

MONTANA

BOARD OF INVESTMENTS

REGULAR BOARD MEETING
April 12, 2023

COMMITTEE MEETINGS

- A. Audit Committee – Mark Barry, Chair** **9:30 AM**
Committee Members – Peterson, Bennett, Trost
1. Public Comment – *Public Comment on issues with Committee Jurisdiction*
 2. Approval of February 22, 2023, Committee Minutes
 3. Executive Director Comments
 4. Audit Checklist
- B. Loan Committee – Jeff Meredith, Chair** **10:00 AM**
Committee Members – Barry, Kober, Bennett, Younkin
1. Public Comment – *Public Comment on issues with Committee Jurisdiction*
 2. Approval of February 22, 2023, Committee Meeting Minutes
 3. Executive Director Comments
 4. INTERCAP Loan Requests – **Decisions**
- C. Human Resource Committee – Maggie Peterson, Chair** **10:30 AM**
Committee Members – Meredith, Kober, Trost, Younkin
1. Public Comment – *Public Comment on issues with Committee Jurisdiction*
 2. Executive Director Comments
 3. CLOSED SESSION – *The Board may close the meeting to the public if, in the Chair's discretion, the right to individual privacy exceeds the merits of public disclosure. Motions and Board action are prohibited during closed session.*

- Tab 1 CALL TO ORDER – Jack Prothero, Chairman** **11:30 AM**
- A. Notice of Video Recording of Meeting
 - B. Roll Call
 - C. Public Comment – *Public Comment on issues with Board Jurisdiction*
 - D. Approval of the February 22-23, 2023, Meeting Minutes
 - E. Administrative Business
 1. Audit Committee Report
 2. Loan Committee Report
 3. Human Resource Committee Report
 - F. Comments from Pension Board Members
 - G. Comments from Board Legislative Liaisons

- Tab 2 EXECUTIVE DIRECTOR REPORTS – Dan Villa** **11:45 AM**
- A. Member Requests from Prior Meeting
 - B. Monthly Snapshot
 - C. Benchmarks Used by the Board

LUNCH	12:00 PM
Tab 3 CAPITAL MARKET ASSUMPTIONS – RVK, Inc.	1:00 PM
BREAK	2:15 PM
Tab 4 INTERNATIONAL EQUITY ASSET CLASS REVIEW – Jason Brent & Steve Strong	2:30 PM
RECAP OF STAFF TO DO LIST AND ADJOURNMENT – Jack Prothero, Chairman	4:00 PM

Appendix

- A. Annual Board Meeting Schedule
- B. 2022/2023 Work Plan
- C. Acronym Index/Terminology List

MONTANA

BOARD OF INVESTMENTS

REGULAR BOARD MEETING MINUTES

February 22, 2023

Meeting recordings are posted at: <https://leg.mt.gov/lsc/>
(timestamps may differ)

Call to Order

The Board of Investment's meeting was called to order by Board Chairman Jack Prothero at 1:00 p.m. on Wednesday, February 22, 2023.

Attendance

Board Members Present: Jack Prothero, Jeff Meredith, Tim Kober, Mark Barry, Porter Bennett, Daniel Trost, Cindy Younkin

Board Members Absent: Maggie Peterson

Legislative Liaisons Present: None

Legislative Liaisons Absent: N/A

Board Staff Present: Dan Villa, Dan Whyte, Doug Hill, Eron Krpan, Ethan Hurley, Jason Brent, John Carpenter, John Romasko, Jon Putnam, Julie Feldman, Kelsey Poore, Kirsten Haswell, Louise Welsh, Matt Hoffman, Peggy MacEwen, Peggy Saarela, Polly Boutin, Roberta Diaz, Rob Samson, Sam Holman, Savannah Morgan, Sheli Jacoby, Steve Strong, Tammy Lindgren, Thomas Winkler, Tim House

Interested Parties Present: Kevin Balaod – With Intelligence

Tab 1 CALL TO ORDER (00:02)

A. Notice of Video Recording (00:06)

Chairman Prothero advised of audio and video recording of the meeting.

B. Roll Call (00:27)

Roll was taken. Seven Board members were present, forming a quorum.

C. Public Comment (01:07)

Chairman Prothero asked for public comment. None was given.

D. Approval of Minutes (01:28)

December 6-7, 2022, Regular Board Meeting Minutes

Member Meredith motioned to approve. Member Trost seconded the motion, which passed unanimously.

E. Administrative Business

1. Audit Committee Report (02:19)

Committee Chair Barry briefed the Board.

2. Loan Committee Report (04:46)

Committee Chair Meredith briefed the Board.

3. HR Committee Report (06:05)

Committee Chair Peterson was absent. Committee Member Trost briefed the Board.

F. Comments from Pension Board Members

Member Trost briefed the Board. (06:46)

Member Peterson was absent.

G. Comments from Board Legislative Liaisons (07:30)

No Legislative Liaisons have been appointed at this time.

Tab 2 EXECUTIVE DIRECTOR REPORTS (08:08)

A. Member Requests from Prior Meeting

There were no Board member requests from the prior meeting.

B. Monthly Snapshot

Executive Director Villa briefed the Board.

C. Disaster Recovery and Emergency Preparedness

Executive Director Villa briefed the Board.

D. Custodial Bank Relationship and Continuity

Executive Director Villa briefed the Board.

Tab 3 INVESTMENT POLICY STATEMENT REVIEW (11:11)

Jon Putnam and John Romasko briefed the Board and answered questions.

Chairman Prothero asked for a motion to approve the changes to policies 40.700 through 40.705 and adopt new policy 40.706. Member Barry motioned to approve. Member Kober seconded the motion, which pass unanimously.

Tab 4 CASH MANAGEMENT OF STATE MONIES (27:04)

Polly Boutin and John Carpenter briefed the Board and answered questions.

Tab 5 MONTANA LOAN PROGRAM (45:41)

A. Commercial and Residential Portfolios Report

Doug Hill briefed the Board and answered questions.

Tab 6 BOND PROGRAM (57:43)

A. INTERCAP

Louise Welsh briefed the Board and answered questions.

Tab 7 RVK INVESTMENT UPDATE (01:06:50)

Becky Gratsinger with RVK briefed the Board and answered questions.

Tab 8 INVESTMENT UPDATE (1:57:07)

CIO Update (1:57:17)

Jon Putnam briefed the Board.

Macro Attribution (2:23:33)

Eron Krpan briefed the Board.

Non-Core Fixed Income, Domestic Equity, and International Equity (2:29:30)

Jason Brent briefed the Board.

Real Estate (2:47:54)

Ethan Hurley briefed the Board.

Real Assets (2:57:23)

Ethan Hurley briefed the Board.

Private Investments (3:05:39)

Thomas Winkler briefed the Board.

Core Fixed Income (3:11:34)

John Romasko briefed the Board.

RECAP OF STAFF TO DO LIST AND ADJOURNMENT (03:21:15)

Chairman Prothero adjourned the meeting at 4:37 p.m.

MONTANA BOARD OF INVESTMENTS

APPROVE: _____

Jack Prothero, Chairman

ATTEST: _____

Dan Villa, Executive Director

DATE: _____

MONTANA

BOARD OF INVESTMENTS

To: Members of the Board
From: Dan Villa, Executive Director
Date: April 12, 2023
Re: Executive Director Report

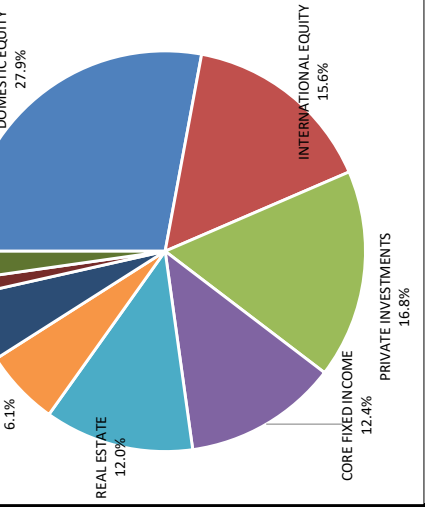
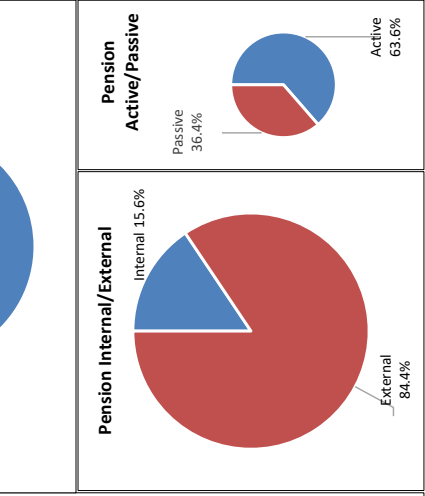
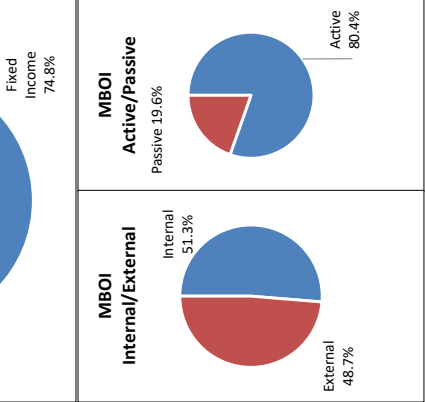
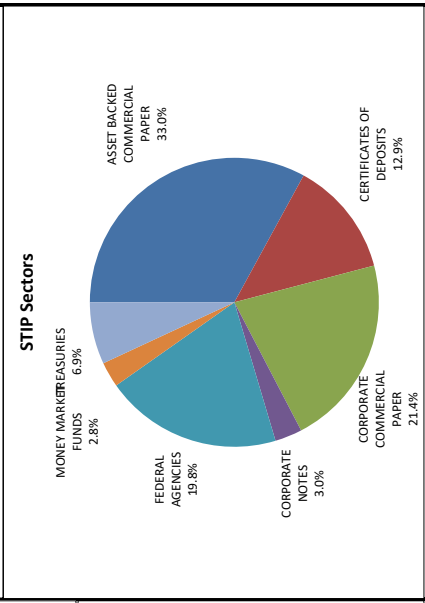
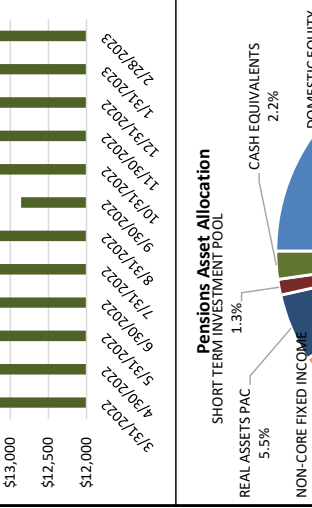
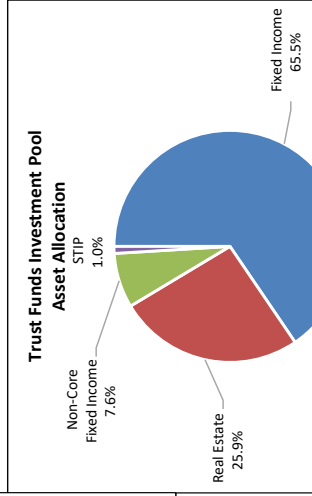
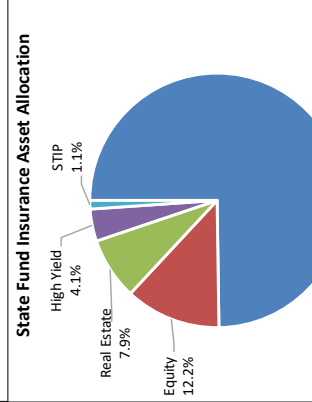
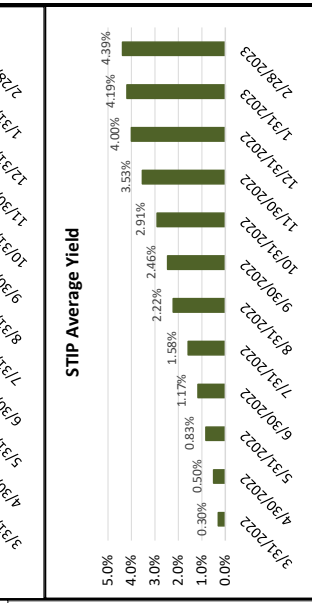
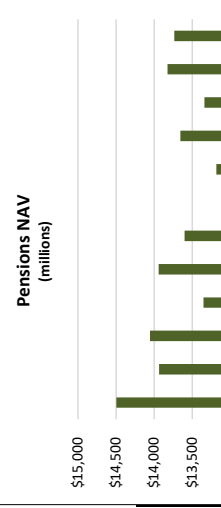
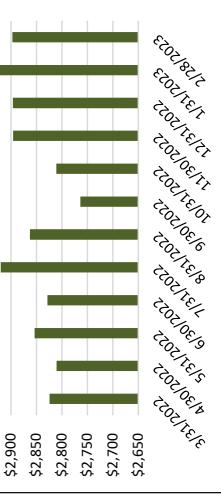
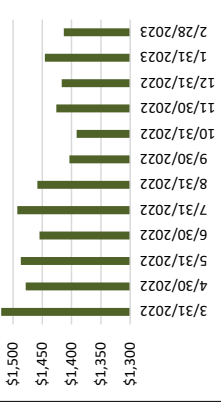
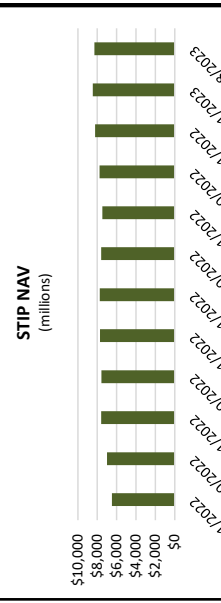
- A. Member Requests from Prior Meeting
- B. Monthly Snapshot – *attached*
- C. Benchmarks Used by the Board – *attached memo from CIO*



MBOI Snapshot
Asset Management View
2/28/2023 Unaudited

Assets Under Management \$26,229,520,974

Pensions		TFIP		State Fund		Other Fixed Income & Pending	
NAV	%	NAV	%	NAV	%	NAV	%
\$3,834,987,030	27.92%	\$1,897,836,174	65.50%	\$1,056,890,363	74.77%	\$2,735,578,300	32.96%
\$2,143,408,509	15.60%	\$750,233,306	25.89%	\$171,866,422	12.16%	\$1,074,721,252	12.95%
\$2,313,024,230	16.84%	\$221,158,736	7.63%	\$111,630,117	7.90%	\$1,780,085,239	21.45%
\$1,708,505,329	12.44%	\$28,155,690	0.97%	\$57,763,030	4.09%	\$252,630,364	3.04%
\$1,654,825,652	12.05%			\$15,404,852	1.09%	\$1,646,683,067	19.84%
\$842,126,923	6.13%					\$235,121,329	2.83%
\$755,876,319	5.50%					\$575,296,869	6.93%
\$174,891,380	1.27%						
\$308,460,012	2.25%						
\$13,736,105,384	100.00%					\$8,300,116,419	100.00%



Definition of NAV: Net Asset Value is the total value of the account including assets held, adjusted for payables, receivables and liabilities
 (1) Other Holdings column on page two represents the value of securities, receivables, payables and liabilities that comprise the Net Asset Value for the asset owner.
 *Difference of \$242,078,600 is attributable the portion of STIP held within CAPP (\$202,194,903) and TFIP (\$27,915,444) as a cash investment and distributions held over month end (\$11,968,252). Such value is represented in the NAV for the CAPP and STIP columns.

MONTANA

BOARD OF INVESTMENTS

TO: Members of the Board
FROM: Jon Putnam, Chief Investment Officer
DATE: April 12, 2023
RE: Asset Class Benchmark Review

BOI's current asset class benchmarks are listed below (page 3). No changes are recommended.

Benchmarks are selected based on seven factors endorsed by the CFA Institute. An optimal benchmark is: **S**pecified in advance, **A**ppropriate, **M**easurable, **U**nambiguous, **R**elevant, **A**ccountable, and **I**vestable. These factors can be remembered with the acronym **SAMURAI**.

BOI's public equity benchmarks (Domestic & International) conform to all seven factors. Investors can invest in these benchmarks at relatively low cost and obtain the return offered by the passive benchmark.

BOI's public fixed income benchmarks (Core, Non-Core & Cash) conform to most of the seven factors. However, it is impossible to fully replicate the fixed income benchmarks. The benchmarks are not investable, but they provide a reasonable approximation of fixed income risk and return characteristics and are a valid point of reference to gauge success.

BOI's illiquid asset class benchmarks (Private Investments, Real Estate & Real Assets) face several inherent challenges in conforming to the seven factors. The main hurdle is the absence of comparable, investable indices for these asset classes. For example, it is not possible to invest in a "private equity index" because there is no investable index that captures all private equity investment opportunities.

Additional challenges include extended time horizons, existence of lock-up periods, less liquid fund structures, and lower levels of information transparency and frequency. A few of the more notable challenges are explained in greater detail below.

- **J-Curve Effect** – Performance of illiquid asset classes can send deceptive signals, as return patterns typically follow a trajectory referred to as a "J-Curve". This return pattern stems from the fact capital is called for investment over several years and the timing of cash flows is uncertain. The J-Curve produces negative returns in the early years, as capital calls and manager fees comprise most cash flows, followed by increasing returns as investments mature. This can create the perception that illiquid investment returns significantly trail public markets in the early years and substantially exceed public markets in the later years.
- **Lagged Valuations** – Asset prices for illiquid investments are typically estimated quarterly resulting in a significant return lag relative to public markets. Within illiquid and private asset classes, there is limited or selective data available from managers as well as the underlying investments.

The above-mentioned obstacles limit the utility of benchmarks for illiquid asset classes – especially when evaluated over short time horizons. Given the obstacles, it is clear there is no perfect benchmark for illiquid asset classes. All benchmarks currently available have some shortcomings with respect to the SAMURAI standard. However, staff has selected benchmarks that provide a reasonable approximation of the risk and return characteristics of the assets over the long-term.

In addition, staff supplements the asset class benchmarks with other information when evaluating the attractiveness of each asset class, sub-asset class, manager, or individual investment. For example, staff considers the performance of previous funds versus peers across multiple metrics and benchmarks when evaluating private investment managers.

In conclusion, staff recognizes the tradeoffs and shortcomings of some of the asset class benchmarks. Nevertheless, we believe the current benchmarks are consistent with industry best practice. The selected benchmarks provide useful information regarding asset class performance and progress towards BOI's long-term goals. Staff will continue to supplement this information to gain a full understanding of the performance of the portfolio and its underlying holdings.

Asset Class	Pension Benchmarks
Domestic Equity	MSCI USA Investable Market Index (IMI)
International Equity	MSCI All Country World Index (ACWI) ex USA Investable Market Index (IMI)
Core Fixed Income	Bloomberg US Aggregate Bond Index
Non-Core Fixed Income	Bloomberg US High Yield 2% Issuer Cap Index
Private Investments	Weighted average of Private Equity and Private Credit
Private Equity	MSCI USA Small Cap Index
Private Credit	S&P/LSTA 100 Leveraged Loan Index
Real Assets	One-third each of the Commodity, Infrastructure and TIPS Indices
Commodity	MSCI All Country World Index (ACWI) Commodity Producers
Infrastructure	MSCI All Country World Index (ACWI) Infrastructure
Treasury Inflation Protected Securities	Bloomberg US Treasury Inflation Protected Securities (TIPS) Index
Real Estate	National Council of Real Estate Investment Fiduciaries (NCREIF) Fund Index - Open End Diversified Core Equity (ODCE) Index
Cash or Short-Term Investment Pool	Federal Reserve US Treasury Constant Maturity 1-Month Index
Asset Class	Trust Funds Investment Pool Benchmarks
Investment Grade Fixed Income	Bloomberg US Aggregate Bond Index
Real Estate	National Council of Real Estate Investment Fiduciaries (NCREIF) Fund Index - Open End Diversified Core Equity (ODCE) Index
Non-Core Fixed Income	Bloomberg US High Yield 2% Issuer Cap Index
Real Assets	50% MSCI All Country World Index (ACWI) Commodity Producers and 50% MSCI All Country World Index (ACWI) Infrastructure
Asset Class	State Fund Investment Pool Benchmarks
Investment Grade Fixed Income	Bloomberg US Aggregate Bond Index
Public Equity	Weighted average of Domestic and International Equity
Domestic Equity	S&P 500 Index
International Equity	MSCI All Country World Index (ACWI) ex USA Investable Market Index (IMI)
Real Estate	National Council of Real Estate Investment Fiduciaries (NCREIF) Fund Index – Open End Diversified Core Equity (ODCE) Index
Non-Core Fixed Income	Bloomberg US High Yield 2% Issuer Cap Index
Real Assets	50% MSCI All Country World Index (ACWI) Commodity Producers and 50% MSCI All Country World Index (ACWI) Infrastructure

April 12, 2023



Capital Market Assumptions

Montana Board of Investments



Capital Market Assumptions

An input into MBOI's annual asset allocation study

- We will be conducting an asset allocation study later this year.
 - As part of that process, we will meet with MBOI staff to review asset allocation and range structures to discuss with the Board.
- Capital Market Assumptions (CMAs) are one input in the asset allocation process, but there are several other factors such as:
 - Portfolio purpose (e.g., retirement plan, insurance pool, trust fund pool), constraints, and asset classes included
 - asset class minimum and maximums
 - return goals
 - risk tolerance, including expected down market performance over varying time periods
 - liquidity requirements
- This presentation reviews RVK's process for creating CMAs and the resulting 2023 assumption set of expected return, risk, and correlations.
- Typically, CMAs don't vary significantly year-over-year due to the long horizon date.
 - However, given the market environment in 2022 which resulted in reduced valuations for many asset classes and the rising interest rate environment and inflationary backdrop, the assumption changes are larger than in many past years.

Capital Market Assumptions

- *Philosophy*
- *Historical Perspective*
- *Key 2023 Observations*
- *Assumption Set*
- *Capital Market Line*
- *Correlation*
- *Assumption Components*



Capital Market Assumptions

Philosophy

- Each year, RVK's general consulting and research teams collaborate to review the capital market environment and update long-term, forward-looking capital market assumptions (CMAs) for each asset class utilized by our clients.
- The forecast horizon is for long-term periods, typically 10 years or more.
- The components we estimate include:
 - Return
 - Risk (volatility of returns)
 - Correlation (relationship of asset class returns with all other asset classes)
- Return assumptions are generally index-based, net of fees, and assume no investment manager alpha.
- Annual updates are typically gradual and incorporate historical performance, current valuations, as well as the overall economic environment.

What does it mean to get CMAs “right”?

Relative accuracy is more important...

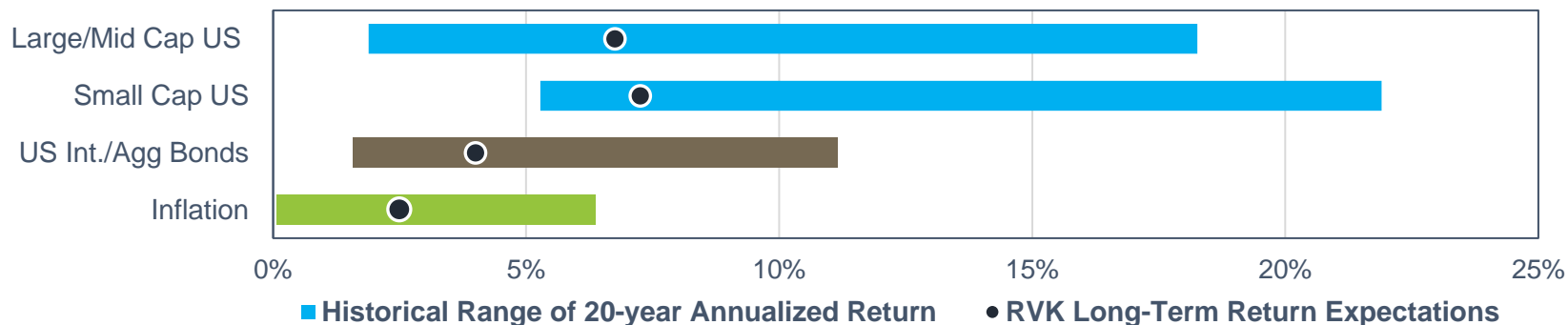
- **Relative Accuracy:** Assumptions capture the relative relationships between asset classes, which are vitally important to trade-off decisions when modeling.
 - Having some assumptions that are spot on, and others that are far off, will produce unbalanced and poorly diversified portfolios.

...but “absolute” accuracy matters too – though perhaps not as much

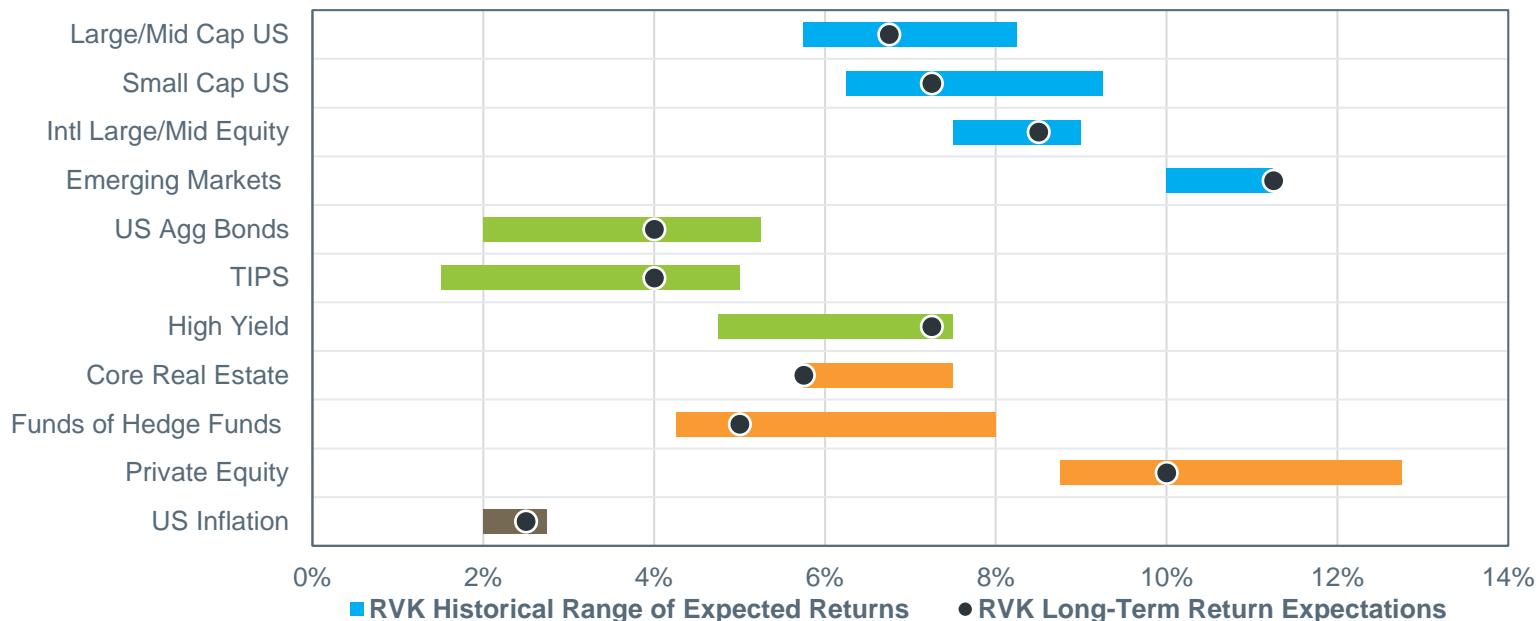
- **Absolute Accuracy:** Assumptions reflect the absolute values actually experienced in future long-term market environments.
 - Having assumptions that are too high or too low across the board can cause a Fund to believe it can distribute more than it can afford or restrict spending more than necessary.

Historical Perspective of Expected Returns

RVK Long-Term Expected Returns vs. Historical Range of Returns¹



2023 Expected Returns vs. RVK Historical Range of Expected Returns²

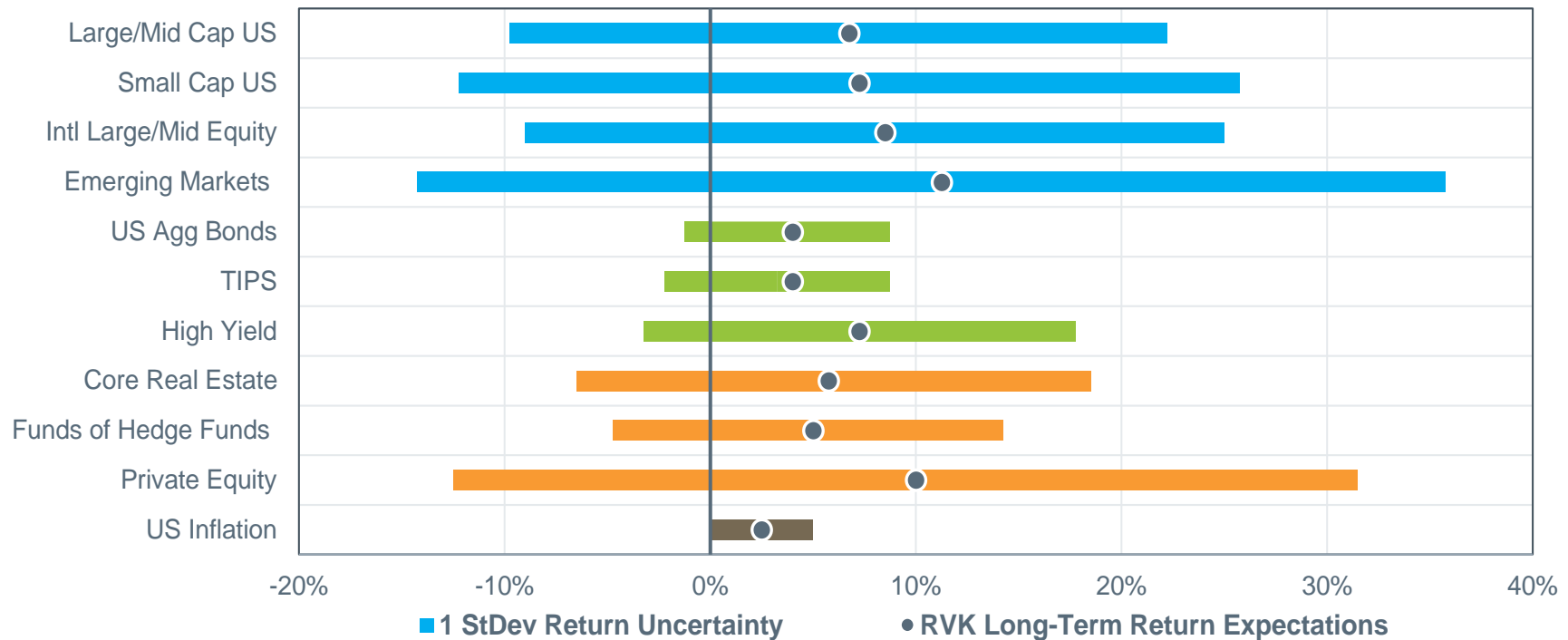


¹ Historical range shows the minimum and maximum 20-year annualized return for a given asset class based on monthly rolling 20-year annualized return series starting from Jan 1926. Large/Mid Cap US is represented by SBBI US Large Stock; Small Cap US by SBBI US Small Stock; US Int./Agg Bonds by SBBI US Intermediate Government Jan 1926 – December 1999 and Barclays US Aggregate Bond Index thereafter; US Inflation by SBBI US Inflation.

² Data shown includes 2006 through 2023 Capital Market Assumptions for selected asset classes.

Range of Potential Outcomes for Expected Returns

RVK 2023 Long-Term Return Expectations and Uncertainty of Returns Distribution



¹ StDev return uncertainty is based on RVK 2023 CMA risk assumption for each asset class.

Themes for 2023 Capital Market Assumptions

Inflation

Past and future inflation levels are studied and considered given market conditions, break-even indications, sovereign intervention, and inflation component pricing behavior. *RVK's 2023 inflation assumption remained constant compared to 2022. This reflects short- to medium-term inflationary pressures stemming from ongoing supply chain bottlenecks, declining stimulus driven demand, and continued wage growth pressures while also accounting for longer-term deflationary factors such as deficits, debt, demographics, automation and globalization.*

Mean-reversion

Mean reversion is considered for asset classes that demonstrated weak/strong performance over the last year (or longer). *Equity return assumptions were increased, given improved valuation levels – although still elevated domestically – following the negative returns in 2022. Dividend yields also improved.*

Increased yields

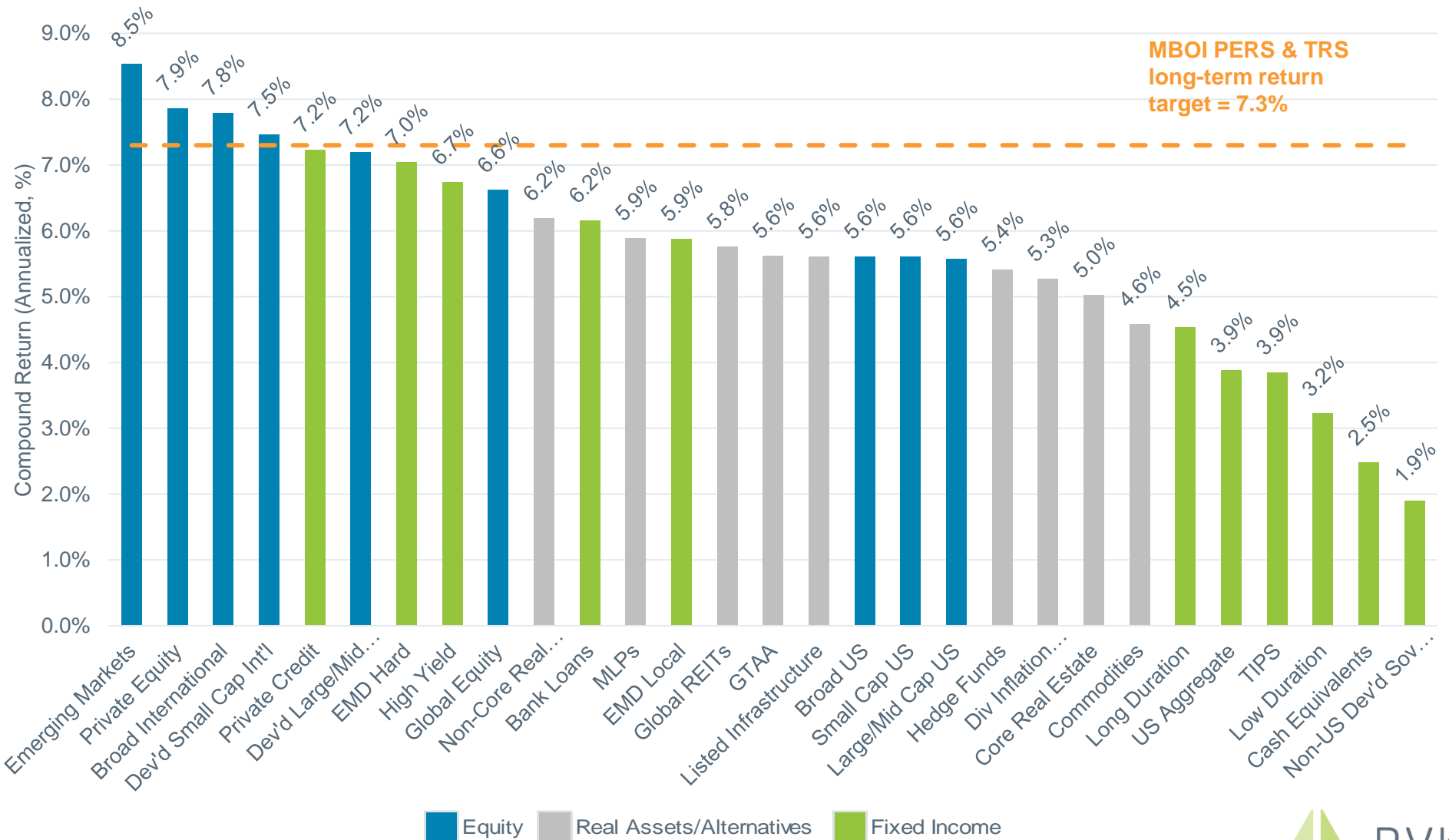
Yield history, current environment, and prospective environments are considered. *The majority of fixed income return assumptions were increased, reflecting elevated current yields – but with the expectation that the inverted yield curve will of course not persist indefinitely.*

RVK 2023 Assumptions vs. 2022

Asset Class	Benchmark	2022			2023			Change		
		Nominal Return (Arith.)	Risk (St. Dev.)	Nominal Return (Geo.)	Nominal Return (Arith.)	Risk (St. Dev.)	Nominal Return (Geo.)	Nominal Return (Arith.)	Risk (St. Dev.)	Nominal Return (Geo.)
Large/Mid Cap US Equity	S&P 500 (Cap Weighted)	5.75%	16.00%	4.56%	6.75%	16.00%	5.57%	1.00%	0.00%	1.01%
Small Cap US Equity	Russell 2000	6.25%	19.00%	4.59%	7.25%	19.00%	5.61%	1.00%	0.00%	1.01%
Broad US Equity	Russell 3000	5.80%	16.00%	4.61%	6.80%	16.10%	5.61%	1.00%	0.10%	1.00%
Dev'd Large/Mid Cap Int'l Equity	MSCI EAFE (Gross)	7.50%	17.00%	6.18%	8.50%	17.00%	7.19%	1.00%	0.00%	1.01%
Dev'd Small Cap Int'l Equity	MSCI EAFE Small Cap (Gross)	8.00%	20.00%	6.19%	9.25%	20.00%	7.46%	1.25%	0.00%	1.27%
Emerging Markets Equity	MSCI Emerging Markets (Gross)	10.25%	25.00%	7.52%	11.25%	25.00%	8.54%	1.00%	0.00%	1.02%
Broad International Equity	MSCI ACW Ex US IMI (Gross)	8.35%	18.65%	6.78%	9.35%	18.70%	7.79%	1.00%	0.05%	1.01%
Global Equity	MSCI ACW IMI (Gross)	6.80%	16.40%	5.56%	7.85%	16.40%	6.62%	1.05%	0.00%	1.06%
US Aggregate Fixed Income	Bloomberg US Aggregate Bond	2.50%	5.00%	2.38%	4.00%	5.00%	3.88%	1.50%	0.00%	1.50%
Non-US Dev'd Sov'n Fixed Income UH	Citi Non-US World Gov't Bond	1.25%	8.50%	0.90%	2.25%	8.50%	1.90%	1.00%	0.00%	1.00%
Emerging Markets Debt Hard Currency	JPM EMBI Global Diversified	6.00%	10.00%	5.53%	7.50%	10.00%	7.04%	1.50%	0.00%	1.51%
Emerging Markets Debt Local Currency	JPM GBI EM Global Diversified	5.75%	11.50%	5.13%	6.50%	11.50%	5.88%	0.75%	0.00%	0.75%
TIPS	Bloomberg US Treasury: US TIPS	2.00%	5.50%	1.85%	4.00%	5.50%	3.85%	2.00%	0.00%	2.00%
Low Duration Fixed Income	Bloomberg US Gov't/Cred: 1-3 Year	2.00%	2.50%	1.97%	3.25%	2.50%	3.22%	1.25%	0.00%	1.25%
Long Duration Fixed Income	Bloomberg US Gov't/Cred: LT Bond	2.75%	10.00%	2.27%	5.00%	10.00%	4.53%	2.25%	0.00%	2.26%
High Yield	Bloomberg US Corp: High Yield	5.50%	10.00%	5.03%	7.25%	10.50%	6.74%	1.75%	0.50%	1.71%
Bank Loans	CS Leveraged Loan	5.00%	8.00%	4.70%	6.50%	8.50%	6.16%	1.50%	0.50%	1.47%
Core Real Estate	NCREIF ODCE (Gross) (AWA)	6.00%	12.50%	5.27%	5.75%	12.50%	5.02%	-0.25%	0.00%	-0.25%
Global REITs	MSCI World Real Estate (Gross)	6.50%	21.00%	4.49%	7.75%	21.00%	5.76%	1.25%	0.00%	1.27%
MLPs	Alerian MLP	8.75%	23.00%	6.40%	8.25%	23.00%	5.89%	-0.50%	0.00%	-0.51%
Funds of Hedge Funds	HFRI Fund of Funds Composite	4.25%	9.50%	3.82%	5.00%	9.50%	4.57%	0.75%	0.00%	0.75%
Multi-Strategy Hedge Funds	HFRI RV Multi-Strat	5.00%	8.50%	4.66%	5.75%	8.50%	5.41%	0.75%	0.00%	0.75%
GTAA	Custom GTAA Index	5.00%	9.00%	4.62%	6.00%	9.00%	5.62%	1.00%	0.00%	1.00%
Private Credit	Cambridge Private Credit Index	7.25%	13.00%	6.47%	8.00%	13.00%	7.23%	0.75%	0.00%	0.76%
Senior Secured Direct Lending	--	6.00%	9.00%	5.62%	7.00%	9.00%	6.62%	1.00%	0.00%	1.00%
Private Equity	Cambridge US Private Equity	9.00%	22.00%	6.85%	10.00%	22.00%	7.86%	1.00%	0.00%	1.02%
Commodities	Bloomberg Commodity	5.50%	17.50%	4.08%	6.00%	17.50%	4.58%	0.50%	0.00%	0.51%
Diversified Inflation Strategies	Custom DIS Index	4.70%	11.55%	4.07%	5.90%	11.60%	5.27%	1.20%	0.05%	1.20%
US Inflation	Consumer Price Index	2.50%	2.50%	2.47%	2.50%	2.50%	2.47%	0.00%	0.00%	0.00%
Cash Equivalents	BofA ML 3 Mo US T-Bill	1.50%	2.00%	1.48%	2.50%	2.00%	2.48%	1.00%	0.00%	1.00%

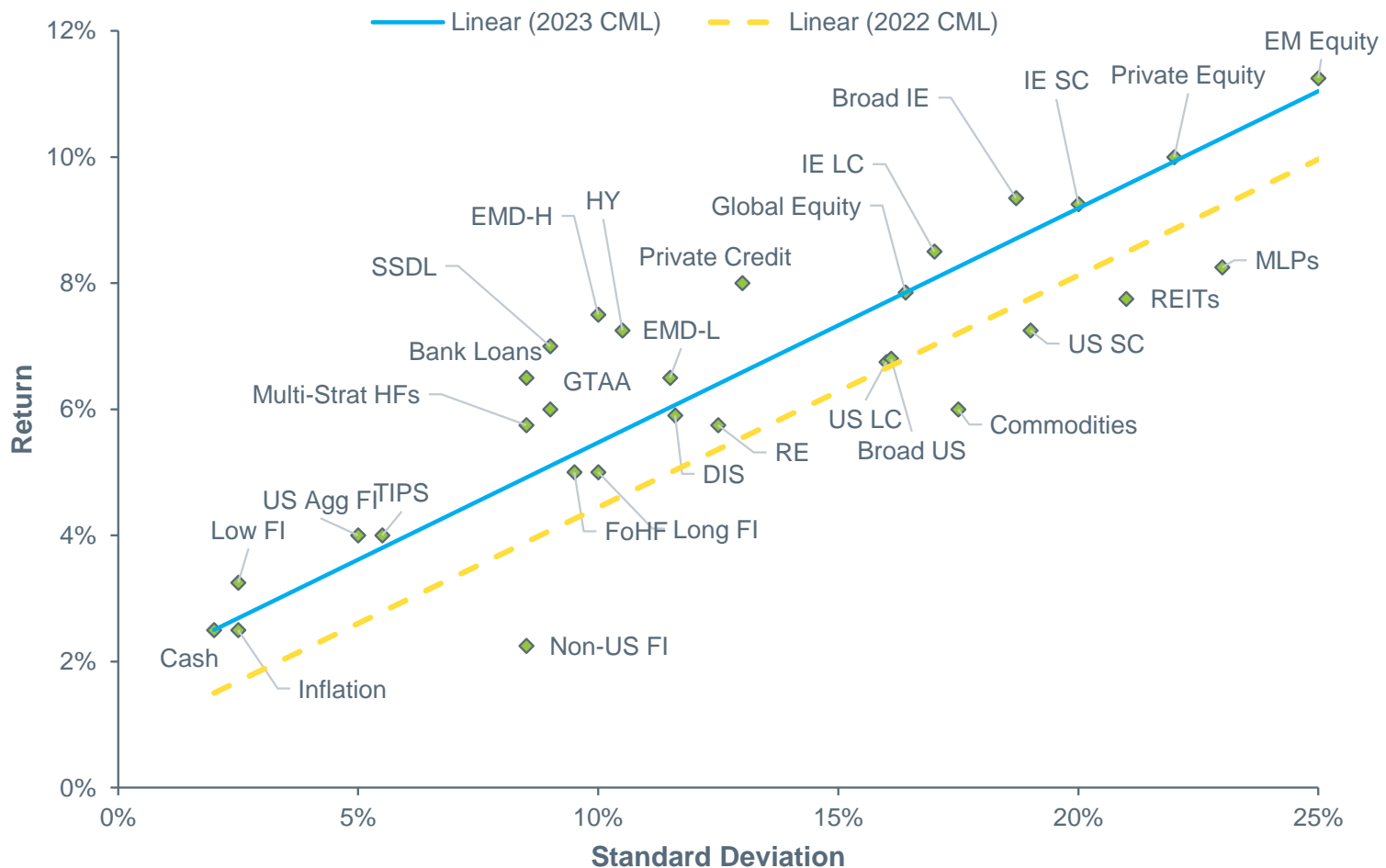
RVK 2023 Expected Geometric Returns

- It is important to note that the asset allocation exercise is not to select only asset classes that individually meet a portfolio's long-term return target.
- In the modeling process each asset class is considered for its contribution to the portfolio through the multiple lenses of expected return, risk, and correlation.



Capital Market Line

- The capital market line represents the return and risk attributes of each asset class and reflects the discipline that return and risk are related and asset classes should be triangulated as an assumption set.
- Note that the return and risk relationships resulting from our 2023 process represent greater return potential for similar risk levels – the Capital Market Line has moved upward.



Correlation

- Correlation is a quantitative measure of the degree to which asset classes move relative to each other. Correlation values can fall between 1.00 and -1.00.
- Diversification opportunities exist because the returns of different asset classes do not always move in the same direction at the same time, or with the same magnitude.

MBOI 2023 Correlation Matrix

	Broad US Equity	Broad International Equity	US Agg Fixed Income	TIPS	High Yield Fixed Income	Private Credit	Convertibles	Core Real Estate	Private Core Infrastructure	Private Equity	Commodities	Cash Equivalents
Broad US Equity	1.00	0.85	0.21	0.19	0.67	0.70	0.83	0.29	0.09	0.78	0.37	-0.01
Broad International Equity	0.85	1.00	0.12	0.24	0.72	0.80	0.76	0.32	0.11	0.77	0.52	-0.08
US Agg Fixed Income	0.21	0.12	1.00	0.78	0.31	-0.18	0.18	-0.01	-0.12	-0.06	0.00	0.30
TIPS	0.19	0.24	0.78	1.00	0.38	0.05	0.24	0.20	-0.17	0.16	0.27	0.04
High Yield Fixed Income	0.67	0.72	0.31	0.38	1.00	0.69	0.71	0.16	0.04	0.63	0.39	-0.05
Private Credit	0.70	0.80	-0.18	0.05	0.69	1.00	0.68	0.39	0.09	0.84	0.51	-0.12
Convertibles	0.83	0.76	0.18	0.24	0.71	0.68	1.00	0.22	0.11	0.73	0.38	-0.06
Core Real Estate	0.29	0.32	-0.01	0.20	0.16	0.39	0.22	1.00	0.25	0.54	0.28	0.02
Private Core Infrastructure	0.09	0.11	-0.12	-0.17	0.04	0.09	0.11	0.25	1.00	0.08	-0.02	-0.22
Private Equity	0.78	0.77	-0.06	0.16	0.63	0.84	0.73	0.54	0.08	1.00	0.52	-0.21
Commodities	0.37	0.52	0.00	0.27	0.39	0.51	0.38	0.28	-0.02	0.52	1.00	-0.03
Cash Equivalents	-0.01	-0.08	0.30	0.04	-0.05	-0.12	-0.06	0.02	-0.22	-0.21	-0.03	1.00

Summary of Expected Return Methodology

- Asset class return expectation building processes - simplified.

Building Block Methodology	Income	+	Inflation	+	Real Growth	+	Valuation Change
Cash Equivalents	Income + Expected interest rate changes						
Fixed Income	Income + OAS change + Expected interest rate changes (and duration impact)						
TIPS	Real Income + Inflation						
Public Equity	Income + Inflation + Real GDP/earnings growth +/- Currency Effect +/- Valuation						
Core Real Estate	Income + Inflation +/- Valuation – Manager Fees						
Hedge Funds	Income (collateral return, cash) + Beta return + Alpha return (net)						
Commodities	Collateral return (cash assumption) + Spot return (inflation assumption) + Roll return						
Spread Methodology	Beta assumption	+	Illiquidity premium				
Private Credit	Bank loan assumption + Return premium						
Private Equity	US Large/Mid cap equity assumption + Return premium						
Asset Blend Methodology							
GTAA	30% global equity + 25% US Agg fixed income + 5% int'l developed fixed income + 10% EMD (local) + 10% TIPS + 10% high yield + 10% commodities						
Diversified Inflation Strategies	1/3 TIPS + 1/3 commodities + 1/3 global REITs						

While the above factors generally inform the direction and magnitude of the capital market assumptions, RVK also considers qualitative, triangulation, and other factors as needed, when arriving at final assumption values.

Capital Market Assumptions



Capital Market Assumptions

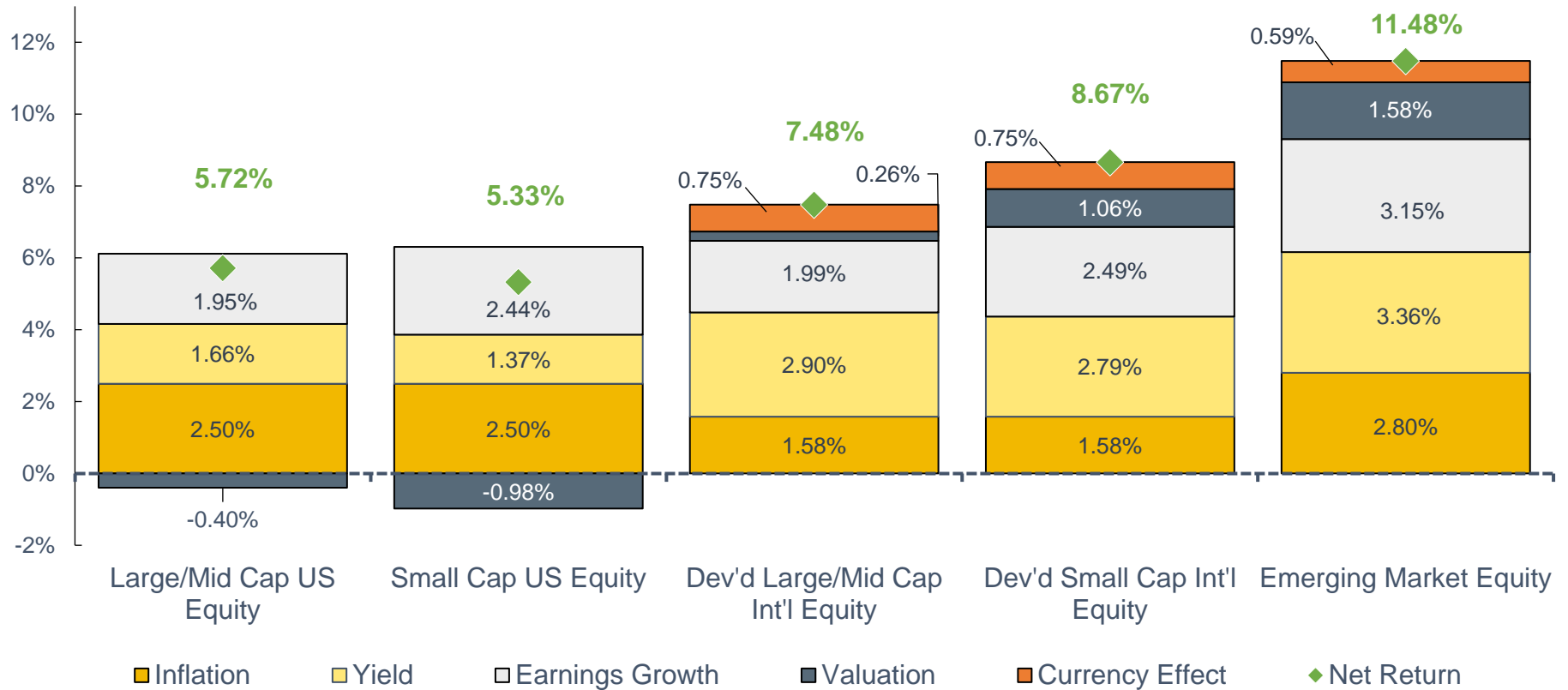
A review of key asset classes

- The following pages provide a view into the process of developing key asset class assumptions.
- There are many more asset classes and assumption construction components that are detailed in our related white paper.
- When clients have bespoke asset class construction that differ from our primary assumptions, we are happy to create custom assumptions that are then tested to ensure they will function well as part of a capital market line.

RVK Return Methodology for Equities

- Quantifying the equity building blocks is one step in the process.

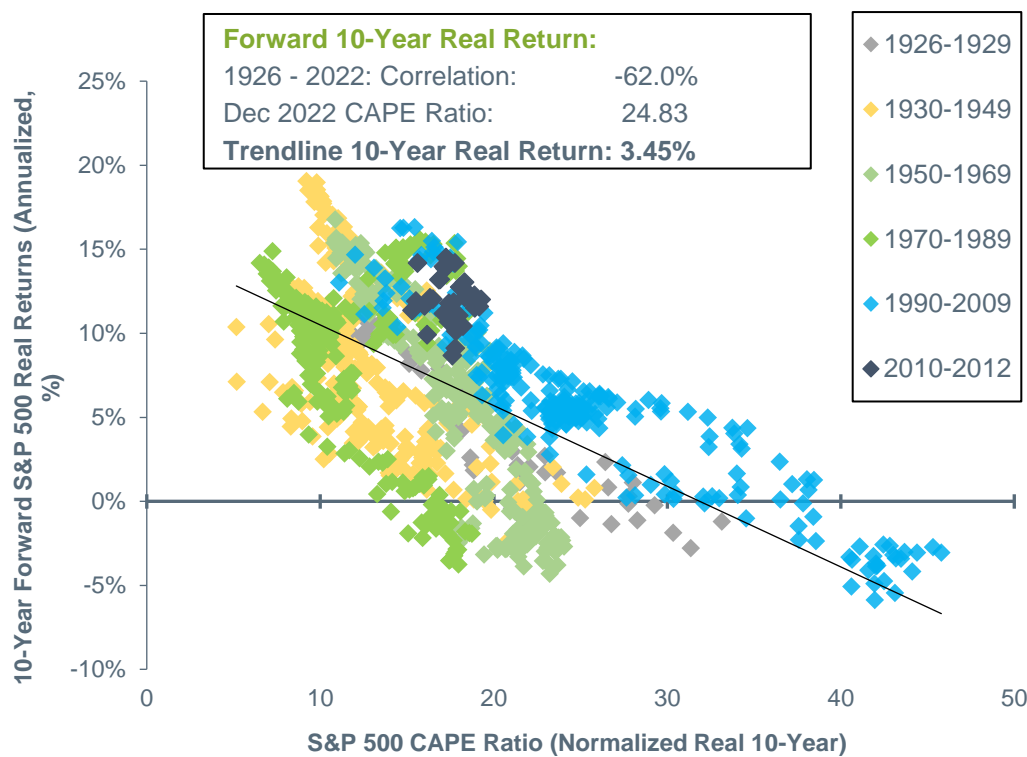
2023 Decomposition of the Building Blocks for Public Equity Asset Classes



Public Equity – US

Public Equity: US									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
Large/Mid Cap US	5.75%	16.00%	4.56%	6.75%	16.00%	5.57%	+1.00%	--	+1.01%
Small Cap US	6.25%	19.00%	4.59%	7.25%	19.00%	5.61%	+1.00%	--	+1.01%
Broad US Equity	5.80%	16.00%	4.61%	6.80%	16.10%	5.61%	+1.00%	+0.10%	+1.00%

Relationship between Valuations and Forward 10 Year Returns



- US equity return forecasts all increased relative to 2022.
- The increase was yield and valuation driven, as domestic equity returns dropped in 2022 with the Fed raising interest rates to combat inflation.
- Despite the drop in returns, the LC US valuation, as represented by the Shiller CAPE, stilled ranked in the 89th percentile of historical values.
- Thus, return assumptions remain lower than historical averages.

RVK Broad US Equity assumption is a combination of 94.0% Large/Mid Cap US Equity and 6.0% Small Cap US Equity.
 Source: RVK, based on data from FactSet (2023). December 2022 CAPE ratio uses the S&P 500 earnings estimate for the Q4 2022.

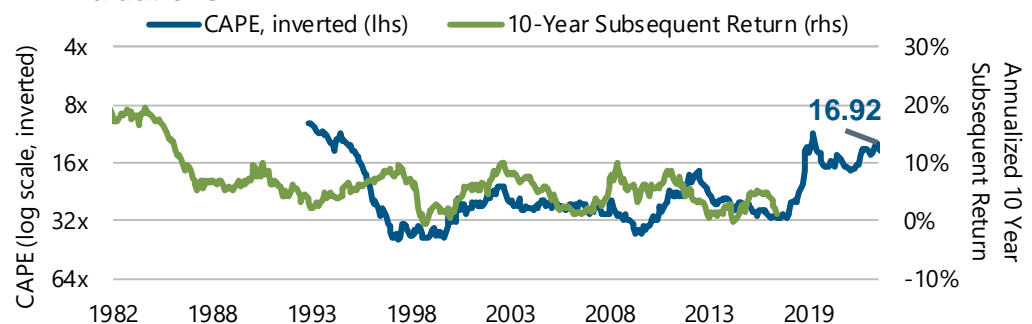
Public Equity – International

Public Equity: International

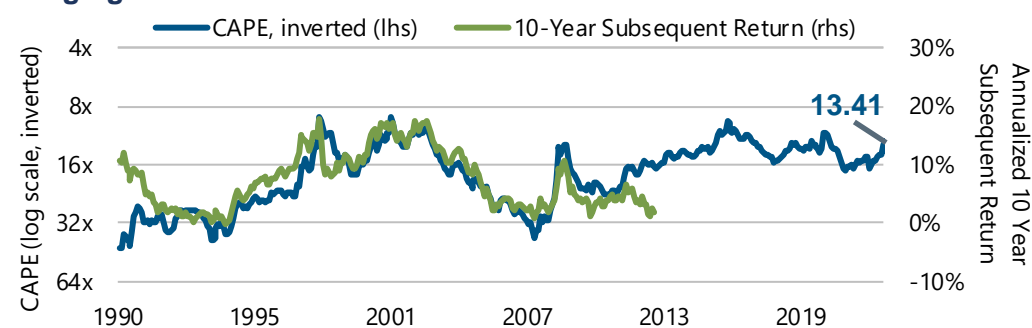
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
Intl Large/Mid Equity	7.50%	17.00%	6.18%	8.50%	17.00%	7.19%	+1.00%	--	+1.01%
Dev'd Small Cap	8.00%	20.00%	6.19%	9.25%	20.00%	7.46%	+1.25%	--	+1.27%
Emerging Markets	10.25%	25.00%	7.52%	11.25%	25.00%	8.54%	+1.00%	--	+1.02%
Broad International	8.35%	18.65%	6.78%	9.35%	18.70%	7.79%	+1.00%	+0.05%	+1.01%

Valuations: Cyclically-adjusted P/E

EAFE valuations



Emerging markets valuations



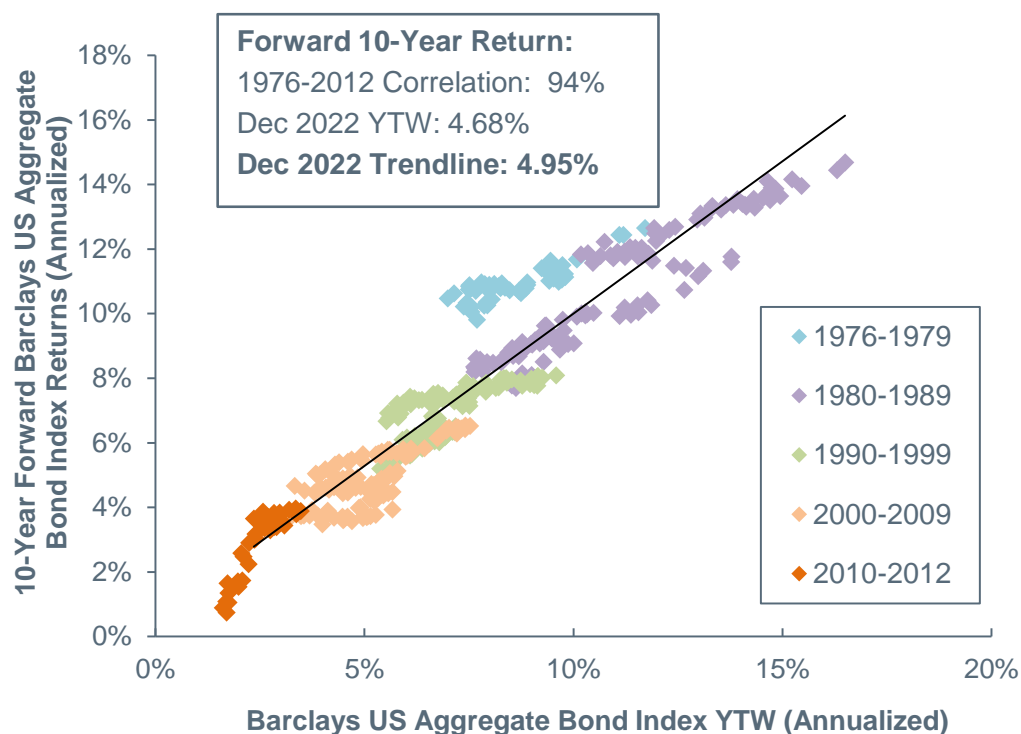
- International equity assumptions all increased due to higher dividend yields, improved valuations and currency expectations; but these were offset by lower inflation and real growth/earnings expectations.
- International developed inflation expectations remain below US expectations. However, all non-US valuations remain better than their US counterparts.

RVK Broad International Equity is a mix of 61.6% Dev'd Large/Mid Cap Int'l Equity, 10.3% Dev'd Small Cap Int'l Equity, and 28.1% Emerging Markets Equity. Source: Research Affiliates (RA); EAFE valuations represented by MSCI EAFE CAPE calculations by RA since December 1982; EM represented by MSCI EM CAPE calculations by RA since Jan 1990. Data as of December 31, 2022.

Fixed Income

Fixed Income									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
US Aggregate	2.50%	5.00%	2.38%	4.00%	5.00%	3.88%	+1.50%	--	+1.50%
Non-US Dev. Sovereign	1.25%	8.50%	0.90%	2.25%	8.50%	1.90%	+1.00%	--	+1.00%
Low Duration	2.00%	2.50%	1.97%	3.25%	2.50%	3.22%	+1.25%	--	+1.25%
Long Duration	2.75%	10.00%	2.27%	5.00%	10.00%	4.53%	+2.25%	--	+2.26%
TIPS	2.00%	5.50%	1.85%	4.00%	5.50%	3.85%	+2.00%	--	+2.00%

Relationship between YTW and Forward 10 Year Returns

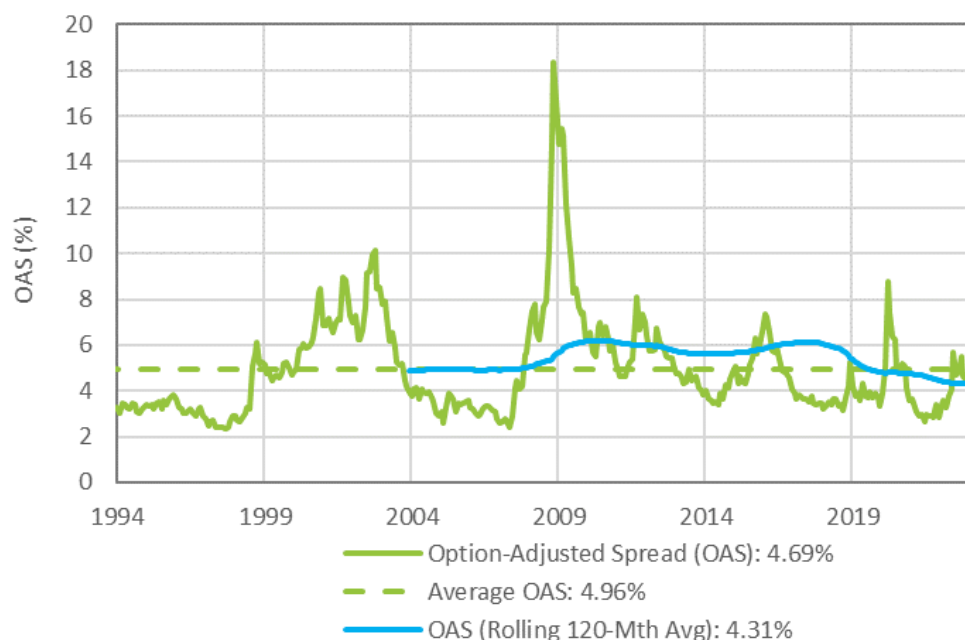


- Starting yields have historically been a reasonable starting point when forecasting future bond returns.
- Therefore, most bond return assumptions increased based on higher starting yields, and an expectation that the yield curve inversion corrects over time.
- Changes in spreads and durations were mostly nominal and thus did not generally have material impacts on the return forecasts.

Fixed Income – Spread Assets

Fixed Income: Spread Sectors									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
High Yield	5.50%	10.00%	5.03%	7.25%	10.50%	6.74%	+1.75%	+0.50%	+1.71%
Emerging Markets Debt (HC)	6.00%	10.00%	5.53%	7.50%	10.00%	7.04%	+1.50%	--	+1.51%
Emerging Markets Debt (LC)	5.75%	11.50%	5.13%	6.50%	11.50%	5.88%	+0.75%	--	+0.75%
Bank Loans	5.00%	8.00%	4.70%	6.50%	8.50%	6.16%	+1.50%	+0.50%	+1.47%

BB US Corporate High Yield Index Option-Adjusted Spread (OAS)

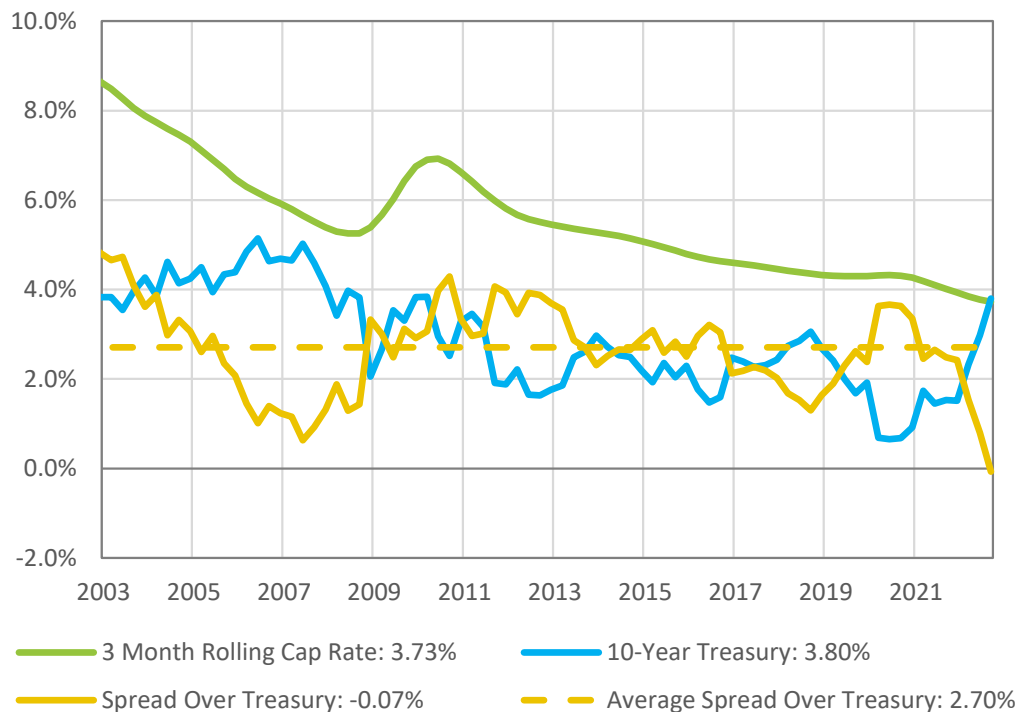


- We significantly increased our long-term return expectations for all fixed income spread sectors.
- Higher starting yields for emerging market debt (both HC and LC) led to higher expected long-term returns.
- Rising rates and widening spreads will – over the long run – help returns for low duration assets such as bank loans and high yield bonds.

Real Estate

Real Estate									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
Core Real Estate	6.00%	12.50%	5.27%	5.75%	12.50%	5.02%	-0.25%	--	-0.25%
Global REITs	6.50%	21.00%	4.49%	7.75%	21.00%	5.76%	+1.25%	--	+1.27%

Cap Rates and Spread to Treasuries

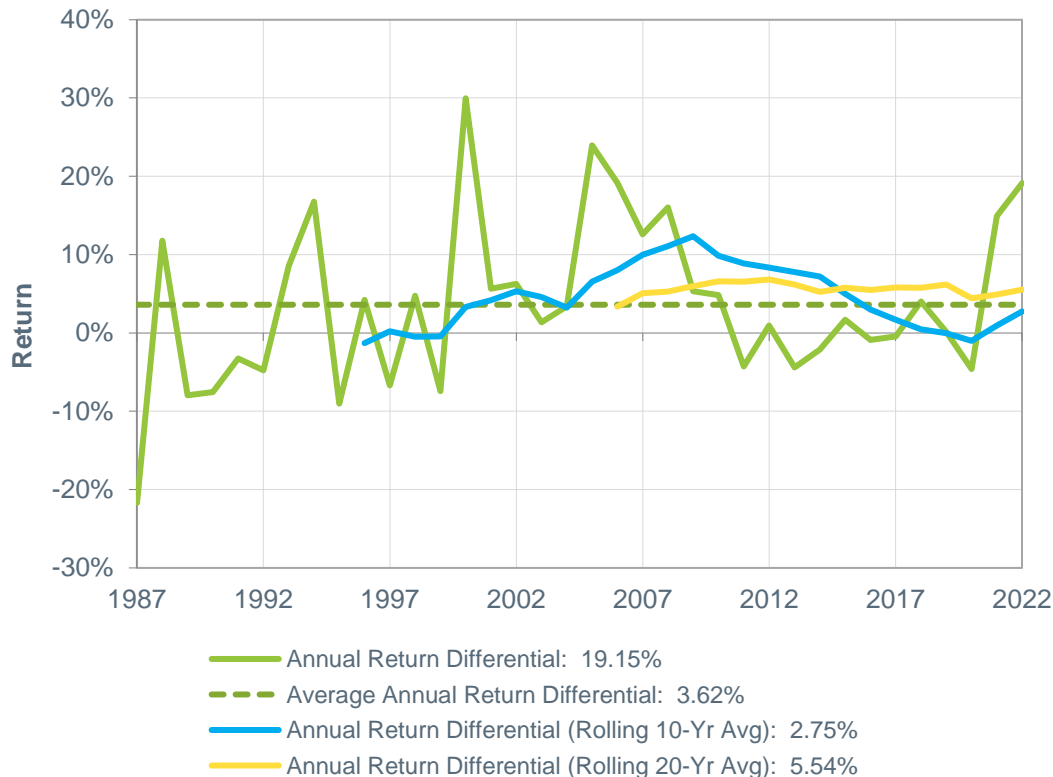


- Cap rates dropped to historic lows as real estate performed well in 2022.
- However, on a relative basis – with Treasury rates materially increased – income yields for core real estate assets are relatively less attractive than in the recent past.
- RVK decreased our long-term core real estate assumption given falling net income yields.
- Global REITs assumption increased due to a significant increase in yield, as well as improved valuations.

Private Equity

Private Equity									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
Private Equity	9.00%	22.00%	6.85%	10.00%	22.00%	7.86%	+1.00%	--	+1.02%

**Annual Return Differential:
Cambridge US Private Equity Index vs. S&P 500 Index**



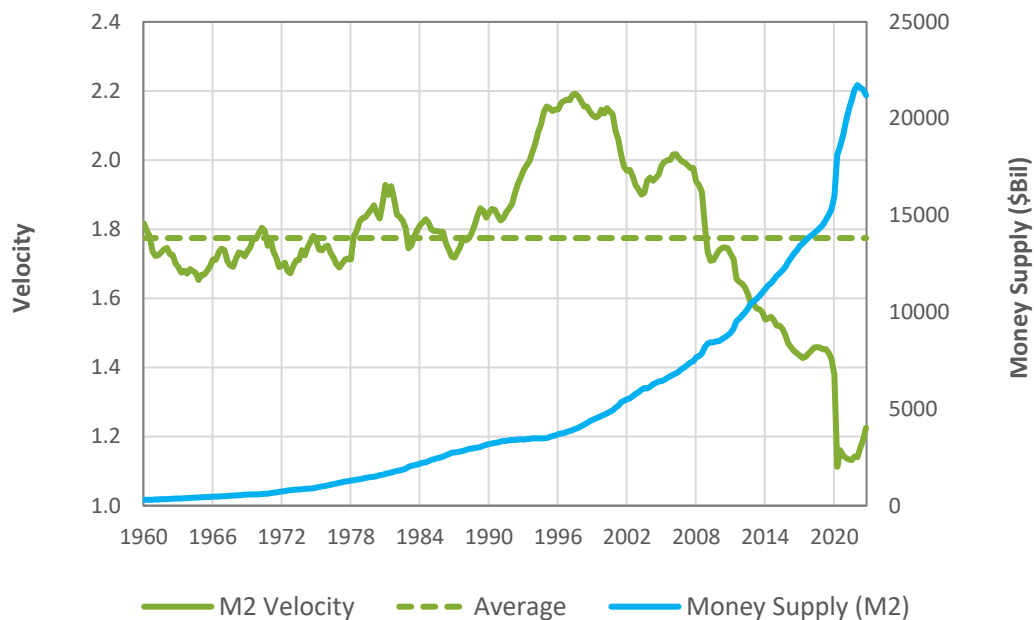
- Our spread assumption remained constant at 225 basis points (geometric) above Large/Mid Cap US Equities.
- This spread differential is similar to the historical spread differential.
- The PE return increase was due to the increase in the underlying public market return forecast. The Large/Mid Cap US Equity assumption was increased by 1.00% due to increased dividend yields and improved valuations.

Source: Cambridge Associates LLC and FactSet (2023). Data as of June 30, 2022. Cambridge index is pooled horizon internal rates of return, net of fees, expenses, and carried interest.

US Inflation & Cash Equivalents

US Inflation & Cash Equivalents									
Asset Class	2022			2023			One Year Adjustment		
	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)	Nominal Return	Risk (StDev)	Nominal Return (Geo.)
US Inflation	2.50%	2.50%	2.47%	2.50%	2.50%	2.47%	--	--	--
Cash Equivalents	1.50%	2.00%	1.48%	2.50%	2.00%	2.48%	+1.00%	--	+1.00%

Supply and Velocity of Money



- The inflation assumption remained constant, to align with break-even inflation rates (as shown below), as well as to balance between near-term inflationary pressures and long-term deflationary factors.
- The cash assumption was increased to reflect increased yields.

As of December 30, 2022	5-Year	7-Year	10-Year	20-Year	30-Year
Treasury Yield	3.99%	3.96%	3.88%	4.14%	3.97%
TIPS Yield	1.66%	1.61%	1.58%	1.62%	1.67%
Implied Expected Inflation	2.33%	2.35%	2.30%	2.52%	2.30%

Source: FactSet (2023).



Next Steps



Applying Capital Market Assumptions: Modeling

Next Steps

- We will discuss our assumptions, asset allocation models, and stress testing with MBOI staff in August.
 - This is an iterative process with the ability to model “what if” scenarios if change is considered.
- As with any asset allocation study, it is important to consider the efficiency of current portfolio construction and the impact of possible change as well as implementation considerations.
- A successful asset allocation process does not always result in portfolio construction change; it can result in re-underwriting the current structure if still optimal.

PORTLAND

BOISE

CHICAGO

NEW YORK

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Montana International Equities Asset Class Review

Presented by:

Jason Brent, CFA, CAIA, Director of Public Market Investments
Steve Strong, Senior Investment Analyst

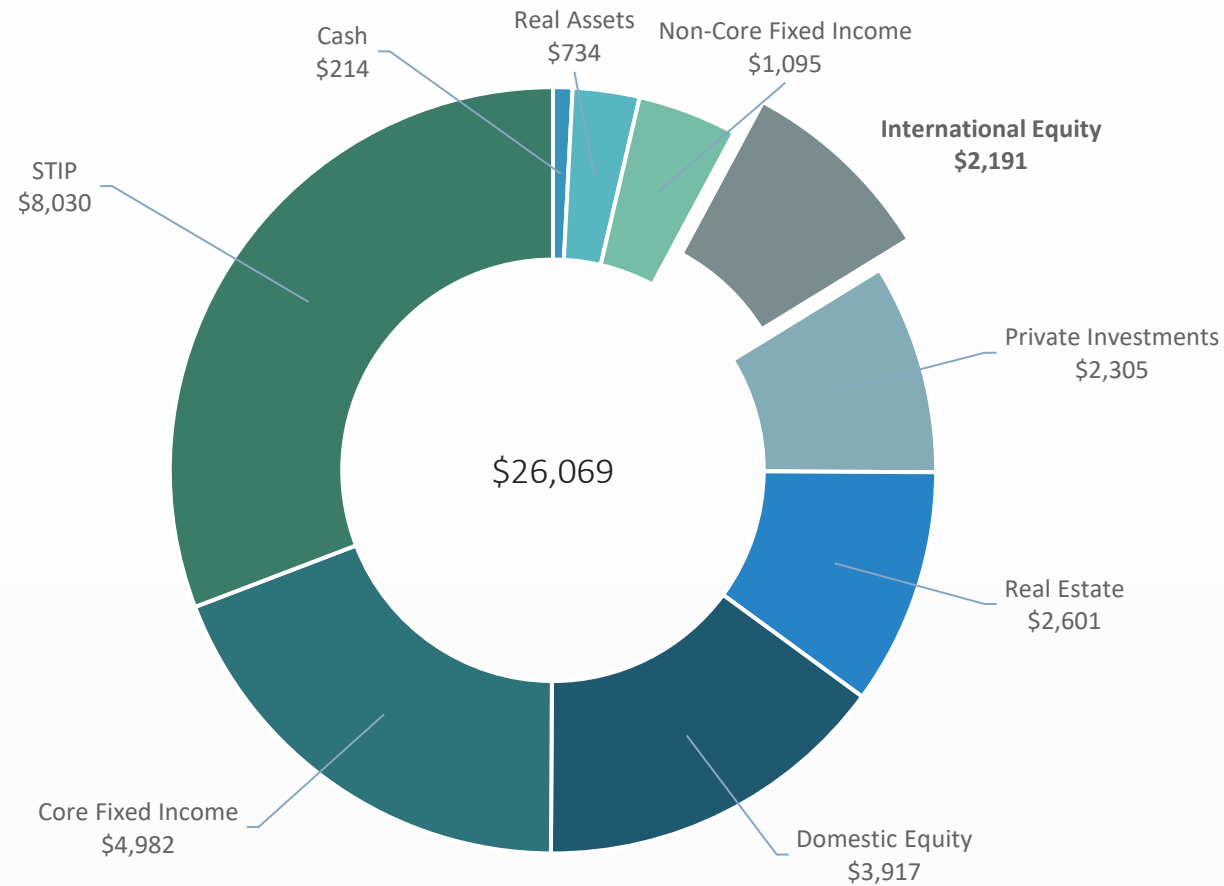
Date:

April 12, 2023

International Equities Overview

- Equity investments in publicly-traded companies based outside the U.S.
- Externally managed
 - Actively-managed portfolios
 - Objective is to outperform a benchmark index
 - Indexed investments
 - Objective is to match the performance of a benchmark index

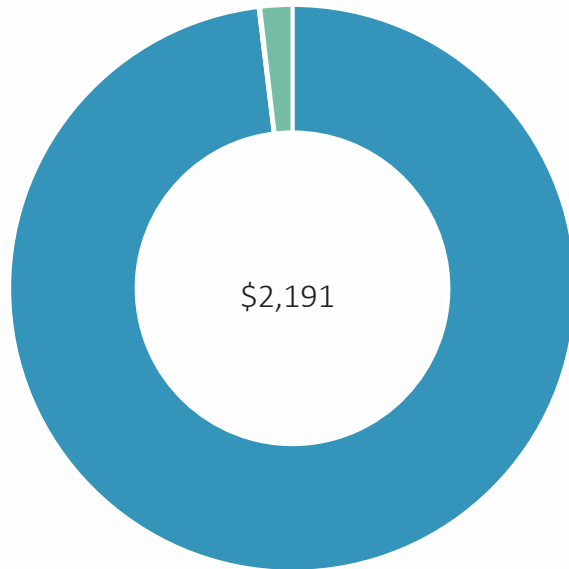
AUM by Asset Class



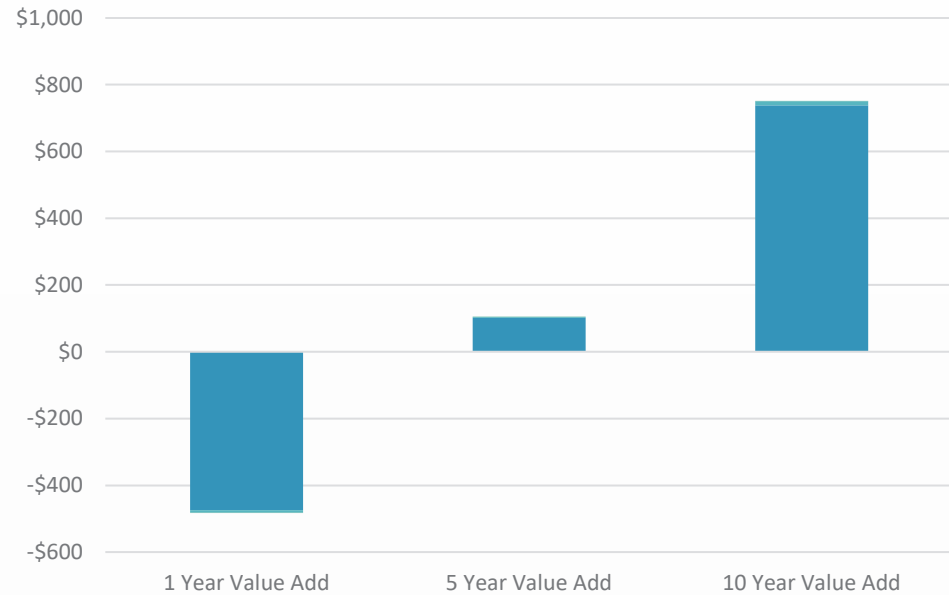
* Dollar values are in \$1,000,000

December 31, 2022

Ownership & Performance



■ Pension ■ DC Disability ■ State Fund



■ Pension ■ State Fund ■ DC Disability

Performance	1 Year	1 Year Benchmark	5 Year	5 Year Benchmark	10 Year	10 Year Benchmark
Pension	-17.66%	-16.58%	1.00%	0.85%	4.23%	3.95%
State Fund	-15.97%	-16.00%	0.92%	0.88%	3.85%	3.80%
DC Disability	-15.71%	-16.00%	1.16%	0.88%	NA	NA

* Dollar values are in \$1,000,000

December 31, 2022

Policies

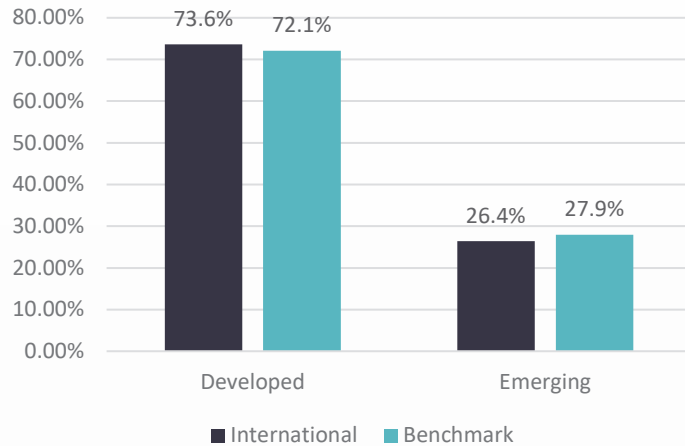
- CAPP Asset Class benchmark: MSCI All Country World ex-US Investable Market Index (IMI)
- CAPP Restrictions
 - Approved range of 10-20% of the Consolidated Asset Pension Pool
 - Small Cap weight not to exceed the benchmark weight +10%
 - Percentage of passive/indexed investments shall be greater than 42%
 - Percentage in Emerging Markets shall not exceed + or – 10% of the benchmark weight
- State Fund Restrictions
 - Maximum of 4% of the SFIP assets invested in International Equity
- DC Disability Plan Restrictions
 - Approved range of 10-30% of the DC Disability Plan assets

Structure

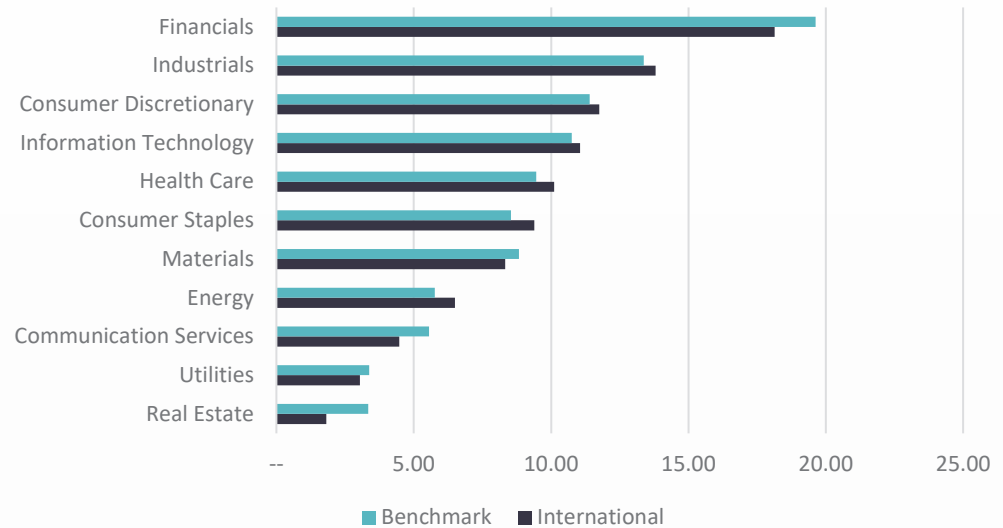
- Well diversified by country, region, sector, style
- Indexed and actively-managed portfolios
- Large Cap and Small Cap exposure
 - Small Cap allocation can be managed independently of Large Caps
- Developed and Emerging Markets (EM)
 - EM classification according to MSCI methodology
 - EM allocation is largely determined by the allocation decisions of the external managers
 - EM weight can be adjusted through use of EM index funds and ETFs
- External manager cash levels are limited by policy

Structure

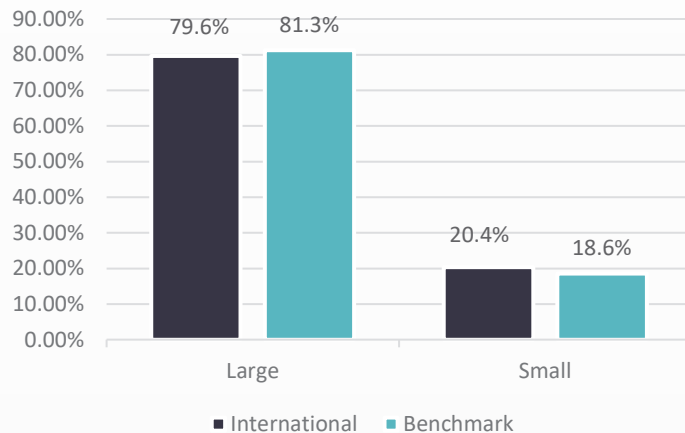
Developed vs. Emerging Markets



Sector



Market Cap

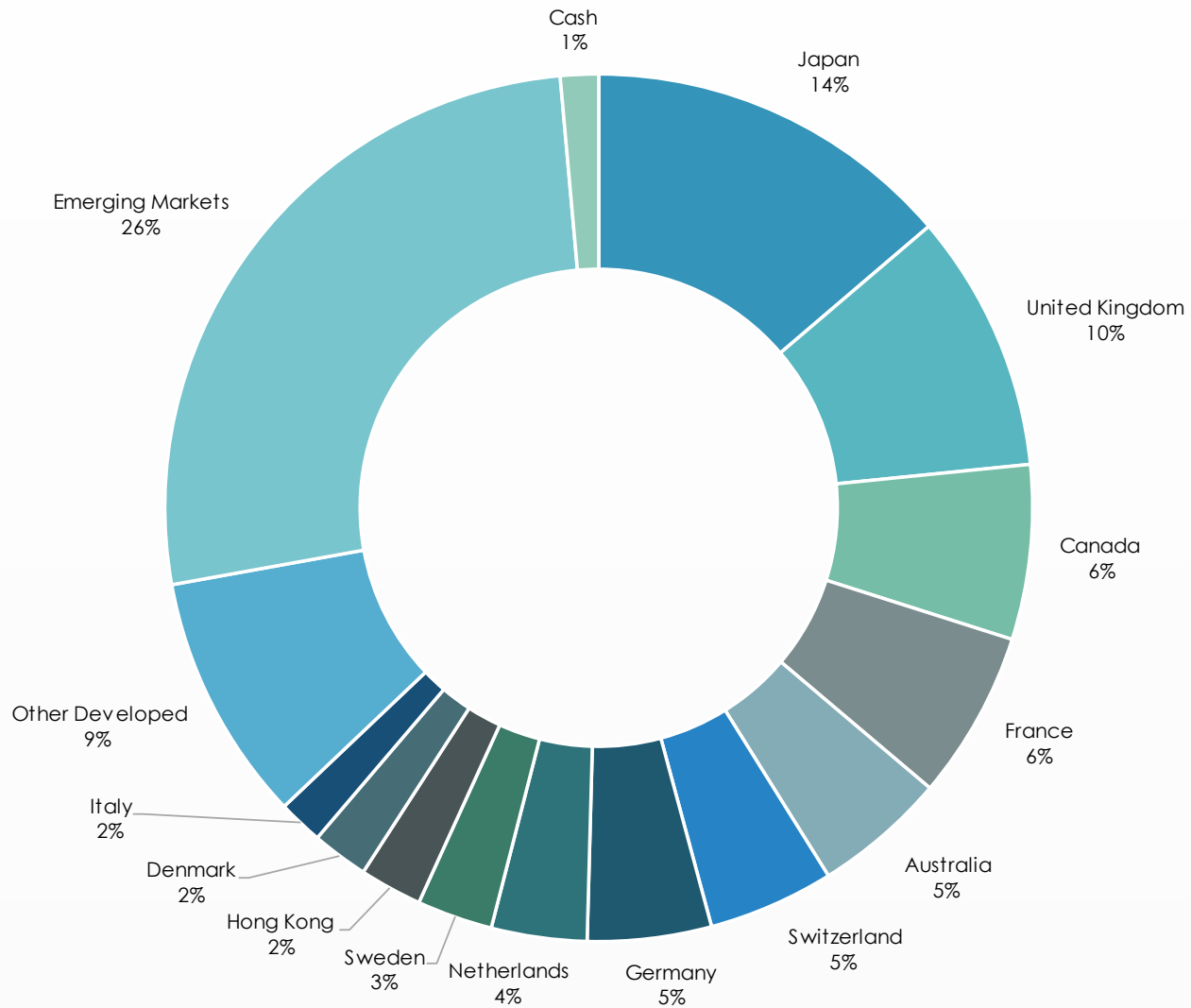


Active vs. Passive



Structure

Country Weights



International vs. Domestic Equities

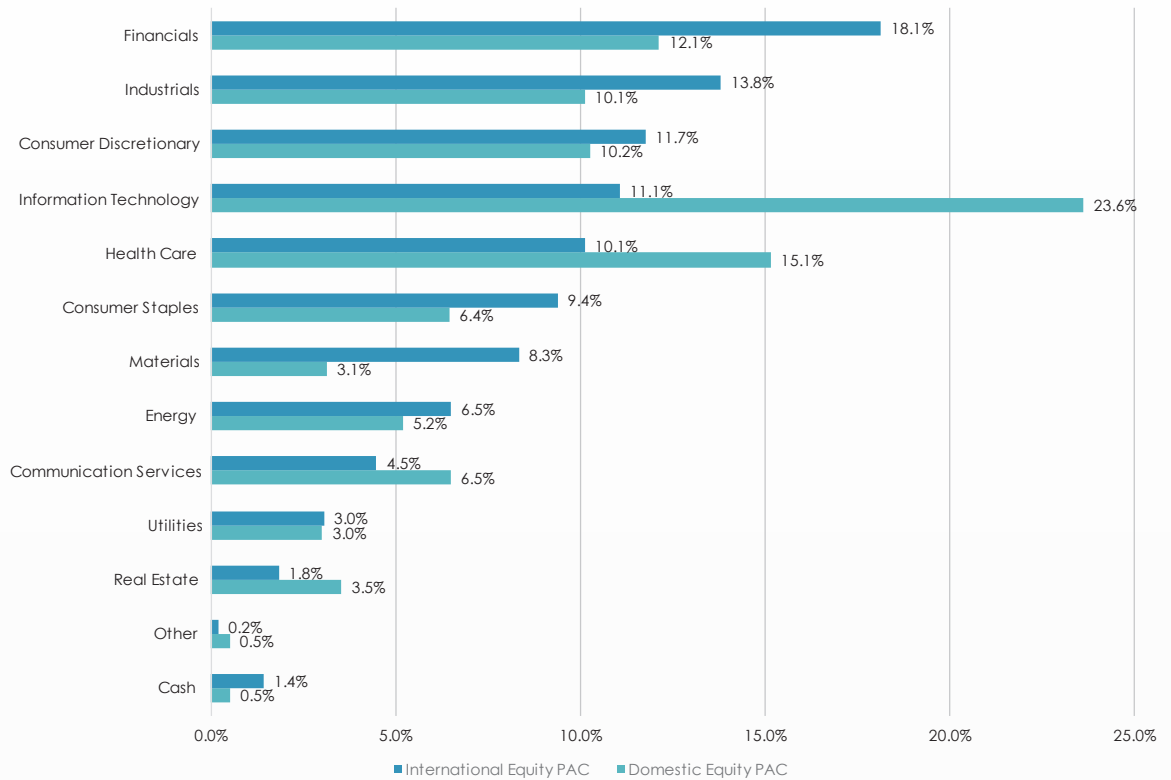
- Different sector exposures
 - More financials in international but less technology
- Currency market movements affect the returns of the Asset Class
- Lower average market capitalization
- Less concentration in a small number of stocks
- Local shares (ordinaries) and American Depositary Receipts (ADRs)
- Cash is largely foreign currency

International vs. Domestic Equities

Characteristics

	International Equity PAC	Domestic Equity PAC
Dividend Yield	3.31	1.67
Est 3-5 Yr EPS Growth	9.95	12.24
Price/Book	1.63	3.36
Price/Cash Flow	6.36	11.08
P/E using FY1 Est	10.74	15.93
Price/Sales	1.14	1.89
ROE	18.43	21.36
Market Cap (Wtd. Avg., \$Bil.)	62	336
Number of Holdings	7,267	4,348

Sector Weights



Types of Portfolios

- Indexed portfolios
 - Commingled funds
- Actively-managed portfolios
 - Separately-managed accounts
 - Fundamental and systematic/quantitative methodologies
- Exchange-Traded Funds (ETFs)

Portfolios

Indexed Portfolios

BlackRock ACWI ex-US Index Fund
BlackRock ACWI ex-US Small Cap Index Fund
BlackRock Emerging Markets Index Fund
BlackRock EAFE Index ETF
BlackRock Emerging Markets Index ETF

Actively-Managed Portfolios

Quantitative

Acadian (Large Cap)
Acadian (Small Cap)

Fundamental

Baillie Gifford
Invesco
Lazard

Portfolios

Value

Acadian (Large Cap)

Lazard

Core

Acadian (Small Cap)

BlackRock ACWI ex-US Index Fund

BlackRock ACWI ex-US Small Cap Index Fund

BlackRock Emerging Markets Index Fund

BlackRock EAFE Index ETF

BlackRock Emerging Markets Index ETF

Growth

Baillie Gifford

Invesco

Due Diligence & Research

- External Manager Evaluation Policy
- Staff performs due diligence and ongoing research
 - Quarterly review process
 - Manager Scorecard
 - Analytic tools (FactSet and Bloomberg)
 - Research database tools (eVestment)
 - On-site visits
- Continual development of a “bench” of managers of interest
- RVK involvement

Current Projects

- Restructuring
 - Achieve meaningful allocations for external managers
 - Improve fee efficiency
 - Maintain return profile
- Management fee reductions
- Positioning
 - Reviewing active/passive allocations

Summary

- Well-diversified exposure to international equities markets
- Exposures are all within policy limits
- Externally managed through active and indexed strategies
- Thorough investment process and commitment to ongoing research
- Have recently undertaken initiatives to improve the pool's structure and reduce management fees

2023 Board of Investments Meetings

JANUARY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

FEBRUARY						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

MARCH						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

APRIL						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

MAY						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

JUNE						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

JULY						
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

AUGUST						
S	M	T	W	T	F	S
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SEPTEMBER						
S	M	T	W	T	F	S
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3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

OCTOBER						
S	M	T	W	T	F	S
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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

NOVEMBER						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

DECEMBER						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

[Board Materials Due](#)
[Board Packet Mailing](#)
[Board Meeting Dates](#)

BOI WORK AND EDUCATION PLAN

2022

February 16-17

Education:

Outreach Efforts for the Board - In-State Loan and INTERCAP Programs
Short Term Investment Pool

Reports:

Ethics Policy
Disaster Recovery and Emergency Preparedness
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Financial Audit Report

April 13

Education:

Domestic Equity Asset Class Review
RVK Annual Capital Market Assumptions

Reports:

Benchmarks Used by the Board

May 25-26

Education:

MT Buildings (Board as Landlord/Tenant Holdings)
Investment Policy Statement Review
Real Estate Asset Class Review

Reports:

Budget Status FYTD
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Accounting Staff Review
HR: Staffing Level Review
HR: Exempt Staff Compensation Review

August 17-18

Education:

Core Fixed Income Asset Class Review
Budget Proposal for FY24-25

Reports:

Proxy Voting
Budget Status Prior FY
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

October 26-27

Education:

Separate Accounts Investment Review
First Reading - Asset Allocation Range Recommendation

Reports:

CEM, Inc Cost Reporting Analysis

Committee Meetings:

HR: Exempt Staff Performance Review
Audit: SOC I, Type 2 Report

December 7-8

Education:

2023 Legislative Session
Policy 217 - Reauthorization of Investment Vendors
Adoption - Asset Allocation Range Approval

Reports:

Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Annual Report and Financial Statements

2023

February 22-23

Education:

Cash Management of State Monies
Custodial Banking Relationship and Continuity

Reports:

Ethics Policy
Disaster Recovery and Emergency Preparedness
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Financial Compliance Audit Report

April 12

Education:

International Equities Asset Class Review
RVK Annual Capital Market Assumptions

Reports:

Benchmarks Used by the Board

May 24-25

Education:

State Government Customer Relationships
Investment Policy Statement Review
Real Assets Asset Class Review
Administrative Rule Review

Reports:

Budget Status FYTD
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Accounting Staff Review
HR: Staffing Level Review
HR: Exempt Staff Performance and Compensation Review

August 23-24

Education:

Trust Funds Investment Review
Non-Core Fixed Income Asset Class Review
Administrative Rule Adoption

Reports:

Budget Status Prior FY
Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

October 11

Education:

Private Investments Asset Class Review
First Reading - Asset Allocation Range Recommendation

Reports:

Securities Lending

Committee Meetings:

HR: Exempt Staff Performance Review
Audit: SOC I, Type 2 Report

December 12-13

Education:

MPERA and TRS Relationship
Policy 217 - Reauthorization of Investment Vendors
Adoption - Asset Allocation Range Approval

Reports:

Quarterly Reports
In-State Loan Reports
INTERCAP Reports

Committee Meetings:

Audit: Annual Report and Financial Statements

BOI TERMINOLOGY

ACTIVE MANAGEMENT (typically with respect to stocks)

Investment method which involves hiring a manager to research securities and actively make investment decisions to buy and sell securities in an effort to outperform an assigned index, rather than purchasing a portfolio of securities that would simply replicate the index holdings (*'passive'* investing).

ACTUARIAL ASSUMED RATE (pension concept)

The investment return rate used by actuaries that enables them to project the investment growth of retirement system assets into the future (typically perpetual).

ACTUARIAL FUNDING STATUS (pension concept)

A measurement made by actuaries to measure a pension system's financial soundness (ratio of actuarial liabilities to the actuarial value of the assets available to pay the liabilities).

ALPHA (investment term)

Return on an investment portfolio in excess of the market return or benchmark return; generally used in the context of *'active'* management (as passive management, by definition, does not seek excess returns, or *'alpha'*).

ALTERNATIVE INVESTMENTS

A wide range of investments, other than traditional assets such as publicly traded stocks and bonds. The most common nontraditional or alternative investments are private equity, real estate, commodities, and hedge funds.

ARBITRAGE (bond program)

A structural or systematic difference between investment types which may allow profiting from the *'difference,'* i.e., arbitrage. The most common context for the use of *'arbitrage'* at the BOI is the federal law that prevents *'arbitrage,'* i.e., the profiting of investing tax-exempt securities (e.g., INTERCAP) into taxable yields investments (such as U.S. Treasuries).

ASSET ALLOCATION AND ASSET ALLOCATION RANGE (general investment principle)

The Board's invested assets are divided or allocated into various asset classes such as stocks and bonds, each with its own characteristics, with the objective of attaining an optimal mix of risk and return. The total expected return of a portfolio is primarily determined by the mix or allocation to its underlying assets classes. Given the importance of *'asset allocation,'* the BOI Board sets the asset allocation *'range'* for each broad investment type or asset class.

ASSET-BACKED SECURITY

Bonds or notes backed by loan paper or accounts receivable originated by banks, credit card companies, or other providers of credit. Not mortgages.

AVERAGE LIFE (fixed income, particularly bonds)

The average time period the debt is expected to be outstanding. This is typically the maturity date for a traditional bond structure; however, it will be shorter for bonds having a sinking fund or amortizing payment structure.

BANKER'S ACCEPTANCE

A short-term credit investment which is created by a non-financial firm and whose payment is guaranteed by a bank. Often used in importing and exporting, and as a discount money market fund investment.

BARCLAY'S AGGREGATE INDEX (fixed income)

A composite of outstanding bond issues, including corporate, structured, and government bonds whose overall investment features such as return and investment type are tracked over many years. This is the most common benchmark used for comparing the performance of a portfolio that invests in U.S. investment grade fixed income securities. Formerly known as the Lehman Aggregate bond index.

BASIS POINTS (investment jargon)

A basis point is 1/100th of a percentage. Ten basis points is one tenth of a percent, typically written as 10 bps.

BENCHMARK (standard investment concept)

The concept of employing a particular independent or market investment return as a measurement to judge an investment portfolio's return; typically chosen investment benchmarks have the following attributes: they are investible, quantifiable, chosen in advance, easily understandable, and have a long history; common examples are the S & P 500 Index and the Barclay's Aggregate Index.

BETA (investment jargon)

A measure of the risk (or volatility) of a security or a portfolio in comparison to the market as a whole. If the stock or portfolio moves identically to that market, its beta value is 1; if its price volatility (or movement) is greater than that market's price volatility, it is said to have beta greater than 1.

CAP, AS IN LARGE 'CAP' (generally for stocks, e.g., public equities)

'Cap' is short for capitalization, as a reference to the market value of a publicly-traded company. The current stock price times the total shares outstanding of the company equals its market capitalization or market 'cap'; often used contextually such as 'large-cap,' 'mid-cap,' and 'small-cap' for different sized public companies.

CERTIFICATE OF DEPOSIT (CD):

A short-or medium-term, interest-bearing deposit obligation offered by banks and savings and loans. These may include "Yankee CDs" which are CDs issued by foreign banks or their U.S. affiliates in the U.S. which are denominated in U.S. dollars

CLAWBACK (private equity)

A clause in the agreement between the general partner and the limited partners of a private equity fund. The clawback gives limited partners the right to reclaim a portion of distributions to a general partner for profitable investments based on significant losses from later investments in a portfolio which ultimately resulted in the general partner receiving more distributions than it was legally entitled to.

COMMERCIAL PAPER

An unsecured obligation issued by a corporation or bank to finance its short-term credit needs, such as accounts receivable and inventory. Maturities typically range from two (2) to two hundred seventy (270) days. Commercial paper is available in a wide range of denominations, can be either discounted or interest-bearing, and usually a limited or nonexistent secondary market. Commercial paper is usually issued by companies with high credit ratings, meaning that the investment is almost always relatively low risk.

CORE (context varies for equity, fixed income, real estate)

In equity and fixed income, 'core' refers to investments that are generally always found in the portfolio and normally expect to hold for a very long time e.g. 'core' holdings of the largest U.S. companies, or U.S. treasuries; in real estate, 'core' generally refers to the best quality of real estate holdings such as prime commercial property in major metropolitan cities that have low leverage and low levels of vacancy.

CORPORATE NOTE

A type of unsecured debt issued by a corporation that may be longer-term than Commercial Paper, but shorter-term than a typical Corporate Bond.

CORRELATION (common statistical concept)

A measure of how two or more investment values or two asset classes move relative to each other during the same time period. A central concept in portfolio construction is to seek investments whose values do not move *together* at the same time, i.e., are uncorrelated. A correlation of 1 means that two or more investments 'move' precisely together.

CREDIT ENHANCEMENT (bond program)

At BOI, the term generally refers to credit support or a bond or loan guarantee. For example, the Board's INTERCAP bonds are 'enhanced' by the BOI's performance guarantee bringing down the yearly interest rate.

CUSTOM BENCHMARK (or sometimes custom index)

A way to measure investment performance using a tailor-made measurement versus a generic industry-standard benchmark. At the BOI, total pension performance is measured against the Board's 'custom index' or 'custom benchmark' which is a weighted blend of all the underlying asset class benchmarks used to measure the asset class returns.

DERIVATIVES (investment jargon)

Investment securities whose performance itself depends (or is 'derived') from another underlying investment return. Examples include stock options, puts/calls, and forward currency contracts whose returns are based on the underlying stock or currency.

DEVELOPED MARKETS (equity)

Countries having a long period of stable industrialization; or are the most economically developed.

DISCOUNT (fixed income, generally)

Used most often with respect to bonds, the price paid that is less than face (or 'par') value. A \$1 million face-value of a bond purchased for less than a million is bought at a 'discount.' Described as the difference between a bond's current market price and its face or redemption value.

DIVERSIFICATION (standard investment concept)

The concept of spreading risk by putting assets in several investment categories, each having different attributes with respect to type, expected return, risk, and correlation, to best protect against the risk of loss.

DURATION (bonds)

Almost exclusively used when discussing fixed income bonds, a measurement of how sensitive a bond's change in price is to a change in general market interest rates, expressed in years (specifically calculated as a weighted average term to maturity of the bond's cash flows). The greater the duration of a bond, the greater the volatility of price for changes in market interest rates.

EFFICIENCY (usually when discussing various stock markets)

Used to describe markets where it is very difficult to achieve return in excess of that of the overall market from individual stock selection. When information is widely available on a company and its securities are traded regularly the market is considered 'efficient.'

EMERGING MARKETS (most often for public equities)

Certain international securities markets that are typically small, new, have low turnover, and are located in countries where below-average income prevails and is developing in response to the spread of capitalism.

ENHANCED (pertaining to stocks)

Generally linked with 'index' as in enhanced index, an indexed investment management style that has been modified to include the portfolio manager's idea of how to outperform the index by omitting some stocks in the index and overweighting others in a limited manner designed to enhance returns but at minimal risk.

EXCESS RETURNS (standard investment concept)

Returns are 'excess' if they are more than the market or more than the benchmark they are measured against.

EXEMPT STAFF VS. CLASSIFIED STAFF (specific to Montana state government)

"Exempt" refers to the Board's eleven employees who, under state law, do not fall under the state's standard employment rules (the 'classified' staff).

FIDUCIARY (from the Latin verb, *fidere*, to trust)

The concept of trust and watchfulness; a fiduciary is charged with the responsibility of investing the money wisely for the beneficiary's benefit. Board members are the ultimate 'fiduciaries' for the Board's assets and are obligated to be a good agent.

FTE (state government jargon)

An acronym in state government: "full time equivalent" as in full time employee. The concept is a slot or position, not the actual individuals. The BOI is currently authorized for 32 FTE's.

FUND OF FUNDS (private equity)

A concept used in alternative investments referring to using an investment manager to invest in **other** managers or funds, as opposed to making direct investments in funds.

GAAP/GASB (accounting terminology)

GAAP...Generally Accepted Accounting Principles; Montana state law uses GAAP accounting principles unless specifically allowed otherwise. GASB...Government Accounting Standards Board, the board that sets GAAP standards for U.S. governments (FASB...Financial Accounting Standards Board, the entity for commercial and business accounting standards).

GENERAL OBLIGATION (municipal finance term)

Used to describe the promise that a government makes to bond holders, backed by taxing and further borrowing power, it is generally considered the highest level of commitment to bondholders. At the local government level, general obligation bonds typically require a vote of the residents.

GENERAL PARTNER VS. LIMITED PARTNER (private equity)

In private equity, the general partner is responsible for the operations of the partnership and makes the actual underlying investment decisions; the limited partner is the investor, and therefore has limited liability for investment decisions; the BOI is the 'limited' partner in its private equity fund investments (and real estate funds as well).

GROWTH (as to style public equities)

An investment style that more heavily invests in companies whose earnings are expected to grow at an above average rate to the market. A growth stock usually does not pay a dividend, as the company would prefer to reinvest retained earnings in capital projects to grow the company (vs. 'value,' which considers buying established companies they feel are trading at bargain prices to the fundamental analysis of the company's financial statements and internal competitive factors).

INDENTURE (bond and loan programs)

The central document describing the contract between investors and the borrower or user of the proceeds. The Board's INTERCAP program is structured around a bond indenture.

HEDGE FUND (as defined by Investopedia)

An aggressively managed portfolio of investments that uses advanced investment strategies such as *leverage*, long, short and *derivative* positions in both domestic and international markets with the goal of generating high returns (either in an absolute sense or over a specified market *benchmark*).

HURDLE RATE (private equity)

a minimum return per annum that must be generated for limited partners of a private equity fund before the general partner can begin receiving a percentage of profits from investments.

INDEX (investment concept)

Typically, a single measure of a broadly-based group of investments that can be used to judge or be compared to the return performance of an individual investment or manager.

INDEXING (investment concept)

Typically refers to investing in a portfolio to match a broad range of investments that are set within a pre-determined grouping, such as the S&P 500, so as to match its performance; such investing is generally labeled 'passive' or indexed investing; or buying shares in an Index Fund.

IN-STATE LOAN PROGRAM (Montana-specific)

Programs that are funded by the state's coal severance tax monies.

INTERNAL SERVICE VS. ENTERPRISE FUND (state accounting concept)

Within Montana state government: a program whose funding is dependent on **mandatory participation** by another state government program is labeled an 'internal' service fund; a program whose funding is dependent on voluntary participation is labeled an enterprise fund. At BOI, the investment program is an internal service fund because participation is not voluntary; the Board's bond and loan programs, because their use is voluntary, are accounted for as an enterprise.

INVESTMENT GRADE (bonds)

Bond ratings from Moody's, Standard and Poor's, and Fitch high enough to be considered secure enough for most investors (bonds rated AAA – BBB). Below investment-grade bonds (below BBB) are generally considered to have a more speculative outlook and carry more risk of default.

IRR (private equity)

A measure of investment performance, short for 'internal rate of return,' expressed as a percentage (the 'internal rate of return' number, or discount rate) that mathematically will equalize the total future cash flows of an investment to the initial cash outflow of the investment, the concept accounts for the time value of money.

LEVERAGE (investment concept)

As an investment concept, a way to increase a return on an investment through a combination of one's own money and by borrowing additional money to enhance such an investment; high 'leverage' is also associated with high risk.

LINK DEPOSIT

The Link Deposit program can provide a financial institution a long-term fixed rate funding source "linked" to a specific loan. The State of Montana provides the financial institution funding in the form of a deposit through the Montana Board of Investments using coal tax funds.

MASTER LIMITED PARTNERSHIP

An investment structure that combines the tax benefits of a limited partnership with the liquidity of a common stock. While an MLP has a partnership structure, it issues shares that trade on an exchange like common stock. MLPs are often broadly associated with energy companies operating in midstream services.

MEAN VARIANCE OPTIMIZATION MODEL ('Modern Portfolio Theory')

A theory that it is possible to construct a portfolio to maximize the return for the least amount of risk or volatility. This theory is based on various asset types and their level of expected return, risk (volatility) and their correlation with each other or how the asset values move with each other. The central idea of the model is to blend investments so that in total, they provide both the best expected return and optimal amount of diversification to minimize deep performance swings (volatility); a central tenant is that long term historical returns are indicative of future returns.

MEZZANINE FINANCE (private equity)

Subordinated debt with an equity 'kicker' or ability to share in the equity value of the company. It is typically lower quality because it is generally subordinated to debt provided by senior lenders such as banks, thus is considered higher risk.

MULTIPLE (as in "multiple" of invested capital, private equity)

The ratio of total cash returned over the life of the investment plus the investment's residual value over the total cash expended in making the investment. A multiple of 2 means, regardless of the total investment time period, that total cash returned was twice the cash invested.

130/30 STRATEGY (public equities)

Also called 'partial long short,' this strategy involves the establishment of a short position in select stocks while taking the proceeds of those shorts and buying additional long positions in stocks. The net effect is an overall market position that is 100% long, but the active decisions on individual stock selections are amplified by this ability to short. If the stock selections are successful, the strategy enables the portfolio to profit more than if a stock had simply not been owned, as with traditional long-only portfolios.

OPPORTUNISTIC (real estate)

In real estate, a euphemism for the most risky real estate investments, typically distressed, raw land, newly developed buildings or other high risk investments in the real estate sector, (versus, 'core,' which are the best quality fully leased commercial properties).

OVERWEIGHT OR UNDERWEIGHT (investment concept)

Generally, the level of holdings of a certain type of investment that is above or below either a benchmark's weight (portion of total investment), or the percentage held of a particular asset class compared to the Board's asset allocation policy weight. Also used to describe an external investment manager's decision to have more (or less) of a particular investment than the percentage or weighting found in the benchmark.

P/E RATIO (equity)

The price of a publicly traded stock divided by its estimated or actual earnings is the price/earnings or P/E ratio. This can also be calculated for a stock index or portfolio of stocks. Over the last 100 years, the S&P 500 has had an overall P/E ratio of about 15, or a total index price of about 15 times the annual earnings of its underlying companies.

PACING STUDY (private equity)

An analysis of the likely timing and amount of the drawdown of committed but yet uninvested monies and the estimated distributions or returns from the funds held in an alternative investment portfolio, generally used to judge the future size of the portfolio and its potential liquidity needs, i.e., cash funding demands.

PAR (fixed income)

The initial principal amount designated by the issuer of the bond, or face value of a bond.

PASSIVE

For investments, generally not materially participating in an investment decision, meaning an investment portfolio whose returns follows that of a broad market index, such as an investable stock index, i.e. the S & P 500.

PASSIVE MANAGEMENT OR PASSIVE INVESTMENT (most often in public equities, but not exclusively)

An investment style where a fund's portfolio mirrors a market index, such as the S&P 500, with limited selection decisions by the manager, resulting in market returns. Passive management is the opposite of active management in which a fund's manager attempts to beat the market with various investment strategies and buy/sell decisions of a portfolio of securities to enhance returns.

PASSIVE WEIGHT (generally equities)

The percentage of a stock held in a particular index portfolio, or percentage of an overall asset class that is held in passive portfolios.

POLICY PORTFOLIO

A fixed-target asset allocation, as opposed to asset allocation ranges, which theoretically allows gauging whether deviations from the target portfolio had a positive or negative impact on overall performance.

PORTABLE ALPHA (public equities)

An investment strategy which involves the active selection of securities while neutralizing overall beta or market risk. This often involves the use of derivative investments such as futures to replicate the market return, either taking a short or long position, while then selecting securities which are expected to add return in an absolute sense or in addition to the market return. As an example, this strategy can be found with certain hedge funds where a market exposure is shorted while individual securities such as specific stocks are purchased that are expected to outperform the general market. The concept of portable applies when the ability to generate positive alpha can be overlaid or ported onto a portfolio. This is not a strategy employed by any of MBOI's existing managers.

PREMIUM (fixed income)

Most often the amount paid over the stated face amount (often called 'par') of a bond, but also used in other contexts, typically paying more (the premium) than a market price (as in a take-over bid for a company).

PRIVATE ANNUAL WAGE

The private annual wage is determined annually by the Montana Department of Labor & Industry using the average annual employment divided by the total wages.

PROXY (publicly traded companies)

An agent legally authorized to act on behalf of another party. Shareholders not attending a company's annual meeting may choose to vote their shares by proxy by allowing someone else to cast votes on their behalf, but the word 'proxy' is used more frequently colloquially as a 'close approximation.'

PRUDENT EXPERT, PRUDENT PERSON (a central fiduciary concept)

These legal terms have long histories of court-determined standards of care, deriving originally under English common law. The BOI is empowered to operate under the 'prudent expert rule,' which states that the Board shall manage a portfolio:

- a) *with the care, skill, prudence, and diligence, under the circumstances then prevailing, that a prudent man acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of a like character and with like aims;*
- b) *diversify the holdings of each fund within the unified investment program to minimize the risk of loss and to maximize the rate of return unless, under the circumstances, it is clearly prudent not to do so; and*
- c) *discharge the duties solely in the interest of and for the benefit of the funds forming the unified investment program.*

At an 'expert' level; there is more room for accepting risk under the prudent expert rule than the prudent person rule.

REBALANCING (general investment term)

The process of realigning the weightings of the portfolio of assets. Rebalancing involves periodically buying or selling assets in the portfolio to maintain the original desired level of asset allocation and/or to stay within predetermined asset category range; it is part of a disciplined investment approach within modern portfolio theory.

REPURCHASE AGREEMENT

A contract in which the seller of securities, such as Treasury Bills, agrees to buy them back at a specified time and price. May also be called "Repo" or "Buyback." Typically used as a short-term form of collateralized borrowing by a bank or securities dealer.

RESOLUTION (government term)

Generally, a formal and written action by a governmental (or corporate) body that has long term significance and requiring a vote of the governing body. BOI uses 'resolutions' generally only for its most significant and long term actions and/or policies.

REVERSE REPURCHASE AGREEMENT

A purchase of securities with an agreement to resell them at a higher price at a specific future date. The investor essentially borrows money and allows its securities to be held as collateral. Reverse Repurchase Agreements occur most often in government securities or other securities that are highly valued and thus considered a good form of collateral.

SECURITIES LENDING (general investment)

Investments that are temporally borrowed by other investors for a fee; the BOI allows most of its publicly traded investments to be loaned for additional marginal income.

STANDARD DEVIATION (common statistical concept)

A specific statistic that measures the dispersion of returns from the mean over a specific time period to determine the "historical volatility" of returns for a stock, or portfolio, or asset class; more specifically a single unit (i.e., one standard deviation) of dispersion that accounts for approximately 66% of all data around a mean using a 'normal' (or 'uniform' or 'bell-shaped' curve; as opposed to a skewed or asymmetrical) distribution. The standard deviation is used as a gauge for the amount of expected future volatility.

SABHRS (accounting jargon)

Montana state government's State Accounting, Budgeting and Human Resource System; the State's central information management system. BOI investment and other financial data must tie and be reported on this system, which is the official book of record and includes the state's financial statements.

STYLE DRIFT (often in reference to public equity managers, but applicable to other managers, too)

As the name implies, a divergence from an investor's professed investment bias or style or objective.

TRANCHE

A division or portion of a pool or whole; specifically: an issue of bonds derived from a pooling of like obligations (such as securitized mortgage debt) that is differentiated from other issues especially by maturity or rate of return.

TRACKING ERROR (statistical concept in investments)

A measurement of the standard deviation of a portfolio's return versus the return of the benchmark it was attempting to outperform. The concept is often used when discussing investment managers. For example, some styles are expected to have high 'tracking errors,' (e.g., deep 'value' investors who buy companies that may be dogs for years), versus passive managers, whose stock volatility is expected to be very close to their benchmark. Tracking error can either be intentional or unintentional; it can also be regarded as an accepted deviation or contrary to the management agreement. High *unexpected* tracking error is generally a serious concern to be examined and understood.

UNDERWRITER (bond program)

In investments, the agent who buys investments to be resold to the public; at BOI, the investment firms that buy the Board's bonds to be resold to the public.

UNIFIED INVESTMENT PROGRAM (Montana Constitution)

The Program in the State's constitution requiring a central investment program which the legislature has assigned to the BOI.

VALUE (as to style when discussing public equities)

An investment style that focuses on buying established companies that investors believe are undervalued and trading at bargain prices to the fundamental analysis of the company's financial statements and internal competitive factors.

VENTURE CAPITAL (private equity)

A higher-risk/high-return type of investing in startup firms and small businesses with perceived long-term growth potential. Sometimes these are already existing business ventures with limited operating history that need additional management expertise and access to capital. (For start-ups, 'seed capital,' or 'angel investor' are terms differentiating this even higher risk type of investment.)

VOLATILITY (investment jargon)

A statistical measure of the dispersion of returns for a given security or market index. Volatility is typically measured by using the standard deviation of returns from the security or market index. Commonly, the higher the volatility, the riskier the security.

YIELD (general investment, but most often within fixed income)

The amount returned to the investor above the original investment generally expressed as a percentage. Yield can be thought of as the expected return from the combination of interest and price accrual or amortization to maturity (in the case of a bond trading at a discount or premium to par).

YIELD CURVE (fixed income)

A line that plots the prevailing interest rates at a given time for bonds ranging in maturity from as short as three months out to 30 years. When plotted across these various maturities (typically 2, 5, 7, 10 and 30 years), the resultant line is shaped like a curve with generally low interest rates (the yield) for shorter maturities and gradually higher interest rates for longer maturities, because generally investors demand higher interest rates for longer term investments. The yield curve for U.S. Treasury debt is the most common when referring to the prevailing level of interest rates.

MONTANA BOARD OF INVESTMENTS

ACRONYM INDEX

ACH.....	Automated Clearing House
ADV.....	Uniform Application for Investment Adviser Registration and Report by Exempt Reporting Advisor
AUM.....	Assets Under Management
ADR.....	American Depository Receipts
AOF.....	All Other Funds
ARC.....	Actuarially Required Contribution
BOI.....	Board of Investments
CAPP.....	Consolidated Asset Pension Pool
CFA.....	Chartered Financial Analyst
EM.....	Emerging Market
FOIA.....	Freedom of Information Act
FWP.....	Fish Wildlife and Parks
FX.....	Foreign Exchange
IPS.....	Investment Policy Statement
IRP.....	Intermediary Relending Program
LDI.....	Liability-Driven Investing
MBOH.....	Montana Board of Housing
MBOI.....	Montana Board of Investments
MDEP.....	Montana Domestic Equity Pool
MLP.....	Master Limited Partnership
MFFA.....	Montana Facility Finance Authority
MPEP.....	Montana Private Equity Pool
MPT.....	Modern Portfolio Theory
MSTA.....	Montana Science and Technology Alliance
MTIP.....	Montana International Pool

MTRP Montana Real Estate Pool

MTSBA Montana School Boards Association

MVO Mean-Variance Optimization

NAV Net Asset Value

PERS Public Employees' Retirement System

PFL Partnership Focus List

QZAB Qualified Zone Academy Bonds

QSCB Qualified School Construction Bonds

RFBP Retirement Funds Bond Pool

RFP Request for Proposal

SABHRS Statewide Accounting Budgeting and Human Resource System

SLQT Securities Lending Quality Trust

SOC1 Service Organization Controls 1 (Audit)

SSBCI State Small Business Credit Initiative

STIP Short Term Investment Pool

TFBP Trust Funds Bond Pool

TFIP Trust Funds Investment Pool

TIF Tax Increment Financing

TIFD Tax Increment Financing District

TRS Teachers' Retirement System

TUCS Trust Universe Comparison Service

UIP Unified Investment Program

VIX Volatility Index

ASSET CLASS ACRONYMS

DEPAC	Domestic Equity Pension Asset Class
IEPAC	International Equity Pension Asset Class
PEPAC	Private Equity Pension Asset Class
NRPAC	National Resources Pension Asset Class
REPAC	Real Estate Pension Asset Class
TIPAC	TIPS Pension Asset Class
BFPAC.....	Broad Fixed Income Pension Asset Class
USPAC	UST/AGY Pension Asset Class
IGPAC	Investment Grade Corp Pension Asset Class
MBPAC.....	MBS Pension Asset Class
HYPAC	High Yield Pension Asset Class
DSPAC	Diversified Strategies Pension Asset Class
CPAC.....	Cash Pension Asset Class