



Investment Advisory Committee (IAC) Meeting

[1111 East Main Street](#)
[Richmond, VA 23219](#)

Thursday, 8/26/2021
10:00 AM - 12:00 PM ET

I. Approval of Minutes (April 14, 2021 Meeting)

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- **TAA Strategies (DStrat)**

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Minutes

An electronic meeting, held in accordance with § 2.2-3700 et seq. of the *Code of Virginia* and Chapter 1289 of the 2020 Acts of Assembly, of the Investment Advisory Committee of the Virginia Retirement System was held on April 14, 2021 with the following members present:

Larry Kochard, Chairperson
Hance West
Michael Beasley
Theodore Economou
Deborah Allen Hewitt
Nan Leake
Bryan Lewis
Rod Smyth

The following Board members were present:

O'Kelly E. McWilliams, III
Joseph Montgomery
Brandon Bell
Michael Disharoon
William Garrett
Wallace Harris
Brett Hayes
Troilen Seward

The following staff members were in attendance:

Trish Bishop, Ron Schmitz, Jennifer Schreck, Stephen Adelaar, John Alouf, Advait Apte, Rory Badura, Parham Behrooz, Ty Bowers, Jeanne Chenault, Sara Denson, Valerie Disanto, Laurie Fennell, Josh Fox, Katherine Grawe, JT Grier, Wendy Jenkins, Dane Honrado, K.C. Howell, Robert Irving, Ross Kasarda, Kristina Koutrakos, Matt Lacy, Chung Ma, Curt Mattson, Jennifer MacKnight, Steve McClelland, Walker Noland, Greg Oliff, Steven Peterson, Vera Pleasants, Garret Rhodes, Dan Schlussler, Kristy Scott, Jillian Sherman, Virginia Sowers, Korey Turner, Lisa Turner, Dan Whitlock, Cindy Wilkinson, and Nick Zizzo.

Also in attendance was Spencer Adair of Baillie Gifford; Lauren Albanese of Financial Investment News; Keith Bruch of LSV Asset Management; Sean Burns of Credit Suisse and HOLT Investment Strategy Team; John Carnegie of Baillie Gifford; Steff Chavez of Mandate Wire; Rachel Furash of Goldman Sachs; Sean Gray of Credit Suisse; Latosha Johnson of the

Virginia Department of Planning and Budget; Josef Lakonishok of LSV Asset Management; Bill Porter of DDJ Capital Management; Adam Rees of Pageant Media; James Rosatelli of the Virginia Senate Finance & Appropriations Committee; and Kimberly Sarte of the Joint Legislative Audit and Review Commission.

Ms. Turner served as host and walked participants through the logistics of an electronic meeting. Ms. Turner turned the meeting over to Mr. Kochard to call the meeting to order.

Mr. Kochard called the meeting to order at 10:05 a.m. Mr. Kochard noted that given the current circumstances related to COVID-19, the IAC was unable to meet in person. However, utilizing electronic means, the IAC could hold this meeting in accordance with § 2.2-3700 et seq. of the *Code of Virginia* and Chapter 1289 of the 2020 Acts of Assembly as it relates to conducting business during the pandemic.

Mr. Kochard took a roll call of each IAC member for attendance purposes:

Mr. Beasley – present
Mr. Economou – present
Dr. Hewitt – present
Ms. Leake – present
Mr. Lewis – present
Mr. Smyth – present
Mr. West – present
Mr. Kochard – present

Mr. Kochard noted that Mr. Gayner could not be in attendance due to a schedule conflict.

Public Comment

Mr. Kochard noted that the meeting is open to public comment, however, there are no public comments to be entered into the record.

Minutes

A motion was made by Mr. Kochard and seconded by Mr. Beasley to approve the minutes for the November 10, 2020 Committee meeting. The motion was unanimously approved via roll call:

Mr. Beasley – approve
Mr. Economou – approve
Dr. Hewitt – approve
Ms. Leake – approve
Mr. Lewis – approve
Mr. Smyth – approve

Mr. West - approve
Mr. Kochard - approve

Election of Vice Chairperson

Mr. Kochard nominated Hance West as Vice-Chair of the IAC, and then asked for other nominations. Hearing no other nominations, Hance West was nominated to serve in the capacity of Investment Advisory Committee Vice-Chairperson, to which Mr. West agreed. The nomination was confirmed unanimously via roll call:

Mr. Beasley – approve
Mr. Economou – approve
Dr. Hewitt – approve
Ms. Leake – approve
Mr. Lewis – approve
Mr. Smyth – approve
Mr. West – approve
Mr. Kochard - approve

CIO Report

Mr. Schmitz gave a brief overview of economic and market conditions. Mr. Schmitz presented the Performance Summary and Asset Allocation Report as of February 28, 2021, and Total Fund Tracking Error as of December 31, 2020. Last, Mr. Schmitz reviewed the New Investments and Terminations Report.

Equity Manager Perspectives

The Investment Advisory Committee hosted three guest speakers, two from equity managers to discuss growth and value investing and one who spoke to the Committee about discounted cash flow modeling. Mr. Grier introduced the following guest speakers: Spencer Adair, Global Alpha Investment Manager of Baillie Gifford; John Carnegie, Client Service Director of Baillie Gifford; and Josef Lakonishok, Founding Partner, CEO and CIO of LSV Asset Management. Mr. Adair and Mr. Carnegie spoke about Baillie Gifford’s global alpha growth philosophy. Mr. Lakonishok spoke about current market conditions. Then Mr. Grier introduced Sean Burns, Vice President, Credit Suisse and a member of the HOLT Investment Strategy Team in New York. Mr. Burns spoke about discounted cash flow modeling. The Committee members engaged in general discussion with the presenters. Mr. Kochard thanked the guest speakers for meeting with the Committee.

Public Market Asset Class Reviews

Mr. Grier provided a brief overview of Public Market Assets, provided a preview of agenda items that each Program Director will be covering, and introduced the following Program reviews: Internal Equity Management, Public Equity, and Fixed Income.

Mr. Schlussler provided an annual review of the Internal Equity Management program. Annual review topics included: an overview of factor selection and alpha score, asset allocation, performance, markets, strategies, team members, and looking forward on process and projects.

Mr. Whitlock provided an annual review of the Public Equity program. Annual review topics included: an overview of team members, markets, exposures, results, and manager hires and terminations.

Mr. Behrooz and Mr. Oliff provided an annual review of the Fixed Income program. Annual review topics included: an overview of team members, markets, exposures, and results.

**Portfolio Solutions
Group Function Review**

Mr. Ma provided a function review of the Portfolio Solutions Group (PSG) including an overview of program objectives and team members.

Mr. Kasarda provided an overview of the Risk Team. Review topics included: team members, risk function, and projects.

Dr. Peterson provided an update on the Research program. Review topics included: environmental, social & corporate governance (ESG), natural language processing (NLP), sector rotation, scenario analyses, stress tests, and liquidity model.

**Review of Investment
Belief Statements**

The Committee reviewed a revised version of the Investment Belief Statements, as requested by the Investment Policy Committee. The Committee noted that they are comfortable with the proposed draft and asked for a section on fiduciary responsibilities to be included in a future draft.

The Committee members engaged in general discussion throughout all the reviews provided.

Adjournment

Mr. West made a motion to adjourn the meeting. Mr. Economou seconded the motion. Mr. Kochard asked for each Committee member to vote on the motion:

Mr. Beasley – aye
Mr. Economou – aye
Dr. Hewitt – aye
Ms. Leake – aye
Mr. Lewis – aye
Mr. Smyth – aye
Mr. West – aye

Mr. Kochard – aye

The motion to adjourn the meeting passed.

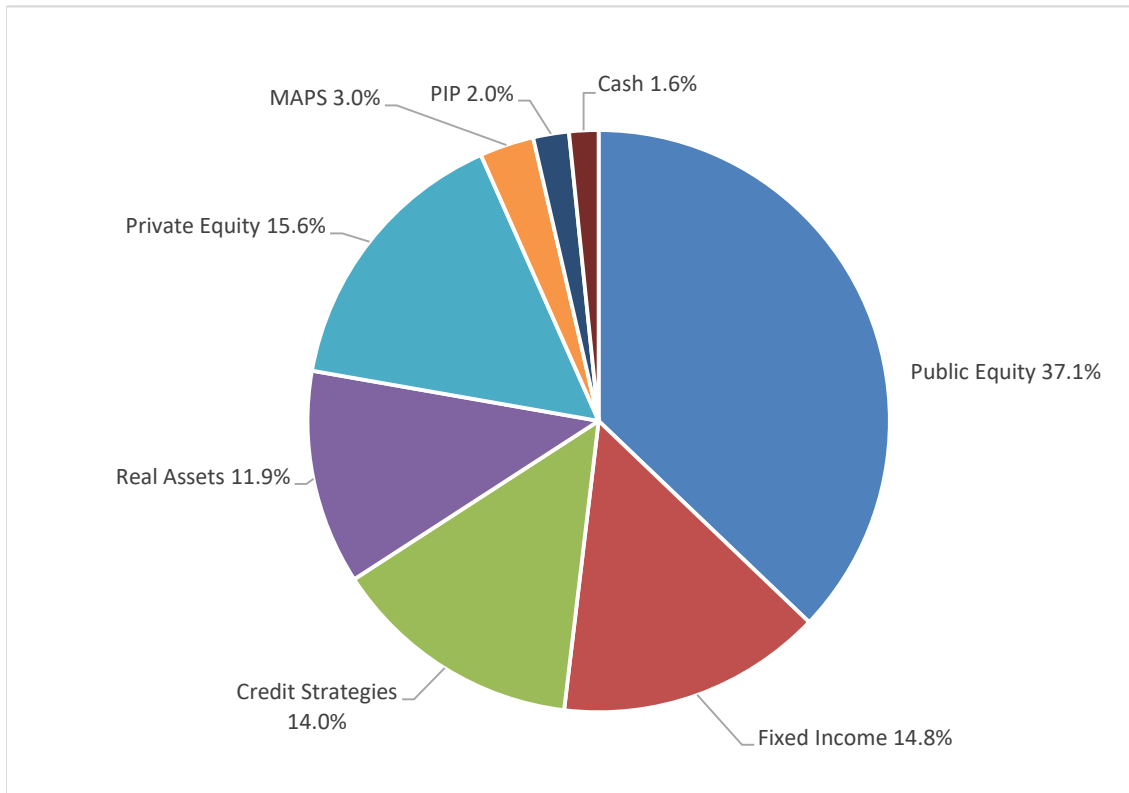
The meeting was adjourned at 12:31 p.m.

Larry Kochard, Chairperson

Asset Allocation Report

June 30, 2021

For Internal Investment Purposes Only



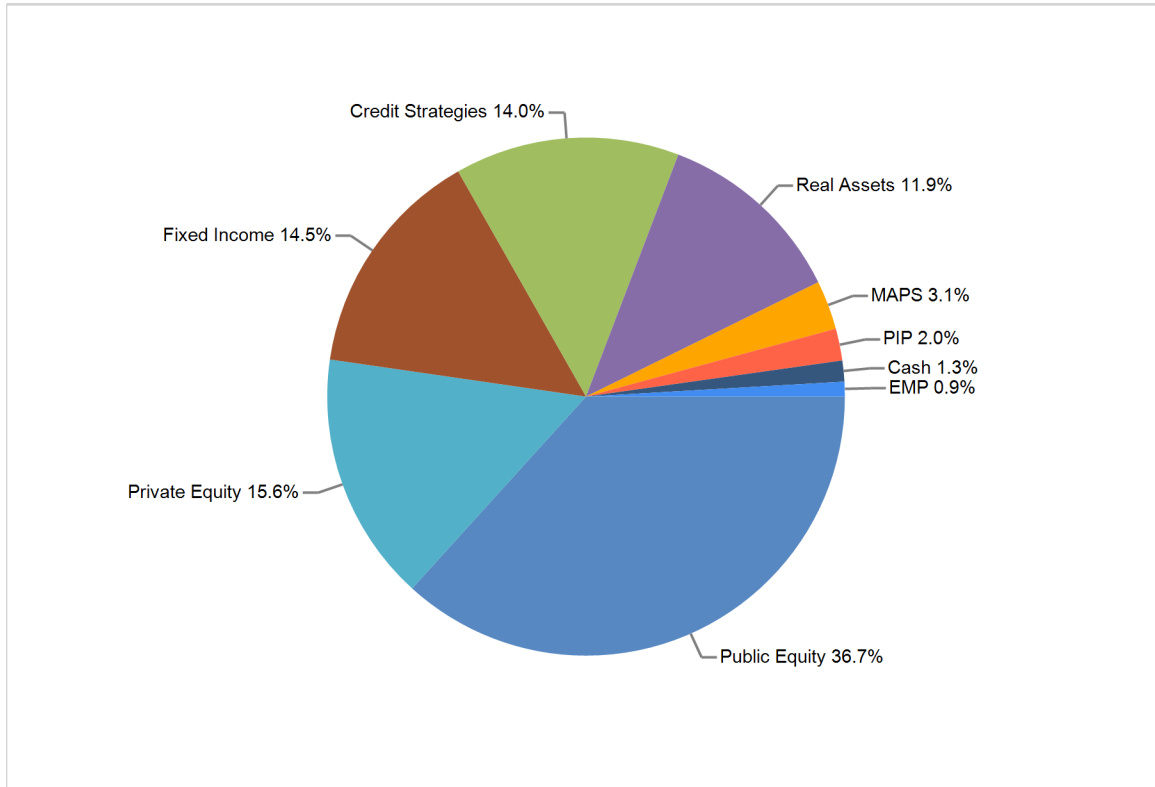
	<u>Current</u> <u>\$Bil</u>	<u>Current</u> <u>Weight</u>	<u>Policy</u> <u>Weight</u>	<u>Variance</u>	<u>Allowable</u> <u>Range</u>		<u>Internal</u> <u>%</u>
Total Fund	101.8						29.2%
Public Equity	37.8	37.1%	37.0%	0.1%	-5%	+5%	37.2%
Fixed Income	15.0	14.8%	16.0%	-1.2%	-3%	+5%	95.2%
Credit Strategies	14.2	14.0%	14.0%	0.0%	-5%	+5%	
RS Credit	5.5	5.4%	5.6%	-0.2%			
NRS Credit	8.8	8.6%	8.4%	0.2%			
Real Assets	12.1	11.9%	14.0%	-2.1%	-5%	+5%	10.7%
Public RE	1.3	1.3%					99.9%
Private RE	6.9	6.8%					
Other RA	3.9	3.8%					
Private Equity	15.9	15.6%	13.0%	2.6%	-5%	+5%	
MAPS	3.1	3.0%	3.0%	0.0%	-1%	+1%	
DSTRAT	1.6	1.6%					
RBI	1.4	1.4%					5.3%
PIP	2.0	2.0%	2.0%	0.0%	-1%	+2%	
Cash	1.7	1.6%	1.0%	0.6%	-1%	+4%	
	<u>Current</u> <u>\$Bil</u>	<u>Current</u> <u>Weight</u>	<u>Policy</u> <u>Limit</u>	<u>3 Year Tracking Error</u>			
Hedge Funds	11.1	10.9%	15.0%	Total Fund: 2.87%			
				Total Public: 1.06%			

*Total Fund includes the following amt held by the Treasurer of VA: \$ 503 million

• The values shown for each asset class on this report may differ from the VRS Monthly Performance Report due to adjustments related to derivative positions in the Rebalance Account, pending transactions, and certain accruals. The values on this report are a more descriptive representation of the Virginia Retirement System's true economic exposure to each asset class. (9 adjustments applied)

*Total Fund and Total Public tracking error are calculated using monthly returns, then annualized

* Differences in totals are due to rounding.



	Current \$Bil	Current Weight	Policy Weight	Variance	Allowable Range		Internal %
Total Fund	101.9						29.2%
Public Equity	37.4	36.7%	36.0%	0.7%	-5%	+5%	38.1%
Fixed Income	14.8	14.5%	15.0%	-0.5%	-3%	+5%	95.1%
Credit Strategies	14.3	14.0%	14.0%	0.0%	-5%	+5%	
RS Credit	5.4	5.3%	5.6%	-0.3%			
NRS Credit	8.9	8.7%	8.4%	0.3%			
Real Assets	12.2	11.9%	14.0%	-2.1%	-5%	+5%	11.1%
Public RE	1.3	1.3%					99.9%
Private RE	7.0	6.8%					
Other RA	3.8	3.7%					
Private Equity	15.9	15.6%	14.0%	1.6%	-5%	+5%	
MAPS	3.1	3.1%	4.0%	-0.9%	-2%	+2%	
DSTRAT	1.7	1.7%					6.3%
RBI	1.4	1.4%					2.1%
PIP	2.0	2.0%	2.0%	0.0%	-2%	+2%	
EMP	0.9	0.9%	0.0%	0.9%		+3%	
Cash	1.3	1.3%	1.0%	0.3%	-1%	+4%	

	Current \$Bil	Current Weight	Policy Limit
Hedge Funds	11.3	11.1%	15.0%

3 Year Tracking Error	
Total Fund:	2.91%
Total Public:	1.07%

*Total Fund includes the following amt held by the Treasurer of VA: \$ 264 million

• The values shown for each asset class on this report may reflect adjustments related to derivative positions in the Rebalance Account, pending transactions and certain accruals, in order to provide a more descriptive representation of the true economic exposure to each asset class (5 adjustments applied)

*Total Fund and Total Public tracking error are calculated using monthly returns, then annualized

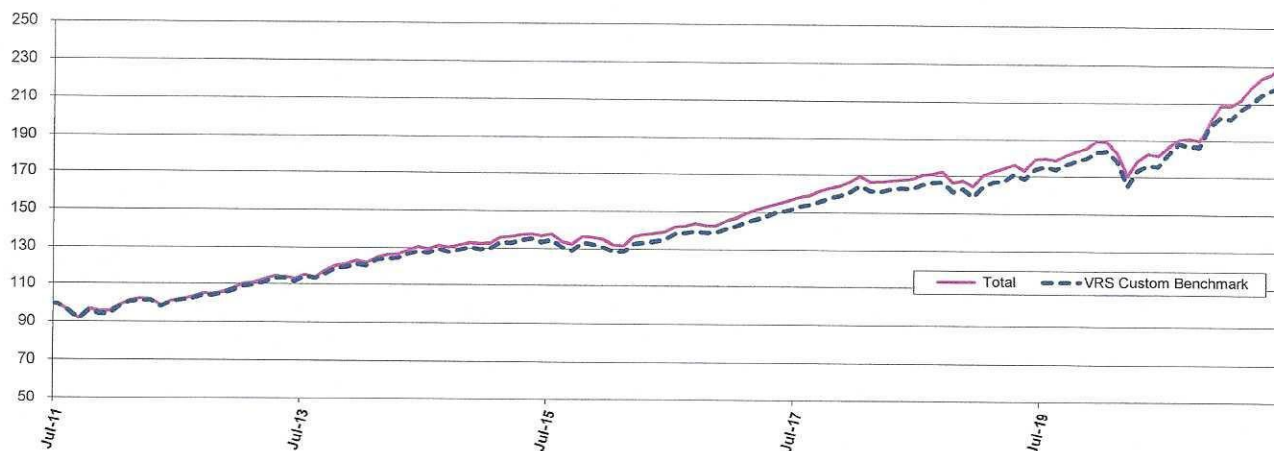
PERFORMANCE SUMMARY
Rolling Periods Ending
June 30, 2021



TOTAL FUND PERFORMANCE

	10 Yr	5 Yr	3 Yr	1 Yr	Qtr	Month	Fiscal YTD	Cal YTD	Market Value (\$MM)
Total Public Equity Strategies	10.2	13.4	13.3	41.0	6.5	0.8	41.0	14.2	37,228
<i>Benchmark</i>	10.3	14.4	14.5	41.5	7.3	1.2	41.5	12.9	
Total Fixed Income	4.2	4.2	7.0	3.3	2.4	0.9	3.3	-0.5	13,580
<i>Benchmark</i>	3.4	3.1	5.4	0.7	2.0	0.7	0.7	-1.4	
Total Credit Strategies	6.6	8.0	8.2	18.4	4.0	2.6	18.4	7.1	14,225
<i>Benchmark</i>	5.7	6.5	6.7	11.3	1.9	0.7	11.3	2.8	
Total Real Assets	10.0	8.0	6.6	11.3	4.0	2.5	11.3	7.0	12,122
<i>Benchmark</i>	8.5	6.1	5.2	6.4	2.9	0.8	6.4	4.6	
Total Private Equity	15.8	19.8	21.0	54.1	13.0	11.1	54.1	23.6	15,880
<i>Benchmark</i>	14.0	17.1	16.3	57.8	5.6	3.0	57.8	22.2	
Total Private Investment Partnerships	n/a	9.2	9.3	30.8	8.8	8.8	30.8	16.1	2,031
<i>Benchmark</i>	n/a	9.3	9.4	25.0	3.3	1.5	25.0	10.5	
Total Multi-Asset Public Strategies	n/a	n/a	6.0	20.4	3.6	0.2	20.4	6.3	3,068
<i>Benchmark</i>	n/a	n/a	8.7	16.6	4.0	0.8	16.6	5.4	
Total Fund	8.8	10.7	11.3	27.5	5.9	2.7	27.5	10.9	101,788
<i>VRS Custom Benchmark</i>	8.3	10.2	10.6	25.3	4.6	1.2	25.3	8.7	

10-Year Performance
Indexed to 100



Effective July 2013, the VRS Custom Benchmark is a blend of the Asset Class Benchmarks at policy weights.

The VRS Cash Account, the Treasurer Short-Term Investment Account, the VRS Rebalancing Account, transition activity and accounts with market values of less than \$1 million are included in the Total Fund's market value. Differences in market value totals are due to rounding.



Total Fund Tracking Error

Figure 1: Policy Tracking Error Rolling Three Year - Plan (as of 6/30/2021)

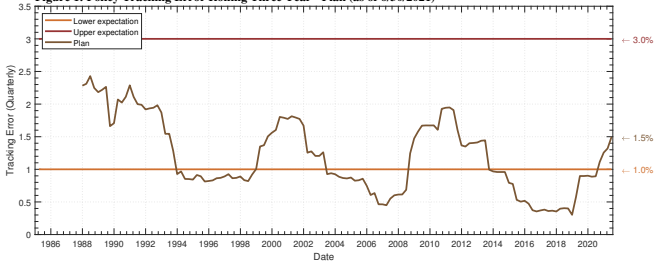
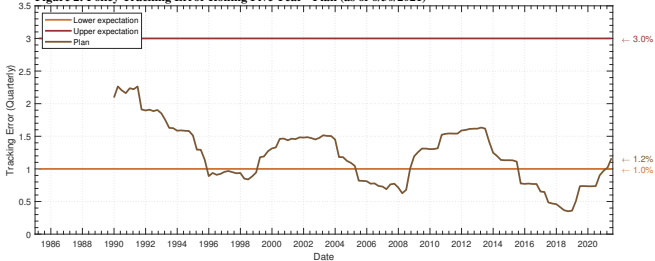


Figure 2: Policy Tracking Error Rolling Five Year - Plan (as of 6/30/2021)



Program	Action	Effective Date	Commitment/ Current Value	Funding/ Defunding Period	Description
Public Equity	Hired	07/01/2021	\$250 Million	< 1 Year	Farallon Healthcare Partners, L.P. – A long/short equity fund.
Credit Strategies	Hired	07/14/2021	€300 Million	5 Years	ICG Europe VIII – A closed-end fund targeting subordinated debt and equity investments in European mid-market companies.
Real Assets	Hired	05/18/2021	\$100 Million	5 Years	Apomad Partners – A closed-end fund investing in solar ground leases in the United States.
Real Assets	Hired	06/14/2021	\$75 Million	4 Years	* Artemis Real Estate Partners Income and Growth Sidecar Fund – A closed-end fund investing in diversified, core-plus real estate in the United States.
Real Assets	Hired	06/22/2021	€75 Million	5 Years	Antin Infrastructure Partners Mid-Cap I – A closed-end fund investing in diversified, mid-cap infrastructure deals in Europe as well as the United States.
Real Assets	Hired	06/30/2021	\$250 Million	5 Years	Carlyle Realty Partners IX – A closed-end fund investing in diversified opportunistic real estate in the United States.
Real Assets	Terminated	07/14/2021	\$85 Million	Immediate	SailingStone Global Natural Resources – A publicly traded strategy focused on global natural resources.
Private Equity	Hired	04/23/2021	€170 Million	5 Years	Charterhouse XI – An international buyout fund targeting middle-market services, specialized industrial, and healthcare related companies in Western Europe.
Private Equity	Hired	05/19/2021	\$40 Million	5 Years	Abry Senior Equity VI – A middle market private equity fund that targets minority investments with some combination of preferred equity, convertible debt, or subordinated debt with warrants.
Private Equity	Hired	06/22/2021	\$175 Million	6 Years	Quad-C X – The fund will target founder / management owned companies in the business & consumer services, industrials, specialty distributions, healthcare, and transportation & logistics sectors.
Private Equity	Hired	07/01/2021	\$250 Million	6 Years	Audax DLS II – The fund will originate and agent Unitranche and stretch senior loans to middle market and lower middle market platform companies, primarily in the United States.

* The manager is considered DIME under the Commonwealth of Virginia definition, which defines ownership threshold of 51% or more.

Program	Action	Effective Date	Commitment/Current Value	Funding/Defunding Period	Description
Private Equity	Hired	07/01/2021	\$250 Million	6 Years	Hellman and Friedman X – A mega buyout fund that will target high quality businesses with defensible competitive positions, strong economic profiles and a growth orientation in the U.S. and Europe.
Private Equity	Hired	07/01/2021	\$300 Million	6 Years	TA XIV – A growth equity fund that will invest in global, private, middle market companies in select growth industries: technology, healthcare, financial services, consumer, and business services.
Private Equity	Hired	07/01/2021	\$50 Million	6 Years	TA Select Opportunities II – The fund will invest in existing high-performing TA portfolio companies. Investments will be made in profitable, private, middle market growth companies operating in select growth industries: technology, healthcare, financial services, consumer, and business services.
Private Equity	Hired	07/07/2021	\$100 Million	5 Years	Apax Digital II – The fund will provide growth capital to companies / entrepreneurs in the technology sector who are developing new products, platforms, and services.
Private Equity	Hired	07/09/2021	\$100 Million	5 Years	Insight XII – The fund will target small-mid cap growth-stage software, software-enabled services, and internet businesses with established momentum and potential for significant revenue growth and profitability.
Private Equity	Hired	08/05/2021	\$100 Million	5 Years	Harbourvest Co-Invest VI – The fund will target investments in the growth equity, small, mid and large market buyout space, as well as special situations and equity-oriented credit transactions.
Dynamic Strategies	Hired	07/01/2021	\$50 Million	Immediate	Schroder Global Climate Change – A long-only global equity mandate investing across a variety of climate-related themes.

* The manager is considered DIME under the Commonwealth of Virginia definition, which defines ownership threshold of 51% or more.

August 26, 2021 IAC Meeting

Portfolio Solutions Group
Chung Ma
Managing Director



Overview: Team Members Portfolio Solutions Group



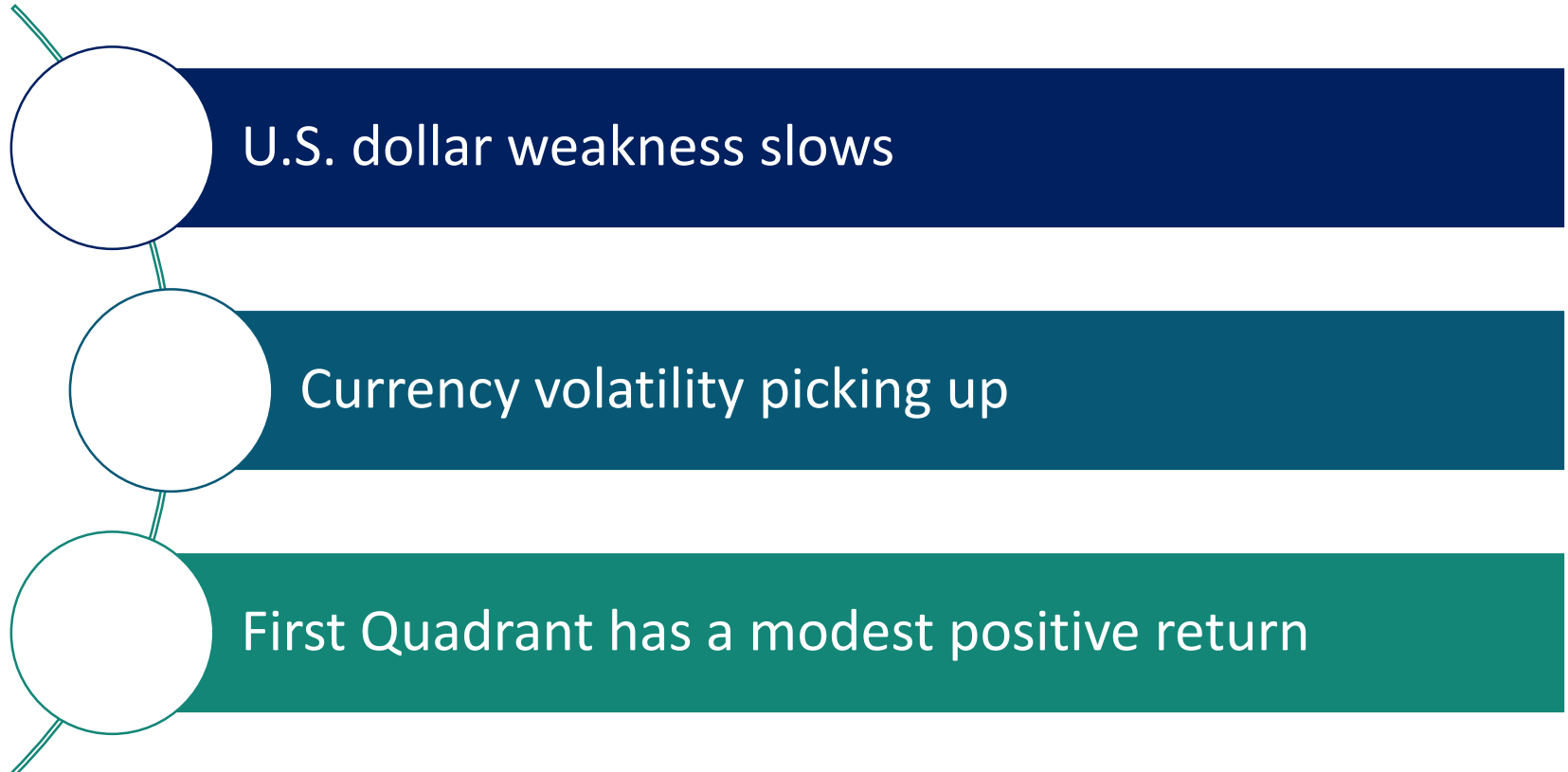
Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Chung Ma	Managing Director	MA	CFA	25	7
Matt Lacy	Program Director, Port. Integration	MA	CFA	22	22
Kristina Koutrakos	Director, Portfolio Strategy	MBA	CAIA	22	5
Katie Grawe	Sr. Investment Officer	MBA		22	3
Steven Peterson	Program Director, Research	PhD		40	13
Dane Honrado	Research Director, IDS	MS/MBA	FRM	18	5
Advait Apte	Investment Officer	PhD	CFA	3	4
Lisa Davis	Decisions Systems Analyst II	BS	PMP, CSM	5	5
Quynh Phuong	Decision Systems Principal	BS		2	1
Jeff Halun	Decision Data Analyst	MBA		2	2
Ross Kasarda	Director, Risk Management	MA	CFA	16	16
Moses Maxfield	Investment Officer	MBA	CFA, CAIA	15	15
Greg Hines	Investment Officer	MA	CFA	10	7

Currency Management

Chung Ma

Managing Director

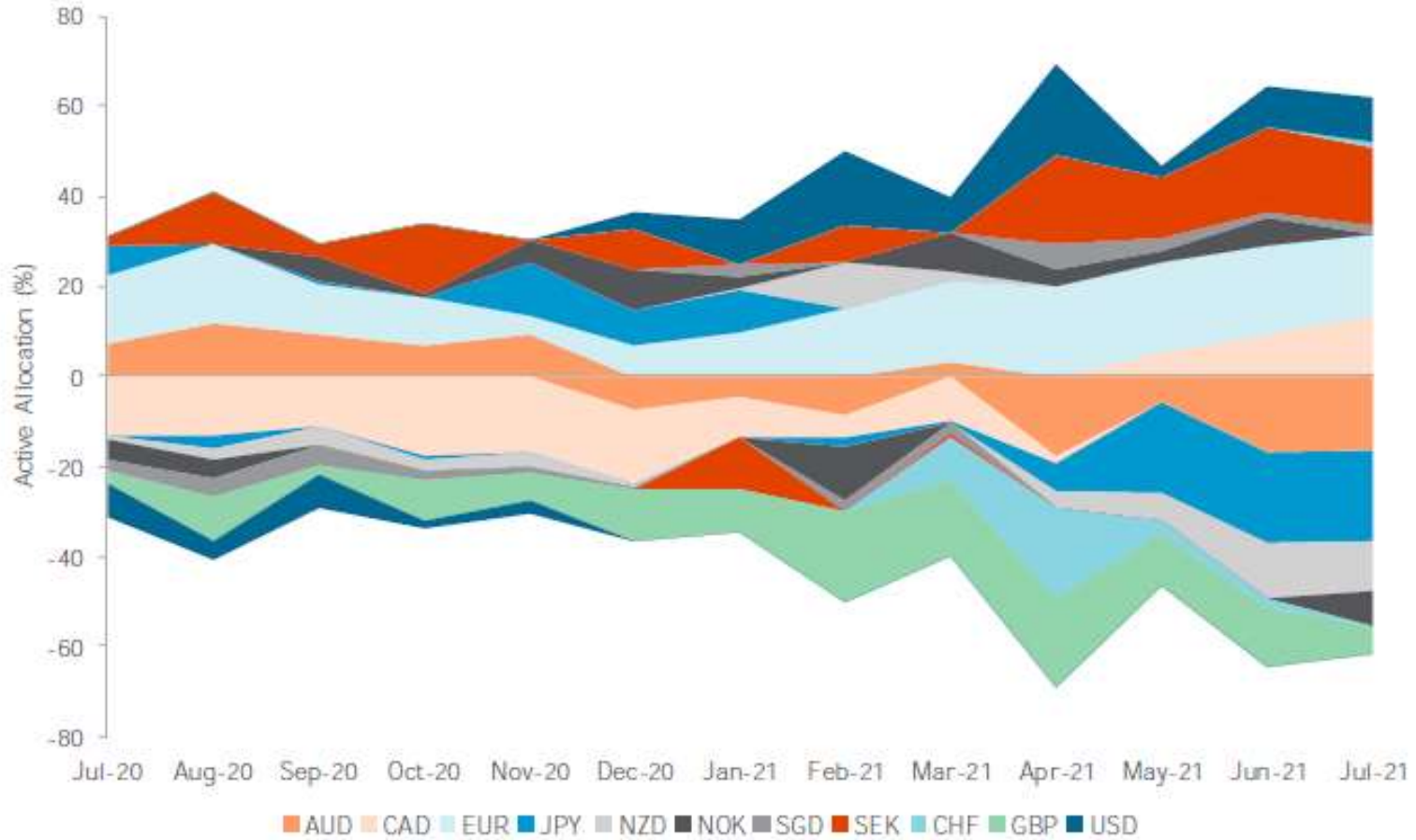




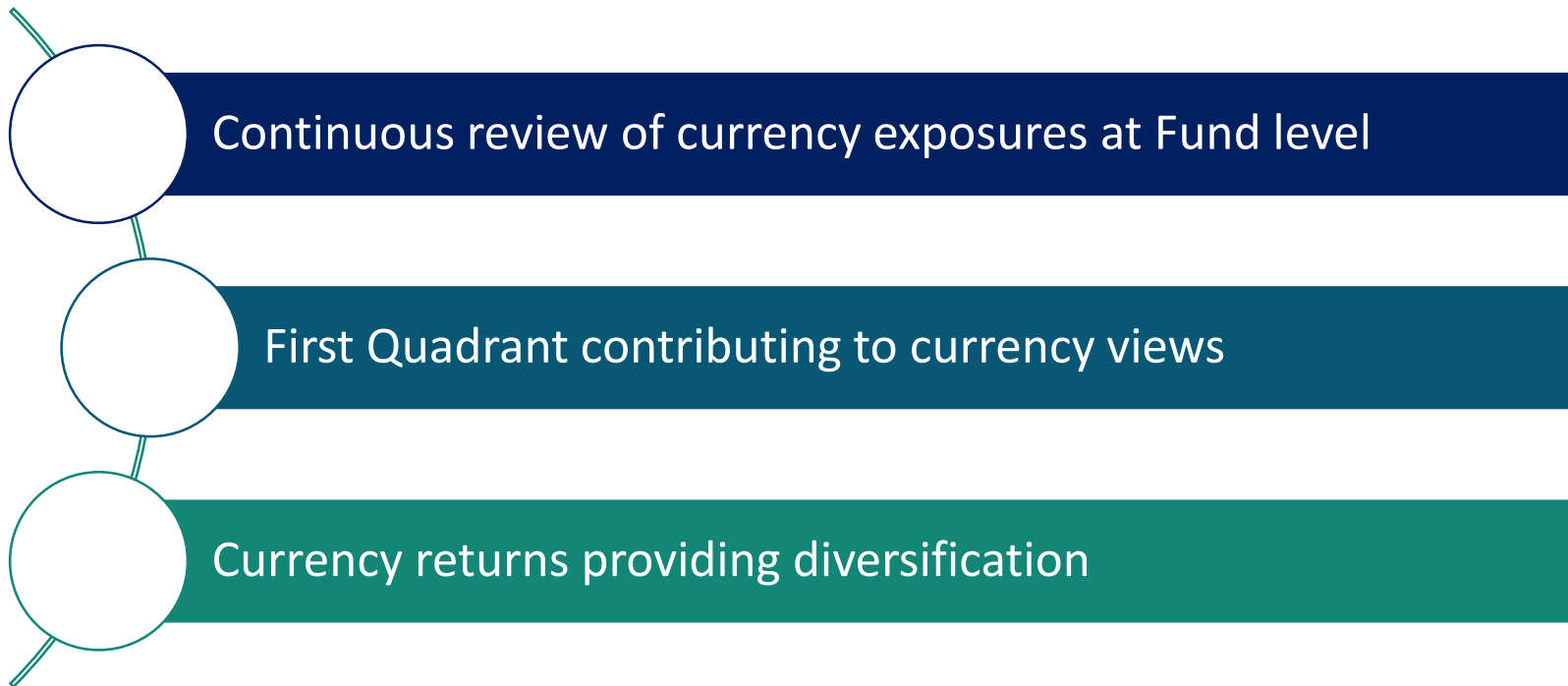
Timeframe	Return	Volatility
FY 2021	0.2	1.1
3 Year	1.3	2.0
5 Year	0.4	1.7
Inception	0.2	1.6

As of June 30, 2021

First Quadrant - Positioning



Managing FX risk beneficial for VRS. Balance of in-house and external management continues to be an effective model to manage our FX risk



Dynamic Strategies

Kristina Koutrakos

Director, Portfolio Strategy

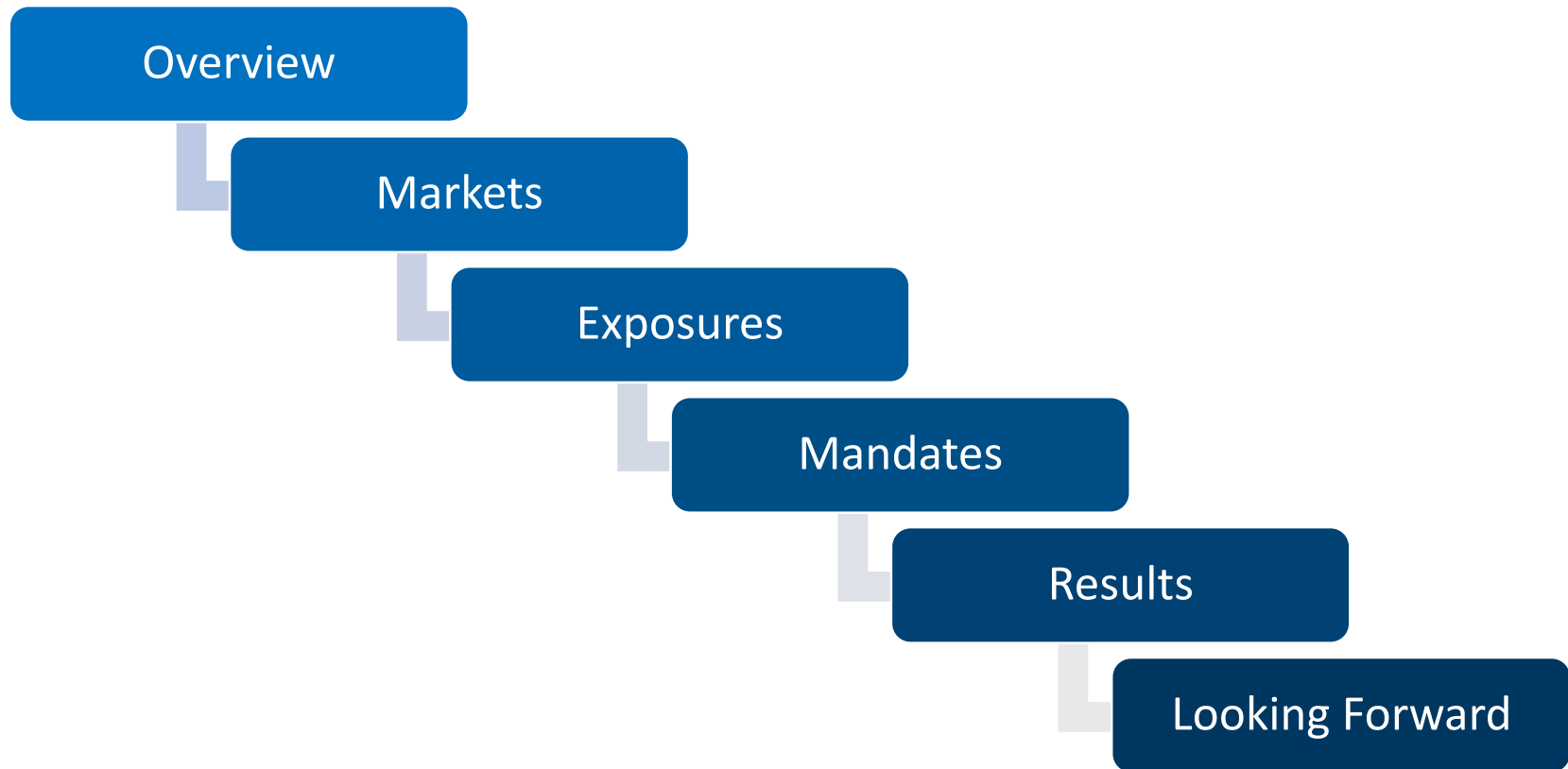


Team Members



Professional	Position	Highest Degree / Credentials	Investment Experience	VRS Tenure
Kristina Koutrakos	Director, Portfolio Strategy	MBA, CAIA	22	5
Katherine Grawe	Senior Investment Officer	MBA	22	3
Additional Resources	Portfolio Solutions Group VRS Investment Staff External Managers & Research Partners Investment Operations Department Portfolio Assistant			

Annual Review Topics



VRS Strategic Advantages

- Access to a broad and flexible set of **investment insights** across asset classes, geographies, and time frames
- **Long-term** time horizon

Strategy Team Investment Objective

- Add **asset allocation alpha** and **diversify excess return** sources
- Identify long-term **thematic drivers** and consider ways to incorporate **structural change** into the portfolio
- Invest over **multiple time horizons**

The Strategy team seeks to add value through active asset allocation management and the identification of opportunities across the investment landscape.

Dynamic Strategies Goals

Generate returns that meet or exceed that of a broad, public market opportunity set with a similar risk profile focusing on active asset allocation and the consideration of structural drivers.

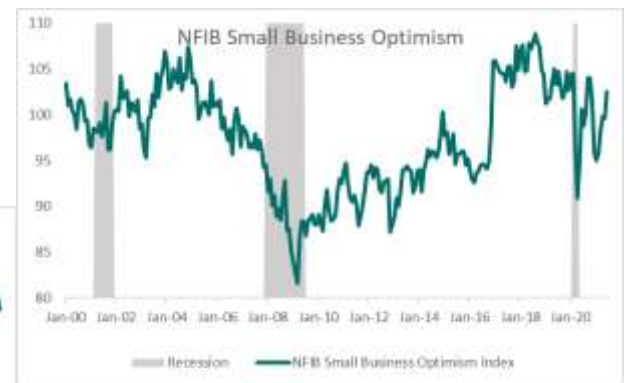
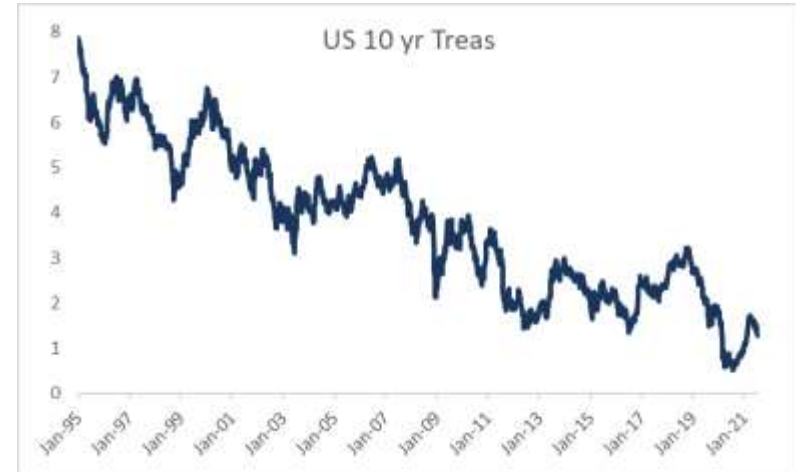


Diversify excess return sources

Knowledge transfer across the Plan

Asset allocation and thematic implementation

Tangible investment solutions



Sources: Bloomberg, Citigroup, Conference Board, NFIB

Pre-COVID

- Weak global growth environment coming out of 2018 into early 2019 with leading indicators bottoming in late 2019
- Resolution of key geopolitical risks in the second half of 2019 – Brexit, U.S./China trade negotiations
- Global monetary policy accommodation
- Shift to pro-cyclical positioning across all three managers in improving macroeconomic backdrop

COVID

- Pandemic-focused viewpoints now shifted to longer-term, structural positioning
- Focus on dislocations between market pricing and forward earnings/risks
- Pro-cyclical positioning with risk spend on both relative opportunities and directional positioning
- Emphasis on stimulus measures looking through pandemic economic impact
- Acceleration of structural change across economies (energy, technology, ESG)

(A New...) “New Normal”

- Mid-cycle dynamics moderating pro-cyclical positioning
- Forward expectations of policy developments and inflation likely as important to market behavior as growth forecasts
- Structural shifts increasingly accepted as probable; pathways uncertain and progression likely non-linear

Long-term themes

- Technological advancement & the 4th Industrial Revolution
- Wealth inequality & populism
- Climate & low carbon transition
- Public liabilities, pensions, & fiscal deficits
- Demographics

Structural undercurrents and drivers

- Dislocation between markets & economic performance
- Market concentration at the macro (holders) and micro (industry) level
- Productivity
- Return of asynchronous cycles across markets
- Rise of geopolitical risk
- Shareholder to stakeholder focus

Ancillary themes

- Pick-up in global volatility
- Growth/value divergence
- Technological revolution
- Global trade reversal

Regional drivers

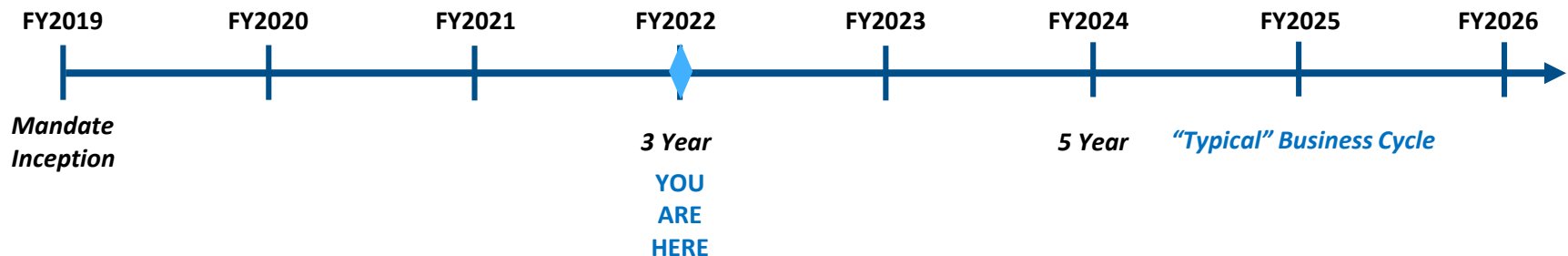
- U.S./China decoupling
- European stability
- Japanese corporate reforms

Portfolio Overview

Dynamic Strategies Mandate (as of 6/30/2021)		
	Market Value (\$, MM)	Market Value (%)
BlackRock	\$540	33%
JPMorgan	\$280	18%
Morgan Stanley	\$660	42%
Shenandoah	\$110	7%
Total	\$1.6 billion	



Program Timeline



Program Performance



<i>As of June 30, 2021</i>	FY2021	2 Year (annualized)	Since Inception (annualized)	<i>Long-term Expectations</i>
Dynamic Strategies Mandate	29.3%	13.7%	11.3%	
Dynamic Strategies Custom Benchmark	25.8%	14.1%	11.8%	
Total Excess Return	+348 bps	-46 bps	-57 bps	100-120 bps
Active Risk	206 bps	211 bps	188 bps	200 bps
Information Ratio	1.7	-0.2	-0.3	0.5 - 0.6

Active Return Correlations

	DStrat	RBI	CS	Fixed	Pvt Eqty	Pub Eqty	Real Assets	PIP	Total Plan
Dynamic Strategies Program	1.00								
Risk Based Investment Program	0.57	1.00							
Credit Strategies	-0.02	-0.07	1.00						
Investment Grade Fixed Income	0.66	0.53	-0.21	1.00					
Private Equity	0.05	0.03	0.50	0.05	1.00				
Public Equity	-0.32	-0.21	-0.02	-0.24	0.03	1.00			
Real Assets	0.82	0.55	0.07	0.60	0.06	-0.37	1.00		
Private Investment Partners	0.58	0.38	0.36	0.39	0.69	-0.21	0.61	1.00	
VRS Total Plan	0.42	0.29	0.51	0.30	0.88	0.05	0.45	0.87	1.00

Barra data as of May 2021



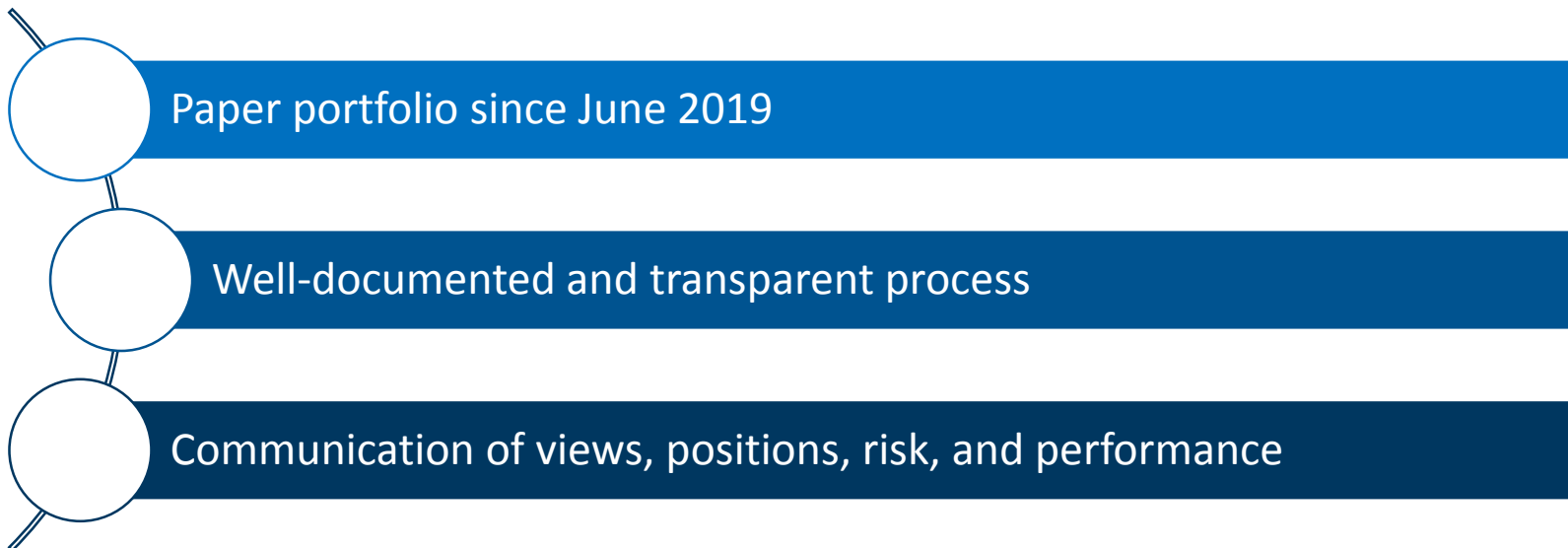
Shenandoah Philosophy

- Add **asset allocation alpha** and **diversification of excess return** sources
- Identify long-term **thematic drivers** and consider ways to incorporate **structural change** into the portfolio
- Invest over **multiple time horizons** □
- **Flexible and adaptive approach** taking the investment environment and VRS opportunity set into account

Harness **best ideas** across asset classes and geographies
to create a **total portfolio**
capable of achieving the objective to **outperform** a reference portfolio
with an **appropriate level of risk.**

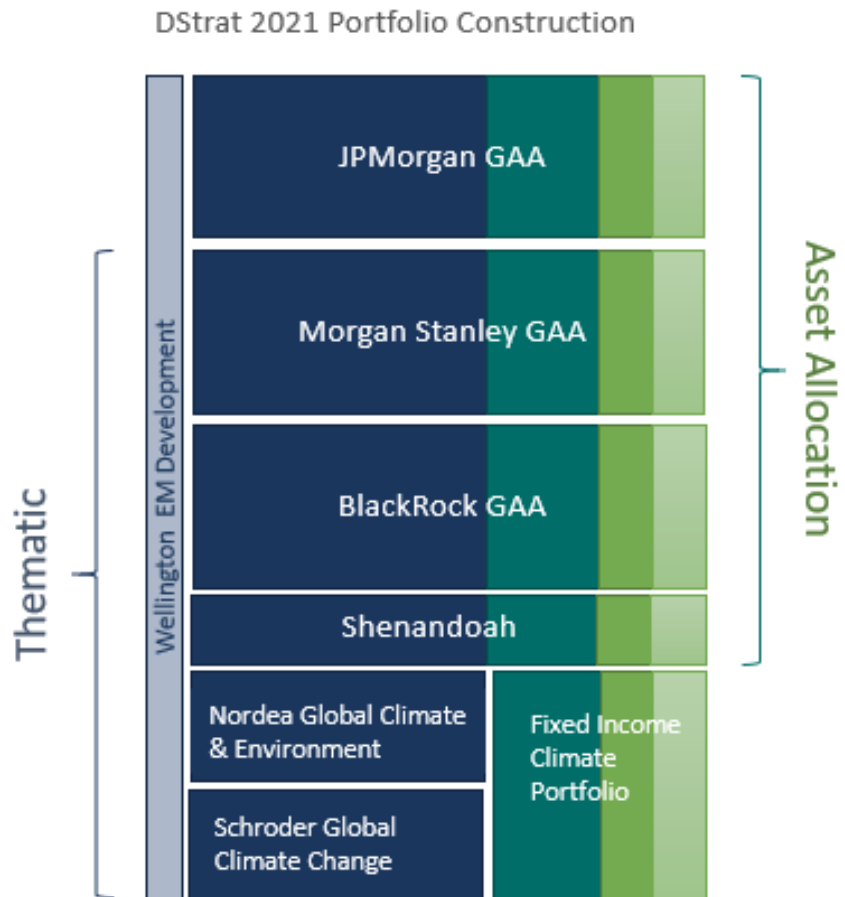
Shenandoah Performance

<i>As of June 30, 2021</i>	Since Inception (Nov 2020)	<i>Long-term Expectations</i>
Shenandoah	11.3%	
Dynamic Strategies Custom Benchmark	11.1%	
Total Excess Return	23 bps	30-60 bps
Active Risk	84 bps	100 bps
Information Ratio	0.3	0.3 - 0.6



FY2022 Plans & Priorities

- Strategic partnerships and asset allocation mandates continue to strengthen
- Ongoing focus on Shenandoah and internal active asset allocation efforts
- Continued collaboration across the Plan
- Continued thematic development and incorporation into the investment portfolio where appropriate and impactful



Risk Based Investments

Ross Kasarda

Director, Risk



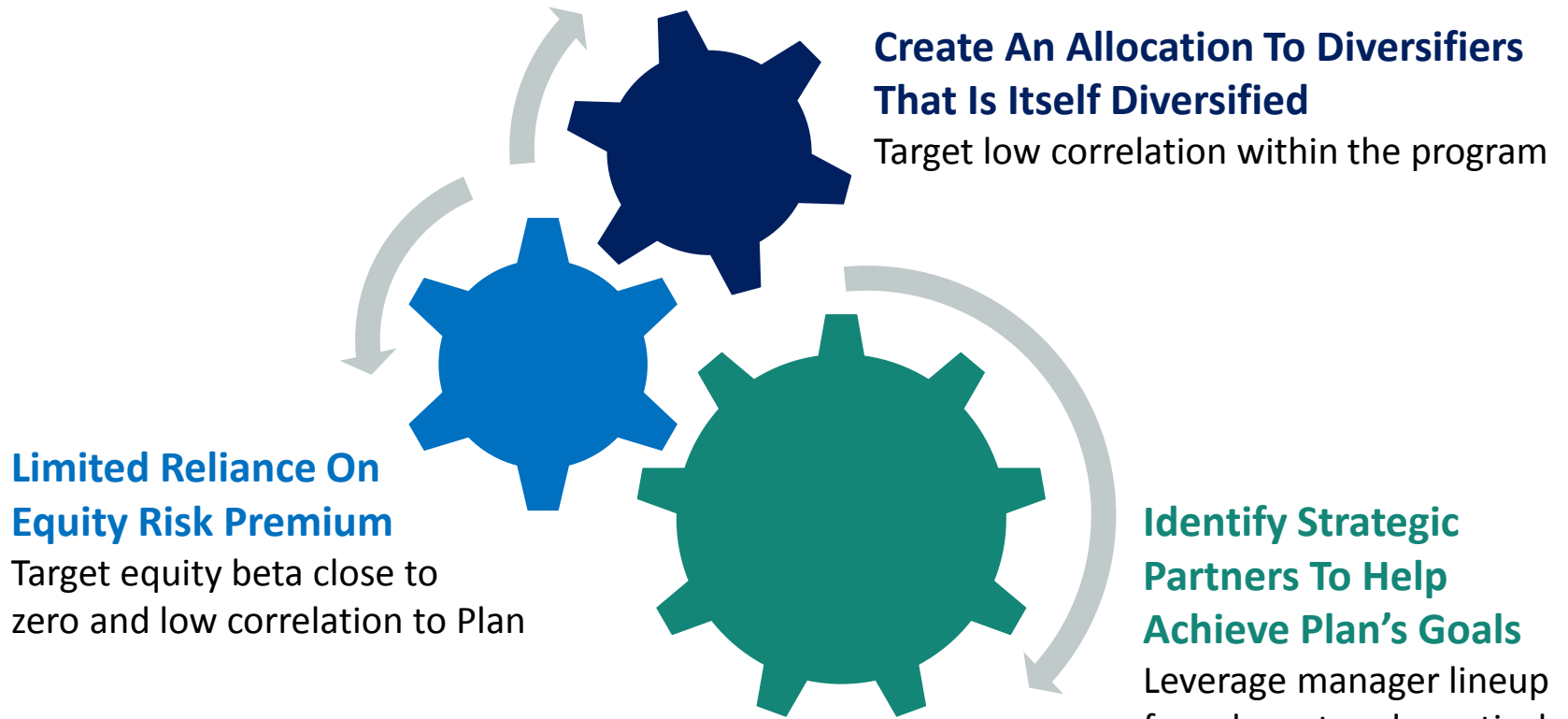
- Team
- Program Objectives
- Results
- Looking Ahead

Team Members



Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Ross Kasarda	Director	MA	CFA	17	17
Moses Maxfield	Investment Officer	MBA	CFA, CAIA	15	15
Greg Hines	Investment Officer	MA	CFA	10	8

Other Resources
Director of Portfolio Integration
Executive Committee
Investment Operations Department
Investment Advisory Committee
Portfolio Assistant



Identify Strategies That Offer Meaningful Diversification To The Plan

- Expected volatility over a cycle of 5%
- Expected tracking error over a cycle of 5%
- Expected equity beta over a cycle of zero
- Expected return over a full cycle of 5%

Mindshare Examples – Beyond Returns

- Frequent dialog and color regarding volatility and options markets
- Bespoke options advice for Total Fund trade ideas (worked closely on implementation of an equity risk reversal trade)
- inflation hedging discussions

Capstone



- High yield factor research – Internal Fixed Income
- Counterparty risk dashboard –Internal Equity team
- EMP Value mandate

AQR Capital



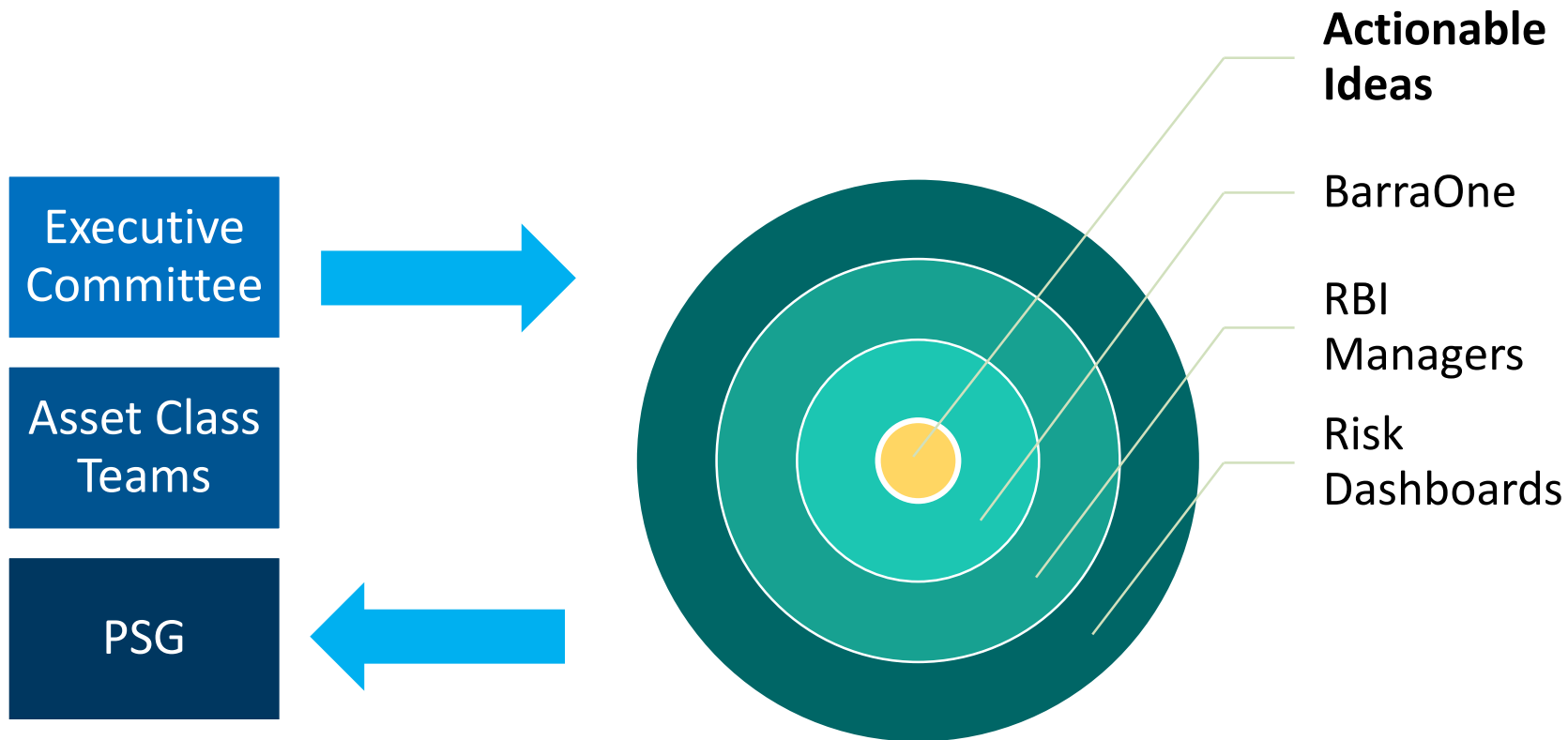
- Plan level FX factor models and inputs to hedging decisions
- Research and insight into Natural Language Processing and Flows based metrics
- Systematic macro strategy discussions

First Quadrant
(Active Currency)



Identify Managers That Offer Actionable Knowledge Transfer

Risk Team Synergies



Manager & Strategy Lineup

AQR Capital

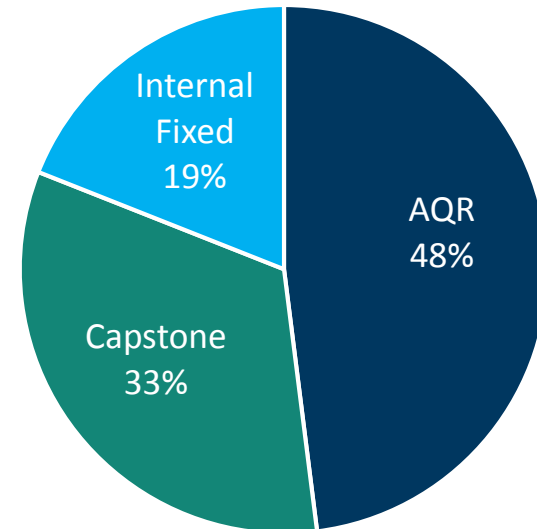
- 7 mandates
- Uncorrelated, factor and trend-based approaches
- Invested since 2013

Capstone Investment Advisors

- 3 mandates
- Multi strategy volatility mandates
- Invested since 2019

Internal Fixed Income

- 1 mandate
- Long duration treasury strategy
- Invested since 2018



RBI Mandates (as of 06/30/2021)		
	\$ MM	%
AQR	713	50%
Capstone	645	45%
Internal FI	76	5%
Total RBI	1,434	

Program Results

	Since July 2018	1 Year
Risk Based Investments	1.6%	12.3%
Benchmark*	5.7%	8.1%
Excess Return	-4.8%	4.3%

*Benchmark for RBI is 80% Cash + 250 bps + 20% S&P Risk Parity Index effective January 2020. Prior years benchmark was a custom blend of peer-based and market-based benchmarks.

Program Risk Metrics

Total Program	Since Inception	1 Year
Volatility	5.2%	3.6%
Tracking Error	4.6%	2.9%
Beta to MSCI ACWI	0.2	0.1

Diversifiers	Since Inception	1 Year
Volatility	4.3%	3.2%
Tracking Error	4.8%	3.2%
Beta to MSCI ACWI	0.1	0.0

Risk Parity	Since Inception	1 Year
Volatility	10.0%	10.0%
Tracking Error	6.2%	4.9%
Beta to MSCI ACWI	0.4	0.5

Inception of July 2018

- Continue exploring diversifying partnerships with external managers as the program grows
- Enhance the synergies between RBI and the risk management effort
- Increase mindshare with current and prospective RBI managers

Forward Returns & Scenario Analyses

Steven Peterson
Research Director



Summary Forward Returns And Scenario Analyses



Forward Returns (10 year & 20 year)

Forward Returns Attribution (10 year)

External Managers' Forward Returns Comparison (10 year)

Scenarios (Impact on Funded Status, Contributions)

- Base Case
- Stagflation
- Inflation Surprise/Rate Hike
- Covid Variant

Forward Returns and Volatilities By Asset Class (10 year)



Asset Class	Wt.	Current		Allowable	
		E(r)	E(σ)	Min	Max
Public Equity	34.0%	6.4%	14.0%	-5.0%	5.0%
Fixed Income	15.0%	2.2%	4.0%	-3.0%	5.0%
Credit Strategies	14.0%	6.2%	6.5%	-5.0%	5.0%
Real Assets	14.0%	6.8%	10.0%	-5.0%	5.0%
Private Equity	14.0%	10.4%	20.0%	-5.0%	5.0%
MAPS	6.0%	5.2%	8.0%	-2.0%	2.0%
PIP	3.0%	8.1%	15.0%	-2.0%	2.0%
Cash	0.0%	0.0%	0.5%	-1.0%	4.0%
<i>Currency Return Addition</i>		0.1%			
Total Fund		6.4%	11.4%		

Asset Class and Strategy	Wt.	Current	
		E(r)	E(σ)
Public Equity	34.0%	6.4%	14.0%
Fixed Income	15.0%	2.2%	4.0%
Treasury	4.1%	1.1%	
Agency	0.2%	1.4%	
MBS	4.3%	2.1%	
CMBS	0.3%	2.1%	
ABS	0.3%	2.6%	
IG	4.0%	2.3%	
HY	0.8%	3.8%	
JPM EMBI Core	1.1%	5.1%	
Credit Strategies	14.0%	6.2%	6.5%
Rate Sensitive HY	4.2%	3.7%	
Rate Sensitive IG	1.4%	2.0%	
Non-Rate Sensitive	8.4%	7.4%	
Real Assets	14.0%	6.8%	10.0%
Private Real Estate	7.7%	6.6%	
Public Real Estate	2.1%	6.9%	
Other Real Assets	4.2%	7.2%	
Private Equity	14.0%	10.4%	20.0%
MAPS	6.0%	5.2%	8.0%
PIP	3.0%	8.1%	15.0%
Cash	0.0%	0.1%	0.5%
<i>Currency Return Addition</i>			
Total Fund		6.4%	11.4%

Forward Returns and Volatilities By Asset Class (10 and 20 year)



10 Year

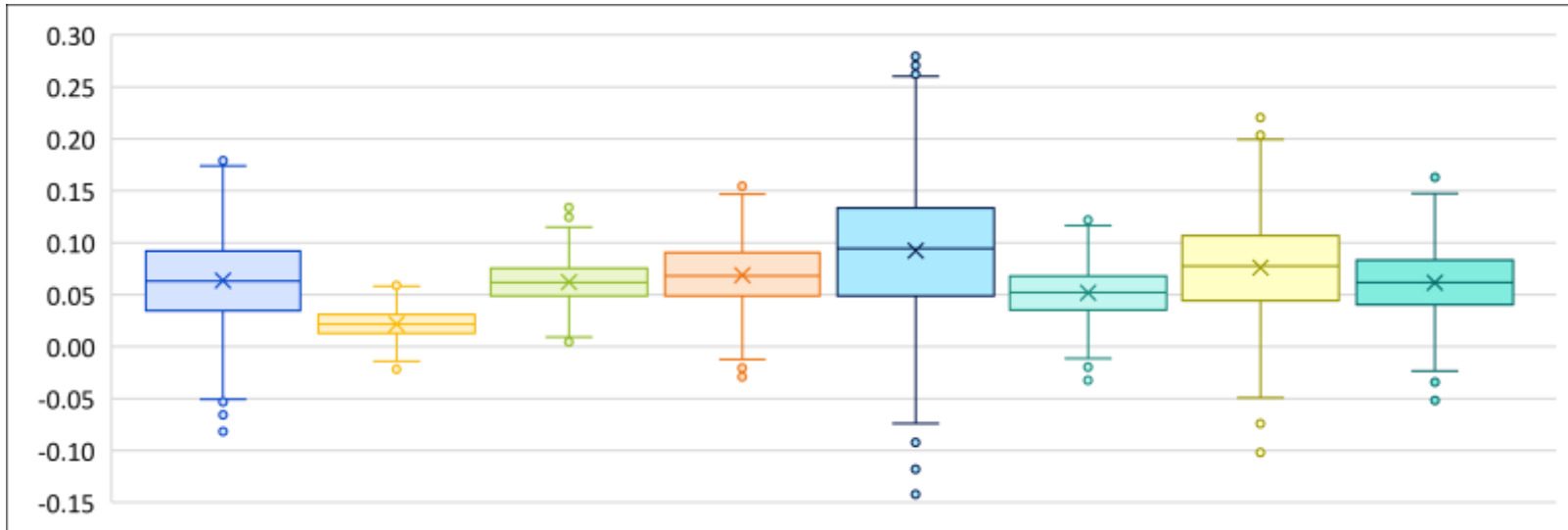
Asset Class	Wt.	Current		Allowable	
		E(r)	E(σ)	Min	Max
Public Equity	34.0%	6.4%	14.0%	-5.0%	5.0%
Fixed Income	15.0%	2.2%	4.0%	-3.0%	5.0%
Credit Strategies	14.0%	6.2%	6.5%	-5.0%	5.0%
Real Assets	14.0%	6.8%	10.0%	-5.0%	5.0%
Private Equity	14.0%	10.4%	20.0%	-5.0%	5.0%
MAPS	6.0%	5.2%	8.0%	-2.0%	2.0%
PIP	3.0%	8.1%	15.0%	-2.0%	2.0%
Cash	0.0%	0.0%	0.5%	-1.0%	4.0%
<i>Currency Return Addition</i>		0.1%			
Total Fund		6.4%	11.4%		

20 Year

Asset Class	Wt.	Current		Allowable	
		E(r)	E(σ)	Min	Max
Public Equity	34.0%	6.6%	14.0%	-5.0%	5.0%
Fixed Income	15.0%	3.0%	4.0%	-3.0%	5.0%
Credit Strategies	14.0%	6.8%	6.5%	-5.0%	5.0%
Real Assets	14.0%	6.8%	10.0%	-5.0%	5.0%
Private Equity	14.0%	10.6%	20.0%	-5.0%	5.0%
MAPS	6.0%	5.5%	8.0%	-2.0%	2.0%
PIP	3.0%	8.3%	15.0%	-2.0%	2.0%
Cash	0.0%	0.0%	0.5%	-1.0%	4.0%
<i>Currency Return Addition</i>		0.1%			
Total Fund		6.8%	11.4%		

VRS Forward Returns By Asset Class

Annualized 10 Yr E[r]



Quant	PubEq	FI	CS	RA	PvtEq	MAPS	PIP	Fund
P5	-0.006	0.002	0.030	0.021	-0.002	0.013	0.005	0.012
P25	0.035	0.014	0.048	0.049	0.062	0.035	0.050	0.043
P50	0.065	0.022	0.062	0.069	0.107	0.052	0.082	0.064
P75	0.095	0.030	0.075	0.091	0.147	0.069	0.114	0.088
P95	0.139	0.041	0.095	0.120	0.213	0.094	0.161	0.118

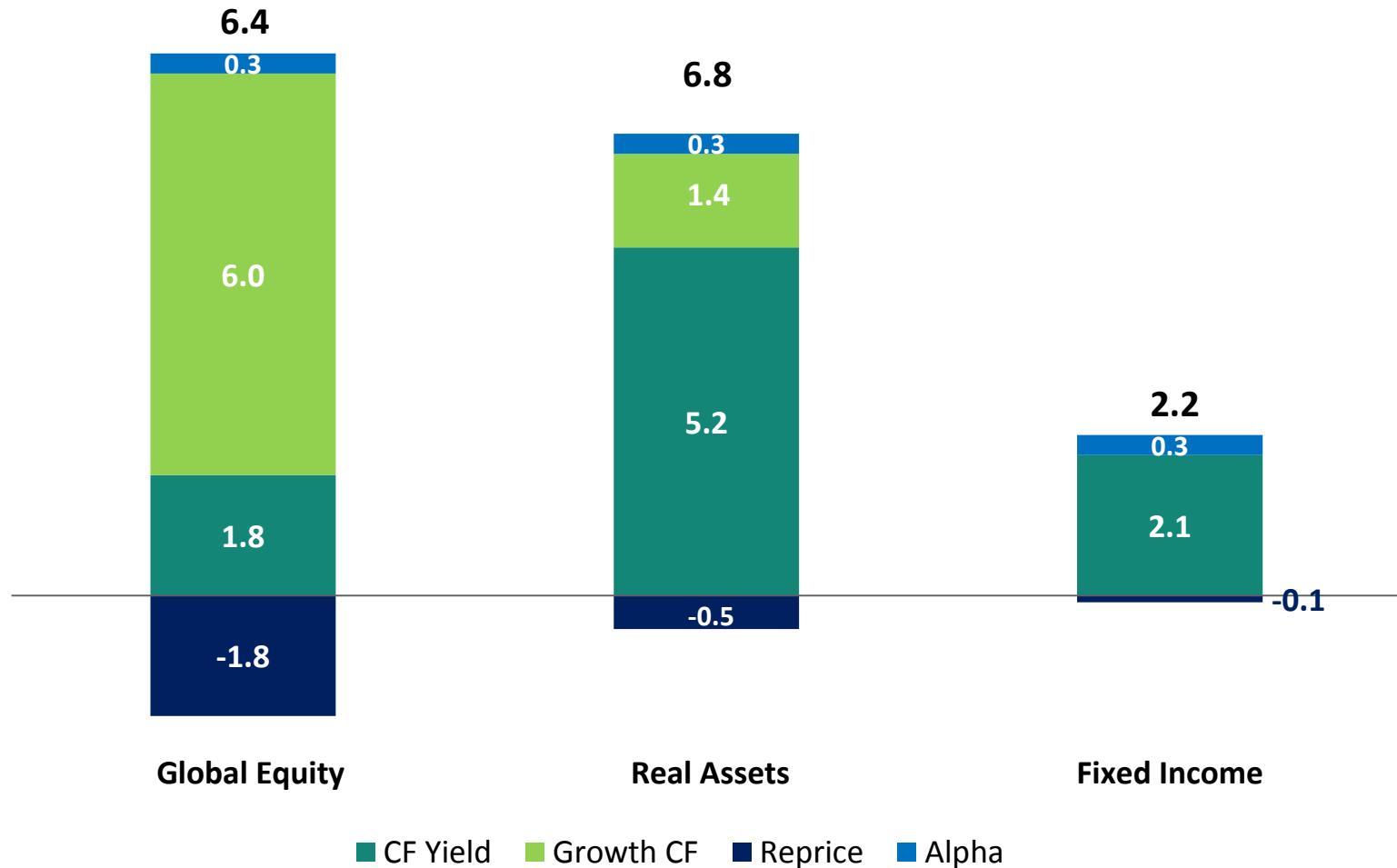
Selected Forward Returns Attribution



	10 Year	CF Yield	Growth in CF	Reprice	Alpha
Global Eq	6.4%	1.8%	6.0%	-1.8%	0.3%
US Eq	4.7%	1.5%	5.0%	-2.1%	0.3%
Non-US Eq	8.1%	2.3%	7.3%	-1.9%	0.3%
EM Eq	7.6%	2.1%	6.2%	-0.9%	0.3%
Real Assets	6.8%	5.2%	1.4%	-0.5%	0.3%
Private RE	6.6%	3.8%	3.0%	-0.8%	0.3%
Global REITs	6.9%	3.0%	3.6%	0.0%	0.3%
Infrastructure	7.4%	3.7%	2.3%	-0.1%	0.5%
Energy & Mining	8.5%	25.0%	-17.0%	0.0%	0.5%
Timberland	4.8%	3.0%	2.5%	-0.2%	0.5%
Farmland	6.4%	5.9%	1.2%	0.0%	0.5%
Tot. ORA	7.2%	8.7%	-2.2%	-0.1%	0.5%
Total IFI	2.2%	2.1%	0.0%	-0.1%	0.3%
BC Treasury	1.1%	1.1%	0.0%	-0.1%	0.1%
BC Agency	1.4%	1.4%	0.0%	-0.1%	0.2%
BC MBS	2.1%	1.8%	0.0%	-0.1%	0.4%
BC CMBS	2.1%	1.9%	0.0%	-0.2%	0.4%
BC ABS	2.6%	2.4%	0.0%	-0.1%	0.4%
BC IG Credit	2.3%	2.1%	0.0%	-0.2%	0.4%
BC HY Credit	3.8%	3.8%	0.0%	-0.4%	0.4%
JPM EMBI Core	5.1%	5.2%	0.0%	-0.3%	0.2%

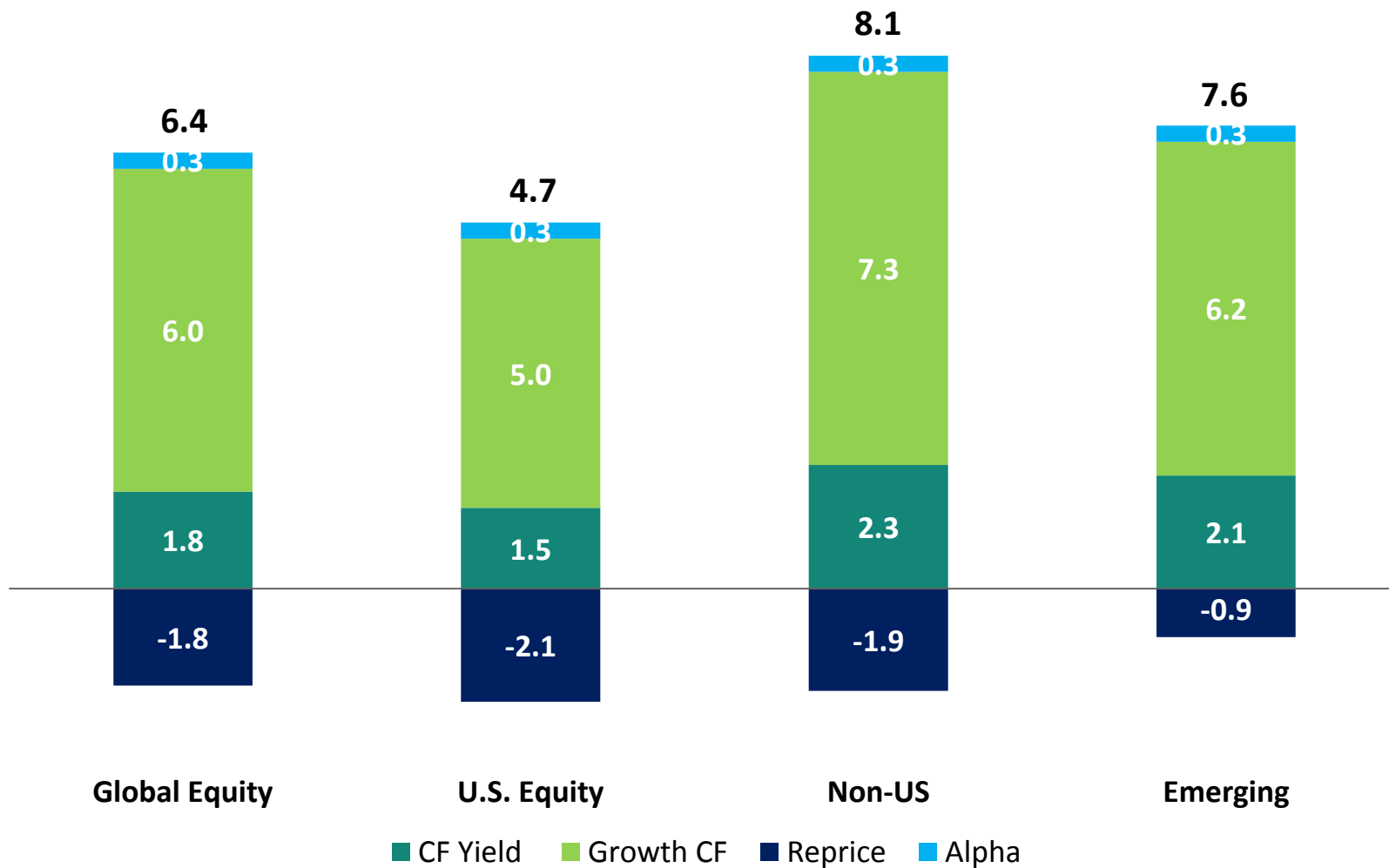
Notes: Includes expected inflation (2.5% US); Includes leverage; IFI CF Yield includes growth in CF

Selected Attribution, cont. (Percent)

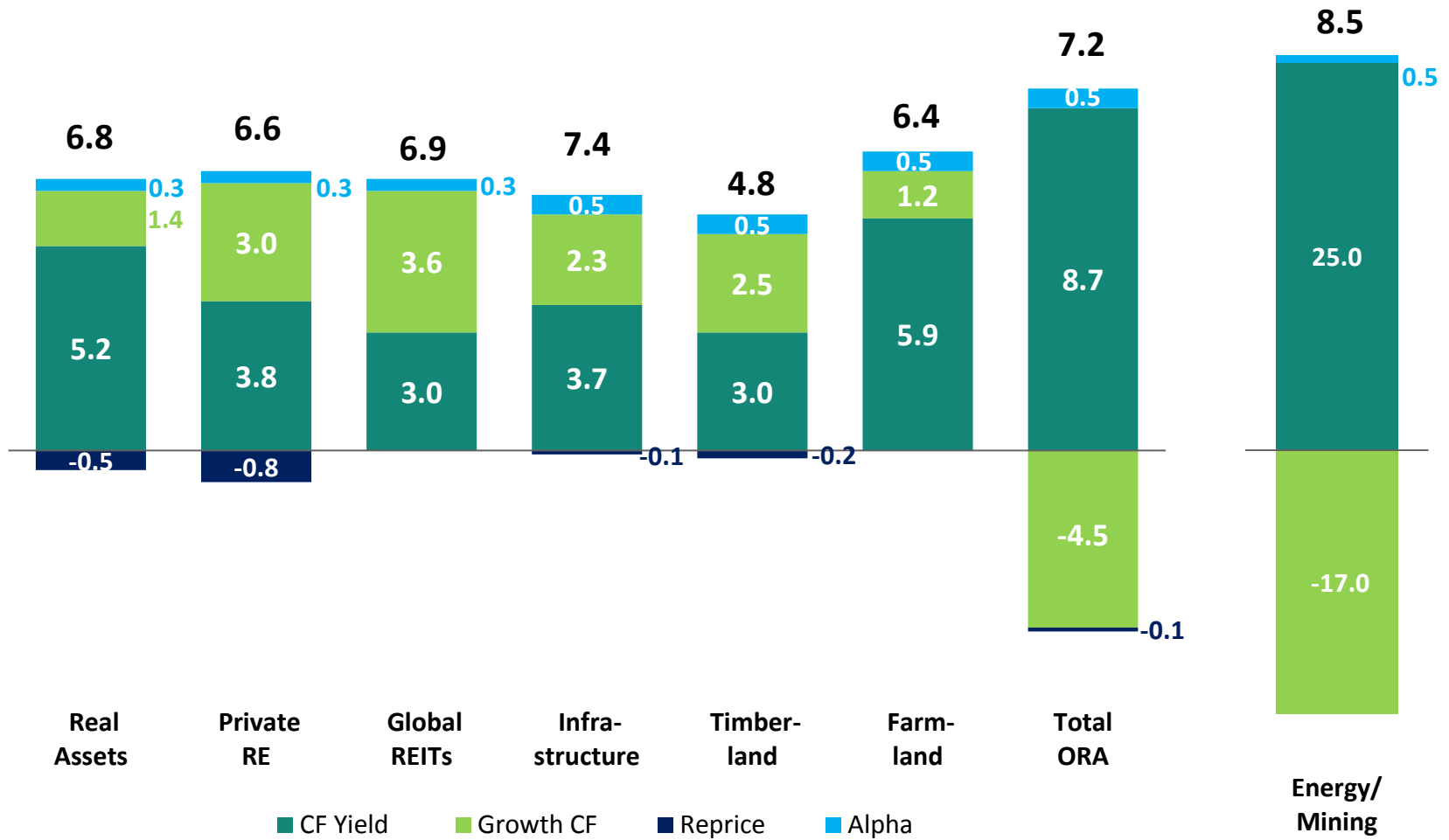


Real Assets included expected inflation (2.5% US); Includes leverage; IFI CF Yield includes growth in CF

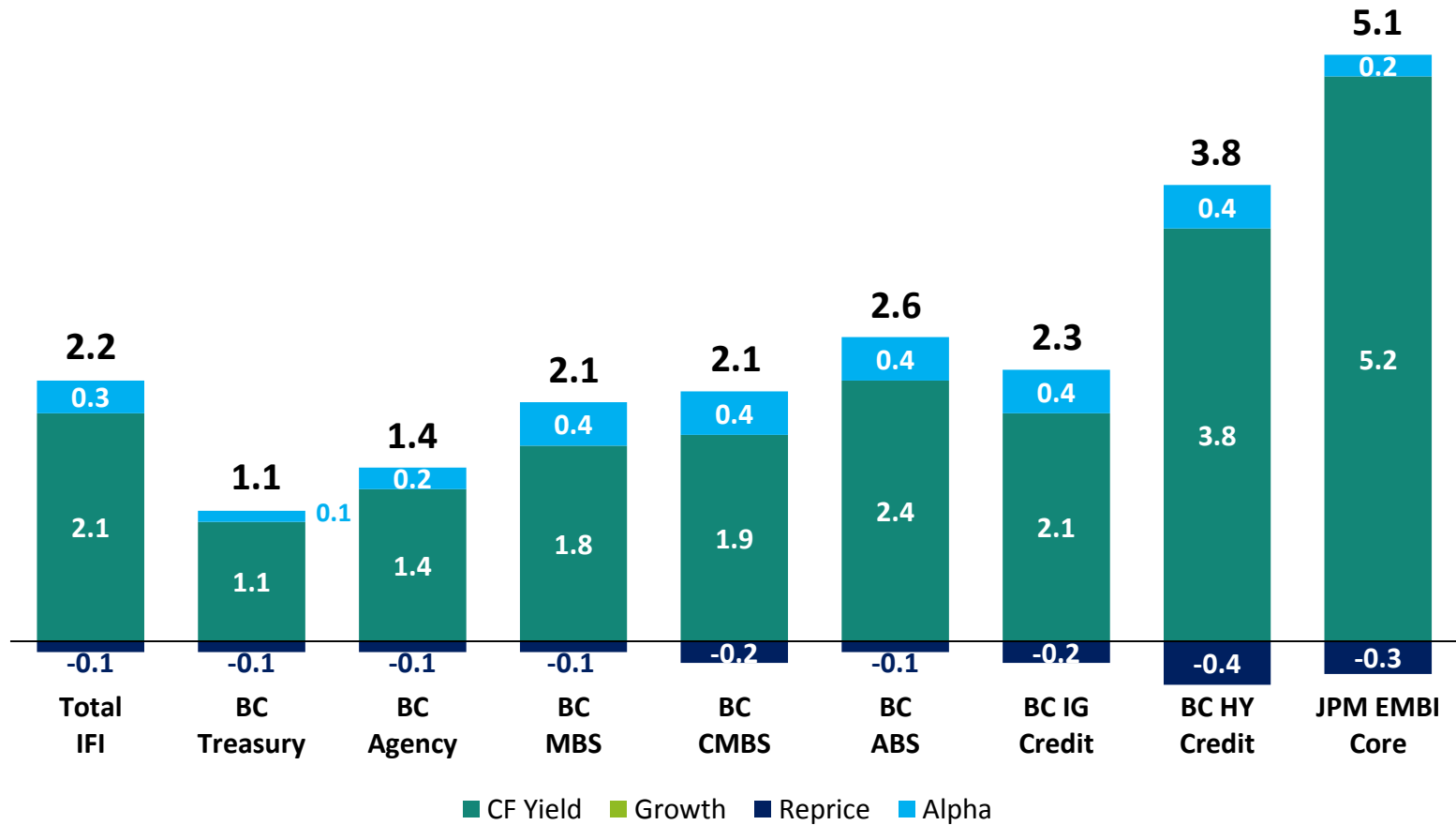
Global Equity Attribution (Percent)



Real Assets Attribution (Percent)



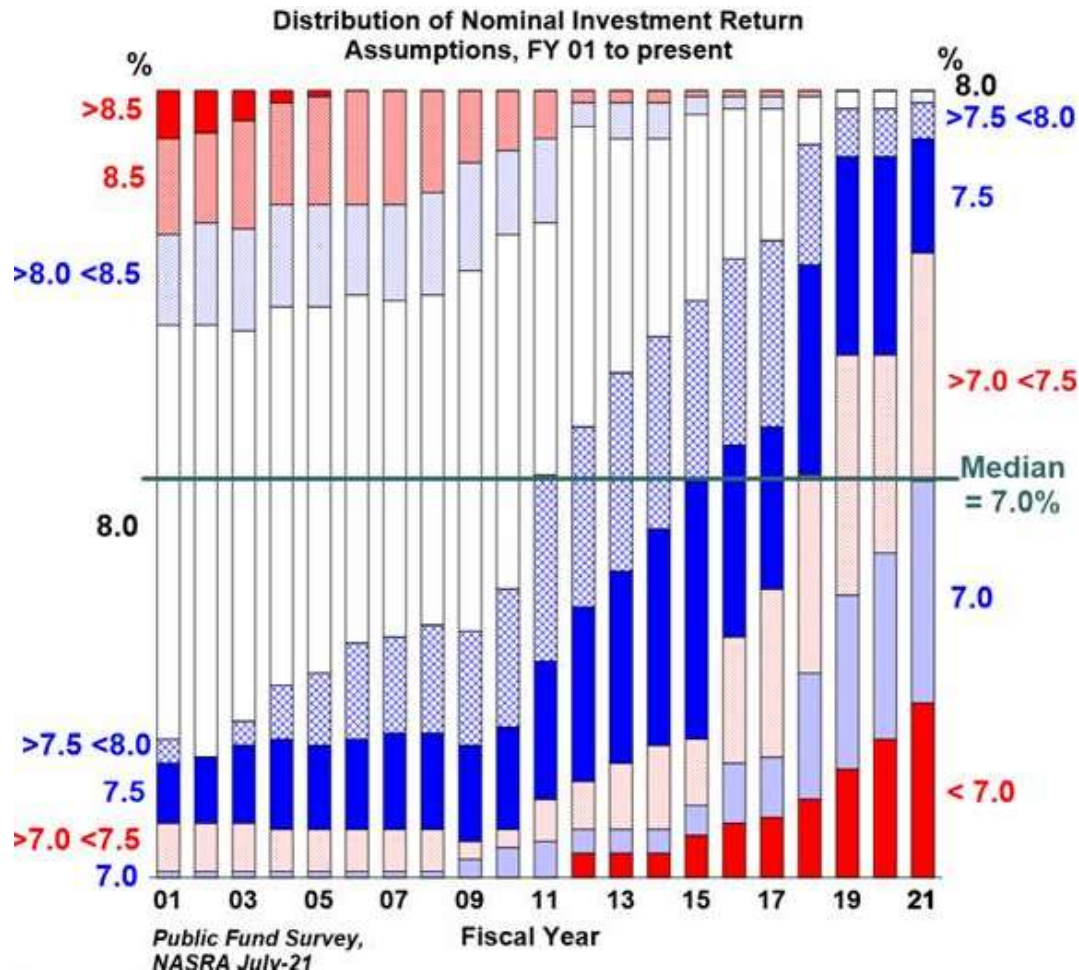
Fixed Income Attribution (Percent)



Macro Factor Impact on Forward Returns

	Factor	Impact
Alpha	Rising Vol	+
	Growth In Yield	-
Real Yield	Taxes	-
	Productivity	-
Inflation	De-Globalization	-
	Rates v Inflation	+
Revaluation	Discount Factor	-
	Tapering (Fed)	-
	Commodity Prices	-
	Nominal Wages	-
	P/E Mean Reversion	-
	Discount Factor	-
	Risk Aversion	-

Public Pension Plan Discount Rate Through Time



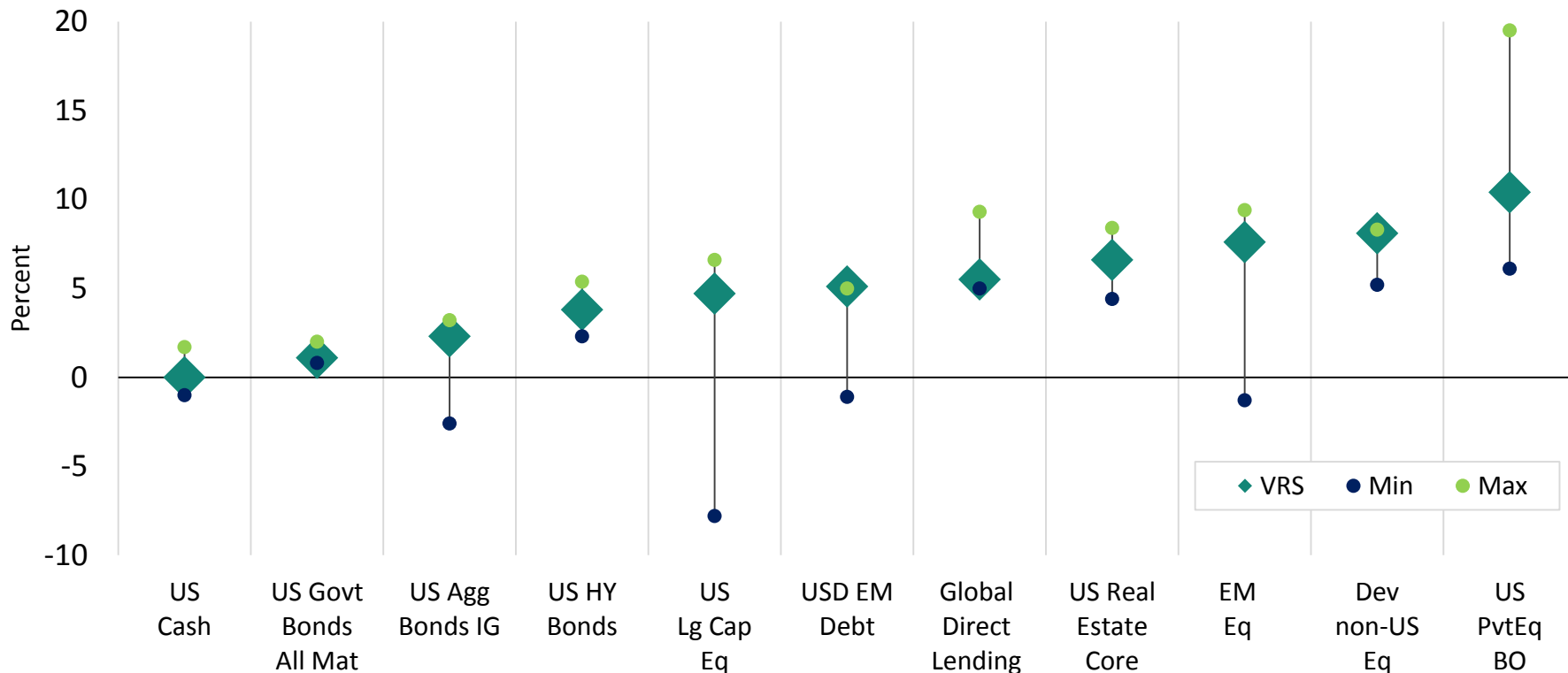
External Managers' 10-Yr Forward Return History



	2015	2017	2018	2019	2020	2021
U.S. Core Fixed	3.0	3.1	3.1	3.4	1.5	1.6
Credit (HY)	5.0	4.6	4.4	5.0	4.8	3.5
Core Real Estate	5.4	5.5	5.2	5.7	5.3	5.9
U.S. Stocks	6.2	6.0	5.5	5.7	5.5	4.0
Int'l Developed Stocks	6.9	6.4	6.8	6.7	6.2	6.2
Emerging Stocks	8.4	7.5	7.1	8.2	7.6	6.6
Private Equity	8.9	7.2	7.7	9.2	8.9	9.5

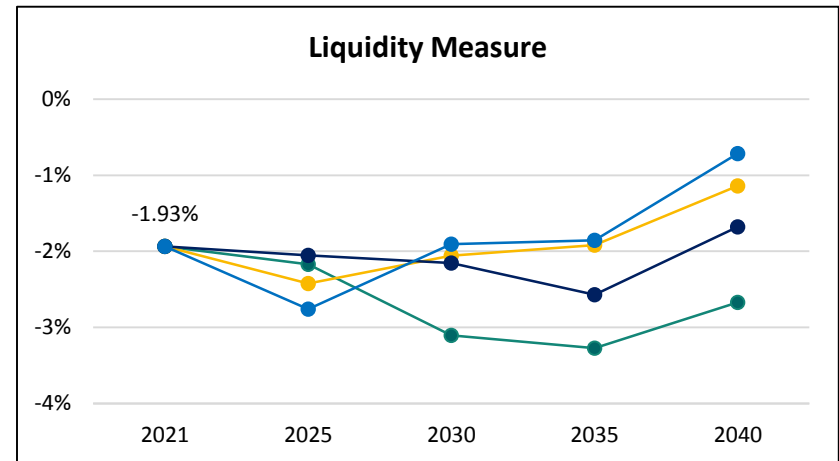
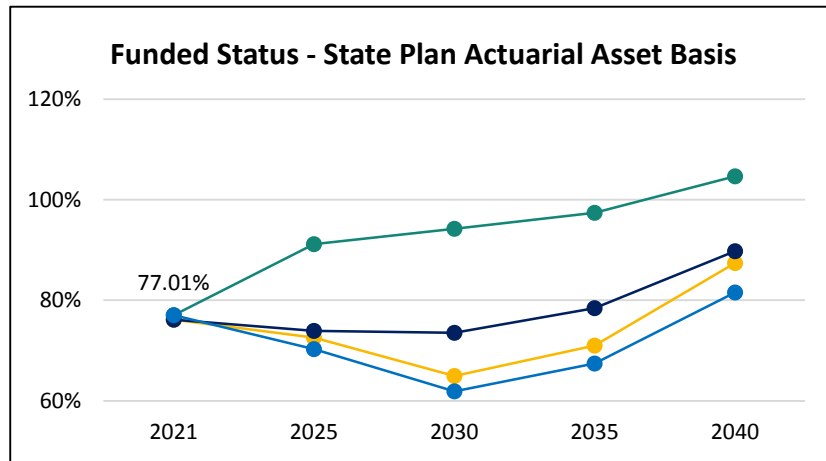
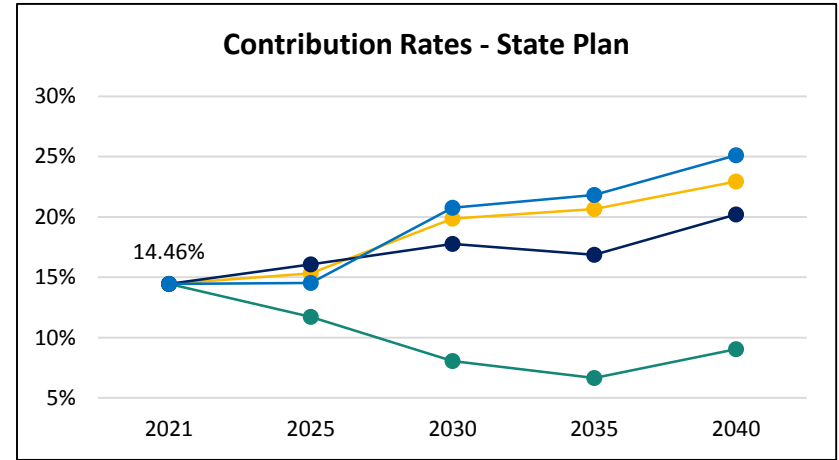
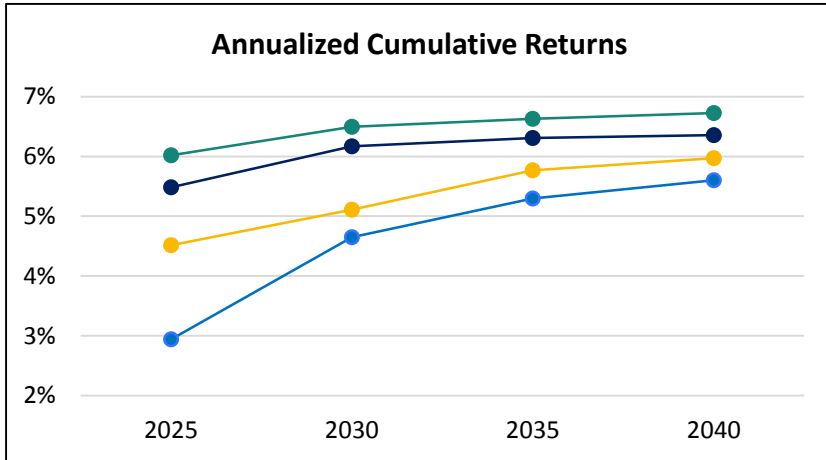
10 Year Forward Return Expectations

10 Year Forward Return Expectations External Manager & VRS



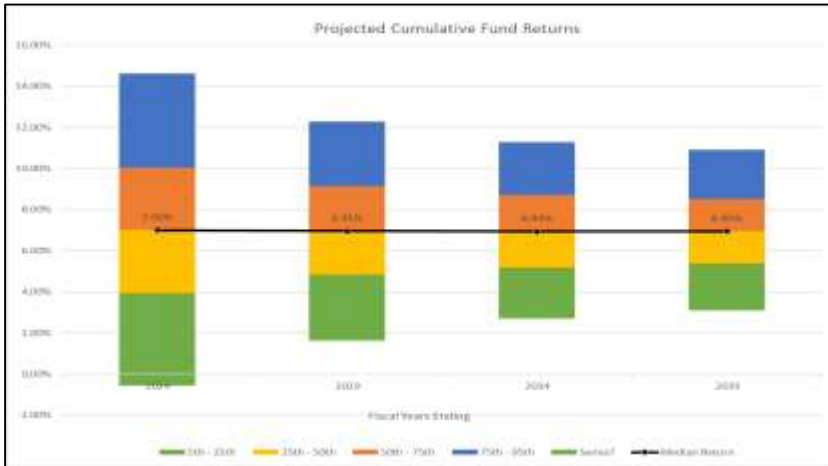
VRS Forward Return Expectations										
0.0	1.1	2.3	3.8	4.7	5.1	5.5	6.6	7.6	8.1	10.4

Scenarios – Median Paths

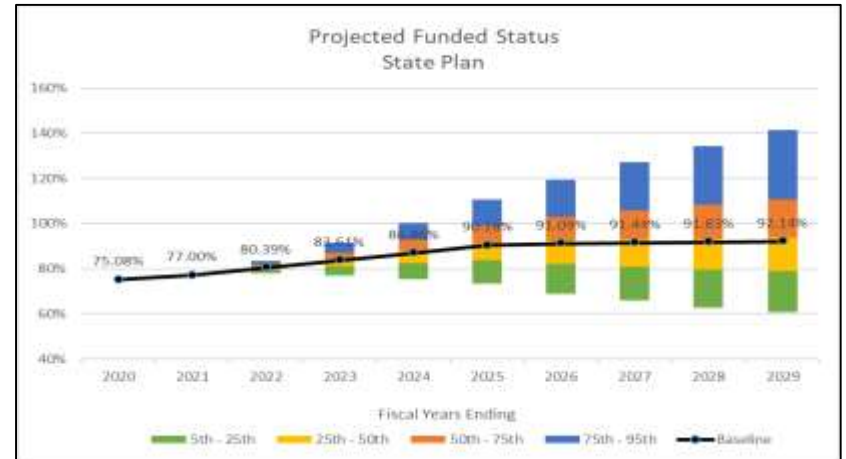


Legend: Baseline Stagflation Inflation Surprise/Rate Hike Delta Variant

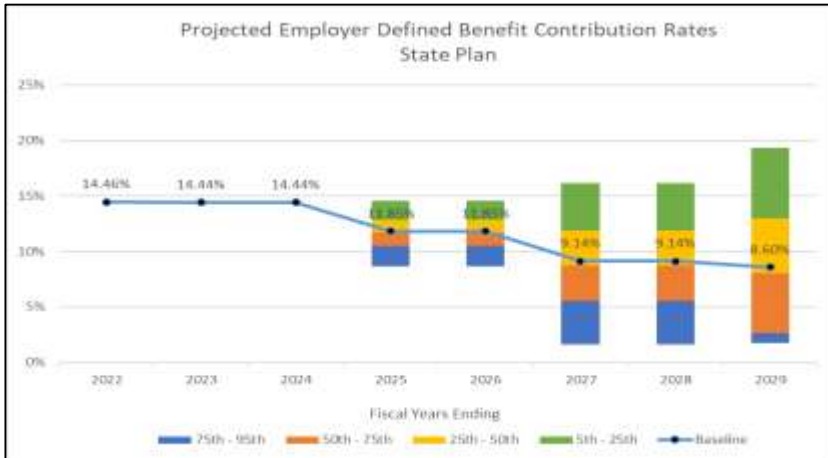
Rates of Return



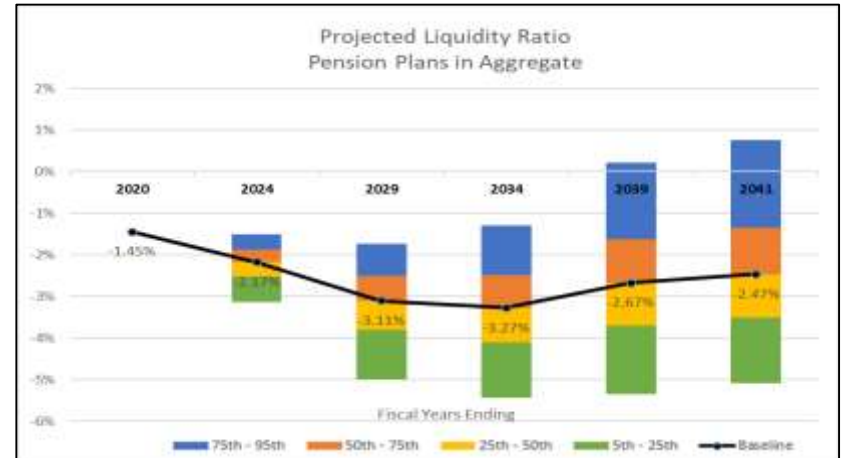
Funded Status



Contribution Rates

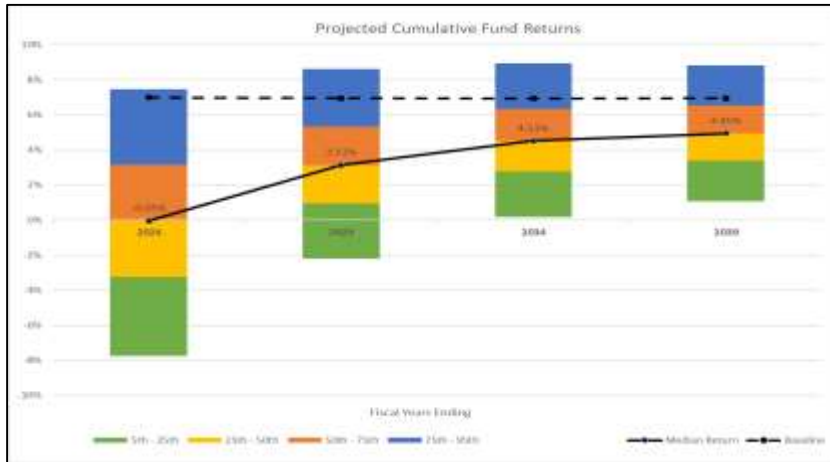


Liquidity

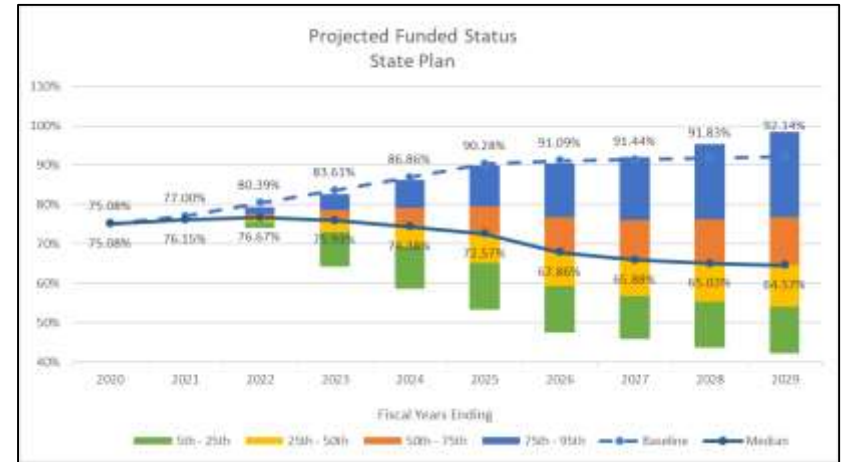


Stagflation

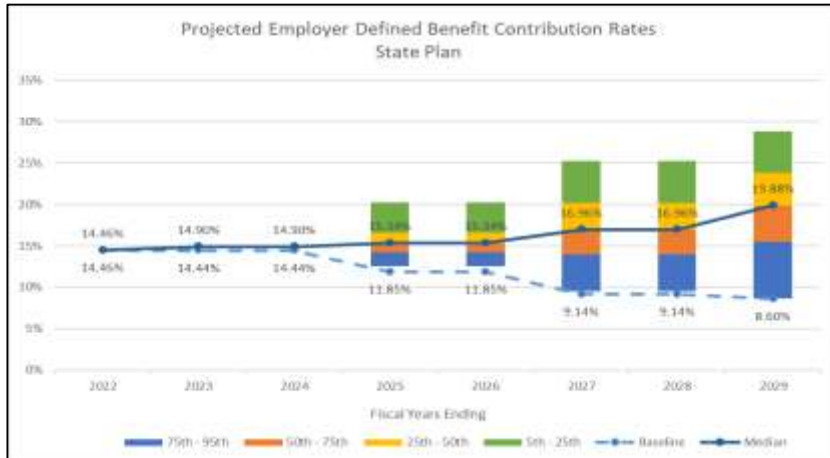
Rates of Return



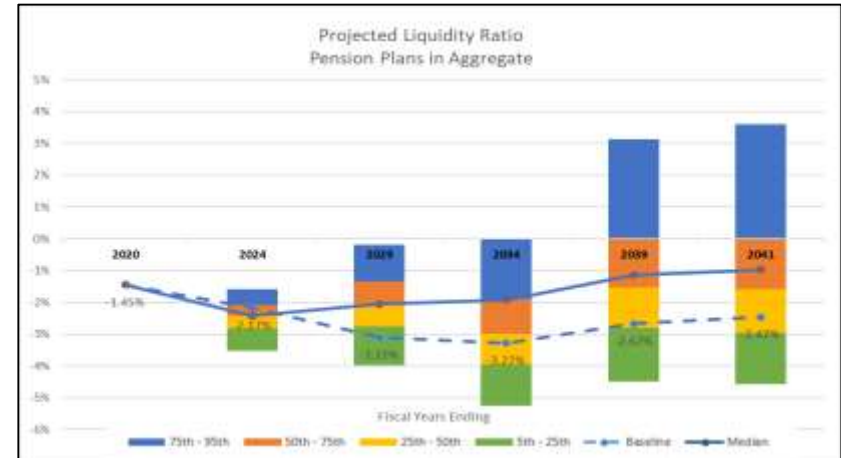
Funded Status



Contribution Rates

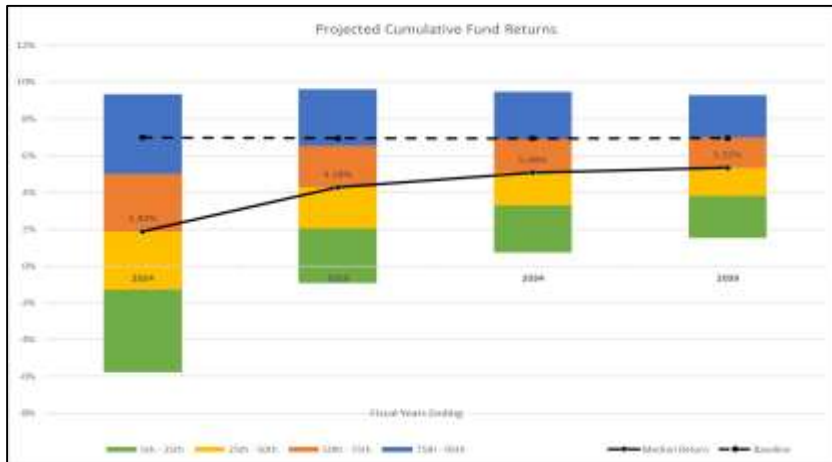


Liquidity

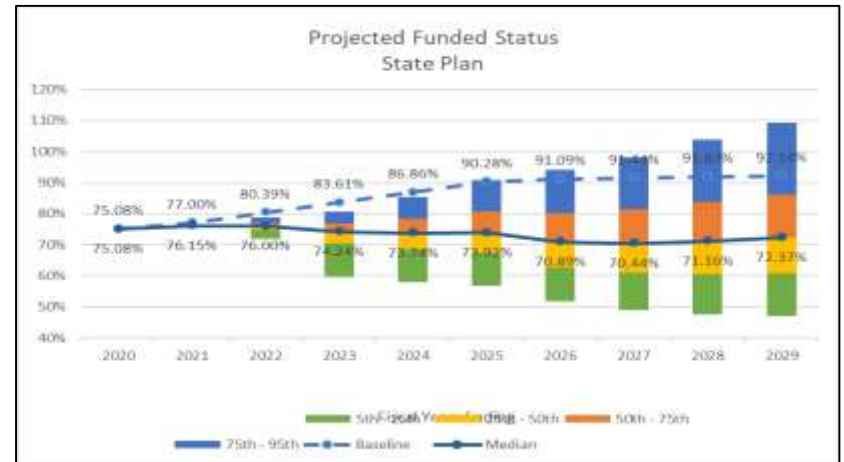


Inflation Surprise

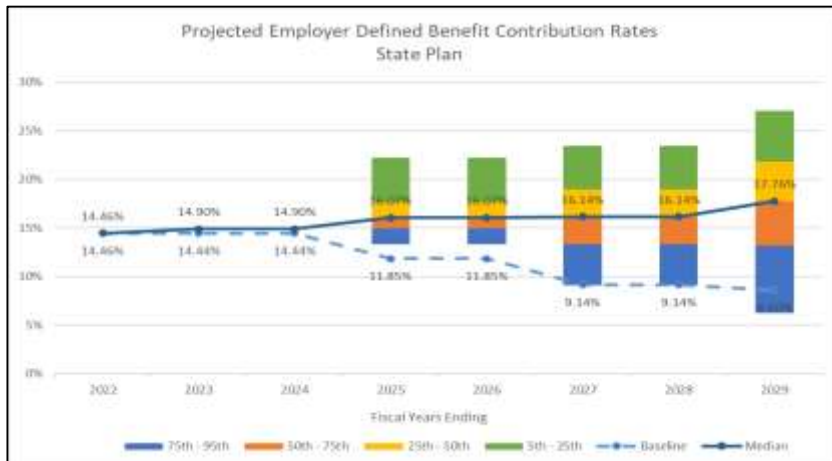
Rates of Return



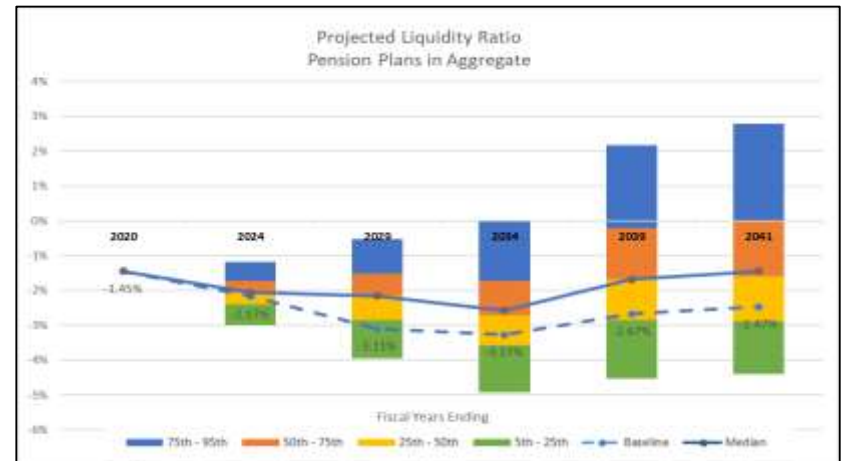
Funded Status



Contribution Rates

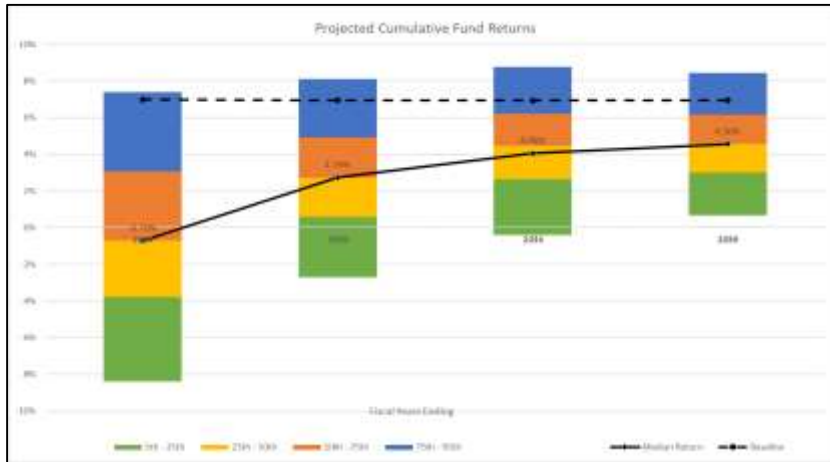


Liquidity

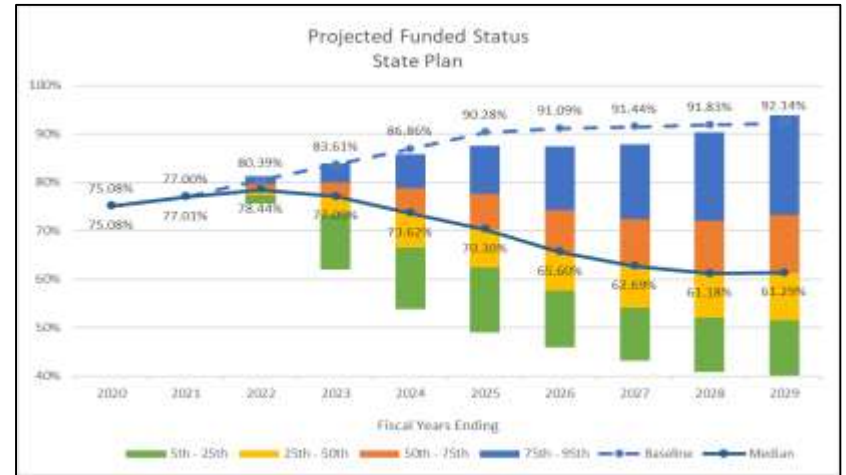


Covid Variant

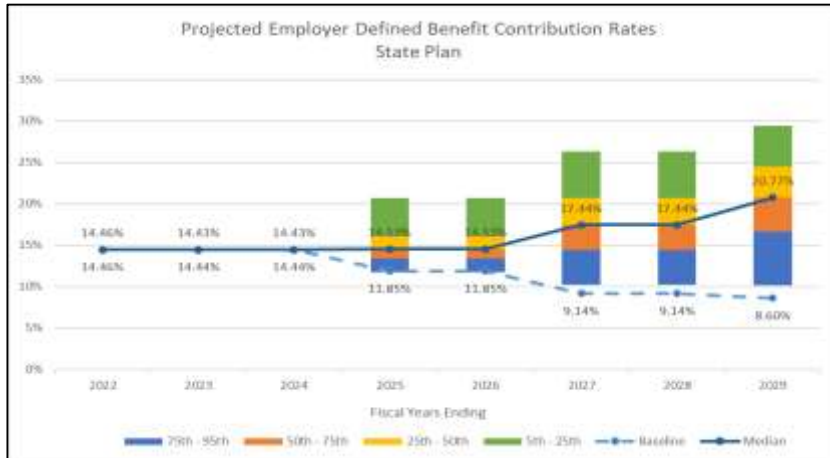
Rates of Return



Funded Status



Contribution Rates



Liquidity

