OREGON
STATE
TREASURY

Oregon Investment Council

March 10, 2021

John Russell
Chair

Rex Kim
Chief Investment Officer

Tobias Read
State Treasurer

Investment Division
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OREGON INVESTMENT COUNCIL

Agenda

March 10, 2021
9:00 AM

Oregon State Treasury
Investment Division
16290 SW Upper Boones Ferry Road
Tigard, OR 97224

Time	A. Action Items	Presenter	Tab
9:00-9:05	**1. Review & Approval of Minutes** January 28, 2021	**John Russell** *OIC Chair*	**1**
	2. Committee Reports	**Rex Kim** *Chief Investment Officer*	**2**
	B. Information Items		
9:05-10:00	**3. Real Estate Market Overview**	**Ken Riggs** *Vice Chair, RERC, a SitusAMC Company*	**3**
10:00-10:45	**4. OPERF Real Estate Program**	**Anthony Breault** *Senior Investment Officer, Real Estate* **Christy Fields** *Managing Principal, Meketa* **David Glickman** *Executive Vice President*	**4**
10:45-11:30	**5. OPERF Alternatives Program**	**Ben Mahon** *Senior Investment Officer, Alternatives* **Tom Martin** *Head of Private Equity & Real Assets Research, Aksia/TorreyCove* **Steve Kennedy** *Partner, Portfolio Analyst, Albourne*	**5**

--- BREAK ---

11:40-12:25	**6. Capital Markets Assumptions**	**Karl Cheng** *Senior Investment Officer, Portfolio Risk & Research* **Allan Emkin** *Managing Principal, Meketa Investment Group* **Mika Malone** *Managing Principal/Consultant, Meketa Investment Group* **Kristen Doyle** *Partner, Aon Investments* **Raneen Jalajel** *Senior Consultant, Aon Investments*	**6**
12:25-12:55	**7. Q4 OPERF Performance**	**Allan Emkin** **Mika Malone** **Kristen Doyle** **Raneen Jalajel**	**7**
12:55	**8. Asset Allocation & NAV Updates** a. Oregon Public Employees Retirement Fund b. SAIF Corporation c. Common School Fund	**Rex Kim**	**8**
	9. Calendar — Future Agenda Items	**Rex Kim**	**9**
1:00	**10. Open Discussion**	**OIC Members** **Staff** **Consultants**	

C. Public Comment

TAB 1 – REVIEW & APPROVAL OF MINUTES

January 28, 2021 Regular Meeting

OREGON STATE TREASURY

State of Oregon
Office of the State Treasurer

16290 SW Upper Boones Ferry Road

Tigard, Oregon 97224

OREGON INVESTMENT COUNCIL

January 28, 2021

Meeting Minutes

Members Present:	John Russell, Patricia Moss, Cara Samples, Monica Enand, Tobias Read and Kevin Olineck.
Staff Present:	Rex Kim, John Hershey, Michael Langdon, David Randall, Karl Cheng, Ben Mahon, Geoff Nolan, Tony Breault, Michael Viteri, Mike Mueller, Rachel Wray and May Fanning.
Staff Participating virtually:	Andrey Voloshinov, Steve Kruth, Anna Totdahl, Lisa Pettinati, Ahman Dirks, Eric Messer, Aliese Jacobsen, Amy Bates, Andrew Robertson, Paul Koch, Roy Jackson, Krystal Korthals, Sommer May, Taylor Bowman, Christopher Ebersole, David Elott, Jen Plett, Robin Kaukonen, Austin Carmichael, Faith Sedberry, Debra Day, Sam Spencer, Wil Hiles, Perrin Lim, Ian Huculak, Andrew Coutu, Claire Illo, Tan Cao, Tyler Bernstein, Andrew Hillis, Kristi Jenkins, Angela Schaffers, Mark Selfridge, Amanda Kingsbury, Deena Bothello, Jo Recht, John Lutkehaus, Monique Sadegh, Kenny Bao, Will Hampson, Tiffany Zahas, Dana Millican, Dmitri Palmateer, Jeremy Knowles, Andrew Coutu, Ian Huculak, Scott Robertson
Consultants Present:	Allan Emkin, Mika Malone, David Glickman and Christy Fields (Meketa Investment Group, Inc.); Stephen Cummings, Kristen Doyle and Raneen Jalajel (Aon Investments); Tom Martin and David Fann, (Aksia, TorreyCove Capital Partners LLC)
Legal Counsel Present:	Steven Marlowe, Department of Justice

Before proceeding with the OIC meeting, Chief Investment Officer, Rex Kim provided a disclosure pertaining to the virtual set-up of this OIC meeting, informing those in attendance (virtual and in person) of the guidelines in which this meeting will proceed.

The January 28th, 2021 OIC meeting was called to order at 9:00 am by John Russell, OIC Chair.

I. 9:00 am Review and Approval of Minutes, Vice-Chair Election

MOTION: Chair Russell asked for approval of the December 9th, 2020 OIC regular meeting minutes. Vice Chair, Moss moved approval at 9:01 am, and Ms. Enand seconded the motion which then passed by a 5/0 vote.

Treasurer Read, nominated Ms. Cara Samples as the new Vice-Chair.

MOTION: Treasurer Read, moved approval at 9:02 am, and Ms. Moss seconded the motion which then passed by a 5/0 vote.

Chair Russell then thanked Ms. Moss for her valuable contribution and service to the Council.

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II. 9:02 am OIC Calendar Approval and Committee Reports:

Rex Kim, requested Council approval for a proposed list of 2022 OIC meeting dates.

MOTION: Treasurer Read moved approval at 9:03 am, and Ms. Enand seconded the motion which then passed by a 5/0 vote.

Committee Reports: Mr. Kim, then gave an update on the following committee actions taken since the December 9, 2020 OIC meeting:

Real Estate Committee:

December 11, 2020	Harrison Street Real Estate Partners Fund VIII, L.P.	$150M
	HS-OR Life Science Partners	$200M

Alternatives Portfolio Committee:
Staff Authority Approval:

December 11, 2020	Brookfield Infrastructure Co-Investment Side-Car, L.P.	$50M

Per INV 702, Chief Investment Officer approved this investment based on the recommendation of both the Director of Private Markets and Aksia/TorreyCove, the OIC's consultant.

Private Equity Committee:

December 7, 2020	ClearVue OPERF	$50M

Per INV 701, Chief Investment Officer approved this investment based on the recommendation of both the Director of Private Markets and Aksia/TorreyCove, the OIC's consultant.

January 22, 2021	Hellman & Friedman Capital Partners X, L.P.	$350M
	Luminate Capital Partners III, L.P.	$150M
	Roark Capital Partners VI, L.P.	$250M

Opportunity Committee:

None

III. 9:05 am Oregon Short Term Fund Policy Revision

Geoff Nolan, Senior Investment Officer, Fixed Income, walked the Council through the proposed OSTF INV 303 Policy Updates, detailed below:

Staff propose the following changes to improve risk mitigation and language clarity:

1. More Conservative Counterparty Requirements:
   a. Limit counterparties to Primary Dealers as recognized by the Federal Reserve Bank of New York. Primary Dealers are amongst the largest and most heavily regulated financial institutions.
2. More Conservative Collateral Management:
   a. Collateral to be held at a tri-party custodian. Tri-party arrangement minimizes counterparty risk.
   b. Custodian acts as the intermediary between the parties in administering the transaction:
      i. Daily collateral allocation, marking positions to market, collateral substitution, margin top ups.

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c. Custodian manages collateral eligibility requirements as set by OST staff.

3. Broaden Eligible Collateral from just Treasuries & Agencies:
   a. Enhances investment opportunities for OSTF given broader eligibility is more attractive to counterparties.
   b. OSTF staff sets collateral eligibility standards.
4. Eliminate Unnecessary Counterparty Language:
   a. Removes $100MM "net capital" requirement as counterparties are Primary Dealers who rank among the largest & strongest financial institutions in the world.
   b. Removes "2%" cap of counterparty liabilities as it is superfluous.
      i. More conservative counterparty exposure limit of 5% would be would be triggered first.

MOTION: Ms. Samples moved approval of the recommended updates to INV 303 at 9:11 am, and Treasurer Read seconded the motion which then passed by a 5/0 vote.

IV. 9:11 am Evolution of Private Equity

Chair Russell, Introduced Mr. Jim Coulter, Co-Founder and Co-CEO, TPG, who provided an interactive presentation on the evolution of private equity.

V. 10:18 am OPERF Private Equity Program

Michael Langdon, Director of Private Markets, and Tom Martin, Head of PE & RA Research, Aksia/TorreyCove, joined by Pathway Capital representatives, Karen Jokobi, Senior Managing Director, Derrek Ransford, Managing Director and Pete Veravanich, Managing Director, provided the Council with the OPERF Private Equity Annual Review and 2021 Plan.

VI. 11:50 am OPERF Opportunity Program

Mike Mueller, Investment Officer, Opportunity Portfolio delivered the OPERF Opportunity Portfolio 2020 Annual Review that comprised of an overview, performance, history and year in review.

VII. 12:14 pm Annual Placement Agent Report

John Hershey, Director of Investments, provided the Council with the Annual Placement Agent Disclosure report. This report was made in accordance with Policy COM 201: Conflict of Interest and Code of Conduct which states that OST shall disclose, in all investment recommendations to the Oregon Investment Council, any Placement Agent used by an investment firm *that has had any contact with Treasury investment staff*. Consistent with that policy, Mr. Hershey provided the Council with a summary of all placement agent contact that occurred in calendar year 2020, a summary that will also be made available to the public on the Treasury website.

VIII. 12:16 pm General Consultant

Kristen Doyle, Partner, Aon Investments, Raneen Jalajel, Senior Consultant, Aon Investments and Stephen Cummings, Global Head of Aon Investments gave the Council and attendees a brief introduction of their work experience and their new role as General Consultants. Then, Allan Emkin, Managing Principal, Meketa Investment Group, and Mika Malone, Managing Principal/Consultant, Meketa Investment Group began by thanking the Council for extending the long-standing relation with Meketa. They then went on to provide a presentation highlighting the ongoing 2021 projects that included but not limited to, Investment Related Policy Statements, Meeting with OIC members, Asset Allocation & Asset liability Modeling and Performance Reporting.

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IX. 12:27 pm Asset Allocation & NAV Updates

Mr. Kim reviewed asset allocations and NAVs across OST-managed accounts for periods ended December 31, 2020.

X. 12:29 pm Calendar – Future Agenda Items

A calendar listing of future OIC meetings and scheduled agenda topics was included in the Council's meeting material.

XI. 12:32 pm Open Discussion

None

XII. 12:32 pm Public Comments

None.

Mr. Russell adjourned the meeting at 12:32 pm.

Respectfully submitted,

May Fanning
Executive Support Specialist

TAB 2 – Committee Reports

March 10, 2021

Oregon Investment Council

Committee Reports

Rex T. Kim, Chief Investment Officer

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TAB 3 – Real Estate Market Overview

RERC
A SitusAMC Company

March 10, 2020

RERC Client Presentation

Finding Alpha in a Post-Pandemic Environment

Investment Market Research

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Finding Alpha in a Post-Pandemic Environment

Investment Perspectives & Trends	4
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U.S. Property Type Observations – Winners & Losers	26
2021 CRE Outlook	42

Reimagining a Post-Pandemic World

- The place we call home
- Business travel
- Workplace of the future
- Fiscal & monetary policies
- Consumer behavior patterns

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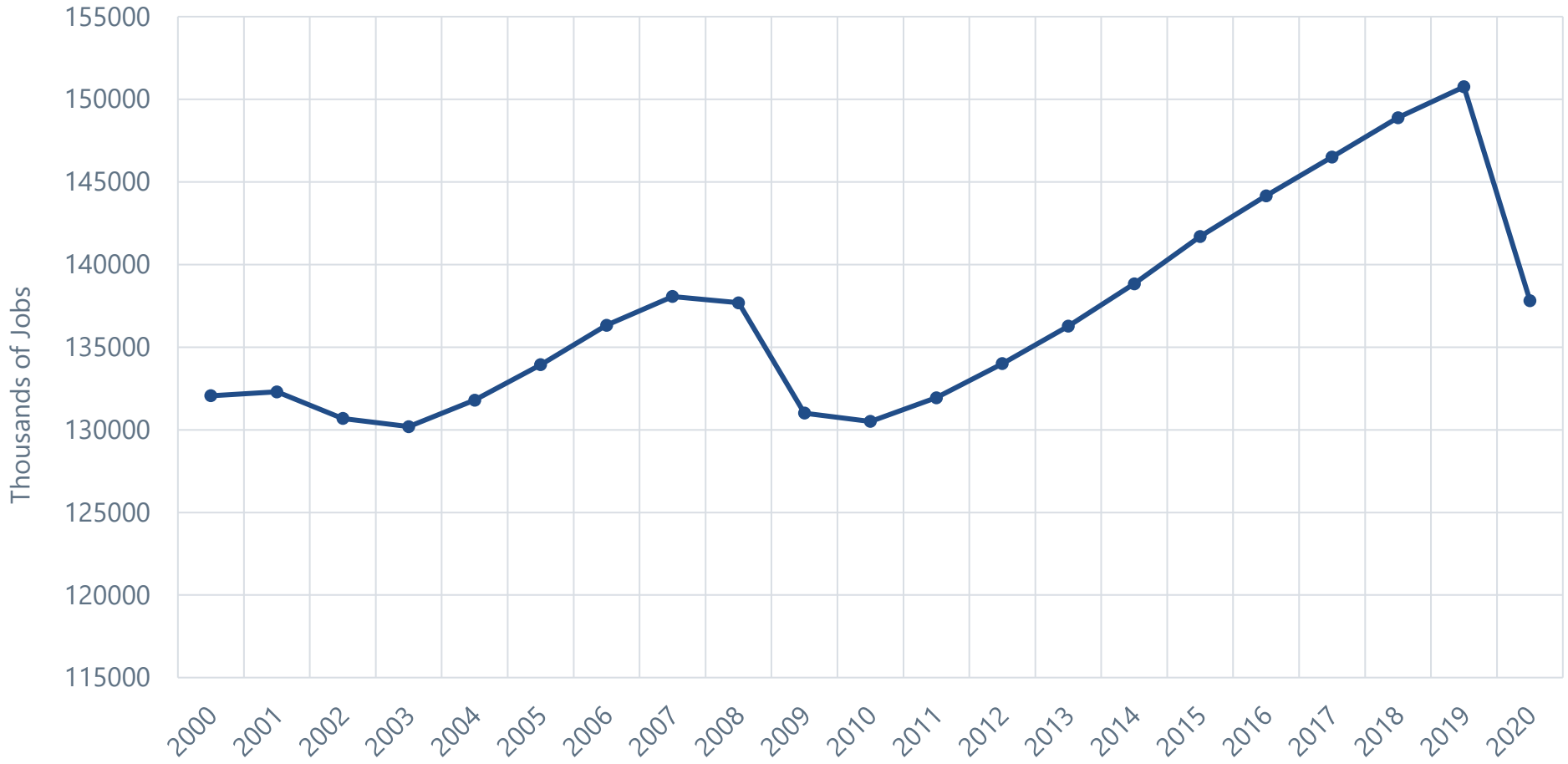
4Q 2020

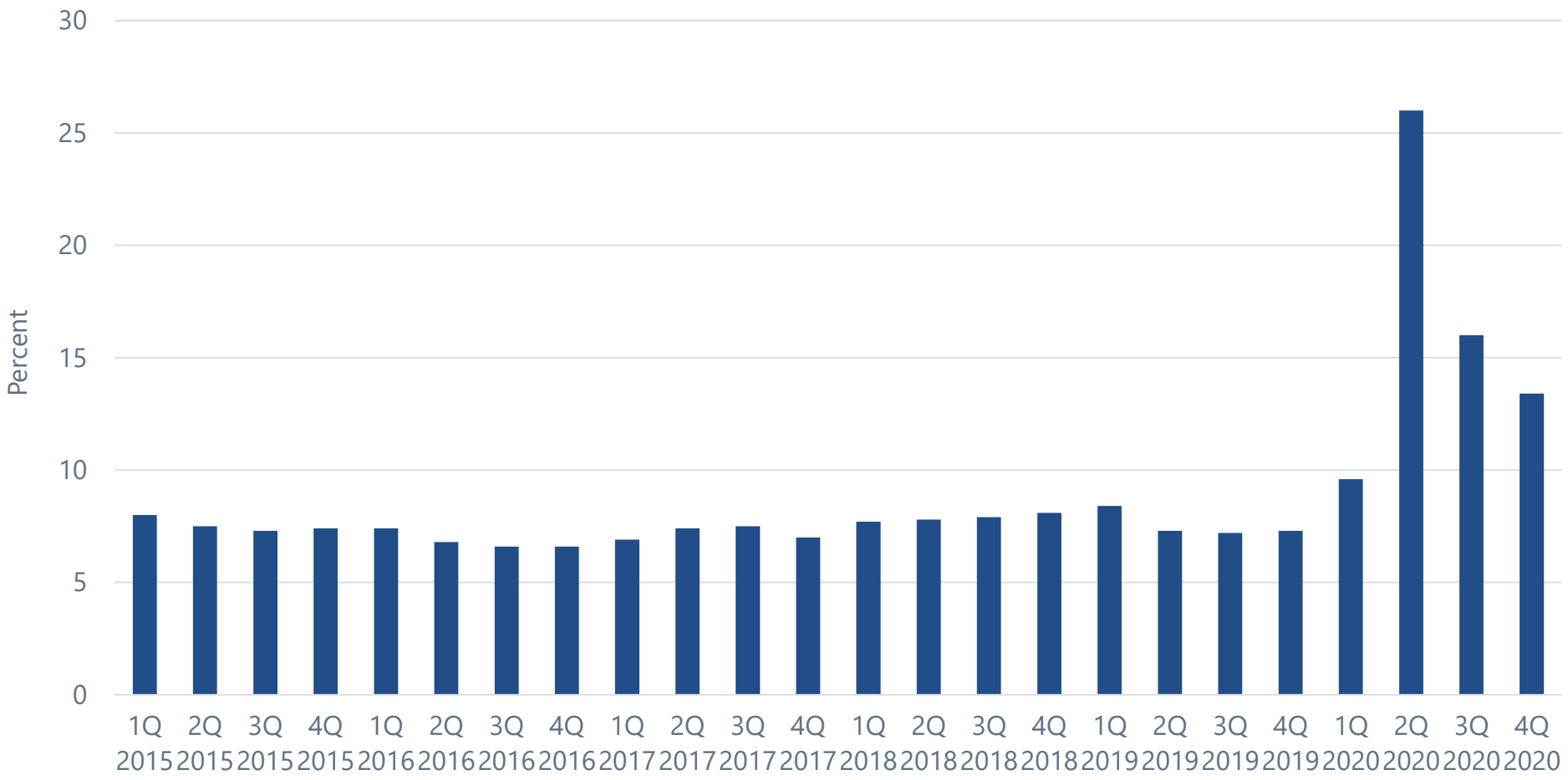
Investment Perspectives & Trends

Employment Dynamics



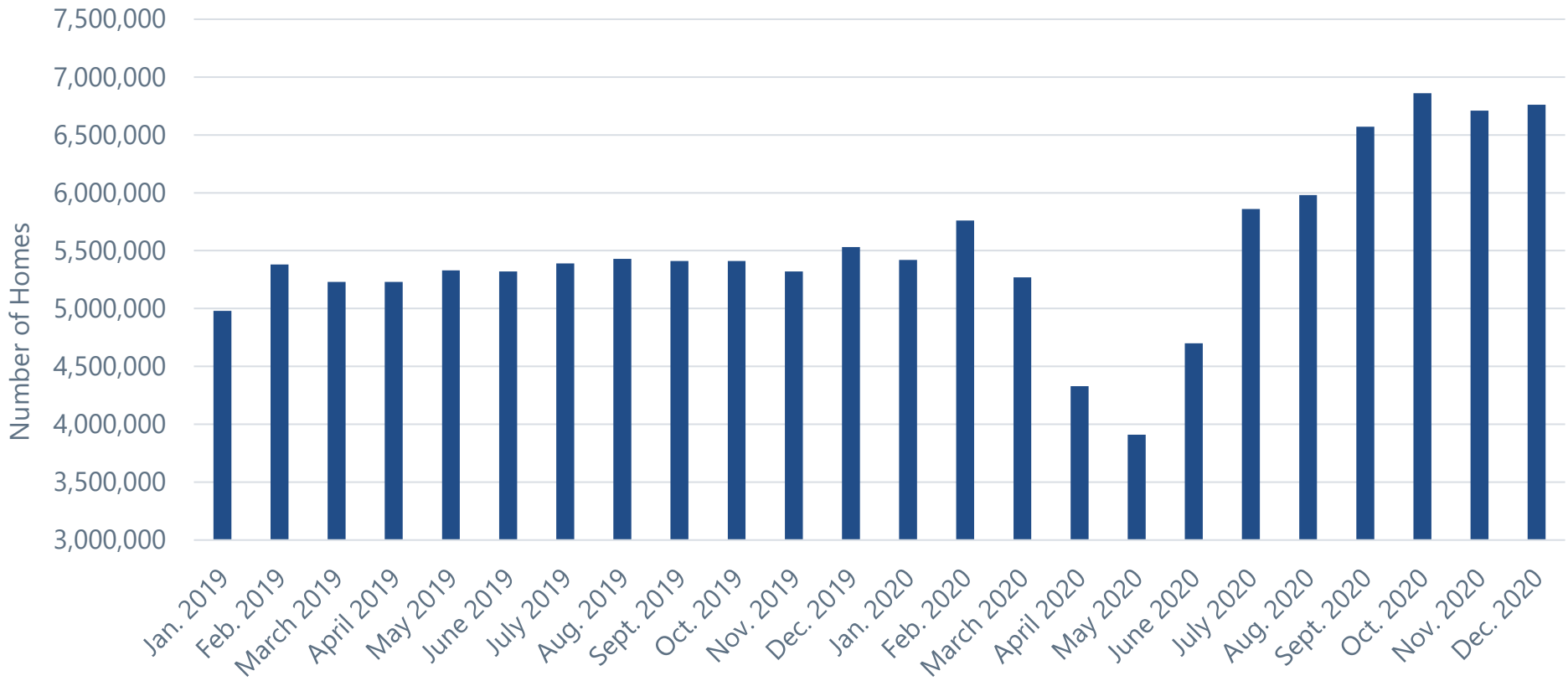
Source: U.S. Bureau of Labor Statistics, Jan. 2021.

Savings Rate Extremely Strong



Source: U.S. Bureau of Economic Analysis, 4Q 2020.

Housing Market Resiliency
(Seasonally Adjusted Annualized Rate)



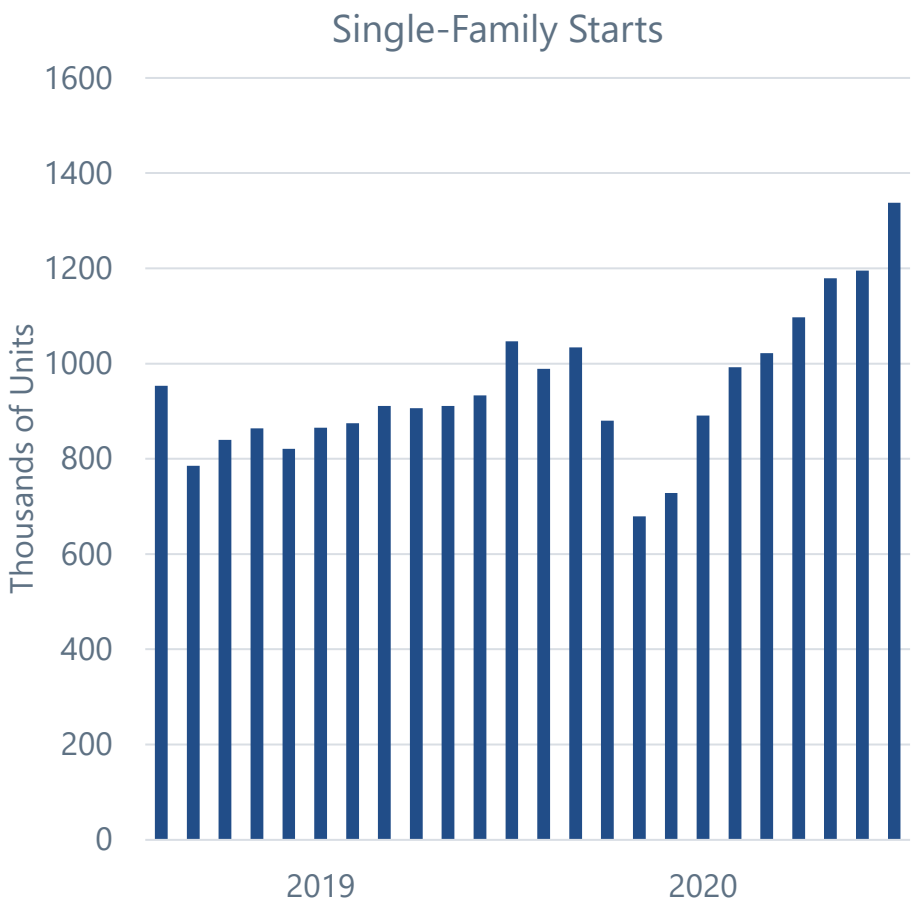
Source: National Association of REALTORS©, Dec. 2020.

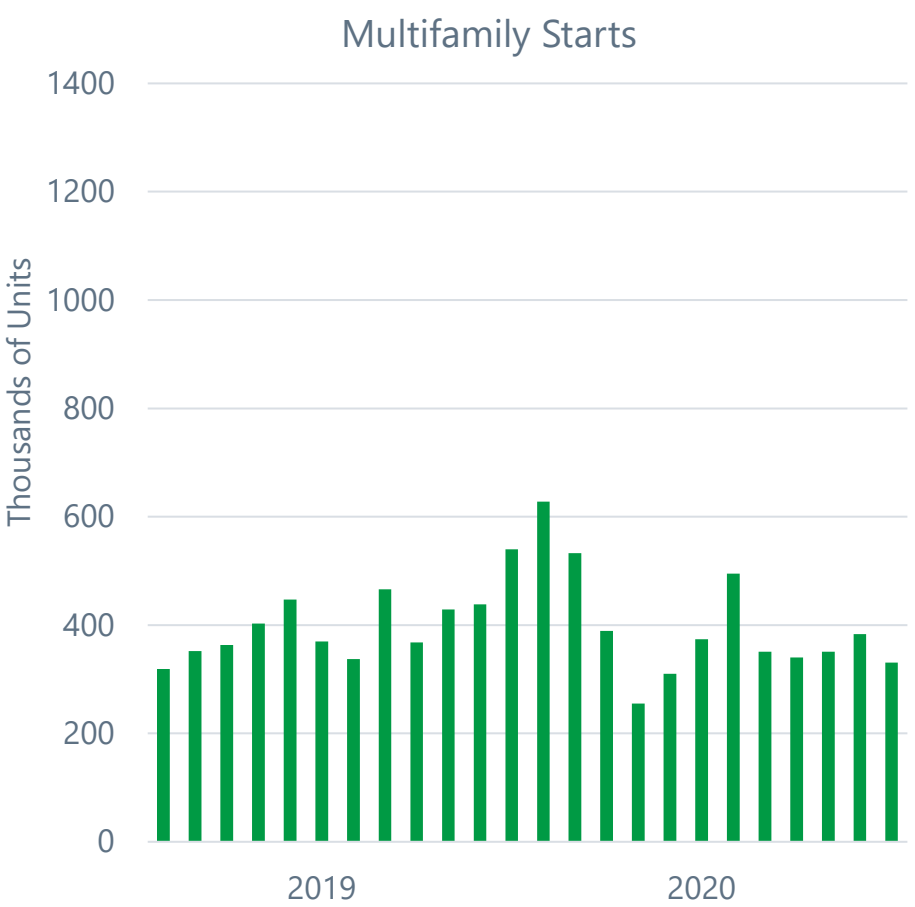
Housing Leading Indicators Remain Strong

	Time Period	% Change from One Year Ago
Pending contracts from MLSs	Dec. 2020	21.4%
Newly built homes under contract	Dec. 2020	15.8%
Mortgage applications for home purchase	Jan. 2021	17.9%
Lockbox openings of SentriLock	Dec. 2020	24.0%
REALTOR® assessment of buyer traffic	Dec. 2020	18.3%
Single-family housing starts (for future inventory)	Dec. 2020	27.8%
Prevalence of multiple offers of 3 or more buyers	Dec. 2020	48.0%

Sources: National Association of REALTORS©; Mortgage Bankers Association; U.S. Census Bureau, Jan. 2021.

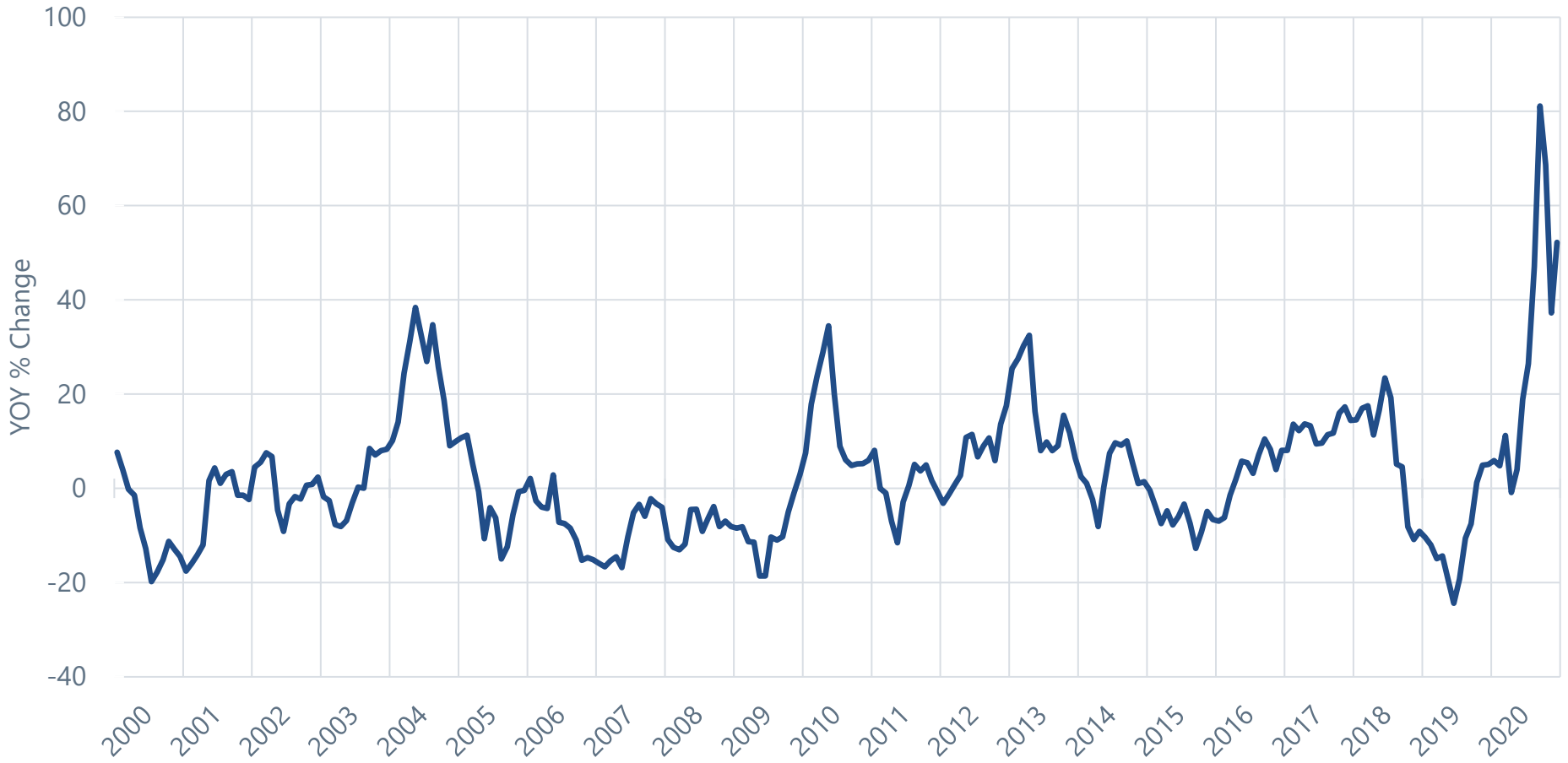
Housing Starts Boost on the Economy





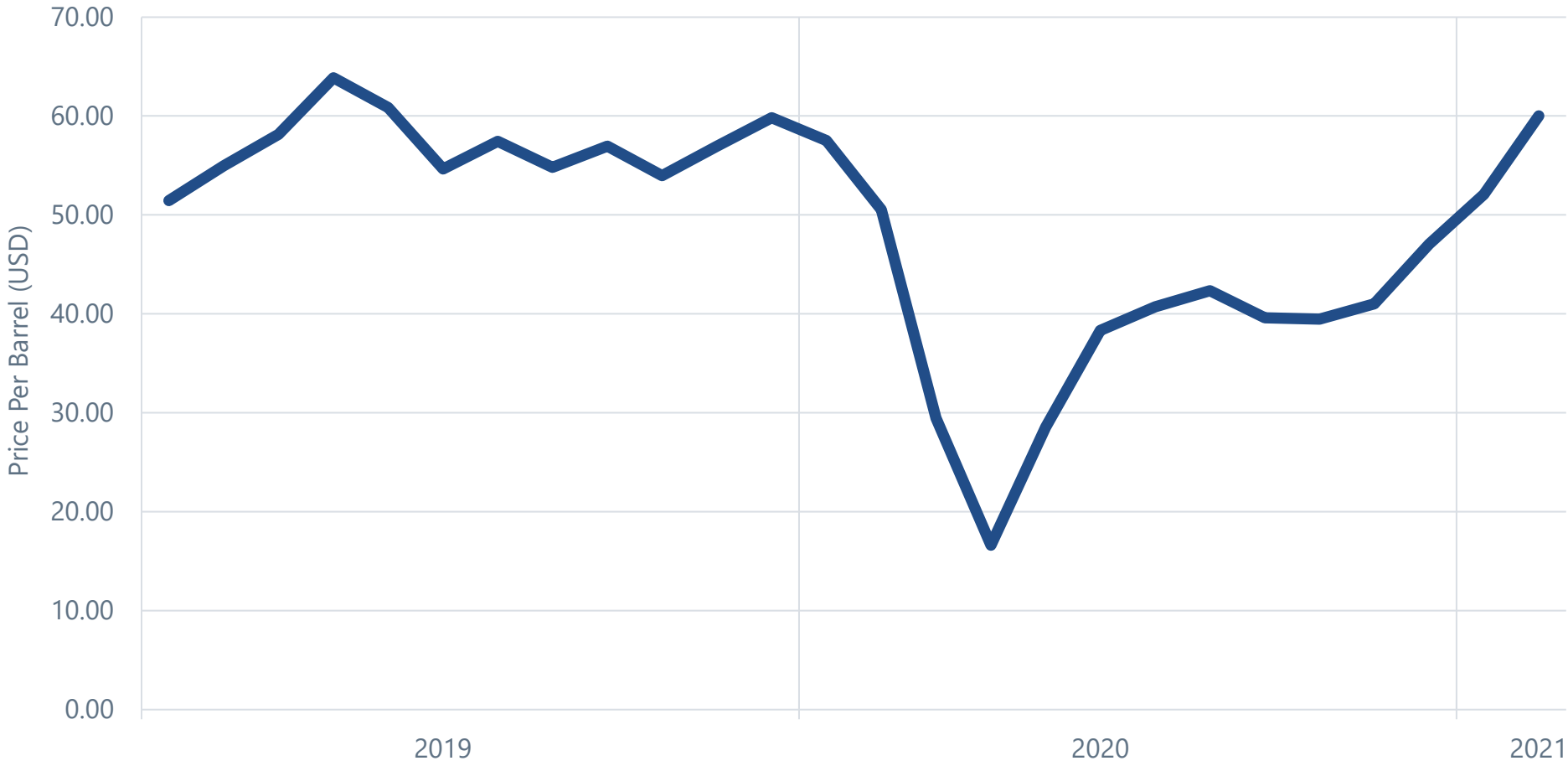
Source: U.S. Census Bureau, Dec. 2020.

PPI Softwood Lumber



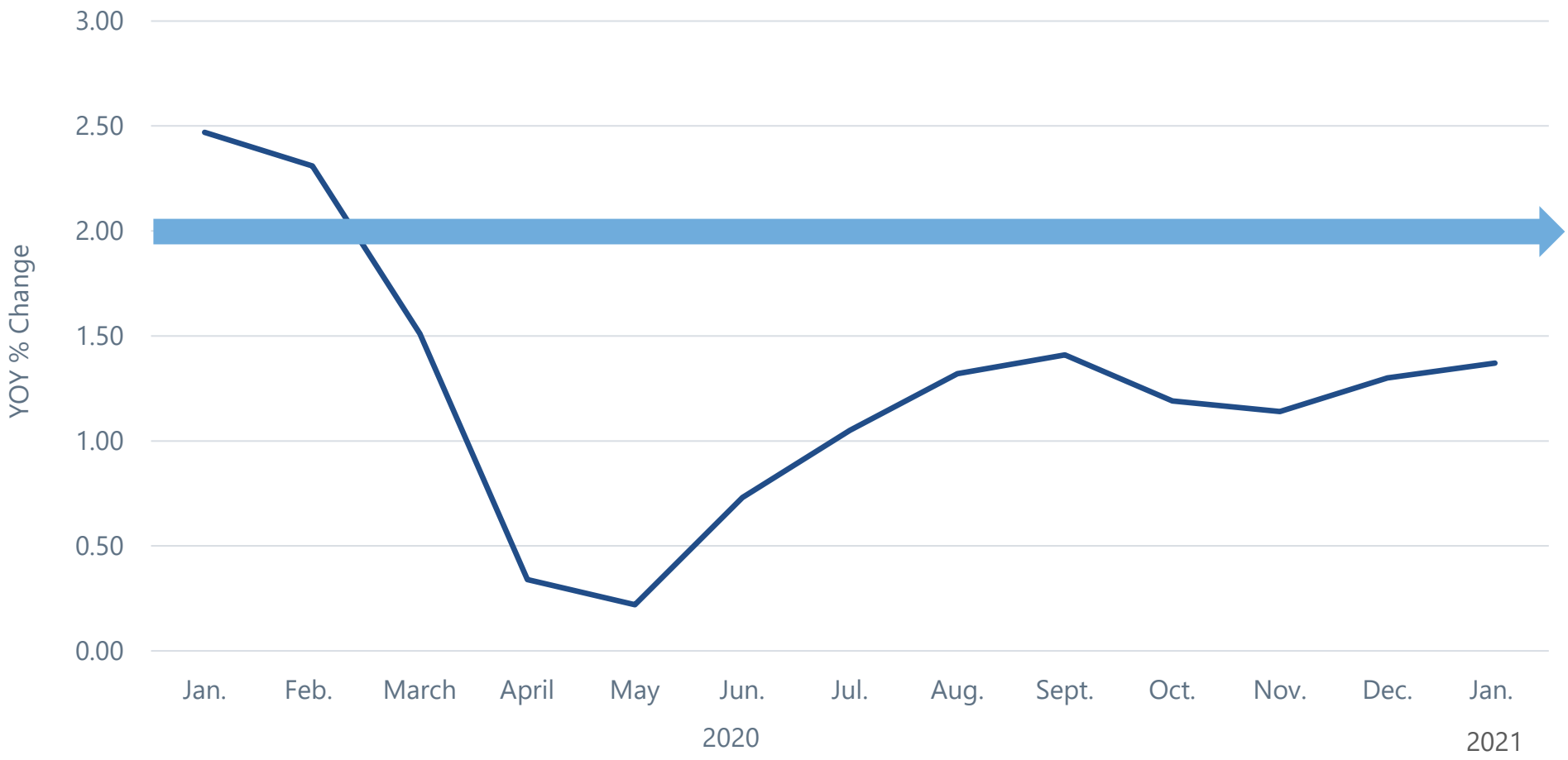
Source: U.S. Bureau of Labor Statistics, Producer Price Index (PPI), Nov. 2020.

Oil Prices Rebound



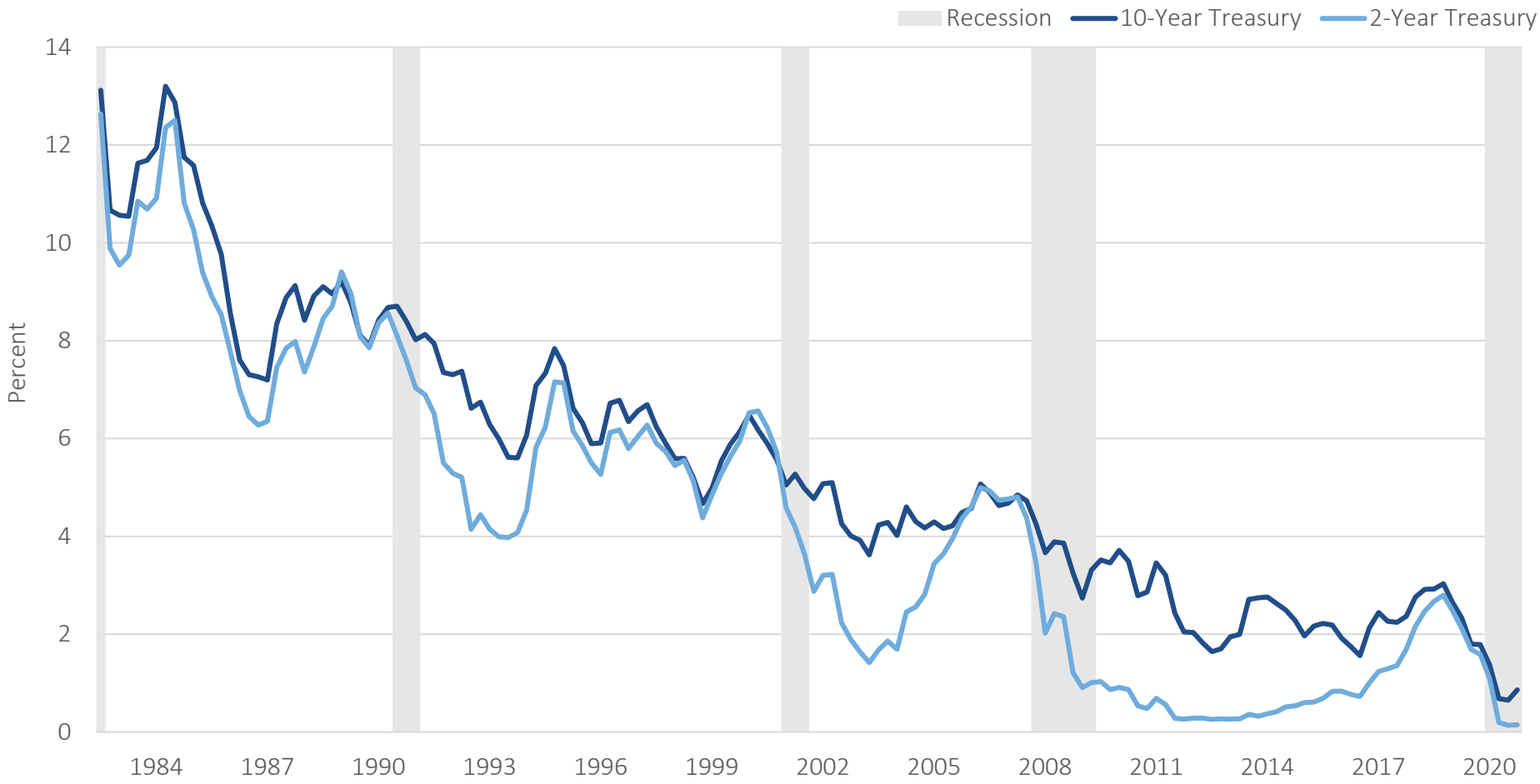
Source: U.S. Energy Information Administration, Feb. 2021.

Inflation Contained for Now



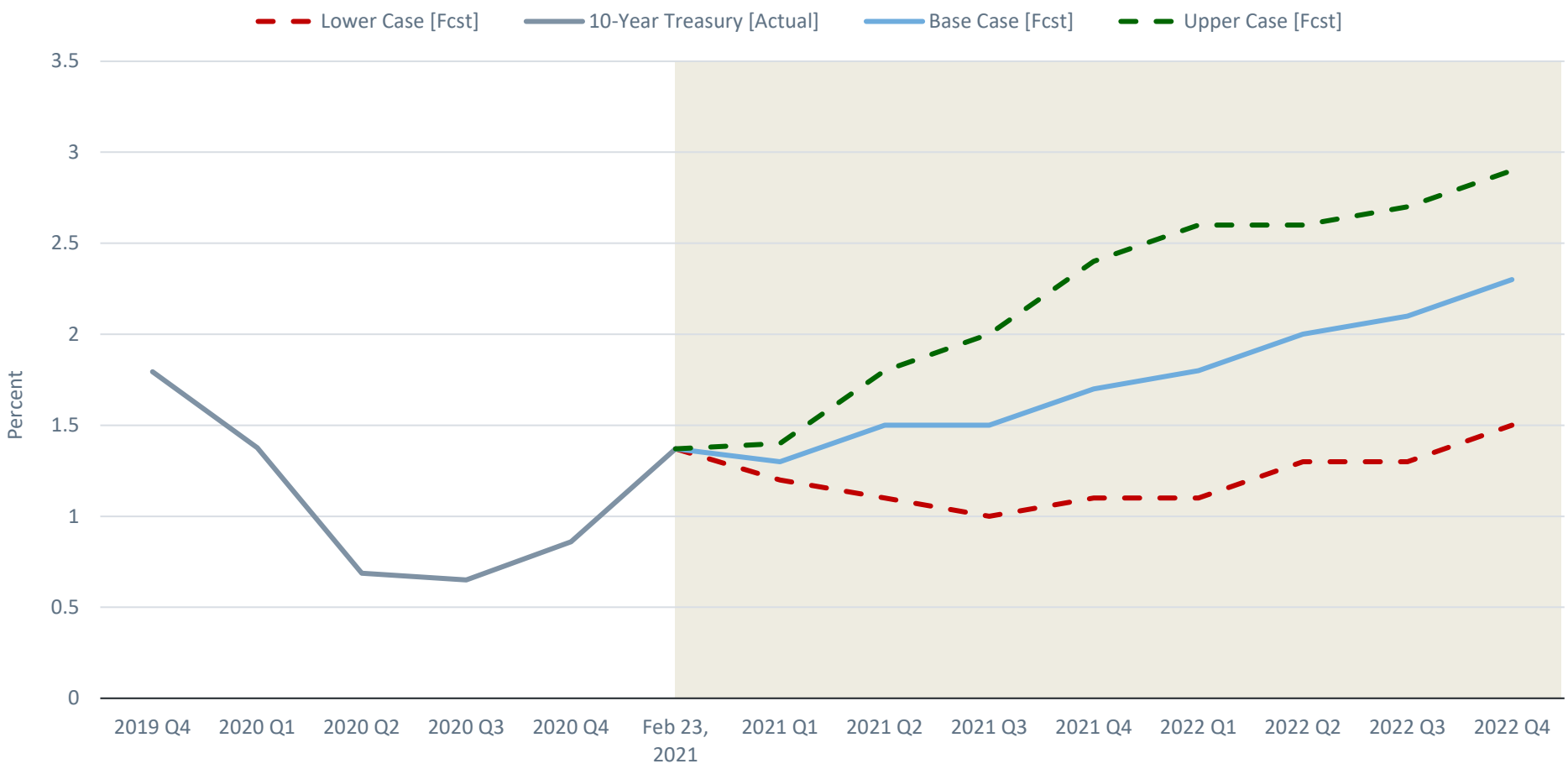
Source: U.S. Bureau of Labor Statistics, Consumer Price Index (CPI), Jan. 2021.

Historical 2-Year vs. 10-Year Treasury Rates – U.S.



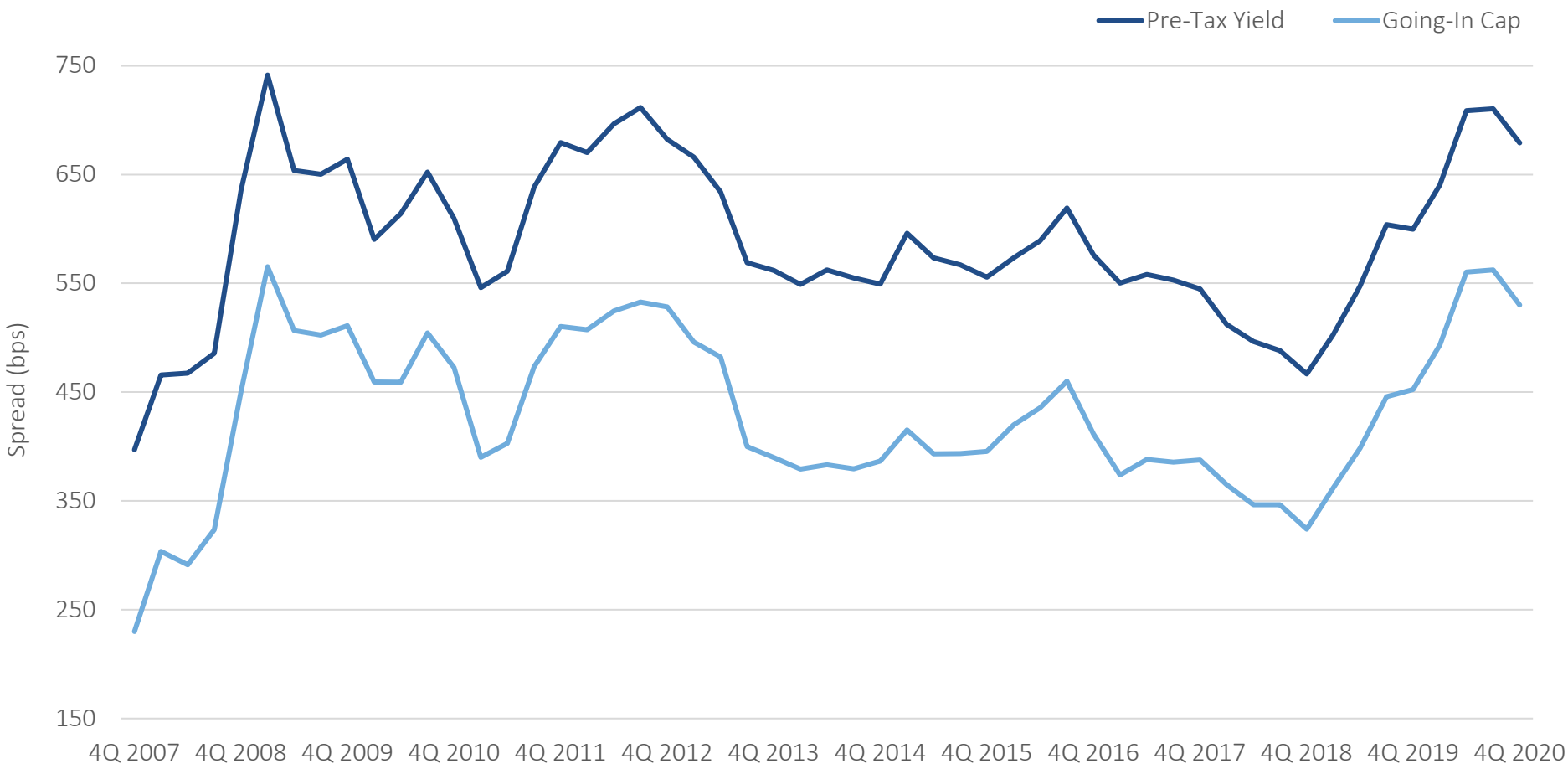
Note: 10-year Treasury data are based on quarterly averages.
Source Federal Reserve, current as of 4Q 2020.

Actual 10-Year Treasury Rates vs. RERC Treasury Forecast



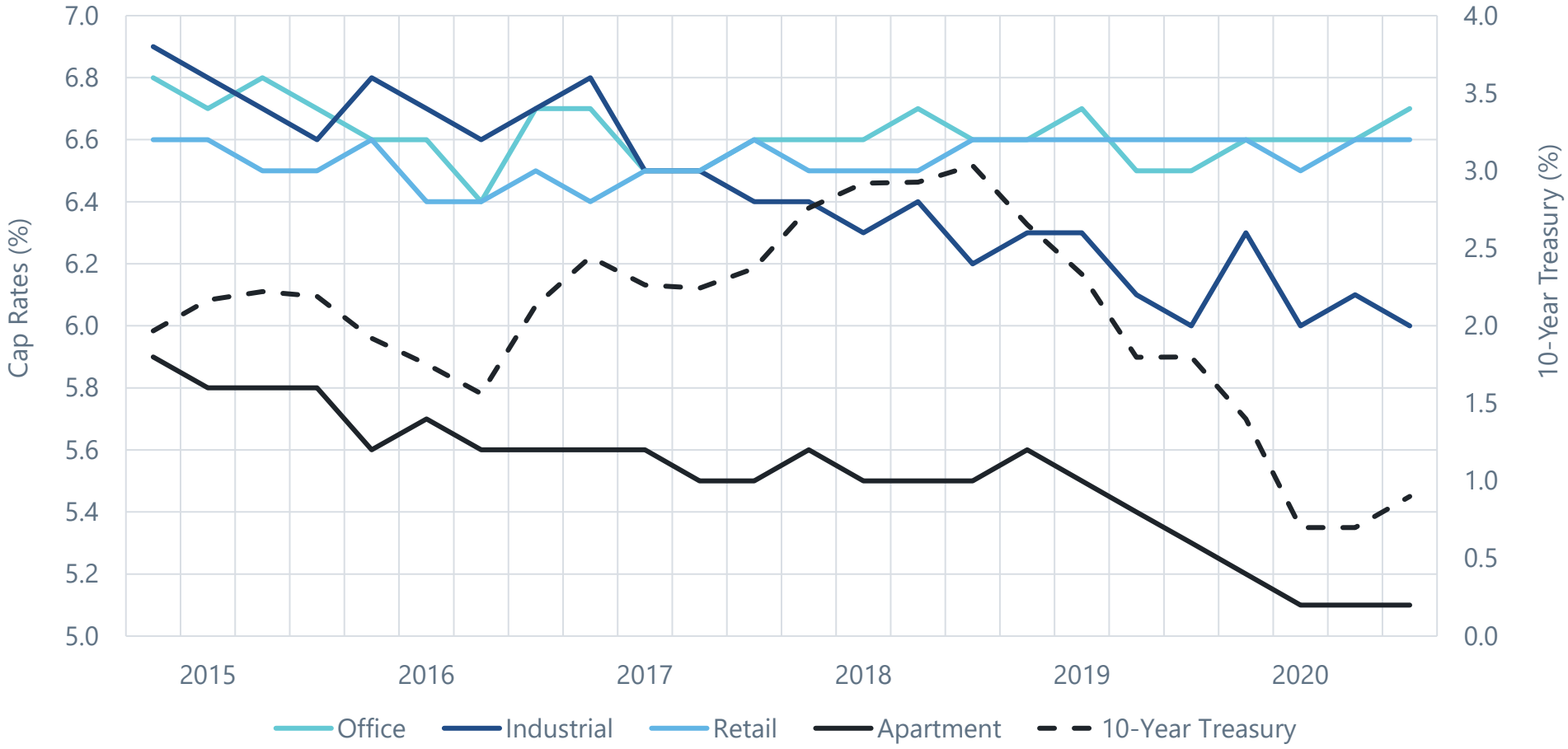
Note: Quarterly data based on quarterly average. February 23, 2021 data represent daily Treasury yield curve rate. Shaded area indicates forecast.
Sources RERC, Federal Reserve, 4Q 2020.

RERC Historical Spreads Over 10-Year Treasurys 2007-2020



Source RERC, 4Q 2020.

Commercial Property Cap Rates vs. 10-Year Treasury



Source: Real Capital Analytics, 4Q 2020.

Key Observations

Economy

- GDP contracted 3.5% in 2020; largest decline since 1946
- Unemployment at 6.3% in January 2021
- Stock market performance vs. the economy
- Low interest rates and inflation expectations on market pricing of stocks, bonds and CRE
- Few alternatives that have not already been bid up in price

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4Q 2020

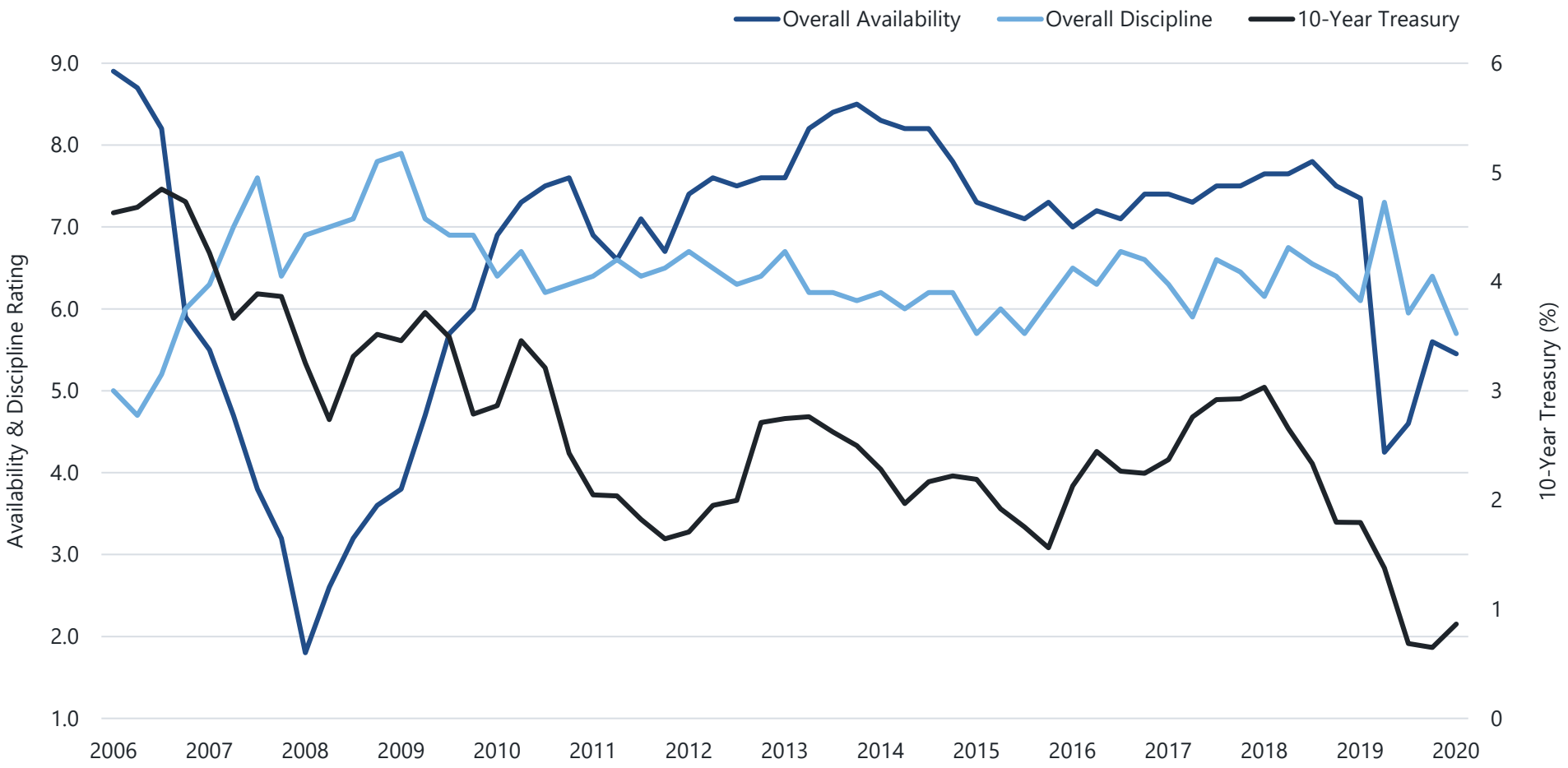
CRE Viewpoints

CRE & Investment Alternatives

Market Indexes	4Q 2020	2020[6]	3-Year Trailing	5-Year Trailing	10-Year Trailing	15-Year Trailing
NCREIF NPI[1]	1.15%	1.60%	4.89%	5.91%	9.00%	7.14%
NCREIF NFI-ODCE[1]	1.10%	0.34%	3.99%	5.27%	8.87%	5.46%
NAREIT (All Equity REITS)[2]	8.15%	-5.12%	5.41%	6.70%	9.27%	7.15%
Consumer Price Index[3]	0.60%	1.21%	1.82%	1.87%	1.74%	1.84%
Dow Jones Industrial Average[2]	10.73%	9.72%	9.90%	14.65%	12.97%	10.00%
NASDAQ Composite[4]	15.41%	43.64%	23.13%	20.81%	17.12%	12.49%
NYSE Composite[4]	14.35%	4.40%	4.28%	7.44%	6.19%	4.27%
S&P 500[2]	12.15%	18.40%	14.18%	15.22%	13.88%	9.88%
		4Q 2020	4Q 2017	4Q 2015	4Q 2010	4Q 2005
10-Year Treasury Bond[5]		0.86%	2.37%	2.19%	2.86%	4.49%

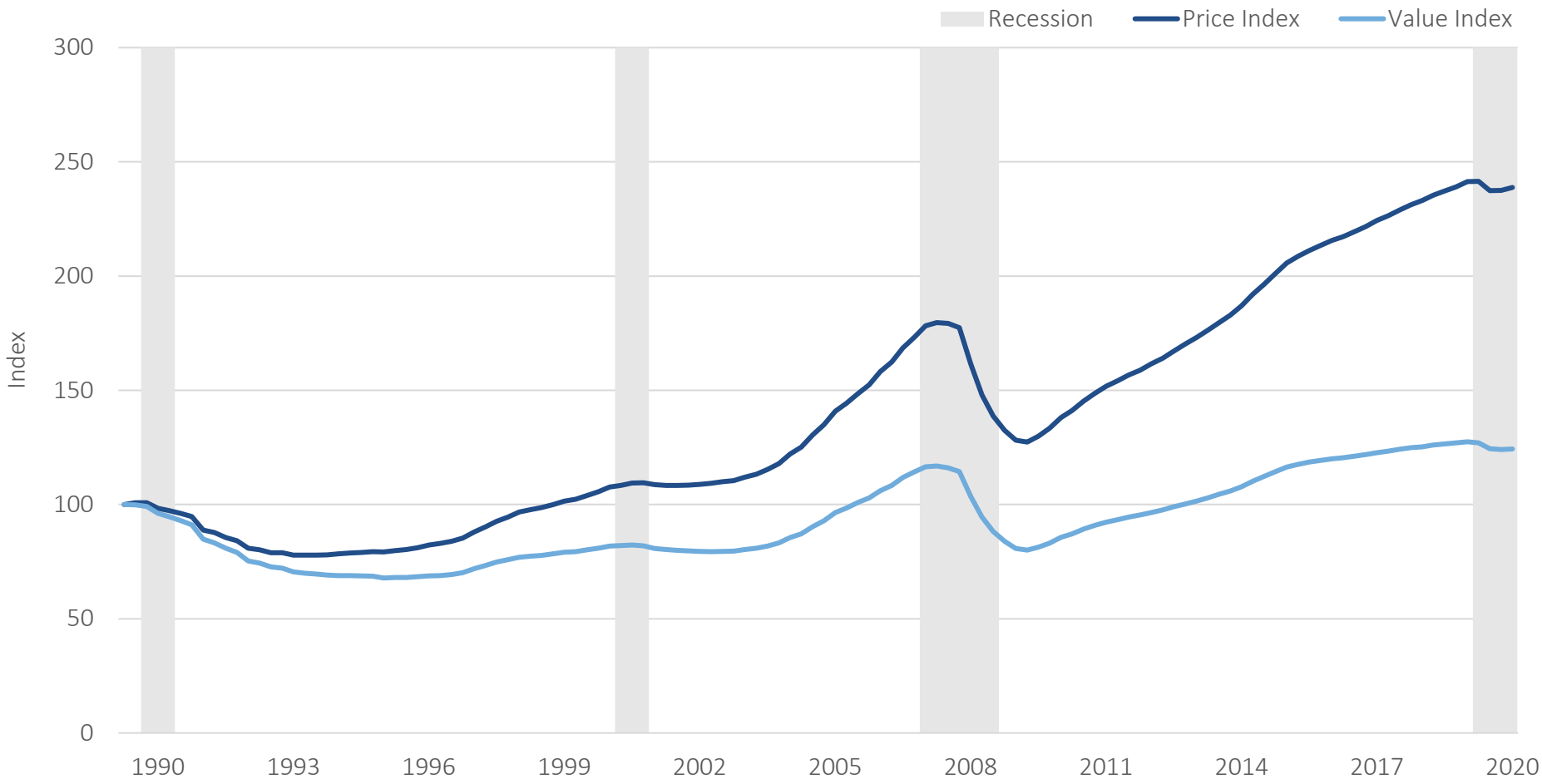
[1]NCREIF NPI is a property-level (unleveraged) total return index, gross of fees; NCREIF NFI-ODCE is a fund-level (leveraged equity) total return index, net of fees.
[2]Based on total return index and includes the dividend yield.
[3]Based on the published data from the Bureau of Labor Statistics (seasonally adjusted).
[4]Based on price index and does not include the dividend yield.
[5]Based on average quarterly T-bond Rates.
[6]2020 averages are not compounded annually except for CPI and NAREIT.
Sources BLS, Federal Reserve Board, S&P, Dow Jones, NCREIF, NAREIT, compiled by RERC, current as of December 31, 2020.

RERC Availability & Discipline of Capital



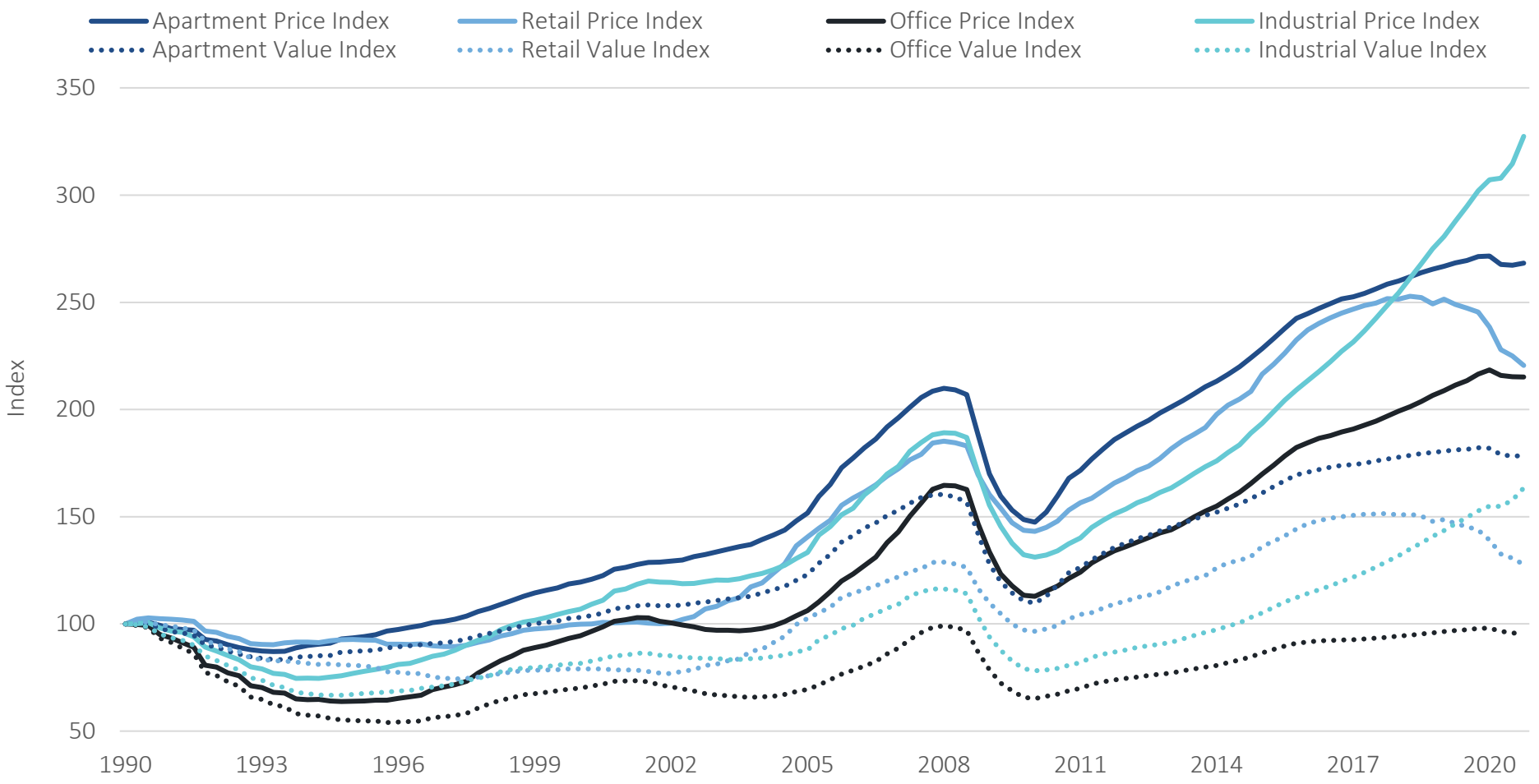
Ratings are based on scale of 1 to 10, with 10 being excellent.
Source RERC, 4Q 2020.

RERC Price & Value Indexes



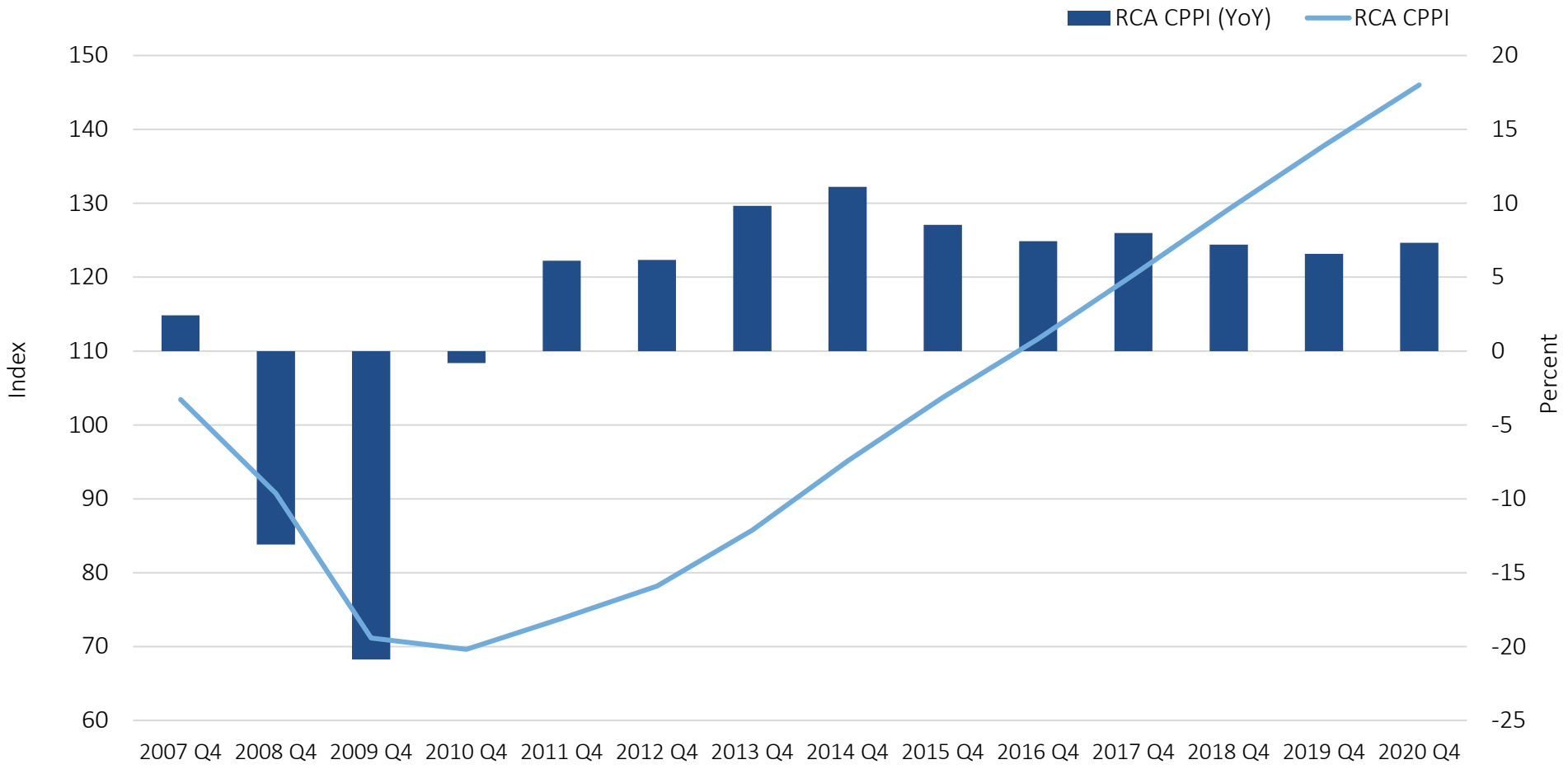
Note: Price index combines capital expenditures and capital returns. Value index represents capital returns only. Price Index from 1Q 1990 to 4Q 2020 = 138.79%. Value Index from 1Q 1990 to 4Q 2020 = 24.30%. Shaded area indicates recession.
Sources RERC, NCREIF, 4Q 2020.

RERC Price and Value Indexes by Property Type



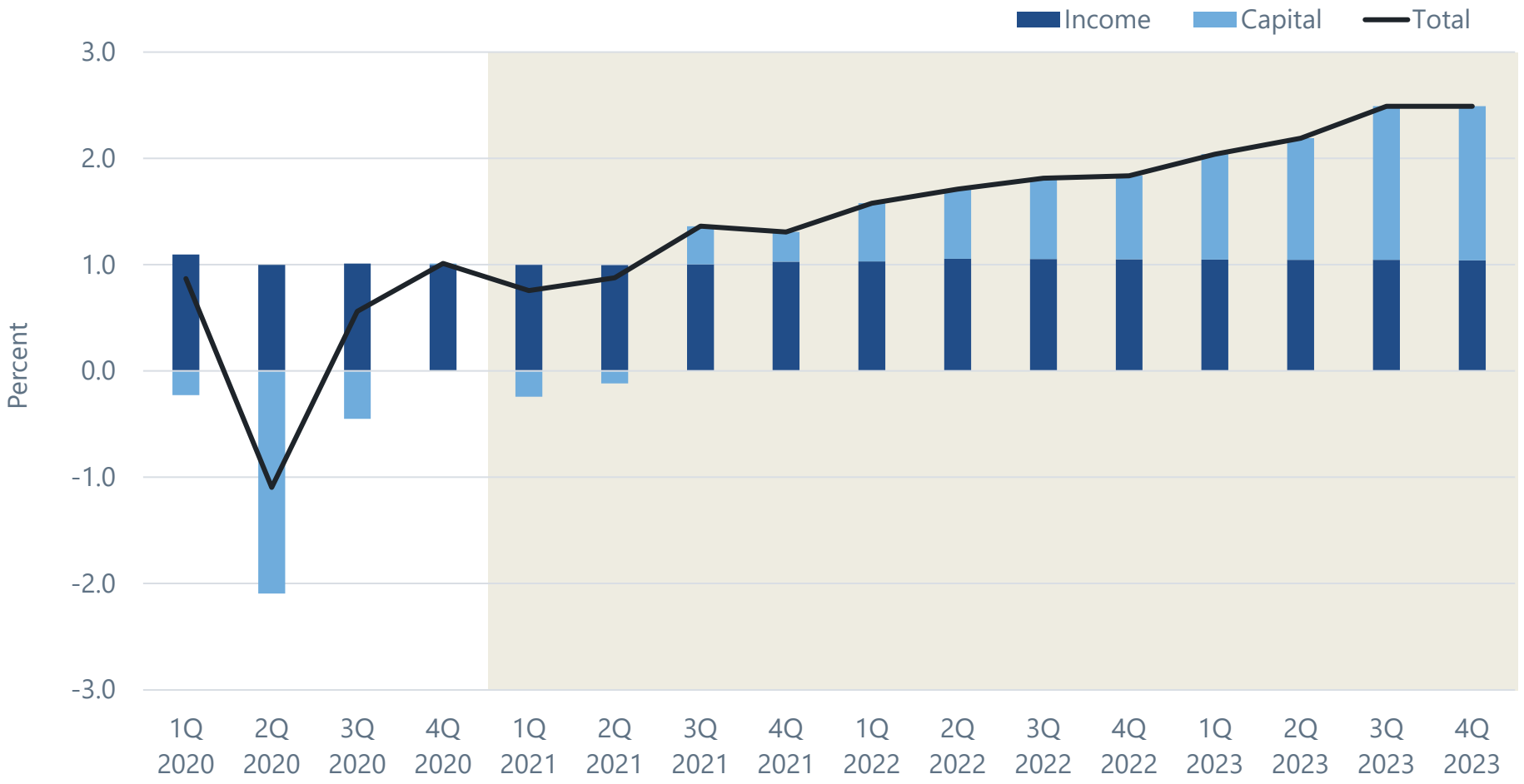
Note: Price index combines capital expenditures and capital returns. Value index represents capital returns only.
Sources RERC, NCREIF, 4Q 2020.

CRE Pricing – National All-Property



The RCA CPPI is based on repeat-sales (RS) transactions that occurred at any time up through the month of the current report.
Source Real Capital Analytics, 4Q 2020.

RERC Total Return Forecast – U.S. CRE Overall (Quarterly Base Case)



The total return forecast is RERC's proprietary model based on RERC data and data from NPI-ODCE, and is for unleveraged, institutional-grade properties. Total returns are derived from an income component and a capital appreciation/depreciation component. Shaded area represents forecast.
Sources RERC, NCREIF, 4Q 2020.

Key Observations

Stock Market

- The Dow soared past 30,000 for the first time in history on Nov. 24
- Dow closed 2020 at 7.3%; S&P 500 rose 16.3%

CRE Returns

- 2020 NPI (gross of fees) and NFI-ODCE (net of fees) were 1.60% and 0.34%, respectively.
- Annual NPI returns by property type: industrial (11.78%); apartment (1.83%); office (1.57%); retail (-7.48%); hotel (-25.56%)
- CRE valuations – fundamental analysis vs. price or technical analysis

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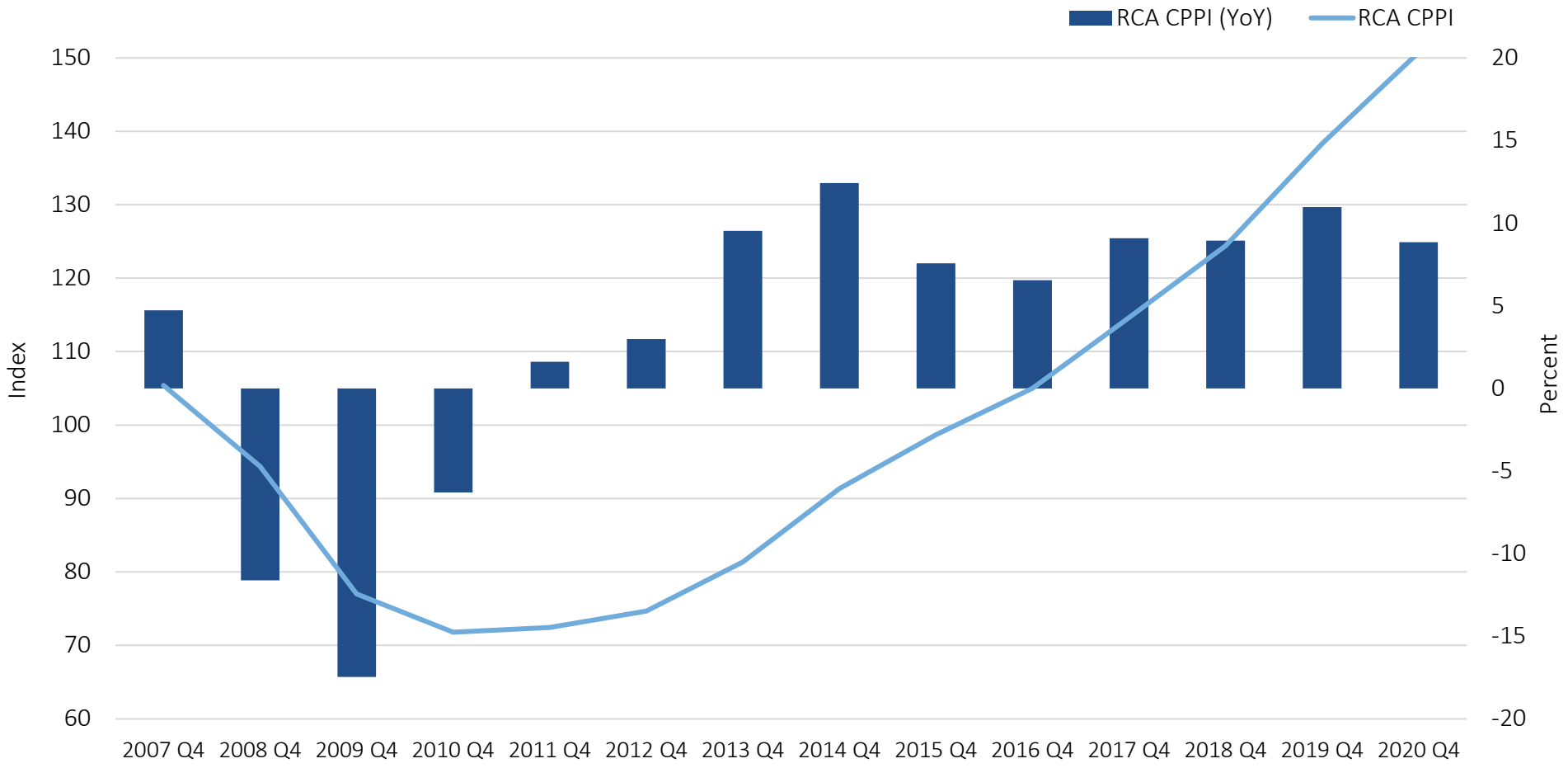
4Q 2020

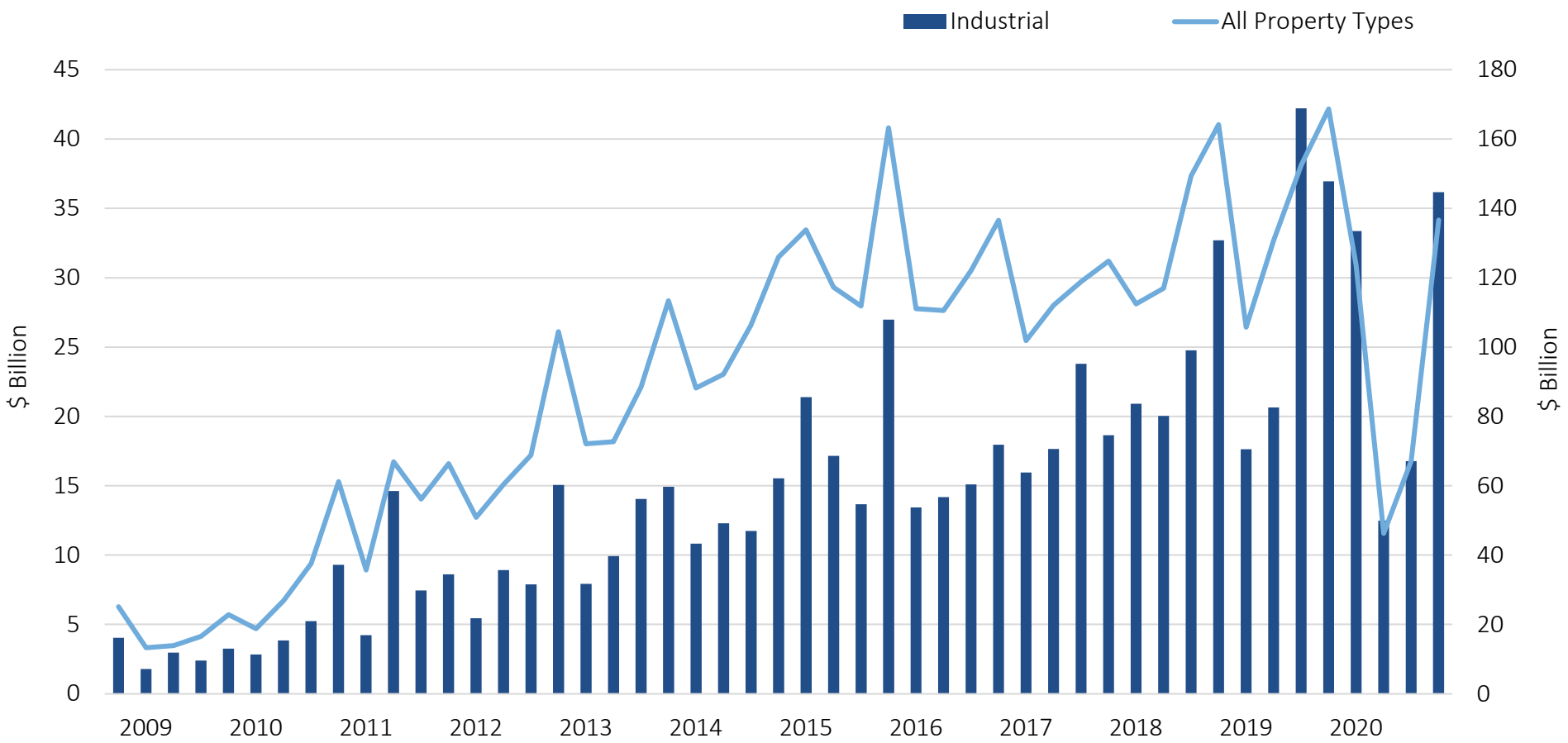
U.S. Property Type Observations – Winners & Losers

CRE Pricing – U.S. Industrial



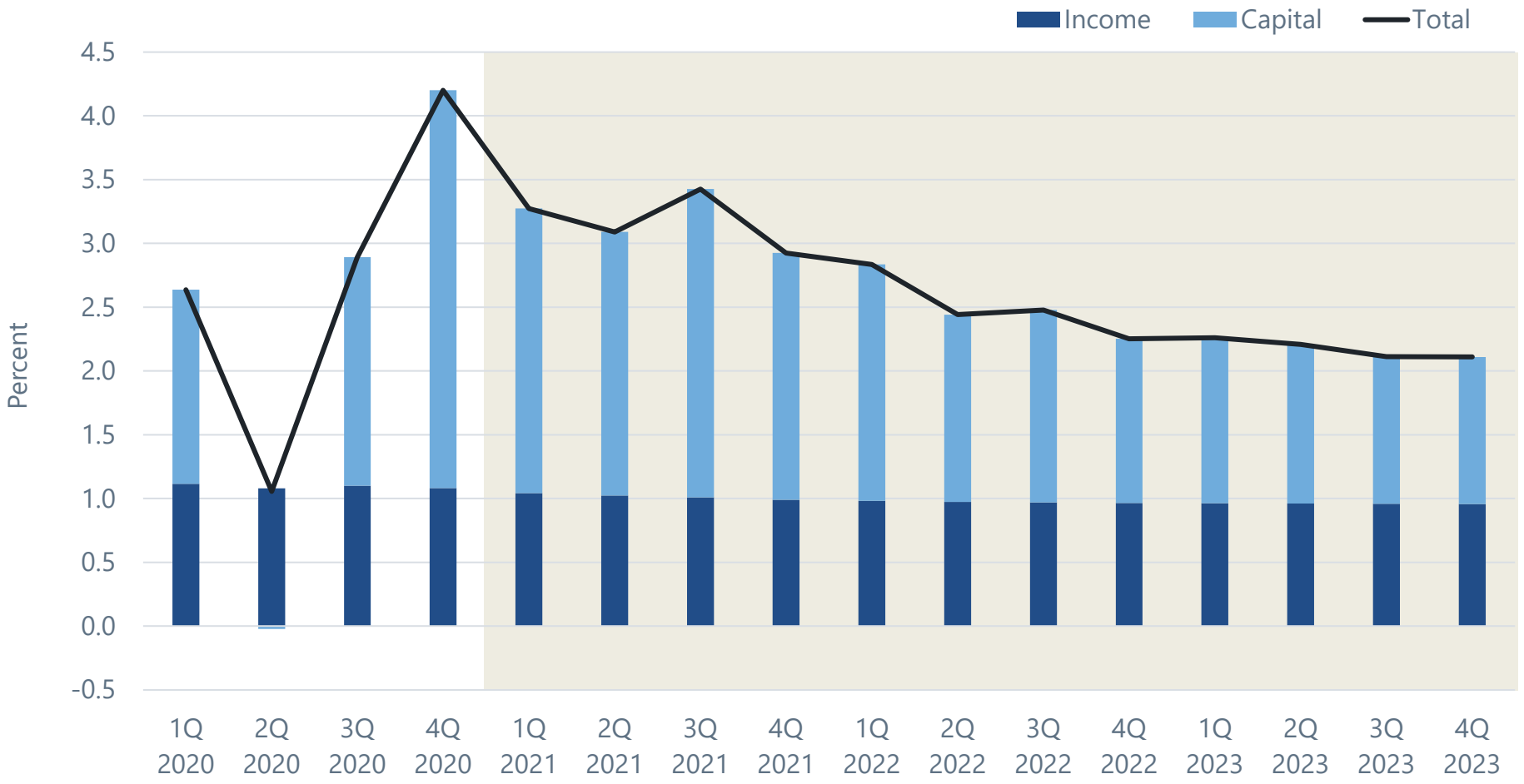
The RCA CPPI is based on repeat-sales (RS) transactions that occurred at any time up through the month of the current report.
Source Real Capital Analytics, 4Q 2020.

CRE Transaction Volume – U.S. Industrial



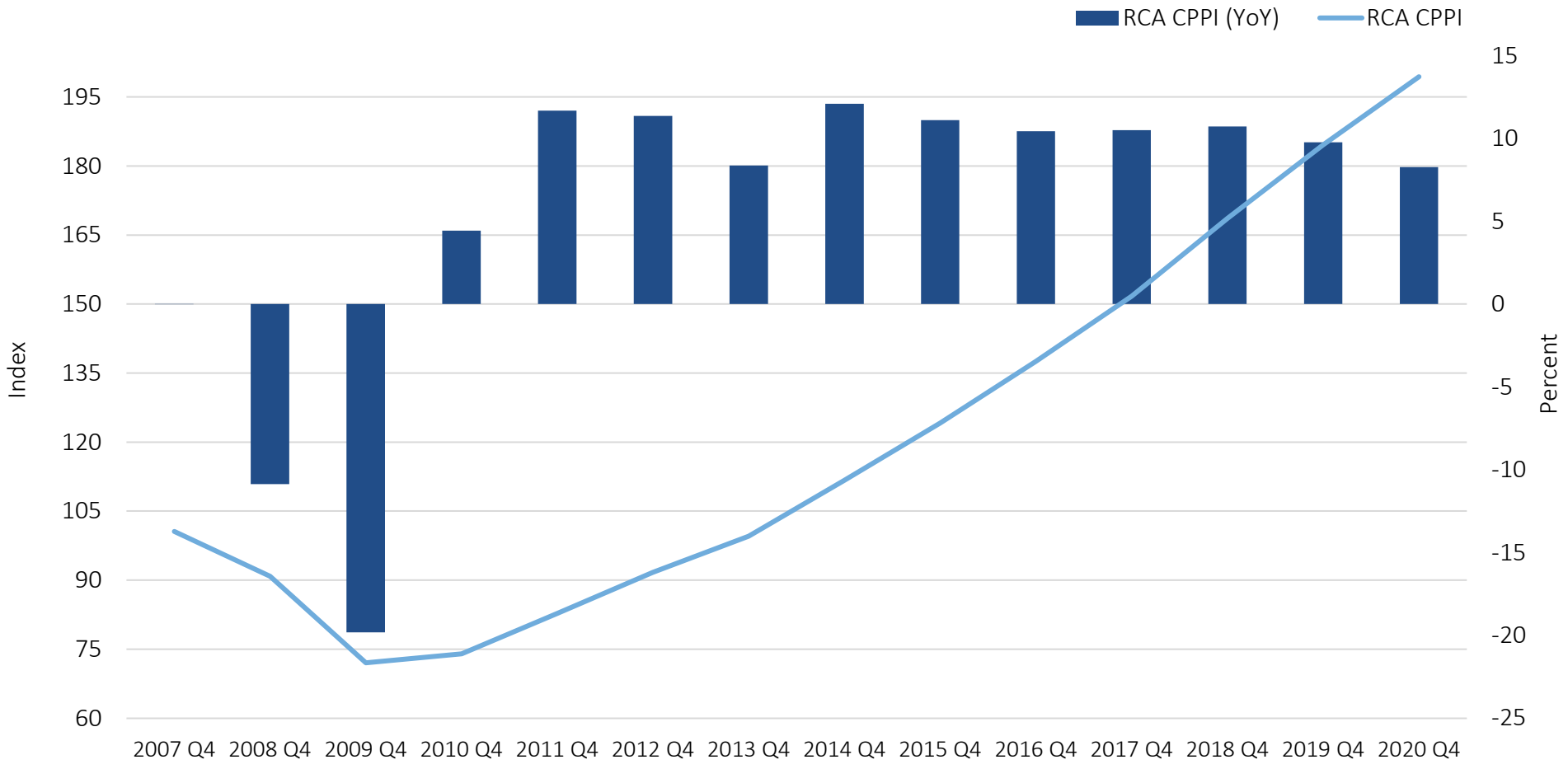
Source Real Capital Analytics, 4Q 2020.

RERC Total Return Forecast – Industrial (Quarterly Base Case)



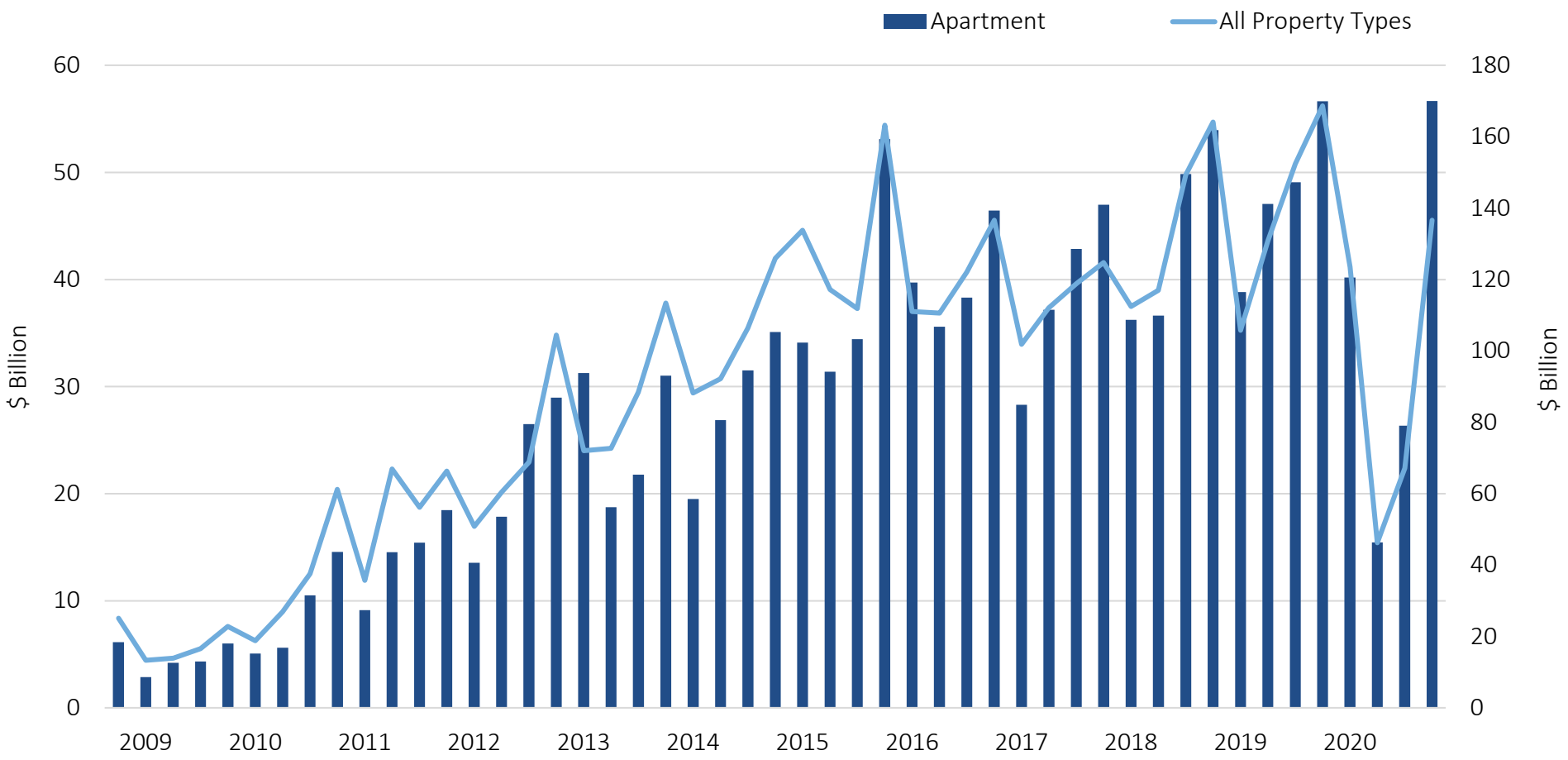
The total return forecast is RERC's proprietary model based on RERC data and data from NPI-ODCE, and is for unleveraged, institutional-grade properties. Total returns are derived from an income component and a capital appreciation/depreciation component. Shaded area represents forecast.
Sources RERC, NCREIF, 4Q 2020.

CRE Pricing – U.S. Apartment



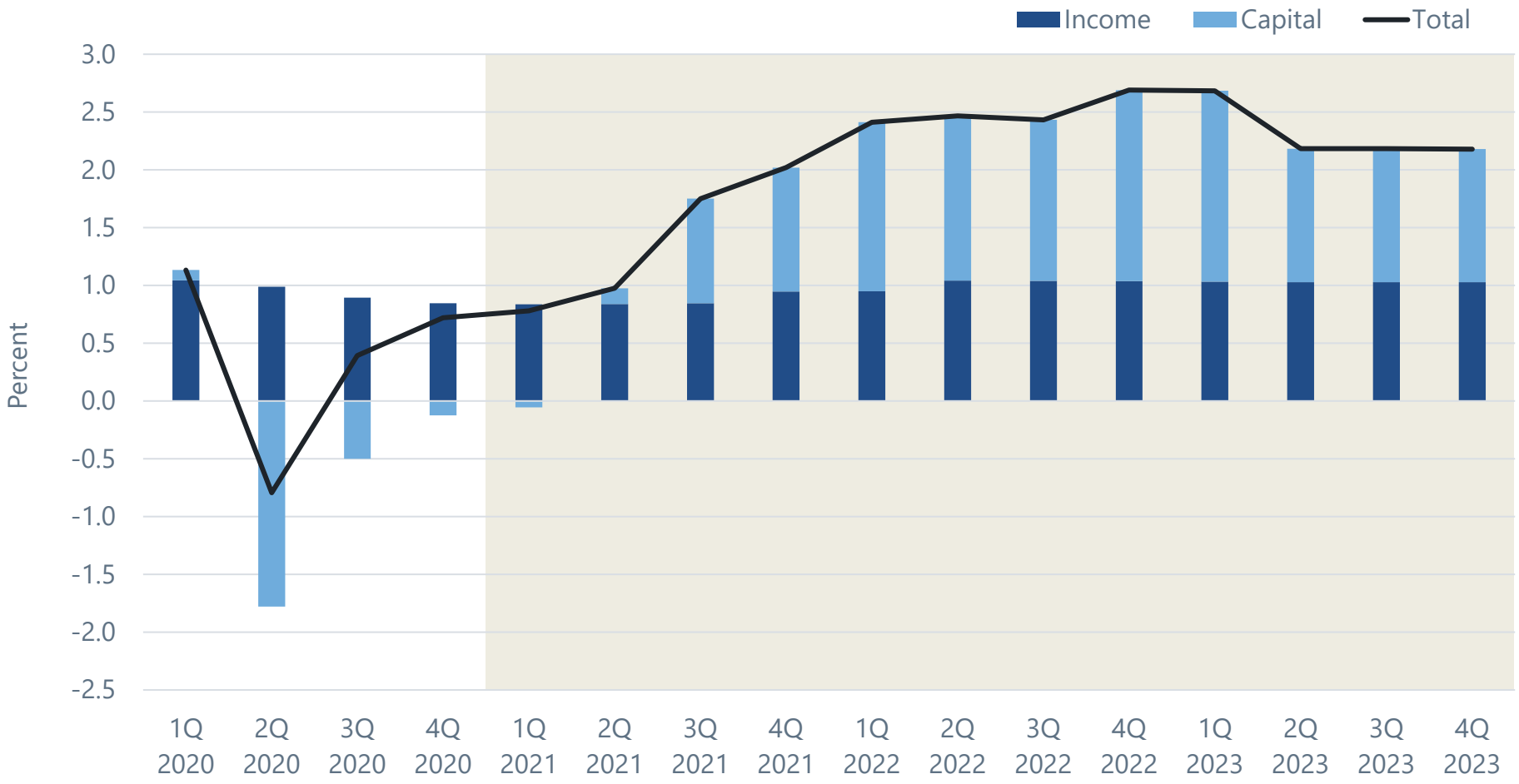
The RCA CPPI is based on repeat-sales (RS) transactions that occurred at any time up through the month of the current report.
Source Real Capital Analytics, 4Q 2020.

CRE Transaction Volume – U.S. Apartment



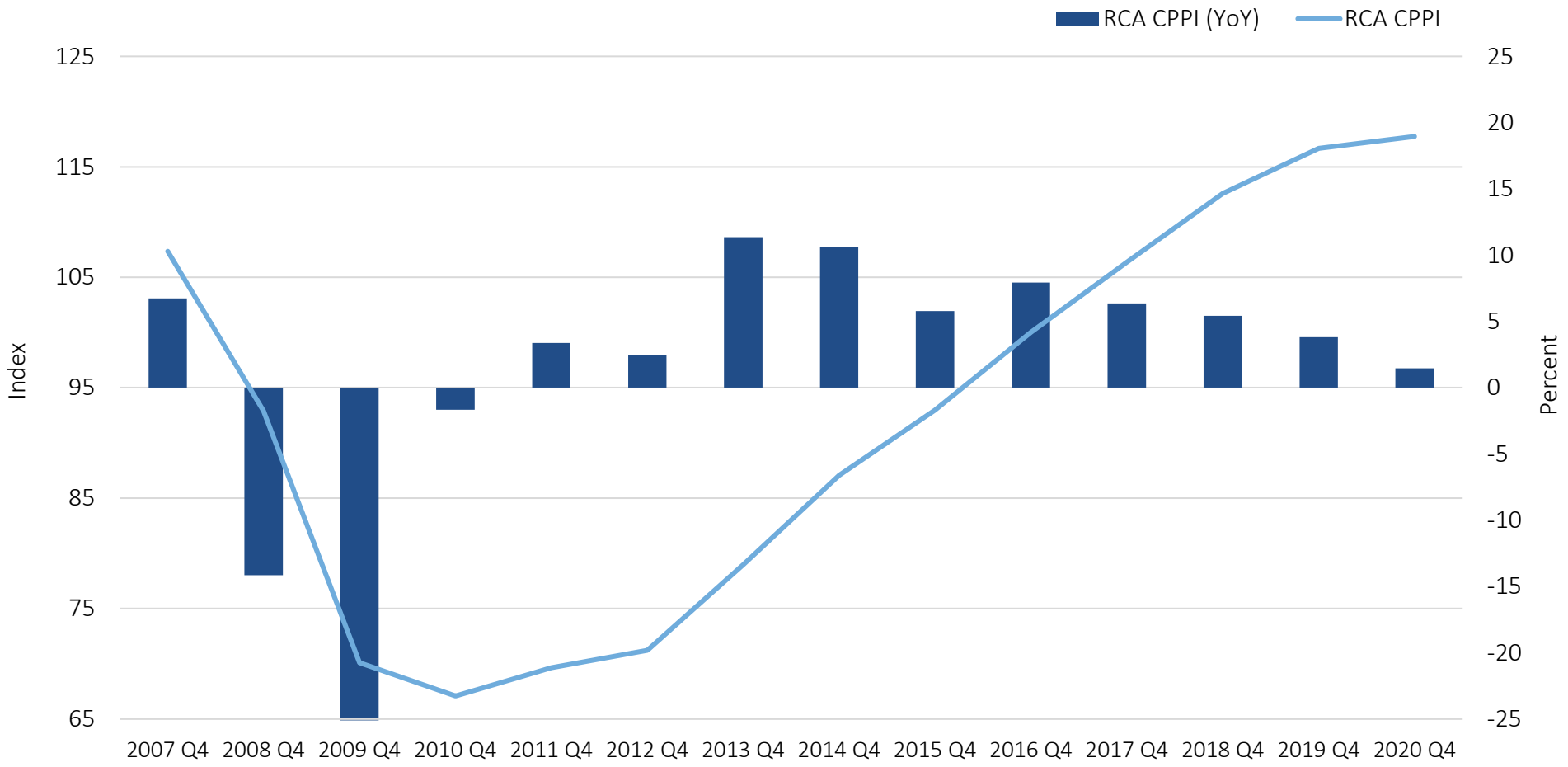
Source Real Capital Analytics, 4Q 2020.

RERC Total Return Forecast – Apartment (Quarterly Base Case)



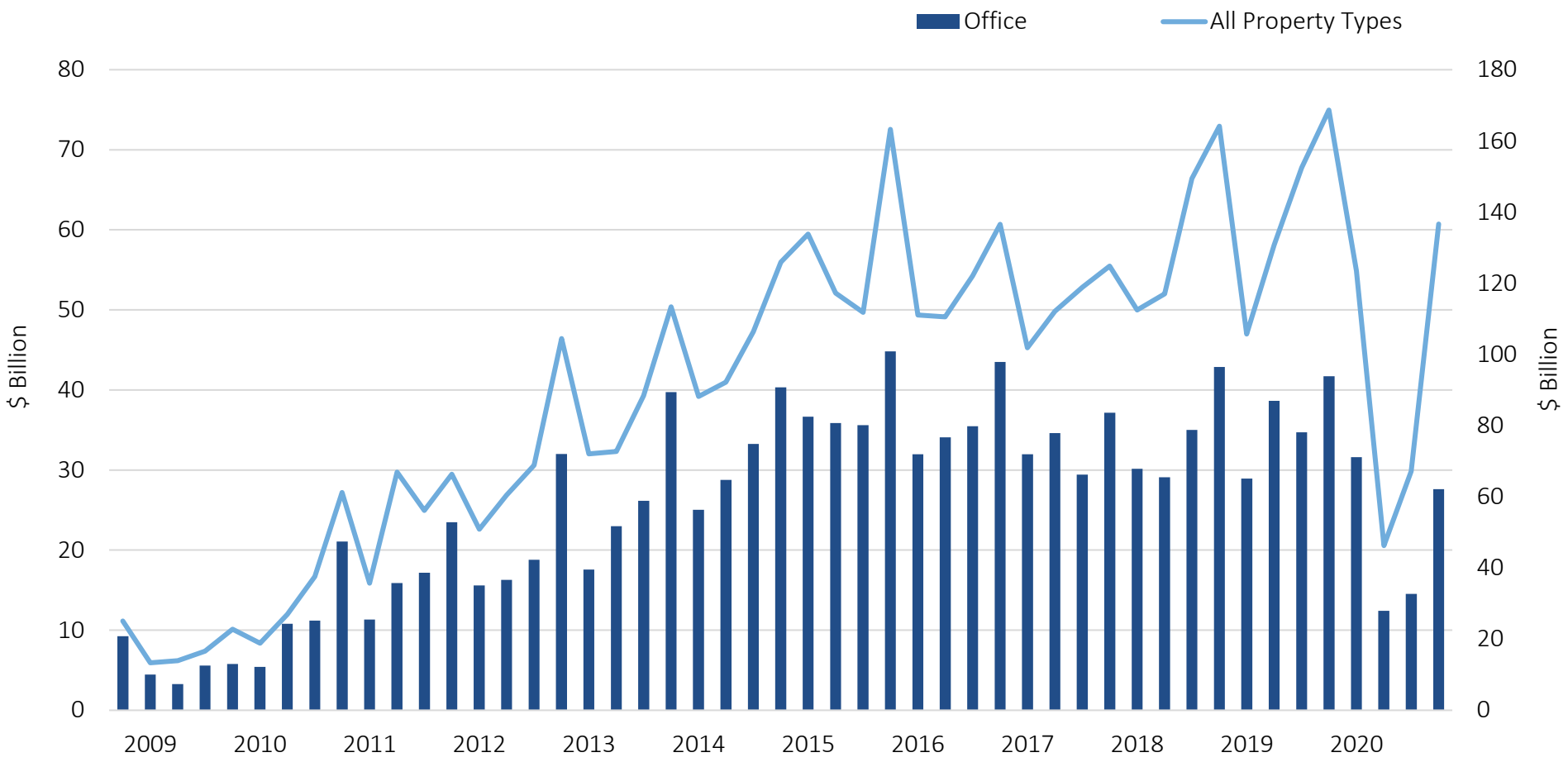
The total return forecast is RERC's proprietary model based on RERC data and data from NPI-ODCE, and is for unleveraged, institutional-grade properties. Total returns are derived from an income component and a capital appreciation/depreciation component. Shaded area represents forecast.
Sources RERC, NCREIF, 4Q 2020.

CRE Pricing – U.S. Office



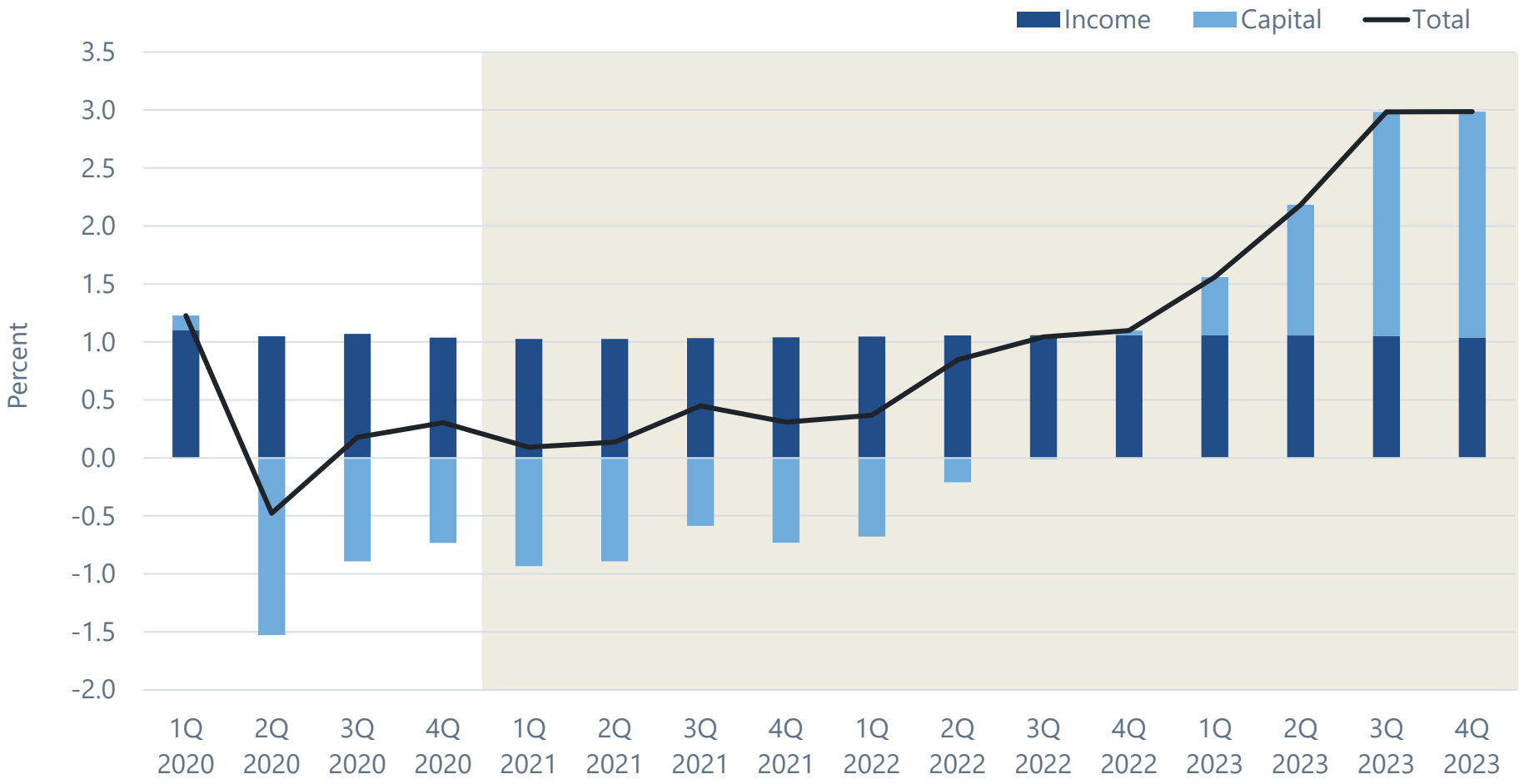
The RCA CPPI is based on repeat-sales (RS) transactions that occurred at any time up through the month of the current report.
Source Real Capital Analytics, 4Q 2020.

CRE Transaction Volume – U.S. Office



Source Real Capital Analytics, 4Q 2020.

RERC Total Return Forecast – Office (Quarterly Base Case)



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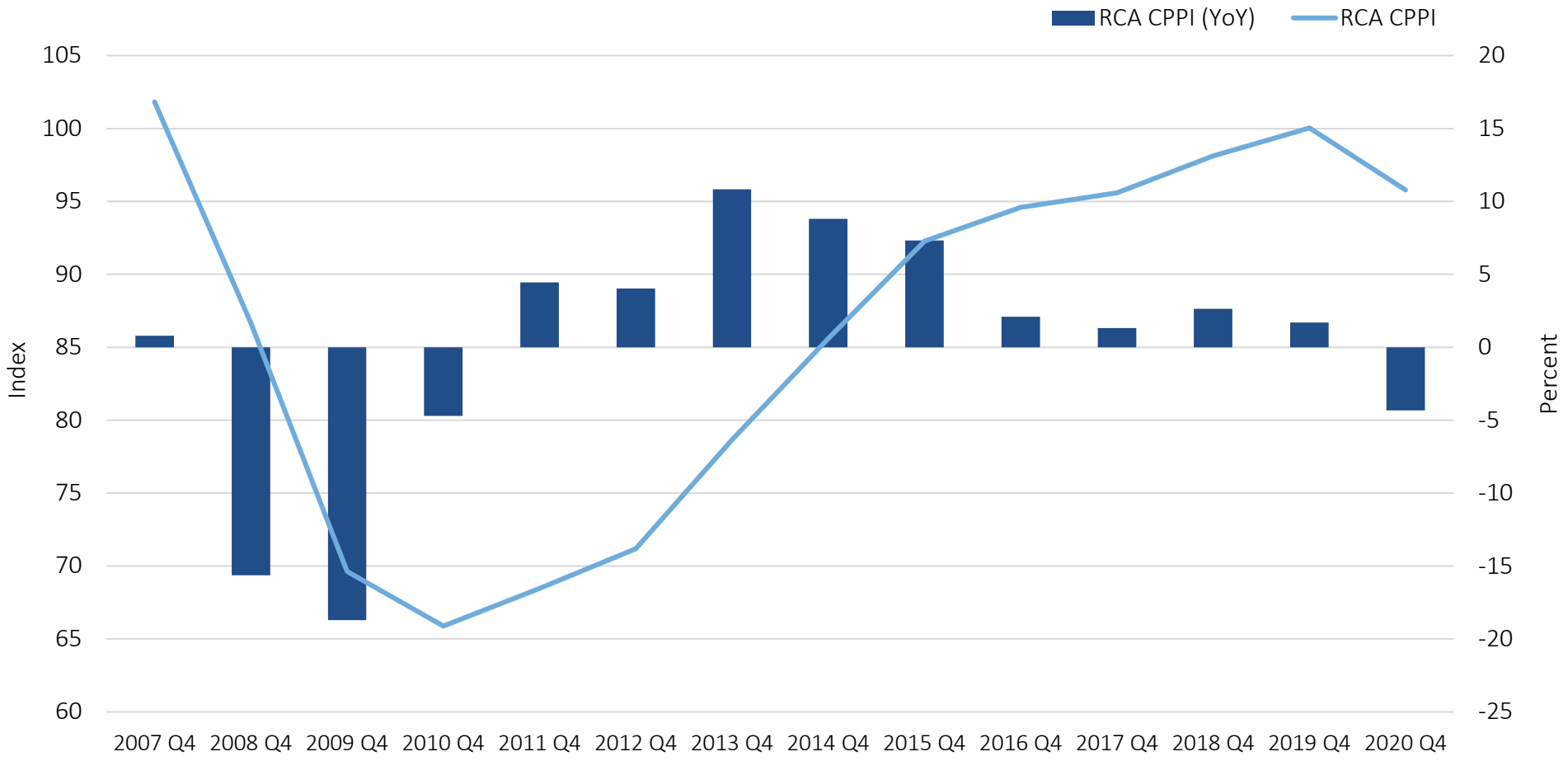
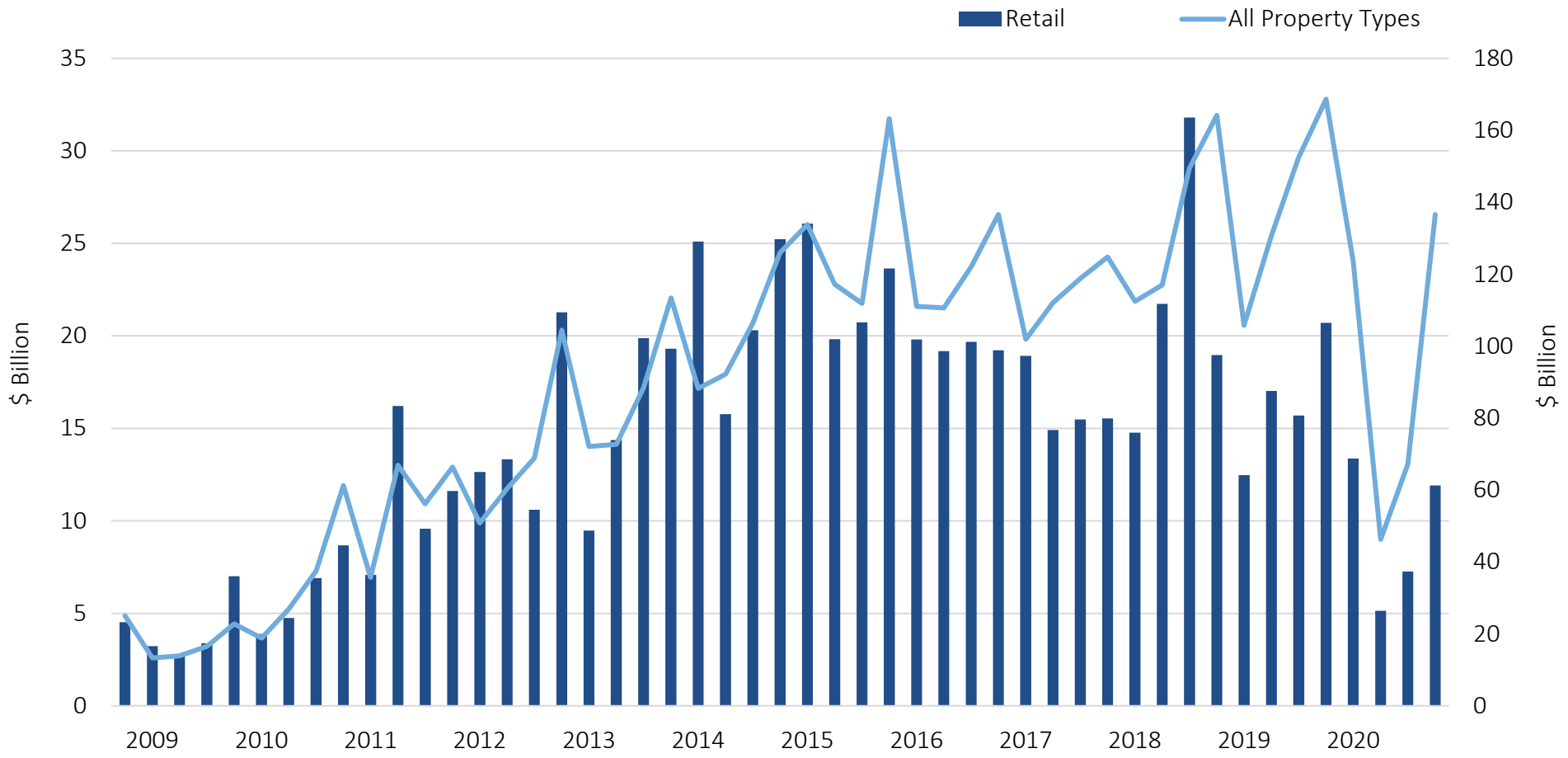
Sources RERC, NCREIF, 4Q 2020.

CRE Pricing – U.S. Retail



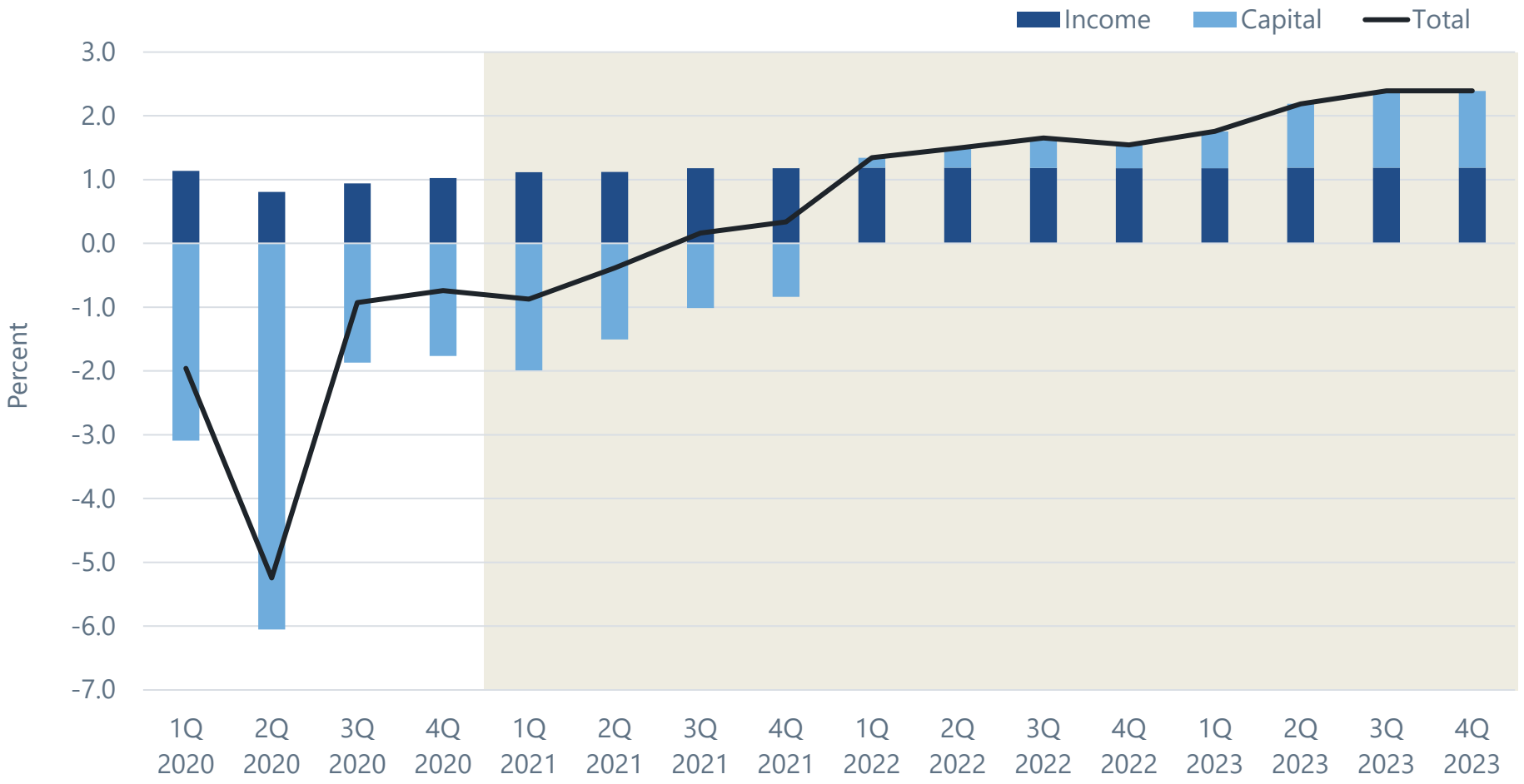
The RCA CPPI is based on repeat-sales (RS) transactions that occurred at any time up through the month of the current report.
Source Real Capital Analytics, 4Q 2020.

CRE Transaction Volume – U.S. Retail



Source Real Capital Analytics, 4Q 2020.

RERC Total Return Forecast – Retail (Quarterly Base Case)



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Sources RERC, NCREIF, 4Q 2020.

U.S. Property Type Observations – Winners & Losers

Office

- Shorter-term leases and smaller footprints
- Stronger recovery in CBD markets
- Lower demand in tech markets due to WFH

Industrial

- High demand
- Increasing net absorption and low vacancy rates
- Niche types – cold storage last-mile delivery locations, data centers

U.S. Property Type Observations – Winners & Losers

Retail

- Tenant quality important
- Store strategies (e.g., buy online and pick-up in store)
- Increasing vacancy rates

Apartments

- Supply slowing
- Moderating growth
- Continuing investor appetite

U.S. Property Type Observations – Winners & Losers

Hotel

- Recovery dependent on vaccine
- Operational efficiencies needed
- Improving fundamentals in late 2023 to 2025

2021 CRE Outlook

Will CRE be attractive in 2021?

- Attractive alternative vs. historic pricing of alternative investments
- Low interest rates are not fully priced into investment real estate pricing
- Historical values in check
- Fundamental valuation principles vs. technical pricing strategies

2021 valuation trends are about finding alpha

- Increased leverage at historic low rates
- Urban vs. suburban investment strategies
- Migration to 18-hour markets
- Lifecycle investment strategies
- Investment in non-traditional vs. core assets

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Thank You!

Disclaimers

The COVID-19 virus outbreak has recently caused turmoil in the global economy and financial markets. The effect of the COVID-19 pandemic on the commercial real estate market is rapidly evolving. While the future impacts of COVID-19 are not known at this time and will depend on many factors, we have taken into account the available market information and market feedback and applied it to our analysis as of the date of the report.

The conclusions presented in the report, including any projections, are based on a number of factors and market assumptions that have been adjusted to the extent we believe to be appropriate in light of material events such as the COVID-19 outbreak discussed above. Our view of these factors and market assumptions may differ from other parties. Actual results achieved may vary from our projections.

Our conclusions apply only as of the effective date(s) indicated in the report and are based on information available as of the date of report. Readers are cautioned not to rely on conclusions made prior to the most recent developments and are encouraged to exercise diligence in reviewing those conclusions as circumstances evolve.

No statement in this publication is to be construed as a recommendation to make any real estate investment or to buy or sell any security or as investment advice. The examples are intended for use as background on the real estate industry as a whole, not as support for any particular real estate investment or security.

TAB 4 – OPERF Real Estate Program

March 10, 2021

OPERF Real Estate Portfolio Annual Review & 2021 Plan

OREGON STATE TREASURY

Agenda

		OIC Investment and Management Beliefs Mapping																
Section	**Pages**	**1A**	**1B**	**1C**	**1D**	**2A**	**2B**	**3A**	**4A**	**4B**	**5A**	**5B**	**6A**	**6B**	**7A**	**7B**	**8A**	**8B**	**9A**
Agenda	2																		
Real Estate Portfolio Preface	3 - 5					■	■	■	■	■									
Executive Summary	6						■			■			■	■					
Investment Environment	7									■									
Real Estate Year In Review	8 - 10						■		■	■			■	■			■		■
Real Estate Performance	11 - 12								■	■									
Real Estate Portfolio Update	13 - 19						■		■	■			■	■			■		■
2021 Real Estate Plan	20 - 24						■		■	■									
Policy Reporting	25		■										■	■					
Closing	26						■		■	■			■	■					

	LEGEND: OIC INVESTMENT AND MANAGEMENT BELIEFS
1	**THE OIC SETS POLICY AND IS ULTIMATELY RESPONSIBLE FOR THE INVESTMENT PROGRAM**
A.	Investment management is dichotomous -- part art and part science.
B.	The OIC is a policy-setting council that largely delegates investment management activities to the OST and qualified external fiduciaries.
C.	The OIC is vested with the authority to set and monitor portfolio risk. Both short-term and long-term risks are critical.
D.	To exploit market inefficiencies, the OIC should be long term, contrarian, innovative, and opportunistic in its investment approach.
2	**ASSET ALLOCATION DRIVES RISK AND RETURN**
A.	Asset allocation is the OIC's primary policy tool for managing the investment program's long-term risk/return profile.
B.	Portfolio construction, including diversification and correlation considerations, is essential to maximizing risk-adjusted returns.
3	**THE EQUITY RISK PREMIUM WILL BE REWARDED**
A.	Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.
4	**PRIVATE MARKET INVESTMENTS CAN ADD SIGNIFICANT VALUE AND REPRESENT A CORE OIC/OST COMPETENCY**
A.	The OIC can capitalize on its status as a true, long-term investor by making meaningful allocations to illiquid, private market investments.
B.	Dispersion in private market investment returns is wide; accordingly, top-quartile manager selection, diversification across vintage year, strategy type, and geography, and careful attention to costs are paramount.
5	**CAPITAL MARKETS HAVE INEFFICIENCIES THAT CAN BE EXPLOITED**
A.	Inefficiencies that can be exploited by active management may exist in certain segments of the capital markets.
B.	Passive investment management in public markets will outperform the median active manager in those markets over time.
6	**COSTS DIRECTLY IMPACT INVESTMENT RETURNS AND SHOULD BE MONITORED AND MANAGED CAREFULLY**
A.	All fees, expenses, commissions, and transaction costs should be diligently monitored and managed in order to maximize net investment returns.
B.	External incentive structures should be carefully evaluated to ensure proper alignment with investment program objectives.
7	**FAIR AND EFFICIENT CAPITAL MARKETS ARE ESSENTIAL FOR THE LONG-TERM INVESTMENT SUCCESS**
A.	The OIC recognizes that the quality of regulation and corporate governance can affect the long-term value of its investments.
B.	The OIC also recognizes that voting rights have economic value.
8	**THE INTEGRATION OF ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) FACTORS, SIMILAR TO OTHER INVESTMENT FACTORS, MAY HAVE A BENEFICIAL IMPACT ON THE ECONOMIC OUTCOME OF AN INVESTMENT AND AID IN THE ASSESSMENT OF RISKS ASSOCIATED WITH THAT INVESTMENT**
A.	The consideration of ESG factors within the investment decision-making framework is important in understanding the near-term and long-term impacts of investment decisions.
B.	Over time, there has been an evolution of multi-factor, or more holistic approaches, to identify opportunities and remediate risks, in a large globally-diversified investment portfolio.
9	**DIVERSITY, IN ALL ASPECTS, IS ACCRETIVE TO MEETING OIC OBJECTIVES**
A.	By embracing and enhancing diversity and inclusion efforts, the OIC ensures that the investment program will be exposed to and informed by a wide range of perspectives, ideas and opinions.

Real Estate Strategic Role

The strategic role of OPERF real estate investments is outlined in OIC INV 1201 – Statement of OIC Investment and Management Beliefs and OIC Policy INV 501 – Acquiring and Managing Equity Real Estate. Return and risk objectives for the Real Estate Portfolio (outlined in OIC Policy INV 501 Acquiring and Managing Equity Real Estate) are as follows:

1) To achieve long-term, net returns to OPERF above the NFI-ODCE plus 50 basis points; and
2) To reduce risk among the Portfolio's investments through diversification by strategy, property type, investment size, geography, and time

Real Estate Policy Objective – The OIC's real estate policy objective of long-term, net returns above the NFI-ODCE plus 50 basis points [bps] has been achieved over all time periods except for the trailing one-year

Period Ending 6/30/20	Market Value	3 Months	1 Year	3 years	5 Years	10 Years	Since Inception
OPERF Real Estate Portfolio	**$8,378,824,430**	**-0.16%**	**1.42%**	**5.75%**	**7.14%**	**10.50%**	**10.32%**
NFI-ODCE, Net + 50 bps		-1.63%	1.83%	5.22%	6.85%	10.28%	
Excess		**1.47%**	**-0.41%**	**0.53%**	**0.29%**	**0.22%**	

Real Estate Position

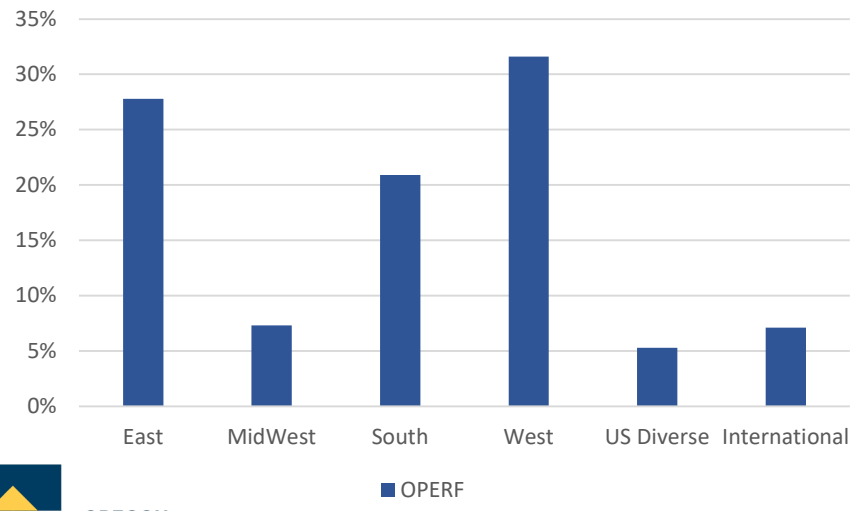
Strategic Allocation Targets

Allocation	Market Value ($mm)	Market Value (%)	OIC Target	OIC Ranges
Core	$ 5,850.5	69.8%	55%	+/- 10%
Value Added	$ 1,007.5	12.0%	20%	+/- 10%
Opportunistic	$ 1,201.7	14.3%	20%	+/- 10%
REITs	$ 319.1	3.8%	5%	0-10%

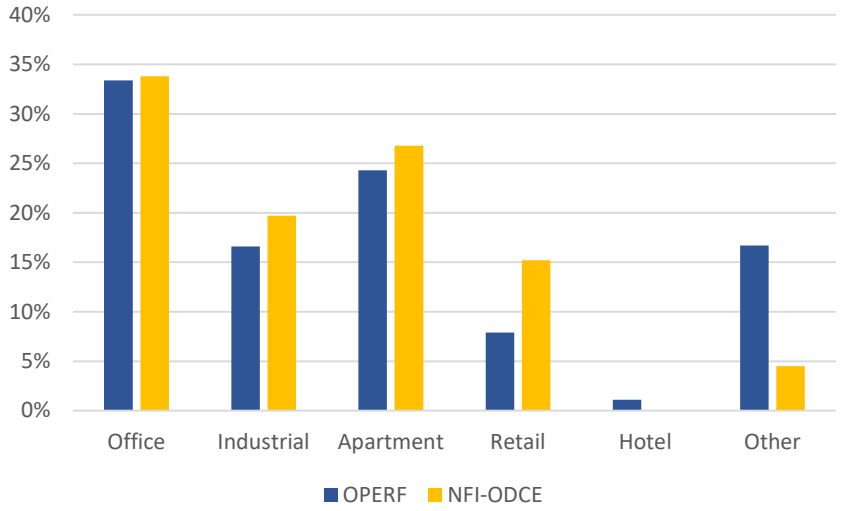
Top 10 Manager Strategies

Manager	Market Value ($mm)	Market Value (%)	Risk
GID	$ 934	11.1%	Core
Clarion Partners	$ 919	11.0%	Core
Lincoln Advisors	$ 896	10.7%	Core
Lionstone	$ 883	10.5%	Core/Value Add
Regency	$ 498	5.9%	Core
Prologis	$ 430	5.1%	Core
Lone Star	$ 396	4.7%	Opportunistic
DivcoWest	$ 382	4.6%	Core/Value Add
Ascentris	$ 321	3.8%	Core/Value Add
Harrison Street	$ 318	3.8%	Core/Value Add

Geographic Weights



Property Sector Weights



Real Estate Benchmark

Market Coverage

Benchmark: National Council of Real Estate Investment Fiduciaries – Open End Diversified Core Equity Index (NFI-ODCE) + 50 bps (net)

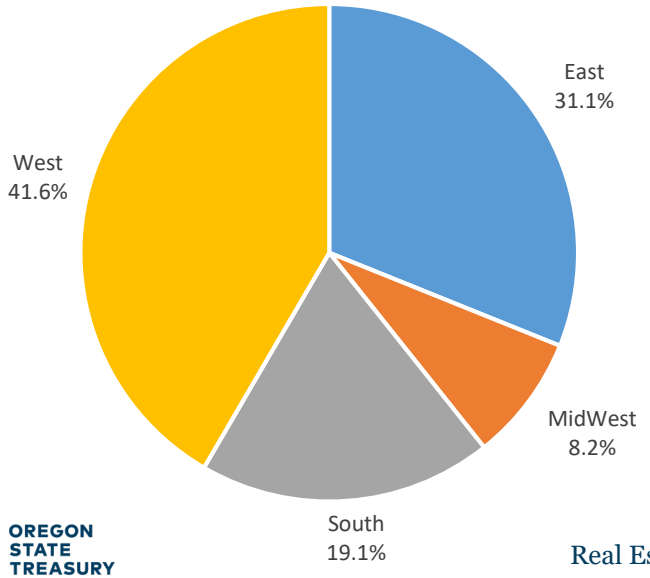
Number of Funds: 26

- United States
- Open-End Core Funds

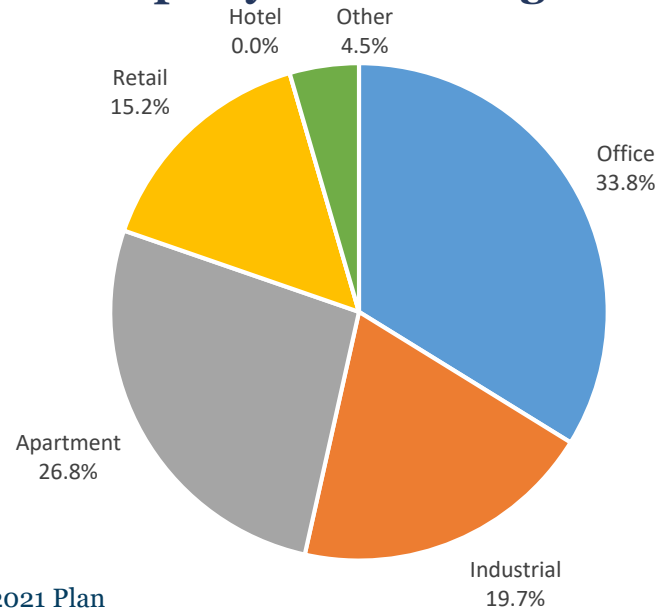
Top 10 Constituents

Fund	NAV ($ M)
JP Morgan Strategic Property Fund	$ 30,420
Morgan Stanley Prime Property Fund	$ 26,159
PGIM PRISA	$ 20,887
UBS Trumbull Property Fund	$ 14,935
Clarion Lion Properties Fund	$ 12,107
DWS RREEF America REIT II	$ 12,064
Invesco Core Real Estate	$ 10,413
Heitman America Real Estate Trust	$ 8,793
Principal U.S. Property Account	$ 8,016
BGO Diversified US Property Fund	$ 7,607

Geographic Weights



Property Sector Weights



Executive Summary

Key Takeaways…

1. The “shift to core,” started in 2015, is complete

2. Primary focus for foreseeable future is the continuation of constructing a balanced portfolio, capable of weathering various cycles and diversified across sectors, markets and strategies

3. Majority of portfolio is constructed around high quality, cash-flowing assets designed to preserve capital in a downturn while diversifying OPERF equity risk, complemented by value-creation strategies for consistent outperformance relative to the benchmark

4. The core portfolio has exhibited sustained, above-benchmark performance, net of all fees and expenses

5. The shift to longer-term hold mandates, renegotiated partnership agreements, and founder LP economics has resulted in significant fee savings

Investment Environment

- **Capital Markets**
  - Property trades were largely muted and sidelined throughout 2020. With near-term uncertainty in NOI forecasts, accurate pricing for property has been a challenge with many potential sellers postponing sales until the economic recovery commences
  - Rent collections in 2020 were better than first envisioned at the onset of the pandemic, averaging 90% for offices, multifamily residential, and logistics, with retail between 60-90%. As of 3Q 2020, total NOI across all property types had fallen 7.2% year-over-year, its largest such decline since at least 1983
  - As the recovery stage of this cycle begins in 2021, growth rate forecasts for most major markets are above the 20-year average
- **Residential**
  - Many suburban markets experienced valuation increases due to compression of terminal cap rates
  - The potential for increased real estate taxes and insurance costs in some metro areas remain a concern
  - New construction starts have stabilized close to five-average as of the third quarter of 2020
  - 2020 saw an increase in vacancy rates proportional to that of the GFC (approx. 100 basis points). However, with strong rental demand leading into the pandemic, vacancy in 2021 is expected to rise only modestly above its long-term average
- **Office**
  - Leasing velocity in 2020 was near GFC-era lows and more than 30% lower than the quarterly average over the past five years. Net absorption across the U.S. major markets in 2020 is estimated to show the largest decline in any year since the 2001 dot.com bust
  - Traditionally the most cyclical of the real estate sectors; stress is likely to continue into 2021 as users evaluate long-term needs
  - Most corporate tenants generally continued to pay rent on their office space even as most of their employees worked from home while large tech tenants took significant amounts of space in core gateway markets such as New York and Seattle
- **Industrial**
  - The U.S. industrial market has outperformed all other property sectors in the NPI due to consistent leasing demand, high occupancy and rent levels and strong investor interest
  - The sector is reliant on economic health to maintain strongly positive momentum, leading to variations across markets
  - The accelerated shift to online shopping is a strong tailwind for logistics assets, representing a 37% increase YOY as of Q3 2020
- **Retail**
  - Service and experiential retail has shown a resistance to e-commerce competition, however the pandemic has been a challenge
  - Bankruptcies and store closures continued to accelerate in 2020 with already-challenged retailers further stressed by legislative mandates restricting social gatherings and consumer patterns due to the pandemic

The onset of the global pandemic has stressed some property types and accelerated trends across all property types

Source: OST, DWS, SitusAMC

Real Estate 2020 Year In Review

2020, on whole, was focused primarily on team integration and a concerted administrative effort to drive down partnership expenses through renegotiated Limited Partnership Agreements (LPAs) while keeping an eye towards long-term occupier trends

- $1.8 billion in new commitments
- Onboard an Investment Analyst
- Completed amending three Separate Account agreements to reflect updated terms, improved alignment and significant fee savings
- Solid strides in improved due diligence and monitoring processes
- Developed and implemented initial phase of ESG/DEI framework for investment due diligence with eye toward continued improvement
- Given the remote working status brought on by the global pandemic, further research into diversifying the portfolio via international core real estate exposures will be deferred to 2022
- Long term aspirational goals include continued research into the creation of a debt facility for Separate Account portfolio

Real Estate 2020 Year In Review – Approvals

In 2020, 10 real estate commitments were approved, totaling $1.8 billion

Pacing

- The commitments represent the continuation of a multi-year plan to increase exposures to asset classes and strategies that fulfill long-term portfolio construction needs
- Partnership underwriting requirements have entailed significantly lengthier diligence efforts due to: (1) capturing wider investment "landscapes" of comparable alternative investments/partners; and (2) most commitments are to long-term partnerships with evergreen structures and with the intent of scaling over time

Fees

- Continued trend towards lower fees through tailored partnership structures and seed capital negotiations
- $300 million of commitments in 2020 include no carried interest; $900 million of the 2020 commitments include management fees <100 bps (30-50% below average fee structures for non-core marketed funds)
- Two commitments represent renegotiated LPAs with improved alignment and carried interest applying to only the non-core portion of the portfolio

Strategy

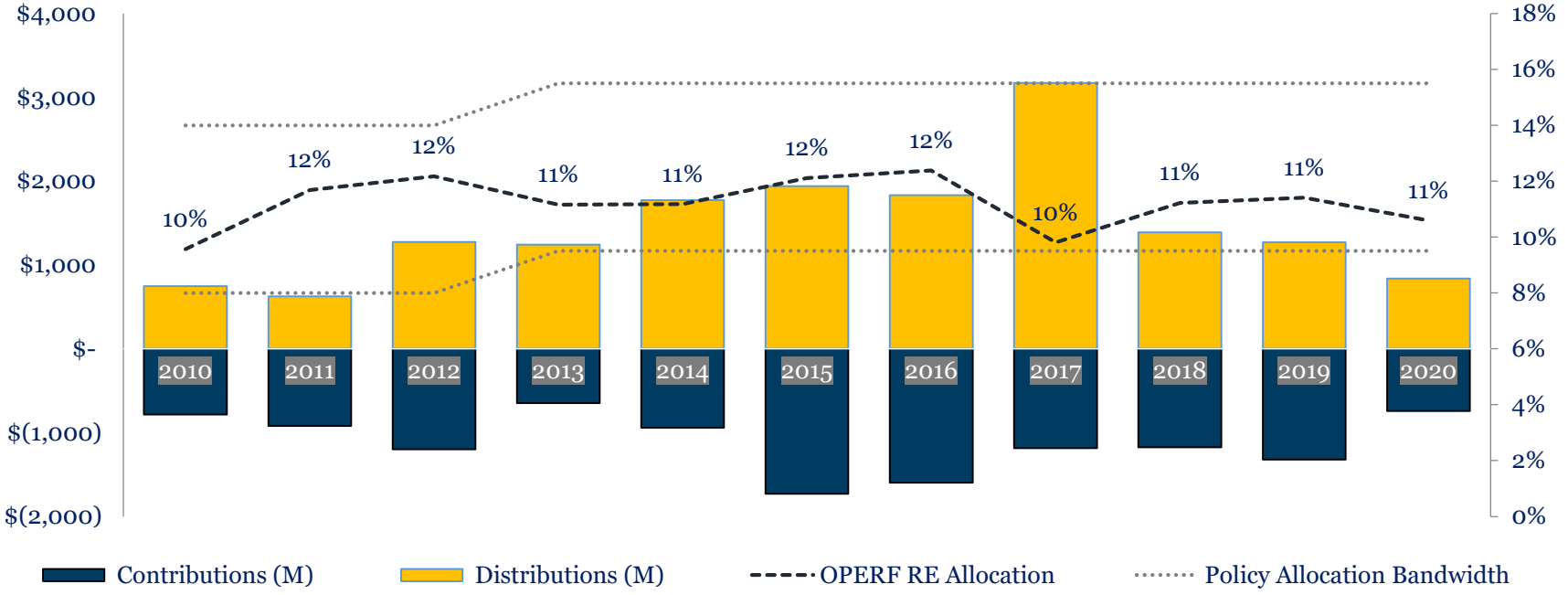
- 2020 commitments represent: (1) long-term overweight to multifamily, industrial and niche real estate assets; (2) three highly tailored joint ventures with strong GP-LP alignment; (3) re-ups to existing partners with demonstrated track records, and (4) lead investor with preferred economics in the formation of two open ended funds

FUND NAME	STRATEGY	SUB-PORTFOLIO	GEOGRAPHY	COMMITMENT ($ MM)	FUNDING STATUS
Nuveen US Cities Multifamily Fund	Multifamily	Core	Domestic	100	Partially Funded
Oak Street Fund V	Diversified / NNN	Value-Add	Domestic	200	Partially Funded
GID All-Weather Fund	Multifamily	Core	Domestic	150	Unfunded
Abacus Multifamily SMA	Multifamily	Core	Domestic	250	Partially Funded
Lincoln Industrial SMA	Industrial	Core/Value-Add	Domestic	150	Partially Funded
Sculptor Capital Real Estate Fund IV	Diversified / Niche	Opportunistic	Domestic	150	Partially Funded
Ascentris Diversified SMA	Diversified	Value-Add/Core	Domestic	300	Partially Funded
Waterton Residential Property Venture XIV	Multifamily	Value-Add	Domestic	150	Partially Funded
Harrison Street Real Estate Partners VIII	Alternative / Niche	Opportunistic	Domestic	150	Unfunded
Harrison Street-OR Life Science Partners	Alternative / Niche	Core / Opp	Domestic	200	Unfunded
NEW COMMITMENTS SUB-TOTAL				**1,800**	

Real Estate 2020 Year In Review – Allocations

Portfolio allocation has been consistently within policy bandwidth

- The real estate portfolio has contributed $2.7 billion in net cash flows to OPERF over the trailing five year period
- As the core commitments made over the past few years fully invest, and with ~70% of the real estate portfolio in evergreen structures (open-ended funds and separate accounts), distributions will become an increasingly larger component of future portfolio cash flows
- At 11% of the OPERF portfolio, real estate is slightly below its 12.5% target, but well within policy bandwidth



As of 12/31/2020

Portfolio strategic weightings to Core = permanent positive cash flow & yield generation

Performance Review

- OPERF's Core portfolio has shown continued strong long-term performance, having outperformed the policy benchmark by 332, 265, 335, and 248 bps over the respective 1-, 3-, 5-, and 10-year periods
- Value Add underperformed the policy benchmark by 339 and 8 bps over the 1-and 3-year periods, although it outperformed by 189 and 239 bps over the 5- and 10-year periods
- The Opportunistic portfolio underperformed the benchmark by 883, 380, 421, and 329 bps over the trailing 1-, 3-, 5- and 10-year time periods

Summary of Portfolio Investment Returns		Q2 2020	1-Yr	3-Yr	5-Yr	10-Yr	Since Inception
Total Private Real Estate	Income	0.73%	3.07%	3.61%	3.71%	3.83%	3.90%
	Appreciation	-1.41%	-0.85%	2.55%	4.13%	6.90%	6.26%
	Total	-0.68%	2.21%	6.23%	7.96%	10.93%	10.36%
Core	Income	1.02%	4.23%	4.41%	4.50%	5.48%	6.97%
	Appreciation	-2.18%	0.89%	3.35%	5.52%	7.01%	2.83%
	Total	-1.16%	5.15%	7.87%	10.20%	12.76%	9.96%
Opportunistic	Income	0.00%	1.61%	3.37%	3.29%	2.79%	0.23%
	Appreciation	0.96%	-8.54%	-1.93%	-0.65%	4.10%	10.21%
	Total	0.96%	-7.00%	1.42%	2.64%	6.99%	10.61%
Value Added	Income	-0.10%	-1.35%	-0.06%	1.28%	2.25%	0.70%
	Appreciation	0.29%	-0.23%	5.19%	7.40%	10.25%	3.74%
	Total	0.20%	-1.56%	5.14%	8.74%	12.67%	4.15%
Public Real Estate – Domestic REITs	Income	1.25%	4.30%	4.46%	4.41%	4.03%	5.64%
	Appreciation	13.78%	-9.32%	-2.80%	-1.26%	5.17%	4.18%
	Total	15.03%	-5.40%	1.53%	3.08%	9.34%	10.02%
Total Portfolio	Income	0.74%	3.14%	3.31%	3.71%	3.76%	4.79%
	Appreciation	-0.91%	-1.69%	2.38%	3.33%	6.56%	5.34%
	Total	-0.16%	1.42%	5.75%	7.14%	10.50%	10.32%
NFI-ODCE, Net +50 bps		-1.63%	1.83%	5.22%	6.85%	10.28%	
NAREIT Index		13.25%	-6.47%	3.39%	6.49%	10.35%	

All returns represented are net of fees.

[1] Since Inception benchmark data not available due to cash flows not-verifiable for period prior to Private Edge contract commencement Q1 2006

[2] Policy benchmark through March 31, 2016 was NPI; gross of fees, unlevered

[3] NFIC-ODCE +50bps was adopted as Policy benchmark commencing April 1, 2016; net of fees, levered

Source: OST, Private Edge

Performance Review

Vintage Exposure

- Given the robust seller's market experienced over the past 7+ years, coupled with relatively moderate capital pacing from 2006-2008, the real estate "legacy" funds (all funds with a 2008 vintage or older) have a decreasing impact on the portfolio
    - $388 million NAV, comprising 4.5% of portfolio value
    - Down considerably from 2017, when legacy funds represented $1.1 billion or 13.7% of portfolio NAV
    - Working with the private equity team for considerations to include ~$600 million in legacy and non-strategic fund positions in phase two of Project Jack in 2021

Separate Account & Open-end Portfolio

- Separate Accounts and Open-end Funds have been a positive driver of returns, outperforming the benchmark over all time periods since the portfolio shift started in 2015

	OPERF SMAs	OPERF Open-end Funds	OPERF Total**	ODCE + 50 bps	Excess
1-Year Total Return	5.94%	2.73%	5.15%	1.83%	3.32%
3-Year Total Return	8.33%	6.42%	7.87%	5.22%	2.65%
5-Year Total Return	10.63%	7.24%	10.20%	6.85%	3.35%
10-Year Total Return	13.22%	9.01%	12.76%	10.28%	2.48%

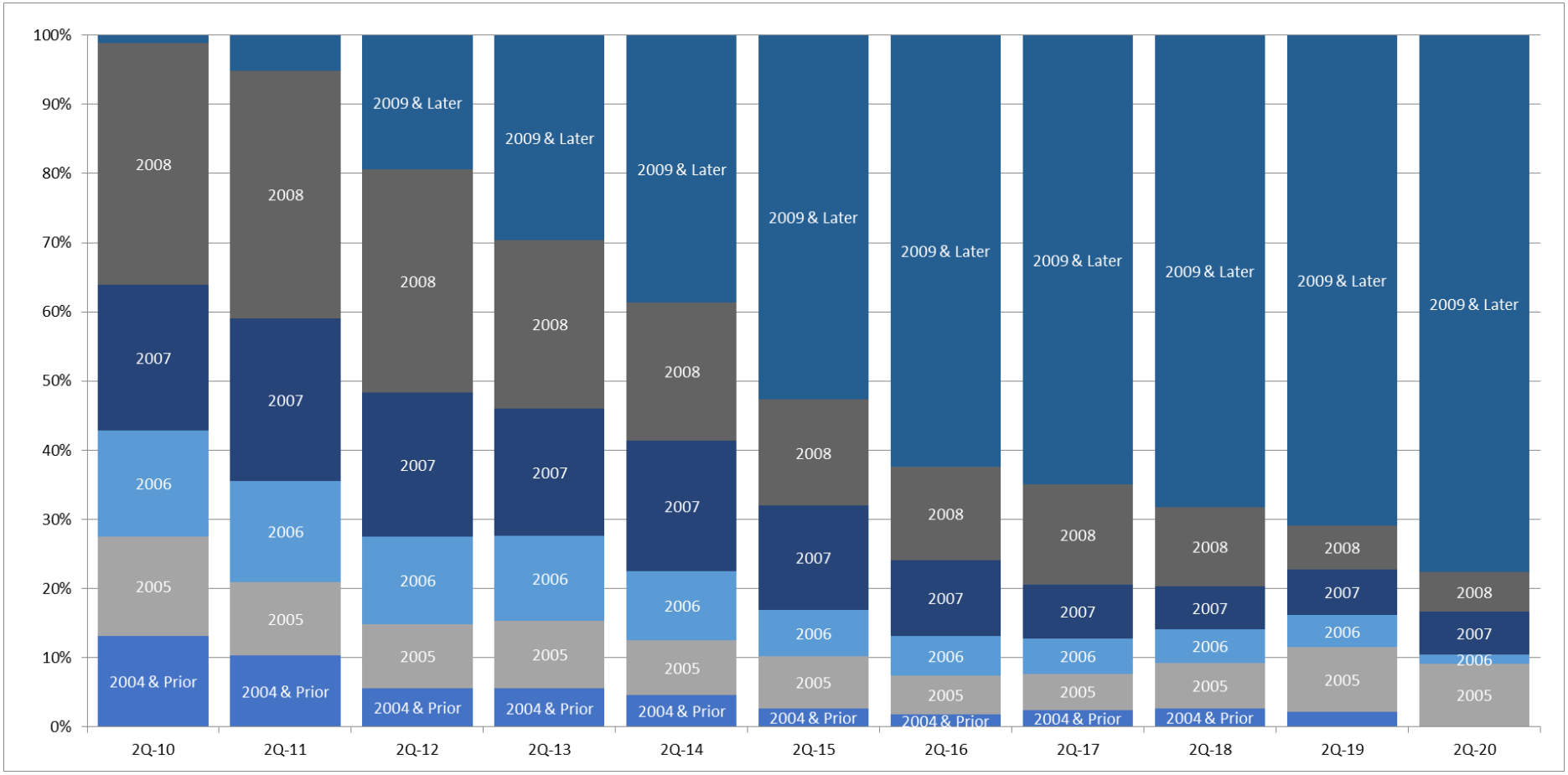
*All returns represented are net of fees; as of 6/30/2020

**OPERF Total represents all Separate Accounts and Open-end funds as of 6/30/2020

Source: OST, Private Edge, SitusAMC

Portfolio Update – Vintage Year Exposure

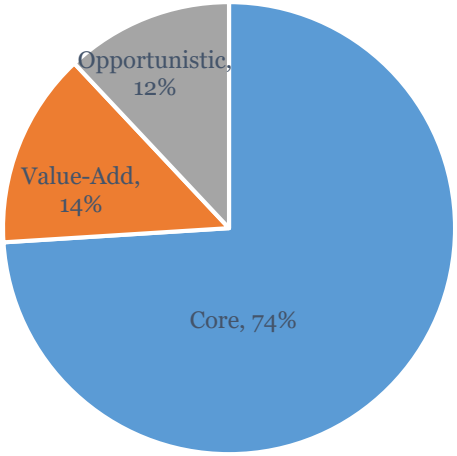
- The real estate portfolio's exposure to 2005-2008 vintage year closed-ended funds across the value-add and opportunistic portfolios have come down significantly over time



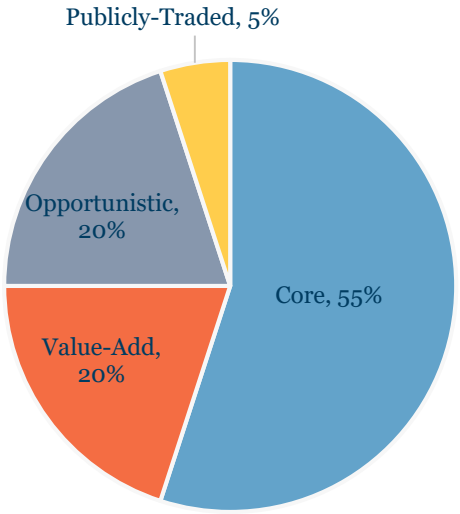
Portfolio Update – Peer Comparison

Risk Allocations

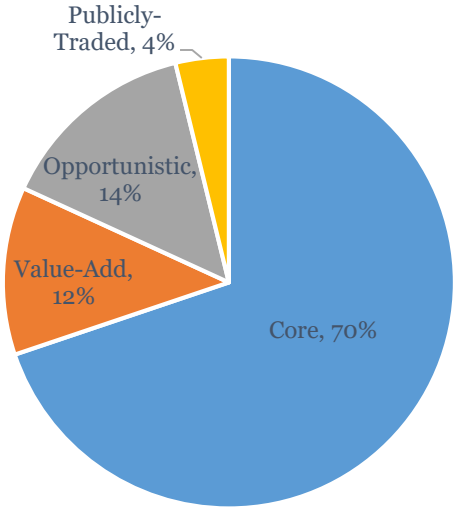
- OPERF slightly riskier than the majority of institutional investors surveyed by Pension Real Estate Association



Peer Group



OPERF Policy (Target)



OPERF (6/30/2020)

- While publicly-traded REITs were not represented in the Peer Group survey, many plans have a blend of private and public
- OPERF policy allocations include bandwidths of +/- 10% from target; REITs bandwidth is 0-10%
- Current Staff objectives include overweight to Core with commensurate underweights to Value Add and Opportunistic

Portfolio Update – Manager Concentration

The Real Estate "Top 10"

Significant portfolio reshaping occurred over the 5-year period 2013-2018, primarily:

- In keeping with reducing portfolio complexity while also leveraging OPERF's scale to achieve preferred economics and improved alignment, the Top 10 managers represent 71% of the portfolio
- As part of Staff's objectives to de-risk the real estate portfolio through lower volatility investments and reducing cyclical risks inherent in closed-end opportunistic funds, private Core now represents 71% of the Top 10 manager NAV, up from 35% in 2014

Q3 2014 → **Q2 2020**

Partner	Risk	Structure	Strategy	NAV ($M)
LaSalle	REIT (Domestic)	SMA	Diversified	830
Lone Star	Opportunistic	Closed End	Diversified	634
Clarion	Core	SMA	Office	595
Morgan Stanley	REIT (ex-US)	SMA	Diversified	428
Talmage	CMBS/Debt	SMA/Closed End	Diversified	407
Lincoln	Core	SMA	Industrial	373
Blackstone	Opportunistic	Closed End	Diversified	361
Regency	Core	SMA	Retail	350
Fortress	Opportunistic	Closed End	Diversified	346
GID	Core	SMA	Multifamily	336
			Total Top 10	**4,660**

Partner	Risk	Structure	Strategy	NAV ($M)
GID	Core	SMA	Multifamily	934
Clarion Partners	Core	SMA	Office	919
Lincoln Advisors	Core	SMA	Industrial	896
Lionstone	Core/Value Add	SMA	Diversified	883
Regency	Core	SMA	Retail	498
Prologis	Core	Open End	Industrial	430
Lone Star	Opportunistic	Closed End	Diversified	396
DivcoWest	Core/Value Add	JV/Closed End	Office	382
Ascentris	Core/Value Add	SMA	Diversified	321
Harrison Street	Core/Opportunistic	Open/Closed End	Diversified	318
			Total Top 10	**5,977**

Core	CRE Debt & High Volatility Core	Non-Core

Source: OST, Private Edge

Portfolio Update – Property Exposure

Portfolio Weightings

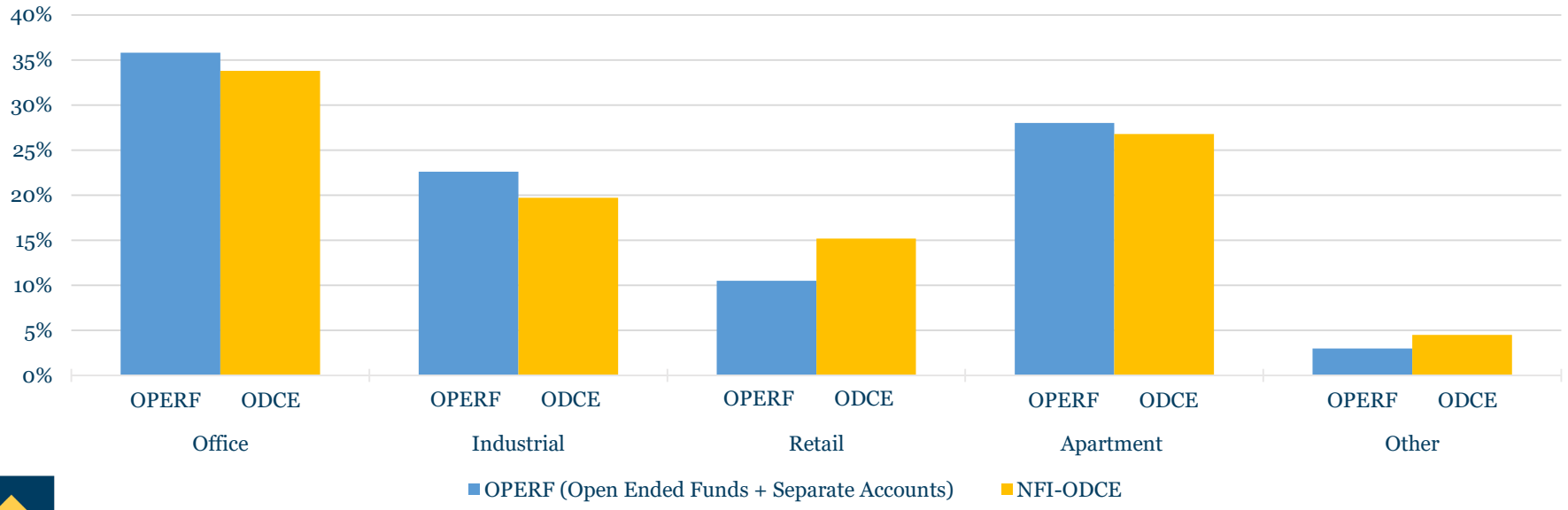
- Staff actively manages portfolio exposures for strategic over and underweights to the benchmark

Core

- Long term: Move to underweight office with continued overweight to industrial and multifamily, and, to a lesser extent, niche assets (i.e., senior living, campus housing, self storage, medical/life science office, etc.)
- Mid term: Maintain underweight to retail

Value Add & Opportunistic

- Continue pursuing strategies and operational expertise not easily replicated within core partnerships. This will entail some exposures to "Other" for mixed-use and transitional assets not defined by the traditional property sectors
- Debt currently comprises 16% of "Other." Staff expect this exposure to decline as credit strategies are not being pursued as a long term portfolio fit

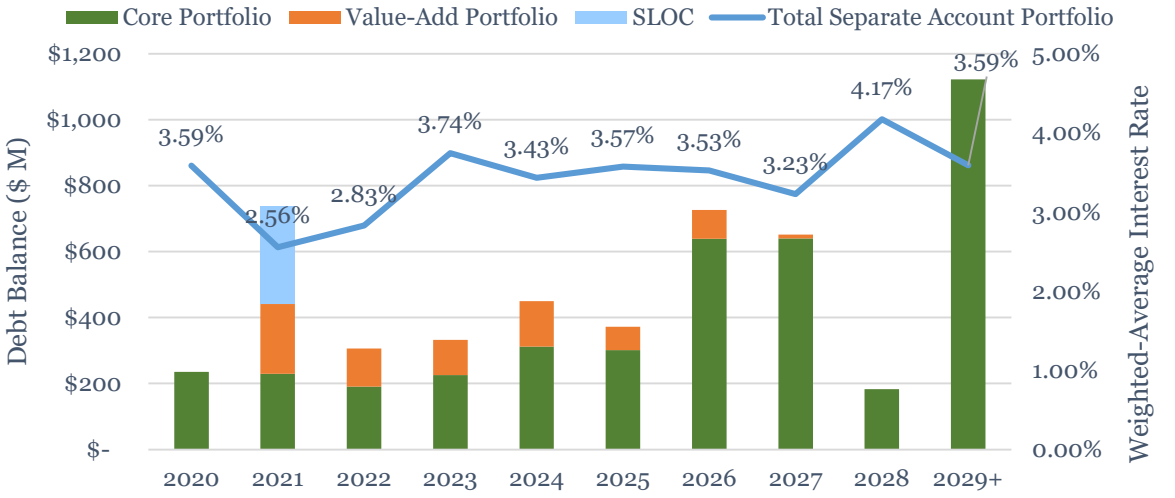


Portfolio Update – Debt Summary

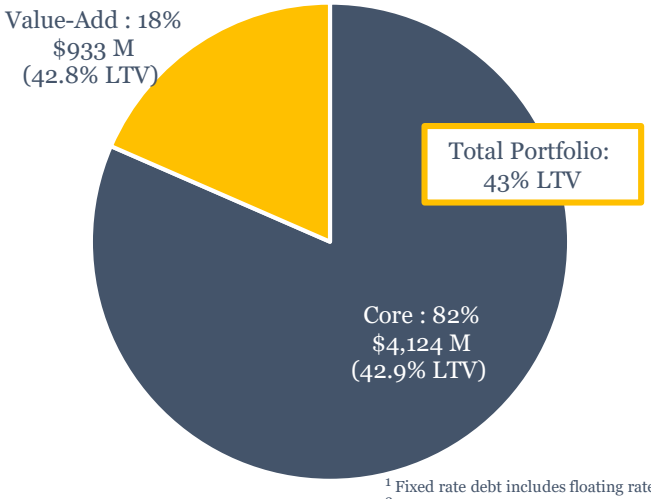
Debt Breakdown

Total Separate Account Portfolio	Debt ($ M)	Debt (%)	Weighted-Ave Years to Maturity	Weighted-Ave Interest Rate
Total Mortgage Debt	**$4,821**	**94%**	**5.5 years**	**3.48%**
Fixed[1]	$4,074	80%	5.9 years	3.65%
Floating	$747	15%	3.2 years	2.56%
Total Subscription Lines of Credit (SLOC)	**$296**	**6%**	**1.0 year**	**1.38%**
Fixed	$0	0%	N/A	N/A
Floating	$296	6%	1.0 year	1.38%
Total Debt	**$5,116**	**100%**	**5.2 years**	**3.35%**

Debt Maturity Schedule



Separate Account Portfolio Outstanding Debt by Strategy[2]



	Core Portfolio		Value-Add Portfolio		SLOC		Total Portfolio	
Maturity Year[3]	Debt Balance ($ M)	Weighted-Ave Interest Rate	Debt Balance ($ M)	Weighted-Ave Interest Rate	Debt Balance ($ M)	Weighted-Ave Interest Rate	Debt Balance ($ M)	Weighted-Ave Interest Rate
2020	$236	3.59%	$0	N/A	$0	N/A	$236	3.59%
2021	$230	3.91%	$212	2.72%	$295	1.38%	$737	2.56%
2022	$191	2.93%	$115	2.84%	$0	N/A	$321	2.83%
2023	$226	4.04%	$106	3.11%	$0	N/A	$332	3.74%
2024	$312	3.66%	$137	2.91%	$0	N/A	$450	3.43%
2025	$301	3.72%	$71	2.97%	$0	N/A	$373	3.57%
2026	$639	3.44%	$88	4.14%	$0	N/A	$727	3.53%
2027	$640	3.21%	$12	4.35%	$0	N/A	$651	3.23%
2028	$183	4.17%	$0	N/A	$0	N/A	$183	4.17%
2029+	$1,122	3.59%	$0	N/A	$0	N/A	$1,122	3.59%
Total	**$4,079**	**3.56%**	**$742**	**3.05%**	**$295**	**1.38%**	**$5,131**	**3.35%**

[1] Fixed rate debt includes floating rate debt that has been hedged with an interest rate swap.
[2] LTV calculations have the Subscription Lines of Credit allocated to the Core and Value-Add Portfolios, about half of which is allocated to the Value-Add portfolio and represents development activity untaken by GID. For all debt maturity calculations, SLOC debt is shown separately.
[2] Maturity Year excludes any extension options that may require certain covenants to be met.

As of 9/30/2020

Portfolio Update – Implementation

Strategy Diversification

- Continue building out a well-balanced portfolio to optimize the long-term role of real estate within the OPERF portfolio, via:

Partnership Strategy	Objective
Strategic Partnerships: Investment mandates based upon long-term fundamentals and cycle-tested strategies (i.e., Core/Core plus/Value add)	• Lower the beta of real estate, relative to a publicly-traded securities portfolio
Value enhancers: Partnerships and investment strategies capable of reacting quicker to prevailing, and changing, market conditions	• Alpha creation to achieve real estate portfolio outperformance relative to the portfolio's NFI-ODCE core benchmark (non-core risks: development, redevelopment, lease-up, etc.)

Tailored & Aligned Partnership Structures

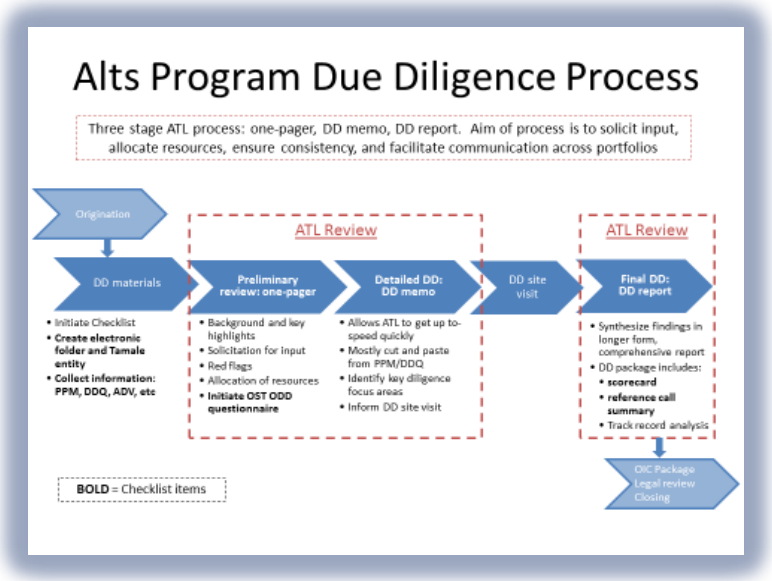
Transfer to Core:

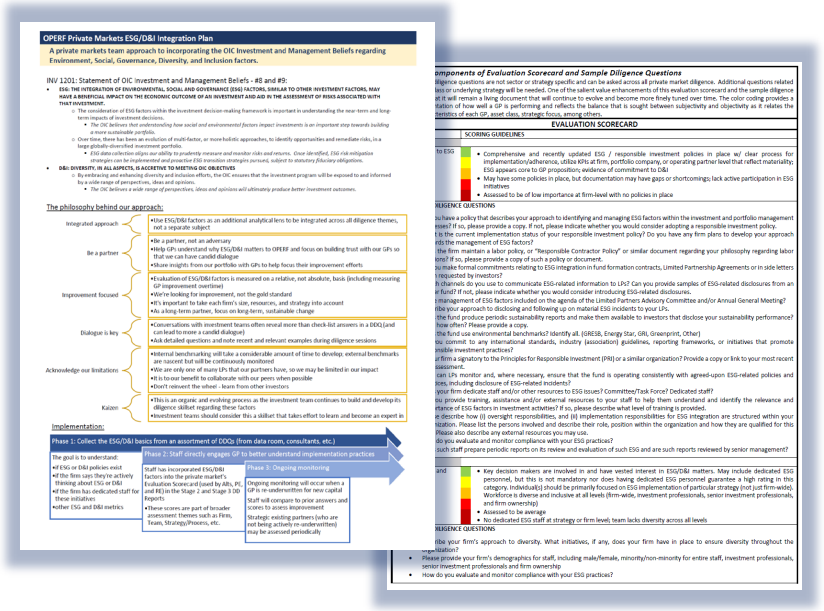
- The integration of the Transfer-to-Core mechanism into the separately managed accounts/programmatic JVs has been largely successful. Namely:
  - Provides staff greater oversight and discretion in controlling the core portfolio holdings by property type and geographic exposure
  - Removing frictional trading costs normally incurred in a typical property transaction from the transfer pricing and limiting carry incentives to outperformance hurdles to only non-core investments, has resulted in 150-200 bps in fee savings to OPERF, while greatly enhancing long-term alignment

Portfolio Update – ESG/DEI Integration

ESG/DEI Factor Inclusion

Building on work done in recent years and acknowledging the OIC's reinforced focus on Environmental Social & Governance (ESG) and Diversity, Equity & Inclusion (DEI), OST's private market "ESG Champions" (Ahman Dirks, Faith Sedberry and Sam Spencer with the oversight of Anna Totdahl) led a project in 2020 to more formally integrate these factors into the investment due diligence process





Physical climate risk scoring across the separate account portfolio via FourTwentySeven

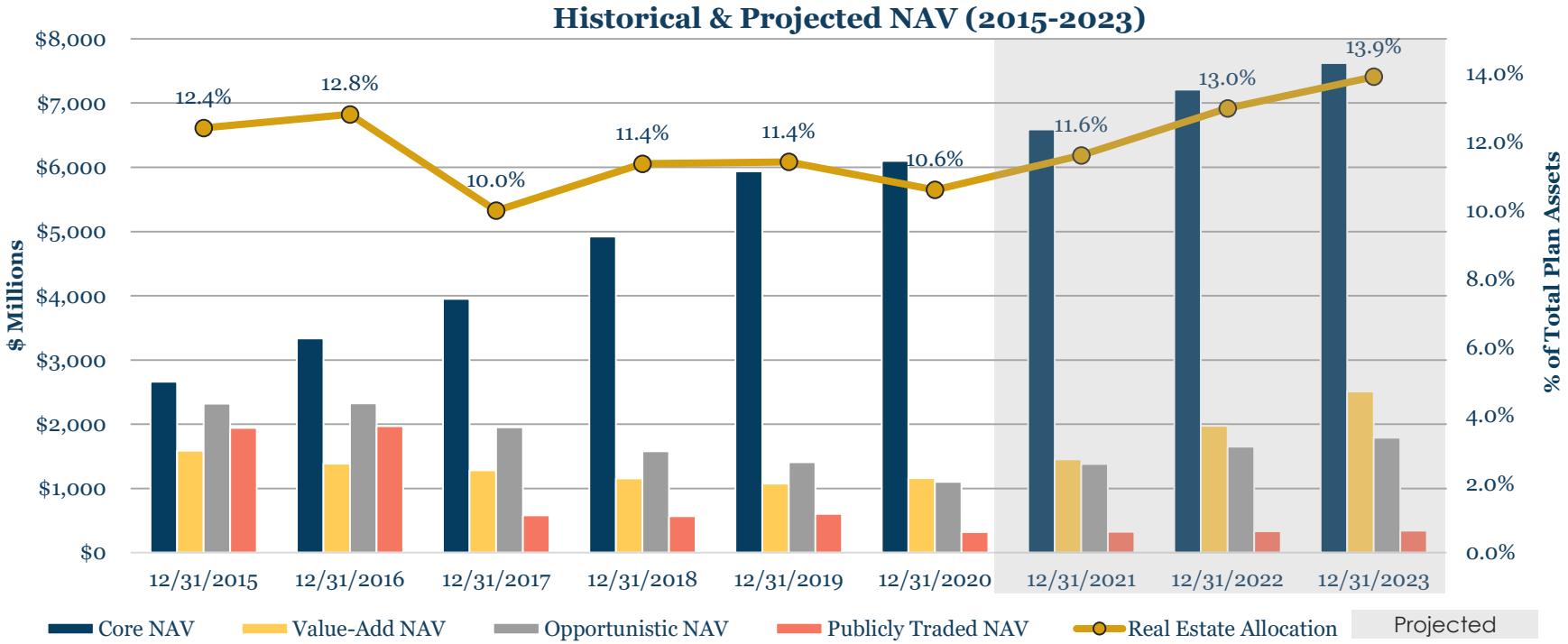
Summary Statistics	Floods	Heat Stress	Hurricanes & Typhoons	Sea Level Rise	Water Stress	Wildfire
Maximum	86	74	57	80	94	96
Mean	25	46	21	8	54	71
Minimum	1	30	0	0	26	31

Source: OST, FourTwentySeven

2021 Plan – Pacing

Maintaining target real estate exposures will rely on allocation management of strategic partnerships

- With ~70% of the portfolio weighted towards separate accounts and open-ended structures, Staff has greater control of capital pacing through scaling successful partnerships which in turn gives Staff more negotiating leverage to reduce fees as partnership AUM grows
- At 20%-30% of the portfolio, closed-end funds will have a reduced impact on capital pacing considerations and will be limited to very select non-core strategies

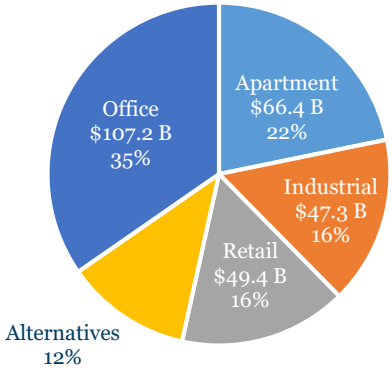


Source: OST

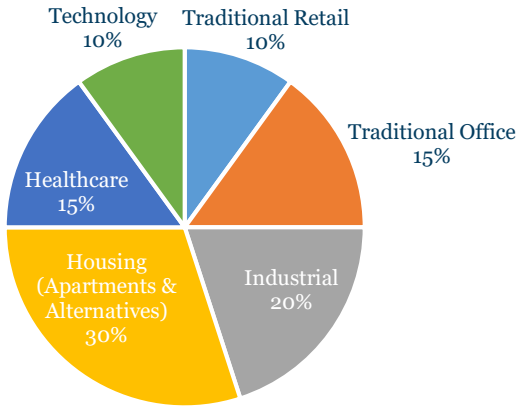
2021 Plan – Property Diversification

Current Real Estate Exposure

(NFI-ODCE ($B) by property type)



Representative Future Real Estate Portfolio



NCREIF Total Returns by Sector

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
13.7%	17.1%	23.0%	21.2%	19.1%	20.5%	-4.1%	-10.9%	18.2%	15.5%	11.6%	12.9%	13.4%	15.3%	12.3%	13.1%	14.3%	13.4%	11.8%
8.8%	8.9%	13.0%	20.3%	17.0%	14.9%	-5.8%	-17.5%	12.6%	14.6%	11.2%	12.3%	13.1%	14.9%	9.0%	6.2%	6.9%	6.6%	1.8%
6.7%	8.2%	12.1%	20.0%	14.6%	13.5%	-7.3%	-17.9%	11.7%	13.8%	10.7%	10.4%	11.5%	12.5%	7.3%	6.0%	6.1%	5.5%	1.6%
2.8%	5.7%	12.0%	19.5%	13.3%	11.4%	-7.3%	-19.1%	9.4%	13.8%	9.5%	9.9%	10.3%	12.0%	6.2%	5.7%	2.2%	1.9%	-7.5%

Apartment Industrial Retail Office

Asset Type Diversification

- As noted above, the relative performance of the different property types can vary considerably over time, hence the need for diversification of asset types is critical in long-term portfolio construction
- Institutional real estate has been quickly expanding beyond the traditional "four food groups." Alternative property types will take up a larger portion of an investor's portfolio over time

(1) Source: NPI as of December 2019; DWS; Nuveen; IREI

2021 Plan – Initiatives

Partnerships / Portfolio Diligence

- $600 million - $800 million in new commitments
  - 3-5 commitments of $100 million - $350 million
  - Focus on diversifying strategies and creation of high-quality core properties with sustained long-term rental growth
- Continue amending the remaining Separate Account agreements to reflect updated terms and improved LP economics
  - On a trailing five-year look back, the real estate portfolio has achieved a 32 bps reduction in gross-to-net spreads. The portfolio is projected to realize a further 40 bps in fee savings by 2024, which equates to an approximate $53 million reduction in annual fees when compared to the portfolio in 2015
- Continue integration of ESG factors into diligence and monitoring process

Administrative

- Amend portfolio policy to reflect core & non-core risk allocations
- Commence RFP for portfolio reporting services (once travels resume)
- Continue enhancements to due diligence and monitoring capabilities
  - Enhanced data capture and monitoring output remain the focus

2021 Plan – Initiatives

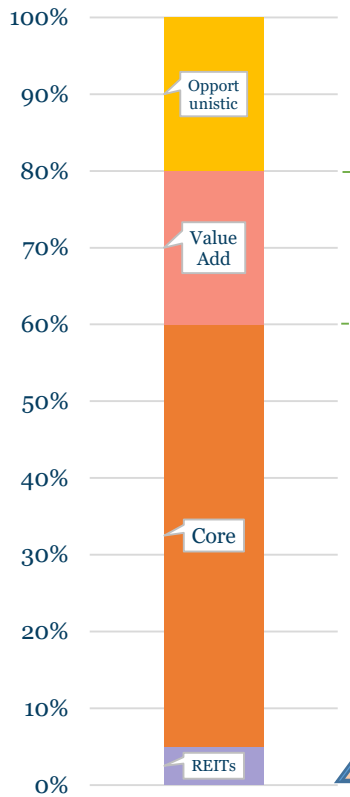
Personnel

- Re-integrate staffing into office setting and travel requirements
- Continue training program ("Bootcamp") started in 2019 for RE staff and analysts
  - 60-hour program, over three phases; leveraging GP platforms, skillsets, and training
- Promote and enhance Oregon's brand through industry participation:
  - Board Member: PREA-NCREIF Reporting Standards Board
  - Board Member: Institute for Real Estate Operating Companies (iREOC)
  - Member: PREA Closed End Value Add Task Force
  - Editorial Advisory Board Member: Institutional Real Estate Americas
  - Board Member: Portland Alternative Investment Association (PAIA)

Best Practices

- Annual Oregon Partners Meeting
- Annual Business Plan Reviews

2021 Plan – Long Term Construction



Opportunistic (Closed Ended Funds)
- Allocation Range: 10-30%
- Objective: Tactical/ODCE + 300 bps
- Optimized portfolio:
  - 8-10 relationships
  - $200MM min / fund
- 2021 focus: Monitoring

Value-Add (Closed Ended Funds)
- Allocation Target: 10-30%
- Objective: ODCE + 100 bps
- Optimized portfolio:
  - 4-6 relationships
  - $200MM min / fund
- 2021 focus: Active

Separate Accounts
- Objective: ODCE + 50 bps
  ODCE + 100 bps (VA)
- Optimized portfolio
  - 4-6 relationships (Core)
  - 2-4 relationships (VA)
- +$400M / SMA
- 2021 focus: Monitoring

Open-Ended Portfolio (Core)
- Allocation Target: 10%
- Optimized portfolio
  - 7-9 funds
  - $200+MM / SMA
- Benchmark: ODCE
- 2021 focus: Active

Separate Accounts/JVs (55%)
- Role: ODCE + 50-100 bps
- Risk-adjusted outperformance
- Core through Value-Add strategies
- Highly tailored
- High degrees of alignment
- Staff directed
- "Transfer to Core" (eliminates transaction costs)

Open-Ended Funds (10%)
- Benchmark (ODCE) subportfolio
- Core+ strategies

REITs – 5%, gap-fill strategies

Policy Reporting

Responsible Contractor Policy (RCP)

- INV 504 (RCP) was approved by the OIC in January 2020
- Per policy, Staff shall "report on this Policy at a regular meeting of the OIC on an annual basis."

OPERATIONAL CONTRACTS				
	Payments to Responsible Contractors	Payments to Non-Responsible Contractors	Total Qualified Operating Expenditures	Payments as a % of Total Qualified Operating Expenditures
Total	$ 38,488,495	$ 43,621	$ 38,532,116	100%

TENANT IMPROVEMENTS & OTHER CAPITAL EXPENDITURES				
	Payments to Responsible Contractors	Payments to Non-Responsible Contractors	Total Qualified Operating Expenditures	Payments as a % of Total Qualified Operating Expenditures
Total	$ 193,304,286	$ 0	$ 193,304,286	100%

* Qualified expenditures are services or tenant improvements and other capital expenditures greater than $100,000. Total qualified expenditures include payments to both responsible contractors and contractors not meeting the responsible contractor definition.

Non-Mandate Activity

- There was no non-mandate activity in 2020

Closing

Key takeaways…

1. Performance has been strong, particularly with the core portfolio, both on an absolute basis and relative to the policy benchmark
2. Non-core portfolio performance attributed primarily due to legacy investments and lack of vintage year diversification since the portfolio policy shift implemented in 2015. This is expected to moderate as measured pacing is achieved in non-core strategies and the core portfolio has been fully built-out
3. Portfolio remains at lower end of target bandwidth; current pacing plans project the portfolio will be at target midpoint by year-end 2021
4. With the shift to core and evergreen structures, the real estate portfolio should remain cash flow positive to the broader OPERF portfolio
5. Significant enhancements to the staffing model, underwriting process, and portfolio analytics allow for optimized portfolio oversight and long term program success

And looking forward…

1. Continue seeking strongly aligned strategic partnerships and leveraging OPERF's scale to drive down fees
2. With scalable strategic partnerships, complemented by tactical strategies, the portfolio is well-positioned to deliver on its role of lowering OPERF's equity beta while creating alpha relative to the policy benchmark

OREGON STATE TREASURY

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Oregon State Treasurer

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MEKETA
INVESTMENT GROUP

Oregon Public Employees' Retirement Fund

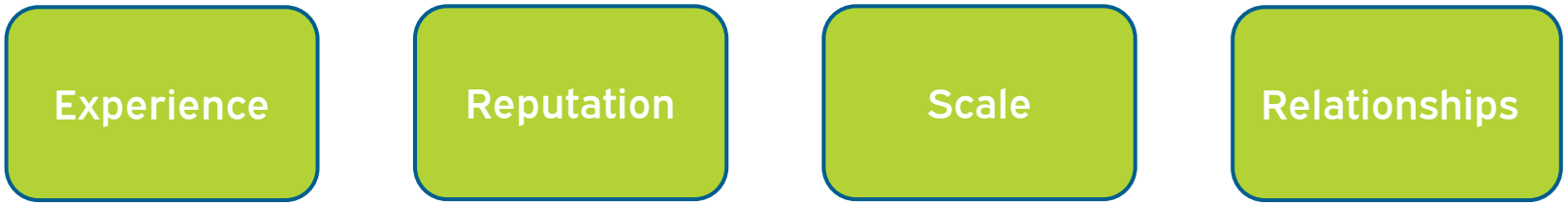
March 10, 2021

2021 Annual Program Review

OPERF 2021 Annual Program Review

Strong Real Estate Business Model

- There is a clear role for real estate within the broader OPERF portfolio
- OPERF has a set of competitive advantages that support long-term outperformance



- Persistency of core manager returns reflects strong manager selection
- Alignment of interests, including fee structures, is a material advantage
- No major changes are needed; continued fine tuning will support long-term resilient performance of portfolio

Market Observations

- Median real estate returns are moderating; opportunities for relative outperformance remain
- Real estate markets are uncertain AND dynamic

Technology Enabled Sectors | Specialty Property Types | Conversions and Mixed Uses | Population Migration

- The landscape of institutional CRE investment opportunities is expanding and increasingly requires evolving skill sets
- Real estate asset management is higher human touch than ever, but also facilitated by new technologies that help reduce risks
- Costs of maintaining and improving assets are increasing
- Complexion of benchmark changing

Opportunities

- Integration of third-party data providers can be used to better understand portfolio performance
- Investors who deeply understand markets and property types can drive value
- Placing capital with partners who can add value at the operational level enhances OST's investment outcomes
- Deeper integration of ESG and DEI factors into OST's and its partners' business processes can further drive sustainable long-term investment performance
- Active collaboration with other institutions can broaden OST's impact

COVID Real Estate Language

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www.meketa.com

TAB 5 – OPERF Alternatives Program

March 10, 2021

OPERF Alternatives Portfolio

Annual Review and Forward Plan

OREGON STATE TREASURY

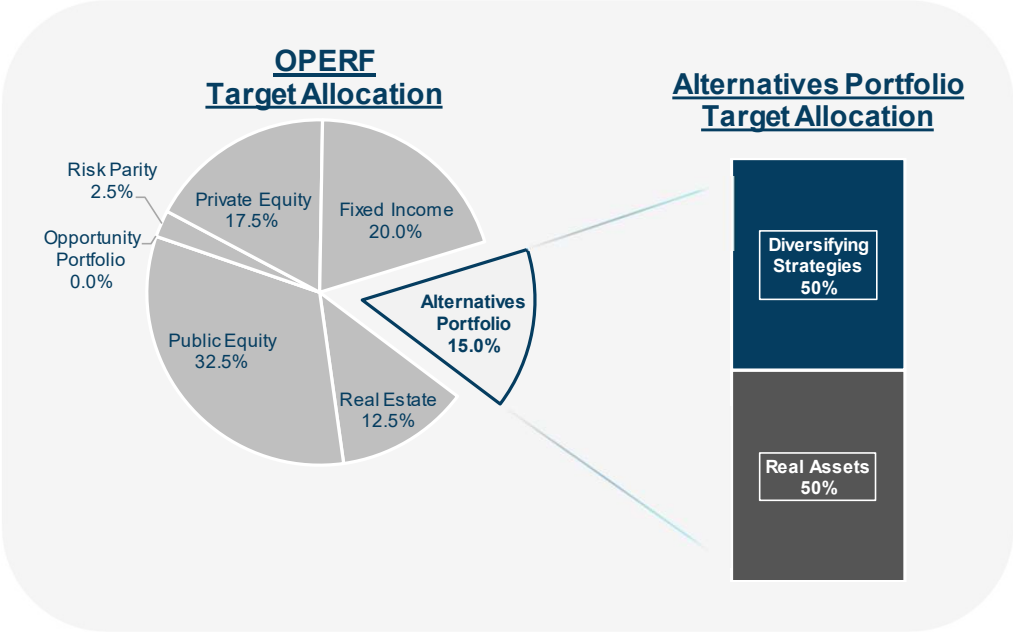
Agenda

		OIC Investment and Management Beliefs Mapping																	
Section	**Pages**	**1A**	**1B**	**1C**	**1D**	**2A**	**2B**	**3A**	**4A**	**4B**	**5A**	**5B**	**6A**	**6B**	**7A**	**7B**	**8A**	**8B**	**9A**
Alternatives Portfolio Overview	2-5				■	■	■		■	■			■	■			■	■	■
Real Assets Portfolio Review	6-21	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Diversifying Strategies Review	22-33				■	■	■				■		■	■			■	■	■
Appendix	34-36	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

	LEGEND: OIC INVESTMENT AND MANAGEMENT BELIEFS
1	**THE OIC SETS POLICY AND IS ULTIMATELY RESPONSIBLE FOR THE INVESTMENT PROGRAM**
	A. Investment management is dichotomous -- part art and part science.
	B. The OIC is a policy-setting council that largely delegates investment management activities to the OST and qualified external fiduciaries.
	C. The OIC is vested with the authority to set and monitor portfolio risk. Both short-term and long-term risks are critical.
	D. To exploit market inefficiencies, the OIC should be long term, contrarian, innovative, and opportunistic in its investment approach.
2	**ASSET ALLOCATION DRIVES RISK AND RETURN**
	A. Asset allocation is the OIC's primary policy tool for managing the investment program's long-term risk/return profile.
	B. Portfolio construction, including diversification and correlation considerations, is essential to maximizing risk-adjusted returns.
3	**THE EQUITY RISK PREMIUM WILL BE REWARDED**
	A. Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.
4	**PRIVATE MARKET INVESTMENTS CAN ADD SIGNIFICANT VALUE AND REPRESENT A CORE OIC/OST COMPETENCY**
	A. The OIC can capitalize on its status as a true, long-term investor by making meaningful allocations to illiquid, private market investments.
	B. Dispersion in private market investment returns is wide; accordingly, top-quartile manager selection, diversification across vintage year, strategy type, and geography, and careful attention to costs are paramount.
5	**CAPITAL MARKETS HAVE INEFFICIENCIES THAT CAN BE EXPLOITED**
	A. Inefficiencies that can be exploited by active management may exist in certain segments of the capital markets.
	B. Passive investment management in public markets will outperform the median active manager in those markets over time.
6	**COSTS DIRECTLY IMPACT INVESTMENT RETURNS AND SHOULD BE MONITORED AND MANAGED CAREFULLY**
	A. All fees, expenses, commissions, and transaction costs should be diligently monitored and managed in order to maximize net investment returns.
	B. External incentive structures should be carefully evaluated to ensure proper alignment with investment program objectives.
7	**FAIR AND EFFICIENT CAPITAL MARKETS ARE ESSENTIAL FOR THE LONG-TERM INVESTMENT SUCCESS**
	A. The OIC recognizes that the quality of regulation and corporate governance can affect the long-term value of its investments.
	B. The OIC also recognizes that voting rights have economic value.
8	**THE INTEGRATION OF ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG) FACTORS, SIMILAR TO OTHER INVESTMENT FACTORS, MAY HAVE A BENEFICIAL IMPACT ON THE ECONOMIC OUTCOME OF AN INVESTMENT AND AID IN THE ASSESSMENT OF RISKS ASSOCIATED WITH THAT INVESTMENT**
	A. The consideration of ESG factors within the investment decision-making framework is important in understanding the near-term and long-term impacts of investment decisions.
	B. Over time, there has been an evolution of multi-factor, or more holistic approaches, to identify opportunities and remediate risks, in a large globally-diversified investment portfolio.
9	**DIVERSITY, IN ALL ASPECTS, IS ACCRETIVE TO MEETING OIC OBJECTIVES**
	A. By embracing and enhancing diversity and inclusion efforts, the OIC ensures that the investment program will be exposed to and informed by a wide range of perspectives, ideas and opinions.

Strategic Role

- Alternatives Portfolio background
  - Alternatives Portfolio approved at January 2011 OIC meeting; seeded July 2011 with 3 investments from the Opportunity Portfolio.
  - Target allocation for the Portfolio has increased 3 times since its inception:
    - From 5% to 10% in June 2013, from 10% to 12.5% in June 2015, and from 12.5% to 15.0% in April 2019.
- Alternatives Portfolio objectives
  - Participate in attractive long-term investment opportunities.
  - Diversify the overall OPERF investment portfolio.
  - Seek non-real estate *real assets* and *diversifying strategies* exposures.
  - Less correlated returns, diversifying risk premia.
  - Includes inflation hedging objective.
  - Performance objective: CPI + 4%.



- Performance

	3 Month	1 Year	3 Year	5 Year	7 Year	Since Incept.
Alternatives Portfolio	**3.1%**	**-4.8%**	**-3.2%**	**0.9%**	**0.7%**	**1.2%**
CPI + 4%	1.4%	5.5%	5.9%	6.1%	5.7%	5.6%
Difference	*1.6%*	*-10.3%*	*-9.1%*	*-5.1%*	*-5.0%*	*-4.4%*

Source: State Street. Data as of January 31, 2021.

Positioning

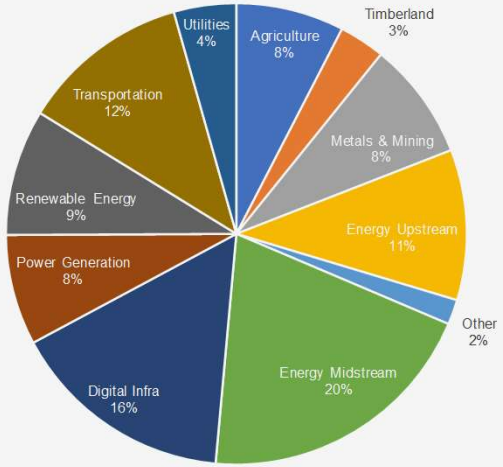
Alternatives Portfolio Strategic Allocation Targets

Strategy	Target ($)	Target (%)	Target Range (%)	Market Value ($)	Market Value (%)
Real Assets	$6,148.5	50.0%	+/- 5.0%	$4,767.2	56.7%
Diversifying Strategies	$6,148.5	50.0%	+/- 5.0%	$3,639.3	43.3%
Total	**$12,296.9**	**100.0%**		**$8,406.5**	**100.0%**

Top 10 Managers

Manager	Market Value ($)	Market Value (%)	Strategy
AQR Capital Management	$1,258.0	15.0%	Diversifying Strategies
Stonepeak Infrastructure Partners	$763.8	9.1%	Real Assets
Global Infrastructure Partners	$651.8	7.8%	Real Assets
Grantham, Mayo, Van Otterloo & Co.	$531.7	6.3%	Diversifying Strategies
Bridgewater Associates	$525.2	6.2%	Diversifying Strategies
Brookfield Asset Management	$518.2	6.2%	Real Assets
Aspect Capital	$491.8	5.9%	Diversifying Strategies
EQT Partners	$396.5	4.7%	Real Assets
NGP Energy Capital Management	$346.2	4.1%	Real Assets
BlackRock Asset Investors	$333.4	4.0%	Diversifying Strategies

Real Assets Sector Weighting



Diversifying Strategies Sector Weighting

OREGON STATE TREASURY

Source: State Street, Aksia. Data as of January 31, 2021. $ in millions.

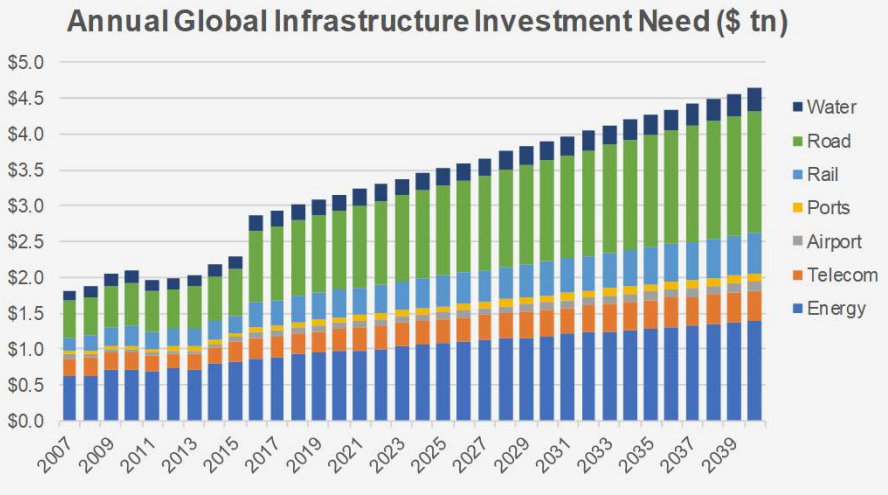
Executive Summary

- Primary role of the Alternatives Portfolio = diversification
  - Seeking less correlated and diversifying sources of returns as well as inflation hedges or inflation-sensitive returns.
- Alternatives Portfolio still young and build-out remains ongoing
  - Market value as of January 31, 2021 =$8.4 billion (vs. $12.3 billion target).
  - Market value as a % of OPERF as of January 31, 2021 = 10.3% (vs. 15.0% target).
  - Approximately 70% of total commitments authorized and capital contributed in past 5 years; Portfolio has a weighted-average age of 3.5 years.
- Real Assets highlights
  - Natural resources experiencing performance headwinds from commodities and commodity-linked exposures; infrastructure performance overall faring better.
  - Although early stage, co-investment implementation proceeding to plan.
  - Strong set of existing managers, offering opportunities to expand relationships.
  - Continued evolution of risk profile, steadily increasing exposure to lower risk segments.
- Diversifying Strategies highlights
  - Equity Value factor was yet again a material driver (and detractor) of returns.
  - New dedicated consultant (Albourne) approved at October OIC meeting; development of DSP 3.0 blueprint ("Project Pathfinder") underway.

Topics

1. Alternatives Portfolio Overview
2. **Real Assets Portfolio (RAP) Update**
   A. Markets
   B. 2020 Review
   C. Exposures
   D. Results
   E. 2021 Priorities
3. Diversifying Strategies Portfolio (DSP) Update
4. Appendix

Markets: Infrastructure

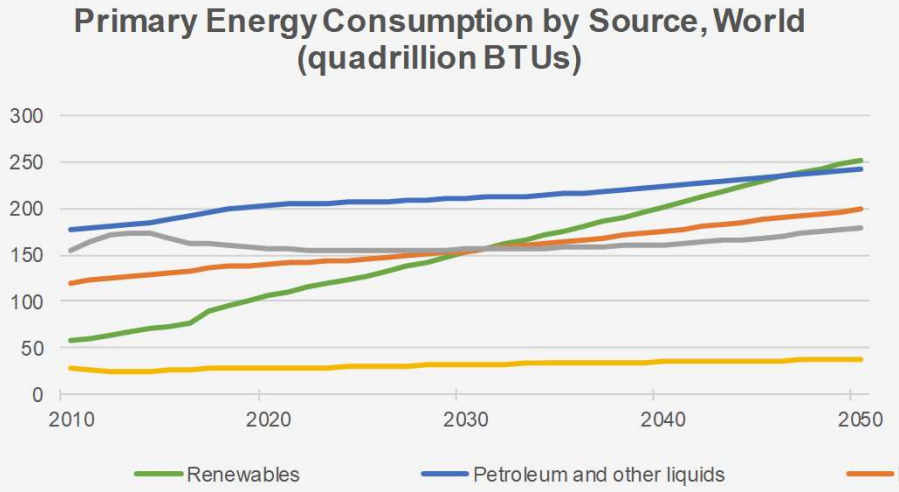


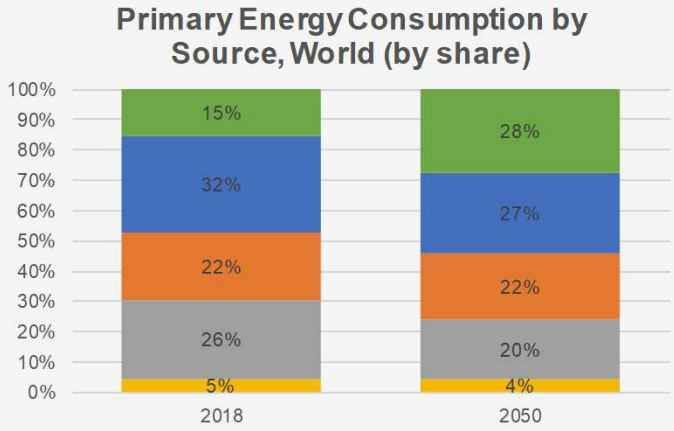
Source: GI HUB

Digital Transformation

Metric	2018	2023	Growth	CAGR
Global population (bn)	7.6	8.0	1.1x	1%
Global internet users (bn)	3.9	5.3	1.4x	6%
Internet users % of pop.	*51%*	*66%*	1.3x	
Global mobile subscribers	5.1	5.7	1.1x	2%
Mobile subscribers % of pop.	*67%*	*71%*	1.1x	
Global Mobile Devices (bn)	8.8	13.1	1.5x	8%
Global avg. devices per capita	2.4	3.6	1.5x	8%
Global M2M connections	6.1	14.7	2.4x	19%
Global Wi-Fi hotspots (mn)	169	628	3.7x	30%
Global avg. mobile speed (Mbps)	13.2	43.9	3.3x	27%
Global avg. fixed broadband speed (Mbps)	45.9	110.4	2.4x	19%
Global mobile speed by network type (Mbps)	4G = 32	5G = 575	18.0x	78%
Number of DDoS attacks (mns)	7.9	15.4	1.9x	14%

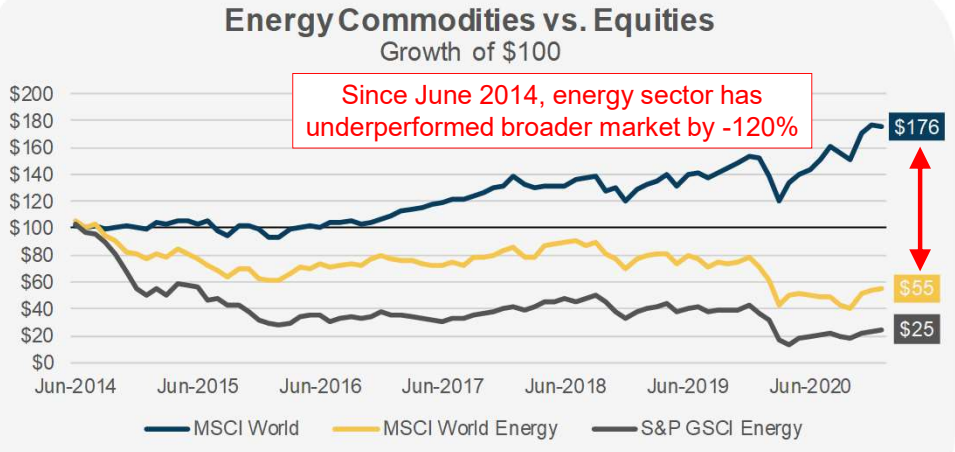
Source: Cisco



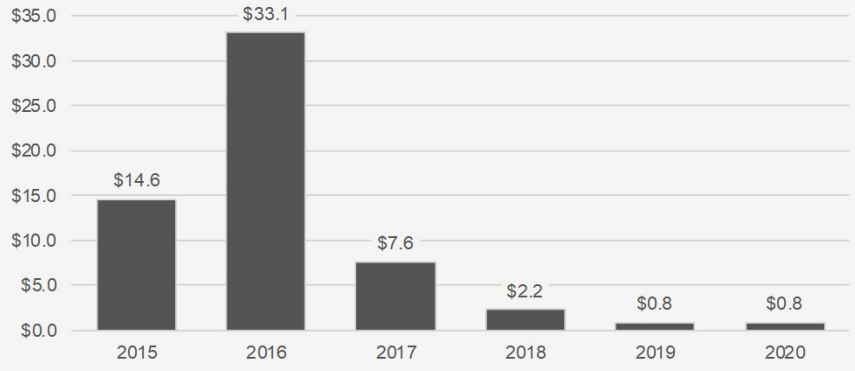


Source: EIA

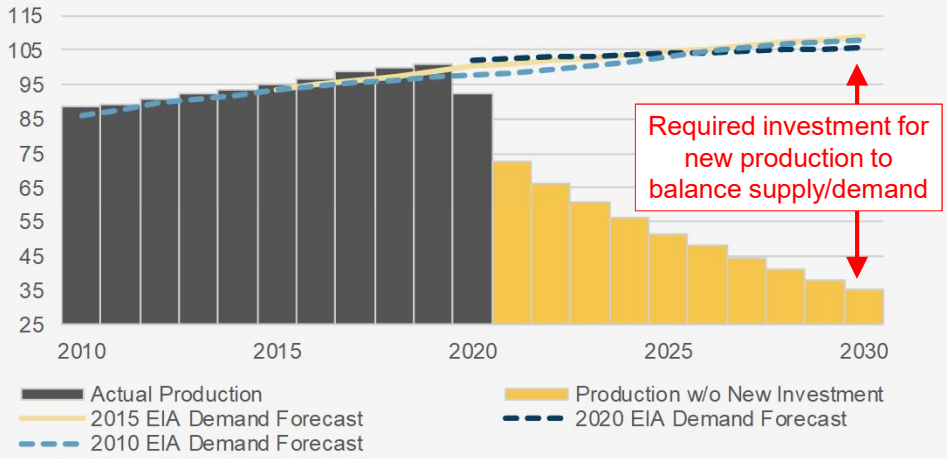
Markets: Natural Resources (1)

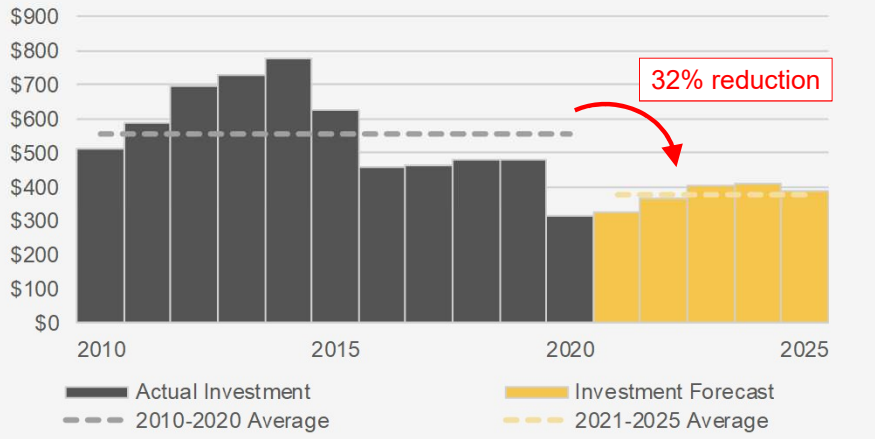


Source: eVestment Alliance. Chart data: June 2014-January 2021.



Source: Dealogic.





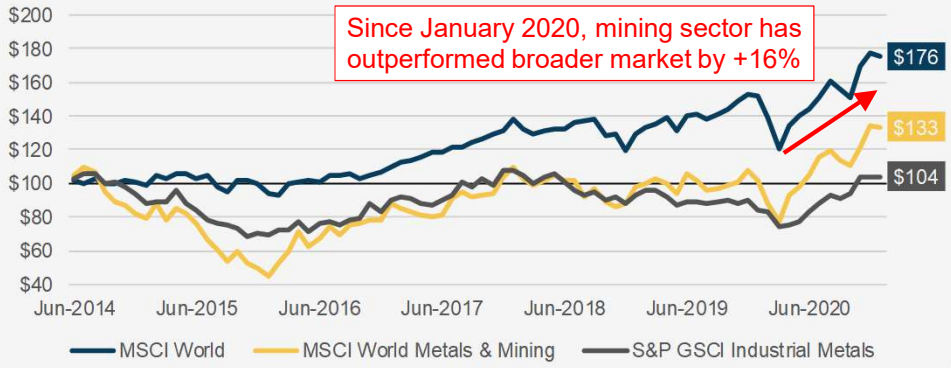
Source: EIA, IEA, Wood Mackenzie

OREGON STATE TREASURY

Markets: Natural Resources (2)

Industrial Metal Commodities vs. Equities

Growth of $100



Source: eVestment Alliance. Chart data: June 2014-January 2021.

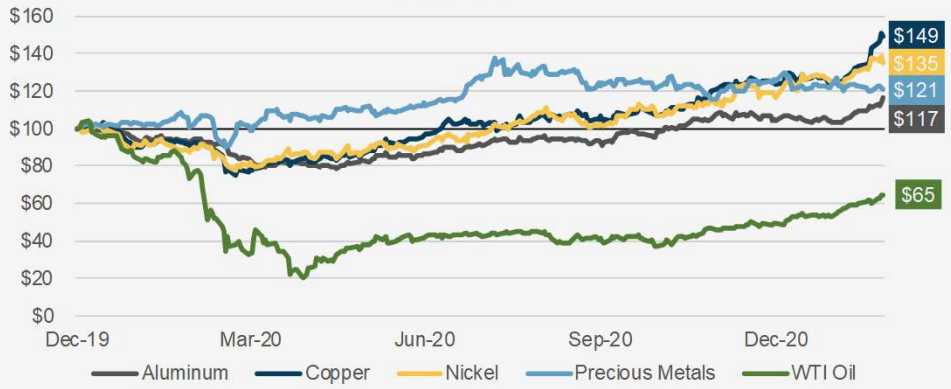
Mapping Commodities with Low-Carbon Technologies

Commodity	Electric Vehicles	Wind	Solar PV	Hydro	Energy Storage	CCS	2040 projected ET-Related Demand[1]	Increase in ET Demand from 2020 to 2040[1]
Cobalt	■				■	■	79%	18.0x
Copper	■	■	■	■	■	■	48%	6.7x
Lithium	■				■		91%	32.2x
Nickel	■	■	■	■	■		52%	40.0x

Source: World Bank, Wood Mackenzie.
[1]"ET" = Energy Transition. Under a 2 degrees warming scenario.

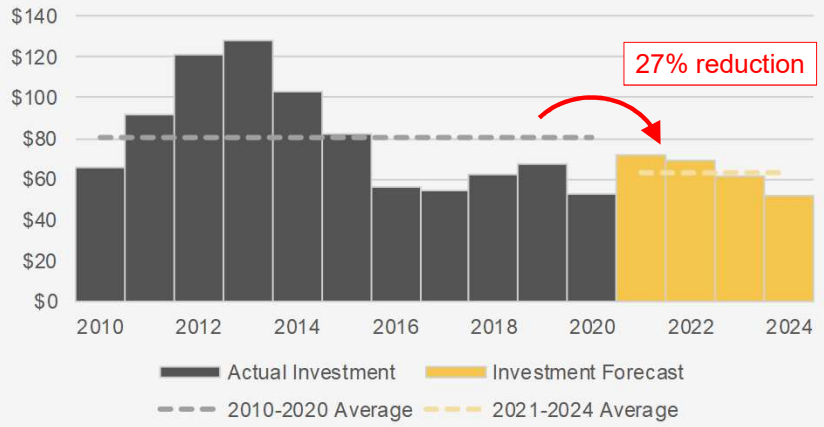
Commodity Price Performance

Growth of $100



Source: Bloomberg Commodity Sub-Indices.
Chart data: December 31, 2019-February 25, 2021.

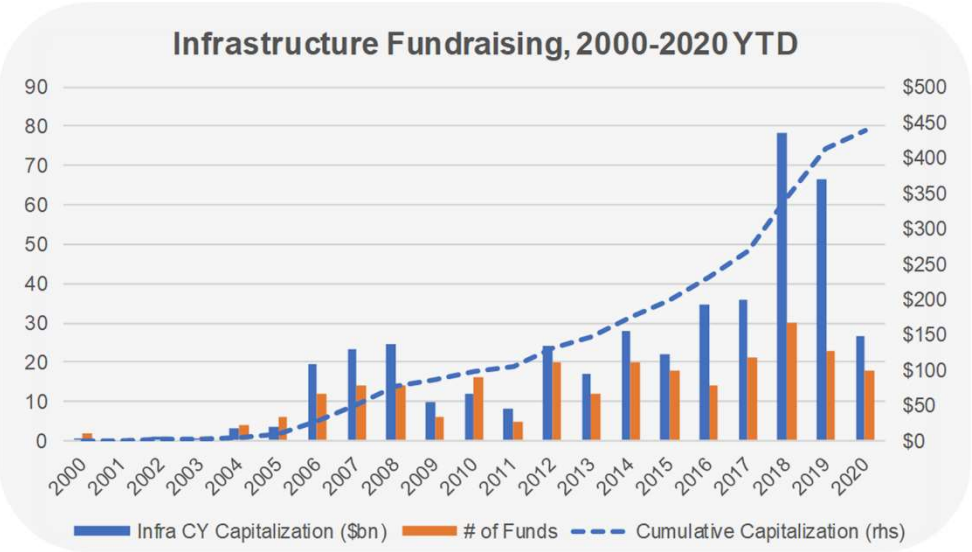
Global Mining Capital Investment ($ bn)

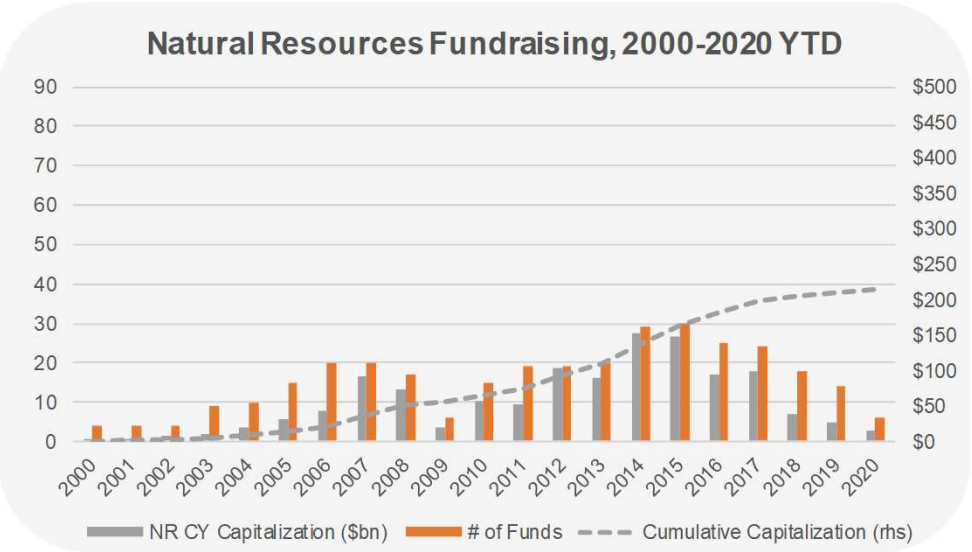


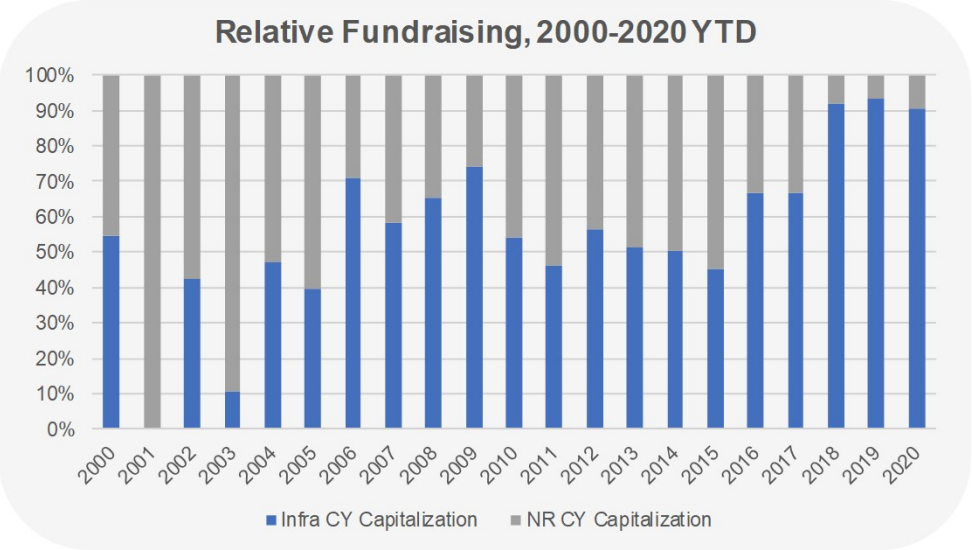
Source: Bloomberg.

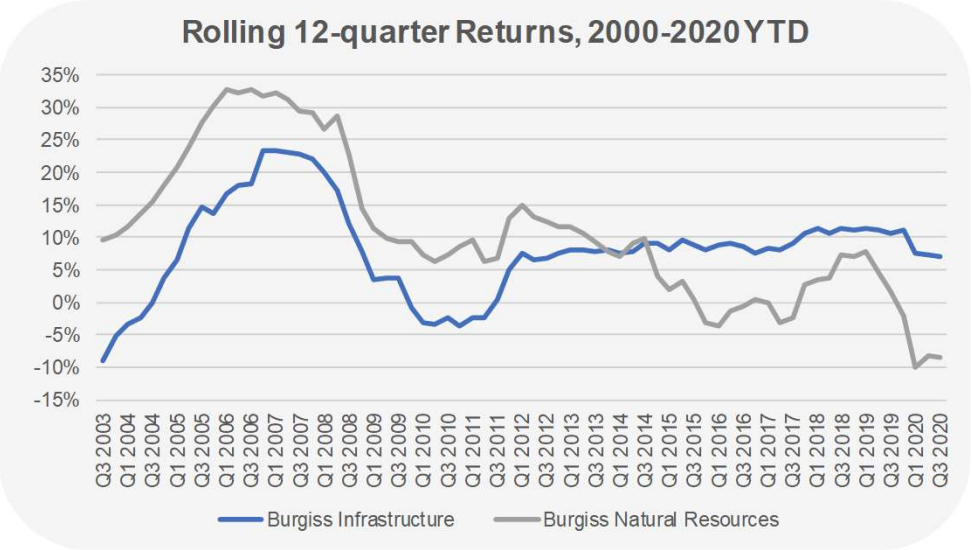
OREGON STATE TREASURY

Markets: Fundraising









OREGON STATE TREASURY

Source: Burgiss. Data as of September 30, 2020.

2020 Review: Priorities

- 2020 commitment pacing
  - $1.5 - $2.0 billion in aggregate commitments.
  - 5-10 commitments with an average commitment size of $150-$250 million.
    - ***Received approval for $1.6 billion in commitments across 9 investments.***
- Co-investment
  - Execute on envisioned side-car implementation structure.
    - ***Received approval for 3 co-investment side-car commitments in 2020; discussions with other relationships progressing well.***
- Monitoring and risk management
  - Continue to pursue enhancements to monitoring and risk management efforts.
  - Assist in formalization of ESG integration across the broader Alternatives Program.
    - ***Made significant progress across monitoring, risk management, and ESG efforts; continue to refine and integrate.***
- Conduct research reviews of areas of interest
  - Communication infrastructure.
  - "Low risk" core infrastructure.
  - Energy natural resources.
    - ***All three completed.***

2020 Review: Approvals

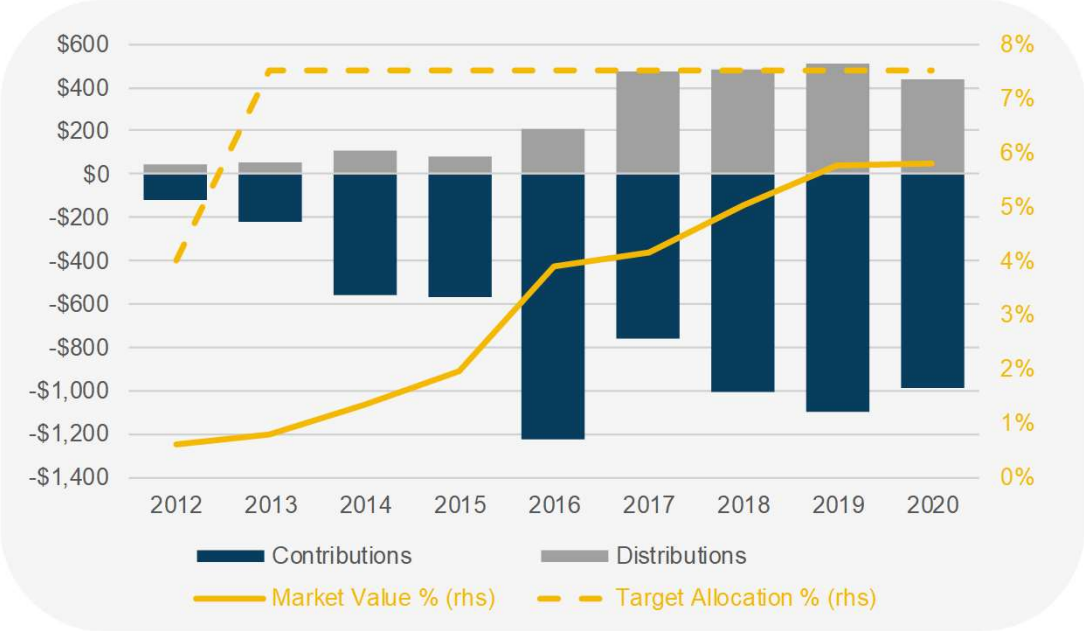
- Portfolio build-out continues on track
  - During 2020, OIC/OST authorized $1.6 billion in commitments across 9 investments.
    - 4 of the commitments were new relationships; 5 were "re-ups."
    - Pacing was within plan ($1.5-2.0 billion per annum).
  - Continued progress towards lower fees through tailored partnership structures, seed capital negotiations, early close discounts, and co-investment. Of note, $150 million (or 9.3%) of commitments were made to dedicated co-investment side car vehicles.
  - Continued refinement to strategy and development of anchor positions complemented by specialist/next generation relationships. No shortage of deal flow! Steady stream of new managers, strategies, and structures.

Investment	Strategy	Authorized Date	Commitment Amount ($MM)
Bolt Energy LLC top-off	Infrastructure	February 2020	$12.0
Stonepeak Infrastructure Fund IV, L.P.	Infrastructure	March 2020	$500.0
NGP Royalty Partners, L.P.	Natural Resources	May 2020	$150.0
EQT Infrastructure V (No. 2) USD SCSp	Infrastructure	October 2020	$350.0
EQT Infrastructure V co-invest side car	Infrastructure	October 2020	$50.0
Brookfield Super-Core Infrastructure Partners L.P.	Infrastructure	December 2020	$250.0
Harrison Street Social Infrastructure Fund, L.P.	Infrastructure	December 2020	$200.0
Harrison Street Social Infrastructure Fund co-invest side car	Infrastructure	December 2020	$50.0
BIF IV co-invest side car	Infrastructure	December 2020	$50.0
2020 Total			**$1,612.0**

Source: OST Staff.

2020 Review: Cash Flow Activity

- Cash flow activity consistent with expectations
  - As anticipated, Portfolio cash outflows have exceeded cash inflows by a meaningful amount with pace of contributions increasing as capital commitments are made. The weighted-average age of commitments has increased gradually through time, averaging approximately 3 years (representing the early stage of the Portfolio).
  - As of December 31, 2020, OPERF has contributed $6.8 billion in capital, funding approximately 66% of aggregate capital commitments. Approximately $4.4 billion of capital commitments remain outstanding. Since inception, a total of $2.4 billion has been distributed to OPERF.

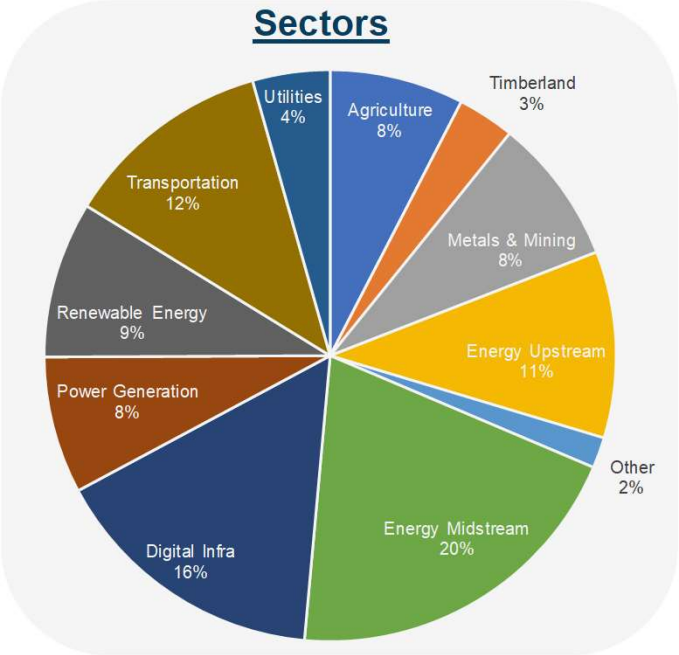


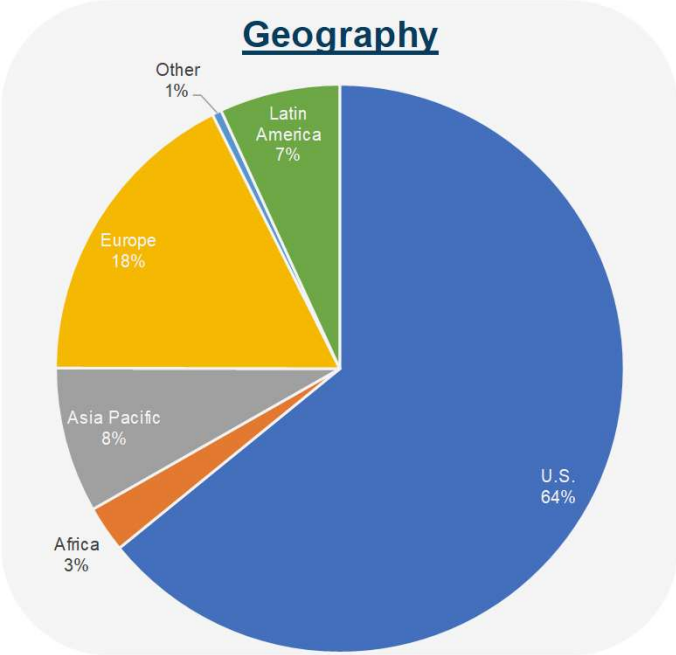
Source: Aksia. Data as of December 31, 2020.

Exposures: Strategies

- Strategy, sector, and geography exposure by market value

Strategy	Active GPs	Total GPs	Active Funds	Total Funds	Committed	Market Value $	MV %	Unfunded	Total Exposure $	TE %
Infrastructure	13	13	27	27	$5,658,088,595	$3,133,425,274	67%	$2,438,045,965	$5,571,471,239	65%
Natural Resources	16	17	27	30	$3,997,362,500	$1,548,728,246	33%	$1,398,140,728	$2,946,868,974	35%
Energy	*5*	*6*	*12*	*15*	*$2,179,862,500*	*$684,622,058*	*15%*	*$865,552,286*	*$1,550,174,344*	*18%*
Metals & Mining	*5*	*5*	*8*	*8*	*$800,000,000*	*$359,843,708*	*8%*	*$377,189,058*	*$737,032,766*	*9%*
Timber & Ag	*6*	*6*	*7*	*7*	*$767,500,000*	*$504,262,480*	*11%*	*$155,399,384*	*$659,661,864*	*8%*
Total	**29**	**30**	**54**	**57**	**$9,655,451,095**	**$4,682,153,520**	**100%**	**$3,836,186,693**	**$8,518,340,213**	**100%**

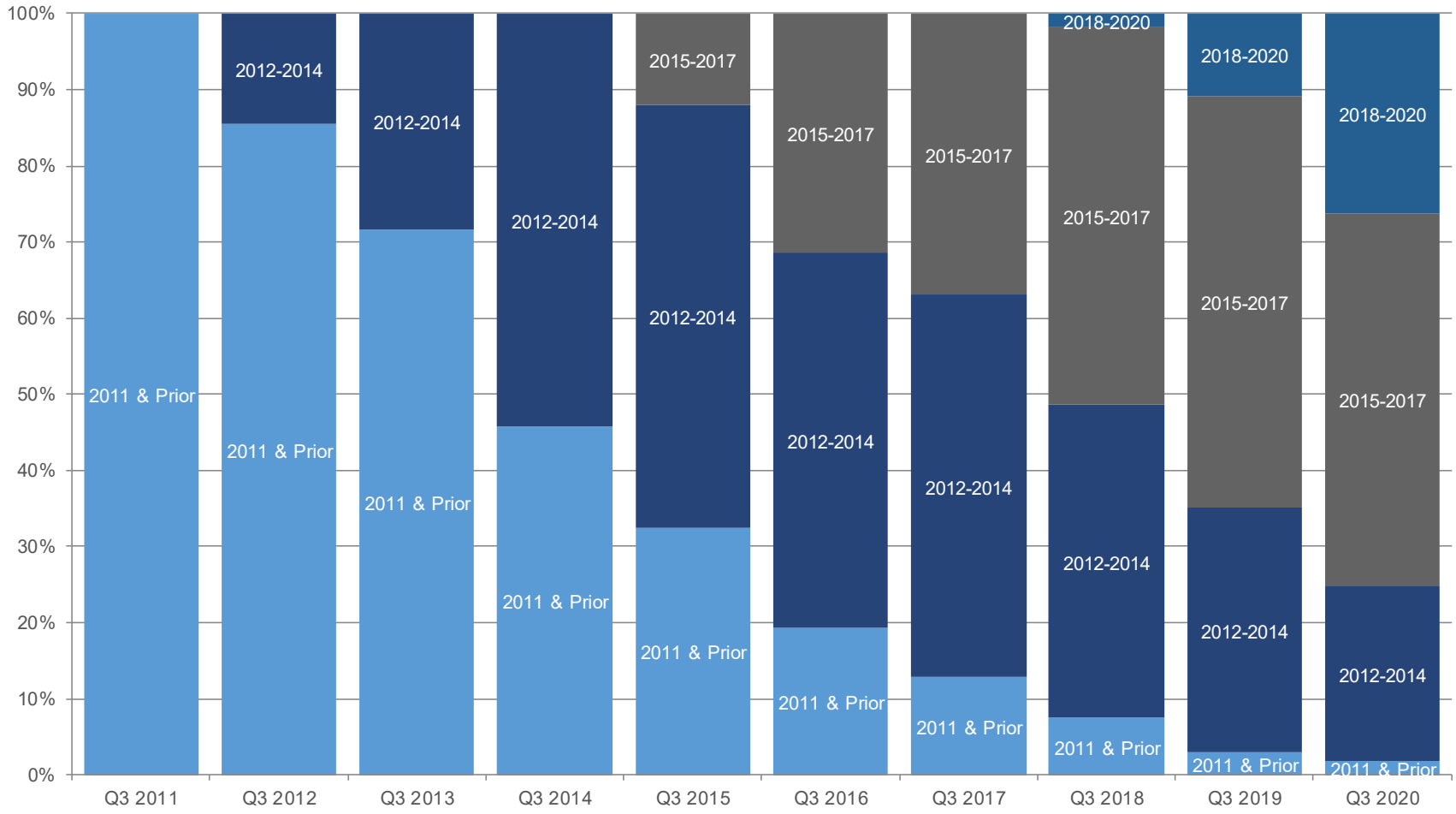




Source: OST, Aksia. Data as of September 30, 2020. Figures do not include post-September 30, 2020 commitments (e.g., EQT Infra V, BSIP, HS SIF, and BIV IV side car).

Exposures: Vintage Years

- Vintage year cohort exposure by market value over time

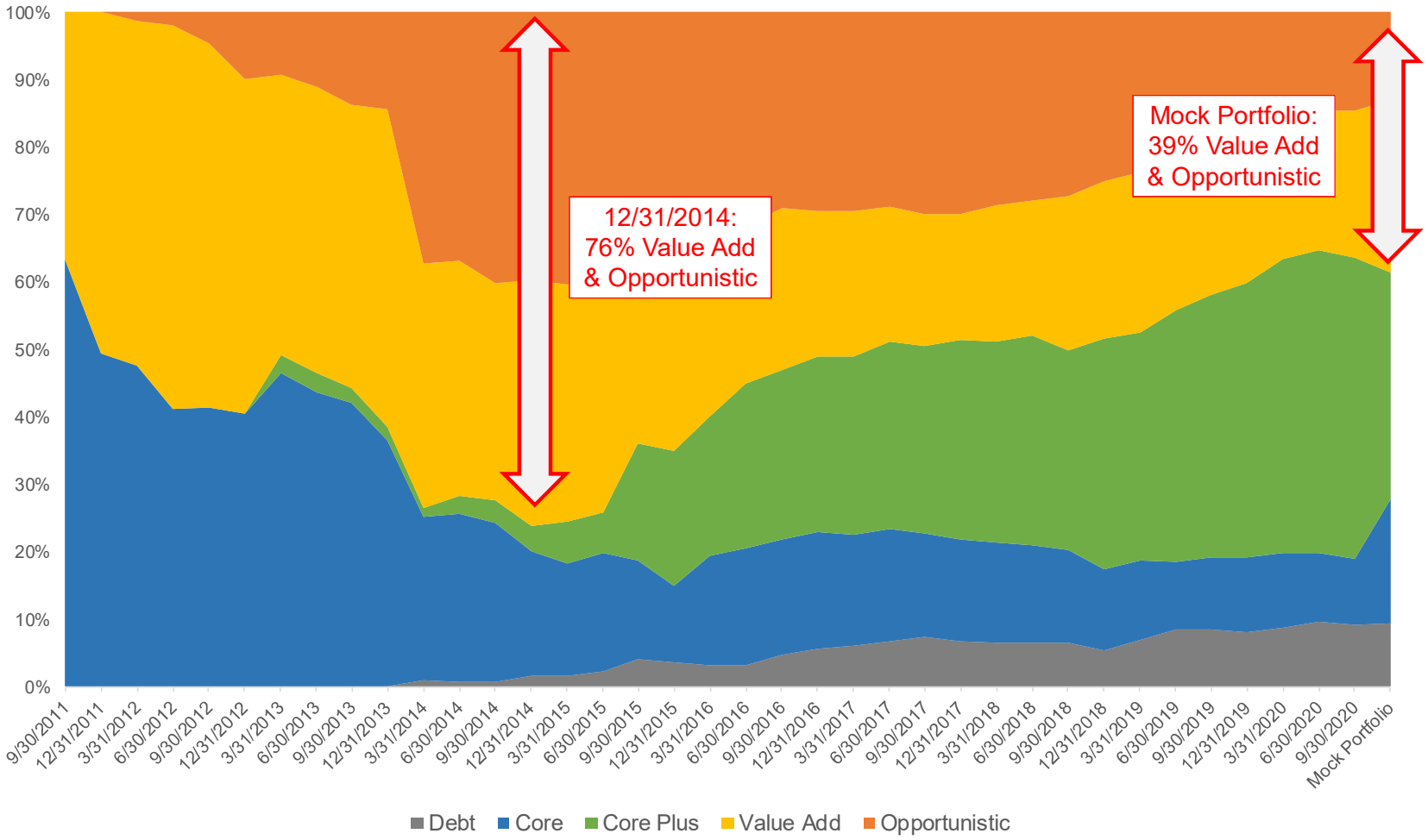


75% of FMV
2015 and later

Source: Aksia. Data as of September 30, 2020.

Exposures: Risk Metrics

- Risk categories by market value over time



Source: OST Staff, Aksia. Data as of September 30, 2020.

Results: Commentary

- Absolute return contributors
  - **Positive**
    - Infrastructure: +8.4% (59% of RAP).
    - Metals & Mining: +7.0% (8% of RAP).
  - **Negative**
    - Natural Resources: -5.0% (41% of RAP).
    - Energy: -7.8% (21% of RAP).
    - J-curve impacts (Portfolio weighted-average age of 3.6 years).
- Relative return contributors vs. Burgiss Real Assets (ex-Real Estate) Universe

While not an official RAP benchmark, the Burgiss Manager Universe (BMU) dataset provides a point of comparison relative to the broader (and investable) market.

  - **Positive**
    - Manager selection in recent vintage years.
    - Infrastructure outperformance.
    - "Other" Natural Resources (e.g., Metals & Mining) outperformance.
  - **Negative**
    - Manager selection in early vintage years.
    - Overweight to Natural Resources.

Approx. equal impacts

Source: OST Staff, Aksia. Data as of September 30, 2020.

Results: Portfolio Returns at 9/30/20

IRR	Q120	Q220	Q320	1 Year	2 Year	3 Year	5 Year	7 Year	ITD
Real Assets Portfolio	**-8.5%**	**3.6%**	**1.7%**	**-1.9%**	**-3.4%**	**-0.1%**	**2.6%**	**1.8%**	**1.8%**
CPI + 4%	1.4%	0.9%	1.9%	5.4%	5.5%	5.8%	5.8%	5.5%	5.6%
Difference	*-9.9%*	*2.7%*	*-0.2%*	*-7.3%*	*-8.9%*	*-5.9%*	*-3.3%*	*-3.7%*	*-3.8%*
Burgiss Real Assets (ex-RE)	-10.6%	3.4%	2.3%	-4.5%	-3.0%	1.0%	4.0%	4.0%	4.2%
Difference	*2.1%*	*0.2%*	*-0.6%*	*2.6%*	*-0.3%*	*-1.1%*	*-1.5%*	*-2.1%*	*-2.4%*

IRR	Q120	Q220	Q320	1 Year	2 Year	3 Year	5 Year	7 Year	ITD
Infrastructure	**-4.6%**	**4.2%**	**2.7%**	**5.4%**	**6.9%**	**7.6%**	**8.2%**	**8.8%**	**8.4%**
CPI + 4%	1.4%	0.9%	1.9%	5.4%	5.5%	5.8%	5.8%	5.5%	5.6%
Difference	*-6.0%*	*3.4%*	*0.8%*	*0.1%*	*1.4%*	*1.8%*	*2.4%*	*3.2%*	*2.9%*
Burgiss Infrastructure	-4.9%	3.0%	2.6%	2.5%	4.6%	6.8%	8.4%	8.4%	7.8%
Difference	*0.3%*	*1.2%*	*0.2%*	*2.9%*	*2.3%*	*0.7%*	*-0.2%*	*0.4%*	*0.6%*
S&P Global Infrastructure	-29.3%	13.6%	1.4%	-14.6%	-1.6%	-2.3%	3.5%	3.2%	3.6%
Difference	*24.7%*	*-9.4%*	*1.4%*	*20.0%*	*8.5%*	*9.9%*	*4.7%*	*5.5%*	*4.8%*

IRR	Q120	Q220	Q320	1 Year	2 Year	3 Year	5 Year	7 Year	ITD
Natural Resources	**-14.4%**	**2.4%**	**-0.3%**	**-13.4%**	**-16.0%**	**-9.2%**	**-3.9%**	**-5.1%**	**-5.0%**
CPI + 4%	1.4%	0.9%	1.9%	5.4%	5.5%	5.8%	5.8%	5.5%	5.6%
Difference	*-15.8%*	*1.6%*	*-2.2%*	*-18.8%*	*-21.6%*	*-15.0%*	*-9.7%*	*-10.7%*	*-10.6%*
Burgiss Natural Resources	-21.5%	4.4%	1.6%	-17.9%	-15.7%	-8.6%	-3.0%	-2.9%	-1.8%
Difference	*7.1%*	*-2.0%*	*-1.9%*	*4.4%*	*-0.4%*	*-0.6%*	*-0.8%*	*-2.2%*	*-3.2%*
S&P Global Natural Resources	-33.0%	20.2%	2.0%	-10.2%	-10.9%	-3.4%	6.0%	-0.8%	-2.3%
Difference	*18.6%*	*-17.7%*	*-2.3%*	*-3.2%*	*-5.1%*	*-5.8%*	*-9.8%*	*-4.3%*	*-2.7%*
S&P GSCI	-42.3%	10.5%	4.6%	-27.8%	-22.3%	-9.5%	-7.9%	-13.7%	-11.0%
Difference	*27.9%*	*-8.0%*	*-4.9%*	*14.4%*	*6.3%*	*0.3%*	*4.0%*	*8.6%*	*6.0%*

Evidence of more defensive tilt?

Source: Aksia, Burgiss, eVestment. Portfolio inception July 1, 2011.

Results: VY Cohort Returns at 9/30/20

IRR	# of Obs	Q120	Q220	Q320	1 Year	3 Year	5 Year	ITD
RAP All Vintages	**57**	**-8.5%**	**3.6%**	**1.7%**	**-1.9%**	**-0.1%**	**2.6%**	**1.8%**
RAP 2007-2014	22	-13.8%	3.3%	1.0%	-10.1%	-8.7%	-1.9%	-2.0%
Burgiss Real Assets (ex-RE) 2007-2014	247	-11.5%	2.9%	1.8%	-7.9%	-1.0%	3.1%	4.2%
Difference vs 2007-2014		*-2.3%*	*0.3%*	*-0.8%*	*-2.3%*	*-7.7%*	*-5.0%*	*-6.2%*
RAP 2015-2020	35	-6.0%	3.7%	2.0%	1.7%	6.2%	6.6%	6.6%
Burgiss Real Assets (ex-RE) 2015-2020	232	-9.8%	3.9%	2.6%	-1.8%	3.6%	5.4%	5.3%
Difference vs 2015-2020		*3.8%*	*-0.1%*	*-0.6%*	*3.5%*	*2.6%*	*1.2%*	*1.2%*

IRR	# of Obs	Q120	Q220	Q320	1 Year	3 Year	5 Year	ITD
Infrastructure All Vintages	**27**	**-4.6%**	**4.2%**	**2.7%**	**5.4%**	**7.6%**	**8.2%**	**8.4%**
Infrastructure 2007-2014	10	-5.4%	1.7%	1.7%	-0.7%	4.0%	6.2%	7.2%
Burgiss Infrastructure 2007-2014	105	-4.5%	1.7%	2.1%	0.1%	5.8%	7.9%	7.1%
Difference vs 2007-2014		*-0.9%*	*0.0%*	*-0.4%*	*-0.8%*	*-1.9%*	*-1.7%*	*0.2%*
Infrastructure 2015-2020	17	-4.4%	5.1%	3.0%	7.6%	9.6%		9.9%
Burgiss Infrastructure 2015-2020	119	-5.1%	3.7%	2.8%	4.1%	7.9%	8.5%	8.4%
Difference vs 2015-2020		*0.7%*	*1.3%*	*0.3%*	*3.5%*	*1.7%*		*1.5%*

IRR	# of Obs	Q120	Q220	Q320	1 Year	3 Year	5 Year	ITD
Natural Resources All Vintages	**30**	**-14.4%**	**2.4%**	**-0.3%**	**-13.4%**	**-9.2%**	**-3.9%**	**-5.0%**
Natural Resources 2007-2014	12	-22.6%	5.5%	0.1%	-20.3%	-19.5%	-9.9%	-10.4%
Burgiss Natural Resources 2007-2014	142	-21.0%	4.9%	1.4%	-18.2%	-9.8%	-3.5%	-0.9%
Difference vs 2007-2014		*-1.6%*	*0.6%*	*-1.2%*	*-2.2%*	*-9.7%*	*-6.4%*	*-9.5%*
Natural Resources 2015-2020	18	-9.1%	1.0%	-0.5%	-9.3%	0.9%	2.5%	2.4%
Burgiss Natural Resources 2015-2020	113	-23.0%	4.4%	2.0%	-17.9%	-6.4%	-1.7%	-1.8%
Difference vs 2015-2020		*13.9%*	*-3.4%*	*-2.5%*	*8.7%*	*7.4%*	*4.1%*	*4.1%*

Source: Aksia, Burgiss, eVestment. Portfolio inception July 1, 2011.

Results: Vintage Year Quartiles at 9/30/20

OPERF RAP					Burgiss Real Assets ex. Real Estate						
Vintage Year	IRR	TVPI	Commit. ($mn)	# of Obs	Top Quartile		Median		Bottom Quartile		# of Obs
					IRR	TVPI	IRR	TVPI	IRR	TVPI	
2007	-100.0%	0.42x	$10.5	1	7.8%	1.43x	2.4%	1.15x	-0.3%	0.96x	33
2008	2.8%	1.18x	$129.6	1	10.6%	1.73x	5.1%	1.24x	-1.5%	0.91x	31
2009			$0.0	0	8.2%	1.41x	6.4%	1.24x	-1.7%	0.96x	12
2010	-16.7%	0.39x	$221.2	2	4.3%	1.28x	1.9%	1.12x	-6.3%	0.71x	30
2011			$0.0	0	7.0%	1.28x	-0.6%	0.98x	-9.3%	0.72x	24
2012	7.4%	1.32x	$542.5	6	11.8%	1.46x	4.3%	1.15x	-2.0%	0.86x	39
2013	1.4%	1.06x	$505.0	5	10.3%	1.43x	1.7%	1.04x	-4.6%	0.81x	32
2014	-6.1%	0.80x	$1,150.0	7	11.0%	1.39x	5.6%	1.19x	-1.1%	0.96x	49
2015	4.3%	1.16x	$675.0	5	10.1%	1.29x	5.0%	1.16x	-1.3%	0.97x	48
2016	7.6%	1.22x	$1,675.0	7	9.9%	1.25x	6.5%	1.15x	-1.6%	0.96x	39
2017	5.0%	1.09x	$659.4	4	10.2%	1.21x	4.7%	1.10x	-6.3%	0.91x	45
2018	11.1%	1.12x	$1,553.0	6	9.7%	1.12x	0.4%	1.00x	-9.9%	0.93x	48
2019	6.6%	1.05x	$1,684.2	10	7.4%	1.04x	-3.2%	0.97x	-19.4%	0.88x	36
2020	N/M	N/M	$850.0	3	2.5%	1.03x	-4.1%	0.97x	-35.1%	0.80x	24

1st	2nd	3rd	4th

Source: Aksia, Burgiss. Data as of September 30, 2020.

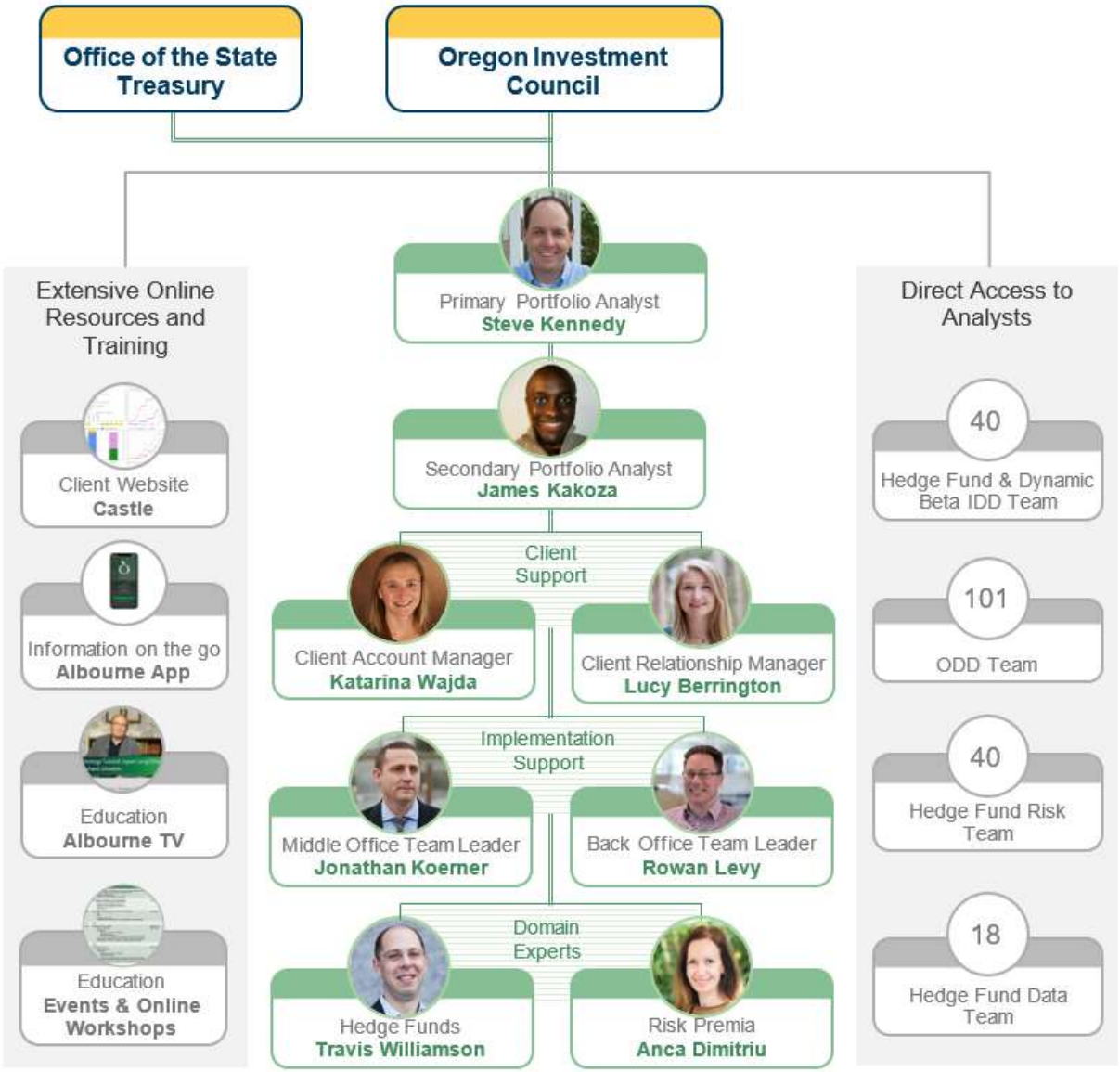
2021 RAP Priorities

1. 2021 commitment pacing
   - $1.5 - $2.0 billion in aggregate commitments.
     - In-line with $1.75 billion annual pacing target.
   - 5-10 commitments with an average commitment size of $150-$250 million.
2. Co-investment
   - Continue to execute on envisioned structure.
3. Consultant contract
   - Initial three-year term of Aksia/TorreyCove agreement ends December 31, 2021.
   - Targeting Q3/Q4 recommendation.
4. Monitoring and risk management
   - Continue to pursue enhancements to monitoring and risk management efforts.
   - Further formalize ESG and D&I integration across the broader Alternatives Program.
5. Conduct research reviews of areas of interest
   - Energy transition.
   - "Middle market" infrastructure.
   - Aviation finance.

Topics

1. Alternatives Portfolio Overview
2. Real Assets Portfolio (RAP) Update
3. **Diversifying Strategies Portfolio (DSP) Update**
   A. Albourne Introduction
   B. 2020 Review
   C. Exposures
   D. Results
   E. 2021 Priorities
4. Appendix

Albourne Introduction: Client Team



Source: Albourne.

Albourne Introduction: Firm (1)

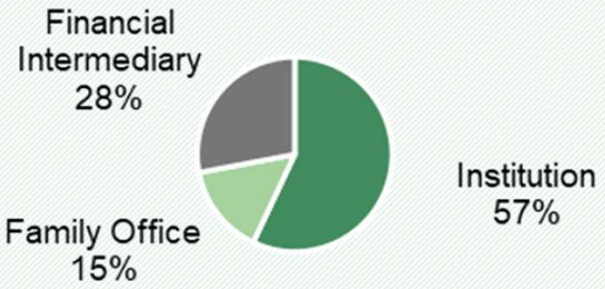
Access & Alignment: Our clients have over $550bn invested in alternative assets

>300 Clients[1]

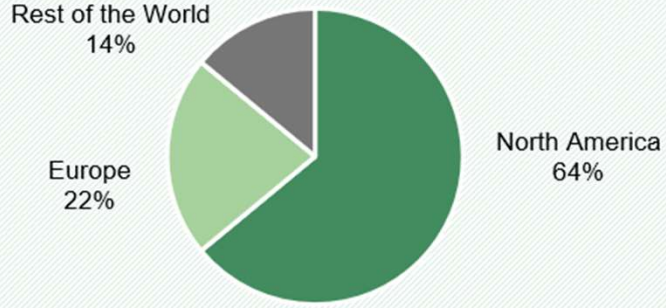
41 Public Pension Plans[2]

- Teacher Retirement System of Texas
- The Missouri Education Pension Trust
- Utah Retirement Systems
- South Carolina Retirement System

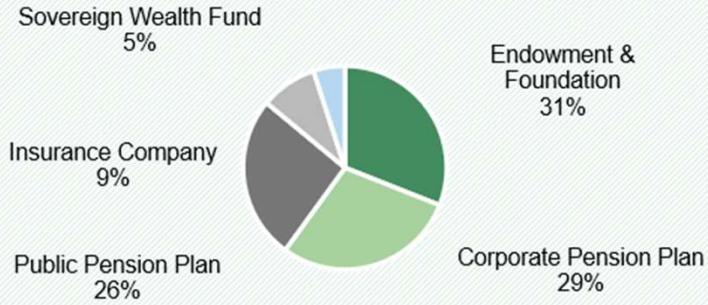
Clients by Type



Clients by Region

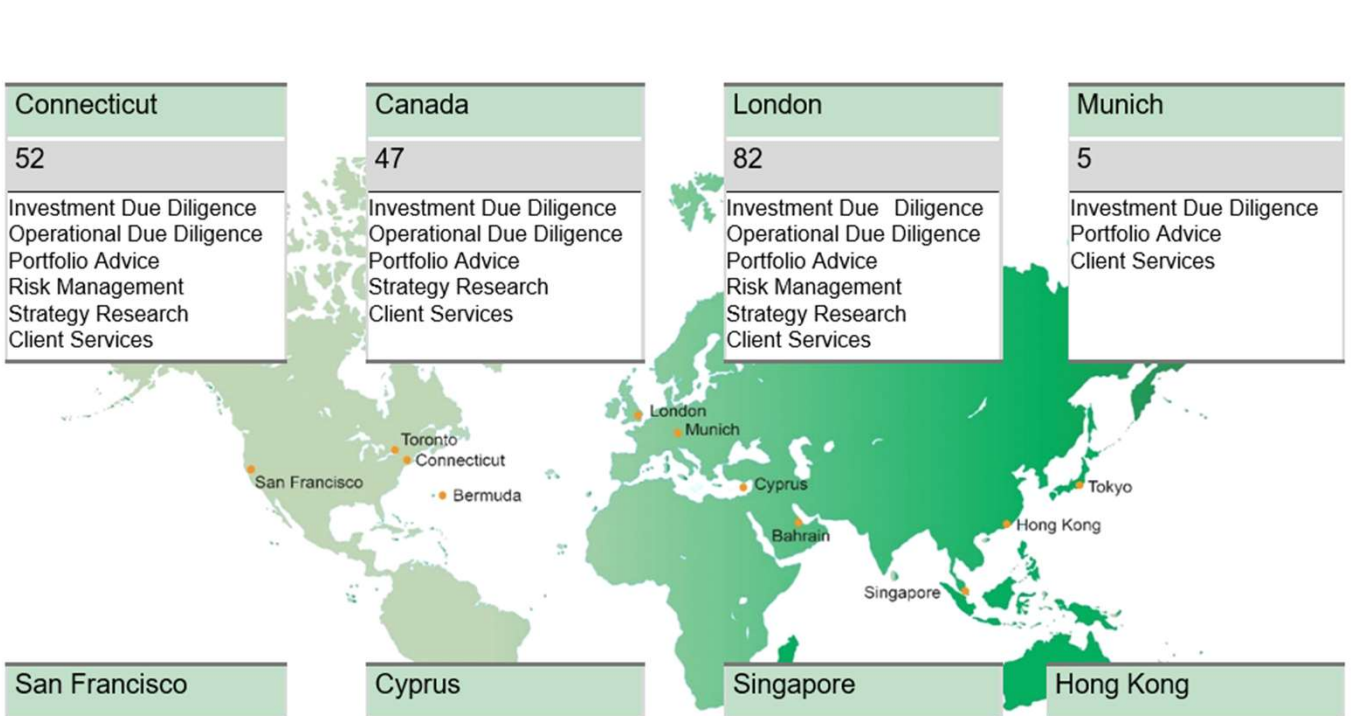


Institutions by Type



Source: Albourne. 1. The aggregate number of client entities for the Albourne Group worldwide. Clients may be subscribed to multiple services. 2. The client list is a partial sampling of Albourne's client universe. In accordance with the SEC's requirement for an objective methodology for partial client lists, these clients are the four largest public pension plan client, using what Albourne believes to be their AUM in hedge funds & private markets as the criterion and omitting only those requesting anonymity. It is not known whether the listed clients approve or disapprove of the services provided Albourne.

Albourne Introduction: Firm (2)



Connecticut	Canada	London	Munich
52	47	82	5
Investment Due Diligence Operational Due Diligence Portfolio Advice Risk Management Strategy Research Client Services	Investment Due Diligence Operational Due Diligence Portfolio Advice Strategy Research Client Services	Investment Due Diligence Operational Due Diligence Portfolio Advice Risk Management Strategy Research Client Services	Investment Due Diligence Portfolio Advice Client Services

San Francisco	Cyprus	Singapore	Hong Kong
46	197	10	14
Investm ent Due Diligence Operational Due Diligence Portfolio Advice Risk Management Strategy Research Client Services	Investment Due Diligence Operational Due Diligence Risk Management Strategy Research IT Development	Investment Due Diligence Operational Due Diligence Portfolio Advice Strategy Research Client Services	Investment Due Diligence Operational Due Diligence Strategy Research Client Services

Firm

443 Staff

Partners

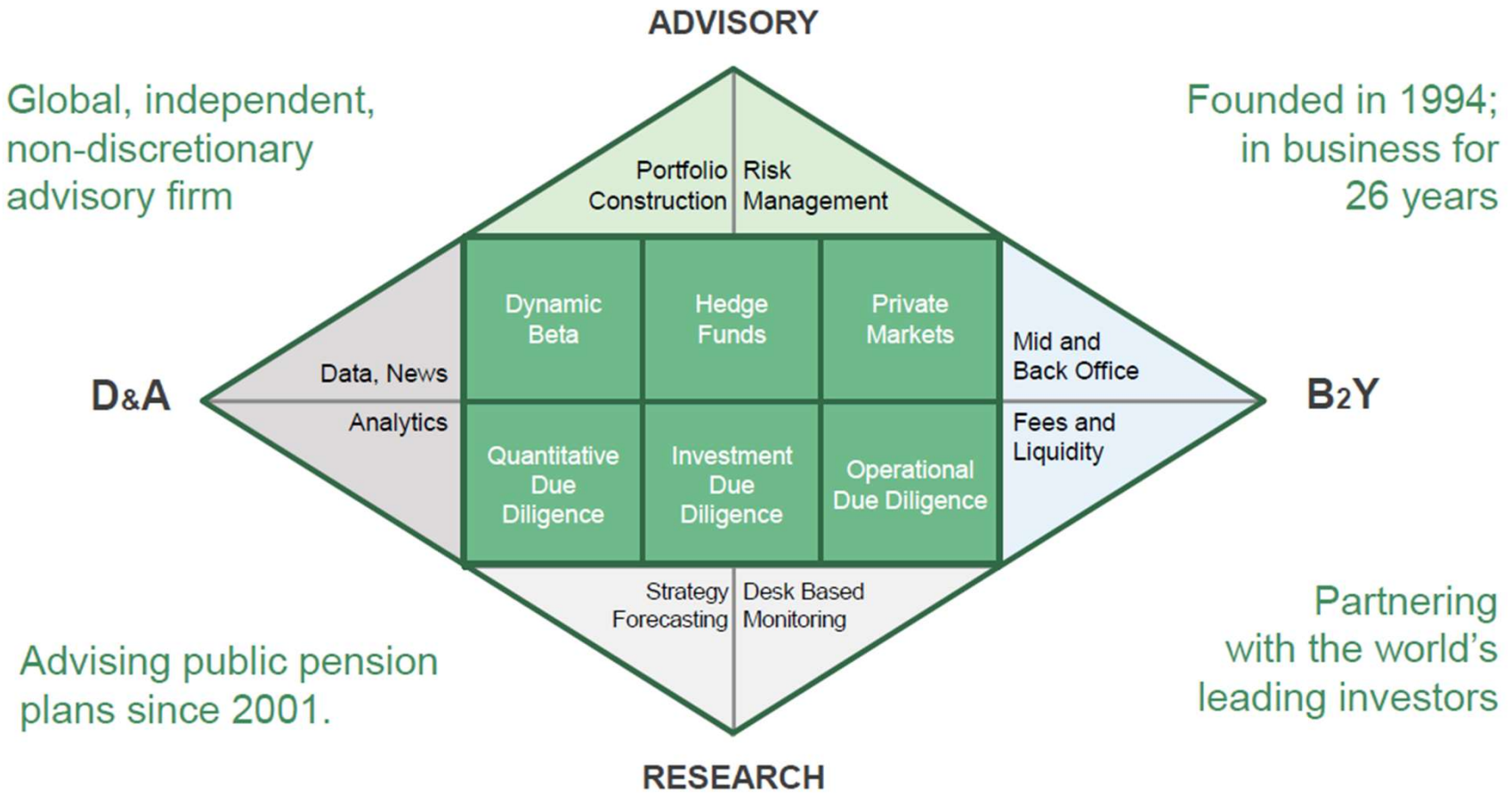
98 Partners

Board

12 Board Members

Source: Albourne. All figures as of January 2021.

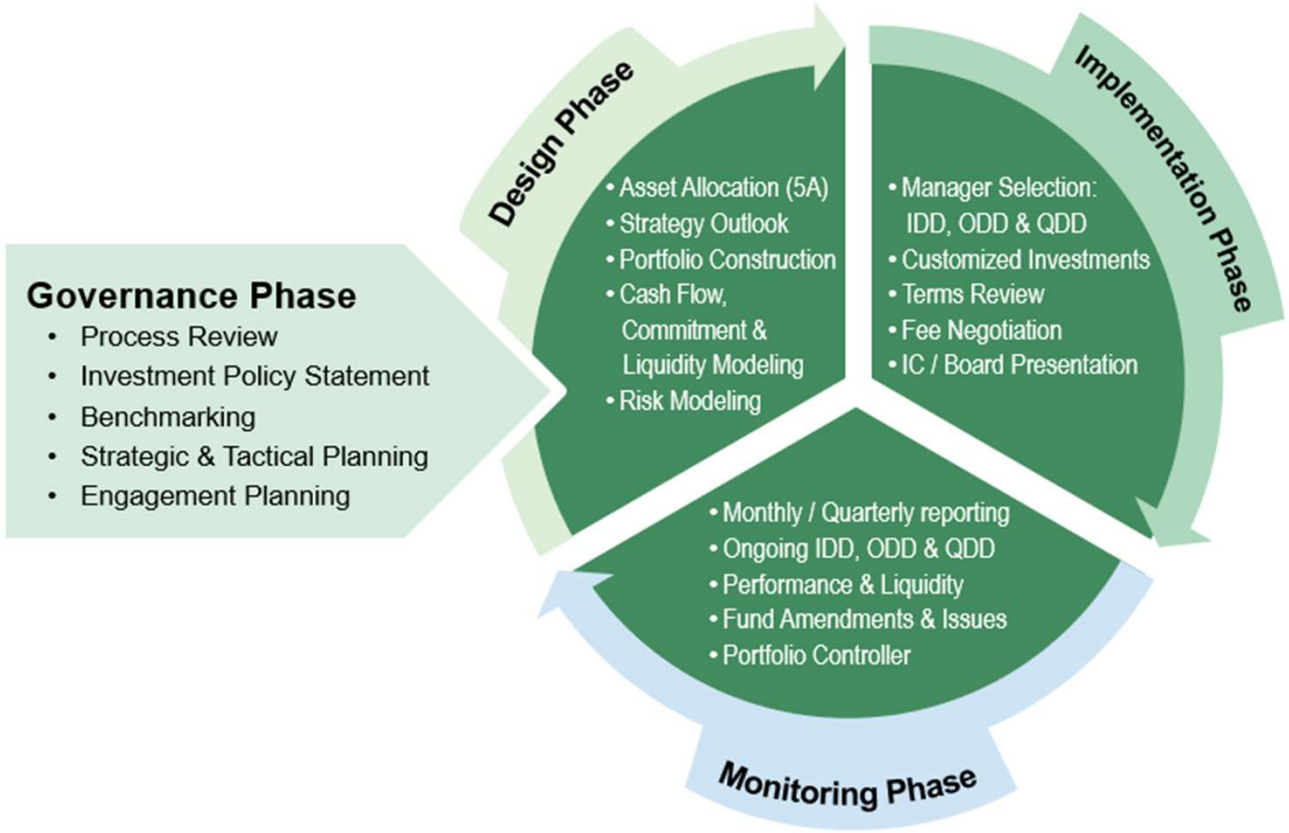
Albourne Introduction: Services



Source: Albourne.

Albourne Introduction: Onboarding

- Onboarding road map and Project Pathfinder
  - Initial kick-off call held February 1, 2021.
  - Introductions to back/middle office and strategy analysts forthcoming.
  - Use Project Pathfinder to evaluate roles and objectives of the Portfolio, followed by the tactical steps required to move today's portfolio in the long-term direction.



Source: Albourne.

2020 Review: Priorities

- Consultant search
  - RFP for dedicated Diversifying Strategies consultant commenced July 1, with the intention of bringing forward a recommendation later in 2020.
    - ***Completed. Albourne selected at October OIC meeting.***
- DSP 3.0 evaluation
  - Once newly hired consultant is onboarded, engage on development of "DSP 3.0" blueprint.
    - ***Although early stage, "Project Pathfinder" underway.***
- Monitoring and risk management
  - Continue to pursue enhancements to monitoring and risk management efforts.
    - ***Made significant progress across monitoring, risk management, and ESG efforts; continue to refine and integrate.***
- Continue Equity Value (and general factor) research
    - ***Completed initial scope of research, but continue to evaluate role and objectives of factor strategies broadly.***

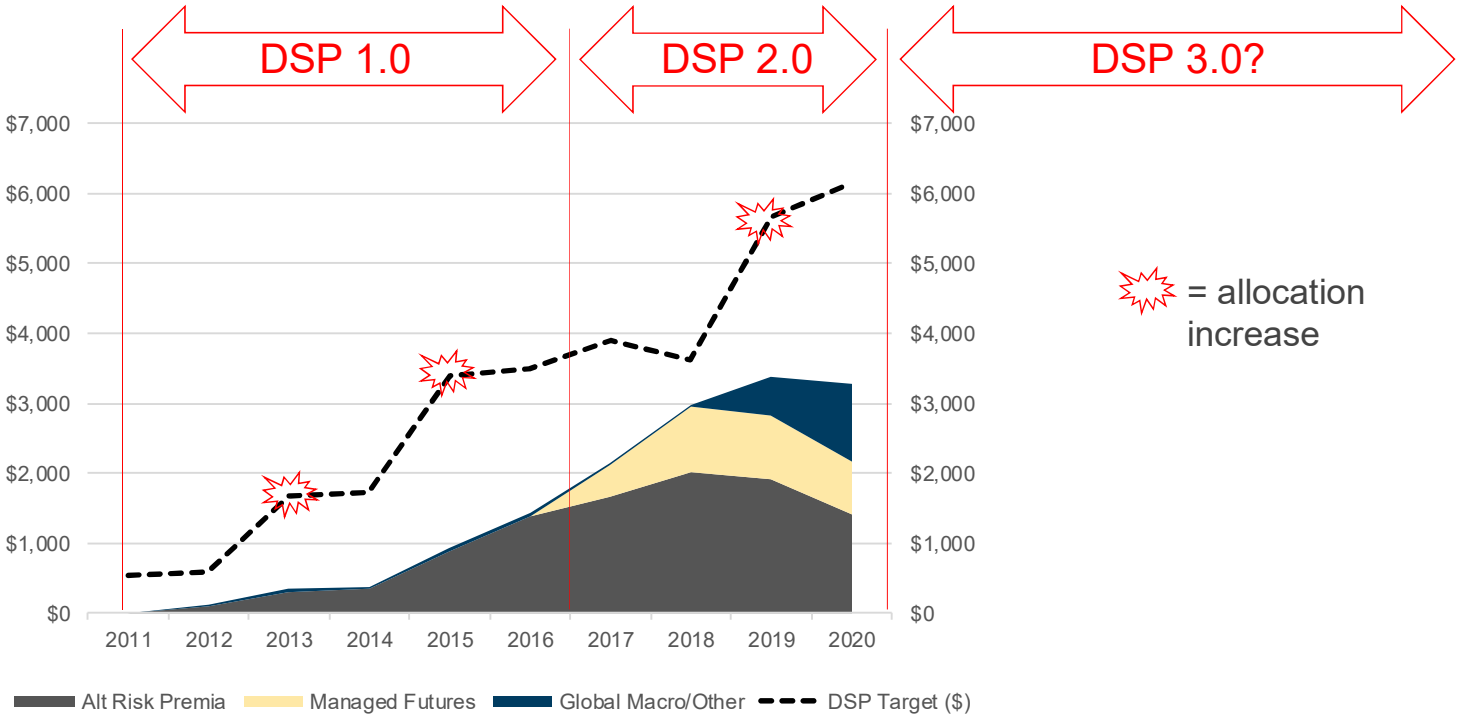
2020 Review: Approvals

- Modest portfolio activity in 2020
  - After addition of third Trend Following manager (FORT) in July 2020, activity was put on pause, awaiting consultant input before advancing further manager recommendations.

Investment	Strategy	Authorized Date	Commitment Amount ($MM)
FORT Global Trend	Trend Following	July 2020	$250.0
2020 Total			**$250.0**

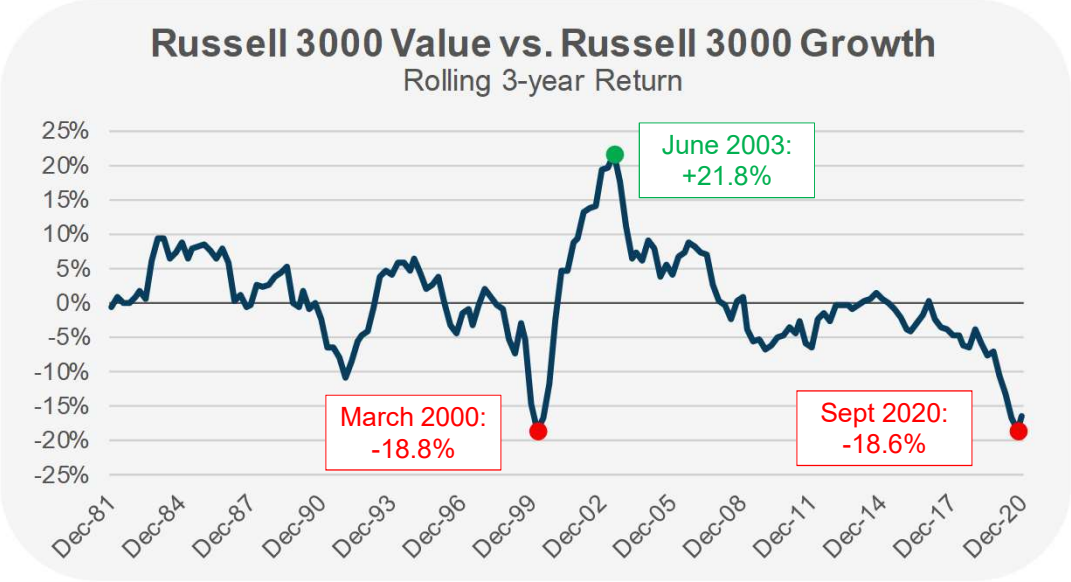
Exposures: Strategies

- Portfolio composition over time
  - Diversifying Strategies allocation has increased three times since inception, with each increase taking place early in the respective build-out of the allocation.
  - Staff considers three distinct periods of Portfolio construction evolution:
    - DSP 1.0: sole focus on Alternative Risk Premia. "Putting our beach towels down," establishing strategic partnership with AQR.
    - DSP 2.0: focused on expanding manager roster; established anchor relationships in Managed Futures and Global Macro/Other sectors.
    - DSP 3.0? Evaluation underway, with Albourne to assist. Likely broadening strategies of interest.



Results: Commentary

- Return contributors
  - DSP performance relative to policy performance objective and sector benchmarks is challenged, but reflective of initial manager and strategy concentration.
  - Despite the Equity Value factor accounting for only ~30% of the Diversifying Strategies Portfolio's risk, it explains nearly all of its losses. Staff believes this reflects just how severe the value drawdown has been.
  - Using the Russell 3000 style indices as proxies, the recent bout of underperformance for value is rivaled only during the height of the Dot-com bubble period.



Source: eVestment Alliance. Chart data: January 1979-December 2020.

Results: Portfolio Returns at 12/31/20

TWR	MRQ	1 Year	3 Year	5 Year	ITD
Diversifying Strategies Portfolio	**1.9%**	**-12.0%**	**-8.8%**	**-3.6%**	**1.1%**
CPI + 4%	1.1%	5.4%	5.9%	5.9%	5.6%
Difference	*0.8%*	*-17.3%*	*-14.7%*	*-9.6%*	*-4.5%*

TWR	MRQ	1 Year	3 Year	5 Year	ITD
Alternative Risk Premia	**-2.6%**	**-26.8%**	**-15.1%**	**-7.2%**	**-0.8%**
CPI + 4%	1.1%	5.4%	5.9%	5.9%	5.6%
Difference	*-3.6%*	*-32.1%*	*-21.0%*	*-13.2%*	*-6.4%*
SG MARP Index	-2.0%	-14.9%	-5.5%	-1.3%	
Difference	*-0.6%*	*-11.9%*	*-9.6%*	*-5.9%*	

TWR	MRQ	1 Year	3 Year	5 Year	ITD
Managed Futures	**3.1%**	**0.1%**	**-4.4%**		
CPI + 4%	1.1%	5.4%	5.9%		
Difference	*2.1%*	*-5.3%*	*-10.3%*		
SG Trend Index	8.5%	6.3%	2.2%		
Difference	*-5.4%*	*-6.2%*	*-6.6%*		

TWR	MRQ	1 Year	3 Year	5 Year	ITD
Global Macro	**6.5%**	**5.4%**			
CPI + 4%	1.1%	5.4%			
Difference	*5.4%*	*0.0%*			
HFRI Macro Total Index	5.0%	5.5%			
Difference	*1.5%*	*-0.1%*			

Source: Callan, Bloomberg, eVestment. Portfolio inception January 31, 2012.

2021 DSP Priorities

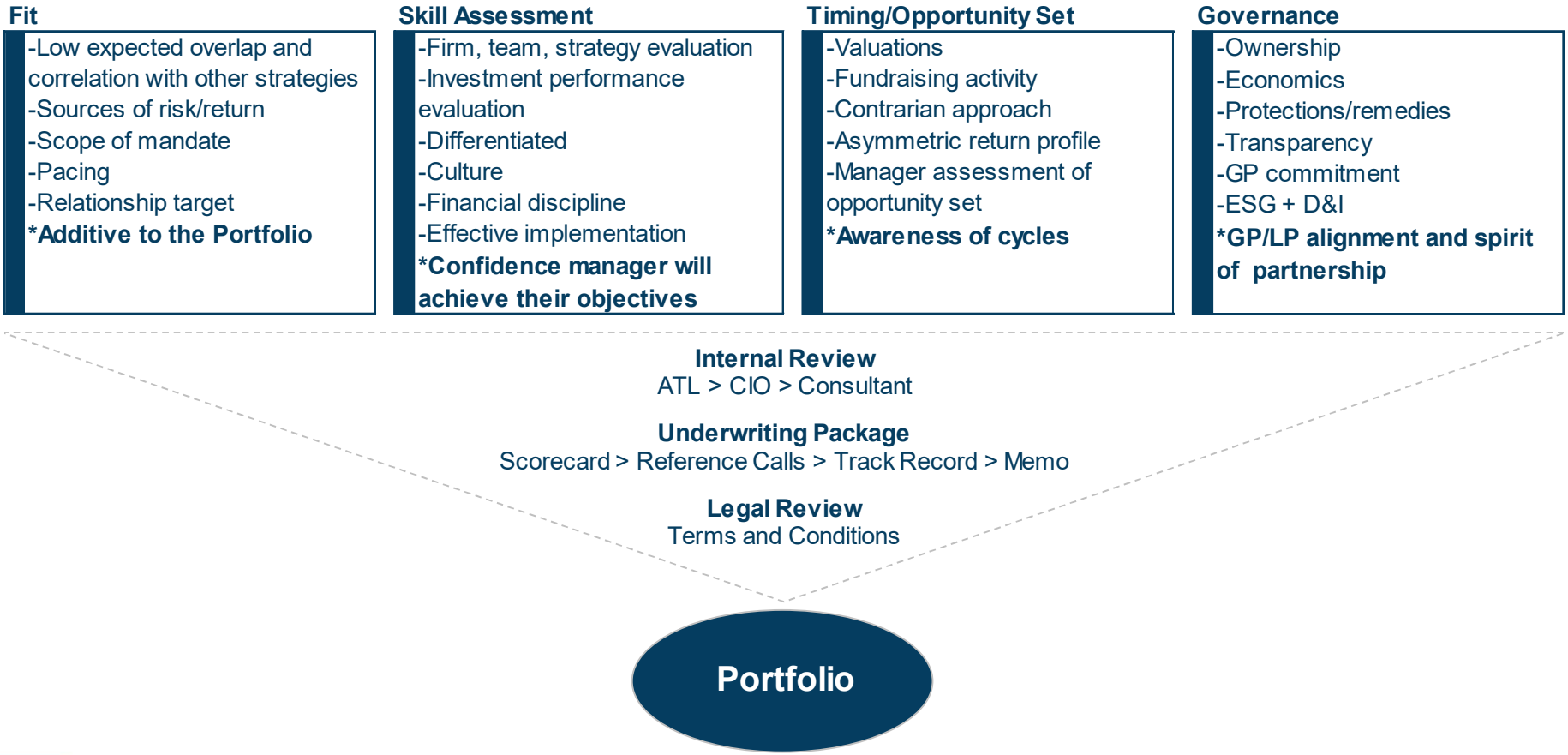
1. DSP 3.0 evaluation
   - Through "Project Pathfinder," look to make substantial progress towards formalizing DSP 3.0 vision and plan.
2. Monitoring and risk management
   - Continue to pursue enhancements to monitoring and risk management efforts, specifically onboarding and leveraging Albourne's capabilities.
   - Further formalize ESG and D&I integration across the broader Alternatives Program.
3. Continue Equity Value (and general factor) research

Topics

1. Alternatives Portfolio Overview
2. Real Assets Portfolio (RAP) Update
3. Diversifying Strategies Portfolio (DSP) Update
4. **Appendix**

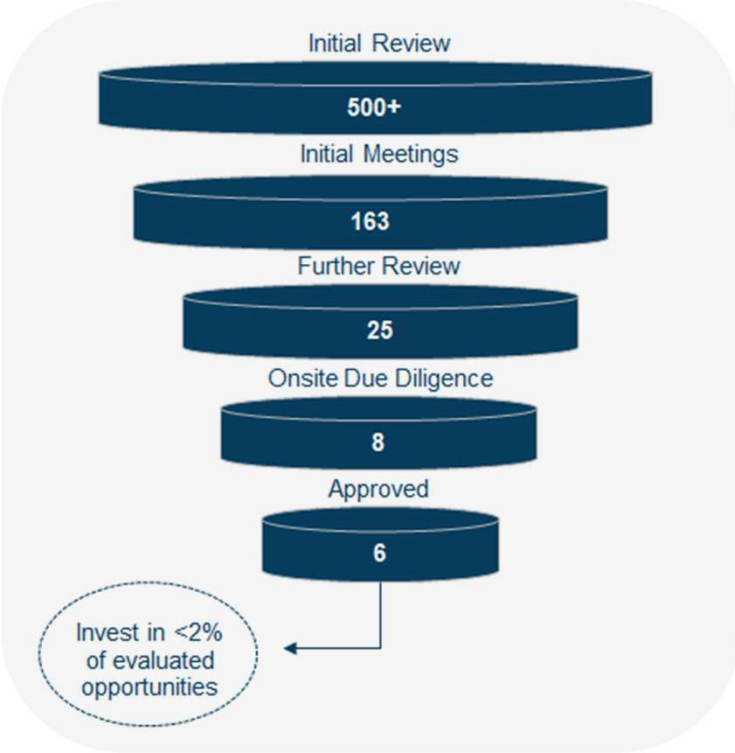
Appendix: Investment Process

- Evaluation framework
  - Very high-level summary of Alternatives Portfolio investment evaluation framework below
  - In practice, many more variables, non-linear, and with numerous feedback channels

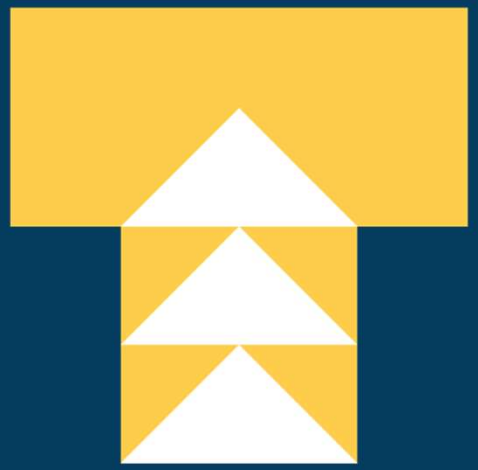


Appendix: Investment Process, cont.

- 2020 Alternatives Portfolio meeting activity
  - Began formally tracking meeting count in 2016.
  - Scale, brand, and open door policy leveraged to foster deal flow.
    - E.g., among U.S. defined benefit plans, OPERF ranks (by assets) in the top 5 in infrastructure, the top 10 in energy and commodities, and the top 20 in hedge funds*.
  - Nearly 4,000 notes and other correspondence deposited in research management system.
  - After screening approximately 500 opportunities, held initial meetings (in-person or telephonic) with 163 distinct prospective managers/investments.
  - "Deep dives" on 25 opportunities.
  - Ultimately sought approval for 6 investments.



*Source: P&I. Market values as of September 30, 2019.



OREGON STATE TREASURY

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Oregon State Treasurer

350 Winter St NE, Suite 100
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TAB 6 – Capital Markets Assumptions

MEKETA
INVESTMENT GROUP

Oregon Investment Council

March 10, 2021

2021 Capital Market Assumptions

Table of Contents

1. Introduction
2. Current Market Environment
3. CMA Development Process
4. Conclusion
5. Appendix

Introduction

Setting Capital Market Assumptions ("CMAs")

- CMAs are the inputs needed to calculate a portfolio's expected return, volatility (standard deviation), and relationships (correlations) to the broader markets.
  - CMAs are also used in mean-variance optimization, simulation-based optimization, and every other technique for finding "optimal" portfolios.
- This involves setting long-term expectations for a variety of asset class/strategy attributes:
  - Returns
  - Standard Deviations
  - Correlations
- Meketa's process relies on both quantitative and qualitative methodologies.
- We seek to incorporate an immense amount of humility into the process. No consultant/vendor CMAs will be perfectly accurate. The goal is to be directionally correct, especially on a relative basis (i.e., one asset class vs. another).

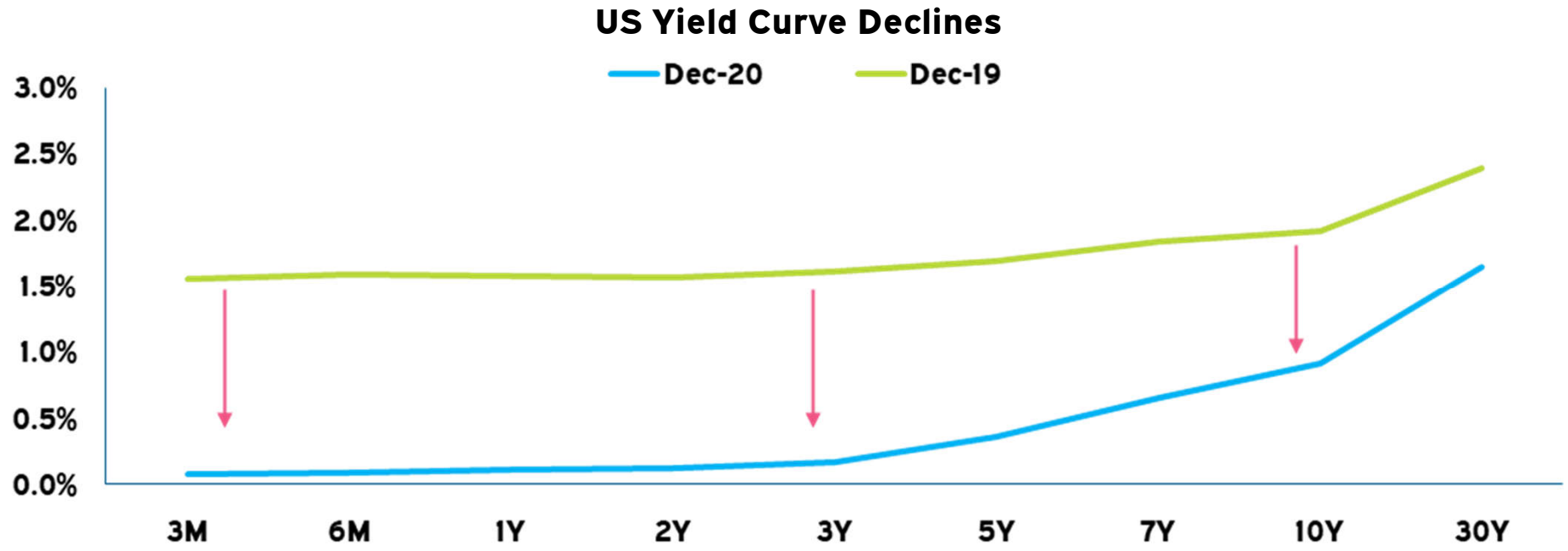
2021 CMA Summary

- We update our capital market assumptions each year in January.
  - Changes are driven by many factors, including interest rates, credit spreads, and equity prices.
- The good news is that most investors achieved returns in 2020 that were above their target return.
  - The bad news is the impact this has on our expectations for future returns.
- In 2020, yields went down, credit spreads tightened, and prices for most risk assets went up.
  - Hence our expected returns have declined for almost every asset class.

Current Market Environment

Declining Interest Rates

- The US Treasury yield curve declined materially during 2020, driven by demand for safe-haven assets (e.g., Treasuries), Federal Reserve polices (e.g., policy rate cuts and the quantitative easing program), and weak US economic fundamentals.
- The change was most dramatic at the shorter end of the curve, but even longer-dated maturities saw significant declines.

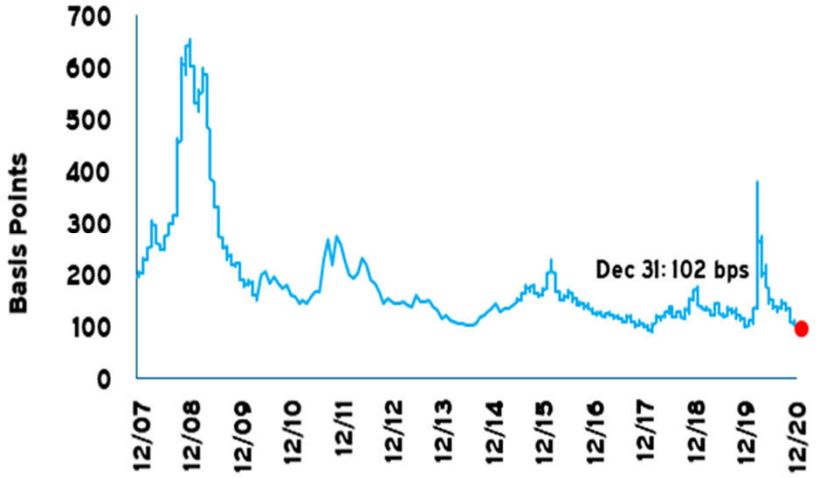


Source: Bloomberg. Data is as of December 31, 2020.

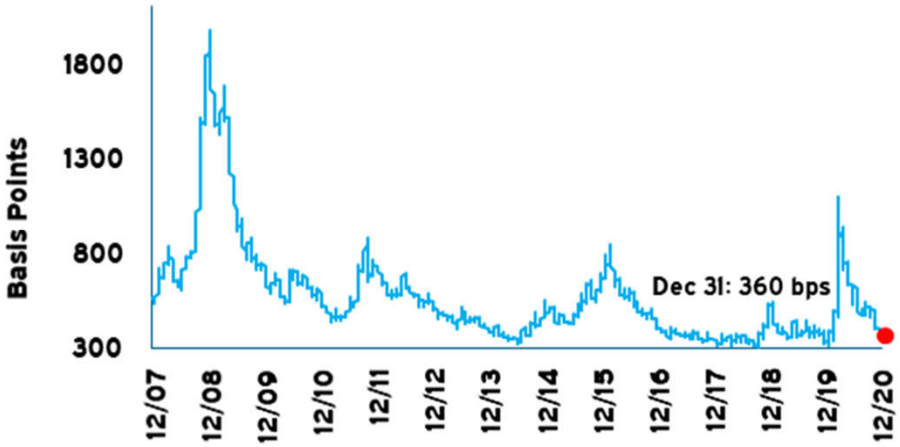
Tighter Credit Spreads

- Credit spreads (the spread above a comparable Treasury) for investment grade and high yield corporate debt tightened in 2020.
- Despite a widening of spreads at the outset of the pandemic, a combination of policy support (by the Fed) and the search for yield led to a decline in spreads to below long-term averages.
- A tighter spread on top of an already low yield for Treasuries equals lower yields for corporate bonds and other riskier bonds.

Investment Grade OAS



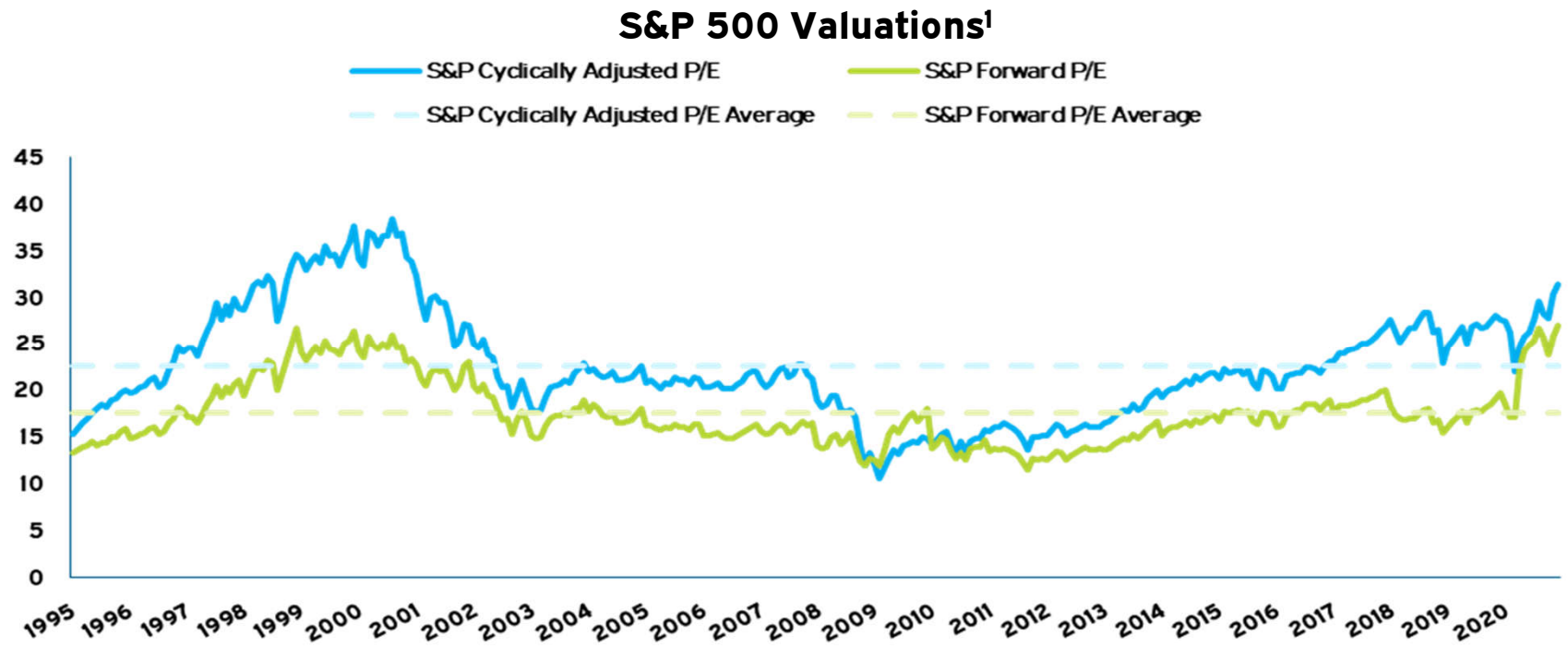
High Yield OAS



Source: Bloomberg. Data is as of December 31, 2020.

Higher Prices for Equities

- After the initial downturn during the outset of the pandemic, stocks rebounded strongly and finished the year well above where they started.
- Valuations based on both forward- and backward-looking earnings rose to levels not seen since 2001.



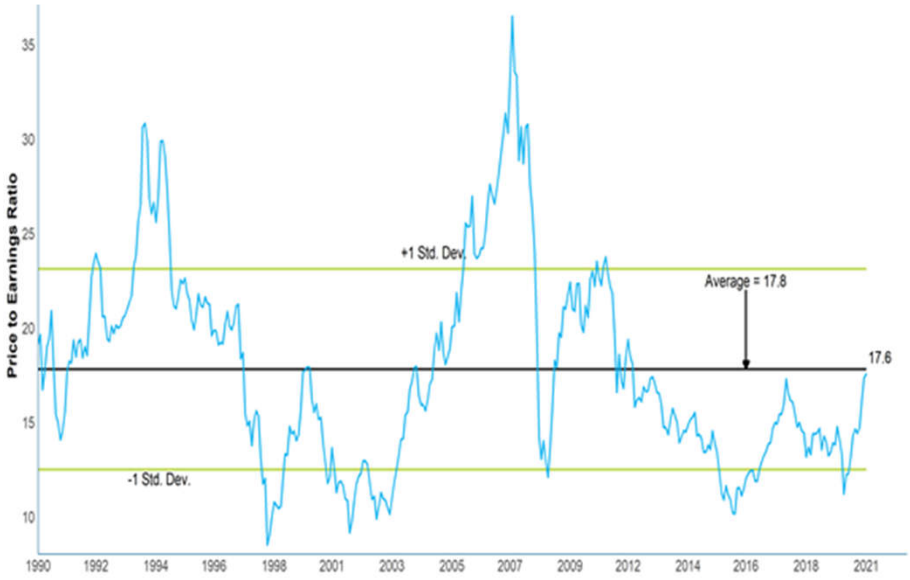
[1] Source: Bloomberg. Data is as of December 31, 2020.

Higher Prices in Non-US Equities, too

- It is not just US equities that saw a jump in PE ratios.
- EM equities had a strong 2020, led by Chinese stocks.
- EAFE equities lagged behind, but because they experienced a much larger hit to earnings[1], their PE ratios likewise moved up.

Developed International Equity Cyclically Adjusted P/E

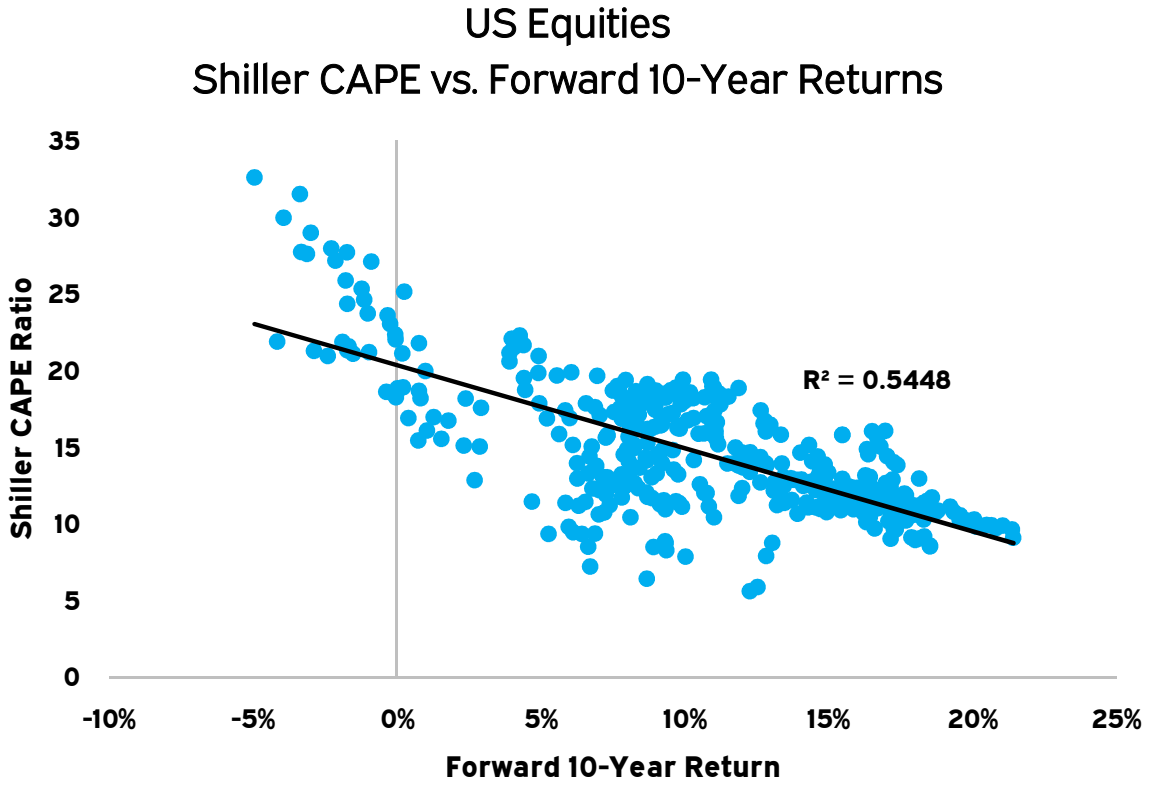
Emerging Market Equity Cyclically Adjusted P/E



[1] Trailing 12-month EPS for MSCI EAFE dropped from 115.4 to 49.1 from December 2019 to December 2020.
[2] Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years. Data as of December 31, 2020.

Higher Prices Imply Lower Returns for Equities

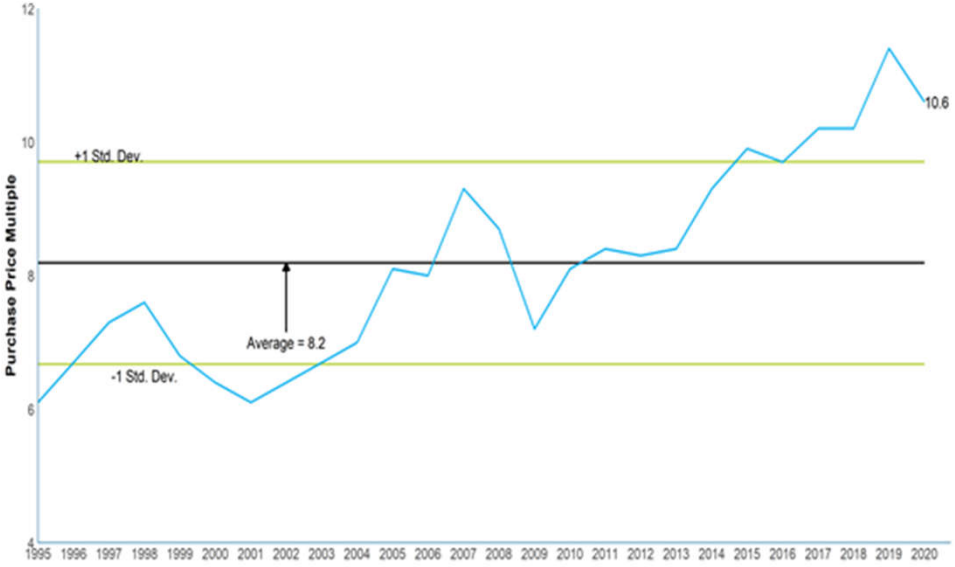
- Relative prices have been indicative of future equity returns.
- Higher prices have led to lower future returns, and vice versa.



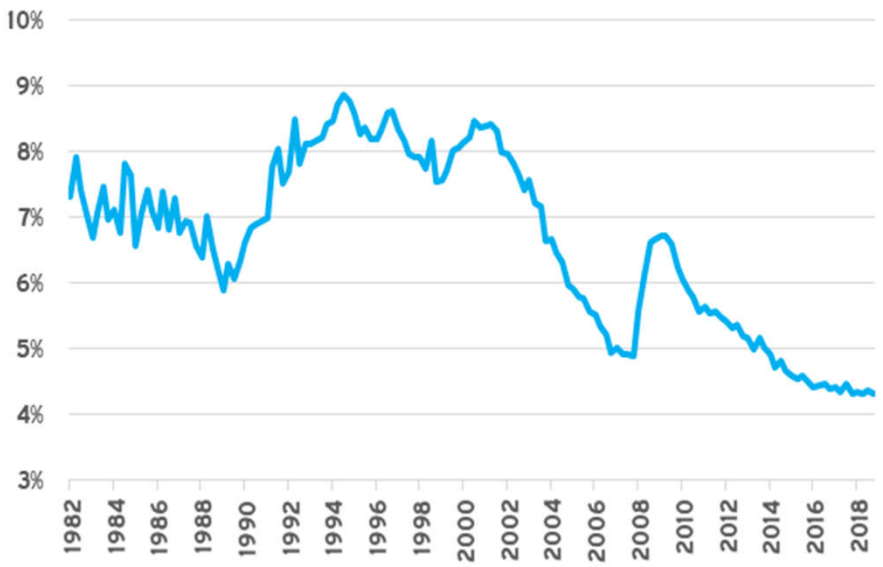
Higher Prices in Private Markets, too

- EBITDA multiples are the closest proxy to a PE ratio for private equity.
  - Like public markets, private markets have seen prices climb gradually higher.
- Real estate cap rates are similar to an earnings yield (the inverse of the PE ratio) for equities.
  - Cap rates are indicative of future returns and have been gradually moving down.

Private Equity Multiples[1]



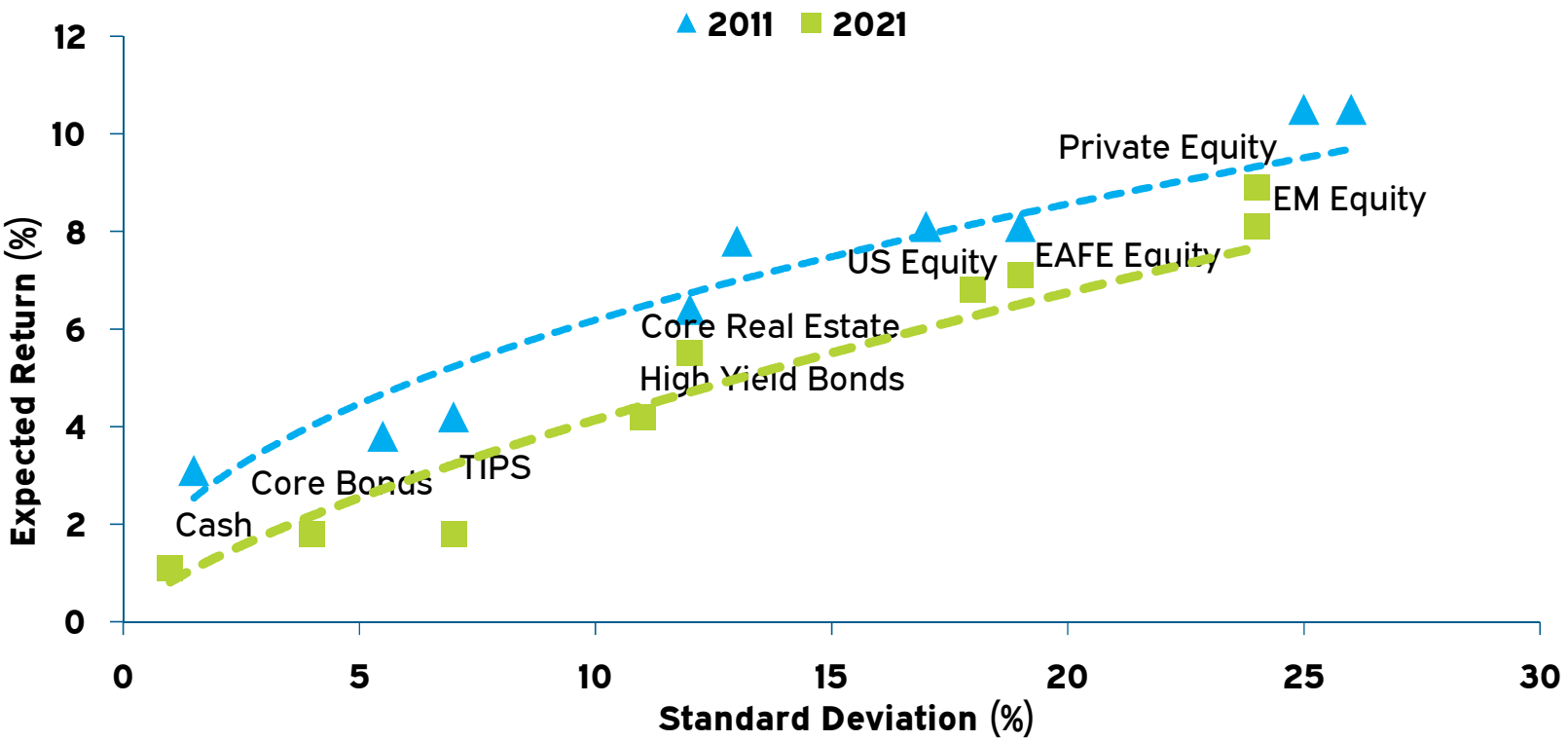
Core Real Estate Cap Rates[2]



[1] Source: S&P LCD Average EBITDA Multiples Paid in All LBOs. Annual figures, except for 2020 (YTD), as of September 30, 2020.
[2] Source: NCREIF NPI value-weighted cap rates. As of September 30, 2020.

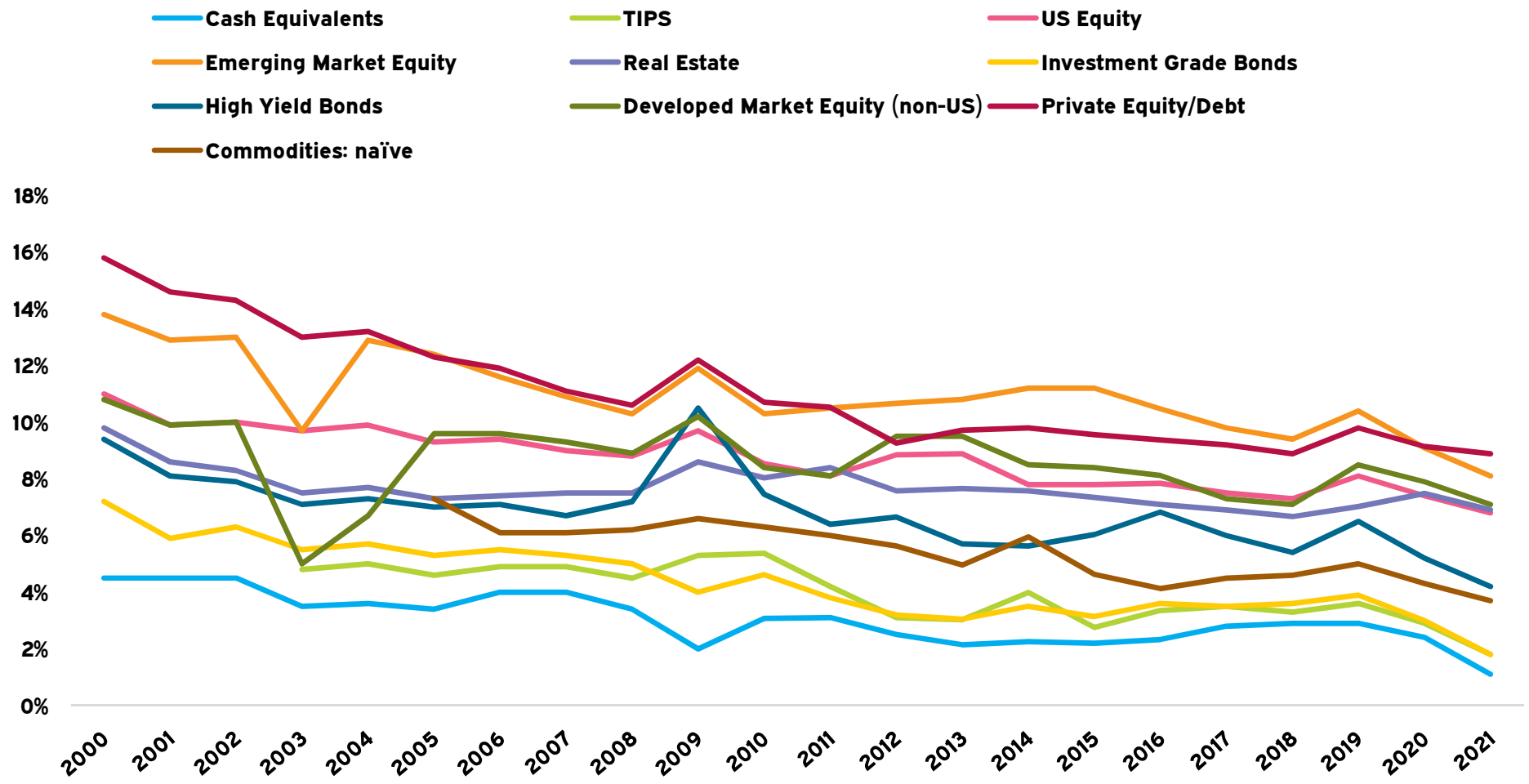
The Big Picture: Less Return for the Same Risk[1]

- The relationship between long-term return expectations and the level of risk accepted is not static.
- We anticipate investors will have to take on greater levels of risk than they have historically if they want to achieve the returns they have in the past.



[1] Expected return and standard deviation are based upon Meketa Investment Group's 2011 and 2021 Capital Markets Expectations.

Our 20-year CMAs since 2000



CMA Development Process

Developing Forecasts

- Our forecasts are based on commonly utilized fundamental models.
  - All models are in-line with industry standards and best practices.
  - Each model is based on the most important factors that drive returns for that asset class.

Asset Class Category	Examples of Major Factors
Equities	Dividend Yield, GDP Growth, Valuation
Bonds	Yield to Worst, Default Rate, Recovery Rate
Commodities	Collateral Yield, Roll Yield, Inflation
Infrastructure	Public IS Valuation, Income, Growth
Natural Resources	Price per Acre, Income, Public Market Valuation
Real Estate	Cap Rate, Yield, Growth
Private Equity	EBITDA Multiple, Debt Multiple, Public VC Valuation
Liquid Alts/Hedge Funds/Other	Leverage, Alternative Betas, Historical Sharpe Ratios

  - The common components are income, growth, and valuation.

10-year Model Example: Equities

- We use a fundamental model for equities that combines income and capital appreciation.

  E(R) = Dividend Yield + Expected Earnings Growth + Multiple Effect + Currency Effect

- Meketa evaluates historical data to develop expectations for dividend yield, earnings growth, the multiple effect, and currency effect.
- Our models assume that there is a reversion toward mean pricing over this time frame.

10-year Model Example: Bonds

- The short version for investment grade bond models is:

  E(R) = Current YTW (yield to worst)

- Our models assume that there is a reversion to the mean for spreads (though not yields).
- For TIPS, we add the real yield of the TIPS index to the breakeven inflation rate.
- As with equities, we make currency adjustments when necessary for foreign bonds.
- For bonds with credit risk, Meketa Investment Group estimates default rates and loss rates in order to project an expected return:

  E(R) = YTW - (Annual Default Rate × Loss Rate)

Moving from 10-Year to 20-Year Forecasts

- Our next step is to combine our 10-year forecasts with projections for years 11-20 for each asset class.
- We use a risk premia approach to forecast 10-year returns in ten years (i.e., years 11-20).
  - We start with an assumption (market informed, such as the 10-year forward rate) for what the risk free rate will be in ten years,
  - We then add a risk premia for each asset class.
  - We use historical risk premia as a guide, but many asset classes will differ from this, especially if they have a shorter history.
  - We seek consistency with finance theory (i.e., riskier assets will have a higher risk premia assumption).
- Essentially, we assume mean-reversion over the first ten years (where appropriate), and consistency with CAPM thereafter.
- The final step is to make any qualitative adjustments.
  - The Investment Policy Committee reviews the output and may make adjustments.

20-Year Forecasts

- For large-scale institutional investors, we recommend utilizing 20-year (or longer) CMAs when conducting asset allocation optimization exercises.
- Advantages:
  - Potentially improved forecasting accuracy.
  - Better alignment with investment horizon.
  - Higher hurdle for material portfolio changes (due to smoother CMA changes).
  - For portfolios with large private markets portfolios, it can take multiple years to adjust to a new policy allocation and most commitments result in 10+ year lockups of capital.
    - This inherently encourages the utilization of longer horizon CMAs.
- Disadvantages:
  - Shorter-term market dynamics must be implemented at the manager or staff level.
  - More challenging to pick-up on major market regime shifts.
- 10-year CMAs are most useful when examining the forward-looking expectation of a current portfolio.

OPERF – Starting CMAs (20- to 30-year horizon)

- The CMAs below represent the initial starting point for OPERF's asset allocation exercise.
- The classes/strategies were selected after collaboration with OST Staff and Aon.
  - All CMAs will be customized to the OPERF's portfolio.

Strategic Class	Asset Class/Strategy	Meketa Return (%)	Aon Return (%)
Public Equity	Global Equity	7.1	7.2
Private Equity	Private Equity	9.1	9.0
Real Estate	Core RE	5.5	5.6
	Value Add RE	7.7	6.2
	Opportunistic RE	9.2	8.5
Diversifying Strategies	Global Macro	4.3	4.2
	Trend Following	4.7	5.2
	Alternative Risk Premia	4.1	5.8
Real Assets	Core Infrastructure	7.0	8.2
	Non-Core Infrastructure	9.0	---*
	Natural Resources	8.3	---*
Fixed Income	Core Fixed Income	1.8	2.0
	Intermediate Govt	1.4	1.4
	Long Govt	2.5	1.7
	Foreign Sovereign	1.7	1.4
	High Yield	4.2	3.8
	Bank Loans	4.0	4.7
	EMD Major	3.7	3.6
	EMD Local	3.9	3.4
Risk Parity	Risk Parity	4.2	5.4

*Assumptions for Non-Core Infrastructure and Natural Resources are custom based on portfolio structure.

Conclusion

Conclusion

- Asset allocation is the most important decision the OIC will make.
  - It is the area we believe the most time should be spent on.
- The asset allocation process is not one-size-fits-all.
  - We customize everything about the modeling process .
  - Constructing/modeling asset classes should be congruent with the asset allocation process.
    - Certain classes (e.g., private markets) should be reflected as they are, and as they are planned to be, in the asset allocation stage.
- The current capital market environment is presenting investors with considerable headwinds in achieving their actuarial rates of return.
- Meketa, Aon, and OST Staff will continue collaborating on CMAs.
- As asset allocations are analyzed/optimized, the liability structure of OPERF will be integrated and examined as a key consideration.

Appendix

OPERF – Starting CMAs

Strategic Class	Asset Class/Strategy	Meketa Return (%)	Aon Return (%)	Meketa Volatility (%)	Aon Volatility (%)
Public Equity	Global Equity	7.1	7.2	18.0	18.5
Private Equity	Private Equity	9.1	9.0	28.0	25.0
Real Estate	Core RE	5.5	5.6	12.0	15.0
	Value Add RE	7.7	6.2	20.0	22.0
	Opportunistic RE	9.2	8.5	26.0	28.0
Diversifying Strategies	Global Macro	4.3	4.2	10.0	12.5
	Trend Following	4.7	5.2	15.0	15.5
	Alternative Risk Premia	4.1	5.8	10.0	9.5
Real Assets	Core Infrastructure	7.0	8.2	14.0	14.5
	Non-Core Infrastructure	9.0	---*	22.0	---*
	Natural Resources	8.3	---*	23.0	---*
Fixed Income	Core Fixed Income	1.8	2.0	4.0	4.5
	Intermediate Govt	1.4	1.4	3.0	3.5
	Long Govt	2.5	1.7	12.0	8.0
	Foreign Sovereign	1.7	1.4	8.0	10.5
	High Yield	4.2	3.8	11.0	12.5
	Bank Loans	4.0	4.7	9.0	7.5
	EMD Major	3.7	3.6	11.0	11.9
	EMD Local	3.9	3.4	14.0	14.5
Risk Parity	Risk Parity	4.2	5.4	12.0	12.0

*Assumptions for Non-Core Infrastructure and Natural Resources are custom based on portfolio structure.

20-year Geometric Expected Returns - Rate Sensitive

	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
Cash Equivalents	1.1	2.4	-1.3	Lower rates
Short-term Investment Grade Bonds	1.3	2.6	-1.3	Lower yields
Investment Grade Bonds	1.8	3.0	-1.2	Lower yields
Intermediate Government Bonds	1.4	2.4	-1.0	Lower yields
Long-term Government Bonds	2.5	3.2	-0.7	Lower yields
Mortgage Backed Securities	1.8	3.1	-1.3	Lower yields
Investment Grade Corporate Bonds	2.3	3.6	-1.3	Lower yields, tighter spreads
Long-term Corporate Bonds	3.2	4.2	-1.0	Lower yields, tighter spreads
Short-term TIPS	1.4	2.7	-1.3	Lower yields
TIPS	1.8	2.9	-1.1	Lower yields
Long-term TIPS	2.9	3.3	-0.4	Lower yields
Global ILBs	1.9	2.4	-0.5	Lower yields
Foreign Bonds	1.7	2.4	-0.7	Lower yields

20-year Geometric Expected Returns - Credit

	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
High Yield Bonds	4.2	5.2	-1.0	Lower yields and tighter spreads
Higher Quality High Yield	3.8	4.5	-0.7	Lower yields and tighter spreads
Bank Loans	4.0	5.0	-1.0	Lower yields
Collateralized Loan Obligations(CLOs)	4.2	NA	NA	*New Asset Class*
Emerging Market Bonds (major)	3.7	4.5	-0.8	Lower yields
Emerging Market Bonds (local)	3.9	4.8	-0.9	Lower yields
Private Debt	6.8	6.9	-0.1	Lower yields
Direct Lending	6.7	NA	NA	*Consolidated Asset Class*
Mezzanine Debt	6.9	7.0	-0.1	Lower yields
Distressed Debt	7.0	7.0	0.0	Lower yields

20-year Geometric Expected Returns - Equities

	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
US Equity	6.8	7.4	-0.6	Higher price-to-earnings, lower dividend
US Large Cap	6.7	7.2	-0.5	Higher price-to-earnings, lower dividend
US Mid Cap	6.9	7.6	-0.7	Higher price-to-earnings, lower dividend
US Small Cap	7.1	7.9	-0.8	Higher price-to-earnings
Developed Non-US Equity	7.1	7.9	-0.8	Higher price-to-earnings, lower dividend
Dev. Non-US Small Cap	7.0	7.8	-0.8	Higher price-to-earnings, lower dividend
Emerging Market Equity	8.1	9.1	-1.0	Higher price-to-earnings, lower dividend
Emerging Market Small Cap	8.2	9.0	-0.8	Higher price-to-earnings, lower dividend
Frontier Market Equity	8.9	10.0	-1.1	Higher price-to-earnings, lower dividend
Global Equity	7.1	7.8	-0.7	Higher price-to-earnings, lower dividend
Low Volatility Equity	6.4	NA	NA	*New Asset Class*
Private Equity	9.1	9.4	-0.3	Higher prices, offset by lower borrowing costs
Buyouts	9.0	9.4	-0.4	Higher prices, offset by lower borrowing costs
Venture Capital	9.6	9.3	0.3	Higher earnings

20-year Geometric Expected Returns - Real Assets

	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
Real Estate	6.9	7.5	-0.6	Lower cap rates
REITs	7.2	7.0	0.2	Higher yields
Core Private Real Estate	5.5	6.3	-0.8	Lower cap rate, partially offset by lower cost of borrowing
Value-Added Real Estate	7.7	8.4	-0.7	Lower cap rate, partially offset by lower cost of borrowing
Opportunistic Real Estate	9.2	9.9	-0.7	Lower cap rate, partially offset by lower cost of borrowing
Natural Resources (Public)	7.3	8.3	-1.0	Higher price-to-earnings
Natural Resources (Private)	8.3	8.8	-0.5	Higher Prices
Energy	9.0	9.4	-0.4	Lower prices offset by lower earnings expectations
Opportunistic Green Strategies	8.8	NA	NA	*New Asset Class*
Gold Mining	7.9	NA	NA	*New Asset Class*
Gold (Metal)	2.3	NA	NA	*New Asset Class*
Commodities	3.7	4.3	-0.6	Lower collateral returns
Infrastructure (Public)	7.4	7.5	-0.1	Lower price-to-earnings
Infrastructure (Core Private)	7.0	6.7	0.3	Lower prices and lower cost of borrowing
Infrastructure (Non-Core Private)	9.0	9.1	-0.1	Higher prices offset by lower cost of borrowing

20-year Geometric Expected Returns - Alternative Strategies (Other)

	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
Hedge Funds	4.3	4.9	-0.6	Higher prices, lower yields
Long-Short	3.8	4.3	-0.5	Higher prices, lower cash return
Event Driven	4.9	5.8	-0.9	Higher prices, lower yields
Global Macro	4.3	4.6	-0.3	Higher prices, lower yields
CTA – Trend Following	4.7	4.8	-0.1	Higher leverage assumption offset by lower cash return
Fixed Income/L-S Credit	3.4	4.0	-0.6	Lower yields
Relative Value/Arbitrage	4.6	5.3	-0.7	Lower yields
Insurance Linked Strategies	4.6	4.1	0.5	Higher yields
Risk Parity (10% vol)	4.0	5.4	-1.4	Higher prices, lower yields
TAA	4.1	4.4	-0.3	Higher prices, lower yields
Alternative Risk Premia	4.1	NA	NA	*New Asset Class*
US Inflation	2.1	2.6	-0.5	

FAQs for 2021

How do these CMAs compare to last year's assumptions?

- To help evaluate this, we created a weighted average of expected returns for the asset classes that comprise a typical Meketa client portfolio. The value of the expected return for the portfolio is not a precise expected return (i.e., it has not been run via MVO), but the magnitude of the change is what is relevant. In short, the average of 20-year expected returns is 90 basis points lower than last January and 50 basis points lower than our July interim CMAs.

- Looking at past years' CMAs, this is the largest change in recent years. However, the volatility of late 2018 and early 2019 caused fairly large changes in the following years' CMAs as well.

Year	Weighted Average Expected Return (%)	Change from Prior Year (%)
2021	5.9	-0.9
2020	6.8	-0.6
2019	7.4	+0.7
2018	6.7	-0.2
2017	6.9	-0.3
2016	7.2	

FAQs for 2021 (cont.)

What is driving the changes from last year (and mid-year)?

- The changes relative to last year are being driven by what happened in the market (primarily lower yields), not by methodology changes. The latter are serving to dampen the former.
- The broad decline in interest rates was reflected in the interim CMEs we published in July. The additional decline since then is primarily due to the strong rebound in risk assets in the second half of 2020 (i.e., tighter credit spreads & higher valuations).

How do Meketa's CMAs compare to peers?

- We believe our CMAs are in the same ballpark as our peers. A preliminary survey of a small group in early 2021 indicates that our CMAs are generally consistent, with a couple of exceptions. We note what appears to be a continuation of the trend of money managers tending to have lower return expectations than consultants.
- We generally cite the survey conducted each year by Horizon Actuarial Services for making peer comparisons, as it is the most comprehensive survey of CMAs that we are aware of. However this survey is usually not published until July or August.
- It is important to distinguish between intermediate term assumptions (e.g., 7-10 years) and long-term assumptions (e.g., 20-30 years) when making these comparisons.

FAQs for 2021 (cont.)

Did volatility expectations increase?

- Yes. Our methodology includes a 15-year look back, and 2020 had the effect of bumping many of these numbers up by 1-2%. The outlier is MLPs, which jumped 6%.
- We also intentionally increased the volatility for CTAs by 9%, to reflect the way they are typically implemented in our clients' RMS approach.

Did Meketa make any qualitative adjustments?

- As usual, we made some qualitative adjustments to the CMAs.
- The largest increase (+1%) was for EAFE equities, as the precipitous decline in earnings (e.g., EAFE small cap EPS dropped in half year over year) resulted in non-intuitive outcomes from our models, and we expect that the trajectory for earnings will follow that of other countries that are further ahead in re-opening their economies once the effects of the virus are under control.
- The biggest decreases (-1%) were for energy, as we expect lower prices reflect a re-pricing of risk and lower secular earnings for the sector.

FAQs for 2021 (cont.)

Is Meketa comfortable with the equity risk premium implied by the CMAs?

- The risk premium for US equities is within its historical range (4-6% over intermediate government bonds), albeit at the high end.

Are equity risk premiums rising?

- The appearance of rising risk premia has to do with our model change this year of adjusting for the level of interest rates.

Is Meketa assuming that interest rates will go up?

- Yes, though indirectly. We use the market's own projections for future rates, as they were priced in at the time of our analysis. For example, we observed that the market was projecting that the ten-year Treasury would be yielding approximately 2.0% in ten years.

Why is the 10-year expected return for long-term corporate bonds lower than the yield?

- Defaults (modest, but there is credit risk) and rising rates. When rates have gone up historically, the return has been lower than the starting yield. This is particularly true with longer duration assets.

FAQs for 2021 (cont.)

How does Meketa arrive at its inflation assumption? Is it based on a combination of breakeven rates and other data?

- Most of our economic projections come from the IMF's World Economic Outlook. Their inflation projections are in the table below. In short, they are expecting a modest jump in 2021, then a return to what we are used to. We combine that five year average with the 5-year-5 inflation swap (i.e., what the market is projecting 5-year inflation will be five years from now), which is 2.4%, to arrive at our 10-year number.

Inflation Estimates

	2021	2022	2023	2024	2025	5-Year Average
US	2.8	2.1	2.1	2.2	2.2	2.3
Euro Area	0.9	1.2	1.4	1.6	1.7	1.9
UK	1.2	1.7	1.9	2.0	2.0	1.8
Japan	0.3	0.7	0.8	0.8	1.0	0.7

Source: IMF World Economic Outlook, October 2020.

FAQs for 2021 (cont.)

If US inflation is expected to be 2.1%, and the real yield on 20 year TIPS is -0.6%, shouldn't the expected return for long TIPS be closer to 1.5% than 1.8%?

- Arguably, it is only our 10-year inflation number that matters, as it flows through the models for several asset classes, while the 20-year does not. This includes our TIPS models. Hence it is possible for there to be a disconnect for the 20-year horizon.
- It is not uncommon to see modest disconnects between economists' projections, the swap market, and the BEI.

Why do put/write expected returns decline along with higher equity prices (i.e., declines in equity expected returns)?

- It makes intuitive sense that as expected returns for equities decline, the ER for options based on those equities also declines (else you could get a much better risk-adjusted return from the options).

FAQs for 2021 (cont.)

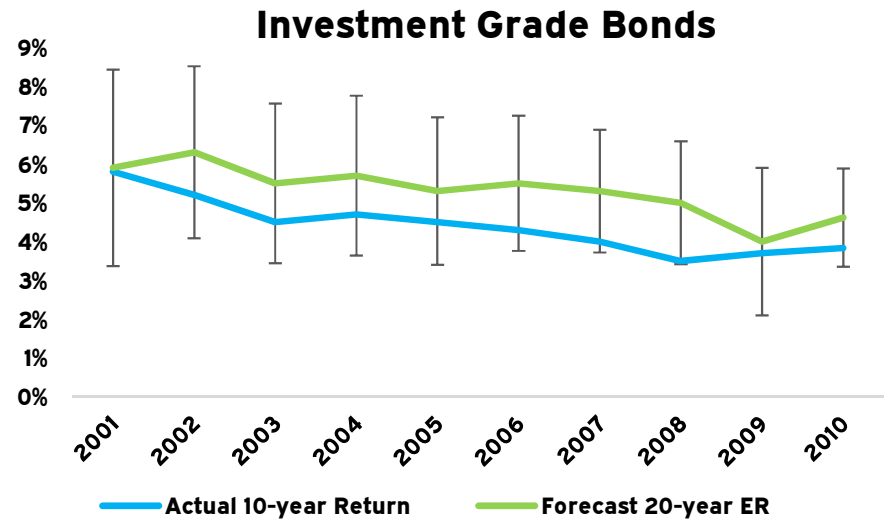
Why did the spread for private equity over public equity widen?

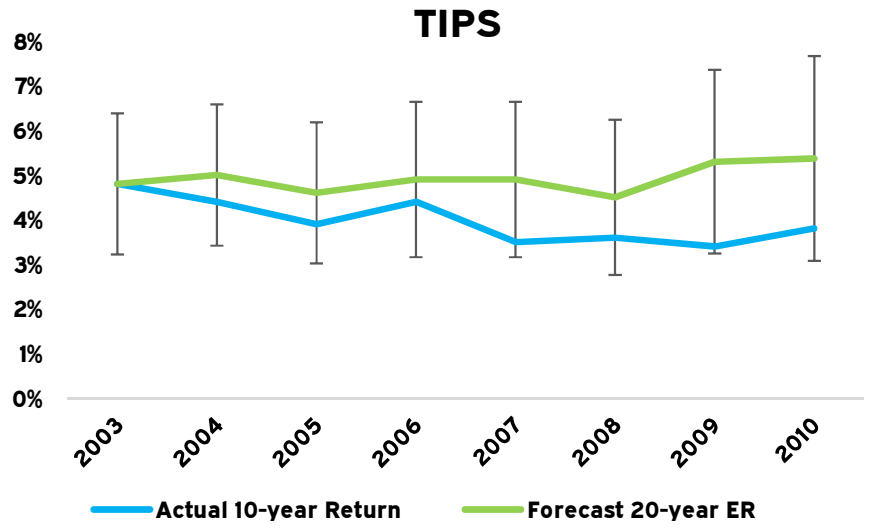
- Quite simply, multiples moved up more quickly for public equities than they did for private equity (e.g., EBITDA multiples for buyouts).
- Of note, the private equity data (as always) is through 9/30; it is possible that buyout multiples will "catch up" with public equity in early 2021.

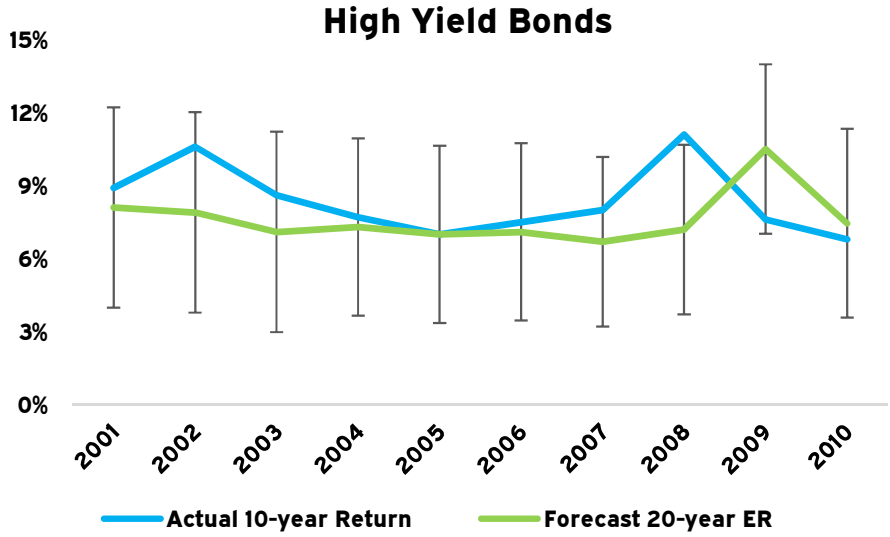
For venture capital, do the public tech sectors Meketa uses as a proxy for pricing really trade at a discount to the Russell 2000?

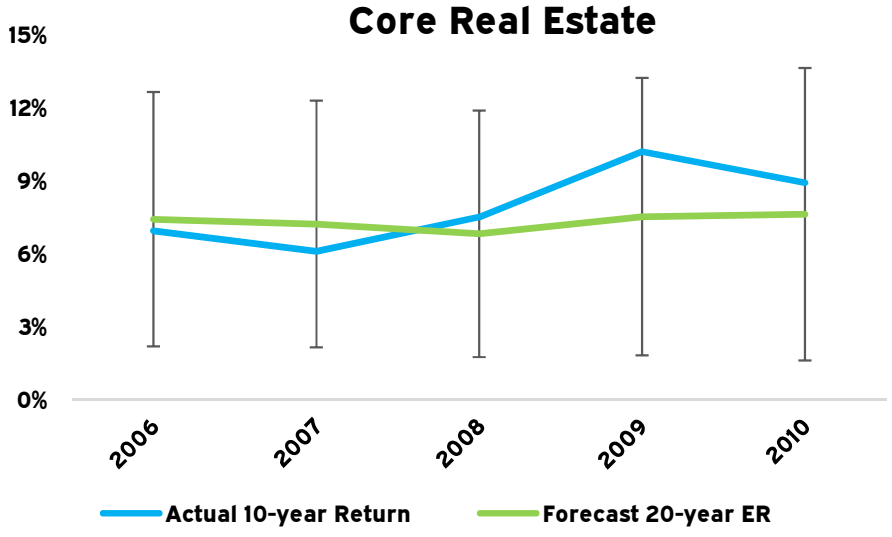
- Yes, though we take our VC model with a large grain of salt, as there is very little data available. That said, yes, the indices we use as a proxy have traded at a PE ratio discount to the R2k for 17 of the past 25 years, including this year.
- Note that the proxy is currently composed of: NASDAQ; Pharma, Biotech & Life Sciences; IT Services; and Clean Tech/Environment. The composition and weightings have changed over time.

Our Track Record

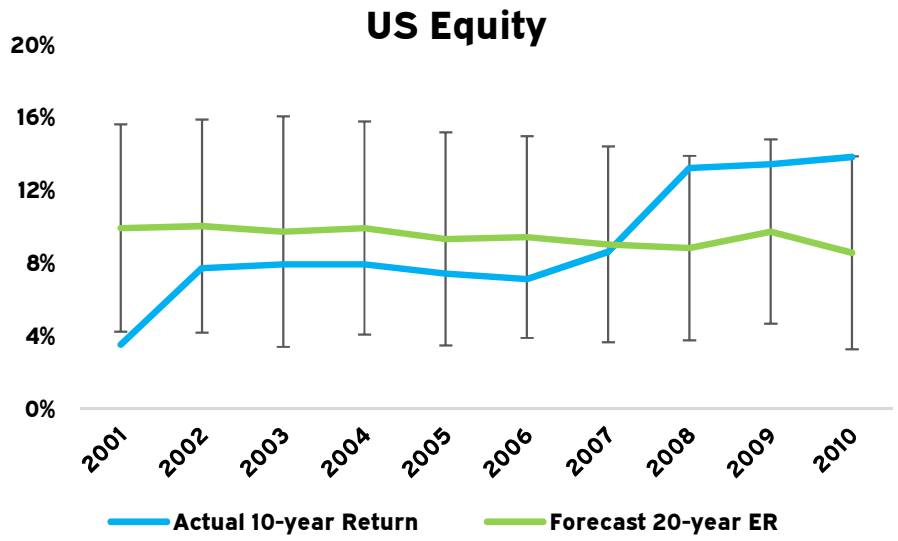


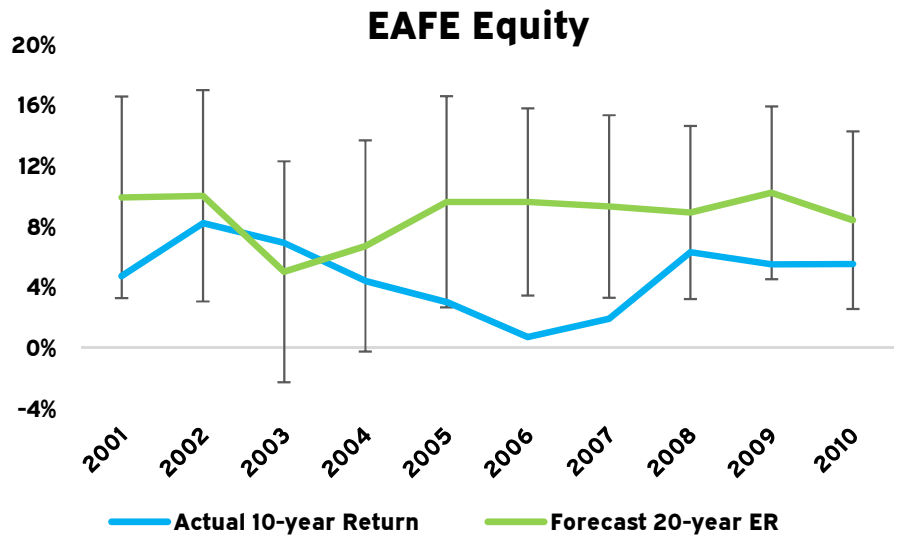


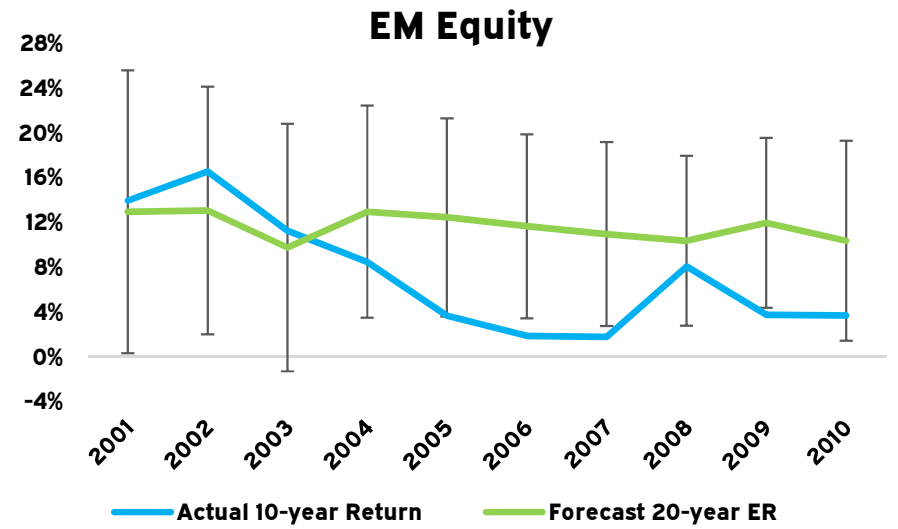


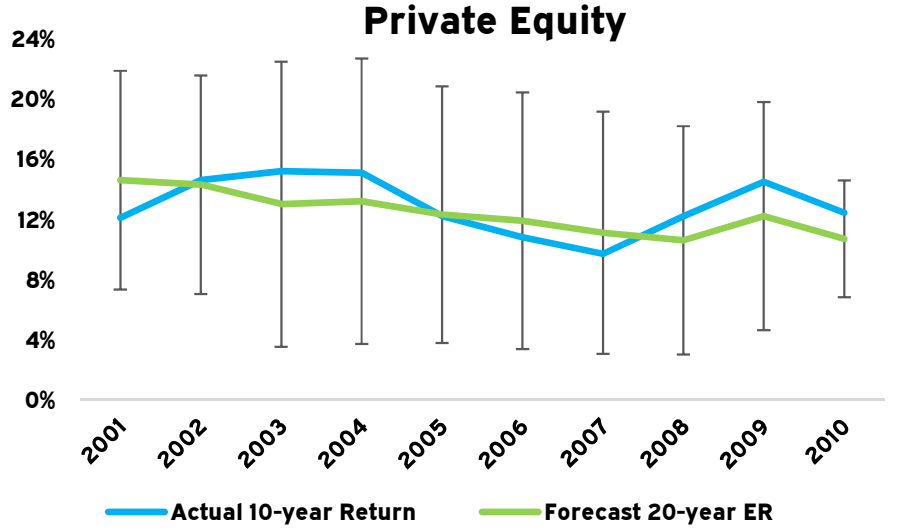


Our Track Record (cont.)







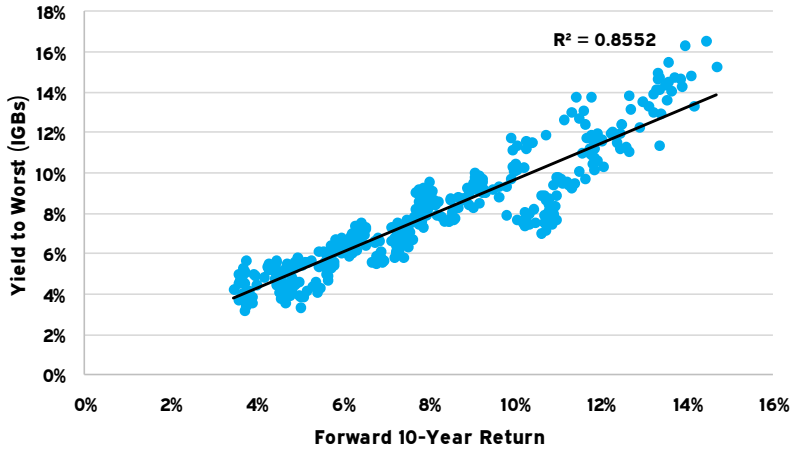


Asset Class Definitions

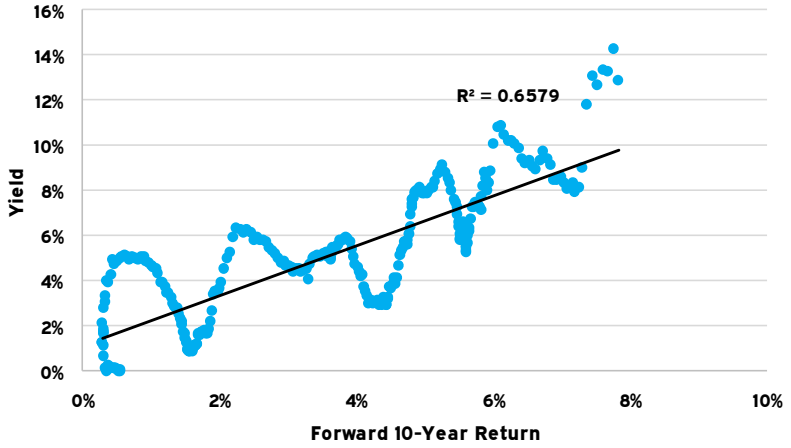
- We identify asset classes and strategies that are both investable and appropriate for the long-term allocation of funds.
- Several considerations influence this process:
  - Unique return behavior,
  - Observable historical track record,
  - A robust market,
  - And client requests.
- We then make forecasts for each asset class.
  - We created inputs for 86 “asset classes” in 2021.

Some factors are naturally more predictive than others

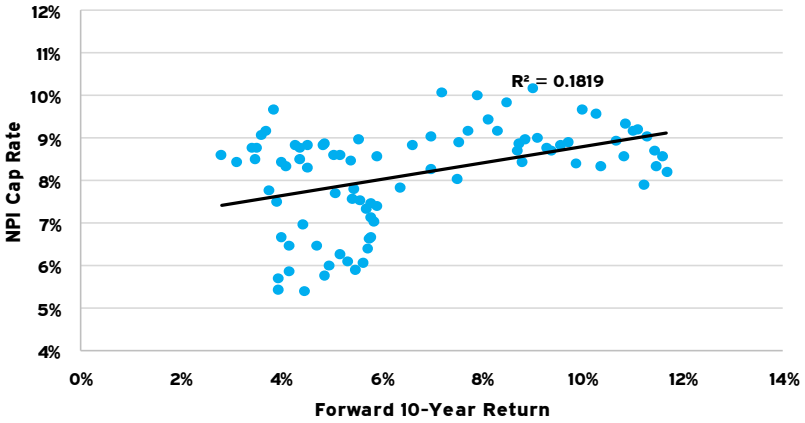
Investment Grade Bonds
Yield to Worst vs. Forward 10-Year Returns



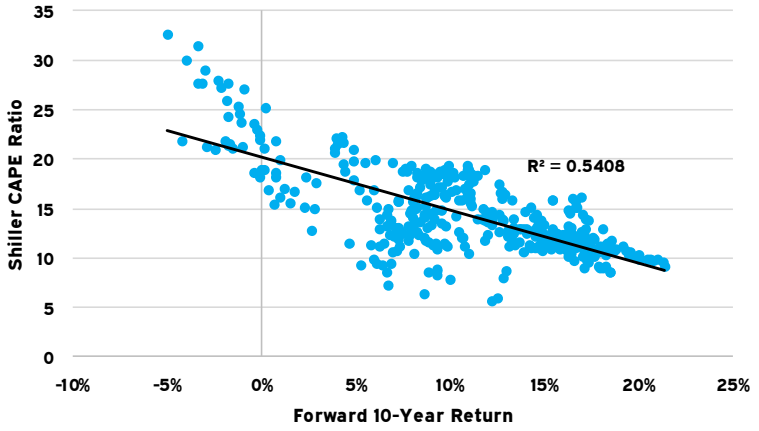
Cash (90-day T-Bill)
Yield vs. Forward 10-Year Returns



Core Real Estate
Cap Rates vs. Forward 10-Year Returns



US Equities
Shiller CAPE vs. Forward 10-Year Returns



Declining Rates + Tighter Spreads = Lower Yields

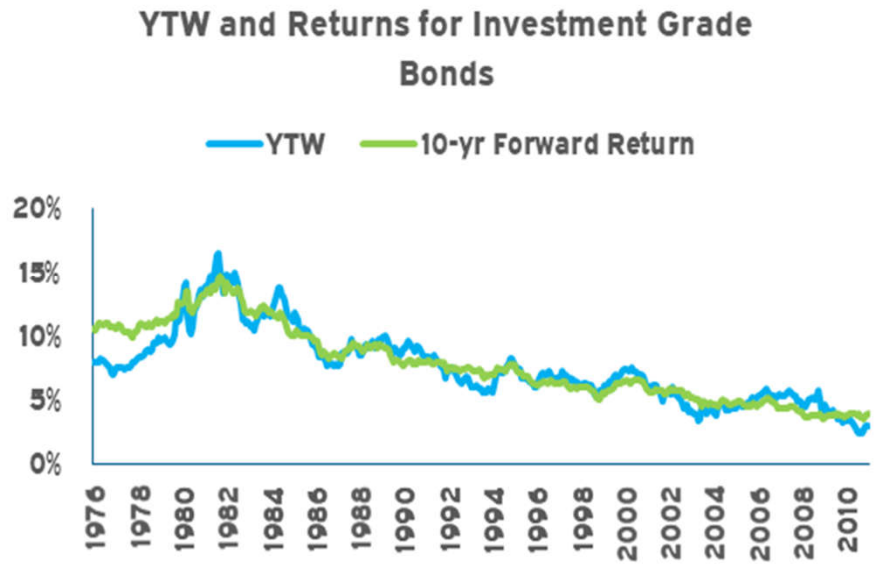
- The combination of declining rates and tight spreads resulted in lower yields across every major sector of the global bond market.

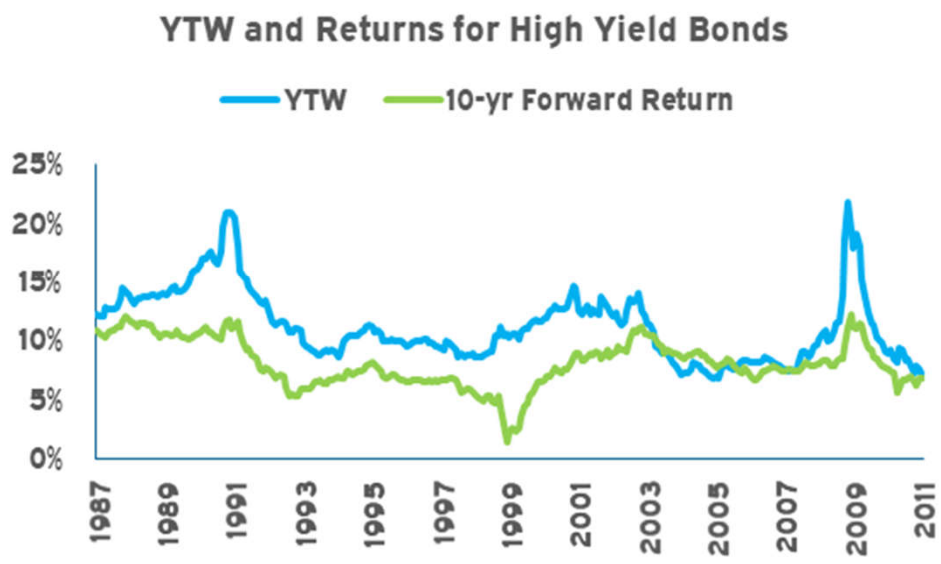
Index	Yield to Worst 12/31/20 (%)	Yield to Worst 12/31/19 (%)
Fed Funds Rate	0.1	1.6
10-year Treasury	0.93	1.92
Barclays Aggregate	1.12	2.31
Barclays Corporate	1.74	2.84
Barclays Securitized	1.24	2.53
Barclays Global Aggregate	0.83	1.45
Barclays EM Local Currency Government	3.20	3.72
Barclays EM Hard Currency Aggregate	3.20	4.45
Barclays US Corporate High Yield	4.18	5.19

Source: Bloomberg. Data is as of December 31, 2020 and 2019.

Lower Yields Means Lower Future Returns

- This decline in interest rates matters because yields are a very good predictor of future returns for bonds[1], at least over a 10-year horizon.





[1] When predicting returns for bonds, default risk should also be taken into account. For example, defaults are why the return for high yield bonds have generally been below the starting yield.

Source: Bloomberg. Data is as of December 31, 2020.

Impact of Low Rates on Equity Prices

- Looking at Price-Earnings (or PE10, or PB) ratios alone results in most equity markets looking historically expensive.
- It is unclear how much of an impact low interest rates are having in supporting these elevated valuations and whether they will continue to provide that support if rates remain low.
- Low rates drive up valuations when discounting future cash flows (or earnings).
  - This is based on the time value of money concept.
- One way analysts quantify this is by using what's known as the dividend discount model (DDM).
  - The bond market's current (lower) interest rates can be used to calculate a present value for the stock market using the DDM.
- Using this approach, equities do not look quite as expensive as they do upon initial inspection.

Correction in Prices Needed to Return to Historical Average

	US Equities (%)	EAFE Equities (%)	EM Equities (%)
Using PE10	-23.4	-15.9	-9.9
Adjusting for Rates	-9.8	-2.7	-8.3

Equities

- We use a fundamental model for equities that combine income and capital appreciation:

$$E(R) = Dividend\ Yield + Price\ Return + Currency\ Effect$$

$$Price\ Return = Earnings\ Growth + Multiple\ Effect$$

- We use the current dividend yield on the respective index.[1]
- Earnings growth is a function of Real GDP growth, inflation, and exposure to foreign revenue sources.
- We use three approaches to calculate the multiple effect.
  - The models assume reversion to the mean or fair value.
- We arrive at our preliminary 10-year assumption (in local currency)

$$\text{US } Equity\ E(R) = 1.5\% + [(1 + 5.3\%) \times (1 - 1.8\%) - 1] = 4.9\%$$

- For non-US equities, we add the expected currency effect vs. the US Dollar to the local expected return.

[1] The source for dividend yields is S&P 500 for the US and MSCI for non-US equities.

Equities: Model [1]

- To calculate the price return, we estimate the fair value of the index in ten years.
  - We first calculate future EPS by compounding current EPS[1] at the projected earnings growth rate.
  - We average the next ten years of projected EPS to arrive at an EPS 10.

	US	EAFE	EM	EAFE Sm	EM Small	Frontier
2021	125.6	49.1	50.7	3.9	26.3	39.9
2022	132.2	51.4	54.1	4.0	28.1	42.3
2023	139.3	53.8	57.8	4.2	30.0	44.9
2024	146.7	56.3	61.7	4.3	32.1	47.7
2025	154.4	58.9	65.9	4.5	34.3	50.6
2026	162.6	61.7	70.4	4.7	36.7	53.8
2027	171.3	64.6	75.2	4.9	39.3	57.1
2028	180.4	67.6	80.3	5.1	42.0	60.6
2029	190.0	70.8	85.7	5.3	44.9	64.4
2030	200.1	74.1	91.5	5.5	48.0	68.3
2031	210.7	77.6	97.7	5.7	51.4	72.6
Average EPS10 in 10 years	*168.8*	*63.7*	*74.0*	*4.8*	*38.7*	*56.2*

[1] We use *As Reported* trailing 12-month earnings for the S&P 500, and trailing 12 month earnings from MSCI for the non-US indices.

Equities: Model 1 (cont.)

- For projected earnings growth, we add expected real GDP and expected inflation to arrive at nominal GDP.[1]
  - We are inherently assuming that GDP growth is a close long-term proxy for earnings growth.[2]

1948 - 2019[3]	
Nominal GDP Growth P.A.	Corporate Earnings Growth P.A.
6.4%	6.5%

  - The model is based on the theory that a region's companies will grow at roughly the same rate as its economy, as defined by GDP, over the long term.
  - However, we also adjust for the percentage of earnings that is derived from foreign countries.[4]

	Earnings from EAFE (%)	Earnings from EM (%)	Earnings Frontier (%)	Earnings from US (%)
S&P 500	17	18	1	63
MSCI EAFE	54	23	2	21
MSCI Emerging Markets	8	80	1	11
MSCI Frontier Markets	4	10	85	2

[1] We constructed 5-year GDP based on the IMF World Economic Outlook as of October 2020 and Oxford Economics projections, and then use Oxford Economics projections for the remaining five years to arrive at a ten-year forecast for each. Note that the inflation history for emerging and frontier markets is subjective. We constructed inflation projections based on the IMF World Economic Outlook as of October 2020, historical averages and 5yr Inflation swaps maturing 5 years from now where available (US, Euro Area, UK, and Japan).
[2] For Emerging and Frontier Markets, we assumed a meaningful percentage of GDP growth does not translate to earnings growth due to net issuance, state intervention, etc.
[3] Source: Federal Reserve Economic Data. Corporate earnings defined as Corporate Profits After Tax (without IVA and CCAdj).
[4] Source: MSCI Economic Exposure indices for North America, EAFE, and Emerging Markets; estimates for small cap and frontier markets.

Equities: Model 1 (cont.)

- We multiply EPS10 by our projected PE10 ratio to arrive at a ten-year price target.
  - We assume investors will pay slightly different ratios for earnings in different regions[1]

$$\text{US Price Target} = 168.8 \times 26.9 = 4532.4$$

- We divide this future price by the current price and then annualize the price change.

$$\text{US Price Return} = (4532.4 \div 3756.1)1/10 - 1 = 1.9\%$$

- We subtract the projected earnings growth[2] from the price change to arrive at the Multiplier Effect.

$$Multiplier\ Effect_{Model\ 1} = 1.9\% - 5.3\% = -3.4\%$$

[1] We assume that PE reverts 75% of the way back to its historical median. For the US, we use 25.0x, which is consistent with its median PE10 since 1990. We assume a lower PE10 for other regions that is consistent with their valuation relative to the US over the past two decades.
[2] Projected Earnings growth for Model 1 equals the US nominal GDP growth projection.

Equities: Model 2

- To calculate the price return, we estimate the fair value of the index in ten years.
  - We first calculate future EPS by multiplying current EPS by projected earnings growth.

$$US\ EPS = 125.6 \times (1 + 5.0\%)10 = 204.52$$

  - For projected earnings growth, we used a subjective growth rate.
    - For the US, we used a rate lower than the historical average due to our current assessment that we are nearer a peak than a trough in the earnings cycle.

- We multiply EPS by our projected PE ratio[1] to arrive at a ten-year price target.

$$\text{US Price Target} = 204.52 \times 17.0 = 4137.2$$

- We divide this future price by the current price and then annualize the price change.

$$\text{US Price Return} = (4137.2 \div 3756.1)1/10 - 1 = 1.0\%$$

- We subtract the projected earnings growth[2] from the US Price return to arrive at the Multiplier Effect.

$$Multiplier\ Effect_{Model\ 2} = 1.0\% - 5.0\% = -4.0\%$$

[1] For the US, we use a PE (trailing twelve months) of 17.0x which is consistent with its median since 1954. We assume a lower PE for other regions that is consistent with their valuation relative to the US over the past two decades.
[2] Projected Earnings growth for Model 2 equals an assumed rate of 5% for the US, 4.5% for EAFE, and 6.5% for EM.

Equities: Model 3

- To calculate fair value, we use the Dividend Discount Model.

$$Fair\ Value = E \times (1 + G) \div (D - G)$$

  - For earnings (E), we use EPS10
  - For the growth rate (G), we use a subjective earnings growth rate
  - For the discount rate (D), we use a rate implied by the projected real rate, the historical discount rate, and the historical real rate[1]

$$\text{Implied Discount Rate} = -0.5\% + 11.3\% - 2.3\% = 8.5\%$$

- The fair value can be calculated as:

$$Fair\ Value = 115.3 \times (1 + 4.9\%) \div (8.5\% - 4.9\%) = 3{,}388.1$$

- We find the difference between fair value and current value, and we assume reversion to fair value is achieved over a ten year period.

$$Multiplier\ Effect_{Model\ 3} = [1 + (3{,}388.1 - 3756.1) \div 3756.1] \wedge (1/10) - 1 = -1.8\%$$

[1] The historical discount rate is calculated based on historical valuations, earnings, and growth rates.

Currency Effect

- For non-US equities, we calculate an adjustment for the expected impact of currency movements.
  - We use a three-factor model that weights 40% on PPP theory, 30% on IRP theory, and 30% on current account differential theory.
    - PPP posits that money will flow to the currency with lower cost of goods and services[1]
    - IRP posits that money will flow to the currency with the lower interest rate[2]
    - Current account differential posits that money will flow to the currency with the lower current account deficit[3]

Market	Expected Inflation (%)	PPP Impact (%)	Interest Rates (%)	IRP Impact (%)	Current Account Impact (%)	Net Effect (%)	Adjusted Net Effect[4] (%)
EAFE	1.5	2.8	-0.4	-0.5	1.8	+1.5	+1.0
EM	4.5	6.5	3.9	3.8	1.5	+4.2	+1.0
US	2.3	NA	0.1	NA	NA	NA	NA

1 Sources for PPP data: World Bank (PPP Conversion Factor) and *The Economist* (Big Mac Index).
2 We use the central bank discount rate or equivalent for the major countries of each region (source: FRED). Due to lack of data for frontier markets, we used yield-to-worst on longer-term bonds and then adjusted the yield down subjectively (to adjust for term structure).
3 We use the differential between each region's current account as a % of global trade (source: FRED & The World Fact Book)
4 We cap the currency adjustment at +/- 1% per annum, given the unpredictable nature of currency markets.

Equities: US Mid, Small & Micro

- The models are similar to that used for the overall equity model.
- To calculate the price return, we estimate the fair value of the index in ten years. We do this using both price-earnings and price-book ratios.
- We calculate future EPS by looking at a similar ratio of historical earnings growth for each index vs. the R1k.
  - We assume earnings will grow 1.1x faster for midcap, 1.15x faster for small cap, and 1.2x faster for microcap (subjective yet fairly consistent with their respective relationships since 1978).
  - We multiply EPS by our projected PE ratio[1] to arrive at a ten-year price target.
- We take a similar approach for price-book, comparing current ratios to historical ratios.
  - Price-book can be particularly helpful for small and micro cap, as short term earnings volatility can distort PE comparisons.
- We divide the future price by the current price and then annualize the price change.
- We add the price change to the dividend yield to arrive at the expected return.

[1] For the US, we use the median PE (trailing twelve months) for the longest available period. For the Russell Top 200, this was 17.8x. We assume a higher PE for mid, small, and micro that is consistent with their historical valuations relative to large cap. We assume reversion 75% back toward the median.

Bonds

- The short version for most investment grade bond models is: E(R) = current YTW.
- The longer version accounts for the expected term structure in the future.
  - If the average duration is roughly five years, we calculate the expected yield in five years.
  - The net effect tends to be minimal, since higher income in years 5 to 10 is offset by price declines in years 1 to 5.
- For corporate bonds, we assume the spread vs. Treasuries will revert most of the way back to their mean since 1990.
- For Cash, we use an average of the current rate and the rate suggested by the Taylor Rule (inputs are current & potential GDP, current & desired inflation).
- For TIPS, we add the real yield for the TIPS index to the Expected Inflation rate used in the Equities models.
- As with equities, we also make currency adjustments when necessary.
  - This currently provides a tailwind to foreign and EM local currency debt.

Bonds (con't)

- For anything with credit risk, we also take into account the expected default & recovery rates.

	Inv. Grade Corporate (%)	LT Corporate (%)	Foreign Debt (%)	EM Debt (major) (%)	EM Debt (local) (%)	High Yield (%)	Bank Loans (%)
Default Rate	0.08	0.08	0.10	1.52	0.26	3.00	3.00
Loss Rate	50	60	50	50	50	55	38

  - As a guide, we use Moody's historical global default & recovery data for each bucket as it is currently rated.
    - Example: EM Debt (local currency)

Rating	Weighting (%)	Default Rate (%)	Weighted Default (%)
Aaa	15.7	0.06	0.01
Aa	43.5	0.09	0.04
Baa	32.9	0.27	0.09
Ba	6.4	1.06	0.07
B	1.5	3.40	0.05
	Total Weighted Average Default Rate:		0.26

Private Equity

- For Buyouts, we start with public equity expected returns.
- We add a premium or discount based on the pricing of buyouts relative to stocks.
  - EBITDA multiples provide an indication of pricing.
- We add a premia for control (e.g., for greater operational efficiencies) and leverage.
  - We assume leverage of 1.4x - 1.6x.
- We subtract borrowing costs and fees.
  - We assume borrowing costs are consistent with the yield on syndicated loans.

[1] Source: Venture Economics, S&P. We use the middle-market as a proxy given our long-standing bias toward this area.

Private Equity (cont.)

- For Venture Capital, we create a public market proxy that we can compare through time.
  - The composite is composed of: traditional technology, biotech, pharmaceuticals, life sciences, IT services, internet, and clean tech & environmental stocks.
    - The weighting to each sector varies through time.
    - The data is an imperfect proxy and the correlation with future returns is not high.
    - Still, this proxy provides some indication of pricing relative to small cap stocks.
- The proxy was trading below the small cap market as of year end.
  - Therefore, using this signal, we arrived at an expected return above the historical average (median) for the asset class.

Real Estate

- For Core Real Estate, we used two models.
  - The first model adds a premium to the Cap Rate[1].
    - Core RE has historically returned approximately 1.0% more than its cap rate at the start of the period over the subsequent ten years.
  - The second model combines income with capital appreciation potential.
    - The income for core RE has historically been the cap rate minus 2-3% (for Cap Ex).
    - We assume income (NOI) grows at the rate of inflation.
    - We assume there is some measure of fair value for cap rates relative to bond yields.
      - We make a price adjustment based on the forward yield curve.
  - We adjust for leverage, borrowing costs, and fees.
- For High Yield Real Estate Debt, we used our high yield bond model.
  - Data is sparse on default rates and spreads.
    - We use the same default rate as high yield bonds.
    - We use the YTW on the Barclays CMBS 2.0 BBB index and then add a "high yield" spread onto this.
    - We adjust for leverage, borrowing costs, and fees.

[1] Source: NCREIF.

Real Estate (cont.)

- For Non-Core Real Estate, we started with a historical premiums versus core RE.
  - This includes the effect of greater control, development, buying at distress, etc.
- We added a non-US component (e.g., premium for lower cap rates) and a currency effect.
  - We assume 20% to 40% of non-core commitments will be ex-US (majority in Europe).
- We lever the portfolio and then subtract the cost of borrowing.
  - Value-added leverage ranges 40-70% while opportunistic ranges 50-80%
  - Value-added cost of debt at LIBOR plus 200-350 and opportunistic at LIBOR plus 300-500
- Finally, we subtracted management fees and carried interest.

[1] Source: NCREIF, Townsend.

Private Credit

- For mezzanine debt, we use a building blocks approach that is based on income and loss thereof.
  - We use the average coupon rate (including PIKs) of observed mezz deals
  - We add an equity kicker, adjusted for expected defaults
    - Managers expect 2.5% to 5% return from warrants and co-invests
  - We add an upfront fee (paid by the borrower) that usually ranges 1-3%
  - We incorporate default & recovery rates
    - These are subjective, as no hard data exists on mezz debt defaults
    - We use a default rate roughly twice that for high yield bonds
  - We subtract management fees and carried interest
- For distressed debt, we use a model similar to that for public credit.
  - It is based on the yield of the Barclays US Ca-D index and adjusts for defaults and recoveries.
    - It uses a much high default rate than high yield bonds (the historical rate is approximately 30%).
  - We subtract management fees and carried interest.

Private Credit (cont.)

- For direct lending, we use a building blocks approach that is based income and loss thereof.
  - We use the average coupon rate of unitranche deals
  - We add an upfront fee (paid by the borrower) or original issue discount
  - We incorporate default & recovery rates
    - We use a default rate and recovery rate roughly the same as for bank loans
  - We subtract management fees and carried interest
- For aggregate private credit, we take a weighted average based on a typical client allocation to private debt.

Component	Weight (%)	E(R) (%)
Mezzanine Debt	30	6.8
Distressed Debt	20	7.0
Direct Lending	50	6.3
Private Debt Composite		6.6

REITs

- For REITs, we focus on historical pricing and yields.
  - We first look at current REIT Yields[1].
    - REITs have historically returned 2.4% more than their yield at the start of the period over the subsequent ten years.
  - We next looked at spreads versus Treasuries and Baa corporates.
    - REITs have yielded 1.8% more than 5-year Treasuries since 1990.
    - REITs have historically yielded 1.2% less than Baa corporate bonds since 1990.
  - We also looked at the price change required for REITS to return to the average REIT yield spread implied in 5 years.

REIT Yield (%)	5-year Treasury Yield (%)	Baa Yield (%)
4.0	0.4	3.3

  - We combine these factor by averaging the impact of pricing factors and then adding this to income and income growth.

[1] Source: NAREIT.

Infrastructure

- For public IS, we first take the weighted average of the regional public equity returns.

Region	Weighting (%)	Weighted Return (%)
US	43.1	2.1
Developed	46.5	2.6
EM	10.4	0.7
	Expected Equity Return:	5.4

- We then look at the P-E and P-B ratios of the IS index vs. the global equity market to derive a signal as to how discounted or expensive IS stocks may be.[1]
  - We assume some reversion in pricing to half the difference between the two.

	Public IS	Global Equities	Price Adjustment
P-E ratio	17.8	33.3	23.3%
P-B ratio	1.87	2.92	18.0%

- Finally, we add the average of the price adjustments (per annum) to the expected equity return to arrive at our preliminary expected return for public IS

$$E(R) = 5.4\% + 2.1\% = 7.5\%$$

[1] We used the trailing 12-month P-E ratio for the MSCI World Infrastructure and MSCI World indices, respectively.

Infrastructure (con't)

- For private infrastructure, we built a model that combines income and capital appreciation.
- For income, we used our best estimate of expected yield.
  - Assume a range of 4-6% for core and 2-4% for non-core.
- We assume asset prices keep up with inflation and/or GDP growth.
  - Use inflation for core IS and GDP for non-core, since the latter is more economically sensitive.
- We then make a qualitative judgment on our infrastructure team's assessment of current market pricing.
  - There is a paucity of publicly available data on pricing for private infrastructure.
- We add a control premium for non-core IS (as these more closely resemble buyouts).
- We lever the portfolios and then subtract the cost of borrowing.
  - Core levered at 2.5:1, non-core at 1.7:1
  - Cost of debt ranges from LIBOR plus 300-400 for core IS to plus 300-700 for non-core IS.
- Finally, we add any currency effect and subtract management fees and carry.

Natural Resources

- For public NR, we take the weighted average of the regional public equity returns.

Region	Weighting (%)	Weighted Return (%)
US/Canada	49.8	2.5
Developed	39.9	2.2
EM	10.3	0.7
	Expected Equity Return:	5.4

- We then look at the P-E, P-B and EV/EBITDA ratios of two NR indices vs. the global and US equity markets and average them to derive a signal as to how discounted or expensive NR stocks may be and assume reversion in pricing between the two[1].

P-E Ratio	Public NR	Global / US Equities	Price Adjustment
S&P Global NR vs. S&P Global BMI	22.2	23.5	3.0%
S&P NA NR vs S&P 500	19.5	27.6	20.5%

[1] We used the trailing 12-month P-E ratio for the S&P Global Natural Resource and S&P Global BMI indices and the S&P NA Natural Resources and S&P 500, respectively. We assume reversion to half of the historical difference

Natural Resources (cont.)

EV/EBITDA	Public NR	Global/ US Equities	Price Adjustment
S&P Global NR vs. S&P Global BMI	12.2	16.3	17.0%
S&P NA NR vs S&P 500	10.3	18.7	40.7%

P-B Ratio	Public NR	Global/ US Equities	Price Adjustment
S&P Global NR vs. S&P Global BMI	1.5	2.1	17.5%
S&P NA NR vs S&P 500	1.6	4.2	82.0%

$$Average\ Price\ Adjustment = 30\%$$

- Finally, we add the price adjustment (per annum) to the expected equity return to arrive at our preliminary expected return for public NR.

$$E(R) = 5.4\% + 1.7\% = 7.1\%$$

Natural Resources (cont.)

- Most "private" mining partnerships consist of investments in "junior" mining stocks.
  - We again take the weighted average of the regional public equity returns.
    - Roughly 50/50 USA/Canada and Australia.
  - Similarly to Public Natural Resources, we then look at the P-E, P-B and EV/EBITDA ratios of the regional indices vs. their own history and their local market to derive a signal as to how discounted or expensive mining stocks may be.

	Current PE	Avg. PE	Current P-B	Avg. P-B	Current EV/EBITDA	Avg. EV/EBITDA
MSCI Australia Small Met/ Min	14.7	24.1	2.3	2.2	6.0	6.8
S&P TSX Div. Met /Min	9.1	18.1	0.6	1.5	4.3	6.6

  - We add a control premium (as these resemble buyouts) and subtract fees & carry.
- For oil & gas, we use a similar approach.
  - We again take the weighted average of the regional public equity returns.
    - 30% in US/Canada, 65% EAFE, and 5% EM
  - We then look at the relative pricing of small cap oil & gas stocks.
  - We add a control premium (and subtract management fees & carry.

Natural Resources (cont.)

- For Timberland, we combine land pricing with income potential.
- We examine the average price per acre of timberland transactions since 1995, excluding the highest and lowest numbers for each year[1].
  - We then adjusted these prices for inflation and derived a long-term average.

Current Price/Acre	Inflation-Adjusted Average	Price Adjustment
$1,450	$1,192	4.0%

  - We assume that prices move halfway back toward their historical inflation-adjusted average
- We assume that property values grow in the future at the rate of inflation.
- We assume that real income will be consistent with its trailing 5-year average of 1.1%.
- We add a non-US component (premium for lower cap rates) and a currency effect.
  - We assume 25-50% of commitments will be ex-US (Latin America and Australasia).
- We lever the portfolio at 1.15:1 and then subtract the cost of borrowing, which is estimated at LIBOR plus 250-350 basis points.
- Finally, we subtract management fees (as well as carry).

[1] Source: RISI.

Natural Resources (cont.)

- For Farmland, we use essentially the same model as Timberland.
- We looked at the average price per acre of farmland and cropland[1].
  - We then adjusted these prices for inflation and derived a long-term average.

	Current Price/Acre ($)	Inflation-Adjusted Average ($)	Price Adjustment (%)
Farmland	3,160	2,070	-26
Cropland	4,100	3,336	-19

  - We assume that prices move halfway back toward their historical inflation-adjusted average
- We again assume that property values grow in the future at the rate of inflation.
- We assume that real income will be consistent with its trailing 5-year average of 2.5%.
- We add a non-US component (premium for lower cap rates) and a currency effect.
  - We assume 20-50% of commitments will be ex-US (Latin America and Australasia).
- We lever the portfolio at 1.6:1 and then subtract the cost of borrowing, which is estimated at LIBOR plus 300-400 basis points.
- Finally, we subtract management fees and carried interest.

[1] Source: RISI and USDA. Farmland includes dwellings on properties as well as pastureland.

Natural Resources (cont.)

- To arrive at the aggregate NR assumption, we took a weighted average of our expectations for each of the five components.

Component	Weight (%)	E(R) (%)
Timberland	5	5.7
Farmland	15	6.2
Oil & Gas	50	8.2
Opportunistic Green	10	8.2
Mining	20	8.3
	Aggregate Private NR	7.8

Commodities

- For a traditional (or naïve) portfolio, we use the following model:

$$E(R) = Collateral\ Yield + Roll\ Return + Spot\ Return + Diversification\ Return$$

$$E(R) = 0.6\% - 0.1\% + 0.7\% + 2.1\% = 3.4\%$$

  - The collateral yield represents our expected return from cash.
  - The roll return should vary based on how backwardated or contagoed the market is
    - However, this state could change quickly, so our assumption is anchored near zero
  - For the spot return, we use the market's expectation for inflation.
  - The diversification return is the result of regular rebalancing between commodity futures.
    - The diversification return rises as the average variance of the securities in a portfolio rises, as the average correlation in the portfolio falls and as the number of securities in the portfolio rises.
    - However, we use a lower than historical number (2.2%) since correlations among commodities have risen since the academic research was originally conducted[1].

[1] De Chiara and Raab (2002) document a 2.8% diversification return for the rebalanced Dow Jones AIG Commodities index during the time period 1991 to 2001. Gorton and Rouwenhorst suggest a diversification return of between 3.0% and 4.5% for an equally-weighted basket of commodity futures.

Commodities (cont.)

- In addition, we have models for several more complex strategies, specifically risk parity and real return.
- For Commodities Risk Parity, we use a strategy with a target volatility of 15%.
  - The basic inputs are the same as for a naïve portfolio, except we assume a higher diversification return (2.6%) as risk parity strategies tend to be better diversified than the broad index.
  - We lever the portfolio at 1.5:1, which is in line with the average for managers using this strategy.
  - We then subtract the cost of borrowing as well as management fees (as there is no passive option).
- For Commodities Real Return, we use a "portable alpha" approach.
  - We add the return of TIPS on top of the return for the naïve commodities portfolio.
  - We then subtract the cost of borrowing as well as management fees.

Hedge Funds

- To construct the hedge fund models, we use a variety of traditional and alternative betas:
  - Traditional betas:
    - Equities, distressed debt, credit, commodities, bonds
  - Alternative betas:
    - Carry trade, convert arb, currency (value and momentum)
- We also add leverage (where appropriate) and subtract the cost of debt and fees.

Hedge Funds (cont.)

- To arrive at the aggregate Hedge Fund assumption, we take a weighted average of our expectations for each of the five components.
- The weightings are revised (less in Long-Short, more in Global Macro) based on the approximate allocation of each category in the hedge fund universe.

Component	Weight (%)	E(R) (%)
Long-Short	28	1.7
Event-Driven	26	4.2
Global Macro	19	3.6
Fixed Income/L-S Credit	11	3.2
Relative Value/Arbitrage	16	5.3
Aggregate Hedge Funds		3.4

Risk Parity

- To build our model we used the five most common risk parity betas.
  - We weighted each such that their contribution to risk (volatility) was equal.
  - This requires MVO (due to correlations being less than one).
- We leveraged the group (at 1.4:1) such that the aggregate standard deviation was at the target (10%).
- We subtract management fees (of 50 basis points; there is no passive option).

Component	Weight (%)	Contribution to Levered E(R) (%)	Std Dev (%)
Equities	14	1.1	17
Credit	26	0.8	9
Commodities	14	0.7	17
Currencies	20	1.0	12
Interest Rates	26	1.0	9
Aggregate Risk Parity (net)		4.1	

Tactical Asset Allocation

- To build our model, we used a compilation of many common traditional betas.
  - The weightings reflect a rough average of the TAA managers employed by our clients.
- We subtract management fees (of 75 basis points; there is no passive option).

Component	Weight (%)	E(R) (%)
US Equities	25	4.9
EAFE Equities	15	5.5
EM Equities	10	7.2
Commodities	10	3.4
Cash	5	0.6
Investment Grade Bonds	15	1.0
EM Debt	10	2.8 & 4.3
High Yield	5	3.1
TIPS	10	1.2
	Aggregate TAA (net)	2.7

The Other Inputs: Standard Deviation and Correlation

- Standard deviation:
  - We review the trailing fifteen-year standard deviation, as well as skewness.
  - Historical standard deviation serves as the base for our assumptions.
  - If there is a negative skew, we increased the volatility assumption based on the size of the historical skewness.

Asset Class	Standard Deviation (%)	Skewness	Assumption (%)
Bank Loans	6.6	-2.3	9.0

  - We also adjust for private market asset classes with "smoothed" return streams.
- Correlation:
  - We use trailing fifteen-year correlations as our guide.
  - Again, we make adjustments for "smoothed" return streams.
- Most of our adjustments are conservative in nature (i.e., they increase the standard deviation and correlation).

Return and Risk Data

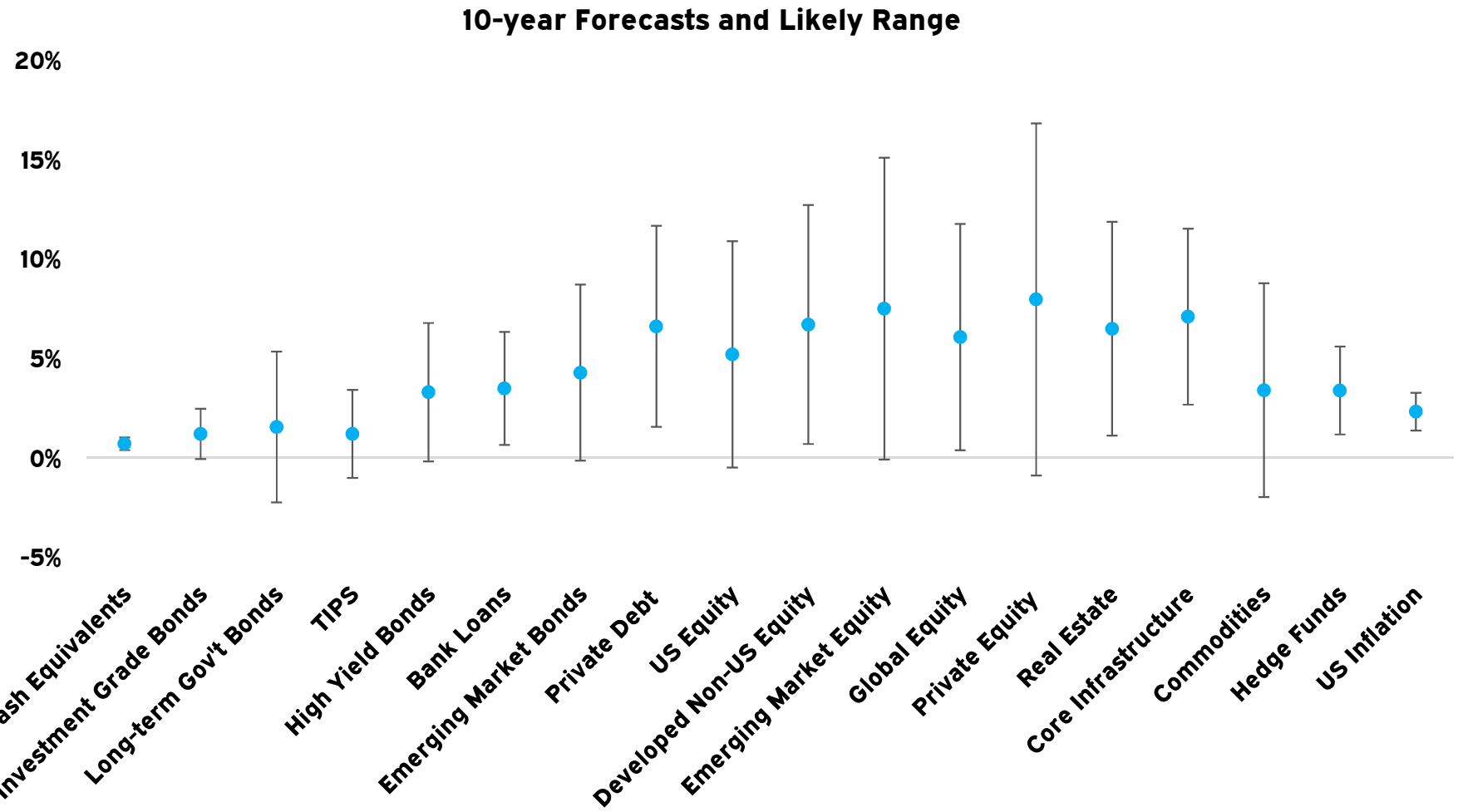
Asset Class	10-year Expected Return (%)	20-year Expected Return (%)	Standard Deviation (%)	20-year Risk Premia[1]
Cash Equivalents	0.7	1.1	1.0	-0.3%
Investment Grade Bonds	1.2	1.8	4.0	0.4%
Long-term Government Bonds	1.6	2.5	12.0	1.1%
TIPS	1.2	1.8	7.0	0.4%
High Yield Bonds	3.3	4.2	11.0	2.8%
Bank Loans	3.5	4.0	9.0	2.6%
Emerging Market Debt (local)	4.3	3.9	14.0	2.5%
Private Debt	6.6	6.8	16.0	5.4%
US Equity	5.2	6.8	18.0	5.4%
Developed Non-US Equity	6.7	7.1	19.0	5.7%
Emerging Non-US Equity	7.5	8.1	24.0	6.7%
Global Equity	6.1	7.1	18.0	5.7%
Private Equity	8.0	9.1	28.0	7.7%
Real Estate	6.5	6.9	17.0	5.5%
Core Private Infrastructure	7.1	7.0	14.0	5.6%
Commodities	3.4	3.7	17.0	2.3%
Hedge Funds	3.4	4.3	7.0	2.9%
Inflation	2.3	2.1	3.0	

[1] Risk Premia are calculated relative to our 20-year expected return for intermediate-term government bonds.

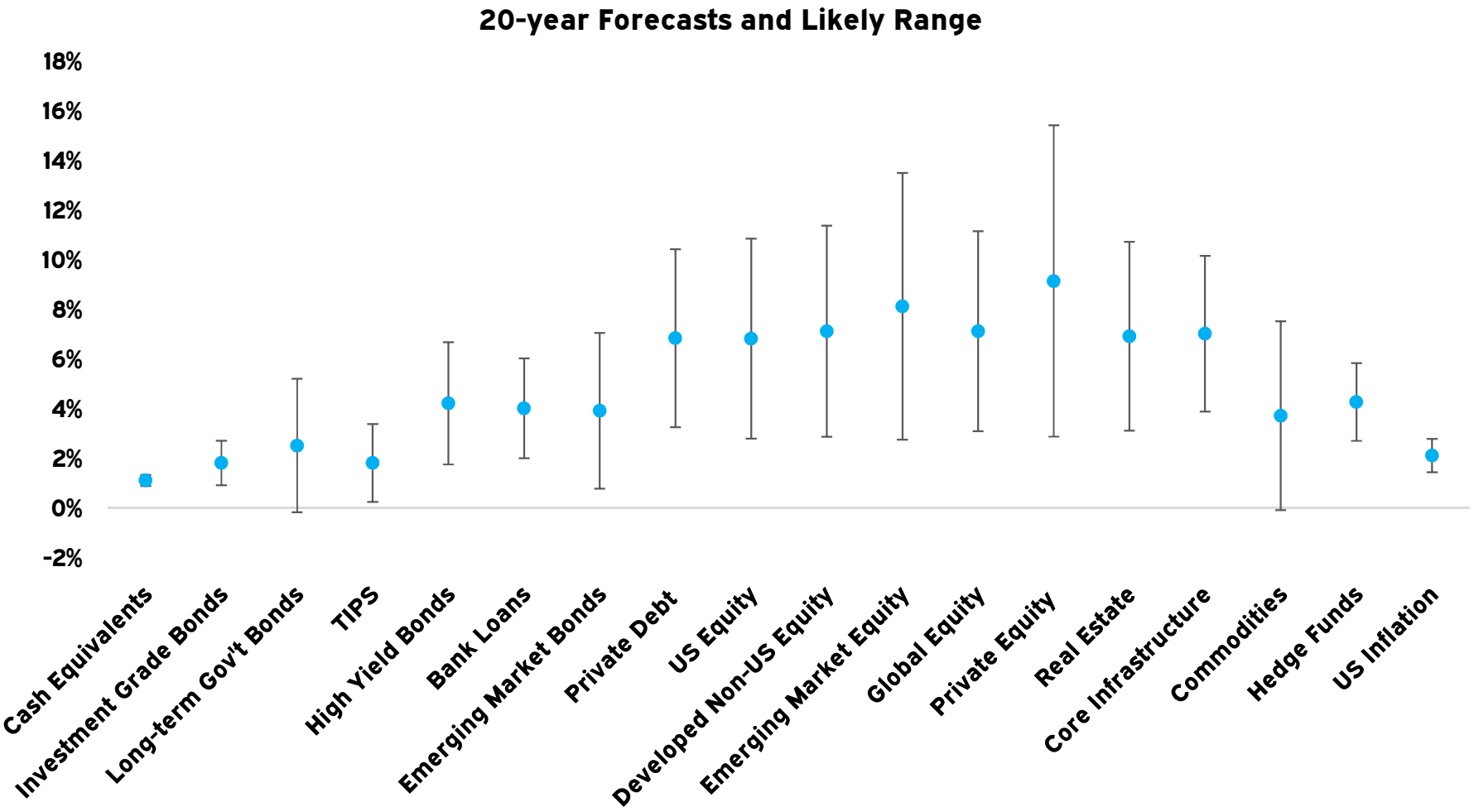
Correlation Data

	Inv. Grade Bonds	Long-term Gov't Bonds	TIPS	High Yield Bonds	US Equity	Dev. Non-US Equity	Em. Market Equity	Private Equity	Real Estate	Commod.	Core Infra. (private)	Hedge Funds
Investment Grade Bonds	1.00											
Long-term Government Bonds	0.82	1.00										
TIPS	0.77	0.53	1.00									
High Yield Bonds	0.23	-0.22	0.41	1.00								
US Equity	0.02	-0.32	0.19	0.75	1.00							
Developed Non-US Equity	0.10	-0.28	0.24	0.76	0.89	1.00						
Emerging Market Equity	0.15	-0.23	0.33	0.75	0.78	0.87	1.00					
Private Equity	0.00	-0.10	0.05	0.70	0.85	0.80	0.75	1.00				
Real Estate	0.20	0.05	0.10	0.50	0.50	0.45	0.40	0.45	1.00			
Commodities	0.02	-0.29	0.31	0.54	0.53	0.60	0.65	0.30	0.15	1.00		
Core Infrastructure (private)	0.30	0.15	0.30	0.60	0.55	0.55	0.50	0.45	0.60	0.35	1.00	
Hedge Funds	0.05	-0.34	0.26	0.78	0.86	0.88	0.86	0.60	0.45	0.67	0.60	1.00

10-Year Return Expectations



20-Year Return Expectations



2020 Peer Survey

- Annually, Horizon Actuarial Services, LLC publishes a survey of capital market assumptions that they collect from various investment advisors.[1]
- The Horizon survey is a useful tool to determine whether a consultant's expectations for returns (and risk) are reasonable.

Asset Class	10-Year Average (%)	Meketa 10-Year (%)	20-Year Average (%)	Meketa 20-Year (%)
Cash Equivalents	1.6	0.5	2.3	1.3
TIPS	2.0	1.3	2.7	2.1
US Core Bonds	2.6	1.2	3.6	2.1
US High Yield Bonds	4.9	4.0	5.6	4.9
Emerging Market Debt	5.2	4.0	5.9	4.3
Private Debt	7.8	6.5	7.9	6.7
US Equity (large cap)	6.2	5.2	7.1	7.2
Developed Non-US Equity	6.8	7.4	7.5	7.8
Emerging Non-US Equity	7.9	8.4	8.4	8.8
Private Equity	9.1	8.1	9.9	9.1
Real Estate	5.8	6.4	6.6	7.0
Infrastructure	6.9	6.4	7.3	6.4
Commodities	3.2	4.3	4.0	3.9
Hedge Funds	4.7	3.1	5.7	4.3
Inflation	2.0	1.8	2.2	2.2

[1] The 2020 survey included 39 respondents. The 10-year horizon included all 39 respondents, and the 20-year horizon included 18 respondents. Figures based on Meketa's 2020 interim CMEs.

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TAB 7 – Q4 OPERF Performance

MEKETA
INVESTMENT GROUP

Oregon Investment Council

March 10, 2020

Meketa Investment Group

Purpose of Executive Summary

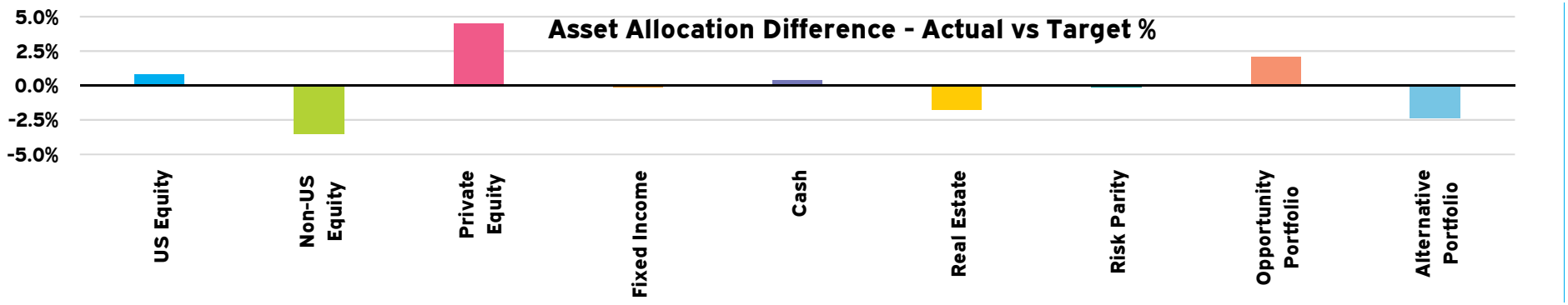
- Assist OIC Council Members in their oversight of risk/return for investment portfolios under their purview.
- By looking backwards, we can make informed decisions about what worked and what did not.
- Use the data and analysis to inform decisions about the future.

OPERF Performance Summary – Commentary

- Within Domestic Equity, meaningful portfolio exposures (bets) have detracted from performance across the various time horizons. Specifically, value and small size exposures relative to the Index have been a headwind. Consideration should be given towards determining and re-assessing the magnitude and conviction of these exposures within the portfolio.
- Significant overweight to Private Equity - actual allocation of 23.5% versus a target allocation of 19%. OPERF is actively looking to reduce private equity exposure, though it will take some time given the illiquid nature of the asset class. From an absolute return standpoint, Private Equity returns have been strong, producing double digit results in the low teens over the last 3, 5 and 7 years. Benchmark- relative returns have been more challenging.

OPERF Asset Allocation as of December 31, 2020

Asset Class	Actual ($ 000)	Actual Weight	Target Weight[1]	Difference (%)	Difference ($ 000)
Fixed Income	16,342,826	19.9%	20.0%	-0.1%	-49,982
US Equity	14,402,767	17.6%	16.75%	0.8%	673,790
Non-US Equity	10,858,018	13.2%	16.75%	-3.5%	-2,870,959
Real Estate	8,737,169	10.7%	12.5%	-1.8%	-1,508,336
Risk Parity	2,001,324	2.4%	2.5%	-0.1%	-47,777
Opportunity Portfolio	1,718,880	2.1%	0.0%	2.1%	1,718,880
Alternative Portfolio	8,319,181	10.1%	12.5%	-2.4%	-1,926,324
Private Equity	19,245,718	23.5%	19.0%	4.5%	3,672,551
Cash	338,157	0.4%	0.0%	0.4%	338,157
Total	81,964,040	100.0%	100.0%		
YTD Net Cash Flow	(2,879,427)				
Gain/Loss	5,777,882				



- A significant majority of OPERF's assets are allocated to risk-oriented assets in the public and private equity markets.
- Efforts are underway/ liquidity programs in place to reduce the overweight to Private Equity. It is important to note that reducing exposure to PE is challenging given the nature of the asset class, and a work in progress.

[1] Reflects interim policy target adopted July 1, 2020. Strategic policy target not shown.

OPERF Q4 2020 Performance Attribution

	QTD	1 Yr	3 Yr	5 Yr	10 Yr
Total OPERF	7.51	7.66	7.10	8.71	8.42
Total OPERF ex Overlay	7.81	8.28	7.18	8.75	8.36
OPERF Benchmark	7.76	12.37	9.04	10.31	9.33
excess	-0.25	-4.71	-1.94	-1.60	-0.91
IM All DB > $5B Net Median	9.55	12.17	8.47	9.85	8.38
Peer Quartile Rank	*4*	*4*	*4*	*4*	*2*
US Equity	16.52	13.60	10.52	13.31	12.25
Russell 3000	14.68	20.89	14.49	15.43	13.79
excess	1.84	-7.29	-3.97	-2.12	-1.54
Non-US Equity	18.02	13.47	5.80	10.05	6.43
MSCI ACWI x US IMI	17.22	11.12	4.83	8.98	5.06
excess	0.80	2.35	0.97	1.07	1.37
Private Equity	8.04	12.74	13.96	13.03	13.03
Russell 3000 + 3% (Qtr Lag)	9.99	18.42	14.97	17.06	16.85
excess	-1.95	-5.68	-1.01	-4.03	-3.82
Fixed Income	0.89	7.66	5.51	4.65	4.45
Custom Benchmark	0.75	7.26	5.22	4.29	3.85
excess	0.14	0.40	0.29	0.36	0.59
CASH in OSTF	0.13	1.56	2.30	1.88	1.28
91 Day Treasury Bill	0.03	0.67	1.61	1.20	0.64
excess	0.10	0.89	0.69	0.68	0.64
Real Estate	2.66	2.66	5.95	7.15	10.02
NCREIF ODCE (Qtr Lag)	0.27	0.52	4.25	5.65	9.04
excess	2.39	2.14	1.70	1.50	0.98
Risk Parity	6.68				
S&P Risk Parity - 12% Vol	12.20				
excess	-5.52				
Opportunity Portfolio	7.97	10.15	7.37	7.73	8.35
CPI +5%	1.26	6.45	6.85	6.94	6.68
excess	6.71	3.70	0.52	0.79	1.67
Alternative Portfolio	1.58	-6.61	-3.48	0.75	
CPI +4%	1.06	5.41	5.92	6.02	
excess	0.52	-12.02	-9.40	-5.27	

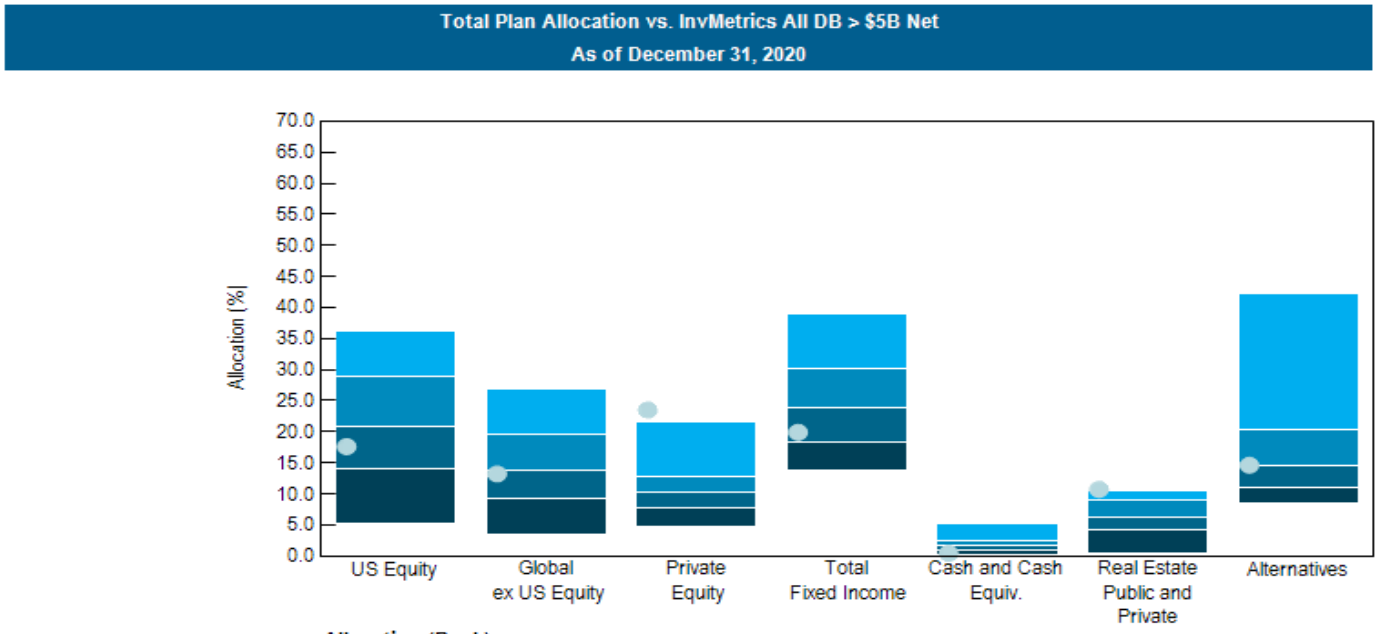
Overweight / Underweight	Contributors / Detractors to excess return	
o/w = overweight to target u/w = underweight to target -on average for the period-	QTD	YTD
O/W	contributor	strong detractor
U/W	detractor	contributor
O/W	strong detractor	strong detractor
U/W	neutral	neutral
O/W	neutral	neutral
U/W	contributor	contributor
U/W	detractor	--
O/W	neutral	neutral
U/W	contributor	strong detractor

Action Items / General Updates

- While the OPERF portfolio had a strong 2020 in terms of absolute returns, several structural headwinds reduced performance potential on a relative basis.
  - Underweight to public equity, coupled with relative underperformance from the asset class in 2020 (see value and small cap bias noted previously).
  - Overweight to private equity coupled with a public market equivalent benchmark during a period of significant public equity market gains.
- The Asset Allocation study that is ongoing is a primary responsibility of the OIC, to help determine whether the current portfolio's course is prudent. Important areas of focus/conversation should be:
  - Private Equity's overweight (which cannot be meaningfully reduced in the near term).
  - Risk Parity as an "asset class/portfolio objective."
  - Alternatives portfolio goals and performance.

Appendix

OPERF – Asset Allocation Peer Comparison[1]



Allocation (Rank)	US Equity		Global ex US Equity		Private Equity		Total Fixed Income		Cash and Cash Equiv.		Real Estate Public and Private		Alternatives	
5th Percentile	36.1		27.0		21.7		39.1		5.3		10.5		42.2	
25th Percentile	28.9		19.4		12.8		30.0		2.5		9.0		20.3	
Median	20.9		13.7		10.2		23.9		1.6		6.3		14.5	
75th Percentile	13.9		9.1		7.7		18.2		0.8		4.3		11.1	
95th Percentile	5.3		3.4		4.6		13.9		0.1		0.4		8.5	
# of Portfolios	24		29		26		29		29		29		27	
OIC	17.6	(70)	13.2	(52)	23.5	(4)	19.9	(64)	0.4	(90)	10.7	(4)	14.6	(50)

- Relative to peers, OPERF has significantly more private equity and real estate exposure than the peer median, while traditional US Equity and fixed income exposure is somewhat lower than peer averages.

[1] Alternatives asset class as shown in the chart above reflects the sum of Risk Parity, Opportunity Portfolio, and Alternative Portfolio for OPERF.

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CERTAIN INFORMATION CONTAINED IN THIS REPORT MAY CONSTITUTE "FORWARD - LOOKING STATEMENTS," WHICH CAN BE IDENTIFIED BY THE USE OF TERMINOLOGY SUCH AS "MAY," "WILL," "SHOULD," "EXPECT," "AIM", "ANTICIPATE," "TARGET," "PROJECT," "ESTIMATE," "INTEND," "CONTINUE" OR "BELIEVE," OR THE NEGATIVES THEREOF OR OTHER VARIATIONS THEREON OR COMPARABLE TERMINOLOGY. ANY FORWARD-LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION ARE BASED UPON CURRENT ASSUMPTIONS. CHANGES TO ANY ASSUMPTIONS MAY HAVE A MATERIAL IMPACT ON FORWARD - LOOKING STATEMENTS, FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS. ACTUAL RESULTS MAY THEREFORE BE MATERIALLY DIFFERENT FROM ANY FORECASTS, PROJECTIONS, VALUATIONS, OR RESULTS IN THIS PRESENTATION.

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Callan

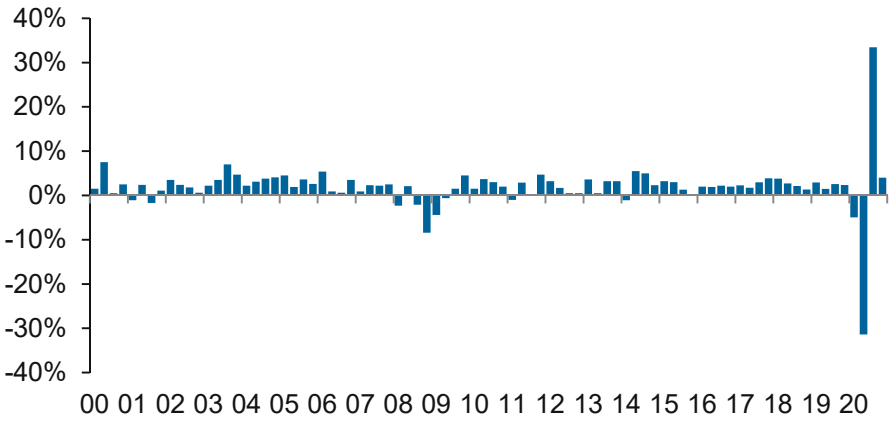
Oregon Investment Council

Fourth Quarter 2020
Performance Review

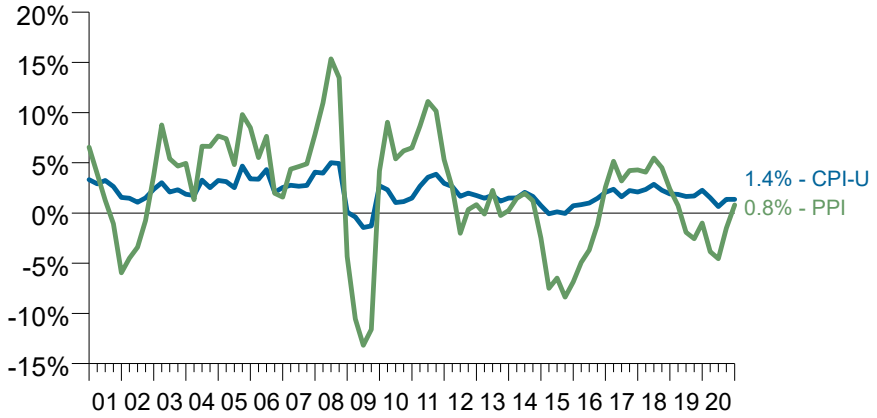
U.S. Economy—Summary

For periods ended 12/31/20

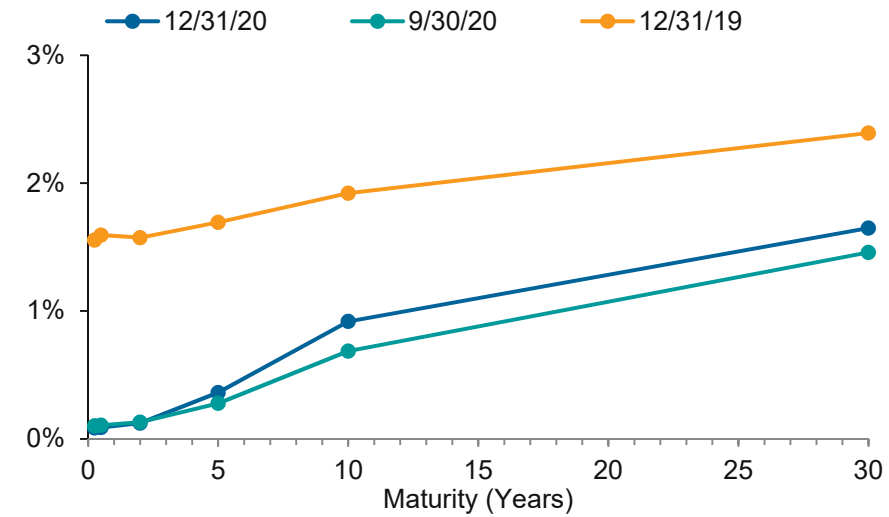
Quarterly Real GDP Growth*



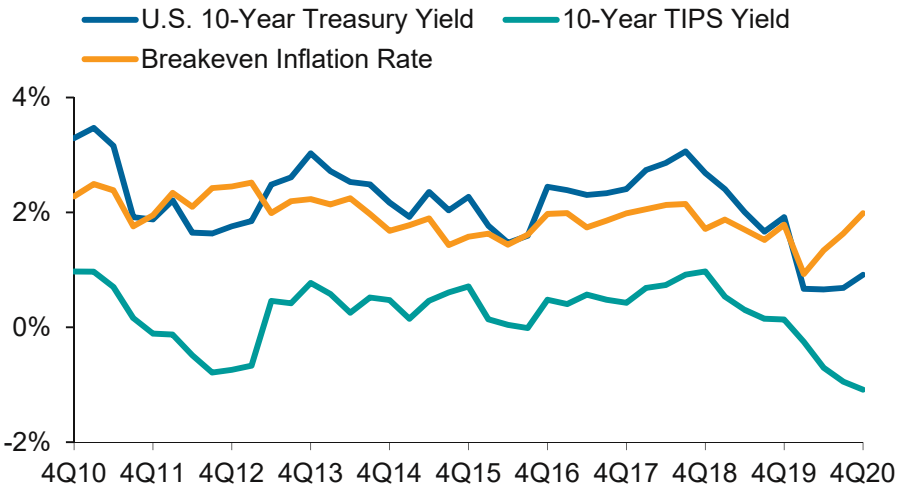
Inflation Year-Over-Year



U.S. Treasury Yield Curves



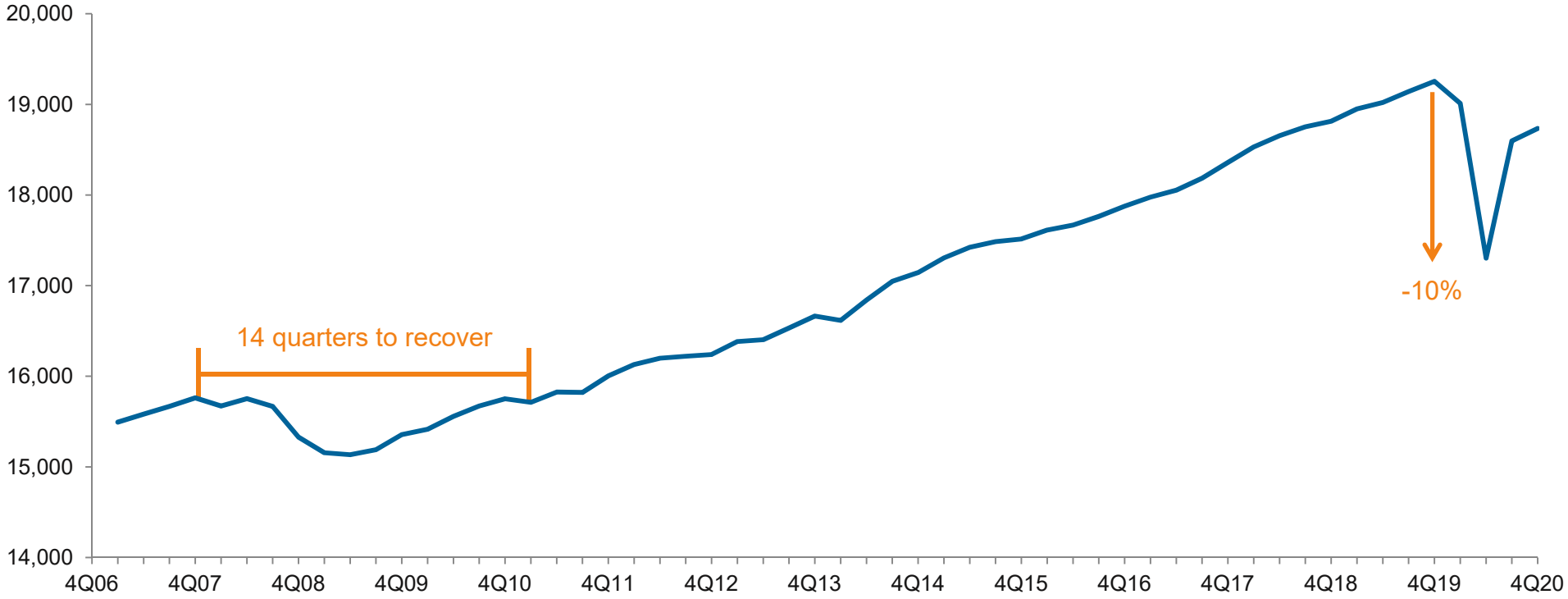
Historical 10-Year Yields



*Preliminary estimate for 4Q20. Sources: Bloomberg, Bureau of Labor Statistics, Callan, IHS Markit

GDP Rebounds in Second Half of 2020 After Precipitous First-Half Decline

Seasonally Adjusted Real GDP in Billions of Dollars



- After the Global Financial Crisis, it took 3.5 years before real GDP reclaimed its pre-recession highs.
- GFC peak to trough was down 4%.
- 2Q20 real GDP levels were down over 10% from 4Q19.
- 3Q20 real GDP bounced back 7.5%, and climbed another 0.75% in 4Q20 (IHS Markit estimate); 4Q20 GDP is now down only 2.7% from the level set in 4Q19. Annual GDP declined an estimated 3.6% over 2019.

Source: St. Louis FRED. 4Q20 is estimate.

Market Environment: 4Q20

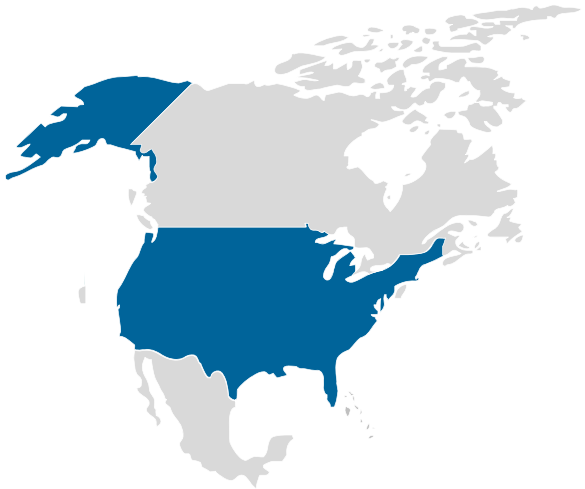
High degree of uncertainty

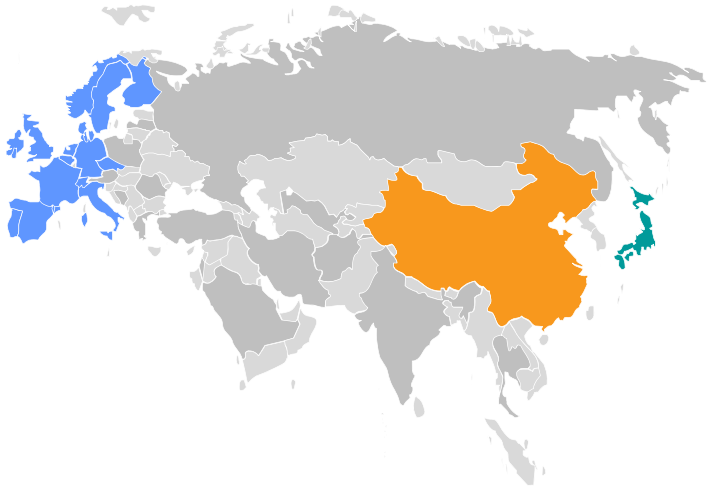
U.S.

- 2Q GDP -31.4%, largest decline on record; 3Q gain of 33%, solid growth of 4% in 4Q
- Retail sales, durable goods, and personal spending rebounded in 2Q and 3Q, but growth slowed in August and September as stimulus waned.
- Unemployment dropped to 6.7% in November from 14.7% April peak.
  - Jobless claims decelerated to less than 1 million per week but are still elevated relative to prior recession peaks.
- Housing benefiting from relatively low mortgage rates
- Fed left rates close to 0% and expects to be on hold until at least 2023.

Global

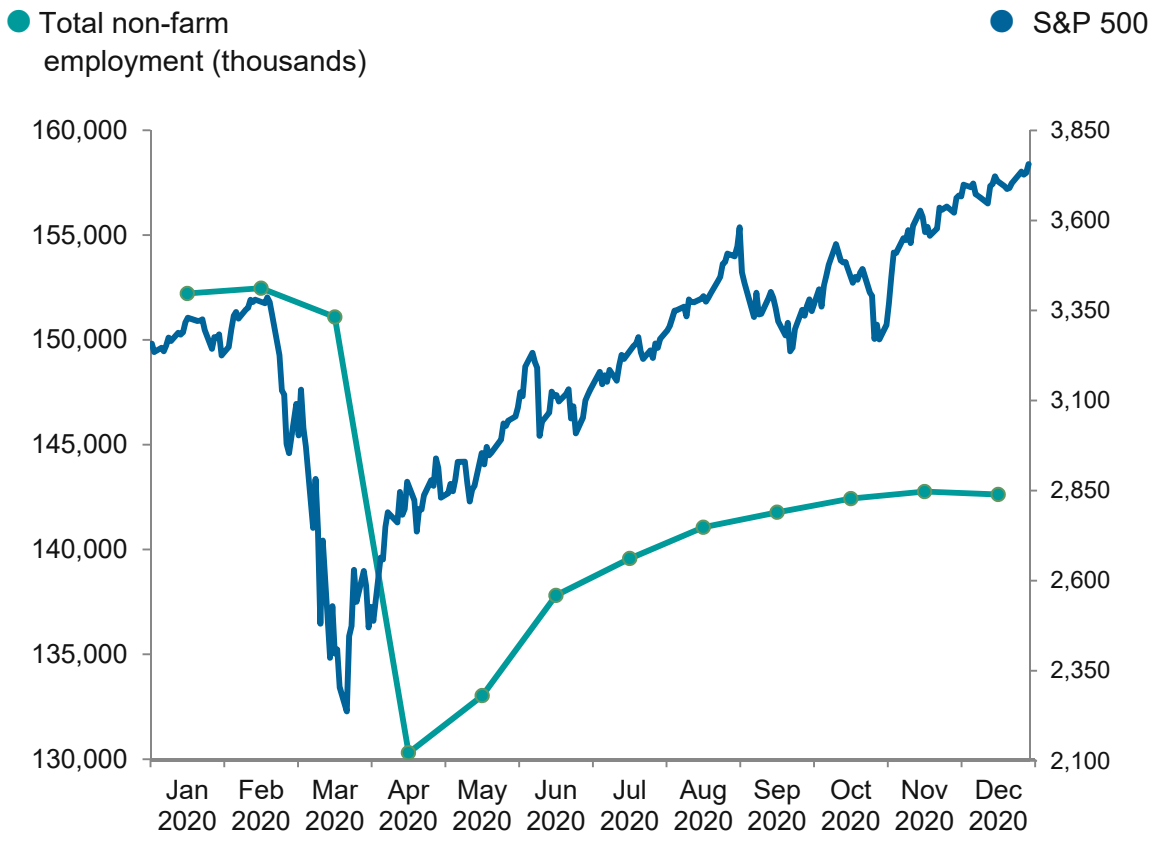
- Euro zone 1Q GDP contracted 3.7% (-14% annualized), followed by 11.7% drop (-39.2% annualized) in 2Q, largest Q drop on record; 12.5% jump (60% annualized!) in 3Q
- U.K. GDP sank 18.8% in 2Q (-57% annualized)—most ever, rebounded 16% (81% annualized) in 3Q
- Japan's economy shrank 8.3% (-29% annualized) in 2Q; third straight quarterly drop, dating back to 2019; 5.3% growth (22.9% annualized) in 3Q
- China's GDP fell 10% (-34% annualized) in 1Q, but rebounded 11.7% (56% annualized) in 2Q and is up 2.7% (11.3% annualized) in 3Q; only country expected to grow in 2020





The Stock Market Is Not the Economy

- U.S. equity market has already recovered from the March 2020 plunge and was up 18.4% through December 2020.
- The job market lost over 22 million jobs in March and April, and has recovered just over half (12 million) since May.
- GDP is projected to remain below the February 2020 pre-COVID peak until mid- to late 2021.
- Steep structural challenges face many job-laden sectors of the economy that are underrepresented in the current stock market valuation.
- Stimulus benefit to unemployed and to employers carried through 3Q; extension of benefits at year-end 2020 helped, but growth slowed in 4Q20 and the recovery faces a serious slowdown in 1Q21 and perhaps into 2Q.
- Containment of COVID-19 surges and rollout of the vaccines are key to retaining confidence in the recovery.



Sources: St. Louis FRED, S&P Dow Jones Indices

OPERF Total Regular Account

Performance Summary for the Fourth Quarter 2020

Total Fund:

For the quarter ended December 31, 2020, the Total Regular Account rose 7.65% (+7.51% net of fees), trailing the 7.76% return of the Policy Benchmark, and ranked in the fourth quartile of Callan's $10B+ public fund peer group. For the twelve months ended December, the Total Regular Account gained 8.20% (+7.66% net of fees), short of the return for the Policy Target, and ranked in the fourth quartile in Callan's $10B+ public fund peer group. Longer term results against the Policy Target were mixed, however, peer group ranks were near or above median.

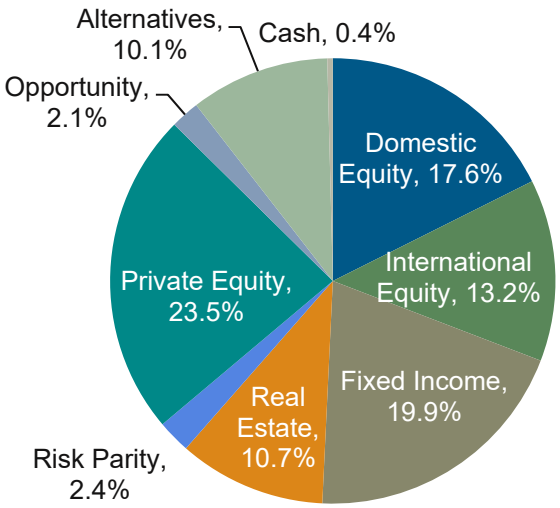
Asset Classes:

- **Total Fixed Income:** The Fixed Income Portfolio added 0.92% (+0.89% net of fees) for the quarter versus a gain of 0.75% for the Custom Fixed Income Benchmark, and ranked in the 69th percentile of Callan's Public Funds $10B+ US Fixed Income (Gross) peer group. For the trailing year, the Portfolio rose 7.80% (+7.66% net of fees), ahead of the 7.26% return of the benchmark, and ranked in the 73rd percentile of the peer group. 10 year results were ahead of the benchmark and ranked in the top quartile of the peer group.
- **Total Public Equity:** Total Public Equity portfolio returned 16.24% (+16.18% net of fees) for the quarter versus the 15.70% increase in the MSCI ACWI IMI Net benchmark, and ranked in the 31st percentile of its peer group. For the trailing year, the portfolio rose 12.90% (+12.66% net of fees), behind the 16.25% return of the benchmark and ranked in the 62nd percentile of peer group.
  - **U.S. Equity:** The U.S. Equity Portfolio increased 16.53% (+16.52% net of fees) for the quarter, outpacing the Russell 3000 Index return of 14.68%, and ranked in the 40th percentile of Callan's Public Fund: $10B+ Domestic Equity (gross) peer group. On a trailing 12 month basis, the Portfolio rose 13.67% (+13.60% net of fees) versus a return of 20.89% for the benchmark and ranked in the 97th percentile of the peer group. 10 year results of 12.43% (+12.25% net of fees) lagged the benchmark return of 13.79% and ranked in the 95th percentile of the peer group.
  - **International Equity:** The International Equity Portfolio registered returns of 18.14% (+18.02% net of fees) for the quarter, outperforming the 17.22% return of the MSCI ACWI ex-U.S. IMI Index, and ranked in the 21st percentile of Callan's Public Fund: $10B+ International Equity (gross) peer group. For the trailing year, the Portfolio returned 13.91% (+13.47% net of fees) outperforming the benchmark return of 11.12%, and ranked in the 38th percentile in the peer group. 10 year results remained comfortably ahead of the benchmark (+6.43% net of fees versus +5.06%) and continued to rank in the top quartile of the peer group.
- **Total Real Estate:** The Real Estate Portfolio continued to show competitive absolute results over the last decade with an annualized return of 10.02% net of fees.
- **Opportunity Portfolio:** The Opportunity Portfolio's results over the last ten years continued to be favorable with an annualized return of 8.35% net of fees.
- **Alternative Portfolio:** The Alternative Portfolio returned 0.75% per annum net of fees over the last five years.
- **Total Private Equity:** The Private Equity Portfolio's returns remained strong with an annualized return of 13.03% net of fees over the last ten years.

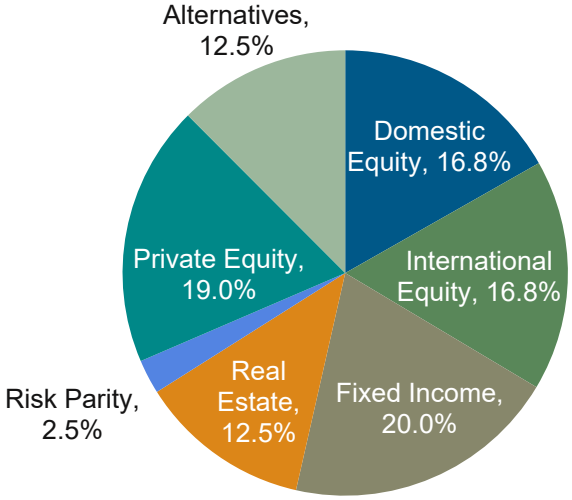
OPERF Total Regular Account

Asset Allocation

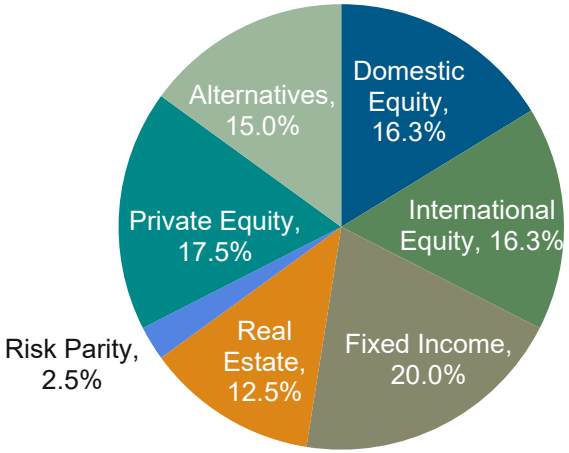
Actual Allocation as of 12/31/2020



Interim Policy Target*



Strategic Policy Target**



Asset Class	$000s Actual	Weight *** Actual	Target	Percent Difference	$000s Difference
Total Fixed Income	16,342,826	19.9%	20.0%	(0.1%)	(49,982)
U.S. Equity Portfolio	14,402,767	17.6%	16.8%	0.8%	673,790
Non-U.S. Equity Portfolio	10,858,018	13.2%	16.8%	(3.5%)	(2,870,959)
Total Real Estate	8,737,169	10.7%	12.5%	(1.8%)	(1,508,336)
Risk Parity	2,001,324	2.4%	2.5%	(0.1%)	(47,777)
Opportunity Portfolio	1,718,880	2.1%	0.0%	2.1%	1,718,880
Alternative Portfolio	8,319,181	10.1%	12.5%	(2.4%)	(1,926,324)
Total Private Equity	19,245,718	23.5%	19.0%	4.5%	3,672,551
Cash	338,157	0.4%	0.0%	0.4%	338,157
Total	81,964,040	100.0%	100.0%		

*Interim policy target adopted July 1, 2020 **Strategic policy target adopted April 24, 2019 ***Totals provided by OST Staff

OPERF Total Regular Account

Net Performance by Asset Class as of December 31, 2020

	Last Quarter	YTD	Last 3 Years	Last 5 Years	Last 10 Years
Total Regular Account	**7.51%**	**7.66%**	**7.10%**	**8.71%**	**8.42%**
Total Regular Account ex-Overlay	7.81%	8.28%	7.18%	8.68%	8.36%
OPERF Policy Benchmark*	7.76%	12.37%	9.04%	10.31%	9.33%
Total Fixed Income	**0.89%**	**7.66%**	**5.51%**	**4.65%**	**4.45%**
Custom FI Benchmark	0.75%	7.26%	5.22%	4.29%	3.85%
Callan Public Fund > $10bn U.S. Fixed	1.26%	8.50%	5.75%	5.39%	4.48%
Total Public Equity	**16.18%**	**12.66%**	**8.10%**	**11.55%**	**9.12%**
MSCI ACWI IMI Net	15.70%	16.25%	9.72%	12.15%	9.09%
Total Real Estate	**2.66%**	**2.66%**	**5.95%**	**7.15%**	**10.02%**
Total Real Estate ex REITs	2.51%	2.96%	6.34%	8.02%	10.85%
Oregon Custom Real Estate Benchmark	0.27%	0.52%	4.25%	5.65%	9.04%
Callan Public Plan - Real Estate	1.67%	0.50%	4.58%	5.96%	9.76%
Opportunity Portfolio	**7.97%**	**10.15%**	**7.37%**	**7.73%**	**8.35%**
CPI + 5%	1.26%	6.45%	6.85%	6.94%	6.68%
Alternative Portfolio	**1.58%**	**-6.61%**	**-3.48%**	**0.75%**	**-**
CPI + 4%	1.06%	5.41%	5.92%	6.02%	-
Total Private Equity	**8.04%**	**12.74%**	**13.96%**	**13.03%**	**13.03%**
OIC - Russell 3000 + 300 BPS Qtr Lag	9.99%	18.42%	14.97%	17.06%	16.85%

*Current Policy Benchmark = 33.5% MSCI ACWI IMI, 20.0% OPERF Total Custom FI Benchmark, 19.0% Russell 3000 + 300 BPS Qtr Lag, 12.5% Oregon Custom Real Estate Benchmark, 12.5% CPI + 400 bps and 2.5% S&P Risk Parity 12% Vol.

Public Equity Performance – US Equity

Periods Ending December 31, 2020

	Last Quarter	YTD	Last 3 Years	Last 5 Years	Last 10 Years
Total Public Equity	**16.18%**	**12.66%**	**8.10%**	**11.55%**	**9.12%**
MSCI ACWI IMI Net	15.70%	16.25%	9.72%	12.15%	9.09%
U.S. Equity	**16.52%**	**13.60%**	**10.52%**	**13.31%**	**12.25%**
Russell 3000 Index	14.68%	20.89%	14.49%	15.43%	13.79%
Lg Public >10 B DE	16.04%	18.72%	13.44%	14.92%	13.29%
Market Oriented	**15.09%**	**15.19%**	**11.68%**	**14.30%**	**12.56%**
Russell 3000 Index	14.68%	20.89%	14.49%	15.43%	13.79%
Large Cap Value	**17.29%**	**-1.17%**	**2.05%**	**6.77%**	**9.07%**
Russell 1000 Value Index	16.25%	2.80%	6.07%	9.74%	10.50%
CAI Large Cap Value Style	17.56%	3.68%	6.18%	10.14%	10.74%
Small Cap Growth	**32.84%**	**38.87%**	**21.00%**	**18.96%**	**13.55%**
Russell 2000 Growth Index	29.61%	34.63%	16.20%	16.36%	13.48%
CAI Sm Cap Growth Style	26.86%	45.33%	22.89%	20.44%	15.50%
Small Cap Value	**32.79%**	**0.30%**	**1.49%**	**8.11%**	**8.07%**
Russell 2000 Value Index	33.36%	4.63%	3.72%	9.65%	8.66%
CAI Small Cap Value Style	31.65%	3.89%	3.28%	9.16%	9.64%

Public Equity Performance – Non-US and Global Equity

Periods Ending December 31, 2020

	Last Quarter	YTD	Last 3 Years	Last 5 Years	Last 10 Years
Non-U.S. Equity	**18.02%**	**13.47%**	**5.80%**	**10.05%**	**6.43%**
MSCI ACWI ex-US IMI Index (Net)	17.22%	11.12%	4.83%	8.98%	5.06%
Lg Public >10 B IE	17.32%	12.36%	5.77%	9.95%	5.98%
International Market Oriented (Core)	**16.84%**	**12.46%**	**5.87%**	**9.77%**	**6.90%**
MSCI World ex-US IMI Net	16.10%	8.32%	4.34%	7.92%	5.43%
CAI Core Int'l Equity	15.95%	9.44%	4.53%	7.95%	6.35%
International Value	**22.24%**	**4.87%**	**2.70%**	**8.38%**	**5.80%**
MSCI ACWI ex-US IMI Value	20.52%	-0.06%	-0.23%	5.97%	3.06%
CAI Core Value Int'l Equity Style	18.74%	2.34%	1.01%	5.83%	4.98%
International Growth	**10.93%**	**19.87%**	**12.85%**	**12.89%**	**7.84%**
MSCI World ex US Growth	12.63%	18.41%	9.57%	10.50%	7.01%
CAI Core Growth Int'l Equity Style	14.35%	19.74%	9.72%	11.21%	8.13%
International Small Cap	**21.17%**	**9.28%**	**0.88%**	**6.99%**	**5.83%**
ACWI Sm Cap ex US	18.56%	14.24%	4.59%	9.37%	5.95%
CAI Int'l Small Cap Style	16.97%	13.76%	4.48%	9.24%	8.67%
Emerging Markets	**20.92%**	**23.54%**	**7.59%**	**13.27%**	**5.15%**
EM IMI Index	19.95%	18.39%	5.78%	12.22%	3.47%
CAI Emerging Markets Equity DB	19.92%	21.71%	7.63%	13.39%	5.39%
Global Equity	**11.36%**	**7.39%**	**6.35%**	**9.92%**	**8.04%**
MSCI ACWI Value Net Index	16.63%	-0.33%	2.35%	7.38%	6.08%
CAI Global Eq Broad Style	15.08%	18.44%	11.03%	12.88%	10.48%

Fixed Income Performance

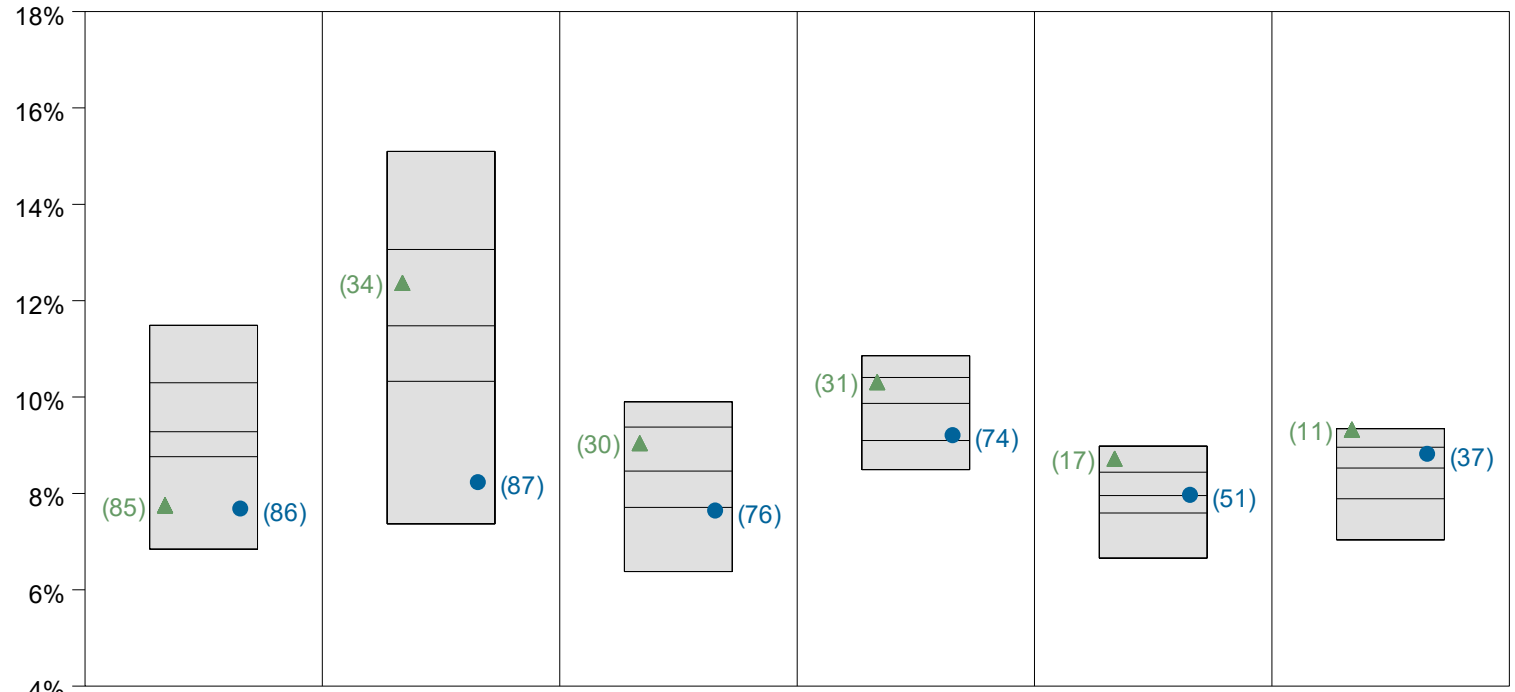
Periods Ending December 31, 2020

	Last Quarter	YTD	Last 3 Years	Last 5 Years	Last 10 Years
Total Fixed Income	**0.89%**	**6.71%**	**5.51%**	**4.65%**	**4.45%**
Oregon Custom FI Benchmark	0.75%	6.46%	5.22%	4.29%	3.86%
Lg Public >10 B DF	1.22%	5.72%	5.53%	5.36%	4.48%
Core Fixed Income	**1.33%**	**7.31%**	**6.01%**	**5.17%**	**4.74%**
AllianceBernstein	0.48%	6.26%	5.19%	4.51%	4.23%
BlackRock	0.87%	8.02%	5.89%	4.82%	4.46%
Wellington	1.16%	8.02%	6.18%	5.43%	5.09%
Western Asset	2.74%	6.15%	6.52%	5.77%	5.20%
Oregon Custom FI Benchmark	0.67%	6.79%	5.34%	4.44%	4.06%
CAI Core Bond Style	1.15%	7.71%	6.00%	5.07%	4.47%
US Government*	**-0.80%**	**8.95%**	**5.24%**	**-**	**-**
Blmbg Treasury	-0.83%	8.90%	5.19%	3.77%	3.34%
Callan Core Bond FI	1.15%	7.71%	6.00%	5.07%	4.47%
Non-Core Fixed Income	**4.02%**	**-0.30%**	**4.68%**	**5.78%**	**5.60%**
Leveraged Loans & Bond Idx	4.48%	-0.57%	4.49%	6.04%	4.89%
KKR Credit Advisors	4.52%	-1.64%	4.19%	5.03%	5.45%
Leveraged Loans & Bond Idx	4.75%	-0.53%	4.68%	6.36%	5.12%
Oak Hill	3.84%	0.97%	5.23%	6.62%	5.67%
Leveraged Loans & Bond Idx	4.21%	-0.61%	4.30%	5.72%	4.66%
Leveraged Bank Loans	3.41%	-1.28%	3.69%	4.97%	4.55%

OPERF Total Regular Account

Gross Performance and Peer Group Rankings* as of December 31, 2020

Performance vs Callan Public Fund Spons- V Lg DB (>10B) (Gross)

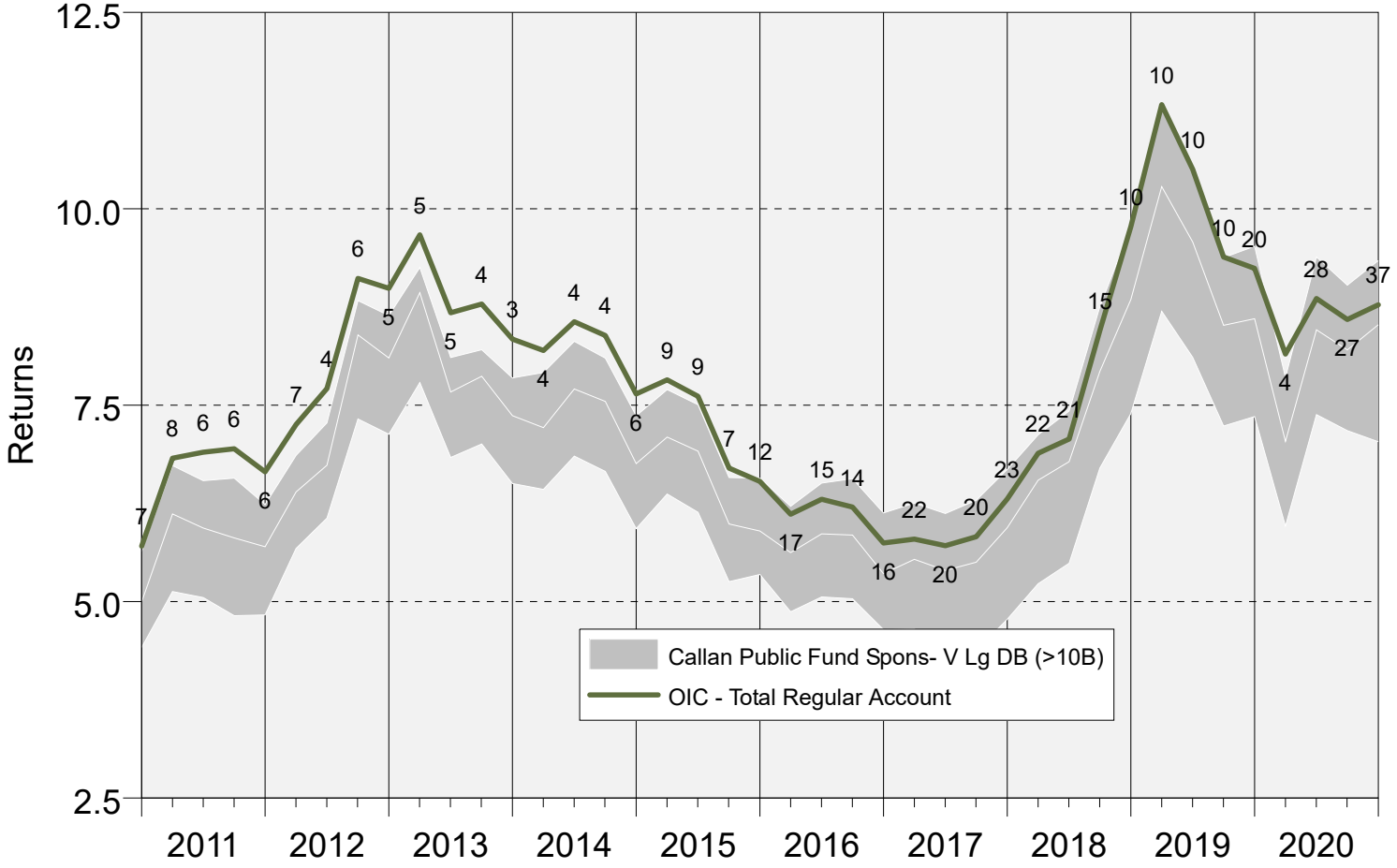


	Last Quarter	Last Year	Last 3 Years	Last 5 Years	Last 7 Years	Last 10 Years
10th Percentile	11.49	15.10	9.90	10.86	8.98	9.34
25th Percentile	10.30	13.06	9.38	10.41	8.44	8.96
Median	9.28	11.48	8.46	9.87	7.96	8.53
75th Percentile	8.76	10.33	7.71	9.10	7.59	7.89
90th Percentile	6.85	7.37	6.38	8.49	6.66	7.03
Total Regular Account ●	7.65	8.20	7.61	9.17	7.93	8.78
Policy Target ▲	7.76	12.37	9.04	10.31	8.72	9.33

*Versus Callan's Very Large Public Funds (> $10 billion) Peer Group (36 funds)

OPERF Rolling 10 Year Returns and Rankings

Rolling 40 Quarter Gross of Fee Returns
for 10 Years Ended December 31, 2020

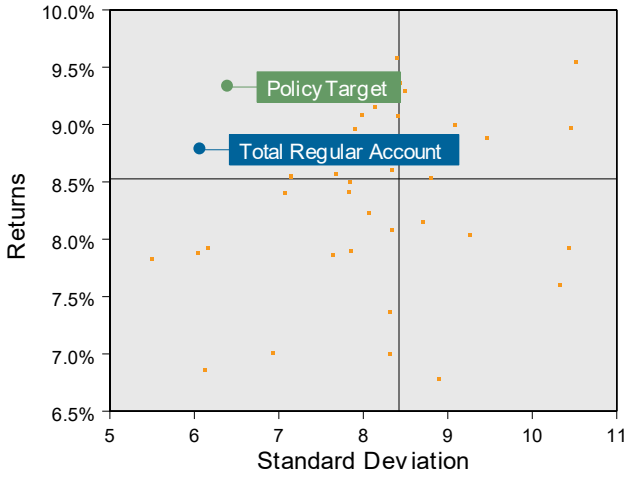


Data labels indicate OIC ranking among Callan Public Fund Sponsor – Very Large DB Database (>10B) for the trailing 10 years.

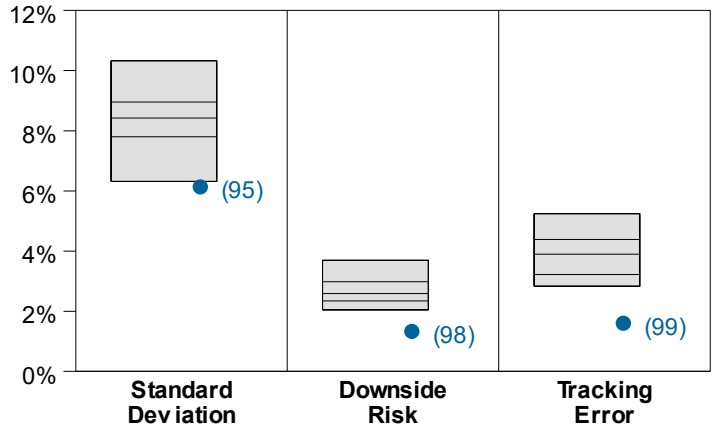
OPERF Total Regular Account

Risk vs Return

Callan Public Fund Spons- V Lg DB (>10B) (Gross)
Annualized Ten Year Risk vs Return



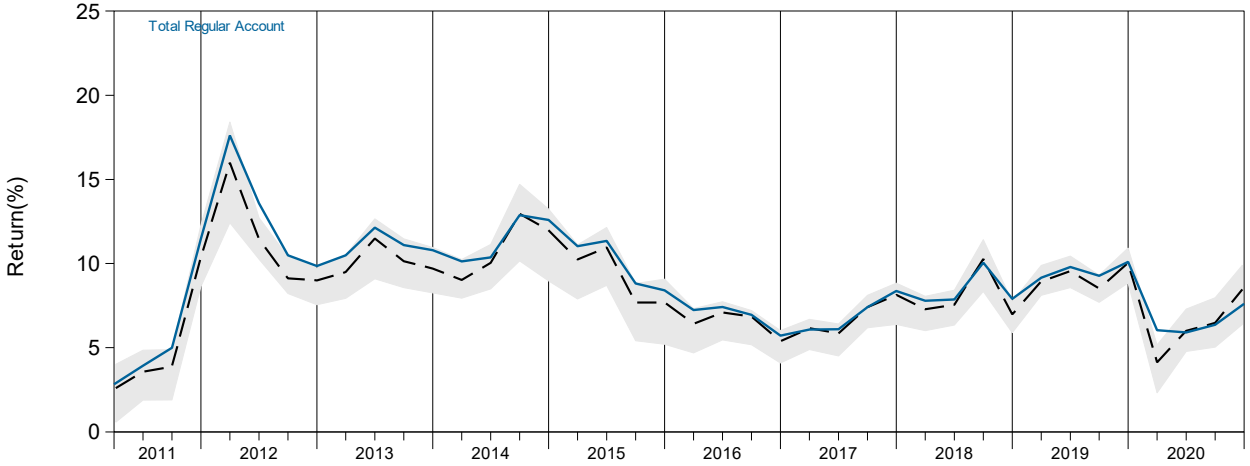
Risk Statistics Rankings vs Policy Target
Rankings Against Callan Public Fund Sponsor- V Lg DB (>10B) (Gross)
Ten Years Ended December 31, 2020



	Standard Deviation	Downside Risk	Tracking Error
10th Percentile	10.33	3.70	5.24
25th Percentile	8.95	2.98	4.39
Median	8.42	2.58	3.90
75th Percentile	7.80	2.35	3.22
90th Percentile	6.32	2.05	2.84
Total Regular Account ●	6.08	1.27	1.54

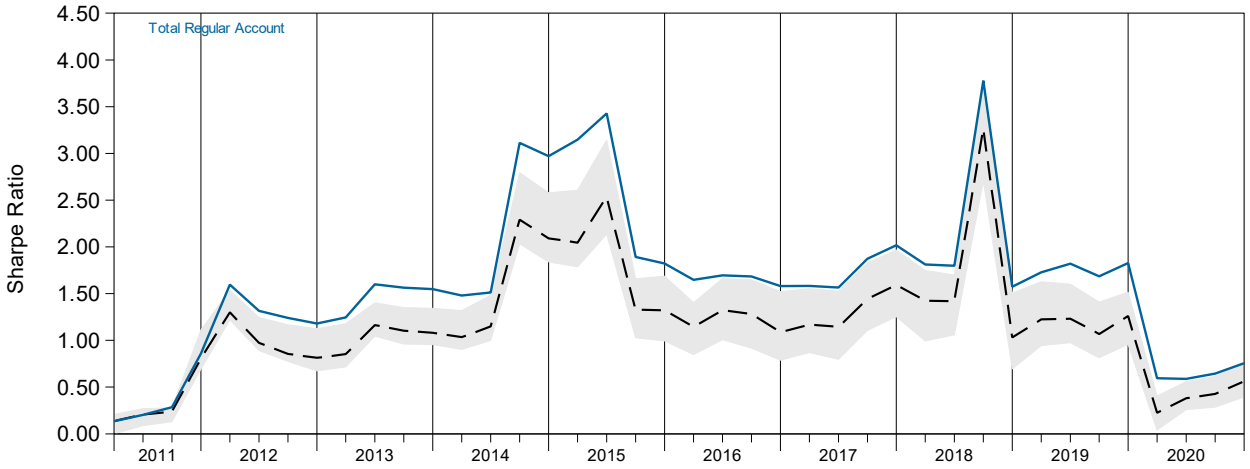
Total Fund Consistency

Rolling Three Year Return(%) Relative to Policy Target
Ten Years Ended December 31, 2020



Rolling Three Year Period Analysis	Median	Portfolio
Average Annual Return(%)	8.37%	8.95%
% Positive Periods	100%	100%
Average Ranking	50	30

Rolling Three Year Sharpe Ratio Relative to Policy Target
Ten Years Ended December 31, 2020



Rolling Three Year Period Analysis	Median	Portfolio
Average Annual Sharpe Ratio	1.18%	1.61%
% Positive Periods	100%	100%
Average Ranking	50	9

Callan

Appendix

OPERF Total Regular Account

Net Calendar Year Performance by Asset Class

	2020	2019	2018	2017	2016
Total Regular Account	**7.66%**	**13.56%**	**0.48%**	**15.39%**	**7.11%**
Total Regular Account ex-Overlay	8.28%	13.19%	0.45%	15.38%	6.73%
OPERF Policy Benchmark*	12.37%	13.99%	1.22%	15.64%	8.95%
Total Fixed Income	**7.66%**	**8.84%**	**0.25%**	**3.70%**	**3.06%**
Custom FI Benchmark	7.26%	8.27%	0.31%	3.32%	2.52%
Callan Public Fund > $10bn U.S. Fixed	8.50%	9.61%	-0.58%	4.61%	4.82%
Total Public Equity	**12.66%**	**25.25%**	**-10.47%**	**24.41%**	**9.89%**
MSCI ACWI IMI Net	16.25%	26.35%	-10.08%	23.95%	8.36%
Total Real Estate	**2.66%**	**7.25%**	**8.03%**	**10.05%**	**7.88%**
Total Real Estate ex REITs	2.96%	7.27%	8.87%	11.19%	10.01%
Oregon Custom Real Estate Benchmark	0.52%	4.64%	7.71%	6.70%	8.88%
Callan Public Plan - Real Estate	0.50%	6.86%	7.98%	7.70%	8.50%
Opportunity Portfolio	**10.15%**	**6.15%**	**5.85%**	**10.47%**	**6.12%**
CPI + 5%	6.45%	7.32%	6.77%	7.18%	6.99%
Alternative Portfolio	**-6.61%**	**-1.32%**	**-2.44%**	**8.30%**	**6.61%**
CPI + 4%	5.41%	6.37%	5.98%	6.19%	6.16%
Total Private Equity	**12.74%**	**11.10%**	**18.15%**	**17.32%**	**6.26%**
OIC - Russell 3000 + 300 BPS Qtr Lag	18.42%	6.00%	21.06%	22.22%	18.37%

*Current Policy Benchmark = 33.5% MSCI ACWI IMI, 20.0% OPERF Total Custom FI Benchmark, 19.0% Russell 3000 + 300 BPS Qtr Lag, 12.5% Oregon Custom Real Estate Benchmark, 12.5% CPI + 400 bps and 2.5% S&P Risk Parity 12% Vol.

New Market Peaks in Year of the Pandemic

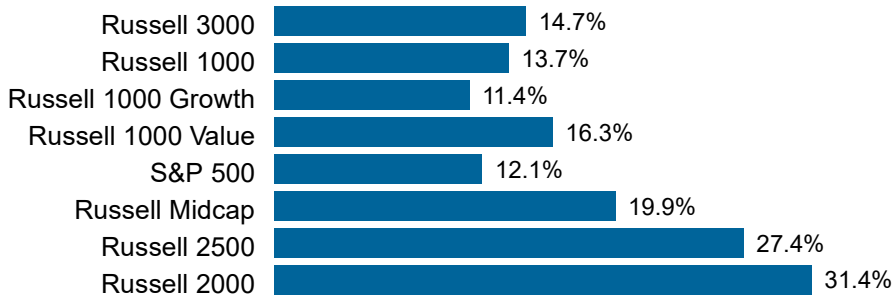
Record highs in 2020

- The S&P 500 Index hit a record high in 4Q20. The Index was up 12.1% for the quarter, bringing the 2020 gain to 18.4%.
  - *Since March low, S&P is up over 70%, with all sectors posting increases greater than 40%*
  - *4Q winner, Energy (+28%), remains down 34% for the year*
  - *Technology (+12% in 4Q) top 2020 sector with 44% gain*
  - *Pandemic has cast a pall over certain sectors while rewarding others: online retail soared 69% in 2020, while hotels/cruise lines, airlines, and retail REITs dropped ~30%*
  - *Apple, Microsoft, Amazon, Facebook, Alphabet made up 22% of S&P 500 at year-end, and for 2020, accounted for 12.1% of 18.4% Index return*

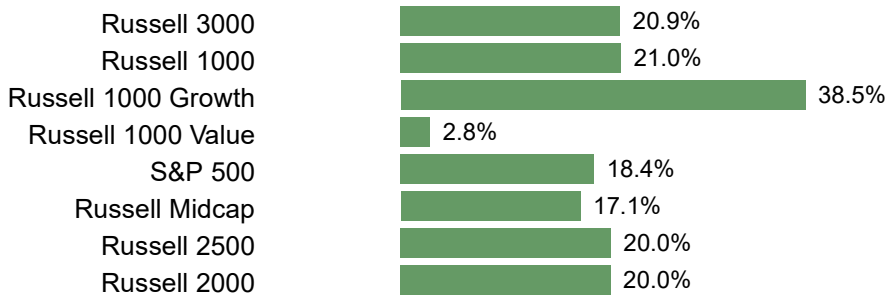
Trend reversal

- In 4Q, driven by vaccine progress, political clarity, and further stimulus, value outperformed growth across the cap spectrum. However, value trails growth by a significant margin for the full year due to Tech's outperformance.
- Fueled by the prospect of an economic recovery, small caps outperformed large in 4Q but were even on the year. Small value was the best performer for the quarter but 2020 gain is a mere 4.6%.

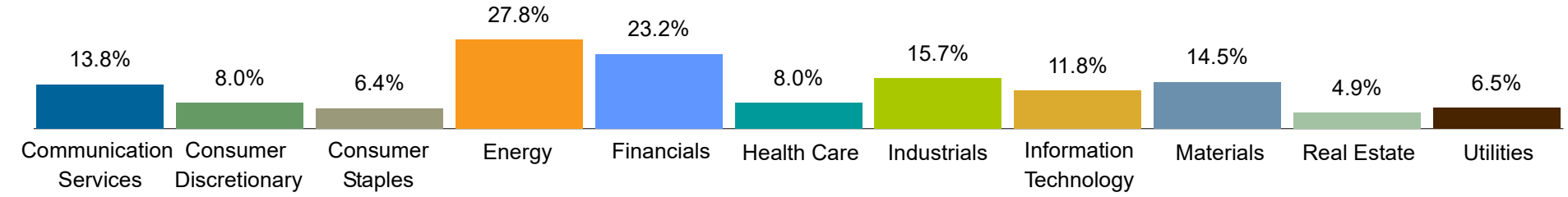
U.S. Equity: Quarterly Returns



U.S. Equity: One-Year Returns



Industry Sector Quarterly Performance (S&P 500)



Sources: FTSE Russell, S&P Dow Jones Indices

Global ex-U.S. Equity Performance

COVID-19 vaccine rollouts extend and expand risk-on rally

- Prospects of global economic recovery propelled by COVID-19 vaccination fueled double-digit returns broadly across developed and emerging markets.
- Expectations of reverting back to normal economic activity by late 2021 enabled risk assets to thrive.
- Emerging markets outperformed developed markets, led by LATAM—specifically Brazil.
- Small cap outperformed large as business confidence improved with news of vaccination.

Market rotates to cyclicals

- Positive outlook on reflation trade stoked Energy, Materials, and Financials to drive the market.
- Beta and volatility led factor performance due to market rotation.

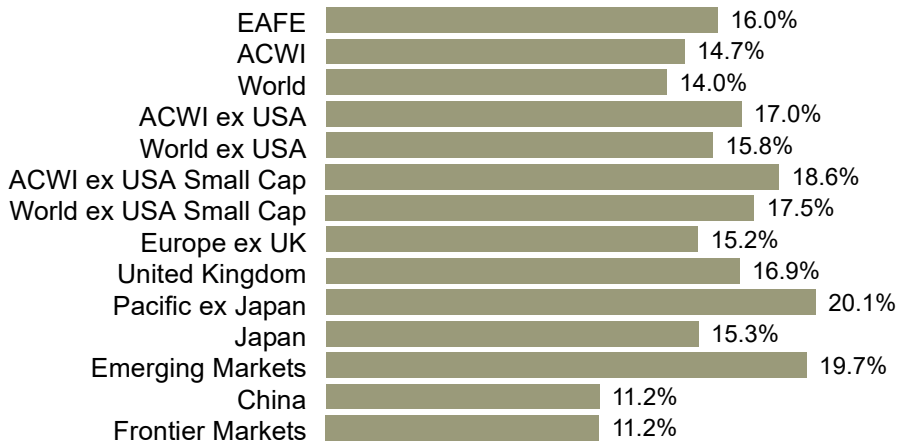
U.S. dollar vs. other currencies

- U.S. dollar continued to lose ground as appetite for risk increased with the expectation that a path to global economic recovery is on the horizon.

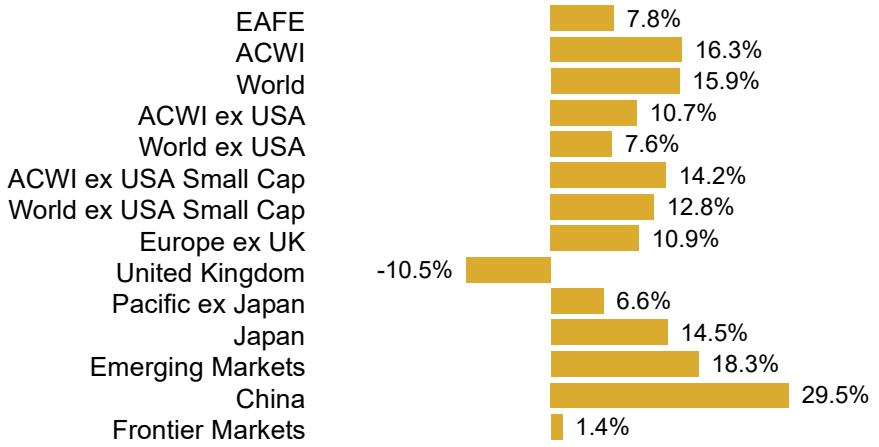
Growth vs. value

- Value outpaced growth as sentiment shifted to cyclical sectors.

Global Equity: Quarterly Returns



Global Equity: One-Year Returns



Source: MSCI

U.S. Fixed Income Performance: 4Q20

Treasury yields rose

- The 10-year U.S. Treasury yield closed 4Q20 at 0.93%, up 24 bps from 3Q20 but off from the year-end level of 1.92%.
- TIPS outperformed nominal U.S. Treasuries as 10-year breakeven spreads widened from 163 bps to 199 bps.
- No rate hikes are expected until at least 2023.

Bloomberg Barclays Aggregate gained slightly

- Corporate credit outperformed treasuries as investors continued to hunt for yield.
- Corporate credit ended the year up 9.89% despite record issuance in 2020.

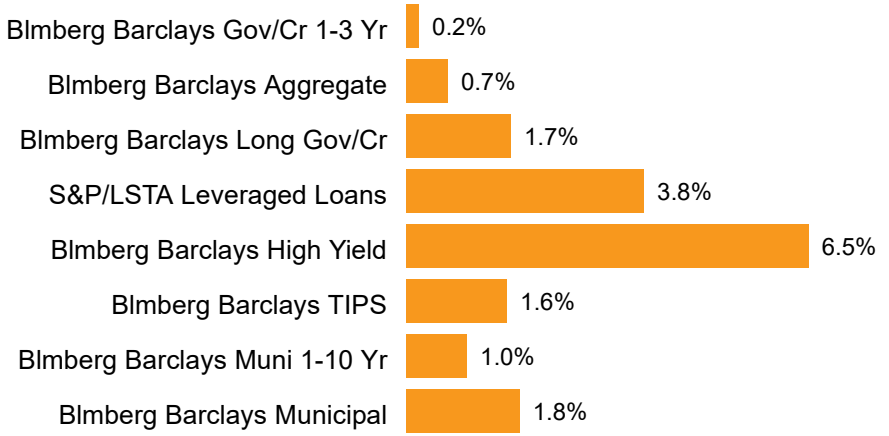
High yield bonds gained on the quarter as rally extended

- High yield bonds outperformed IG in 4Q, returning 6.48%, but trailed IG for the year.
- Leveraged loans gained 3.8% as demand remained strong to finish the year.

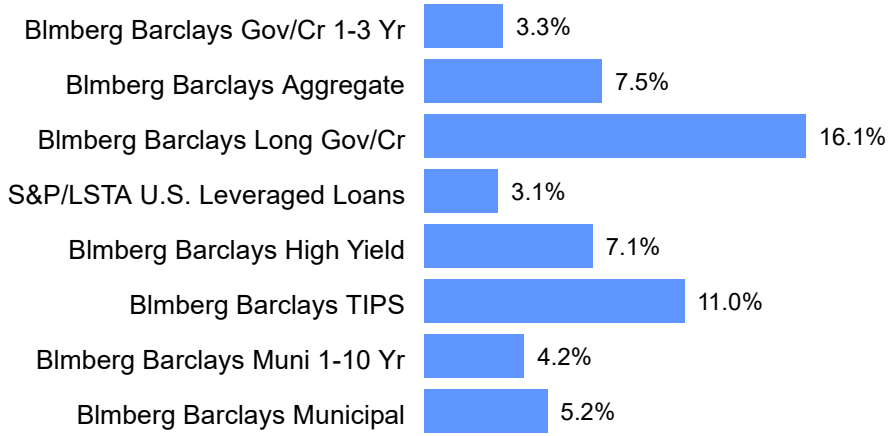
Munis boosted by favorable supply/demand dynamics

- Municipals outperformed Treasuries for the quarter, but remained down for the year.
- Tax-exempt issuance was muted amid strong demand.
- Lower quality outperformed for the quarter; however, higher quality outperformed for the year.

U.S. Fixed Income: Quarterly Returns



U.S. Fixed Income: One-Year Returns



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OREGON STATE TREASURY

Tobias Read
Oregon State Treasurer

Michael Kaplan
Deputy State Treasurer

To: **The Oregon Investment Council**

From: **Karl Cheng, Senior Investment Officer, Portfolio Risk & Research**

Re: **Fourth Quarter 2020 Risk Report for the Oregon Public Employees Retirement Fund**

Executive Summary

This memo summarizes OPERF's predicted volatility, as estimated by Aladdin, Treasury's end-to-end investment analytics platform built by BlackRock. As of December 31, 2020, Aladdin estimated a volatility of return of 22.1% for OPERF, substantially higher than Callan LLC's forward assumptions presented at the June 2020 meeting. Aladdin's estimate is elevated due to: a) the model's short-term emphasis and b) related to the first point, market volatilities spiked in the first half of 2020 which raised Aladdin's estimate. **Staff recommends no additional action at this point.**

The realized and predicted volatilities for the liquid portion of the Fund, mainly the Public Equity and Fixed Income Portfolios, are within OIC guidelines.

OPERF Asset Allocation

Investment Belief #2 in INV 1201: Statement of OIC Investment and Management Beliefs states: "*Asset Allocation Drives Risk and Return*". Shown in the table below are OPERF's target allocations approved by the Council at the April 2019 meeting.

Table 1. OPERF Target Asset Allocation

Asset Class	Target Allocation (%)	Rebalancing Range (%)	Expected Annual Policy Return (%)[1]
Public Equity	32.5	27.5 – 37.5	
Broad U.S. Equity	*16.3*		*7.2*
Global ex-U.S. Equity	*16.3*		*7.3*
Private Equity	17.5	14.0 – 21.0	9.2
Fixed Income	20.0	15.0 – 25.0	2.8
Real Estate	12.5	9.5 – 15.5	7.0
Alternatives	15.0	7.5 – 17.5	
Illiquid	*7.5*		*7.4*
Diversifying Strategies	*7.5*		*6.0*
Risk Parity	2.5	0.0 – 2.5	6.3
Total Fund	**100.0**		**7.1**

[1]Per the OIC-approved Capital Market Assumptions presented by Callan LLC at the June 2020 meeting.

Including the synthetic overlays exposures managed by Russell Investments, Figure 1 below shows OPERF's allocation.

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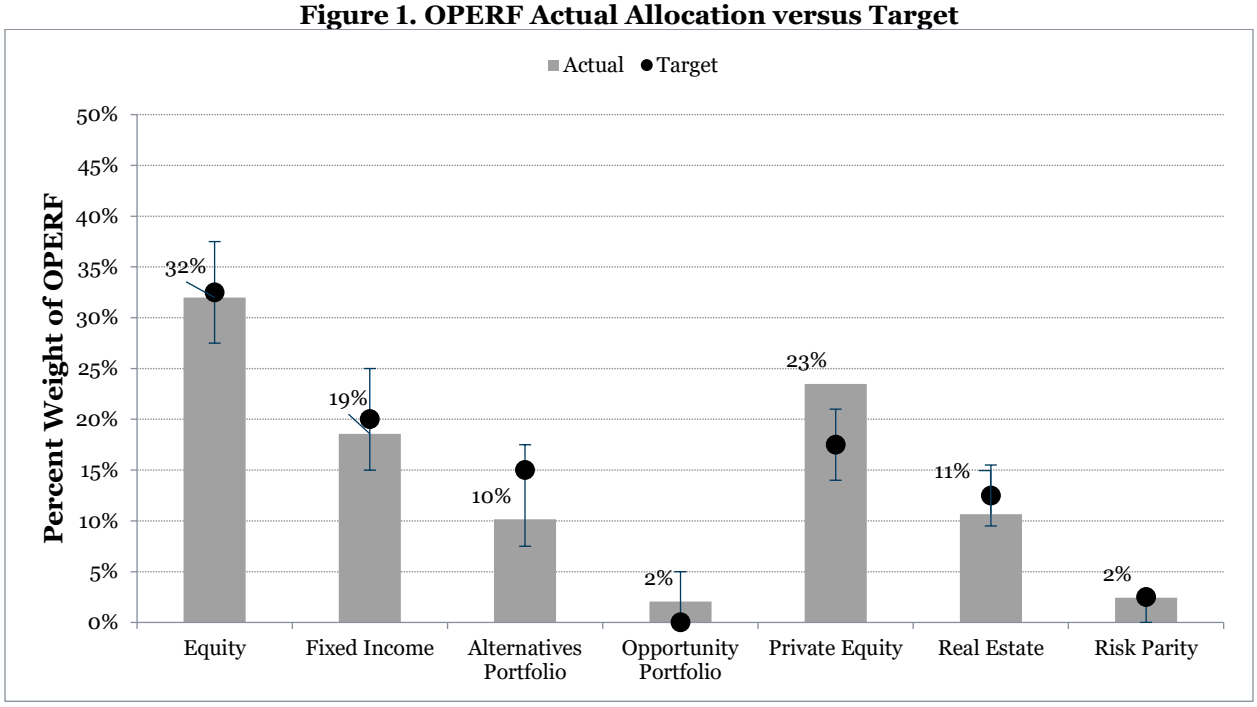
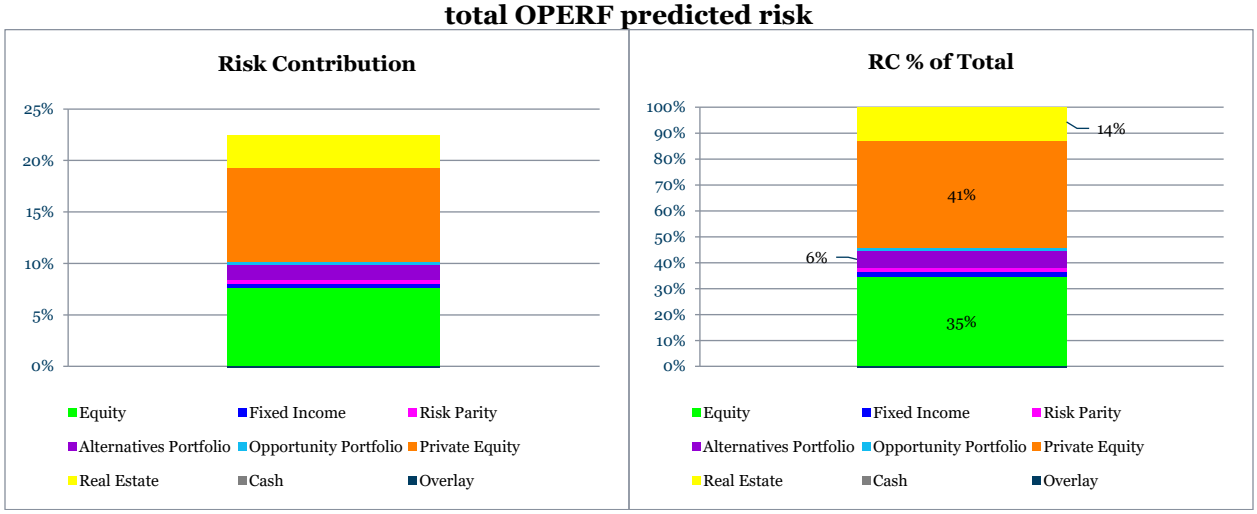
Figure 1. OPERF Actual Allocation versus Target



OPERF Predicted Risk

The risk estimates are shown in the charts below.

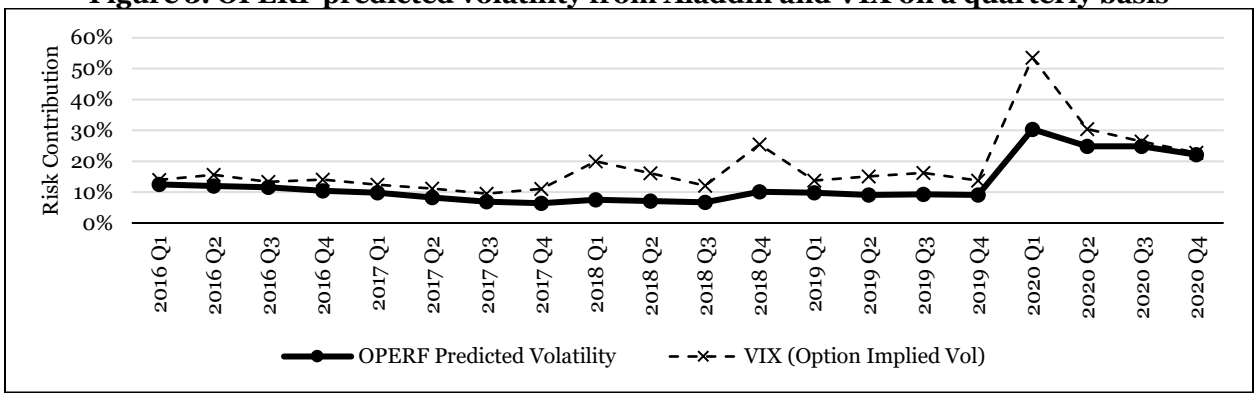
Figure 2. OPERF Risk Contribution by Asset Class and Risk Contribution as a percent of total OPERF predicted risk



The total predicted **standard deviation**, or **volatility**, for OPERF is 22.1% as of December 31, 2020. To put that in context, Callan LLC ("Callan"), the OIC's previous investment consultant, estimates OPERF's long-term volatility to be 12.4% using their 2020 Capital Market Assumptions. There are two main explanations for the variation between Callan's and Aladdin's estimates:

1. Callan's estimate is based on their ten-year forward assumptions while Aladdin's estimate uses a short-term, two-year lookback period so there will almost always be some difference between the two estimates; and
2. Aladdin's two-year lookback period for December 2020 captures the highly volatile market environment of March 2020 which impacted its estimate. The chart below compares Aladdin's estimates over the past five years versus the Chicago Board Options Exchange's Volatility Index ("VIX"), which measures the implied volatility of 30-day S&P 500 options. Implied volatility is highly correlated to realized volatility, which is why the chart shows a spike in VIX in March 2020.

Figure 3. OPERF predicted volatility from Aladdin and VIX on a quarterly basis



Another item of note from Figure 2 is that "equity" risk, that is the predicted risk contributions from the Public Equity and Private Equity Portfolios, is estimated to be 73% of OPERF's total predicted risk. Since equity volatility spiked, as shown in Figure 3, OPERF's predicted volatility also spiked.

Equity risk has always been the largest risk contributor to OPERF. OIC Investment Belief #3 summarizes the Council's objective for investing in equity: "*Over the long-term, equity-oriented investments provide reliable return premiums relative to risk-free investments.*" However, the "cost" of this incremental return is that equity investments are much more volatile than investment grade fixed income and U.S. Treasuries. Over the past several years, the OIC has approved changes to asset allocations and portfolio construction to diversify the Fund from equity risk, including:

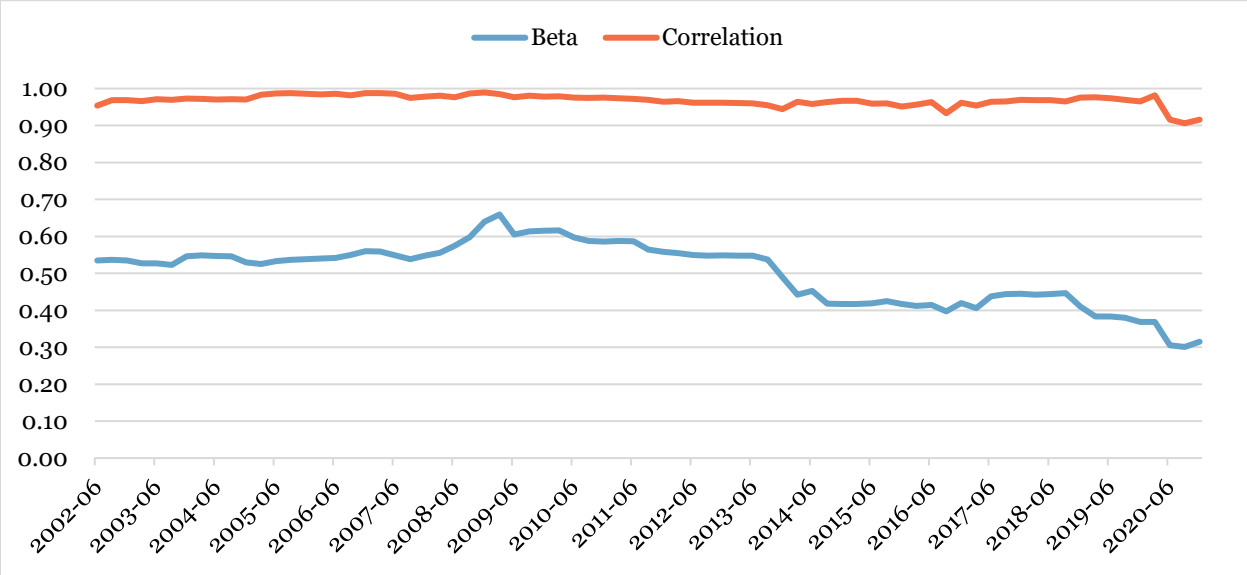
- Increasing Diversifying Strategies allocation,
- Rebalancing the Fixed Income and Real Estate Portfolios,
- Allocating to defensive equity within the Public Equity Portfolio, and
- Adding Risk Parity.

As stated under OIC Investment Belief #1C: "*The OIC must weigh the short-term risk of principal loss against the long-term risk of failing to meet return expectations.*" Volatilities are elevated due to

exogenous macroeconomic events. Despite Aladdin's estimate being nearly double that of Callan's assumption, **staff recommends no action at this time**. As mentioned during previous OIC meetings, OPERF is effectively a "market taker", i.e., while the OIC manages the Fund for the long term, the realized returns and volatilities are dictated by the market. It is staff's belief that any possible gain due to a sudden tactical shift at this time may be offset by transaction cost and/or opportunity cost, e.g., reducing equity allocation due to elevated volatility may risk missing a market rally.

However, the OIC-approved changes have reduced OPERF's volatility over time. Figure 4 below plots OPERF's rolling 20-quarter correlation and beta to MSCI ACWI IMI. Over the period of available data, correlation stayed relatively stable but dipped slightly in 2020. What has mainly led to the decline in OPERF's beta has been a decline in OPERF's volatility relative to that of MSCI ACWI. More specifically, the OIC-approved changes to OPERF's asset class portfolios have had the intended effect.

Figure 4. OPERF's Correlation and Beta to MSCI ACWI IMI

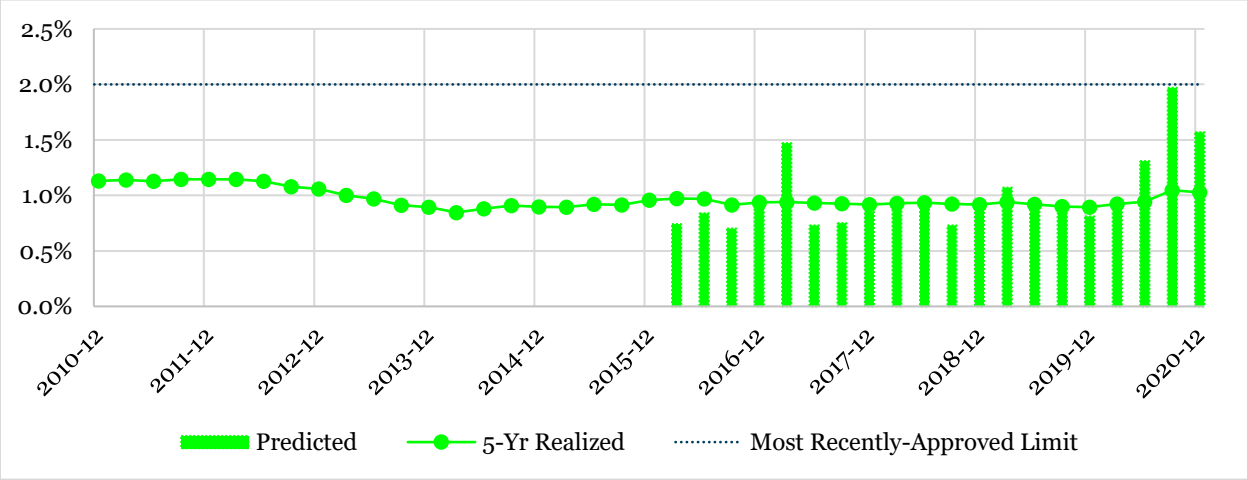


Capital Markets

Public Equity

The Public Equity Portfolio has an OIC-approved **tracking error** range of 0.75% to 2.00%. Using monthly performance data from State Street, the five-year tracking error through December 31, 2020 for the Portfolio is 1.03%, well within the approved range. Predicted active risk increased beginning with Q1 2020 as Covid concerns impacted all aspects of capital markets but still within the OIC-approved range.

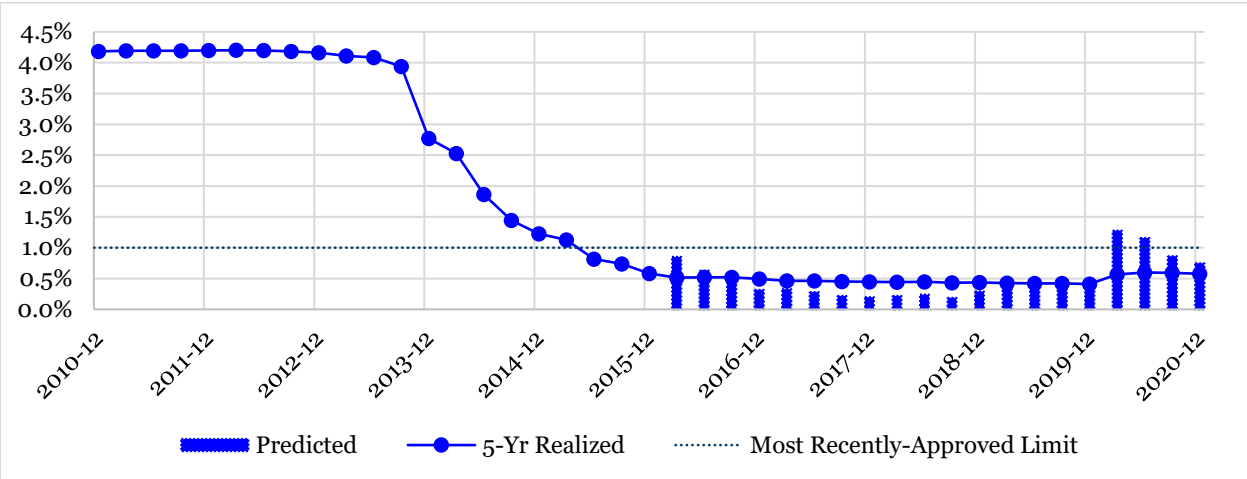
Figure 5. Public Equity's predicted risk and realized five-year tracking error on a quarterly basis



Fixed Income

The Fixed Income Portfolio has an OIC-approved **tracking error** of up to 1.0%. Using monthly performance data from State Street, the five-year tracking error through December 31, 2020 for the Portfolio is 0.58%, well within the approved range. Similar to what occurred for Public Equity, Covid concerns impacted all sectors of the fixed income market. Predicted risk spiked in Q1 and Q2 2020 as both credit and rate risks spiked. The Fixed Income Portfolio underperformed its benchmark by 101 bps in the first quarter as credit spreads widen. However, performance reverted when spreads narrowed in the second quarter and the Portfolio outperformed its benchmark by 82 bps. While they were large excess returns, they were to be expected in a volatile market and predicted risk has since declined.

Figure 6. Fixed Income's predicted risk and realized five-year tracking error on a quarterly basis



OPERF Cash Flow

Table 2 below summarizes approximate net investment cash flow and pension cash flow for the quarter and for the past five years.

Table 2. OPERF Net Cash Flow by Portfolio by Time Period

	Net Cash Flow ($M)					
Asset Class	**Q4 2020**	**2020**	**2019**	**2018**	**2017**	**2016**
Public Equity	+358	+2,853	+2,764	+3,522	+1,451	+1,730
Private Equity	+719	+494	+325	+1,216	+1,434	+1,037
Fixed Income	+431	+2,492	+342	-134	+23	+1,619
Real Estate	-140	+15	-44	-28	+508	+228
Alternatives	-72	-1,185	-1,082	-1,873	-701	-1,530
Opportunity	+65	+72	+18	+157	-2	-134
Risk Parity	-300	-1,800	0	0	0	0
Other	-101	+232	+267	+160	-2	+217
Total Fund	**+961**	**+3,172**	**+2,591**	**+3,019**	**+2,711**	**+3,166**
Net Pension	*-780*	*-2,984*	*-2,536*	*-2,885*	*-3,138*	*-2,990*

The estimated uncalled commitments from the private market portfolios are tabulated below.

Table 3. OPERF Uncalled Commitments

Asset Class Portfolio	**Uncalled Commitment ($B)**
Private Equity	$10.1
Alternatives	$3.7
Real Estate	$3.5
Opportunity	$1.1
Total	**$18.4**

TAB 8 – Asset Allocation & NAV Updates

Asset Allocations at January 31, 2021

	Regular Account						Target Date Funds	Variable Fund	Total Fund
OPERF	**Policy**	**Target[1]**	**$ Thousands**	**Pre-Overlay**	**Overlay**	**Net Position**	**Actual**	**$ Thousands**	**$ Thousands**	**$ Thousands**
Public Equity	27.5-37.5%	32.5%	26,743,979	32.6%	(1,192,887)	25,551,092	31.2%	1,158,995	428,747	27,138,834
Private Equity	13.5-21.5%	17.5%	18,892,790	23.0%		18,892,790	23.0%			18,892,790
Total Equity	**45.0-55.0%**	**50.0%**	**45,636,769**	**55.7%**	**(1,192,887)**	**44,443,882**	**54.2%**			**46,031,624**
Opportunity Portfolio	**0-5%**	**0.0%**	**1,732,171**	**2.1%**		**1,732,171**	2.1%			**1,732,171**
Fixed Income	**15-25%**	**20.0%**	**13,957,077**	**17.0%**	**2,683,429**	**16,640,506**	20.3%	1,878,815		**18,519,321**
Risk Parity	**0.0-2.5%**	**2.5%**	**2,026,844**	**2.5%**		**2,026,844**	2.5%			**2,026,844**
Real Estate	**9.5-15.5%**	**12.5%**	**8,737,084**	**10.7%**	**(2,100)**	**8,734,984**	10.7%			**8,734,984**
Alternative Investments	**7.5-17.5%**	**15.0%**	**8,406,463**	**10.3%**		**8,406,463**	10.3%			**8,406,463**
Cash[2]	**0-3%**	**0.0%**	**1,483,158**	**1.8%**	**(1,488,442)**	**(5,284)**	0.0%		6,951	**1,668**
TOTAL OPERF		**100%**	**$ 81,979,566**	**100.0%**	**$ -**	**$ 81,979,566**	**100.0%**	**$ 3,037,810**	**$ 435,698**	**$ 85,453,074**

[1] Targets established in April 2019. Interim policy benchmark effective July 1, 2020, consists of: 33.5% MSCI ACWI IMI Net, 20% Custom FI Benchmark, 19% Russell 3000+300bps (1 quarter lagged), 12.5% NCREIF ODCE net (1 quarter lagged), 12.5% CPI+400bps, & 2.5% S&P Risk Parity - 12% Target Volatility.

[2] Includes cash held in the policy implementation overlay program.

SAIF	**Policy**	**Target**	**$ Thousands**	**Actual**
Total Equity	**7-13%**	**10.0%**	**573,365**	**11.1%**
Fixed Income	**80-90%**	**85.0%**	**4,369,489**	**84.9%**
Real Estate	**0-7%**	**5.0%**	**159,769**	**3.1%**
Cash	**0-3%**	**0.0%**	**42,174**	**0.8%**
TOTAL SAIF			**$ 5,144,797**	**100.0%**

CSF	**Policy**	**Target**	**$ Thousands**	**Actual**
Global Equities	40-50%	45.0%	1,055,511	52.0%
Private Equity	8-12%	10.0%	196,685	9.7%
Total Equity	**58-62%**	**55.0%**	**1,252,197**	**61.7%**
Fixed Income	**25-35%**	**25.0%**	**525,880**	**25.9%**
Real Estate	**8-12%**	**10.0%**	**132,254**	**6.5%**
Alternative Investments	**8-12%**	**10.0%**	**95,951**	**4.7%**
Cash	**0-3%**	**0.0%**	**22,764**	**1.1%**
TOTAL CSF			**$ 2,029,046**	**100.0%**

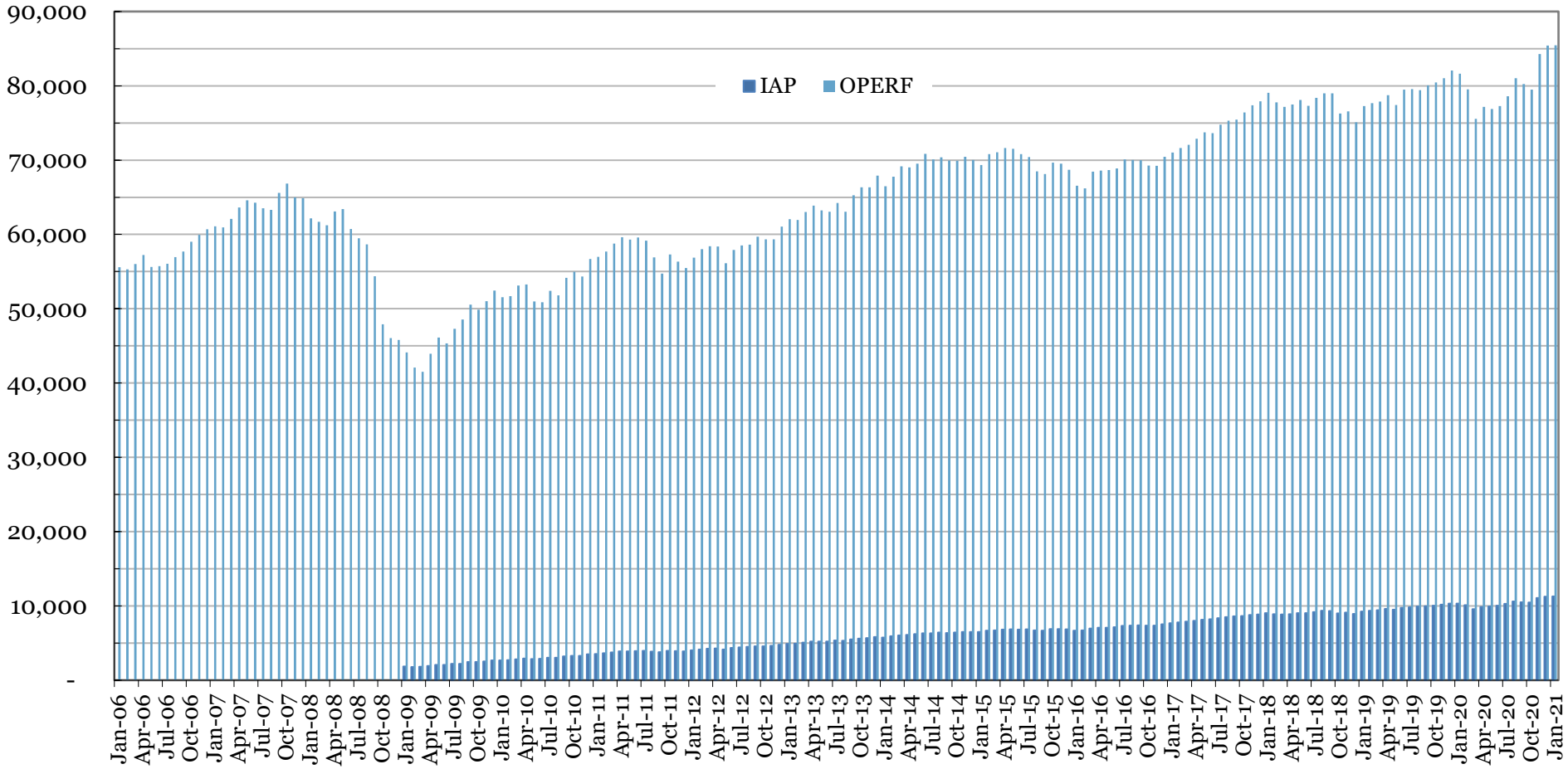
SOUE	**Policy**	**Target**	**$ Thousands**	**Actual**
Global Equities	**0-65%**	**N/A**	2,258	**77.9%**
Fixed Income	**35-100%**	**N/A**	639	**22.0%**
Cash	**0-3%**	**N/A**	2	**0.1%**
TOTAL SOUE			**$ 2,900**	**100.0%**

WOUE	**Policy**	**Target**	**$ Thousands**	**Actual**
Global Equities	**30-65%**	**55.0%**	704	**57.7%**
Fixed Income	**35-60%**	**40.0%**	460	**37.7%**
Cash	**0-25%**	**5.0%**	56	**4.6%**
TOTAL WOUE			**$ 1,220**	**100.0%**

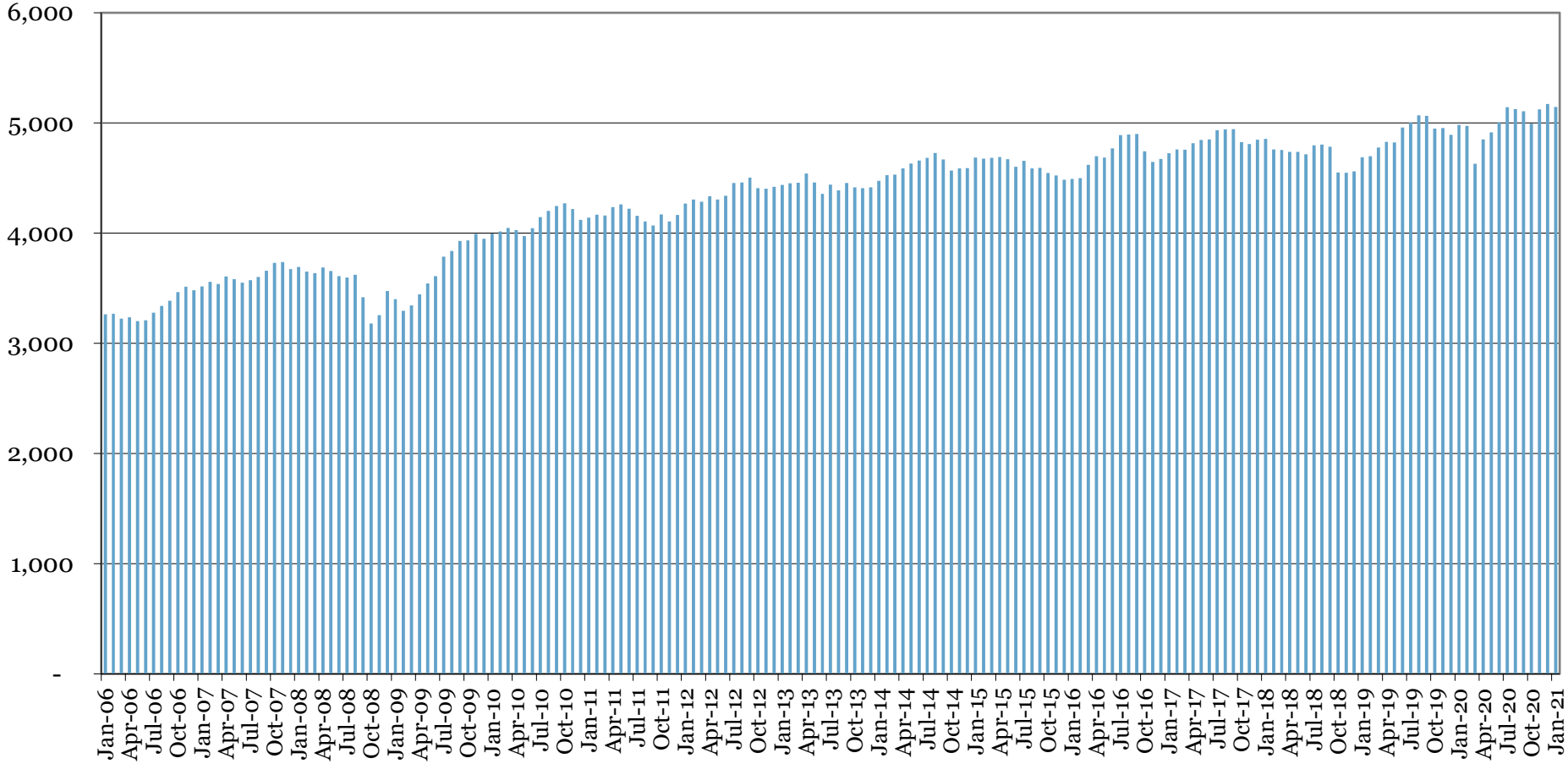
OSTF, OITP & Other State Funds*	**$ Thousands**	**Actual**
OSTF	27,069,345	**92.7%**
OITP	182,190	**0.6%**
DAS Insurance Fund	141,329	**0.5%**
DCBS Operating Fund	183,083	**0.6%**
DCBS Workers Benefit Fund	170,913	**0.6%**
DCHS - Elderly Housing Bond Sinking Fund	1,738	**0.0%**
DCHS - Other Fund	16,458	**0.1%**
Oregon Lottery Fund	131,037	**0.4%**
DVA Bond Sinking Fund	115,259	**0.4%**
ODOT Fund	739,265	**2.5%**
OLGIF	251,549	**0.9%**
OPUF	195,224	**0.7%**
Total OSTF & Other State Funds	**$ 29,197,391**	**100.0%**
Total of All Treasury Funds**	**$ 118,251,971**	

**Balances of the funds include OSTF or OITP investments, which is why total does not foot.

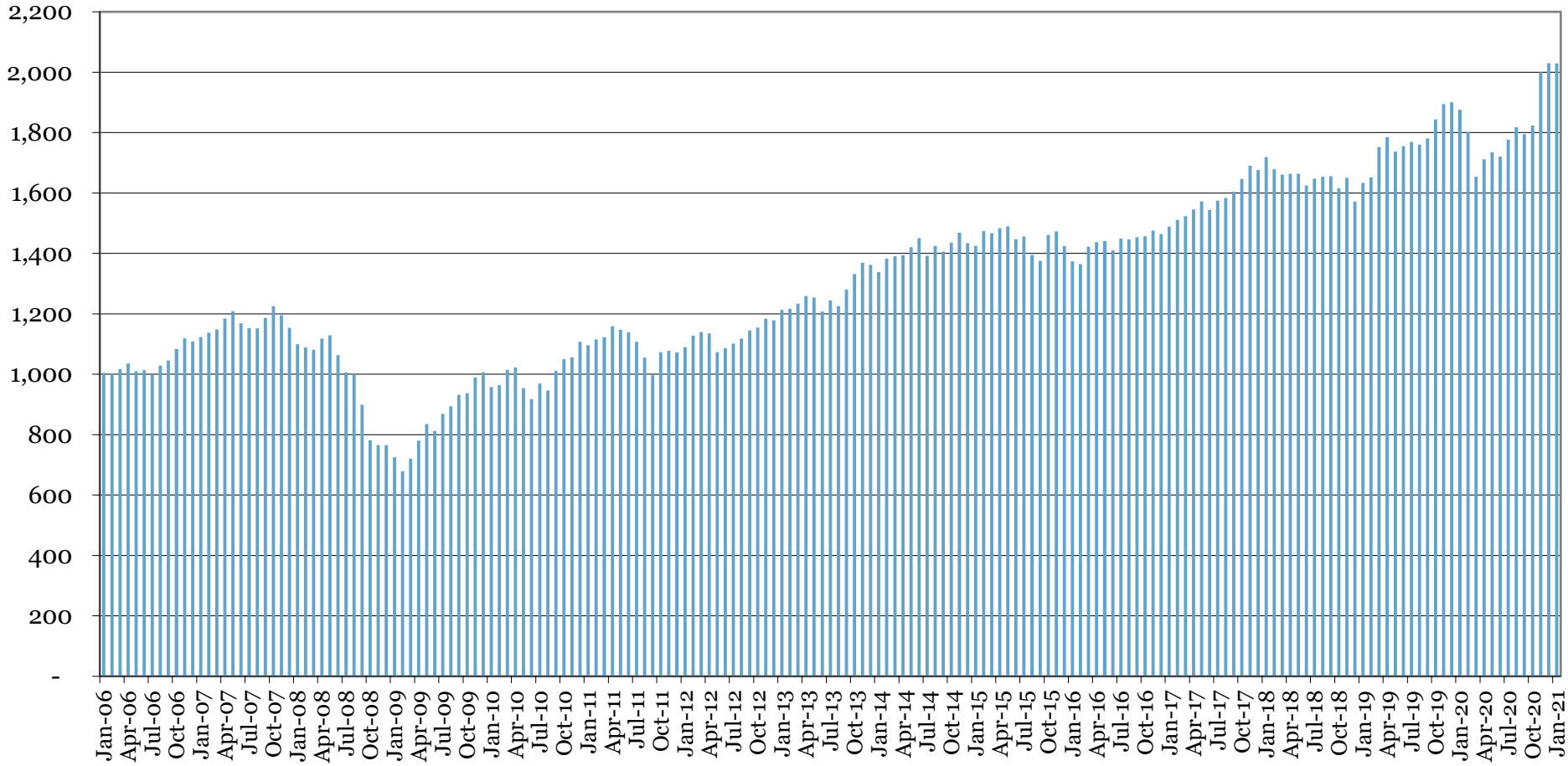
OPERF NAV
15 years ending January 31, 2021
($ in Millions)



SAIF NAV
15 years ending January 31, 2021
($ in Millions)



CSF NAV
15 years ending January 31, 2021
($ in Millions)



TAB 9 – Calendar — Future Agenda Items

2021/22 OIC Forward Calendar and Planned Agenda Topics

April 21, 2021	Leverage Liquidity Risk Mitigation Strategies Risk Review (Currency, Overlay)
June 2, 2021	OIC, PERS Joint Session OPERF Asset Allocation IAP Program Review Operational Annual Review Q1 OPERF Performance & Risk Review
September 8, 2021	ESG Annual Review Corporate Governance, Proxy Voting Securities Lending CEM Benchmarking Q2 OPERF Performance & Risk Review
October 27, 2021	SAIF Annual Review OSGP Annual Review Common School Fund Annual Review
December 8, 2021	Public Equity Program Review Fixed Income Program Review Q3 OPERF Performance & Risk Review
January 26, 2022	Private Equity Program Review Opportunity Portfolio Program Review Placement Agent Report 2023 OIC Calendar Approval
March 9, 2022	Real Estate Portfolio Review Alternatives Program Review Q4 OPERF Performance & Risk Review