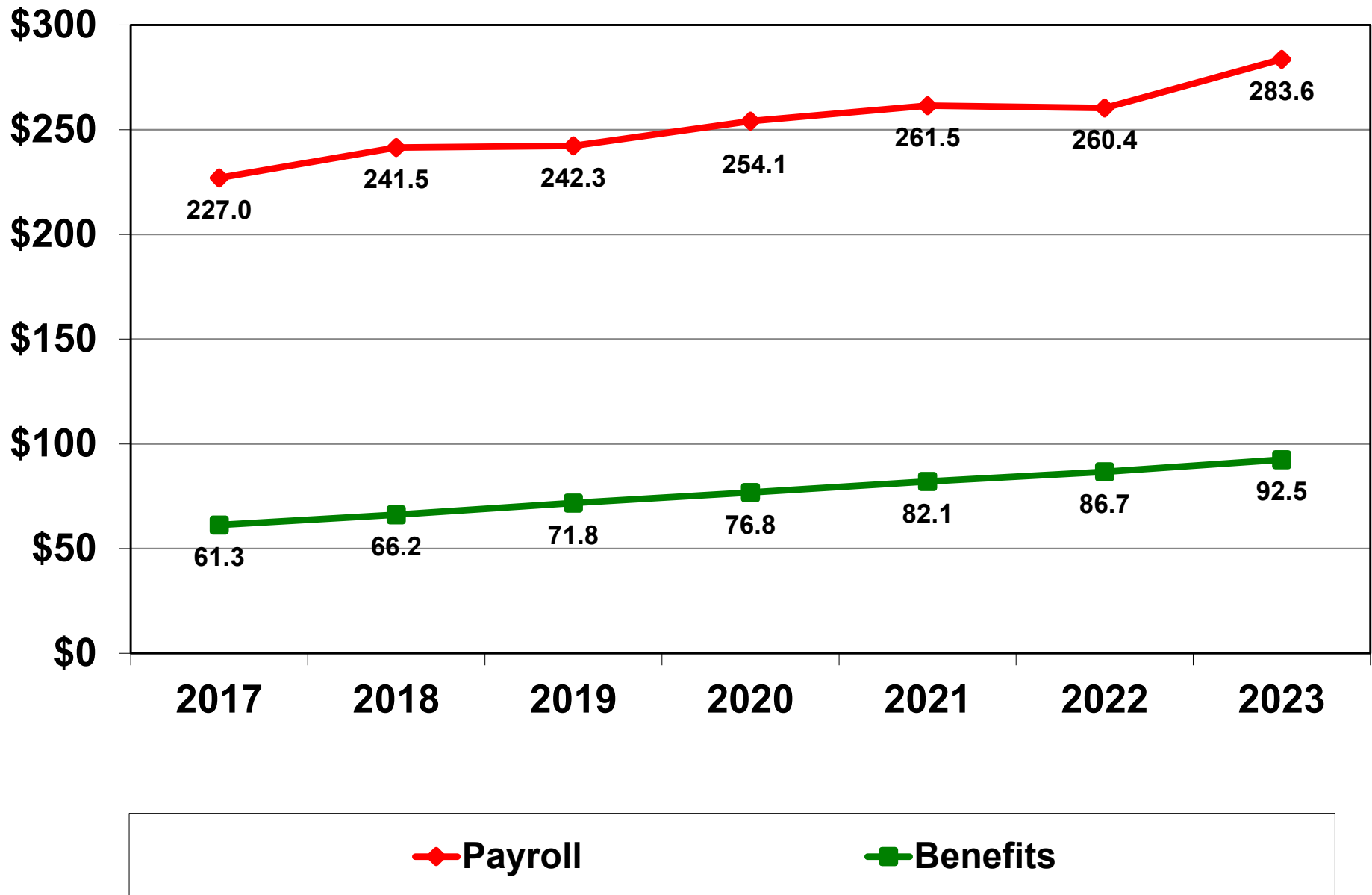
3.5% annual increase for average salary since 2017; 10.9% increase for 2023.

1.7% annual increase for average benefits since 2017; 2.3% increase for 2023.



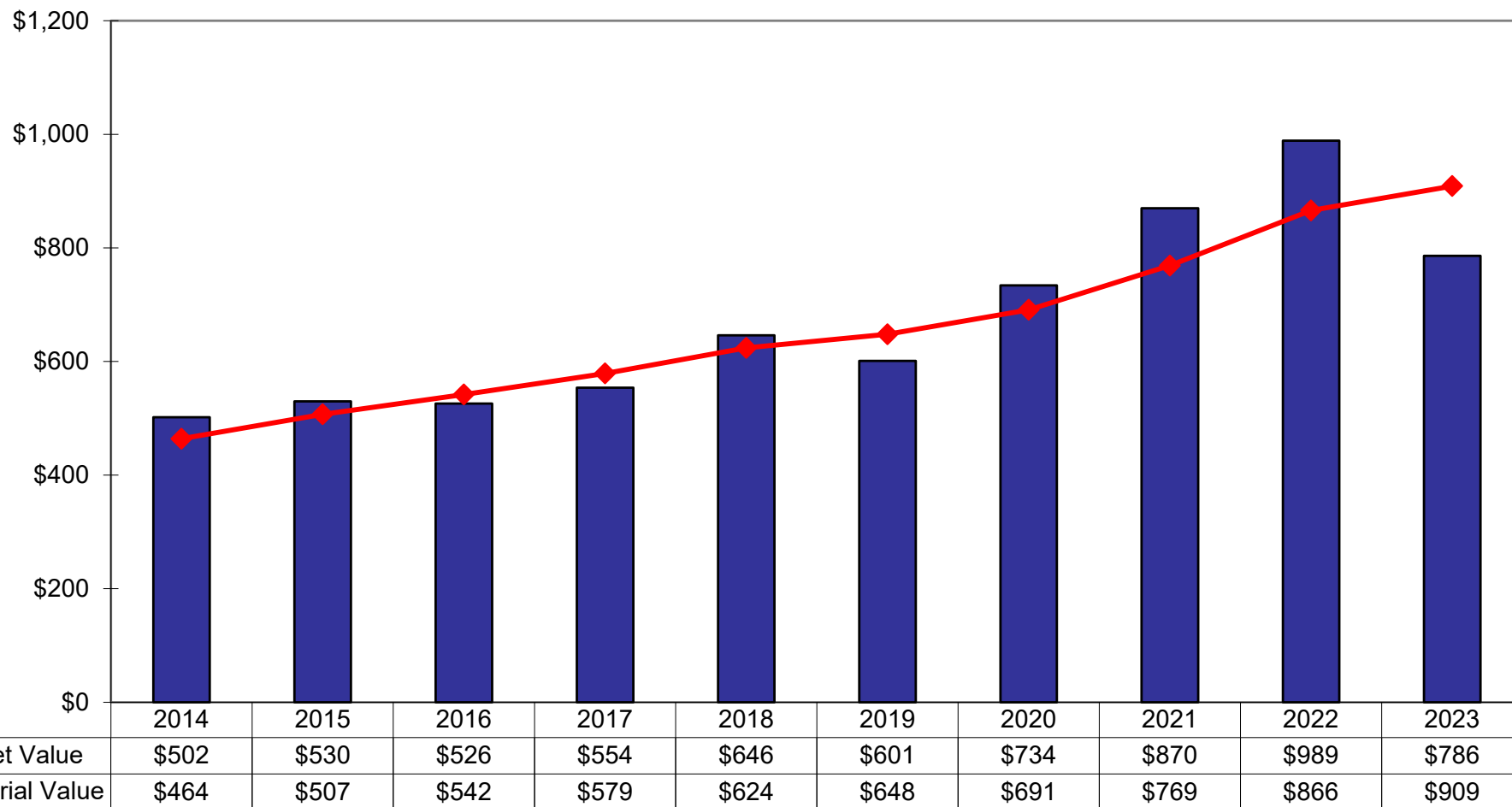
Payroll & Benefits

(\$ Millions)



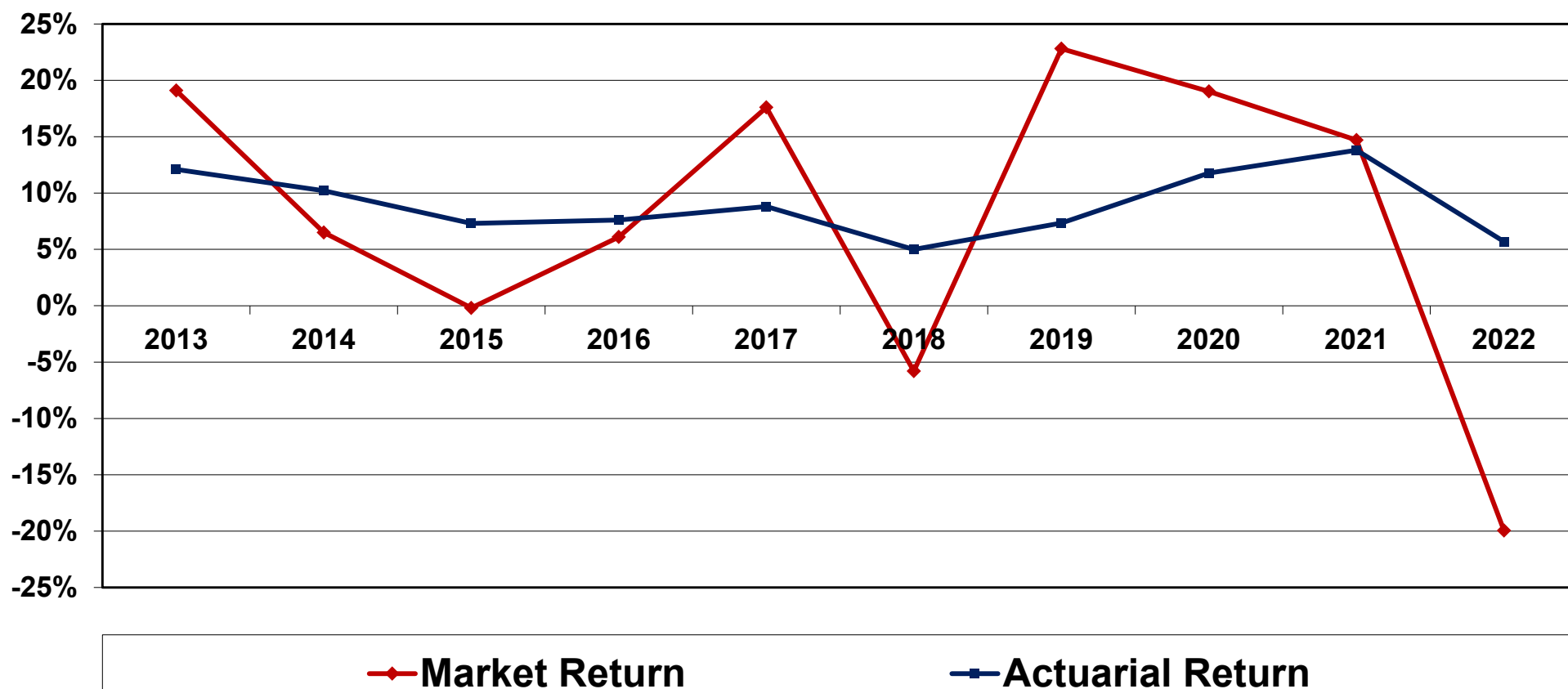


Pension Assets (excluding CIGNA) (\$ Millions)





Asset Returns (excluding CIGNA)



Year Ending	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Market Return	19.1%	6.5%	(0.2)%	6.1%	17.6%	(5.8)%	22.8%	19.0%	14.7%	(20.0)%
Actuarial Return	12.1%	10.2%	7.3%	7.6%	8.8%	5.0%	7.3%	11.8%	13.8%	5.7%

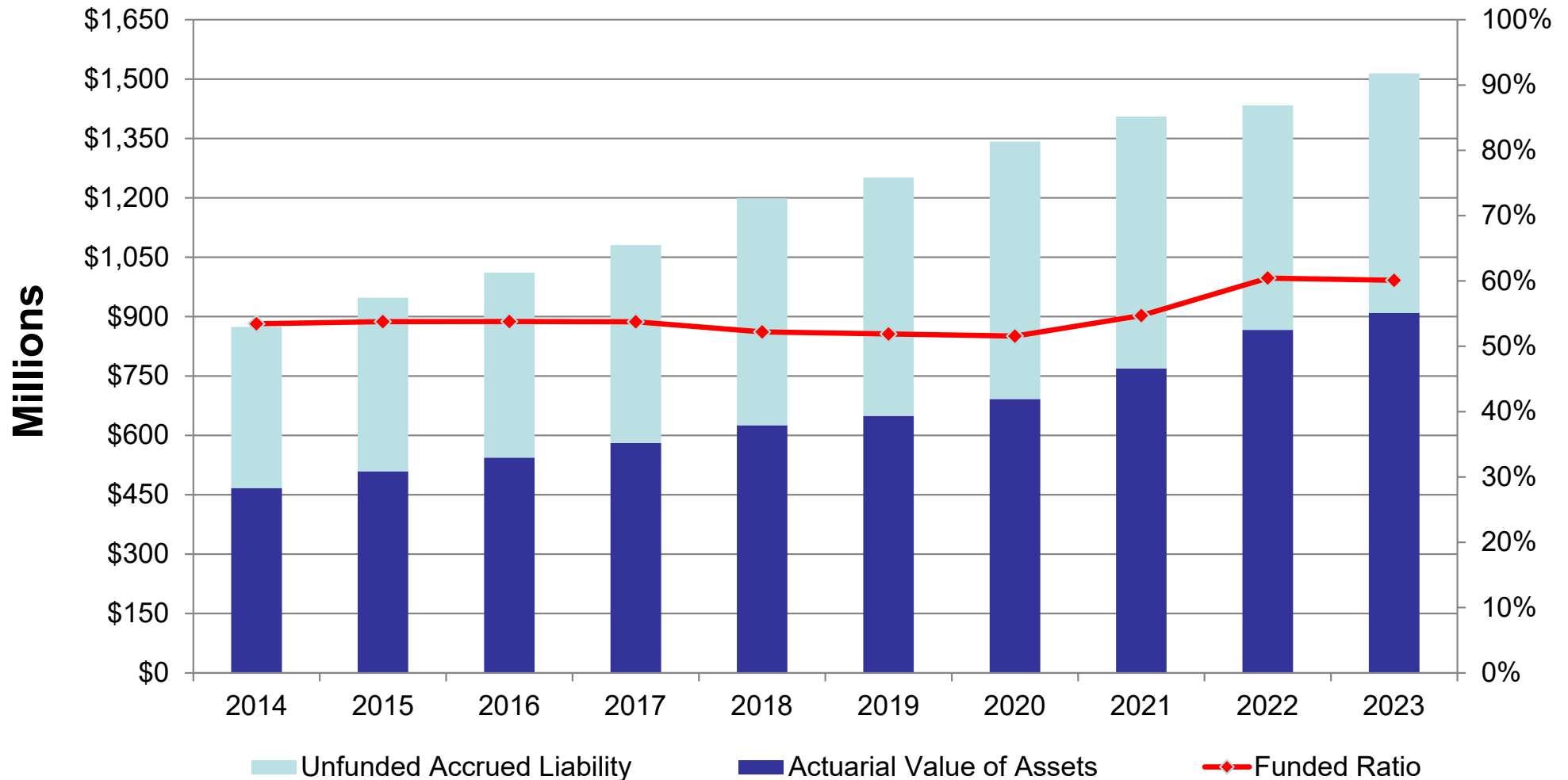


Results of Pension Valuation

Valuation Date	January 1, 2022	January 1, 2023
Covered Payroll for Active Participants	\$260,401,757	\$283,630,892
Actuarial Accrued Liability (AAL)	\$1,433,557,115	\$1,514,691,235
Actuarial Value of Assets	<u>\$866,464,523</u>	<u>\$909,235,002</u>
Unfunded Actuarial Accrued Liability (UAAL)	\$567,092,592	\$605,456,233
Actuarially Determined Contribution (ADC) as a % of covered payroll		
Amortization of UAAL	16.85%	17.02%
Normal Cost	<u>5.01%</u>	<u>4.64%</u>
Total ADC	21.86%	21.66%
Funded Ratio (including CIGNA)	60.5%	60.1%
UAAL Amortization Period	21 Years	20 Years
Discount Rate	7.25%	7.25%

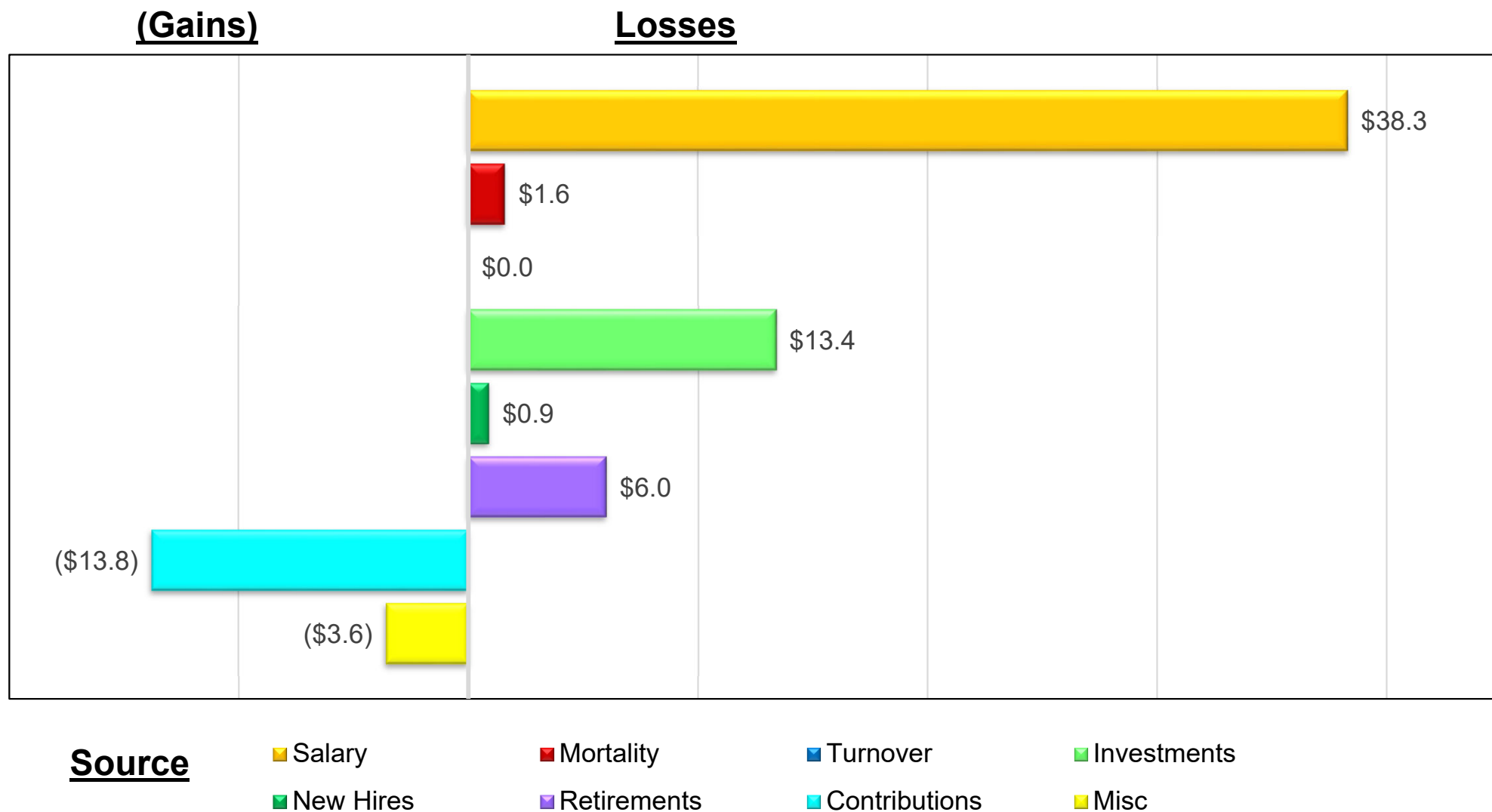


Historical Accrued Liability and Funded Ratio (including CIGNA)





Changes in Unfunded Actuarial Accrued Liability (UAAL) (\$ Millions)





Health Benefit Plan Funding Results



COVID-19

- Society of Actuaries Research Institute released ***Quantifying Long Term Effects of COVID-19 on Health Care Costs*** in April 2023
- Based on commercial health data from January 2019 through July 2021
- There was a noticeable ramp up of costs 6 months prior to COVID-19 diagnosis.
 - Ramp up may be due to deferral of care or not receiving necessary care
- There was a ramp down of costs 6 months after but ending at a noticeable higher level than pre-COVID baseline.
- Ramp up or down and ending baseline increases more significant for sicker patients. Almost no ramp up and almost immediate ramp down for healthy patients with no underlying conditions.
- We do not know yet if any increased costs are due to worsening
 - of underlying conditions, new conditions, or long COVID.
- Limitations of the data are that much of the experience
 - period is pre-vaccine and also does not include longer tail
 - claims periods to determine if post-COVID increased costs
 - are temporary or permanent.





Inflation Reduction Act

The bill's health reforms primarily impact those with Medicare coverage.

Specifically, the bill implements the following measures:

- It allows the Secretary of Health and Human Services to negotiate the prices of certain Medicare drugs each year. The negotiations will take effect in 2026 for 10 drugs covered by Medicare, increasing to 20 drugs in 2029.
- Beginning in 2023, the cost of insulin will be capped at \$35 per month for people with diabetes enrolled in Medicare.
- For Standard Part D, beginning in 2024, the 5% coinsurance for Medicare beneficiaries in catastrophic coverage phase will be eliminated. Beginning in 2025, out-of-pocket prescription drug costs will be capped at \$2,000 per year for Medicare beneficiaries.
- The bill also implements a three-year extension on increased health insurance subsidies for coverage purchased through an Exchange. These enhanced subsidies were originally provided as part of the American Rescue Plan Act, a COVID-19 relief bill, and were set to expire at the end of 2022.



Inputs and Methods

Population

- OPEB valuation includes 115 active employees eligible for health but not pension whose compensation totals \$7.7 M.

Amortization

- UAL amortization period is 20 years, closed.

Methods

- UAL is amortized as a level percentage of pay. Total payroll is assumed to increase by 2.50% per year.

Discount Rate

- Investment return assumption remained at 7.25%.

Asset Smoothing

- Assets are calculated using a five-year smoothing method.



OPEB Valuation Experience



Asset Smoothing

- Using the 5-year smoothing method, we recognize an \$11.1 million investment loss this valuation and each of the following four years.

Upcoming Asset Smoothing

- Year 1: \$ (2,360,690) • Year 2: \$ (5,667,133)
- Year 3: \$ (8,819,178) • Year 4: \$ (11,067,146)

Actuarial Liability Gain

- \$2.2 million gain from claims experience:
- Pre-Medicare claims increased more than expected,
- Stipend for Medicare-eligible retirees did not increase.

Actuarial Liability Loss

- \$2.0 million loss due to changes to healthcare trend assumption.



OPEB Valuation Results

Actuarially Determined Contribution (ADC)

- ADC as a dollar amount increased by \$0.7 million. As a percentage of payroll decreased from 6.84% last year to 6.50%.

Change in ADC Rate

- Decrease in the rate mostly due to payroll increasing significantly more than the assumed 2.5%.

Funded Ratio

- Funded ratio increased from 54.4% last year to 54.9%.



OPEB Valuation Headcounts and Liabilities



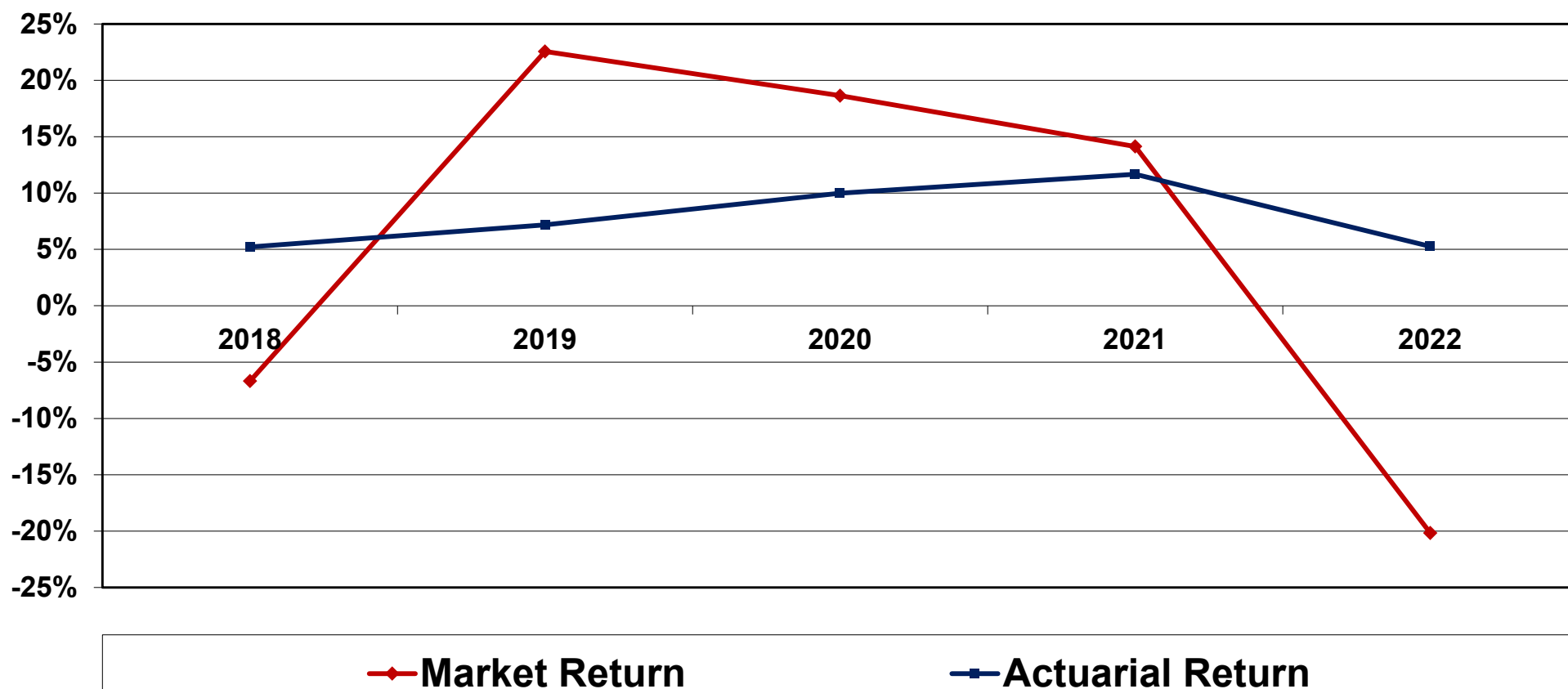
Active Headcounts and Liabilities

	Grandfathered		Non-Grandfathered		Total	
Service Needed For Benefit	Number	Liability	Number	Liability	Number	Liability
10		\$639,306	407	\$61,862,041	417	\$62,501,347
15	0	0	623	60,855,418	623	60,855,418
20	0	0	388	18,573,178	388	18,573,178
30	0	0	<u>2,889</u>	<u>9,935,452</u>	<u>2,889</u>	<u>9,935,452</u>
TOTAL	10	\$639,306	4,307	\$151,226,089	4,317	\$151,865,395

In addition, there are 2,222 retirees with liability totaling \$188,461,452.



Asset Returns



Year Ending	2018	2019	2020	2021	2022
Market Return	(6.7)%	22.6%	18.6%	14.1%	(20.2)%
Actuarial Return	5.2%	7.2%	10.0%	11.7%	5.3%

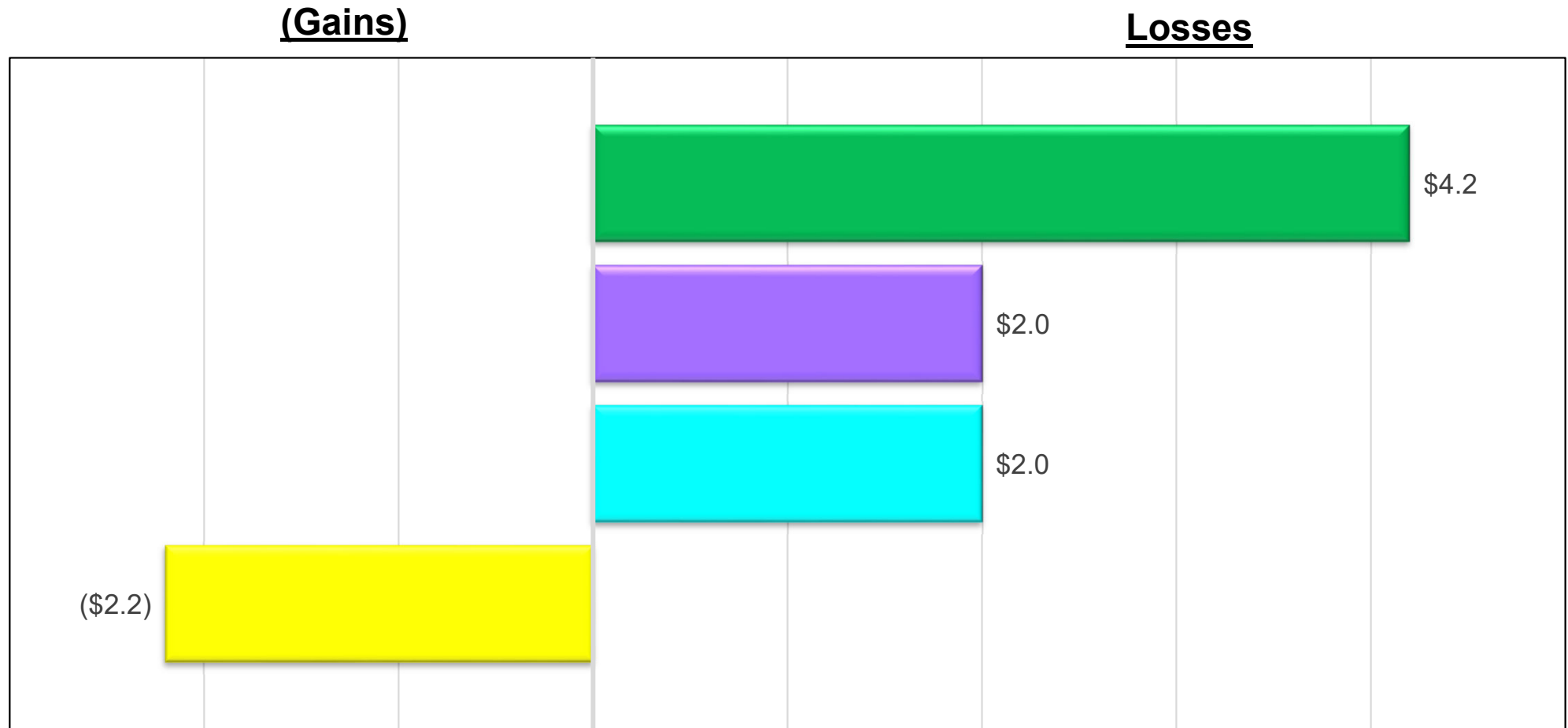


Results of OPEB Valuation

Valuation Date	January 1, 2022	January 1, 2023
Covered Payroll for Active Participants	\$266,942,904	\$291,371,825
Actuarial Accrued Liability (AAL)	\$325,554,352	\$340,326,847
Actuarial Value of Assets	<u>\$177,174,040</u>	<u>\$186,677,561</u>
Unfunded Actuarial Accrued Liability (UAAL)	\$148,380,312	\$153,649,286
Actuarially Determined Contribution (ADC) as a % of covered payroll		
Amortization of UAAL	4.01%	3.92%
Normal Cost	<u>2.83%</u>	<u>2.58%</u>
Total ADC	6.84%	6.50%
Funded Ratio	54.4%	54.9%
UAAL Amortization Period	21 Years	20 Years
Discount Rate	7.25%	7.25%



Changes in Unfunded Actuarial Accrued Liability (UAAL) (\$ Millions)



Source

■ Investments

■ Experience

■ Change in Healthcare Trend

■ Claims



Investment Solutions Portfolio Analysis

Cobb County Strategic 2023

March 16, 2023

Prepared By : UBS Institutional Consulting

UBS Asset Allocation Study

IMPORTANT: The projections or other information generated by the Zephyr Asset Allocation Tool regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Results will vary with each use and over time.

Results reflect the reinvestment of income, but not the impact of transaction costs, advisory fees, taxes and inflation (unless otherwise indicated). If these factors were included, the results shown would be lower.

Historic results are provided for illustrative purposes only and are based on the retroactive application of historic index data to the asset allocation(s) analyzed. The Zephyr tool calculates hypothetical portfolio performance results for the period shown using long-term performance of representative indices as proxies for the hypothetical performance of the asset classes included in the portfolio(s) analyzed. The calculation assumes that the portfolio was rebalanced monthly, which does not necessarily reflect how an actual portfolio would have been managed. Allocations were developed with the benefit of hindsight and results do not consider the impact that material economic and market factors might have had on investment decision-making during the time period. Actual results may be lower than the hypothetical returns and will vary depending on market conditions and the specific composition and implementation of the portfolio. Past performance or historic results provide no guarantee of future returns.

Please see Appendix for important information about this report.

The information herein is based on data and computations by Zephyr Associates and is believed to be reliable but UBS does not warrant its completeness or accuracy.

Scenario Assumptions



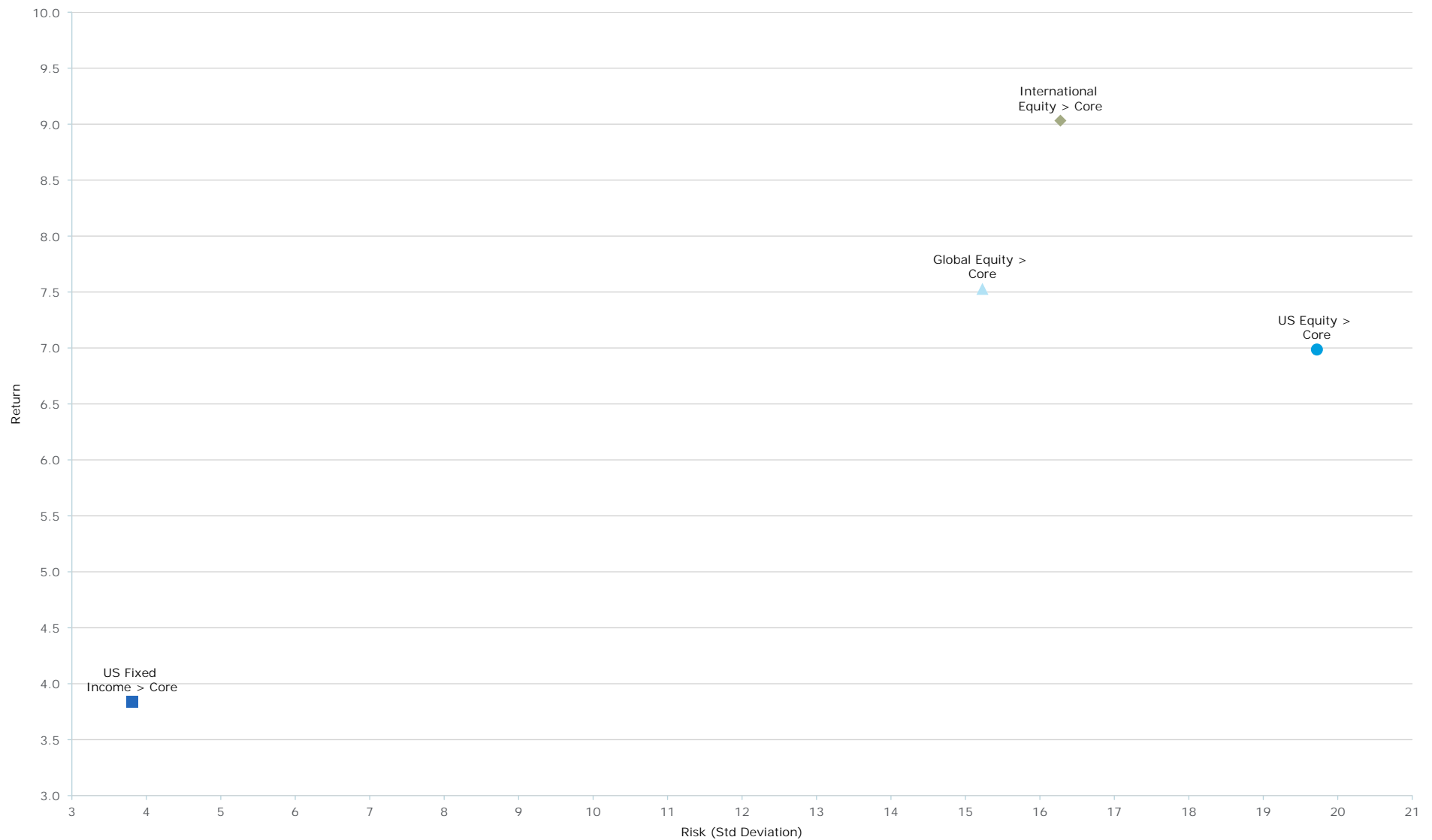
				CONSTRAINTS	
NAME	PROXY	RETURN	STDEV	MIN	MAX
UNGROUPED					
US Fixed Income > Core	Bloomberg U.S. Aggregate	3.84%	3.81%	20.00%	30.00%
US Equity > Core	Russell 3000	6.99%	19.72%	40.00%	60.00%
Global Equity > Core	MSCI ACWI (Net)	7.53%	15.23%	0.00%	12.00%
International Equity > Core	MSCI ACWI ex USA (Net)	9.03%	16.28%	10.00%	20.00%

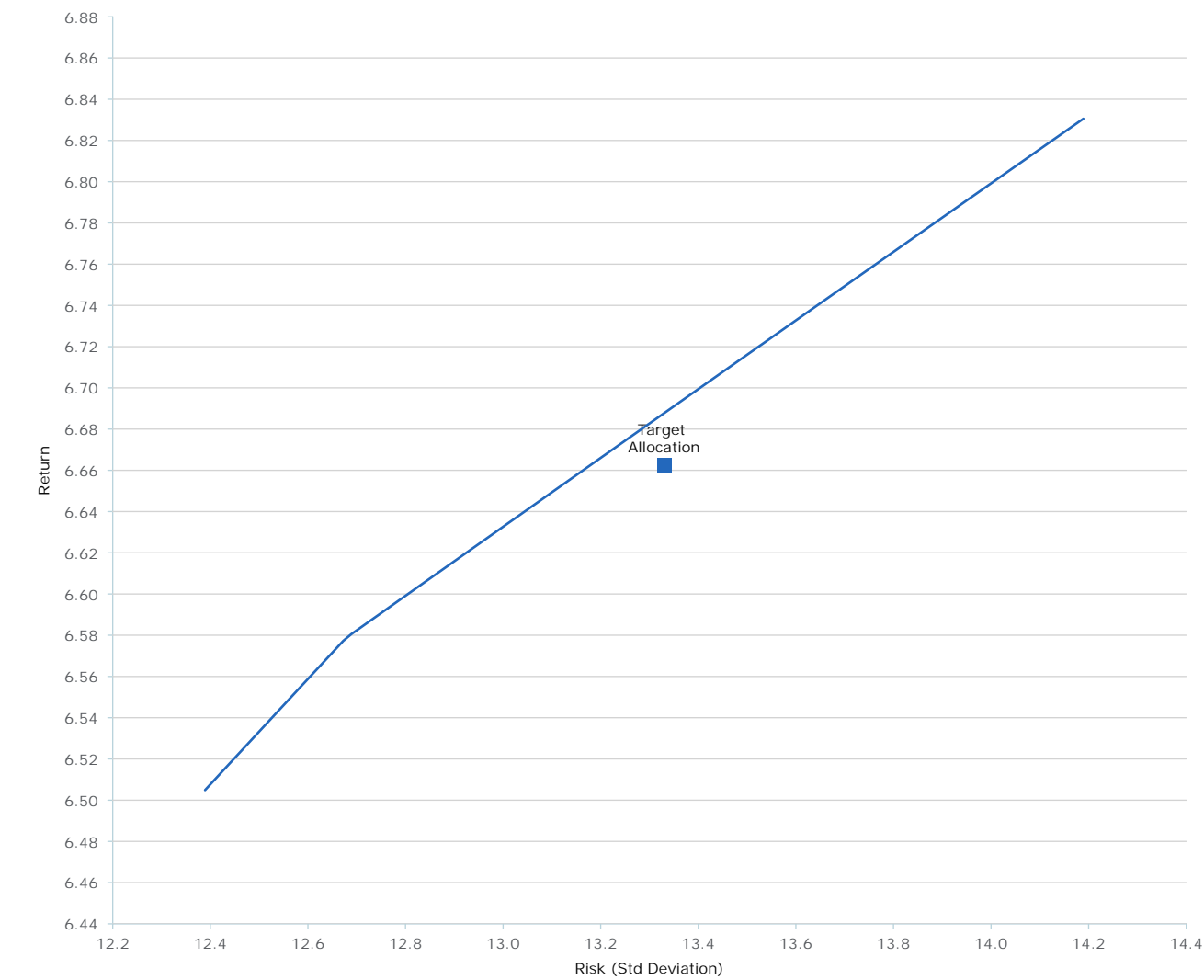
Scenario Assumptions - Correlation Matrix



ASSETS	A	B	C	D
A. US Fixed Income > Core	1.00	0.06	0.05	0.06
B. US Equity > Core	0.06	1.00	0.95	0.84
C. Global Equity > Core	0.05	0.95	1.00	0.96
D. International Equity > Core	0.06	0.84	0.96	1.00

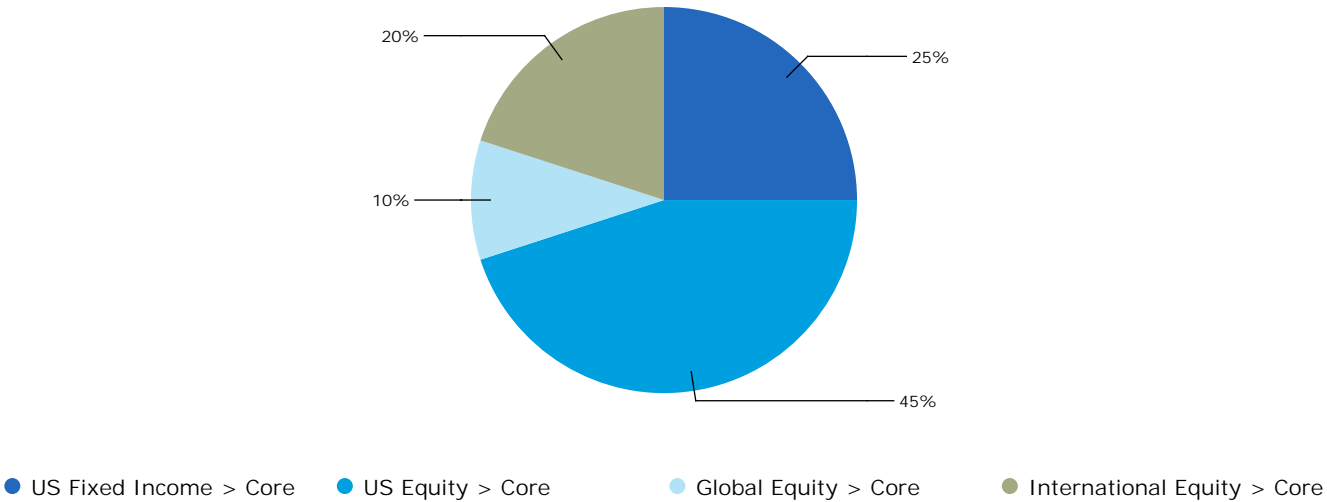
Scenario Return & Risk Assumptions





PORTFOLIOS	RETURN	STDEV	SHARPE RATIO
Target Allocation	6.66%	13.33%	0.47

Target Allocation



	TARGET ALLOCATION
Return	6.66%
Standard Deviation	13.33%
Sharpe Ratio	0.47

Portfolio Allocations

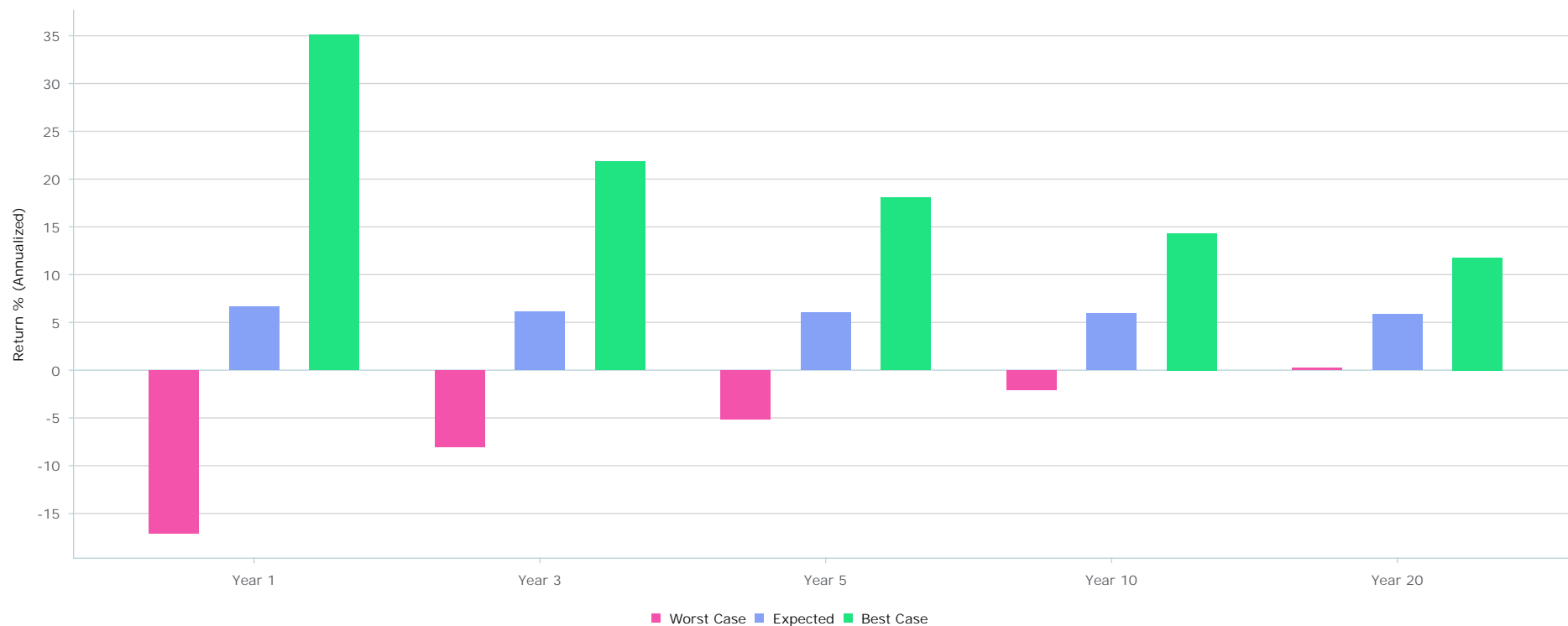


ALLOCATIONS WEIGHTS	TARGET ALLOCATION
US Fixed Income > Core	25.00
US Equity > Core	45.00
Global Equity > Core	10.00
International Equity > Core	20.00
Return	6.66
Standard Deviation	13.33
Sharpe Ratio	0.47

Portfolio Range of Returns



Range of Returns
Target Allocation



	ONE YEAR	THREE YEAR	FIVE YEAR	TEN YEAR	TWENTY YEAR
Best Case	35.09%	21.85%	18.04%	14.33%	11.77%
Expected	6.66%	6.11%	6.00%	5.92%	5.88%
Worst Case	(17.08%)	(8.07%)	(5.10%)	(2.02%)	0.22%
Expected Risk	13.33%	7.64%	5.91%	4.17%	2.95%

Portfolio Single Period Range of Returns



Distribution of Returns - 1 Year



PERCENTILE	TARGET ALLOCATION
Best Case	35.09
Expected	6.66
Worst Case	(17.08)

Portfolio Single Period Range of Returns



Distribution of Returns - 5 Years



PERCENTILE	TARGET ALLOCATION
Best Case	18.04
Expected	6.00
Worst Case	(5.10)

Portfolio Single Period Range of Returns

Distribution of Returns - 10 Years



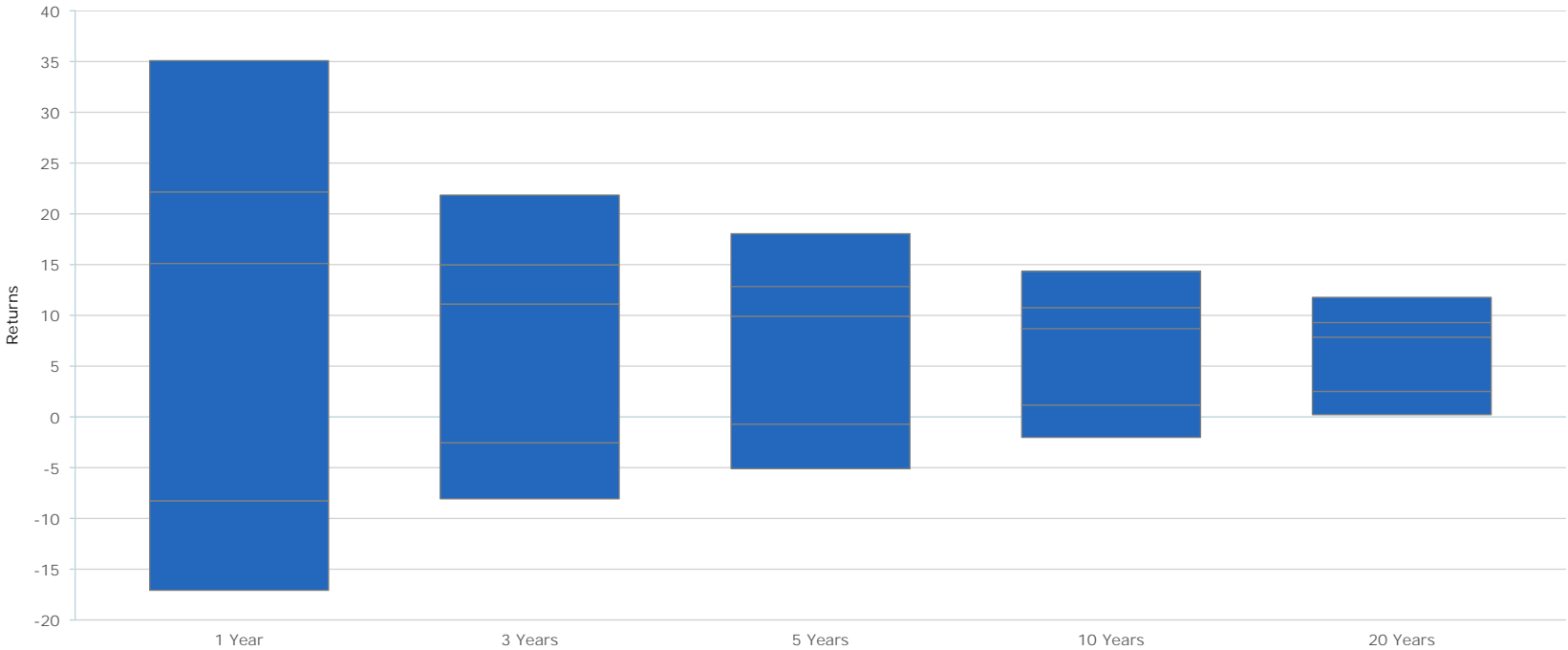
PERCENTILE	TARGET ALLOCATION
Best Case	14.33
Expected	5.92
Worst Case	(2.02)

Distribution of Returns - 20 Years



PERCENTILE	TARGET ALLOCATION
Best Case	11.77
Expected	5.88
Worst Case	0.22

Multiple Portfolio Range of Returns



■ Target Allocation	35.09	21.85	18.04	14.33	11.77	Best Case
	6.66	6.11	6.00	5.92	5.88	Expected
	(17.08)	(8.07)	(5.10)	(2.02)	0.22	Worst Case

Important Information About Your Report

The projections and other information contained in this report have been generated by a digital asset allocation analysis tool developed by Zephyr Associates (the "Zephyr Asset Allocation Tool" or "Zephyr tool"). The goal of the tool is to aid and educate our UBS Consultants, clients and prospective clients in understanding the scope of our service offerings, the issues that should be considered before engaging in an investment strategy or transaction, the basic tenants of investing (particularly with a view towards long-term investing), our views of long-term economic trends and projections and, subject to certain assumptions, the potential effects that a particular strategy, investment program or product or series of transactions may have on a portfolio. You and your UBS Consultant can use this tool to analyze the composition and hypothetical growth of an asset allocation or series of several asset allocations (e.g., your current allocation, a UBS strategic asset allocation model, a custom allocation developed by you and your UBS Consultant based on your individual investment policy, etc.).

The information in this report is based on data and computations provided by Zephyr Associates and other third parties. UBS believes this information to be reliable but we have not independently verified and do not guarantee the accuracy or completeness of the data and computations.

IMPORTANT: The projections or other information generated by the Zephyr Asset Allocation Tool regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results.

Actual results may vary with each use and over time depending on the specific composition of the investor's portfolio, when the portfolio is implemented, and with changing market conditions. All results reflect realized and unrealized gains and losses and the reinvestment of income. Unless otherwise indicated, results do not include the impact of transaction costs (e.g., commissions, mark-ups, mark-downs, fees), advisory fees, or taxes. If these factors were included, the results shown would be lower. Assets are classified based on UBS' proprietary classification methodology (assets held at UBS) or as identified by you (assets held at other financial institutions). Rebalancing to the asset allocation shown is assumed to have occurred at the beginning of each month for the period shown.

Scope of our Services

UBS Financial Services Inc. ("UBS") makes the interactive Zephyr Asset Allocation Tool available to certain UBS Consultants, clients and prospective clients to conduct certain asset allocation analyses. This Zephyr Asset Allocation Tool report is provided for informational purpose only and is not an offer to buy or sell any security or investment strategy, is not meant to be a comprehensive financial plan, and does not create an investment advisory relationship between you and UBS or your UBS Consultant.

This report is intended to aid (and be used by) your UBS Consultant in providing you with actual individualized investment advice. Therefore, the report should only be considered in conjunction with the actual recommendations and advice of your UBS Consultant, our standard account documents, agreements and disclosures and the additional factors that warrant consideration for your particular financial situation, including costs.

If this output is provided as part of a proposal, it is marketing material. You must make independent decisions with respect to any proposals contained within this report. In making those decisions you have reviewed the terms of any Plan with respect to which you are a fiduciary and your obligations to any such Plan under ERISA. This report should be used solely for the purposes of discussion with your prospective UBS Consultant and your independent consideration. UBS does not intend this to be fiduciary or best interest investment advice or a recommendation that you take a particular course of action. If you would like more details about any of the information provided, or personalized recommendations or advice, please contact your UBS Financial Advisor.

Conflicts of Interest. UBS Financial Services Inc. is in the business of establishing and maintaining investment accounts and we will receive compensation from you in connection with investments that you make, as well as additional compensation from third parties whose investments we distribute. This presents a conflict of interest when we recommend that you move your assets to UBS from another financial institution, and also when we make investment recommendations for assets you hold at, or purchase through, UBS. For more information on how we are compensated by clients and third parties, conflicts of interest and investments available at UBS please refer to the "Your relationship with UBS" booklet provided at ubs.com/relationshipwithubs, or ask your UBS Financial Advisor for a copy.

Neither UBS Financial Services nor any of its employees provide tax or legal advice. You must consult with your legal or tax advisors regarding your personal circumstances.

You are not required to implement any of the asset allocation strategies modeled in this report. If you would like UBS to assist you in making any changes to your current asset allocation strategy, the capacity in which we act will depend on, and vary by, the nature of the product, service or account that you select for implementation (i.e., brokerage or advisory). Understanding the ways in which we can conduct business under applicable laws and regulations is essential to the relationship between you and us.

As a firm providing wealth management services to clients in the U.S., UBS Financial Services Inc. is registered with the U.S. Securities and Exchange Commission as an investment adviser and a broker-dealer, offering both investment advisory and brokerage services. Investment advisory services and brokerage services are separate and distinct, differ in material ways and are governed by different laws and separate arrangements. At the end of this report you will find a detailed explanation regarding the distinctions between investment advisory programs and brokerage service, including how we charge for these services and our respective responsibilities to you. See *Conducting Business with UBS: Investment Advisory and Broker-Dealer Services*. It is important that you review and understand the agreements and disclosures we provide to you about the products or services offered. If at any time you would like clarification on the nature of your accounts or the services you are receiving, please speak with your UBS Consultant or visit our website at <http://www.ubs.com/workingwithus>.

Overview

This report is presented for illustrative purposes as a general assessment of the asset allocation strategies displayed. The asset allocations analyzed may include a number of your existing accounts, each with a potentially different investment objective and risk parameter. Where applicable, these accounts have been considered as a whole in helping you develop an overall asset allocation strategy. When considering whether or not to implement any of the asset allocation strategies presented, to buy or sell securities, or to participate in any UBS program, you should carefully review the impact of such changes on each account involved and the impact on the overall portfolio.

Please note that it is your responsibility to determine whether to implement any of the allocation strategies identified in this report and how such implementation would be accomplished. UBS will not track or monitor specific investments you make to determine whether they complement your existing investment objectives, investment policy or any asset allocation strategy you may adopt, unless you have specifically engaged us to provide such monitoring. In addition, this report will not be updated to reflect any changes in your investment strategies, risk tolerances or market conditions.

If your assets are held at UBS Financial Services Inc., your UBS Financial Services Inc. account statements are the only official record of your UBS holdings and account and are not replaced, amended or superseded by any of the information presented in this report.

This report is not intended to provide you with consolidated information or reporting regarding your holdings at other firms. However, at your request, this report may include information regarding assets that you hold at other financial institutions so that we may review your asset allocation and/or investment strategy in the context of your overall holdings. If your assets are held at other financial institutions, this report will be based on information regarding holdings, balances and values of assets you provided to us. We have not verified, and are not responsible for, the accuracy or completeness of this information. If the information you provided is not current, inclusion of these assets will impact the accuracy of the current asset allocation and other analysis presented. You should review the account statements and other documentation you receive from your third party custodian for their record of the assets and asset values held in your accounts. The account statements you receive from your third party custodian regarding the assets you hold with them are the official record of your holdings and accounts and are not impacted or superseded by the information in this report.

UBS's SIPC coverage only applies to assets held at UBS. If you maintain assets at other firms that may be SIPC members, you should contact their financial representative or the other entity or refer to the other entity's statement regarding SIPC membership.

Asset Allocation Presented and Analysis Assumptions:

The results in this report are based on information regarding your investment objectives (as reflected by your allocation criteria), risk tolerance, cash flow requirements, time horizon and other views and requirements. We rely on the accuracy of the information you provide to us in developing this report. Please review the client inputs described in this report carefully as inaccuracies can materially impact the analysis, and advise your UBS Consultant if any change is necessary.

The asset allocation(s) analyzed can be your current asset allocation, a UBS strategic asset allocation or a customized asset allocation developed by you and your UBS Consultant based on your investment policy and risk profile. All asset allocations analyzed were identified by you and/or your UBS Consultant. You should understand that the asset allocation can be modeled at the asset class (e.g., equities, fixed income, etc.) or the sub-asset class (e.g., large-cap equities, emerging market equities) and that there may be asset or sub-asset classes not presented that have characteristics similar or superior to those analyzed in this report. Your UBS Consultant can provide additional information regarding the allocation model(s) analyzed in this report.

UBS strategic asset allocation models are developed using a proprietary process based on UBS capital market assumptions (see Return, Risk, and Correlation Assumptions). UBS has changed its asset allocation models in the past and may do so in the future as circumstances warrant. If UBS strategic asset allocations are used in this report, neither UBS nor your UBS Consultant is required to provide you with an updated analysis based upon changes to asset allocation or other underlying assumptions.

Asset allocation does not assure a profit or eliminate the risk of a loss.

Efficient Frontier Analysis:

Mean-Variance Optimization tools may be used to help determine optimal allocations to different asset classes within a portfolio given a certain level of acceptable risk. The Efficient Frontier analysis is a mean-variance optimization methodology that calculates a series of optimal portfolios that offer the highest expected return for a given level of risk or the lowest risk for a given level of expected return. The Efficient Frontier is determined based on estimated forward-looking risk, return, and correlation of assets assumptions established by UBS (see Return, Risk, and Correlation Assumptions section) and your specific guidelines regarding time horizon and investment objective/ risk tolerance (as reflected in allocation constraints). Each point on the frontier is theoretically efficient based on the given assumptions. An "inefficient portfolio" does not lie on the frontier because alternate portfolios can be found that offers more return for the same amount of risk or the same expected return with a less risk. "Efficient" portfolios on the frontier line are more desirable to investors trying to maximize return and minimize risk. The selection of a proper portfolio depends upon the investor's goals and risk tolerance.

Mean-variance optimization is very sensitive to changes in the forward-looking capital market assumptions and may result in asset allocations and portfolios that are highly concentrated. Your UBS Consultant can provide additional information regarding the Efficient Frontier analysis in this report.

Deterministic Analysis:

Except for any probabilistic analysis sections of this report, a deterministic analysis is used to illustrate the hypothetical growth of the asset allocation strategies presented based on an assumed rate of return, risk and correlation for each asset or sub-asset class identified within the strategy. The rate of return, risk and correlations used are based on estimated forward-looking assumptions established by UBS (see Return, Risk, and Correlation Assumptions section below).

In order to create the analysis presented, the rates of return for each asset or sub-asset class are combined in the same proportion as the asset allocation(s) illustrated (e.g., if the asset allocation indicates 40% equities, then 40% of the results shown for the allocation will be based on the estimated forward-looking risk, return, and correlation assumptions for equities based on UBS proprietary research).

Simulated Portfolio Value Probability Analysis:

Simulated Portfolio Value Probability Analysis (frequently referred to as "Monte Carlo" simulations), is another tool for evaluating the potential future performance of the asset allocation strategies presented. Monte Carlo analyses incorporate future uncertainty by simulating possible return scenarios for a portfolio under variable market conditions. Monte Carlo analysis generally performs several thousand simulations, each simulating the growth of the modeled asset allocation over a specified period of time and assuming certain client inputs and a variety of returns and scenarios, all of which are subject to change as a result of market volatility, economic factors and world events. Monte Carlo results present the probability of achieving certain targets based on the results of the simulations.

IMPORTANT: The projections or other information in this report regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investments results and are not guarantees of future results.

Monte Carlo simulations are based on estimated forward-looking return, risk and correlation assumptions established by UBS (see Return, Risk and Correlation Assumptions section).

Unless noted otherwise, the analysis assumes a constant rate of inflation and does not account for variations in inflation rate over time. Monte Carlo simulations also account for certain client inputs and assumptions regarding inflation and cash flows, the accuracy of which will materially impact the results of the analysis. Please review the client inputs described and advise your UBS Consultant if any change is necessary. Unless specifically included as an outflow, the analysis will not account for investment advisory fees, transaction fees or taxes.

Monte Carlo results are intended to represent a spectrum of possible return outcomes for the modeled asset classes based on the established assumptions. The portfolio value at the end of each scenario is recorded and compared against the established portfolio target. The probability of achieving a target is calculated by dividing the number of scenarios where the portfolio value equaled or exceeded the target by the total number of scenarios. Note that the highest likelihood of success is 99% because there is never a guarantee that a particular result will be actualized. Results should only be viewed as reasonable estimates of possible outcomes and not as a guarantee, prediction or projection. The results shown may vary with each use and over time and if any of the underlying assumptions change. Your actual results can vary materially from the results shown in this analysis.

Monte Carlo analysis does not take into account actual market conditions that may severely affect your portfolio results over the long-term. It does not reflect the average periods of bull and bear markets, which can be longer than those modeled.

The analysis also does not consider short-term correlations among asset class returns and does not consider the results that could occur from an extreme market event, either positive or negative, due to the low probability of such an occurrence. A market crisis can cause asset classes to perform similarly, lowering the accuracy of our return assumptions and diminishing the benefits of diversification in ways not captured by the analysis. As a result, returns actually experienced by the investor may be more volatile than those used in our analysis.

Your UBS Consultant can provide additional information regarding the Monte Carlo/Simulated Portfolio Value Probability analysis reflected in this report.

Historic Asset Allocation Backtest:

If the historical performance of an asset allocation is provided, the historical performance does not reflect your actual performance but, rather, was calculated by the retroactive application of historic index results to the asset allocation(s) analyzed. This performance is based on the long-term performance of certain indexes that have been selected by UBS (or as requested by the Client) as a representative proxy for the asset classes in the asset allocation(s) or portfolio(s) analyzed. See the Scenario Assumptions section for a description of the index proxies used for each asset class in this analysis. UBS selects proxy indices based on our research and understanding of the asset class or the allocation and strategy of the investments in your portfolio, or as requested by the client. Because the asset allocations were structured with the benefit of knowing how each asset class and benchmark performed during the period shown, the hypothetical returns may be higher than the returns of a portfolio that would have been recommended during the time period shown. In addition, backtested performance does not reflect the impact that past economic and market factors might have had on investment decision-making. The results shown reflect realized and unrealized gains and losses and the reinvestment of income, but do not include the impact of transaction costs, advisory fees, taxes and inflation. If these were included, the results shown would be lower. Please note that the historical backtest analysis considers data over the period shown and assumes that the asset allocation was rebalanced at the beginning of each month back to the initial asset allocation. This rebalancing frequency does not necessarily reflect how an actual portfolio would have been managed. There is no guarantee that these backtested results could, or would, have been achieved had this asset allocation been used during the years presented.

Past performance or historic results provide no guarantee of future returns.

Return, Risk and Correlation – Assumptions Forward-Looking Estimates:

The asset class risk and return results used and displayed in this report, as well as the asset class correlations, are based on estimated forward-looking return, risk, as measured by standard deviation, and correlation assumptions ("capital market assumptions"), which are based on UBS proprietary research. The development process includes a review of a variety of factors, including the return, risk, correlations and historical performance of various asset classes, inflation and risk premium.

The strategic returns in the UBS capital market assumptions consider returns over a full business cycle. The capital market assumptions are subject to change at any time at our discretion and without notice. UBS has changed its return, risk and correlation assumptions in the past and may do so in the future. Neither UBS nor your UBS Consultant is required to provide you with an updated analysis based upon changes to these or other underlying assumptions.

Since assumptions are subject to uncertainty, including market forces and factors outside of our control, you should also understand that the assumptions used are estimates, are not guarantees or projections of future results. There is no certainty that the assumptions for the model will accurately estimate asset class return rates going forward. Actual long-term results for each asset class may differ from our assumptions, with those for classes with limited histories potentially diverging more. As a result, UBS will not be responsible for omissions in the analysis, regardless of the source of such inaccuracies, errors, or omissions. In addition, capital market assumptions pertain to the asset or sub-asset class in general, not the performance of specific securities or investments. Particular investment products may have higher or lower returns than the range for the corresponding asset class used in this analysis.

Your actual results may vary significantly from the results shown in this report.

Periodic Reviews:

This report is based on information you have provided as of the date indicated. Over time, your financial circumstances or the other assumptions and estimates that underlie this report may change. For this reason, you should periodically meet with your UBS Consultant to re-evaluate your financial situation, reassess your asset allocation strategy, and review the assumptions upon which this information is based.

Asset Class Risk Considerations:

Some of the general risk considerations associated with the asset classes included in this report are described below. The descriptions are not meant to be a complete list of all investment risks. Individual funds and investments will have specific risks related to their investment programs that will vary from fund to fund. Clients should familiarize themselves with the particular market risks and the other risks associated with the specific investment. All investments contain risk and may lose value.

Alternative Investment Strategies – Alternative investment strategies are investment vehicles that are formed by professional money managers to afford them greater flexibility to manage money in any market environment. These strategies typically have flexibility regarding the types of securities in which they can invest (e.g., options and futures contracts), the types of positions they can take (e.g., long and short positions) and the amount of leverage they are permitted to employ. A professional money manager can use these and other techniques to modify market exposure and create portfolio characteristics that may be desirable for certain clients (e.g., reduced correlation to financial markets, potential lower volatility, and better performance in "down" markets). This flexibility can add value when used skillfully. This flexibility does, however, add additional elements of risk and complexity, including that alternative investments are often long-term, illiquid investments that are subject to restrictions on transfer and not easily valued. Note that due to the nature of alternative investments, the risk and return assumptions used in this analysis may tend to overstate potential benefits but not fully reflect potential risks.

Interests of Non-Traditional Investment Strategies are sold only to qualified investors, and only by means of offering documents that include information about the risks, performance and expenses of the funds, and which Clients are urged to read carefully before subscribing and retain. An investment in a fund is speculative and involves significant risks. The funds' performance may be volatile, and investors may lose all or a substantial amount of their investment in a fund. The funds may engage in leveraging and other speculative investment practices that may increase the risk of investment loss. The funds are subject to high fees, including management fees and other fees and expenses, all of which will reduce profits. Prospective investors should understand these risks and have the financial ability and willingness to accept them for an extended period of time before making an investment in a fund. Investors should consider a fund as a supplement to an overall investment program.

Investing in the fixed income market is subject to risks including market, interest rate, issuer, credit, default and inflation risk. An investment in a portfolio may be worth more or less than its original cost when redeemed. Derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management, default risk, and the risk that the position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

Equity investments represent ownership interest in a company. Historically, equities are more risky than fixed income or cash investments as they experience greater volatility risk, which is the risk that the value of your investment may fluctuate over time. The value of investments in equity securities will fluctuate in response to general economic conditions and to changes in the prospects of particular companies and/or sectors in the economy. The risk of equity investments can vary based on the market capitalization (market value) of the company, for example, Large, Mid, and Small. Investments in small cap and medium company stocks can be more volatile over the short term than investments in large company stocks.

Non-U.S. Equity and Fixed Income represent ownership interests and debt, respectively, of foreign governments and corporations that can be sub-divided into those from countries that have "Developed Markets" or "Emerging Markets." Foreign investing involves risks, including, but not limited to, risks related to foreign currency, limited liquidity, less government regulation and the possibility of substantial volatility due to adverse political, economic or other developments. Investors in securities of issuers located outside of the United States should be aware that even for securities denominated in U.S. dollars, changes in the exchange rate between the U.S. dollar and the issuer's "home" currency can have unexpected effects on the market value and liquidity of those securities. Those securities may also be affected by other risks.

Calculation Definitions

This section includes descriptions for the terms and calculations used within this report. Your UBS Consultant can provide additional information regarding the terms, calculations, and results contained within this report.

Alpha: Alpha is a measure of risk-adjusted return. It measures the difference between a portfolio's returns and the returns the portfolio might be expected to deliver based on the portfolio's level of risk (beta) and a benchmark index over the date range shown. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating alpha. A positive alpha means the portfolio outperformed expectations for the period shown, while a negative alpha indicates that the portfolio underperformed expectations during the period shown. If two portfolios have the same return, but one has a lower beta, that portfolio would have a higher alpha.

Annualized Returns: An annualized return is the geometric average return of a portfolio for each year over the time period shown. Annualized returns take into account compounding returns by considering the portfolio's cumulative return (the total compounded portfolio return over the time period) and expressing that as a per year figure. Annualized returns only provide a snapshot of investment performance as of a given date and do not indicate volatility over the time period analyzed.

Average Positive Return/Average Positive Return: To calculate the average positive return and average negative return for a portfolio over a given date range, the Zephyr Asset Allocation Tool partitions the portfolio's series of returns into two parts, one made up of the positive periods of returns (up periods), the other of the zero and negative periods of returns (down periods). The average positive/up and negative/down returns are the respective averages of these two series.

Batting Average: The batting average of a portfolio is the ratio between the number of periods where the portfolio outperforms a benchmark and the total number of periods. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating batting average.

Best Case/Worse Case: See Range of Returns.

Best Month Return/Worse Month Return: The best month return is simply the maximum of the monthly returns inside the given date range. Similarly, the worst month return is the minimum of the monthly returns inside the date range.

Best Quarter Return/Worse Quarter Return: The best quarter return is simply the maximum of the quarterly returns inside the given date range. Similarly, the worst month return is the minimum of the quarter returns inside the date range.

Best Year Return/Worse Year Return: To calculate the best one-year return for a given portfolio, the Zephyr Asset Allocation moves a one-year time window along the series and calculates the compound return for each of these windows. The best one-year return is the maximum of the returns thus found. Similarly, the worst one-year return is the minimum of the returns thus found. Note that best and worst one-year returns do not refer to calendar years. Rather, they refer to arbitrarily placed one-year periods.

Beta: Beta represents the systematic risk of an analyzed portfolio. Beta measures how the analyzed portfolio performed in relation to the performance of a benchmark index during the time period shown. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark index for calculating beta. A portfolio with a beta of one is considered to be as volatile (risky) as the benchmark and would therefore have provided returns equal to those of the market benchmark during both up and down periods over the date range analyzed. A portfolio with a beta of two would have moved approximately twice as much as the benchmark.

Conditional Value at Risk: See Value at Risk.

Constraints, Min and Max: Portfolio asset class constraints established by the Client to force minimum or maximum allocations to selected asset classes when generating an Efficient Frontier.

Correlation (R): Correlation represents the degree to which an investment's return moves in tandem with another and is a critical component of diversified portfolio construction. The Correlation of assets varies between a minimum of -1 (move in opposite direction) and a maximum of 1 (completely correlated). A correlation of 0 indicates no relationship between the investments. When included within a portfolio, assets with lower Correlations to the other assets in the portfolio enhance diversification and result in better risk-adjusted expected returns for the portfolios. An R of less than 0.3 is often considered low Correlation. Correlation may also be used to represent the degree to which a portfolio's return moves in tandem with a benchmark or an asset class moves in tandem with another asset class.

Cumulative Distribution of Return: **See Omega.**

Cumulative Excess Return: **See Excess Return.**

Distribution of Returns: **The range of possible outcomes that may be expected for a portfolio compounded over the time period(s) shown based on the asset class return, risk (standard deviation), and correlation assumptions set by UBS (and accounting for any Constraints imposed by the Client).** The distribution of returns presents the annualized returns after the period(s) shown and displays various percentiles which represent the percentage of possible return outcomes that may be expected to be equal to or lower than the stated return. The percentiles displayed include the 5th percentile, 25th percentile, 50th percentile (which is a median return), 75th percentile, and 95th percentile.

Down Capture: **See Up Capture/Down Capture.**

Drawdown: **Any sub-period of time during the date range analyzed where the portfolio had a negative loss percentage starting from the date of the loss began (drawdown start date) and ending on the date of the lowest value before the portfolio recovered to its value before the loss began (drawdown end date).** Conceptually, this is the "peak to trough" of the drawdown when displayed on a graph. Drawdown measures the loss percentage (compounded, not annualized) that a portfolio incurred during any sub-period of the date range analyzed. **See Maximum Drawdown.**

Drawdown Average: **The arithmetic average of all returns during all drawdowns over the date range analyzed. The drawdown average is based on drawdowns that begin with a drawdown start date and end with a drawdown end date. Compare to Average Negative Return which is the arithmetic return of all periods (e.g., calendar months) that had a negative return during that period.**

Efficient Frontier: **Nobel Laureate Harry Markowitz developed mean-variance optimization as a way to create optimal portfolios based on risk-return trade-offs. The optimization, which results in an Efficient Frontier, uses three inputs – returns, standard deviations (risk), and correlations – to combine assets into portfolios that maximize return for any given level of risk.**

Excess Return: **Excess return represents the difference between the return of the analyzed portfolio and the return of a benchmark. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating excess return. A positive excess return implies that the portfolio outperformed the benchmark. Cumulative excess returns represent the difference between the total returns in the portfolio and the total returns for the benchmark during a given date range and annualized excess returns represent the difference between the annualized returns of the portfolio series and the annualized returns of the benchmark during a given date range.**

Expected Return: **See Range of Returns.**

Expected Risk: **See Range of Returns.**

Information Ratio: **Information Ratio measures the consistency of excess returns of a portfolio compared to a benchmark. The information ratio is the portfolio's annualized excess return over a benchmark divided by the portfolio's annualized standard deviation of excess return over the benchmark (i.e. tracking error). Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating the information ratio.**

Inflation: **The Monte Carlo simulation projections can include an inflation rate that would be applied to each year being simulated.**

Interpolate: **The Monte Carlo Simulation allows Clients to use multiple expected return distributions using the interpolate option. Clients can enter supplementary mean and standard deviation values in addition to the mean and standard deviation values established by the UBS capital market assumptions. The mean and standard deviation define a distribution that represents possible future returns. Clients can also choose the distribution type as either normal or log-normal. Log-normal distribution intends to account for observations that returns are never less than -100% and that over longer time periods (such as a year) returns are positively skewed. Please speak with your UBS Consultant for more information regarding additional mean and standard deviation values and log-normal distribution.**

Kurtosis: **Kurtosis characterizes the relative peakedness or flatness of a distribution of returns compared with a normal distribution. Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.**

MAR (minimal acceptable return): **A minimal return figure established to assess a portfolio's ability to achieve a certain target. See Sortino Ratio and Omega.**

Maximum Drawdown: Maximum drawdown is the maximum loss percentage (compounded, not annualized) that a portfolio incurred during any sub-period of the date range analyzed. Conceptually, this is the biggest "peak to trough" loss, beginning with the maximum drawdown start date (the date the maximum loss percentage started) and ending with the maximum drawdown end date (the date that the portfolio hit its lowest point before recovering to the peak level reached before the maximum drawdown). The calculation looks at all sub-periods of the entire time period analyzed and calculates the compounded return of the portfolio or index over that period. The maximum drawdown loss value is the largest negative value of all these compounded return periods (or zero if there were no drawdowns during the period analyzed). The maximum drawdown length is the number of periods (days, months, or quarters depending on the periodicity of the data) between the maximum drawdown start date and the maximum drawdown end date. The maximum drawdown recovery date is the date that the portfolio returns to the drawdown start date (the date at which the compounded returns regain the peak level that was reached before the maximum drawdown began). The maximum drawdown recovery length is the number of periods it takes to reach the recovery level from maximum drawdown end date.

Monte Carlo Percentiles: Probability distributions of asset value outcomes generated from the Monte Carlo Simulations.

Monte Carlo Probabilities: The probability of the wealth goal (or target) is the number of simulation trials that meet or exceed the wealth goal (or target) divided by the total number of trials.

Omega: Omega relative to a given minimal acceptable return (MAR) is the ratio between the price of a European call option written against the investment and the price of a European put option written against the investment, with the strike price being equal to the MAR in both cases. Omega is represented graphically as a cumulative distribution of returns function where the x-axis (horizontal axis) of the graph displays returns and the y-axis (vertical axis) of the graph displays the probability that a given portfolio will achieve or exceed that return figure. Upside Omega is the area on a cumulative distribution between the vertical minimum acceptable return (MAR) line and the distribution above the MAR. This is highlighted in green on the Cumulative Distribution of Returns slide(s). It is the numerator in the omega calculation. Downside Omega is the area on a cumulative distribution between the vertical minimum acceptable return line (MAR) and the distribution below the MAR. This is highlighted in red on the Cumulative Distribution of Returns slide(s). It is the numerator in the omega calculation.

Pain Index: The Pain Index is a statistic developed by Zephyr exclusively for use within the Zephyr Asset Allocation tool. It represents the frequency, the depth, and the width of the portfolio's drawdowns by calculating the area enclosed by the downward drawdown graph and the zero drawdown line, divided by the length of the time interval. The pain index is an attempt to capture in one single number as much of the information that is contained in the drawdown graph as possible, rather than just the maximum drawdown number. This number increases as the spikes grow more frequent, deeper, or wider during the same time period.

Pain Ratio: The Pain Ratio indicates the excess return per unit of total risk as measured by the pain index of the portfolio. It is a ratio of the portfolio's annualized excess returns over the risk-free rate to the portfolio's pain index. The pain ratio is a measure of the premium earned for the risk incurred by the portfolio.

Range of Returns: A Range of Returns indicates the range of possible outcomes calculated by the cumulative returns compounded over the period(s) shown for a given portfolio based on UBS return, risk, and correlation assumptions (and Client Constraints). The expected return is the annualized return after the period(s) shown under a base case scenario. The best/worst case return is the annualized return after the period(s) shown under a best/worst case scenario, and the expected risk is the standard deviation of the expected return. As the time horizon increases, the expected risk moves towards zero. For any given portfolio, the expected return for a time period is represented by the 50th percentile (which is a mean return) and the expected best case scenario by the 95th percentile and the expected worst case scenario by the 5th percentile. The likelihood of obtaining a total portfolio value that is more extreme than the best/worst case cumulative value (given the capital market assumptions and Constraints) is approximately 2.5%.

R-Squared: The R-Squared (R2) of a portfolio measures the variance of the portfolio's returns compared to the variance of a benchmark's returns in order to determine how closely the portfolio tracks the benchmark. R2 ranges between zero and 100%. An R2 of 100% indicates perfect tracking, while an R2 of zero indicates no tracking at all. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark for calculating R2.

Relative Constraints: These are portfolio asset allocation constraints established by the Client indicating the allocation to an asset class or asset class group has to be less than, greater than or equal to another asset class or asset class group.

Return, Risk, and Correlation assumptions: Mean-Variance optimization uses three inputs to generate the Efficient Frontier: Returns, Standard Deviations (Risk) and Correlations. These are commonly referred to as the Capital Market Assumptions for generating the Efficient Frontier. These values are based on UBS estimated forward-looking assumptions based on UBS proprietary research (see the Return, Risk, and Correlation Assumptions – Forward-looking Estimates section for more information).

Sharpe Ratio: The Sharpe Ratio indicates the excess return per unit of total risk as measured by standard deviation. It is a ratio of the portfolio's arithmetic average of excess returns over the risk-free rate to the portfolio's standard deviation. The Sharpe Ratio is a measure of the premium earned for the risk incurred by the portfolio. The Sharpe Ratio – Internal is similar to the Sharpe Ratio, but the denominator is the standard deviation of the portfolio's excess returns over the risk-free rate (i.e. tracking error). This captures the risk associated with the excess returns instead of the risk solely associated with the portfolio.

Skewness: Skewness characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

Sortino Ratio: The Sortino Ratio indicates the excess return per unit of total risk as measured by downside deviation. It is a ratio of the portfolio's arithmetic average of excess returns over a minimum acceptable return (MAR) to the portfolio's downside deviation. The Sortino ratio uses the downside deviation with a constant MAR indicated. Downside deviation measures the deviation between returns that are less than the MAR and the MAR.

Standard Deviation: A measure of the extent to which observations in a series vary from the mean of the series. The standard deviation of a series of asset returns is a measure of volatility or risk of the asset. A large standard deviation implies that there have been large swings in the return series. The standard deviation calculation assumes that the return series is a sample of possible returns, while the population standard deviation assumes that the series has all of the returns in the population.

Tracking Error: Tracking Error measures the difference between the returns of the analyzed portfolio and those of a benchmark. Tracking error is calculated as the annualized standard deviation of the excess return of the portfolio compared to the benchmark return. The lower the tracking error, the more closely the portfolio's returns tracked those of the benchmark. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating tracking error.

Trailing Year Returns: Returns trailing from the date analyzed. All returns over one year are annualized.

Treynor Ratio: The Treynor Ratio is a risk-adjusted measure of return which uses beta to represent risk. It is the portfolio's excess return over the risk-free rate divided by the portfolio's beta to the selected benchmark. The Treynor Ratio differs from the Sharpe Ratio insofar as the beta to the market benchmark is used as the measure of risk rather than the standard deviation of the portfolio series.

Up Capture/Down Capture: The up and down capture measure how well the portfolio was able to replicate or improve on phases of positive benchmark returns and how badly the portfolio was affected by phases of negative benchmark returns. To calculate the up capture, we first form a new return series from the portfolio and benchmark return series by dropping all time periods where the benchmark return is zero or negative. The up capture is then the ratio of the annualized return of the resulting portfolio series to the annualized return of the resulting benchmark series. The down capture is calculated analogously. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark for calculating the up capture and down capture.

Upside/Downside Deviation: Downside deviation measures the deviation between returns that are less than a target return and the target return. Upside deviation measures the deviation between returns that are more than a target return and the target return. Target returns may be referred to as a minimal acceptable return (MAR).

Value at Risk: Nonparametric Value at Risk (VaR) attempts to evaluate risk by applying historical returns for a portfolio and determining a VaR value where a certain percentage (called the confidence level) of the rest of the portfolio's returns exceeded that VaR value. For example, if the confidence level is 95%, that means that 95% of the portfolio's historical returns over the given date range were more than the VaR and analogously that 5% of the portfolio's historical returns over the given time frame were less than the VaR. If the confidence level is 99%, that means that 99% of the portfolio's historical returns exceeded the VaR and 1% of the portfolio's returns were less than the VaR. Conditional Value at Risk (CVaR) quantifies the amount of tail risk for an investment portfolio by calculating the average return of the portion of the portfolio's historical returns that exceeded a given confidence level. For example, if the confidence level is 95%, the CVaR calculates the average return of the worst 5% of historical returns over the given time frame. CVaR provides an average historical loss whereas VaR provides a range of the historical losses.

Worst Month Return/Worst Quarter Return: See Upside/Downside.

Conducting Business with UBS: Investment Advisory and Broker Dealer Services:

As a wealth management firm providing services to clients in the United States, UBS Financial Services Inc. is registered with the U.S. Securities and Exchange Commission (SEC) as a broker-dealer and an investment adviser, offering both brokerage and investment advisory services.

Our clients work with their UBS Consultants to determine the services that are most appropriate given their financial goals and circumstances. Based on the services you request, we can fulfill your wealth management needs in our capacity as a broker-dealer, as an investment adviser, or as both. Most of our UBS Consultants are qualified and licensed to provide both brokerage and investment advisory services depending on the services requested by their clients.

In addition, some of our UBS Consultants hold educational or professional credentials, such as the Certified Financial Planner™ (CFP®) designation (Certified Financial Planner Board of Standards Inc. owns these certification marks in the U.S., which it awards to individuals who successfully complete CFP Board's initial and ongoing certification requirements). Holding a professional designation typically indicates that the UBS Consultant has completed certain courses or continuing education. However, a UBS Consultant's professional designation does not change the obligation of UBS or the UBS Consultant to you in providing investment advisory or brokerage services to you.

It is important to understand that brokerage and investment advisory services are separate and distinct and each is governed by different laws and separate arrangements that we may have with you. While there are similarities between the brokerage and investment advisory services we provide, depending on the capacity in which we act, our relationship and legal duties to you are subject to a number of important differences as described in our applicable contracts with you.

This document is intended to inform you about the key distinctions between brokerage and investment advisory services and our respective duties and obligations. We encourage you to review this document carefully and discuss it with your UBS Consultant.

Our Services as a Broker-Dealer and Relationship with You:

As a full-service broker-dealer, our services are not limited to taking customer orders and executing securities transactions. In our capacity as broker-dealer, we may provide a variety of services relating to investments in securities, including investment research, trade execution and custody services. In a brokerage account, you pay us commissions and applicable fees each time we execute a transaction in your account.

We also may make recommendations to our brokerage clients about whether to buy, sell or hold securities. We consider this to be part of our brokerage services and do not charge a separate fee for this advice. Our recommendations must be suitable for you in light of your particular financial circumstances, goals and tolerance for risk. When we provide recommendations with respect to a retirement account such as an IRA, we do so pursuant to the laws, regulations and exemptions that apply to these accounts.

When we work with you in our capacity as broker-dealer, we do not make investment decisions for you or manage your accounts on a discretionary basis. We will only buy or sell securities for brokerage clients based on specific directions from you.

Our Responsibilities to You as a Broker-Dealer:

When we act as your broker, we are subject to the Securities Exchange Act of 1934, the Securities Act of 1933, the rules of self-regulatory organizations such as the Financial Industry Regulatory Authority (FINRA), the rules of the New York Stock Exchange and applicable state laws.

The standards for broker-dealers under these rules and regulations include the following:

- As your broker-dealer, we have a duty to deal fairly with you. Consistent with our duty of fairness, we are obligated to make sure that the prices you receive when we execute transactions for you are reasonable and fair in light of prevailing market conditions and that the commissions and other fees we charge you are not excessive.
- We must have a reasonable basis for believing that any securities recommendations we make to you are suitable and appropriate for you, given your individual financial circumstances, needs and goals.
- We are permitted to trade with you for our own account ("principal trading") or for an affiliate or another client and may earn a profit on those trades. When we engage in these trades, we disclose the capacity in which we acted on your confirmation, though we are not required to communicate this or obtain your consent in advance or to inform you of the profit earned on the trades.
- When we act as your broker-dealer, we do not generally enter into a fiduciary relationship with you; however, special rules apply to our activities, obligations and fiduciary status when we provide recommendations with respect to a retirement account. Absent special circumstances (which would include the special rules applicable to recommendations with respect to retirement accounts) we are not held to the same legal standards that apply when providing investment advisory services to you. Our legal obligations to disclose detailed information to you about the nature and scope of our business, personnel, fees, conflicts between our interests and your interests and other matters are more limited than when we are providing investment advisory services to you. Nevertheless, when we provide recommendations with respect to a retirement account, we do so pursuant to the laws, regulations and exemptions applicable to those retirement accounts.

UBS Institutional Consulting program is an investment advisory program. Details regarding the program including fees, services, features and suitability are provided in the Form ADV Disclosure, available from your UBS Consultant.



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Investment Solutions Portfolio Analysis

Cobb County Equilibrium 2023

March 16, 2023

Prepared By : UBS Institutional Consulting

UBS Asset Allocation Study

IMPORTANT: The projections or other information generated by the Zephyr Asset Allocation Tool regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Results will vary with each use and over time.

Results reflect the reinvestment of income, but not the impact of transaction costs, advisory fees, taxes and inflation (unless otherwise indicated). If these factors were included, the results shown would be lower.

Historic results are provided for illustrative purposes only and are based on the retroactive application of historic index data to the asset allocation(s) analyzed. The Zephyr tool calculates hypothetical portfolio performance results for the period shown using long-term performance of representative indices as proxies for the hypothetical performance of the asset classes included in the portfolio(s) analyzed. The calculation assumes that the portfolio was rebalanced monthly, which does not necessarily reflect how an actual portfolio would have been managed. Allocations were developed with the benefit of hindsight and results do not consider the impact that material economic and market factors might have had on investment decision-making during the time period. Actual results may be lower than the hypothetical returns and will vary depending on market conditions and the specific composition and implementation of the portfolio. Past performance or historic results provide no guarantee of future returns.

Please see Appendix for important information about this report.

The information herein is based on data and computations by Zephyr Associates and is believed to be reliable but UBS does not warrant its completeness or accuracy.

Scenario Assumptions



				CONSTRAINTS	
NAME	PROXY	RETURN	STDEV	MIN	MAX
UNGROUPED					
US Fixed Income > Core	Bloomberg U.S. Aggregate	3.97%	3.81%	20.00%	30.00%
US Equity > Core	Russell 3000	8.57%	16.52%	40.00%	60.00%
Global Equity > Core	MSCI ACWI (Net)	8.41%	15.23%	0.00%	12.00%
International Equity > Core	MSCI ACWI ex USA (Net)	8.38%	16.28%	10.00%	20.00%

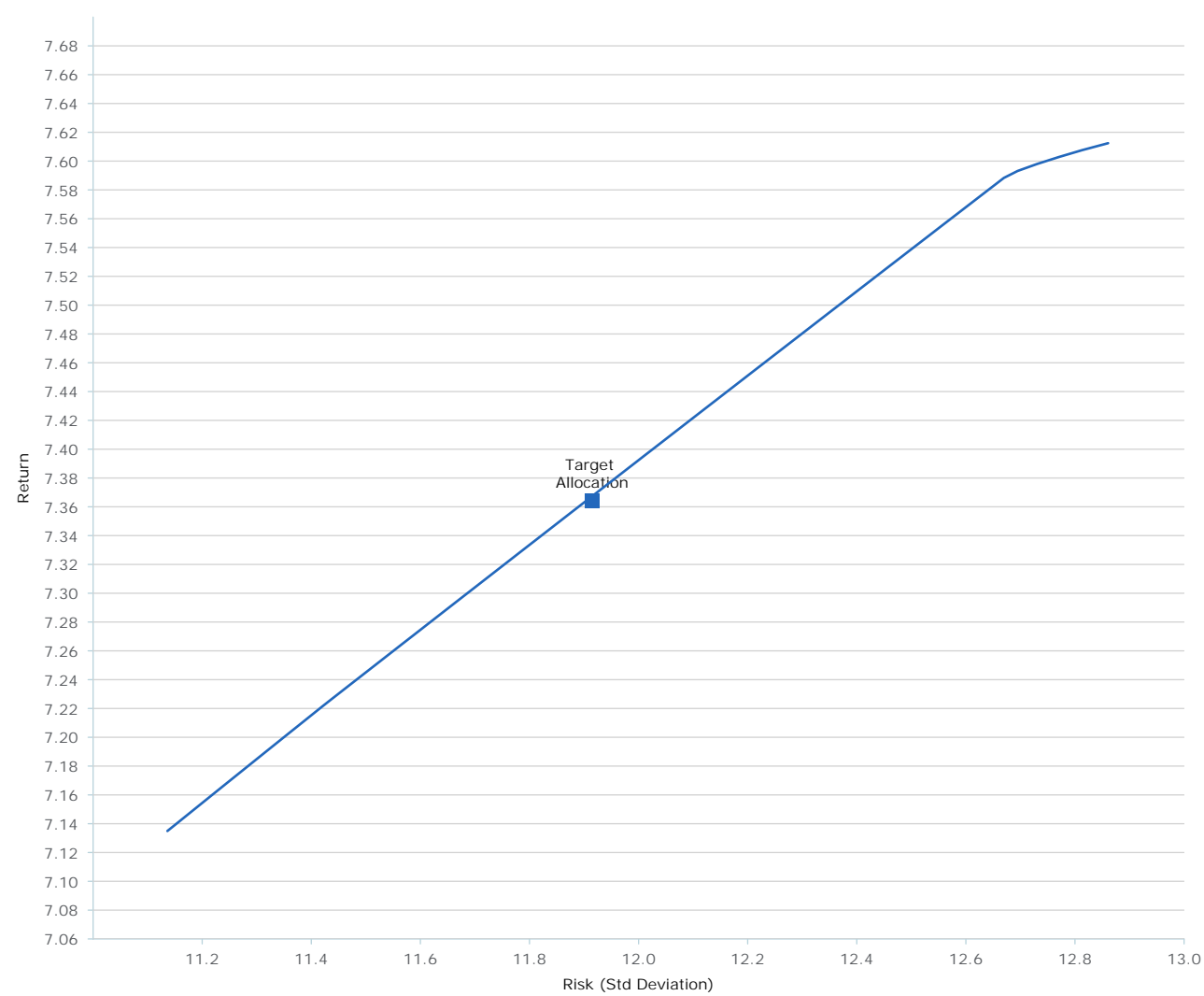
Scenario Assumptions - Correlation Matrix



ASSETS	A	B	C	D
A. US Fixed Income > Core	1.00	0.06	0.05	0.06
B. US Equity > Core	0.06	1.00	0.95	0.84
C. Global Equity > Core	0.05	0.95	1.00	0.96
D. International Equity > Core	0.06	0.84	0.96	1.00

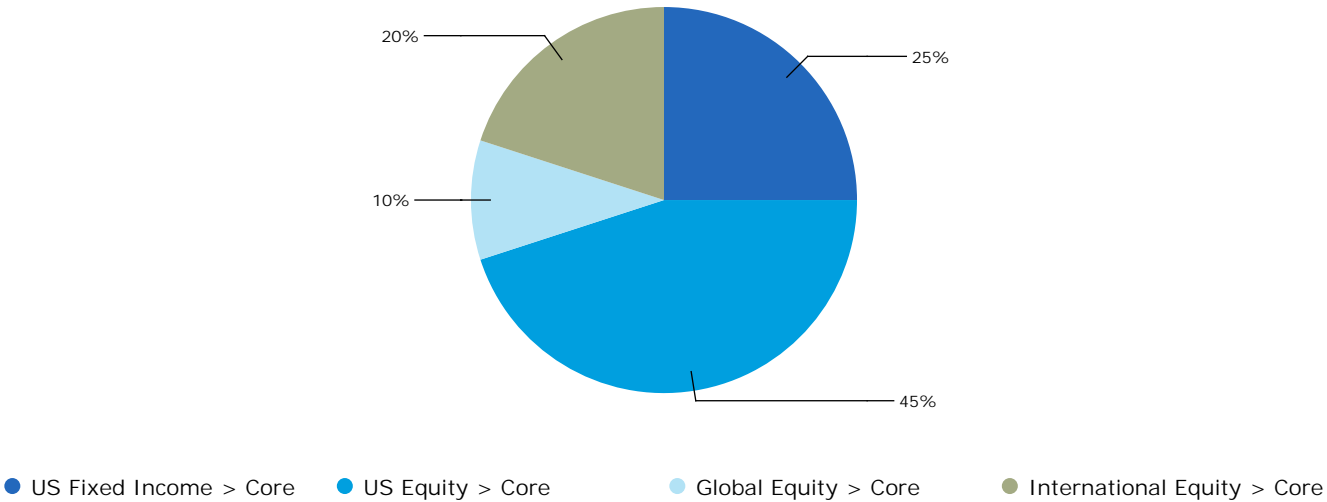
Scenario Return & Risk Assumptions





PORTFOLIOS	RETURN	STDEV	SHARPE RATIO
Target Allocation	7.36%	11.92%	0.59

Target Allocation



	TARGET ALLOCATION
Return	7.36%
Standard Deviation	11.92%
Sharpe Ratio	0.59

Portfolio Allocations

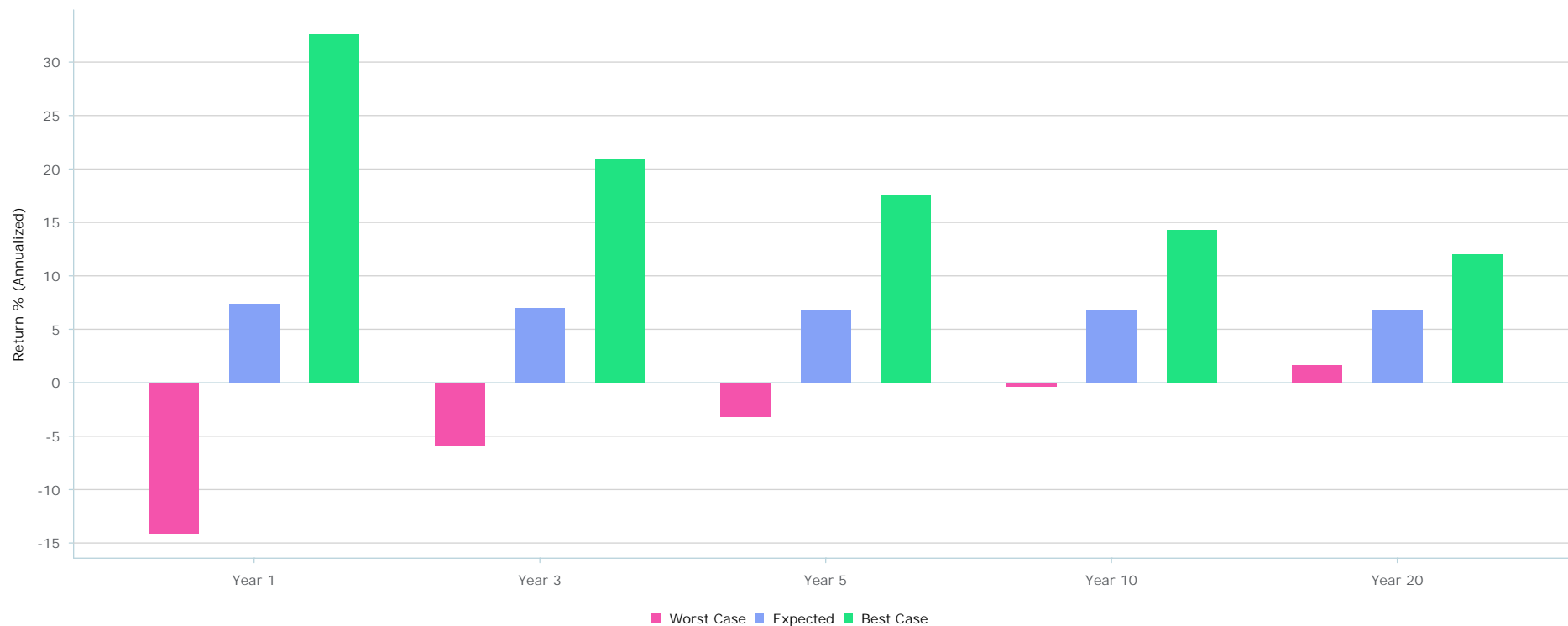


ALLOCATIONS WEIGHTS	TARGET ALLOCATION
US Fixed Income > Core	25.00
US Equity > Core	45.00
Global Equity > Core	10.00
International Equity > Core	20.00
Return	7.36
Standard Deviation	11.92
Sharpe Ratio	0.59

Portfolio Range of Returns



Range of Returns
Target Allocation



	ONE YEAR	THREE YEAR	FIVE YEAR	TEN YEAR	TWENTY YEAR
Best Case	32.55%	20.94%	17.58%	14.28%	12.01%
Expected	7.36%	6.93%	6.84%	6.77%	6.74%
Worst Case	(14.09%)	(5.85%)	(3.15%)	(0.36%)	1.66%
Expected Risk	11.92%	6.84%	5.29%	3.74%	2.64%

Allocation Case: Cobb County Equilibrium 2023

Portfolio Single Period Range of Returns

Distribution of Returns - 1 Year



PERCENTILE	TARGET ALLOCATION
Best Case	32.55
Expected	7.36
Worst Case	(14.09)

Portfolio Single Period Range of Returns



Distribution of Returns - 5 Years



PERCENTILE	TARGET ALLOCATION
Best Case	17.58
Expected	6.84
Worst Case	(3.15)

Portfolio Single Period Range of Returns

Distribution of Returns - 10 Years



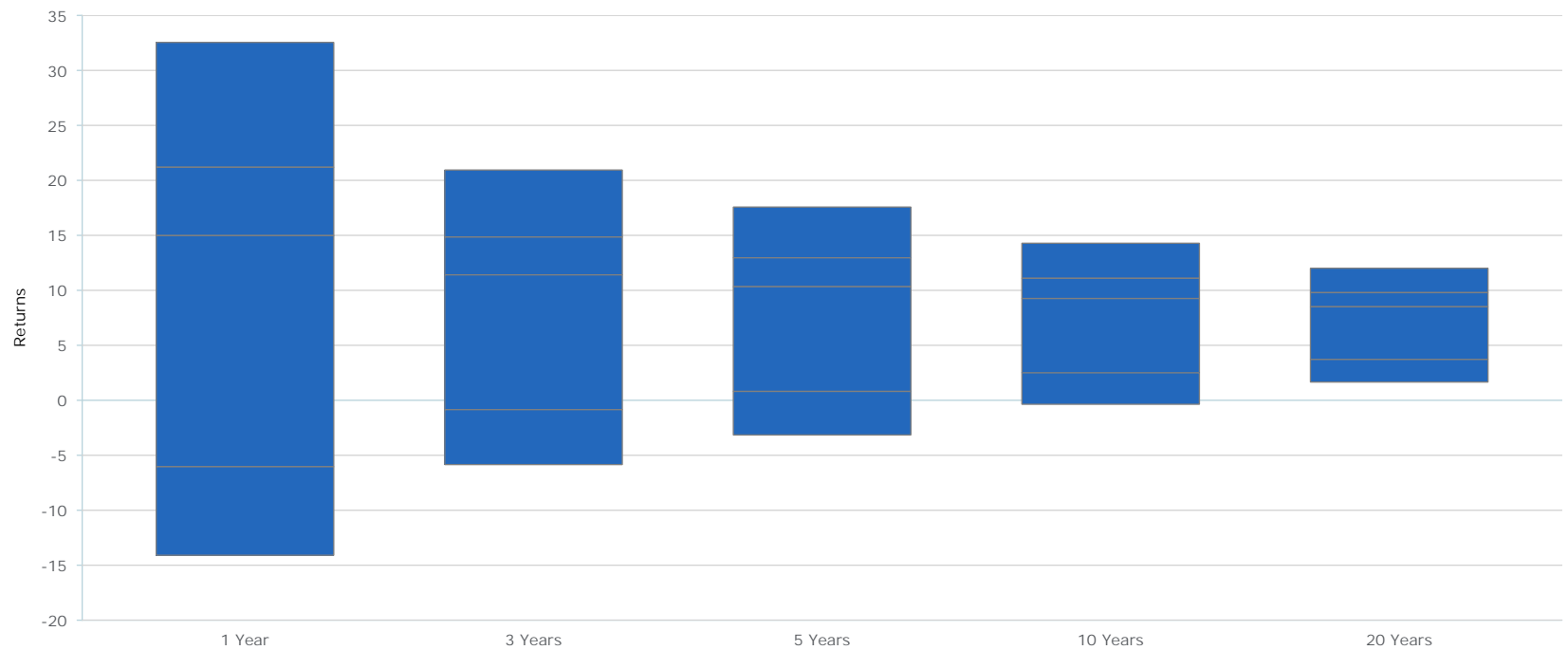
PERCENTILE	TARGET ALLOCATION
Best Case	14.28
Expected	6.77
Worst Case	(0.36)

Distribution of Returns - 20 Years



PERCENTILE	TARGET ALLOCATION
Best Case	12.01
Expected	6.74
Worst Case	1.66

Multiple Portfolio Range of Returns



■ Target Allocation	32.55	20.94	17.58	14.28	12.01	Best Case
	7.36	6.93	6.84	6.77	6.74	Expected
	(14.09)	(5.85)	(3.15)	(0.36)	1.66	Worst Case

Important Information About Your Report

The projections and other information contained in this report have been generated by a digital asset allocation analysis tool developed by Zephyr Associates (the "Zephyr Asset Allocation Tool" or "Zephyr tool"). The goal of the tool is to aid and educate our UBS Consultants, clients and prospective clients in understanding the scope of our service offerings, the issues that should be considered before engaging in an investment strategy or transaction, the basic tenants of investing (particularly with a view towards long-term investing), our views of long-term economic trends and projections and, subject to certain assumptions, the potential effects that a particular strategy, investment program or product or series of transactions may have on a portfolio. You and your UBS Consultant can use this tool to analyze the composition and hypothetical growth of an asset allocation or series of several asset allocations (e.g., your current allocation, a UBS strategic asset allocation model, a custom allocation developed by you and your UBS Consultant based on your individual investment policy, etc.).

The information in this report is based on data and computations provided by Zephyr Associates and other third parties. UBS believes this information to be reliable but we have not independently verified and do not guarantee the accuracy or completeness of the data and computations.

IMPORTANT: The projections or other information generated by the Zephyr Asset Allocation Tool regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results.

Actual results may vary with each use and over time depending on the specific composition of the investor's portfolio, when the portfolio is implemented, and with changing market conditions. All results reflect realized and unrealized gains and losses and the reinvestment of income. Unless otherwise indicated, results do not include the impact of transaction costs (e.g., commissions, mark-ups, mark-downs, fees), advisory fees, or taxes. If these factors were included, the results shown would be lower. Assets are classified based on UBS' proprietary classification methodology (assets held at UBS) or as identified by you (assets held at other financial institutions). Rebalancing to the asset allocation shown is assumed to have occurred at the beginning of each month for the period shown.

Scope of our Services

UBS Financial Services Inc. ("UBS") makes the interactive Zephyr Asset Allocation Tool available to certain UBS Consultants, clients and prospective clients to conduct certain asset allocation analyses. This Zephyr Asset Allocation Tool report is provided for informational purpose only and is not an offer to buy or sell any security or investment strategy, is not meant to be a comprehensive financial plan, and does not create an investment advisory relationship between you and UBS or your UBS Consultant.

This report is intended to aid (and be used by) your UBS Consultant in providing you with actual individualized investment advice. Therefore, the report should only be considered in conjunction with the actual recommendations and advice of your UBS Consultant, our standard account documents, agreements and disclosures and the additional factors that warrant consideration for your particular financial situation, including costs.

If this output is provided as part of a proposal, it is marketing material. You must make independent decisions with respect to any proposals contained within this report. In making those decisions you have reviewed the terms of any Plan with respect to which you are a fiduciary and your obligations to any such Plan under ERISA. This report should be used solely for the purposes of discussion with your prospective UBS Consultant and your independent consideration. UBS does not intend this to be fiduciary or best interest investment advice or a recommendation that you take a particular course of action. If you would like more details about any of the information provided, or personalized recommendations or advice, please contact your UBS Financial Advisor.

Conflicts of Interest. UBS Financial Services Inc. is in the business of establishing and maintaining investment accounts and we will receive compensation from you in connection with investments that you make, as well as additional compensation from third parties whose investments we distribute. This presents a conflict of interest when we recommend that you move your assets to UBS from another financial institution, and also when we make investment recommendations for assets you hold at, or purchase through, UBS. For more information on how we are compensated by clients and third parties, conflicts of interest and investments available at UBS please refer to the "Your relationship with UBS" booklet provided at ubs.com/relationshipwithubs, or ask your UBS Financial Advisor for a copy.

Neither UBS Financial Services nor any of its employees provide tax or legal advice. You must consult with your legal or tax advisors regarding your personal circumstances.

You are not required to implement any of the asset allocation strategies modeled in this report. If you would like UBS to assist you in making any changes to your current asset allocation strategy, the capacity in which we act will depend on, and vary by, the nature of the product, service or account that you select for implementation (i.e., brokerage or advisory). Understanding the ways in which we can conduct business under applicable laws and regulations is essential to the relationship between you and us.

As a firm providing wealth management services to clients in the U.S., UBS Financial Services Inc. is registered with the U.S. Securities and Exchange Commission as an investment adviser and a broker-dealer, offering both investment advisory and brokerage services. Investment advisory services and brokerage services are separate and distinct, differ in material ways and are governed by different laws and separate arrangements. At the end of this report you will find a detailed explanation regarding the distinctions between investment advisory programs and brokerage service, including how we charge for these services and our respective responsibilities to you. See *Conducting Business with UBS: Investment Advisory and Broker-Dealer Services*. It is important that you review and understand the agreements and disclosures we provide to you about the products or services offered. If at any time you would like clarification on the nature of your accounts or the services you are receiving, please speak with your UBS Consultant or visit our website at <http://www.ubs.com/workingwithus>.

Overview

This report is presented for illustrative purposes as a general assessment of the asset allocation strategies displayed. The asset allocations analyzed may include a number of your existing accounts, each with a potentially different investment objective and risk parameter. Where applicable, these accounts have been considered as a whole in helping you develop an overall asset allocation strategy. When considering whether or not to implement any of the asset allocation strategies presented, to buy or sell securities, or to participate in any UBS program, you should carefully review the impact of such changes on each account involved and the impact on the overall portfolio.

Please note that it is your responsibility to determine whether to implement any of the allocation strategies identified in this report and how such implementation would be accomplished. UBS will not track or monitor specific investments you make to determine whether they complement your existing investment objectives, investment policy or any asset allocation strategy you may adopt, unless you have specifically engaged us to provide such monitoring. In addition, this report will not be updated to reflect any changes in your investment strategies, risk tolerances or market conditions.

If your assets are held at UBS Financial Services Inc., your UBS Financial Services Inc. account statements are the only official record of your UBS holdings and account and are not replaced, amended or superseded by any of the information presented in this report.

This report is not intended to provide you with consolidated information or reporting regarding your holdings at other firms. However, at your request, this report may include information regarding assets that you hold at other financial institutions so that we may review your asset allocation and/or investment strategy in the context of your overall holdings. If your assets are held at other financial institutions, this report will be based on information regarding holdings, balances and values of assets you provided to us. We have not verified, and are not responsible for, the accuracy or completeness of this information. If the information you provided is not current, inclusion of these assets will impact the accuracy of the current asset allocation and other analysis presented. You should review the account statements and other documentation you receive from your third party custodian for their record of the assets and asset values held in your accounts. The account statements you receive from your third party custodian regarding the assets you hold with them are the official record of your holdings and accounts and are not impacted or superseded by the information in this report.

UBS's SIPC coverage only applies to assets held at UBS. If you maintain assets at other firms that may be SIPC members, you should contact their financial representative or the other entity or refer to the other entity's statement regarding SIPC membership.

Asset Allocation Presented and Analysis Assumptions:

The results in this report are based on information regarding your investment objectives (as reflected by your allocation criteria), risk tolerance, cash flow requirements, time horizon and other views and requirements. We rely on the accuracy of the information you provide to us in developing this report. Please review the client inputs described in this report carefully as inaccuracies can materially impact the analysis, and advise your UBS Consultant if any change is necessary.

The asset allocation(s) analyzed can be your current asset allocation, a UBS strategic asset allocation or a customized asset allocation developed by you and your UBS Consultant based on your investment policy and risk profile. All asset allocations analyzed were identified by you and/or your UBS Consultant. You should understand that the asset allocation can be modeled at the asset class (e.g., equities, fixed income, etc.) or the sub-asset class (e.g., large-cap equities, emerging market equities) and that there may be asset or sub-asset classes not presented that have characteristics similar or superior to those analyzed in this report. Your UBS Consultant can provide additional information regarding the allocation model(s) analyzed in this report.

UBS strategic asset allocation models are developed using a proprietary process based on UBS capital market assumptions (see Return, Risk, and Correlation Assumptions). UBS has changed its asset allocation models in the past and may do so in the future as circumstances warrant. If UBS strategic asset allocations are used in this report, neither UBS nor your UBS Consultant is required to provide you with an updated analysis based upon changes to asset allocation or other underlying assumptions.

Asset allocation does not assure a profit or eliminate the risk of a loss.

Efficient Frontier Analysis:

Mean-Variance Optimization tools may be used to help determine optimal allocations to different asset classes within a portfolio given a certain level of acceptable risk. The Efficient Frontier analysis is a mean-variance optimization methodology that calculates a series of optimal portfolios that offer the highest expected return for a given level of risk or the lowest risk for a given level of expected return. The Efficient Frontier is determined based on estimated forward-looking risk, return, and correlation of assets assumptions established by UBS (see Return, Risk, and Correlation Assumptions section) and your specific guidelines regarding time horizon and investment objective/ risk tolerance (as reflected in allocation constraints). Each point on the frontier is theoretically efficient based on the given assumptions. An "inefficient portfolio" does not lie on the frontier because alternate portfolios can be found that offers more return for the same amount of risk or the same expected return with a less risk. "Efficient" portfolios on the frontier line are more desirable to investors trying to maximize return and minimize risk. The selection of a proper portfolio depends upon the investor's goals and risk tolerance.

Mean-variance optimization is very sensitive to changes in the forward-looking capital market assumptions and may result in asset allocations and portfolios that are highly concentrated. Your UBS Consultant can provide additional information regarding the Efficient Frontier analysis in this report.

Deterministic Analysis:

Except for any probabilistic analysis sections of this report, a deterministic analysis is used to illustrate the hypothetical growth of the asset allocation strategies presented based on an assumed rate of return, risk and correlation for each asset or sub-asset class identified within the strategy. The rate of return, risk and correlations used are based on estimated forward-looking assumptions established by UBS (see Return, Risk, and Correlation Assumptions section below).

In order to create the analysis presented, the rates of return for each asset or sub-asset class are combined in the same proportion as the asset allocation(s) illustrated (e.g., if the asset allocation indicates 40% equities, then 40% of the results shown for the allocation will be based on the estimated forward-looking risk, return, and correlation assumptions for equities based on UBS proprietary research).

Simulated Portfolio Value Probability Analysis:

Simulated Portfolio Value Probability Analysis (frequently referred to as "Monte Carlo" simulations), is another tool for evaluating the potential future performance of the asset allocation strategies presented. Monte Carlo analyses incorporate future uncertainty by simulating possible return scenarios for a portfolio under variable market conditions. Monte Carlo analysis generally performs several thousand simulations, each simulating the growth of the modeled asset allocation over a specified period of time and assuming certain client inputs and a variety of returns and scenarios, all of which are subject to change as a result of market volatility, economic factors and world events. Monte Carlo results present the probability of achieving certain targets based on the results of the simulations.

IMPORTANT: The projections or other information in this report regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investments results and are not guarantees of future results.

Monte Carlo simulations are based on estimated forward-looking return, risk and correlation assumptions established by UBS (see Return, Risk and Correlation Assumptions section).

Unless noted otherwise, the analysis assumes a constant rate of inflation and does not account for variations in inflation rate over time. Monte Carlo simulations also account for certain client inputs and assumptions regarding inflation and cash flows, the accuracy of which will materially impact the results of the analysis. Please review the client inputs described and advise your UBS Consultant if any change is necessary. Unless specifically included as an outflow, the analysis will not account for investment advisory fees, transaction fees or taxes.

Monte Carlo results are intended to represent a spectrum of possible return outcomes for the modeled asset classes based on the established assumptions. The portfolio value at the end of each scenario is recorded and compared against the established portfolio target. The probability of achieving a target is calculated by dividing the number of scenarios where the portfolio value equaled or exceeded the target by the total number of scenarios. Note that the highest likelihood of success is 99% because there is never a guarantee that a particular result will be actualized. Results should only be viewed as reasonable estimates of possible outcomes and not as a guarantee, prediction or projection. The results shown may vary with each use and over time and if any of the underlying assumptions change. Your actual results can vary materially from the results shown in this analysis.

Monte Carlo analysis does not take into account actual market conditions that may severely affect your portfolio results over the long-term. It does not reflect the average periods of bull and bear markets, which can be longer than those modeled.

The analysis also does not consider short-term correlations among asset class returns and does not consider the results that could occur from an extreme market event, either positive or negative, due to the low probability of such an occurrence. A market crisis can cause asset classes to perform similarly, lowering the accuracy of our return assumptions and diminishing the benefits of diversification in ways not captured by the analysis. As a result, returns actually experienced by the investor may be more volatile than those used in our analysis.

Your UBS Consultant can provide additional information regarding the Monte Carlo/Simulated Portfolio Value Probability analysis reflected in this report.

Historic Asset Allocation Backtest:

If the historical performance of an asset allocation is provided, the historical performance does not reflect your actual performance but, rather, was calculated by the retroactive application of historic index results to the asset allocation(s) analyzed. This performance is based on the long-term performance of certain indexes that have been selected by UBS (or as requested by the Client) as a representative proxy for the asset classes in the asset allocation(s) or portfolio(s) analyzed. See the Scenario Assumptions section for a description of the index proxies used for each asset class in this analysis. UBS selects proxy indices based on our research and understanding of the asset class or the allocation and strategy of the investments in your portfolio, or as requested by the client. Because the asset allocations were structured with the benefit of knowing how each asset class and benchmark performed during the period shown, the hypothetical returns may be higher than the returns of a portfolio that would have been recommended during the time period shown. In addition, backtested performance does not reflect the impact that past economic and market factors might have had on investment decision-making. The results shown reflect realized and unrealized gains and losses and the reinvestment of income, but do not include the impact of transaction costs, advisory fees, taxes and inflation. If these were included, the results shown would be lower. Please note that the historical backtest analysis considers data over the period shown and assumes that the asset allocation was rebalanced at the beginning of each month back to the initial asset allocation. This rebalancing frequency does not necessarily reflect how an actual portfolio would have been managed. There is no guarantee that these backtested results could, or would, have been achieved had this asset allocation been used during the years presented.

Past performance or historic results provide no guarantee of future returns.

Return, Risk and Correlation – Assumptions Forward-Looking Estimates:

The asset class risk and return results used and displayed in this report, as well as the asset class correlations, are based on estimated forward-looking return, risk, as measured by standard deviation, and correlation assumptions ("capital market assumptions"), which are based on UBS proprietary research. The development process includes a review of a variety of factors, including the return, risk, correlations and historical performance of various asset classes, inflation and risk premium.

The strategic returns in the UBS capital market assumptions consider returns over a full business cycle. The capital market assumptions are subject to change at any time at our discretion and without notice. UBS has changed its return, risk and correlation assumptions in the past and may do so in the future. Neither UBS nor your UBS Consultant is required to provide you with an updated analysis based upon changes to these or other underlying assumptions.

Since assumptions are subject to uncertainty, including market forces and factors outside of our control, you should also understand that the assumptions used are estimates, are not guarantees or projections of future results. There is no certainty that the assumptions for the model will accurately estimate asset class return rates going forward. Actual long-term results for each asset class may differ from our assumptions, with those for classes with limited histories potentially diverging more. As a result, UBS will not be responsible for omissions in the analysis, regardless of the source of such inaccuracies, errors, or omissions. In addition, capital market assumptions pertain to the asset or sub-asset class in general, not the performance of specific securities or investments. Particular investment products may have higher or lower returns than the range for the corresponding asset class used in this analysis.

Your actual results may vary significantly from the results shown in this report.

Periodic Reviews:

This report is based on information you have provided as of the date indicated. Over time, your financial circumstances or the other assumptions and estimates that underlie this report may change. For this reason, you should periodically meet with your UBS Consultant to re-evaluate your financial situation, reassess your asset allocation strategy, and review the assumptions upon which this information is based.

Asset Class Risk Considerations:

Some of the general risk considerations associated with the asset classes included in this report are described below. The descriptions are not meant to be a complete list of all investment risks. Individual funds and investments will have specific risks related to their investment programs that will vary from fund to fund. Clients should familiarize themselves with the particular market risks and the other risks associated with the specific investment. All investments contain risk and may lose value.

Alternative Investment Strategies – Alternative investment strategies are investment vehicles that are formed by professional money managers to afford them greater flexibility to manage money in any market environment. These strategies typically have flexibility regarding the types of securities in which they can invest (e.g., options and futures contracts), the types of positions they can take (e.g., long and short positions) and the amount of leverage they are permitted to employ. A professional money manager can use these and other techniques to modify market exposure and create portfolio characteristics that may be desirable for certain clients (e.g., reduced correlation to financial markets, potential lower volatility, and better performance in "down" markets). This flexibility can add value when used skillfully. This flexibility does, however, add additional elements of risk and complexity, including that alternative investments are often long-term, illiquid investments that are subject to restrictions on transfer and not easily valued. Note that due to the nature of alternative investments, the risk and return assumptions used in this analysis may tend to overstate potential benefits but not fully reflect potential risks.

Interests of Non-Traditional Investment Strategies are sold only to qualified investors, and only by means of offering documents that include information about the risks, performance and expenses of the funds, and which Clients are urged to read carefully before subscribing and retain. An investment in a fund is speculative and involves significant risks. The funds' performance may be volatile, and investors may lose all or a substantial amount of their investment in a fund. The funds may engage in leveraging and other speculative investment practices that may increase the risk of investment loss. The funds are subject to high fees, including management fees and other fees and expenses, all of which will reduce profits. Prospective investors should understand these risks and have the financial ability and willingness to accept them for an extended period of time before making an investment in a fund. Investors should consider a fund as a supplement to an overall investment program.

Investing in the fixed income market is subject to risks including market, interest rate, issuer, credit, default and inflation risk. An investment in a portfolio may be worth more or less than its original cost when redeemed. Derivatives may involve certain costs and risks such as liquidity, interest rate, market, credit, management, default risk, and the risk that the position could not be closed when most advantageous. Investing in derivatives could lose more than the amount invested.

Equity investments represent ownership interest in a company. Historically, equities are more risky than fixed income or cash investments as they experience greater volatility risk, which is the risk that the value of your investment may fluctuate over time. The value of investments in equity securities will fluctuate in response to general economic conditions and to changes in the prospects of particular companies and/or sectors in the economy. The risk of equity investments can vary based on the market capitalization (market value) of the company, for example, Large, Mid, and Smid. Investments in small cap and medium company stocks can be more volatile over the short term than investments in large company stocks.

Non-U.S. Equity and Fixed Income represent ownership interests and debt, respectively, of foreign governments and corporations that can be sub-divided into those from countries that have "Developed Markets" or "Emerging Markets." Foreign investing involves risks, including, but not limited to, risks related to foreign currency, limited liquidity, less government regulation and the possibility of substantial volatility due to adverse political, economic or other developments. Investors in securities of issuers located outside of the United States should be aware that even for securities denominated in U.S. dollars, changes in the exchange rate between the U.S. dollar and the issuer's "home" currency can have unexpected effects on the market value and liquidity of those securities. Those securities may also be affected by other risks.

Calculation Definitions

This section includes descriptions for the terms and calculations used within this report. Your UBS Consultant can provide additional information regarding the terms, calculations, and results contained within this report.

Alpha: Alpha is a measure of risk-adjusted return. It measures the difference between a portfolio's returns and the returns the portfolio might be expected to deliver based on the portfolio's level of risk (beta) and a benchmark index over the date range shown. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating alpha. A positive alpha means the portfolio outperformed expectations for the period shown, while a negative alpha indicates that the portfolio underperformed expectations during the period shown. If two portfolios have the same return, but one has a lower beta, that portfolio would have a higher alpha.

Annualized Returns: An annualized return is the geometric average return of a portfolio for each year over the time period shown. Annualized returns take into account compounding returns by considering the portfolio's cumulative return (the total compounded portfolio return over the time period) and expressing that as a per year figure. Annualized returns only provide a snapshot of investment performance as of a given date and do not indicate volatility over the time period analyzed.

Average Positive Return/Average Positive Return: To calculate the average positive return and average negative return for a portfolio over a given date range, the Zephyr Asset Allocation Tool partitions the portfolio's series of returns into two parts, one made up of the positive periods of returns (up periods), the other of the zero and negative periods of returns (down periods). The average positive/up and negative/down returns are the respective averages of these two series.

Batting Average: The batting average of a portfolio is the ratio between the number of periods where the portfolio outperforms a benchmark and the total number of periods. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating batting average.

Best Case/Worse Case: See Range of Returns.

Best Month Return/Worse Month Return: The best month return is simply the maximum of the monthly returns inside the given date range. Similarly, the worst month return is the minimum of the monthly returns inside the date range.

Best Quarter Return/Worse Quarter Return: The best quarter return is simply the maximum of the quarterly returns inside the given date range. Similarly, the worst month return is the minimum of the quarter returns inside the date range.

Best Year Return/Worse Year Return: To calculate the best one-year return for a given portfolio, the Zephyr Asset Allocation moves a one-year time window along the series and calculates the compound return for each of these windows. The best one-year return is the maximum of the returns thus found. Similarly, the worst one-year return is the minimum of the returns thus found. Note that best and worst one-year returns do not refer to calendar years. Rather, they refer to arbitrarily placed one-year periods.

Beta: Beta represents the systematic risk of an analyzed portfolio. Beta measures how the analyzed portfolio performed in relation to the performance of a benchmark index during the time period shown. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark index for calculating beta. A portfolio with a beta of one is considered to be as volatile (risky) as the benchmark and would therefore have provided returns equal to those of the market benchmark during both up and down periods over the date range analyzed. A portfolio with a beta of two would have moved approximately twice as much as the benchmark.

Conditional Value at Risk: See Value at Risk.

Constraints, Min and Max: Portfolio asset class constraints established by the Client to force minimum or maximum allocations to selected asset classes when generating an Efficient Frontier.

Correlation (R): Correlation represents the degree to which an investment's return moves in tandem with another and is a critical component of diversified portfolio construction. The Correlation of assets varies between a minimum of -1 (move in opposite direction) and a maximum of 1 (completely correlated). A correlation of 0 indicates no relationship between the investments. When included within a portfolio, assets with lower Correlations to the other assets in the portfolio enhance diversification and result in better risk-adjusted expected returns for the portfolios. An R of less than 0.3 is often considered low Correlation. Correlation may also be used to represent the degree to which a portfolio's return moves in tandem with a benchmark or an asset class moves in tandem with another asset class.

Cumulative Distribution of Return: **See Omega.**

Cumulative Excess Return: **See Excess Return.**

Distribution of Returns: **The range of possible outcomes that may be expected for a portfolio compounded over the time period(s) shown based on the asset class return, risk (standard deviation), and correlation assumptions set by UBS (and accounting for any Constraints imposed by the Client).** The distribution of returns presents the annualized returns after the period(s) shown and displays various percentiles which represent the percentage of possible return outcomes that may be expected to be equal to or lower than the stated return. The percentiles displayed include the 5th percentile, 25th percentile, 50th percentile (which is a median return), 75th percentile, and 95th percentile.

Down Capture: **See Up Capture/Down Capture.**

Drawdown: **Any sub-period of time during the date range analyzed where the portfolio had a negative loss percentage starting from the date of the loss began (drawdown start date) and ending on the date of the lowest value before the portfolio recovered to its value before the loss began (drawdown end date).** Conceptually, this is the "peak to trough" of the drawdown when displayed on a graph. Drawdown measures the loss percentage (compounded, not annualized) that a portfolio incurred during any sub-period of the date range analyzed. **See Maximum Drawdown.**

Drawdown Average: **The arithmetic average of all returns during all drawdowns over the date range analyzed.** The drawdown average is based on drawdowns that begin with a drawdown start date and end with a drawdown end date. Compare to Average Negative Return which is the arithmetic return of all periods (e.g., calendar months) that had a negative return during that period.

Efficient Frontier: **Nobel Laureate Harry Markowitz developed mean-variance optimization as a way to create optimal portfolios based on risk-return trade-offs.** The optimization, which results in an Efficient Frontier, uses three inputs – returns, standard deviations (risk), and correlations – to combine assets into portfolios that maximize return for any given level of risk.

Excess Return: **Excess return represents the difference between the return of the analyzed portfolio and the return of a benchmark.** Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating excess return. A positive excess return implies that the portfolio outperformed the benchmark. Cumulative excess returns represent the difference between the total returns in the portfolio and the total returns for the benchmark during a given date range and annualized excess returns represent the difference between the annualized returns of the portfolio series and the annualized returns of the benchmark during a given date range.

Expected Return: **See Range of Returns.**

Expected Risk: **See Range of Returns.**

Information Ratio: **Information Ratio measures the consistency of excess returns of a portfolio compared to a benchmark.** The information ratio is the portfolio's annualized excess return over a benchmark divided by the portfolio's annualized standard deviation of excess return over the benchmark (i.e. tracking error). Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating the information ratio.

Inflation: **The Monte Carlo simulation projections can include an inflation rate that would be applied to each year being simulated.**

Interpolate: **The Monte Carlo Simulation allows Clients to use multiple expected return distributions using the interpolate option.** Clients can enter supplementary mean and standard deviation values in addition to the mean and standard deviation values established by the UBS capital market assumptions. The mean and standard deviation define a distribution that represents possible future returns. Clients can also choose the distribution type as either normal or log-normal. Log-normal distribution intends to account for observations that returns are never less than -100% and that over longer time periods (such as a year) returns are positively skewed. Please speak with your UBS Consultant for more information regarding additional mean and standard deviation values and log-normal distribution.

Kurtosis: **Kurtosis characterizes the relative peakedness or flatness of a distribution of returns compared with a normal distribution.** Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.

MAR (minimal acceptable return): **A minimal return figure established to assess a portfolio's ability to achieve a certain target.** **See Sortino Ratio and Omega.**

Maximum Drawdown: Maximum drawdown is the maximum loss percentage (compounded, not annualized) that a portfolio incurred during any sub-period of the date range analyzed. Conceptually, this is the biggest "peak to trough" loss, beginning with the maximum drawdown start date (the date the maximum loss percentage started) and ending with the maximum drawdown end date (the date that the portfolio hit its lowest point before recovering to the peak level reached before the maximum drawdown). The calculation looks at all sub-periods of the entire time period analyzed and calculates the compounded return of the portfolio or index over that period. The maximum drawdown loss value is the largest negative value of all these compounded return periods (or zero if there were no drawdowns during the period analyzed). The maximum drawdown length is the number of periods (days, months, or quarters depending on the periodicity of the data) between the maximum drawdown start date and the maximum drawdown end date. The maximum drawdown recovery date is the date that the portfolio returns to the drawdown start date (the date at which the compounded returns regain the peak level that was reached before the maximum drawdown began). The maximum drawdown recovery length is the number of periods it takes to reach the recovery level from maximum drawdown end date.

Monte Carlo Percentiles: Probability distributions of asset value outcomes generated from the Monte Carlo Simulations.

Monte Carlo Probabilities: The probability of the wealth goal (or target) is the number of simulation trials that meet or exceed the wealth goal (or target) divided by the total number of trials.

Omega: Omega relative to a given minimal acceptable return (MAR) is the ratio between the price of a European call option written against the investment and the price of a European put option written against the investment, with the strike price being equal to the MAR in both cases. Omega is represented graphically as a cumulative distribution of returns function where the x-axis (horizontal axis) of the graph displays returns and the y-axis (vertical axis) of the graph displays the probability that a given portfolio will achieve or exceed that return figure. Upside Omega is the area on a cumulative distribution between the vertical minimum acceptable return (MAR) line and the distribution above the MAR. This is highlighted in green on the Cumulative Distribution of Returns slide(s). It is the numerator in the omega calculation. Downside Omega is the area on a cumulative distribution between the vertical minimum acceptable return line (MAR) and the distribution below the MAR. This is highlighted in red on the Cumulative Distribution of Returns slide(s). It is the numerator in the omega calculation.

Pain Index: The Pain Index is a statistic developed by Zephyr exclusively for use within the Zephyr Asset Allocation tool. It represents the frequency, the depth, and the width of the portfolio's drawdowns by calculating the area enclosed by the downward drawdown graph and the zero drawdown line, divided by the length of the time interval. The pain index is an attempt to capture in one single number as much of the information that is contained in the drawdown graph as possible, rather than just the maximum drawdown number. This number increases as the spikes grow more frequent, deeper, or wider during the same time period.

Pain Ratio: The Pain Ratio indicates the excess return per unit of total risk as measured by the pain index of the portfolio. It is a ratio of the portfolio's annualized excess returns over the risk-free rate to the portfolio's pain index. The pain ratio is a measure of the premium earned for the risk incurred by the portfolio.

Range of Returns: A Range of Returns indicates the range of possible outcomes calculated by the cumulative returns compounded over the period(s) shown for a given portfolio based on UBS return, risk, and correlation assumptions (and Client Constraints). The expected return is the annualized return after the period(s) shown under a base case scenario. The best/worst case return is the annualized return after the period(s) shown under a best/worst case scenario, and the expected risk is the standard deviation of the expected return. As the time horizon increases, the expected risk moves towards zero. For any given portfolio, the expected return for a time period is represented by the 50th percentile (which is a mean return) and the expected best case scenario by the 95th percentile and the expected worst case scenario by the 5th percentile. The likelihood of obtaining a total portfolio value that is more extreme than the best/worst case cumulative value (given the capital market assumptions and Constraints) is approximately 2.5%.

R-Squared: The R-Squared (R2) of a portfolio measures the variance of the portfolio's returns compared to the variance of a benchmark's returns in order to determine how closely the portfolio tracks the benchmark. R2 ranges between zero and 100%. An R2 of 100% indicates perfect tracking, while an R2 of zero indicates no tracking at all. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark for calculating R2.

Relative Constraints: These are portfolio asset allocation constraints established by the Client indicating the allocation to an asset class or asset class group has to be less than, greater than or equal to another asset class or asset class group.

Return, Risk, and Correlation assumptions: Mean-Variance optimization uses three inputs to generate the Efficient Frontier: Returns, Standard Deviations (Risk) and Correlations. These are commonly referred to as the Capital Market Assumptions for generating the Efficient Frontier. These values are based on UBS estimated forward-looking assumptions based on UBS proprietary research (see the Return, Risk, and Correlation Assumptions – Forward-looking Estimates section for more information).

Sharpe Ratio: The Sharpe Ratio indicates the excess return per unit of total risk as measured by standard deviation. It is a ratio of the portfolio's arithmetic average of excess returns over the risk-free rate to the portfolio's standard deviation. The Sharpe Ratio is a measure of the premium earned for the risk incurred by the portfolio. The Sharpe Ratio – Internal is similar to the Sharpe Ratio, but the denominator is the standard deviation of the portfolio's excess returns over the risk-free rate (i.e. tracking error). This captures the risk associated with the excess returns instead of the risk solely associated with the portfolio.

Skewness: Skewness characterizes the degree of asymmetry of a distribution around its mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values.

Sortino Ratio: The Sortino Ratio indicates the excess return per unit of total risk as measured by downside deviation. It is a ratio of the portfolio's arithmetic average of excess returns over a minimum acceptable return (MAR) to the portfolio's downside deviation. The Sortino ratio uses the downside deviation with a constant MAR indicated. Downside deviation measures the deviation between returns that are less than the MAR and the MAR.

Standard Deviation: A measure of the extent to which observations in a series vary from the mean of the series. The standard deviation of a series of asset returns is a measure of volatility or risk of the asset. A large standard deviation implies that there have been large swings in the return series. The standard deviation calculation assumes that the return series is a sample of possible returns, while the population standard deviation assumes that the series has all of the returns in the population.

Tracking Error: Tracking Error measures the difference between the returns of the analyzed portfolio and those of a benchmark. Tracking error is calculated as the annualized standard deviation of the excess return of the portfolio compared to the benchmark return. The lower the tracking error, the more closely the portfolio's returns tracked those of the benchmark. Unless otherwise described, the Zephyr tool uses the S&P 500 as the market benchmark for calculating tracking error.

Trailing Year Returns: Returns trailing from the date analyzed. All returns over one year are annualized.

Treynor Ratio: The Treynor Ratio is a risk-adjusted measure of return which uses beta to represent risk. It is the portfolio's excess return over the risk-free rate divided by the portfolio's beta to the selected benchmark. The Treynor Ratio differs from the Sharpe Ratio insofar as the beta to the market benchmark is used as the measure of risk rather than the standard deviation of the portfolio series.

Up Capture/Down Capture: The up and down capture measure how well the portfolio was able to replicate or improve on phases of positive benchmark returns and how badly the portfolio was affected by phases of negative benchmark returns. To calculate the up capture, we first form a new return series from the portfolio and benchmark return series by dropping all time periods where the benchmark return is zero or negative. The up capture is then the ratio of the annualized return of the resulting portfolio series to the annualized return of the resulting benchmark series. The down capture is calculated analogously. Unless otherwise described, the Zephyr tool uses the S&P 500 as the benchmark for calculating the up capture and down capture.

Upside/Downside Deviation: Downside deviation measures the deviation between returns that are less than a target return and the target return. Upside deviation measures the deviation between returns that are more than a target return and the target return. Target returns may be referred to as a minimal acceptable return (MAR).

Value at Risk: Nonparametric Value at Risk (VaR) attempts to evaluate risk by applying historical returns for a portfolio and determining a VaR value where a certain percentage (called the confidence level) of the rest of the portfolio's returns exceeded that VaR value. For example, if the confidence level is 95%, that means that 95% of the portfolio's historical returns over the given date range were more than the VaR and analogously that 5% of the portfolio's historical returns over the given time frame were less than the VaR. If the confidence level is 99%, that means that 99% of the portfolio's historical returns exceeded the VaR and 1% of the portfolio's returns were less than the VaR. Conditional Value at Risk (CVaR) quantifies the amount of tail risk for an investment portfolio by calculating the average return of the portion of the portfolio's historical returns that exceeded a given confidence level. For example, if the confidence level is 95%, the CVaR calculates the average return of the worst 5% of historical returns over the given time frame. CVaR provides an average historical loss whereas VaR provides a range of the historical losses.

Worst Month Return/Worst Quarter Return: See Upside/Downside.

Conducting Business with UBS: Investment Advisory and Broker Dealer Services:

As a wealth management firm providing services to clients in the United States, UBS Financial Services Inc. is registered with the U.S. Securities and Exchange Commission (SEC) as a broker-dealer and an investment adviser, offering both brokerage and investment advisory services.

Our clients work with their UBS Consultants to determine the services that are most appropriate given their financial goals and circumstances. Based on the services you request, we can fulfill your wealth management needs in our capacity as a broker-dealer, as an investment adviser, or as both. Most of our UBS Consultants are qualified and licensed to provide both brokerage and investment advisory services depending on the services requested by their clients.

In addition, some of our UBS Consultants hold educational or professional credentials, such as the Certified Financial Planner™ (CFP®) designation (Certified Financial Planner Board of Standards Inc. owns these certification marks in the U.S., which it awards to individuals who successfully complete CFP Board's initial and ongoing certification requirements). Holding a professional designation typically indicates that the UBS Consultant has completed certain courses or continuing education. However, a UBS Consultant's professional designation does not change the obligation of UBS or the UBS Consultant to you in providing investment advisory or brokerage services to you.

It is important to understand that brokerage and investment advisory services are separate and distinct and each is governed by different laws and separate arrangements that we may have with you. While there are similarities between the brokerage and investment advisory services we provide, depending on the capacity in which we act, our relationship and legal duties to you are subject to a number of important differences as described in our applicable contracts with you.

This document is intended to inform you about the key distinctions between brokerage and investment advisory services and our respective duties and obligations. We encourage you to review this document carefully and discuss it with your UBS Consultant.

Our Services as a Broker-Dealer and Relationship with You:

As a full-service broker-dealer, our services are not limited to taking customer orders and executing securities transactions. In our capacity as broker-dealer, we may provide a variety of services relating to investments in securities, including investment research, trade execution and custody services. In a brokerage account, you pay us commissions and applicable fees each time we execute a transaction in your account.

We also may make recommendations to our brokerage clients about whether to buy, sell or hold securities. We consider this to be part of our brokerage services and do not charge a separate fee for this advice. Our recommendations must be suitable for you in light of your particular financial circumstances, goals and tolerance for risk. When we provide recommendations with respect to a retirement account such as an IRA, we do so pursuant to the laws, regulations and exemptions that apply to these accounts.

When we work with you in our capacity as broker-dealer, we do not make investment decisions for you or manage your accounts on a discretionary basis. We will only buy or sell securities for brokerage clients based on specific directions from you.

Our Responsibilities to You as a Broker-Dealer:

When we act as your broker, we are subject to the Securities Exchange Act of 1934, the Securities Act of 1933, the rules of self-regulatory organizations such as the Financial Industry Regulatory Authority (FINRA), the rules of the New York Stock Exchange and applicable state laws.

The standards for broker-dealers under these rules and regulations include the following:

- As your broker-dealer, we have a duty to deal fairly with you. Consistent with our duty of fairness, we are obligated to make sure that the prices you receive when we execute transactions for you are reasonable and fair in light of prevailing market conditions and that the commissions and other fees we charge you are not excessive.
- We must have a reasonable basis for believing that any securities recommendations we make to you are suitable and appropriate for you, given your individual financial circumstances, needs and goals.
- We are permitted to trade with you for our own account ("principal trading") or for an affiliate or another client and may earn a profit on those trades. When we engage in these trades, we disclose the capacity in which we acted on your confirmation, though we are not required to communicate this or obtain your consent in advance or to inform you of the profit earned on the trades.
- When we act as your broker-dealer, we do not generally enter into a fiduciary relationship with you; however, special rules apply to our activities, obligations and fiduciary status when we provide recommendations with respect to a retirement account. Absent special circumstances (which would include the special rules applicable to recommendations with respect to retirement accounts) we are not held to the same legal standards that apply when providing investment advisory services to you. Our legal obligations to disclose detailed information to you about the nature and scope of our business, personnel, fees, conflicts between our interests and your interests and other matters are more limited than when we are providing investment advisory services to you. Nevertheless, when we provide recommendations with respect to a retirement account, we do so pursuant to the laws, regulations and exemptions applicable to those retirement accounts.

UBS Institutional Consulting program is an investment advisory program. Details regarding the program including fees, services, features and suitability are provided in the Form ADV Disclosure, available from your UBS Consultant.



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