

**City of Marlborough
Contributory Retirement System**

**Meeting Materials
November 28, 2023**

Fund Evaluation Report

Agenda

1. Economic and Market Update as of October 31, 2023
2. Performance Update as of September 30, 2023
3. Current Issues
 - Asset Allocation Discussion
4. Appendix

Economic and Market Update

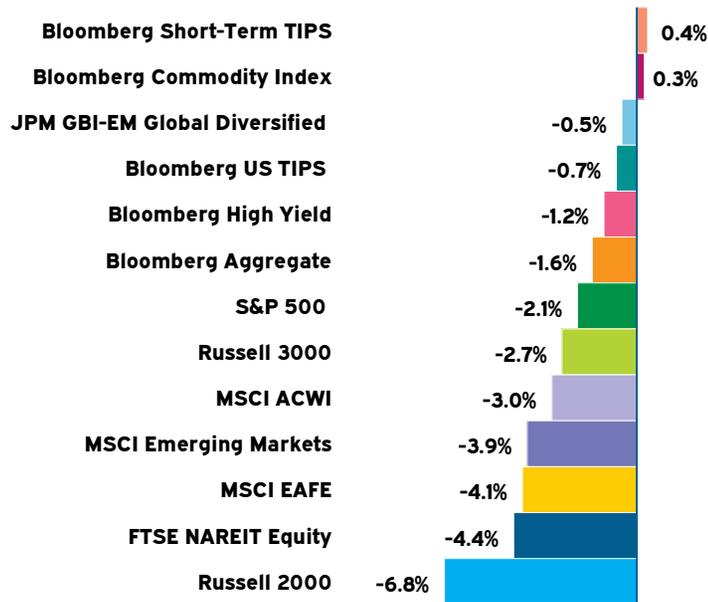
Data as of October 31, 2023

Commentary

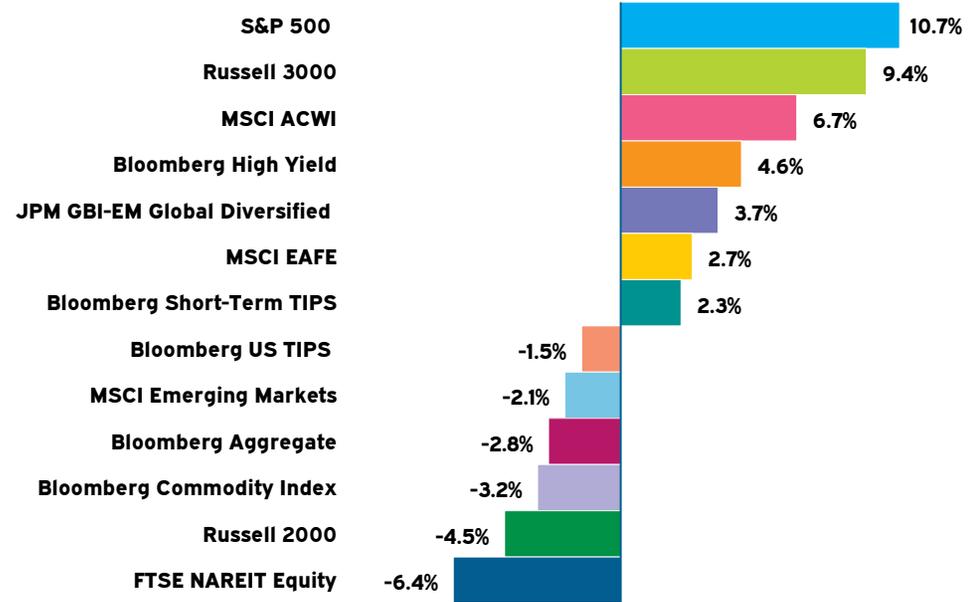
- Global markets continued to struggle in October, as expectations remained on the Fed keeping interest rates higher for longer due to resilient economic data.
- The Federal Open Markets Committee (FOMC), which increased policy rates in July by 0.25% to a range of 5.25% - 5.5%, has been on pause since. Markets are now largely expecting the FOMC to maintain interest rates at this level through the first half of next year with cuts to follow.
 - US equity markets (Russell 3000 index) fell in October (-2.7%), lowering the year-to-date gains to 9.4%. Most sectors except utilities struggled in October.
 - Non-US developed equity markets declined more than the US in October (MSCI EAFE -4.1%), with the strength of the US dollar weighing on returns. This widened the gap between US and international developed equities for the year (to 9.4% versus 2.7%).
 - Emerging market equities also fell in October (-3.9%), with negative results driven by China and the strong US dollar. Emerging markets continue to significantly trail developed market equities year-to-date, returning -2.1%, again driven by losses from China (-11.2%).
 - Interest rates generally rose in October, particularly for longer-dated maturities. The broad US bond market declined (-1.6%) in October falling further into negative territory (-2.8%) year-to-date, as higher income has offset a portion of the capital losses from rising rates.
- For the rest of this year and into 2024, the paths of inflation and monetary policy, slowing global growth, and the wars in Ukraine and Israel will all be key.

Index Returns¹

QTD



YTD



→ After a strong start to the year, the prospect of higher interest rates for longer given resilient economic data has weighed on markets from August through October.

¹ Source: Bloomberg. Data is as of October 31, 2023.

Domestic Equity Returns¹

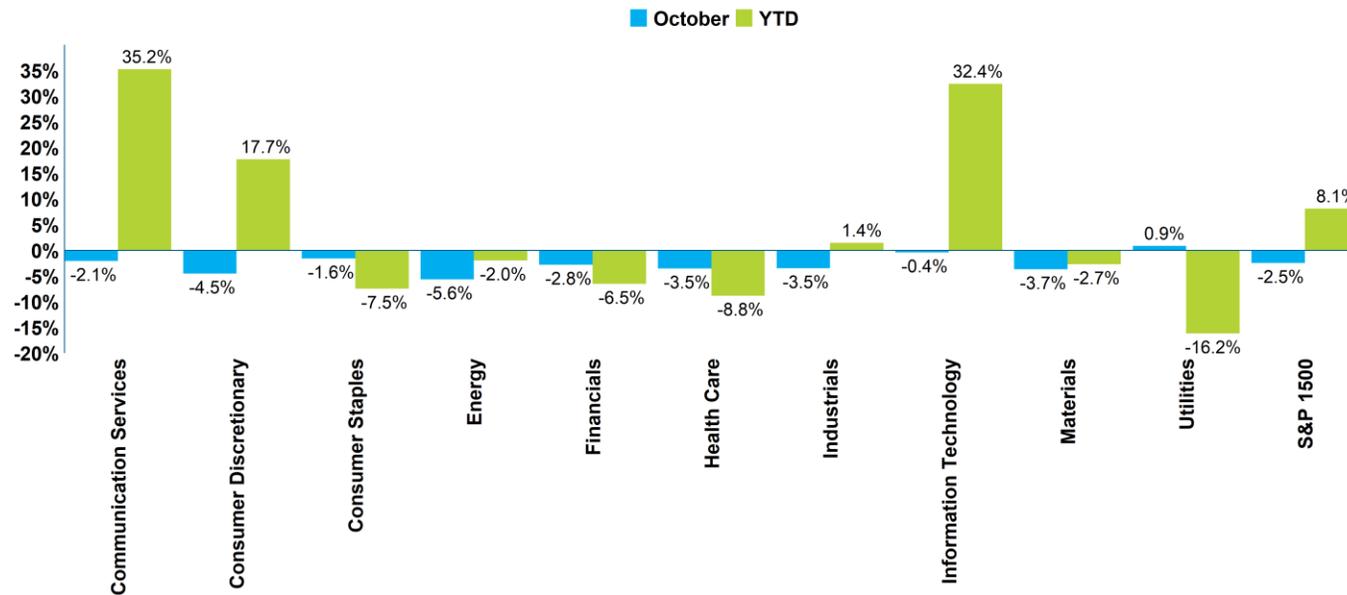
Domestic Equity	October (%)	Q3 (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
S&P 500	-2.1	-3.3	10.7	10.1	10.3	11.0	11.2
Russell 3000	-2.7	-3.3	9.4	8.4	9.2	10.2	10.5
Russell 1000	-2.4	-3.1	10.3	9.5	9.5	10.7	10.9
Russell 1000 Growth	-1.4	-3.1	23.2	19.0	8.7	14.2	13.8
Russell 1000 Value	-3.5	-3.2	-1.8	0.1	10.2	6.6	7.6
Russell MidCap	-5.0	-4.7	-1.3	-1.0	6.0	7.1	8.0
Russell MidCap Growth	-5.1	-5.2	4.3	3.3	0.8	8.1	9.1
Russell MidCap Value	-5.0	-4.5	-4.4	-3.6	8.8	5.7	6.9
Russell 2000	-6.8	-5.1	-4.5	-8.6	3.9	3.3	5.6
Russell 2000 Growth	-7.7	-7.3	-2.9	-7.6	-1.8	2.7	5.7
Russell 2000 Value	-6.0	-3.0	-6.5	-9.9	9.7	3.3	5.2

US Equities: The Russell 3000 Index fell 2.7% in October but is up 9.4% YTD.

- A surprisingly strong September jobs report and third quarter GDP reading reinforced investors' expectations that the Federal Reserve will keep interest rates higher for longer and broadly weighed on US equities.
- The utility sector was the only sector that posted a gain during October. Energy stocks experienced the steepest fall, followed by consumer discretionary stocks.
- Large cap stocks outperformed small cap stocks during October driven by the technology sector. Microsoft and Amazon, both of which reported stronger than expected third quarter results, were significant contributors to this dynamic.

¹ Source: Bloomberg. Data is as of October 31, 2023.

S&P 1500 Sector Returns¹



→ Except for utilities all sectors were down in October.

→ So far in 2023, the communication services (+35.2%) and technology (+32.4%) sectors had the best results, helped by artificial intelligence optimism. Given the continued strength in the US consumer the consumer discretionary sector followed (+17.7%), while more traditionally defensive sectors like utilities (-16.2%), health care (-8.8%), and consumer staples (-7.5%) have trailed.

¹ Source: Bloomberg. Data is as of October 31, 2023.

Foreign Equity Returns¹

Foreign Equity	October (%)	Q3 (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
MSCI ACWI ex. US	-4.1	-3.8	1.0	12.1	3.0	3.5	2.5
MSCI EAFE	-4.1	-4.1	2.7	14.4	5.7	4.1	3.1
MSCI EAFE (Local Currency)	-3.4	-1.3	7.0	10.4	11.0	6.4	6.0
MSCI EAFE Small Cap	-5.9	-3.5	-4.2	6.5	0.3	1.6	3.4
MSCI Emerging Markets	-3.9	-2.9	-2.1	10.8	-3.7	1.6	1.2
MSCI Emerging Markets (Local Currency)	-3.6	-1.4	0.3	9.8	-1.1	3.6	4.2
MSCI China	-4.3	-1.9	-11.2	21.1	-16.9	-2.6	1.0

Foreign Equity: Developed international equities (MSCI EAFE) fell 4.1% in October, dropping the YTD gain to 2.7%. Emerging market equities (MSCI EM) fell 3.9% in the period and were down 2.1% YTD.

- Non-US equities fell for the third consecutive month with steeper declines compared to the US market. The continued strength of the US dollar contributed to losses, as well as the ongoing geopolitical crisis in the Middle East.
- European equities struggled due to slowing growth, falling PMI, and a contraction in household and business credit supply. The UK saw greater losses, with sticky inflation, and continued wage growth suggesting that rates will be high for some time. Japan remains the best performing market year-to-date, though the TOPIX lost momentum in October.
- Emerging market equity performance was slightly better than developed international equities, but the declines for the month brought year-to-date results into negative territory. While there were some positive data out of China on industrial production and retail sales, continued weakness in real estate and new US chip restrictions weighed on market sentiment.

¹ Source: Bloomberg. Data is as of October 31, 2023.

Fixed Income Returns¹

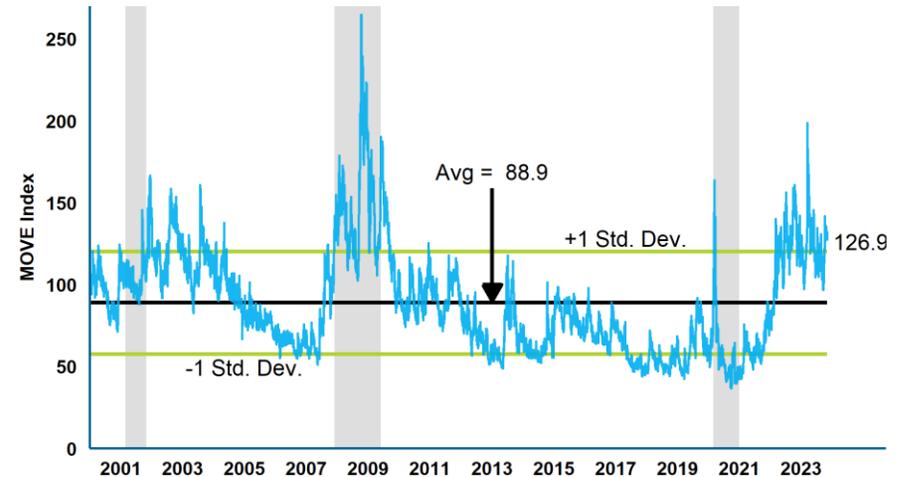
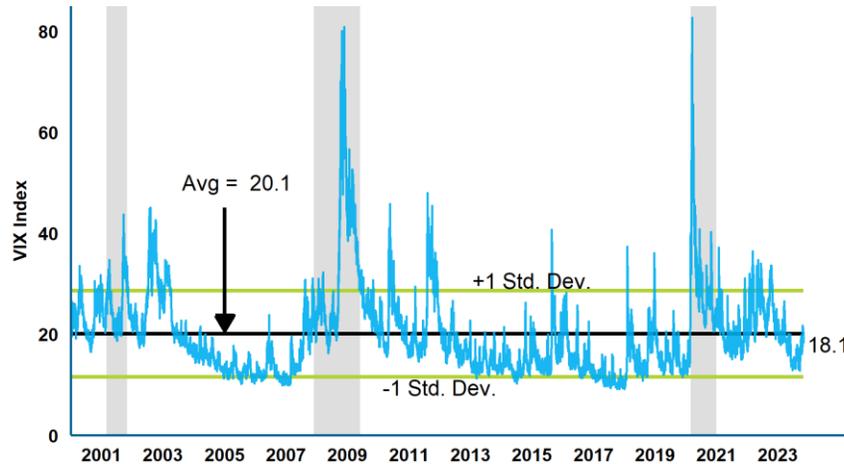
Fixed Income	October (%)	Q3 (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)	Current Yield (%)	Duration (Years)
Bloomberg Universal	-1.5	-2.9	-2.1	1.2	-5.0	0.2	1.2	6.0	5.9
Bloomberg Aggregate	-1.6	-3.2	-2.8	0.4	-5.6	-0.1	0.9	5.6	6.1
Bloomberg US TIPS	-0.7	-2.6	-1.5	-0.7	-2.0	2.3	1.6	5.2	6.6
Bloomberg Short-term TIPS	0.4	0.4	2.3	2.6	2.1	3.0	1.7	5.4	2.5
Bloomberg High Yield	-1.2	0.5	4.6	6.2	1.2	3.0	3.9	9.5	4.0
JPM GBI-EM Global Diversified (USD)	-0.5	-3.3	3.7	13.5	-3.0	0.3	-1.2	7.0	4.9

Fixed Income: The Bloomberg Universal index declined 1.5% in October and 2.1% YTD.

- Expectations for policy rates to remain higher for longer than previously expected continued to weigh on yields in October.
- The broad US bond market (Bloomberg Aggregate) fell 1.6% in the month, driving year-to-date performance further into negative territory. The broader TIPS index fell by 0.7%, while the less interest-rate-sensitive short-term TIPS index outperformed most sectors, up 0.4%.
- High yield bonds also weakened, declining 1.2%, and emerging market bonds fell 0.5%. Volatility in both asset classes is being driven by movement in broader interest rates, but also a modest deterioration in risk appetite.

¹ Source: Bloomberg. JPM GBI-EM data is from InvestorForce. Data is as of October 31, 2023. The yield and duration data from Bloomberg is defined as the index's yield to worst and modified duration respectively.

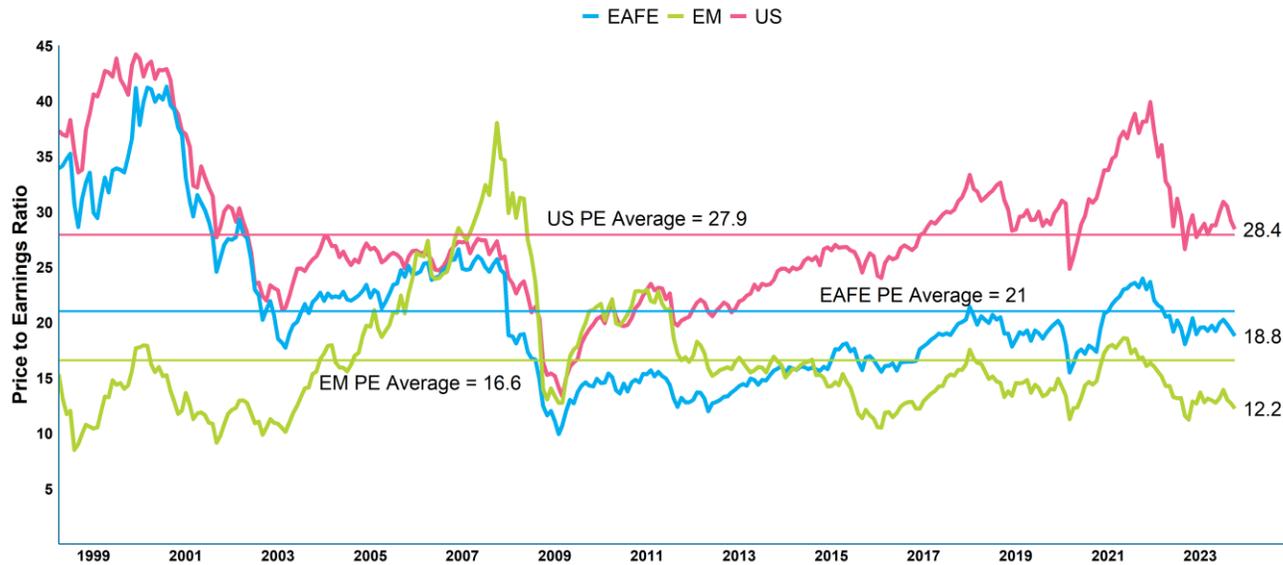
Equity and Fixed Income Volatility¹



- Volatility in equities (VIX) increased in October but finished at a level near the long-term average. The recent increase in equity volatility has largely been driven by investors coming to terms that interest rates might remain higher for a longer period.
- In comparison, volatility in the bond market (MOVE) remains well above its long-run average (88.9) after last year's historic losses and due to continued policy uncertainty. In October, fixed income volatility finished higher compared to where it started, like equities, driven by expectations for rates to stay higher for longer and increased concerns about future US debt issuance.

¹ Equity Volatility – Source: FRED. Fixed Income Volatility – Source: Bloomberg. Implied volatility as measured using VIX Index for equity markets and the MOVE Index to measure interest rate volatility for fixed income markets. Data is as of October 2023. The average line indicated is the average of the VIX and MOVE values between January 2000 and October 2023.

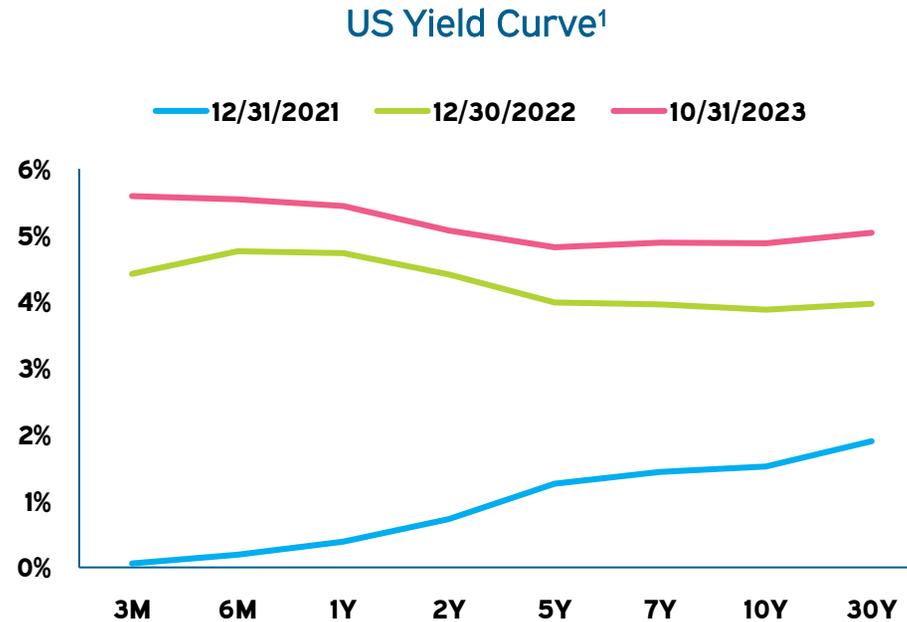
Equity Cyclically Adjusted P/E Ratios¹



→ Given the strong technology-driven rally this year, the US equity price-to-earnings ratio increased above its long-run (21st century) average. With the equity market decline in August through October, the P/E ratio fell from its recent peak.

→ International developed market valuations are below their own long-term average, with those for emerging markets the lowest and well under the long-term average (close to one standard deviation below).

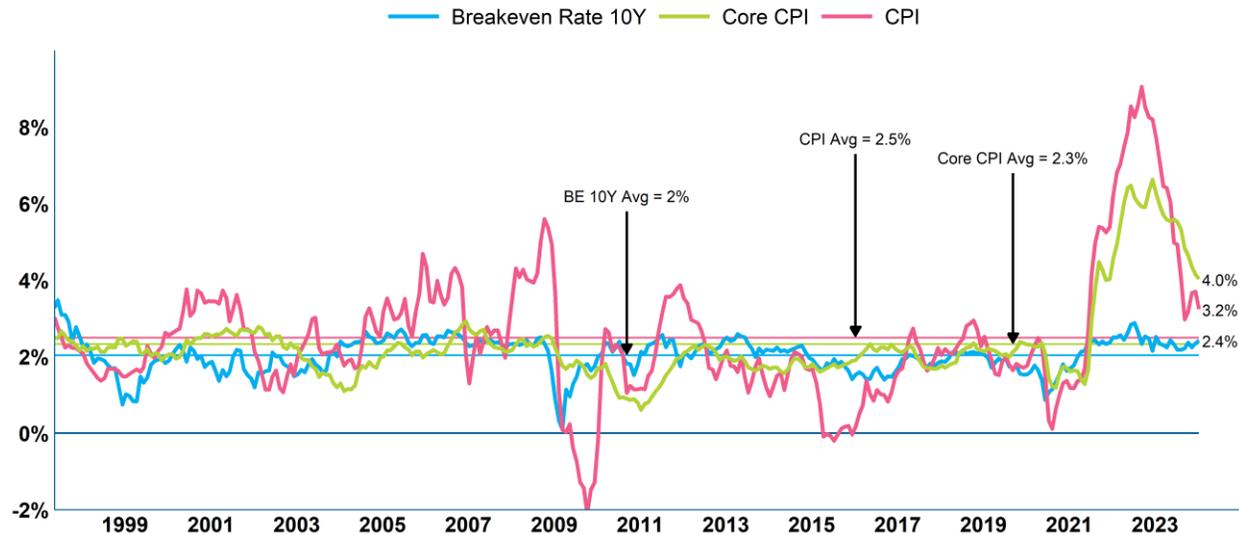
¹ US Equity Cyclically Adjusted P/E on S&P 500 Index. Source: Robert Shiller, Yale University, and Meketa Investment Group. Developed and Emerging Market Equity (MSCI EAFE and EM Index) Cyclically Adjusted P/E – Source: Bloomberg. Earnings figures represent the average of monthly “as reported” earnings over the previous ten years. Data is as of October 2023. The average line is the long-term average of the US, EM, and EAFE PE values from April 1998 to the recent month-end respectively.



- Overall rates continued to increase this year, particularly at the policy sensitive front-end of the yield curve, but at a much slower pace compared to last year.
- In October, very short-term interest rates (two years or less) increased only slightly as monetary policy has likely reached close to its terminal rate for this cycle. By contrast, longer-term rates continued their dramatic rise as investors come to terms with rates remaining higher for longer. The ten-year Treasury yield has experienced a significant increase from 3.9% to 4.9% since the beginning of the year.
- Because of the dynamic above, the yield curve's inversion decreased further with the spread between two-year and ten-year Treasuries at -0.15% at the end of October (it started the third quarter at -1.05%).

¹ Source: Bloomberg. Data is as of October 31, 2023.

Ten-Year Breakeven Inflation and CPI¹

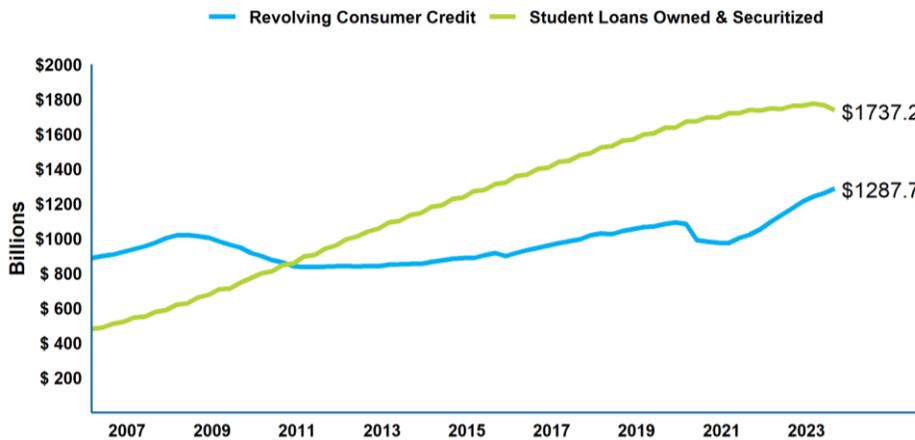


- Year-over-year headline inflation fell from 3.7% to 3.2%, coming in slightly below expectations. Declines were driven by energy, used cars and trucks, and medical services.
- Core inflation – excluding food and energy – fell slightly (4.1% to 4.0%) year-over-year. It remains stubbornly high, though, driven by shelter costs (+6.7%), particularly owners’ equivalent rent, and transportation services (+9.2%).
- Inflation expectations (breakevens) remain below current inflation as investors continue to expect inflation to track back toward the Fed’s 2% average target.

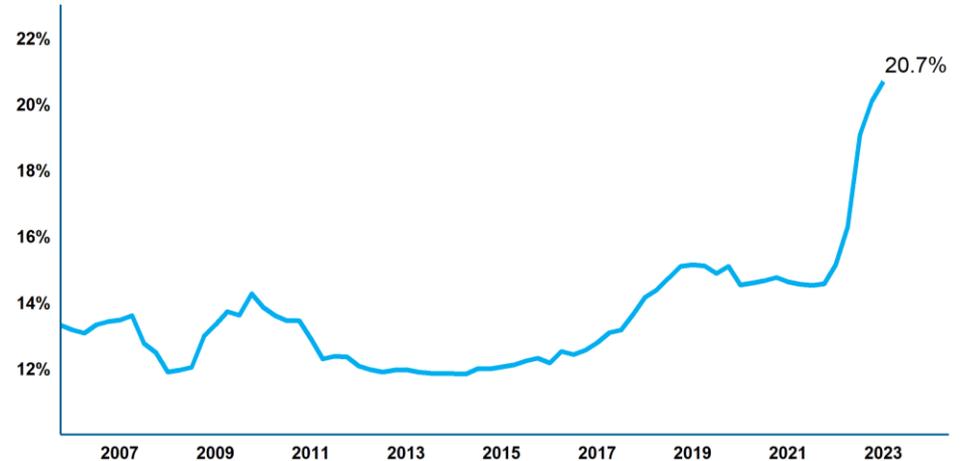
¹ Source: FRED. Data is as October 31, 2023. The CPI and 10 Year Breakeven average lines denote the average values from February 1997 to the present month-end, respectively. Breakeven values represent month-end values for comparative purposes.

US Consumer Under Stress?¹

Revolving Consumer Credit & Student Loans (\$B)



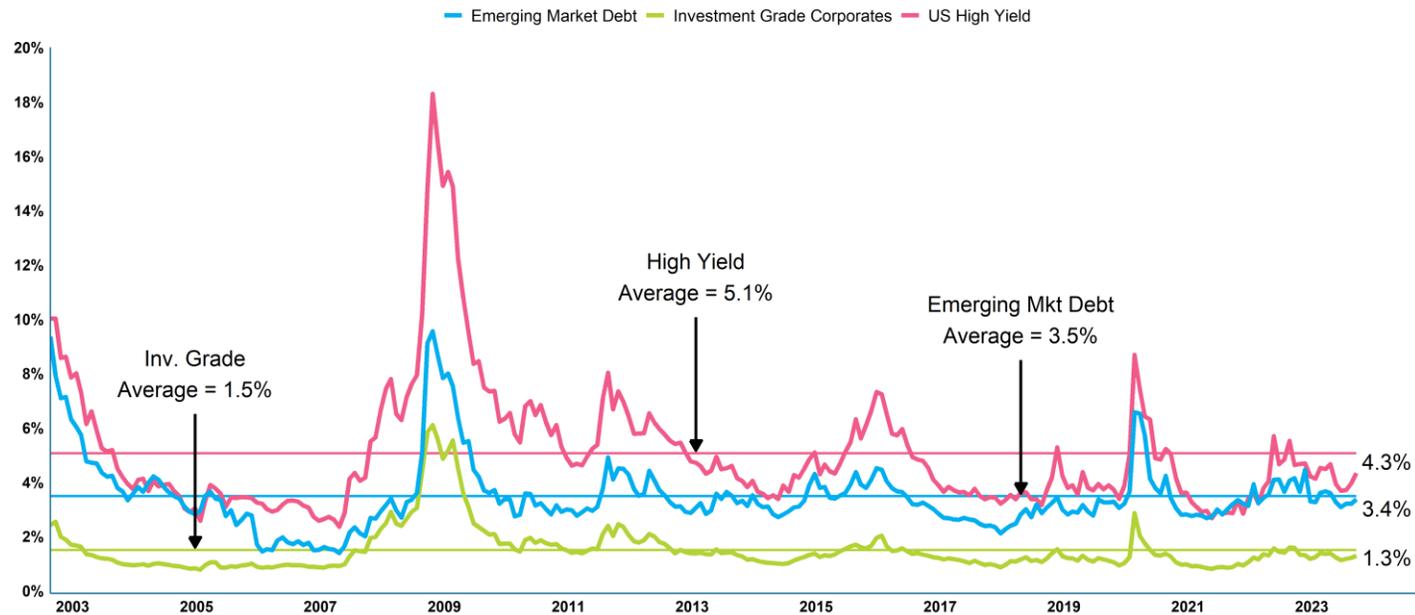
Consumer Credit Card Interest Rates (%)



- Despite the strong labor market and higher wages, pressures have started to build on the US consumer. This is an important consideration as consumer spending has been an important driver of economic growth.
- Revolving consumer credit surged to new highs in 2023 even as credit card interest rates hit levels not seen before (the prior peak was around 19% in the 1980s).
- The return of student loan repayments after a three-year pandemic-related reprieve could add to pressures on consumers' budgets. This might be partially balanced by recently initiated repayment and forgiveness programs.
- As we look ahead, the strength of the US consumer will remain key as this sector makes up most of the domestic economy (GDP).

¹ Source: FRED. Revolving Consumer Credit and Student Loans data is as of September 30, 2023. Revolving Consumer Credit data is seasonally adjusted to remove distortions during the holiday season. Consumer Credit Card Interest Rates data is as of June 30, 2023.

Credit Spreads vs. US Treasury Bonds¹

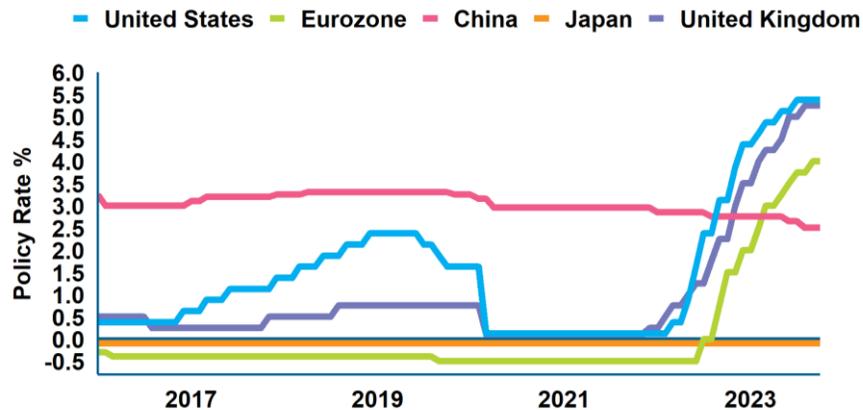


- Credit spreads (the added yield above a comparable maturity Treasury) increased in October but remained below their respective long run averages.
- High yield spreads continue to be the furthest below their long-term average given the overall risk appetite this year. Investment-grade and emerging market spreads are also below their respective long-term averages, but by smaller margins.

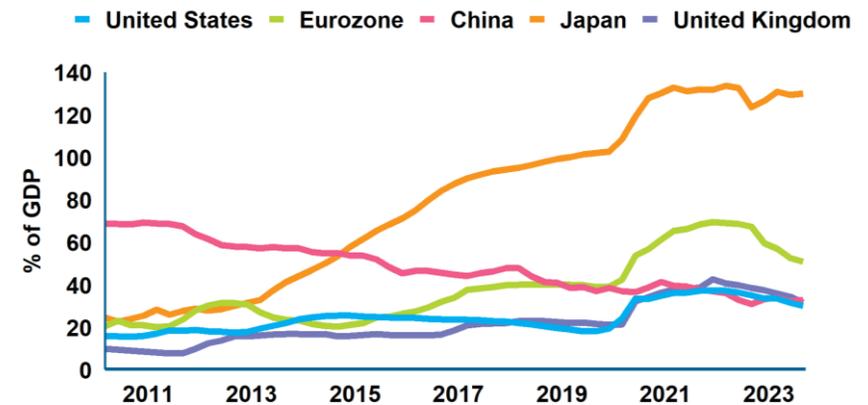
¹ Sources: Bloomberg. Data is as of October 31, 2023. Average lines denote the average of the investment grade, high yield, and emerging market spread values from September 2002 to the recent month-end, respectively.

Central Bank Response¹

Policy Rates



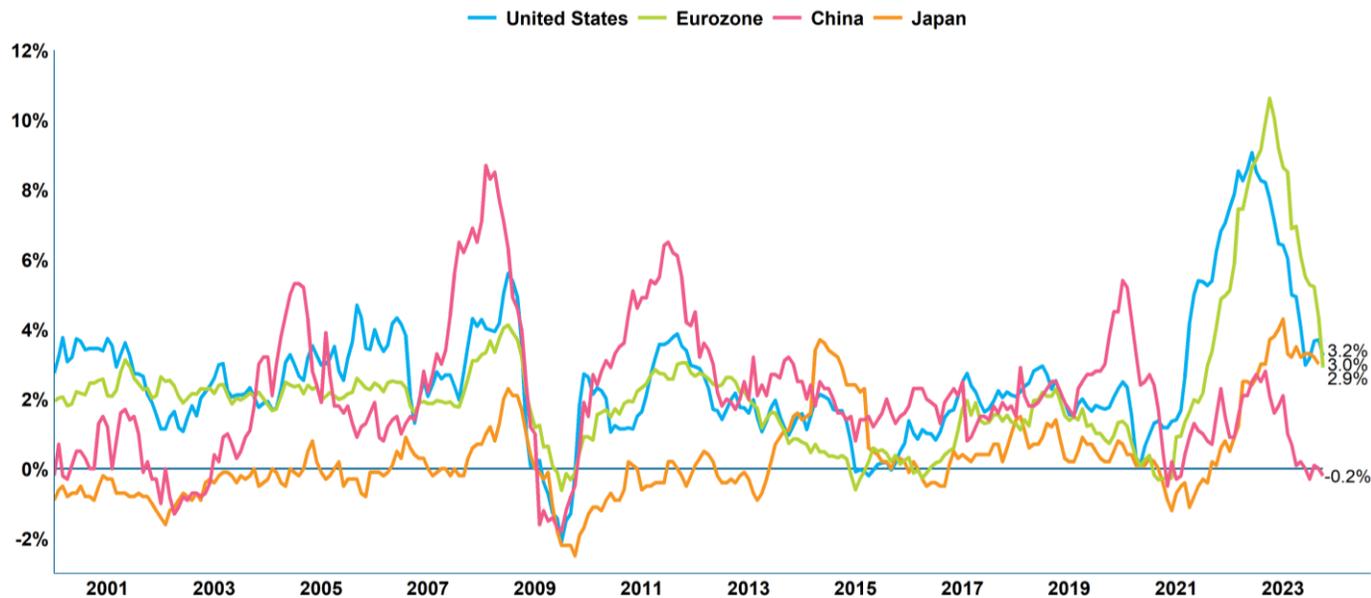
Balance Sheet as % of GDP



- Slowing inflation and growth have led to expectations for a reduction in the pace of aggressive policy tightening.
- In July, the Fed raised rates another 25 basis points to a range of 5.25% to 5.50% and then kept rates at this level at their September and October/November meetings. Markets are not expecting any additional rate hikes.
- The European Central Bank paused in October, with lower-than-expected inflation and weaker growth. In Japan, the BoJ has further relaxed its yield curve control on the 10-year bond, and expectations for further policy normalization are rising.
- The central bank in China has continued to cut interest rates and inject liquidity into the banking system, as weaker than expected economic data appears to indicate a widespread slowdown.
- Risks remain for a policy error as central banks attempt to balance bringing down inflation, maintaining financial stability, and supporting growth.

¹ Source: Bloomberg. Policy rate data is as of October 31, 2023. China policy rate is defined as the medium-term lending facility 1 year interest rate. Balance sheet as % of GDP is based on quarterly data and is as of September 30, 2023.

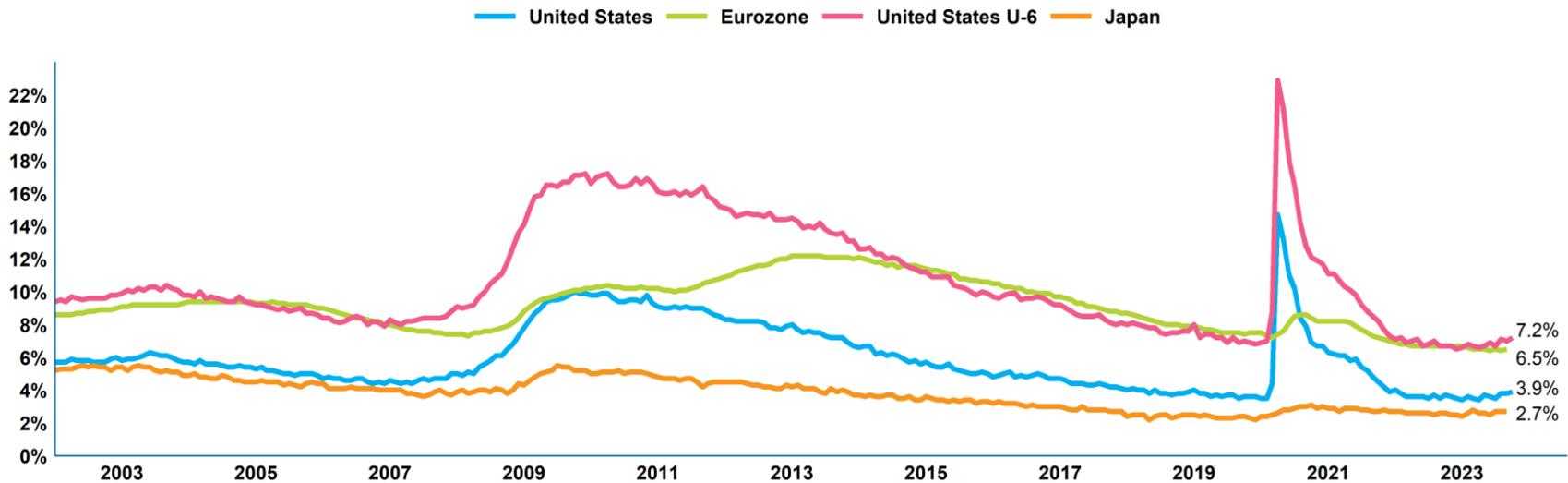
Inflation (CPI Trailing Twelve Months)¹



- The inflation picture remains mixed across the major economies.
- In the US, inflation fell from 3.7% to 3.2%, driven by falling energy prices. In the eurozone inflation experienced a dramatic decline in October (4.3% to 2.9%), to a level below the US, also driven by a decline in energy prices. Despite 2023’s significant declines in the US and Europe, inflation levels remain elevated compared to central bank targets.
- Inflation in Japan, has increased to levels not seen in almost a decade, driven by food and home related items. In China, deflationary pressures returned in October, as consumption declined after the holiday earlier in the month.

¹ United States CPI and Eurozone CPI – Source: FRED. Japan CPI and China CPI - Source: Bloomberg. Data is as October 31, 2023. The most recent data for Japanese inflation is as of September 30, 2023.

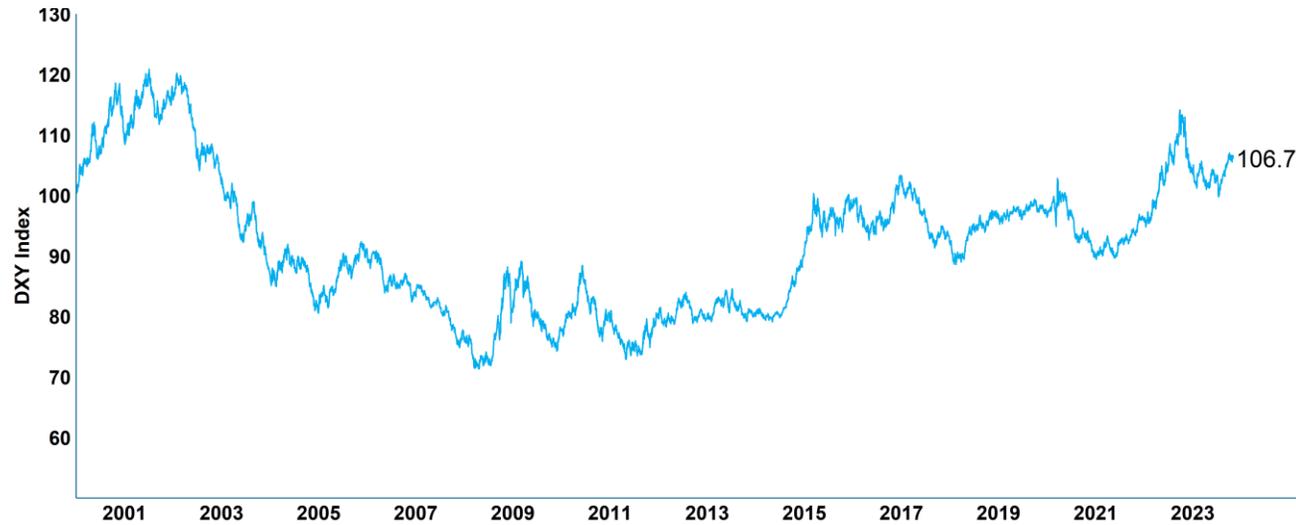
Unemployment¹



- Overall, the US labor market remains healthy with the unemployment rate relatively low, wage growth now positive in real terms, and initial claims for unemployment staying subdued. The pace of wage growth has slowed though, and despite remaining elevated, the number of job openings has declined from recent highs.
- In October, US unemployment increased slightly (3.8% to 3.9%), with job gains of 150,000 coming in below expectations of 180,000. The labor force participation rate declined slightly over the month from 62.8% to 62.7%, well off the lows of the pandemic (60.1%) but not back to pre-pandemic levels (63.3%). Broader measures of unemployment (U-6) finished the quarter at 7.2%, up from the September reading of 7.0%.
- Unemployment in Europe (6.5%) remains higher than the US, while levels in Japan (2.7%) remained low through the pandemic given less layoffs.

¹ Eurozone Unemployment - Source: Bloomberg. Japan, United States, United States U-6 Unemployment – Source: FRED. Data is as October 31, 2023, for the US. The most recent data for Eurozone and Japan unemployment is as of September 30, 2023.

US Dollar versus Broad Currencies¹



- After a strong 2022, the US dollar declined late last year and into early this year as weaker economic data and lower inflation led to investors anticipating the end of FOMC tightening.
- Recently though, the dollar reversed course and appreciated against major currencies as relative growth remains strong and investors anticipate the FOMC keeping interest rates higher for longer.
- For the rest of this year, the track of inflation across economies and the corresponding monetary policies will likely be key drivers of currency moves.

¹ Source: Bloomberg. Data as of October 31, 2023.

Summary

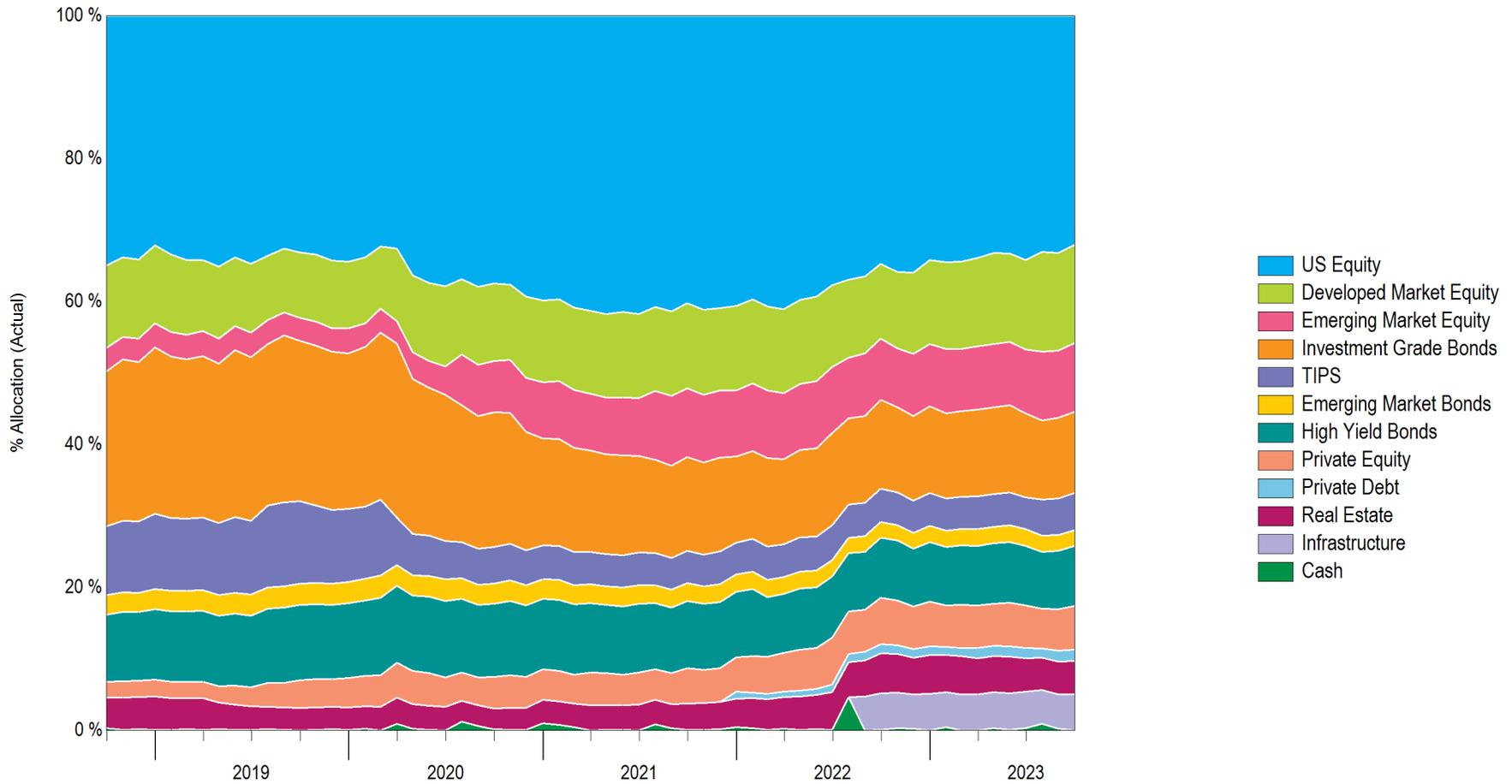
Key Trends:

- The impact of inflation still above policy targets will remain key, with bond market volatility likely to stay high.
- Global monetary policies could diverge going forward. The risk of policy errors remains elevated as central banks try to reduce persistent inflation while not tipping their economies into recession.
- Growth is expected to slow globally this year, with many economies forecasted to tip into recession. However, optimism has been building that some economies could experience soft landings. Inflation, monetary policy, and the war will all be key.
- In the US, consumers could feel pressure as certain components of inflation (e.g., shelter), remain high, borrowing costs are elevated, and the job market may weaken.
- The key for US equities going forward will be whether earnings can remain resilient if growth continues to slow. Also, the future paths of the large technology companies that have driven market gains will be important.
- Equity valuations remain lower in emerging and developed markets, but risks remain, including the potential for recent strength in the US dollar to persist, higher inflation weighing particularly on Europe, and China's sluggish economic reopening and on-going weakness in the real estate sector. Japan's recent hint at potentially tightening monetary policy along with changes in corporate governance in the country could influence relative results.
- Recent, heightened tensions in Israel could add to overall uncertainty and drive safe haven flows.

Performance Update
As Of September 30, 2023

Allocation vs. Targets and Policy				
	Current Balance	Current Allocation	Policy	Policy Range
US Equity	\$68,816,129	32%	17%	11% - 23%
Developed Market Equity	\$29,568,871	14%	14%	6% - 18%
Emerging Market Equity	\$20,634,357	10%	14%	3% - 16%
Investment Grade Bonds	\$24,506,702	11%	5%	3% - 10%
TIPS	\$11,195,881	5%	5%	3% - 10%
Emerging Market Bonds	\$4,758,984	2%	2%	1% - 5%
High Yield Bonds	\$18,041,307	8%	5%	2% - 8%
Private Equity	\$13,070,341	6%	10%	5% - 15%
Private Debt	\$3,538,542	2%	8%	0% - 12%
Real Estate	\$9,945,871	5%	10%	3% - 13%
Infrastructure	\$10,866,259	5%	10%	0% - 13%
Cash	\$9,956	0%	0%	0% - 5%
Total	\$214,953,200	100%	100%	

Asset Allocation History
5 Years Ending September 30, 2023



Asset Class Performance Summary											
	Market Value (\$)	% of Portfolio	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	20 Yrs (%)	Inception (%)	Inception Date
Total Retirement System (net)	214,953,200	100.0	-1.4	6.8	13.6	5.8	5.9	6.4	6.9	7.5	Jul-88
55% MSCI World & 45% Barclays Aggregate			-3.3	5.5	12.1	2.1	4.3	5.2	5.9	6.6	Jul-88
60% MSCI World & 40% Barclays Aggregate			-3.3	6.1	13.2	2.8	4.7	5.6	6.2	6.7	Jul-88
InvMetrics Public DB \$50mm-\$250mm Net Median			-2.9	4.6	10.5	4.6	5.2	6.4	6.4	8.1	Jul-88
Domestic Equity Assets (net)	68,816,129	32.0	-4.5	11.4	21.3	10.4	7.6	10.1	8.9	8.3	Oct-06
Russell 3000			-3.3	12.4	20.5	9.4	9.1	11.3	9.7	9.1	Oct-06
International Developed Markets Equity Assets (net)	29,568,871	13.8	-4.0	7.3	25.7	6.0	3.5	3.5	--	3.0	Oct-06
MSCI EAFE			-4.1	7.1	25.6	5.8	3.2	3.8	5.9	3.2	Oct-06
International Emerging Markets Equity Assets (net)	20,634,357	9.6	-2.2	5.3	12.9	1.4	3.4	--	--	4.2	Jan-15
MSCI Emerging Markets			-2.9	1.8	11.7	-1.7	0.6	2.1	7.3	2.4	Jan-15
Investment Grade Bonds Assets (net)	24,506,702	11.4	-3.2	-1.1	0.6	-5.3	0.0	1.1	2.8	5.2	Jul-88
Bloomberg US Aggregate TR			-3.2	-1.2	0.6	-5.2	0.1	1.1	2.8	5.2	Jul-88
PRIT Core Fixed Income			-6.1	-3.1	-2.5	-7.5	0.0	1.9	3.2	5.7	Jul-88
High Yield Bond Assets (net)	18,041,307	8.4	0.7	6.4	10.3	2.2	3.3	4.1	5.8	5.9	Sep-03
Bloomberg US High Yield TR			0.5	5.9	10.3	1.8	3.0	4.2	6.5	6.6	Sep-03
PRIT Public Value-Added Fixed Income			1.1	6.7	11.2	2.5	2.7	2.8	5.3	5.5	Sep-03
TIPS Assets (net)	11,195,881	5.2	-2.6	-0.7	1.1	-2.1	2.0	1.7	--	3.1	Oct-05
Bloomberg US TIPS TR			-2.6	-0.8	1.2	-2.0	2.1	1.7	3.5	3.2	Oct-05
Emerging Market Debt Assets (net)	4,758,984	2.2	-2.7	2.0	12.5	-3.9	-0.3	--	--	1.8	Jan-15
JP Morgan EMBI Global Diversified			-2.2	1.8	10.0	-4.6	-0.4	2.5	5.4	1.8	Jan-15
Open-Ended Real Estate (net)	6,207,400	2.9	-2.0	-12.4	-16.9	6.5	5.6	8.4	6.9	7.8	Oct-95
NCREIF ODCE			-1.9	-7.6	-12.1	7.1	5.7	8.2	7.6	8.6	Oct-95
Total Closed End Real Estate (net)	3,738,471	1.7	-6.3	-10.0	-8.9	4.3	-9.0	1.5	--	3.0	Jan-13
Private Equity Assets (net)	13,070,341	6.1	0.4	0.4	-0.5	21.5	17.5	10.3	--	8.2	Oct-06
Private Debt Assets (net)	3,538,542	1.6	2.8	9.6	11.6	--	--	--	--	11.1	Dec-21
Infrastructure (net)	10,866,259	5.1	0.8	6.0	10.3	--	--	--	--	9.0	Aug-22
Cash (net)	9,956	0.0									

	Trailing Performance											Inception (%)	Inception Date
	Market Value (\$)	% of Portfolio	% of Sector	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	20 Yrs (%)			
Total Retirement System	214,953,200	100.0	--	-1.4	6.8	13.6	5.8	5.9	6.4	6.9	7.5	Jul-88	
<i>55% MSCI World & 45% Barclays Aggregate</i>				-3.3	5.5	12.1	2.1	4.3	5.2	5.9	6.6	Jul-88	
<i>60% MSCI World & 40% Barclays Aggregate</i>				-3.3	6.1	13.2	2.8	4.7	5.6	6.2	6.7	Jul-88	
<i>InvMetrics Public DB \$50mm-\$250mm Net Median</i>				-2.9	4.6	10.5	4.6	5.2	6.4	6.4	8.1	Jul-88	
Domestic Equity Assets	68,816,129	32.0	32.0	-4.5	11.4	21.3	10.4	7.6	10.1	8.9	8.3	Oct-06	
<i>Russell 3000</i>				-3.3	12.4	20.5	9.4	9.1	11.3	9.7	9.1	Oct-06	
RhumbLine S&P 500 Index	23,410,333	10.9	34.0	-3.3	13.0	21.6	10.1	9.9	11.9	9.7	7.2	Mar-99	
<i>S&P 500</i>				-3.3	13.1	21.6	10.1	9.9	11.9	9.7	7.2	Mar-99	
<i>eV US Passive S&P 500 Equity Net Median</i>				-3.3	13.0	21.5	10.1	9.8	11.8	9.7	7.1	Mar-99	
Frontier Capital Appreciation	22,077,857	10.3	32.1	-6.8	10.3	22.5	11.7	5.5	8.6	--	10.1	Feb-13	
<i>Russell 2500 Growth</i>				-6.8	5.6	10.6	1.0	4.0	8.4	9.4	9.8	Feb-13	
<i>eV US Small-Mid Cap Growth Equity Net Median</i>				-6.3	5.9	11.2	2.2	5.1	8.6	9.8	10.0	Feb-13	
RhumbLine HEDI	23,327,939	10.9	33.9	-3.4	11.1	20.4	--	--	--	--	10.5	Nov-20	
<i>Russell 1000 HEDI Moderate GR USD</i>				-3.4	11.1	20.7	9.4	10.8	12.9	11.0	10.6	Nov-20	
<i>eV US Large Cap Core Equity Gross Median</i>				-3.0	9.8	20.1	9.8	9.4	11.5	10.0	11.0	Nov-20	

Total Retirement System | As of September 30, 2023

	Market Value (\$)	% of Portfolio	% of Sector	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	20 Yrs (%)	Inception (%)	Inception Date
International Developed Markets Equity Assets	29,568,871	13.8	13.8	-4.0	7.3	25.7	6.0	3.5	3.5	--	3.0	Oct-06
<i>MSCI EAFE</i>				-4.1	7.1	25.6	5.8	3.2	3.8	5.9	3.2	Oct-06
RhumbLine MSCI EAFE Index	29,568,871	13.8	100.0	-4.0	7.3	25.7	6.0	3.5	--	--	3.4	Aug-14
<i>MSCI EAFE</i>				-4.1	7.1	25.6	5.8	3.2	3.8	5.9	3.2	Aug-14
<i>eV EAFE All Cap Equity Net Median</i>				-3.7	6.6	23.1	4.7	2.9	4.2	6.6	3.5	Aug-14
International Emerging Markets Equity Assets	20,634,357	9.6	9.6	-2.2	5.3	12.9	1.4	3.4	--	--	4.2	Jan-15
<i>MSCI Emerging Markets</i>				-2.9	1.8	11.7	-1.7	0.6	2.1	7.3	2.4	Jan-15
DFA Emerging Markets	10,988,253	5.1	53.3	-1.5	7.0	18.3	4.7	3.2	--	--	3.8	Jan-15
<i>MSCI Emerging Markets</i>				-2.9	1.8	11.7	-1.7	0.6	2.1	7.3	2.4	Jan-15
<i>eV Emg Mkts All Cap Equity Net Median</i>				-3.8	2.6	12.7	-1.7	1.4	2.8	7.9	3.0	Jan-15
Driehaus Emerging Market Equity	9,646,103	4.5	46.7	-2.9	3.4	7.2	-2.2	3.3	--	--	4.4	Jan-15
<i>MSCI Emerging Markets</i>				-2.9	1.8	11.7	-1.7	0.6	2.1	7.3	2.4	Jan-15
<i>eV Emg Mkts All Cap Equity Net Median</i>				-3.8	2.6	12.7	-1.7	1.4	2.8	7.9	3.0	Jan-15
Investment Grade Bonds Assets	24,506,702	11.4	11.4	-3.2	-1.1	0.6	-5.3	0.0	1.1	2.8	5.2	Jul-88
<i>Bloomberg US Aggregate TR</i>				-3.2	-1.2	0.6	-5.2	0.1	1.1	2.8	5.2	Jul-88
<i>PRIT Core Fixed Income</i>				-6.1	-3.1	-2.5	-7.5	0.0	1.9	3.2	5.7	Jul-88
SSgA U.S. Aggregate Bond Index	24,506,702	11.4	100.0	-3.2	-1.1	0.6	-5.3	0.0	1.1	2.8	3.4	May-01
<i>Bloomberg US Aggregate TR</i>				-3.2	-1.2	0.6	-5.2	0.1	1.1	2.8	3.4	May-01
<i>eV US Core Fixed Inc Net Median</i>				-3.1	-0.9	0.9	-5.0	0.4	1.4	3.1	3.7	May-01

	Market Value (\$)	% of Portfolio	% of Sector	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	20 Yrs (%)	Inception (%)	Inception Date
High Yield Bond Assets	18,041,307	8.4	8.4	0.7	6.4	10.3	2.2	3.3	4.1	5.8	5.9	Sep-03
<i>Bloomberg US High Yield TR</i>				0.5	5.9	10.3	1.8	3.0	4.2	6.5	6.6	Sep-03
<i>PRIT Public Value-Added Fixed Income</i>				1.1	6.7	11.2	2.5	2.7	2.8	5.3	5.5	Sep-03
Shenkman Capital	18,041,307	8.4	100.0	0.7	6.4	10.3	2.2	3.3	4.1	--	5.7	Apr-06
<i>Bloomberg US High Yield TR</i>				0.5	5.9	10.3	1.8	3.0	4.2	6.5	6.2	Apr-06
<i>eV US High Yield Fixed Inc Net Median</i>				0.6	5.3	9.5	1.9	2.9	3.9	6.0	5.6	Apr-06
TIPS Assets	11,195,881	5.2	5.2	-2.6	-0.7	1.1	-2.1	2.0	1.7	--	3.1	Oct-05
<i>Bloomberg US TIPS TR</i>				-2.6	-0.8	1.2	-2.0	2.1	1.7	3.5	3.2	Oct-05
SSgA TIPS Index-NL	11,195,881	5.2	100.0	-2.6	-0.7	1.1	-2.1	2.0	1.7	--	3.1	Oct-05
<i>Bloomberg US TIPS TR</i>				-2.6	-0.8	1.2	-2.0	2.1	1.7	3.5	3.2	Oct-05
<i>eV US TIPS / Inflation Fixed Inc Net Median</i>				-2.4	-0.7	1.4	-1.9	2.2	1.7	3.5	3.1	Oct-05
Emerging Market Debt Assets	4,758,984	2.2	2.2	-2.7	2.0	12.5	-3.9	-0.3	--	--	1.8	Jan-15
<i>JP Morgan EMBI Global Diversified</i>				-2.2	1.8	10.0	-4.6	-0.4	2.5	5.4	1.8	Jan-15
Payden Emerging Market Bond	4,758,984	2.2	100.0	-2.7	2.0	12.5	-3.9	-0.3	--	--	1.8	Jan-15
<i>JP Morgan EMBI Global Diversified</i>				-2.2	1.8	10.0	-4.6	-0.4	2.5	5.4	1.8	Jan-15
Open-Ended Real Estate	6,207,400	2.9	2.9	-2.0	-12.4	-16.9	6.5	5.6	8.4	6.9	7.8	Oct-95
<i>NCREIF ODCE</i>				-1.9	-7.6	-12.1	7.1	5.7	8.2	7.6	8.6	Oct-95
Clarion Partners	6,207,400	2.9	100.0	-2.0	-12.4	-16.9	6.5	5.6	8.4	6.9	7.0	Oct-02
<i>NCREIF ODCE</i>				-1.9	-7.6	-12.1	7.1	5.7	8.2	7.6	7.7	Oct-02

Total Retirement System | As of September 30, 2023

	Market Value (\$)	% of Portfolio	% of Sector	QTD (%)	YTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	20 Yrs (%)	Inception (%)	Inception Date
Total Closed End Real Estate	3,738,471	1.7	1.7	-6.3	-10.0	-8.9	4.3	-9.0	1.5	--	3.0	Jan-13
Rockwood Capital Real Estate Partners Fund XI, L.P. <i>NCREIF-ODCE</i>	3,738,471	1.7	100.0	-6.3 -1.9	-10.0 -7.6	-8.9 -12.1	4.3 7.1	-- 5.7	-- 8.2	-- 7.6	3.3 5.9	Dec-19 Dec-19
Private Equity Assets	13,070,341	6.1	6.1	0.4	0.4	-0.5	21.5	17.5	10.3	--	8.2	Oct-06
North American Strategic Partners 2006	14,091	0.0	0.1									
Ironsides Partnership Fund IV	2,550,424	1.2	19.5									
Ironsides Direct Investment Fund IV	1,294,237	0.6	9.9									
Ironsides Partnership Fund V, L.P.	2,172,398	1.0	16.6									
Ironsides Direct Investment Fund V, L.P.	3,304,376	1.5	25.3									
HarbourVest 2019 Global Fund	3,734,816	1.7	28.6									
Private Debt Assets	3,538,542	1.6	1.6	2.8	9.6	11.6	--	--	--	--	11.1	Dec-21
NB Private Debt Fund IV	3,538,542	1.6	100.0									
Infrastructure	10,866,259	5.1	5.1	0.8	6.0	10.3	--	--	--	--	9.0	Aug-22
IFM Global Infrastructure <i>CPI + 3%</i>	10,866,259	5.1	100.0	0.8 1.6	6.0 6.0	10.3 6.8	-- 8.9	-- 7.2	-- 5.8	-- 5.6	9.0 6.4	Aug-22 Aug-22
Cash	9,956	0.0	0.0									

Closed End Real Estate, Private Equity, and Private Debt market values are as of June 30, 2023 and adjusted for subsequent flows.

North American Strategic Partners market value is cash adjusted as of December 31, 2022. The fund is currently in the liquidation process and will only be reported on annually (as of December 31).

	Calendar Year Performance									
	2022 (%)	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)
Total Retirement System	-12.5	13.8	14.2	17.5	-4.5	13.0	8.7	-0.2	6.3	14.0
<i>55% MSCI World & 45% Barclays Aggregate</i>	<i>-15.6</i>	<i>10.9</i>	<i>12.9</i>	<i>19.1</i>	<i>-4.6</i>	<i>13.6</i>	<i>5.5</i>	<i>0.0</i>	<i>5.5</i>	<i>13.0</i>
<i>60% MSCI World & 40% Barclays Aggregate</i>	<i>-15.9</i>	<i>12.0</i>	<i>13.3</i>	<i>20.0</i>	<i>-5.1</i>	<i>14.5</i>	<i>5.7</i>	<i>-0.1</i>	<i>5.4</i>	<i>14.5</i>
Domestic Equity Assets	-16.9	24.8	13.4	27.6	-6.9	20.1	14.6	-1.6	13.1	33.1
<i>Russell 3000</i>	<i>-19.2</i>	<i>25.7</i>	<i>20.9</i>	<i>31.0</i>	<i>-5.2</i>	<i>21.1</i>	<i>12.7</i>	<i>0.5</i>	<i>12.6</i>	<i>33.6</i>
RhumbLine S&P 500 Index	-18.1	28.6	18.3	31.4	-4.4	21.8	11.9	1.4	13.6	32.2
<i>S&P 500</i>	<i>-18.1</i>	<i>28.7</i>	<i>18.4</i>	<i>31.5</i>	<i>-4.4</i>	<i>21.8</i>	<i>12.0</i>	<i>1.4</i>	<i>13.7</i>	<i>32.4</i>
Frontier Capital Appreciation	-18.0	18.2	18.1	28.9	-13.9	19.1	20.5	-6.5	12.4	--
<i>Russell 2500 Growth</i>	<i>-26.2</i>	<i>5.0</i>	<i>40.5</i>	<i>32.7</i>	<i>-7.5</i>	<i>24.5</i>	<i>9.7</i>	<i>-0.2</i>	<i>7.1</i>	<i>40.6</i>
RhumbLine HEDI	-15.2	25.5	--	--	--	--	--	--	--	--
<i>Russell 1000 HEDI Moderate GR USD</i>	<i>-15.1</i>	<i>25.5</i>	<i>18.5</i>	<i>32.7</i>	<i>-0.9</i>	<i>23.4</i>	<i>11.4</i>	<i>4.8</i>	<i>15.4</i>	<i>30.9</i>
International Developed Markets Equity Assets	-14.2	11.5	7.9	22.3	-13.5	24.9	1.4	-0.8	-8.7	21.2
<i>MSCI EAFE</i>	<i>-14.5</i>	<i>11.3</i>	<i>7.8</i>	<i>22.0</i>	<i>-13.8</i>	<i>25.0</i>	<i>1.0</i>	<i>-0.8</i>	<i>-4.9</i>	<i>22.8</i>
RhumbLine MSCI EAFE Index	-14.2	11.5	7.9	22.3	-13.5	24.9	1.4	-0.8	--	--
<i>MSCI EAFE</i>	<i>-14.5</i>	<i>11.3</i>	<i>7.8</i>	<i>22.0</i>	<i>-13.8</i>	<i>25.0</i>	<i>1.0</i>	<i>-0.8</i>	<i>-4.9</i>	<i>22.8</i>
International Emerging Markets Equity Assets	-19.3	2.3	21.1	20.7	-15.4	39.7	9.4	-12.7	--	--
<i>MSCI Emerging Markets</i>	<i>-20.1</i>	<i>-2.5</i>	<i>18.3</i>	<i>18.4</i>	<i>-14.6</i>	<i>37.3</i>	<i>11.2</i>	<i>-14.9</i>	<i>-2.2</i>	<i>-2.6</i>
DFA Emerging Markets	-16.4	5.8	13.9	16.0	-15.2	36.6	12.4	-14.9	--	--
<i>MSCI Emerging Markets</i>	<i>-20.1</i>	<i>-2.5</i>	<i>18.3</i>	<i>18.4</i>	<i>-14.6</i>	<i>37.3</i>	<i>11.2</i>	<i>-14.9</i>	<i>-2.2</i>	<i>-2.6</i>
Driehaus Emerging Market Equity	-22.4	-1.5	28.0	25.3	-15.6	43.0	6.5	-10.6	--	--
<i>MSCI Emerging Markets</i>	<i>-20.1</i>	<i>-2.5</i>	<i>18.3</i>	<i>18.4</i>	<i>-14.6</i>	<i>37.3</i>	<i>11.2</i>	<i>-14.9</i>	<i>-2.2</i>	<i>-2.6</i>

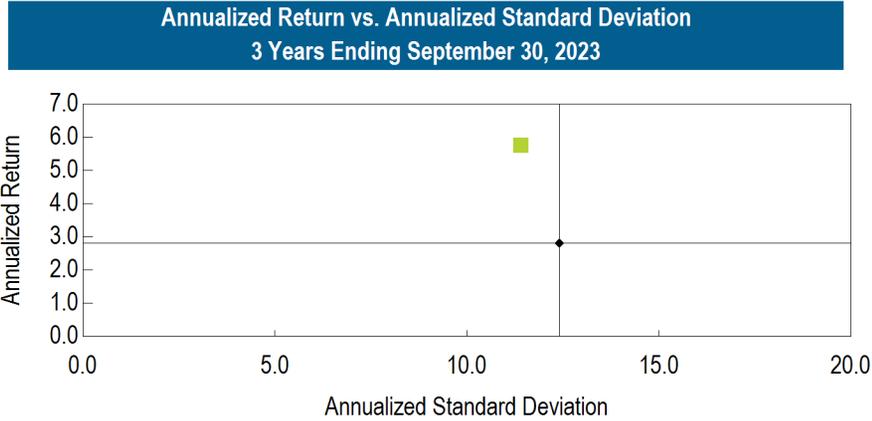
Total Retirement System | As of September 30, 2023

	2022 (%)	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)
Investment Grade Bonds Assets	-13.2	-1.6	7.5	8.7	0.0	3.6	2.6	0.6	6.0	-2.0
<i>Bloomberg US Aggregate TR</i>	-13.0	-1.5	7.5	8.7	0.0	3.5	2.6	0.5	6.0	-2.0
<i>PRIT Core Fixed Income</i>	-18.3	0.1	12.0	11.2	-0.9	5.3	3.9	-2.0	15.1	-2.9
SSgA U.S. Aggregate Bond Index	-13.2	-1.6	7.5	8.7	0.0	3.6	2.6	0.6	6.0	-2.0
<i>Bloomberg US Aggregate TR</i>	-13.0	-1.5	7.5	8.7	0.0	3.5	2.6	0.5	6.0	-2.0
High Yield Bond Assets	-8.9	4.0	6.3	14.0	-1.8	6.5	12.6	-2.3	2.9	6.4
<i>Bloomberg US High Yield TR</i>	-11.2	5.3	7.1	14.3	-2.1	7.5	17.1	-4.5	2.5	7.4
<i>PRIT Public Value-Added Fixed Income</i>	-7.8	3.5	4.3	10.7	-2.5	8.5	11.2	-5.2	-0.7	-2.0
Shenkman Capital	-8.8	4.0	6.3	14.0	-1.8	6.5	12.6	-2.3	2.9	6.4
<i>Bloomberg US High Yield TR</i>	-11.2	5.3	7.1	14.3	-2.1	7.5	17.1	-4.5	2.5	7.4
TIPS Assets	-12.1	5.8	10.9	8.4	-1.4	3.0	4.7	-1.4	3.6	-8.6
<i>Bloomberg US TIPS TR</i>	-11.8	6.0	11.0	8.4	-1.3	3.0	4.7	-1.4	3.6	-8.6
SSgA TIPS Index-NL	-12.1	5.8	10.9	8.4	-1.4	3.0	4.7	-1.4	3.6	-8.6
<i>Bloomberg US TIPS TR</i>	-11.8	6.0	11.0	8.4	-1.3	3.0	4.7	-1.4	3.6	-8.6
Emerging Market Debt Assets	-17.4	-2.4	6.2	16.5	-7.0	12.0	11.5	-0.8	--	--
<i>JP Morgan EMBI Global Diversified</i>	-17.8	-1.8	5.3	15.0	-4.3	10.3	10.2	1.2	7.4	-5.3
Payden Emerging Market Bond	-17.4	-2.4	6.2	16.5	-7.0	12.0	11.5	-0.8	--	--
<i>JP Morgan EMBI Global Diversified</i>	-17.8	-1.8	5.3	15.0	-4.3	10.3	10.2	1.2	7.4	-5.3
Open-Ended Real Estate	9.6	23.4	2.2	7.3	8.6	7.9	9.1	15.7	13.2	12.8
<i>NCREIF ODCE</i>	7.5	22.2	1.2	5.3	8.3	7.6	8.8	15.1	12.5	13.9
Clarion Partners	9.6	23.4	2.2	7.3	8.6	7.9	9.1	15.7	13.2	12.8
<i>NCREIF ODCE</i>	7.5	22.2	1.2	5.3	8.3	7.6	8.8	15.1	12.5	13.9

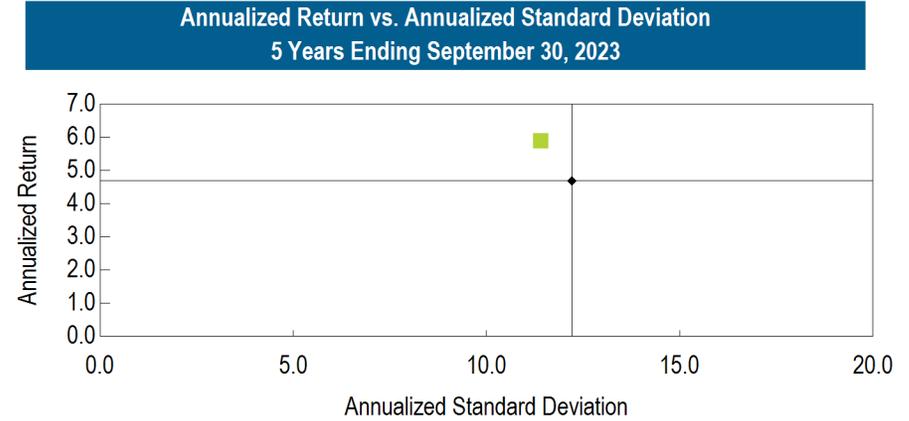
Total Retirement System | As of September 30, 2023

	2022 (%)	2021 (%)	2020 (%)	2019 (%)	2018 (%)	2017 (%)	2016 (%)	2015 (%)	2014 (%)	2013 (%)
Total Closed End Real Estate	10.2	14.3	-5.3	-38.2	-1.8	15.1	9.5	23.8	13.3	18.8
Rockwood Capital Real Estate Partners Fund XI, L.P.	10.2	14.3	0.0	--	--	--	--	--	--	--
<i>NCREIF-ODCE</i>	7.5	22.2	1.2	5.3	8.3	7.6	8.8	15.0	12.5	13.9
Private Equity Assets	10.2	39.5	22.9	17.7	10.2	-5.3	-2.8	8.6	5.5	9.1
North American Strategic Partners 2006										
Ironsides Partnership Fund IV										
Ironsides Direct Investment Fund IV										
Ironsides Partnership Fund V, L.P.										
Ironsides Direct Investment Fund V, L.P.										
HarbourVest 2019 Global Fund										
Private Debt Assets	10.8	--	--	--	--	--	--	--	--	--
NB Private Debt Fund IV										
Infrastructure	--	--	--	--	--	--	--	--	--	--
IFM Global Infrastructure	--	--	--	--	--	--	--	--	--	--
<i>CPI + 3%</i>	9.6	10.2	4.4	5.3	5.0	5.2	5.1	3.7	3.8	4.5
Cash										

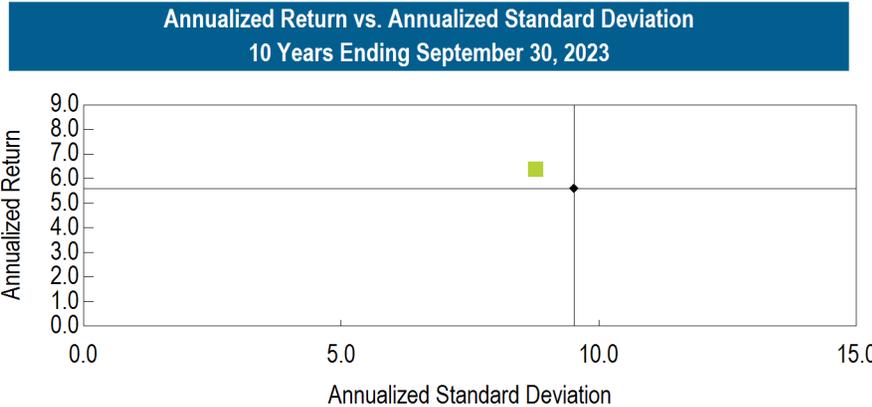
Infrastructure Aggregate returns will be shown after the first full year of performance.



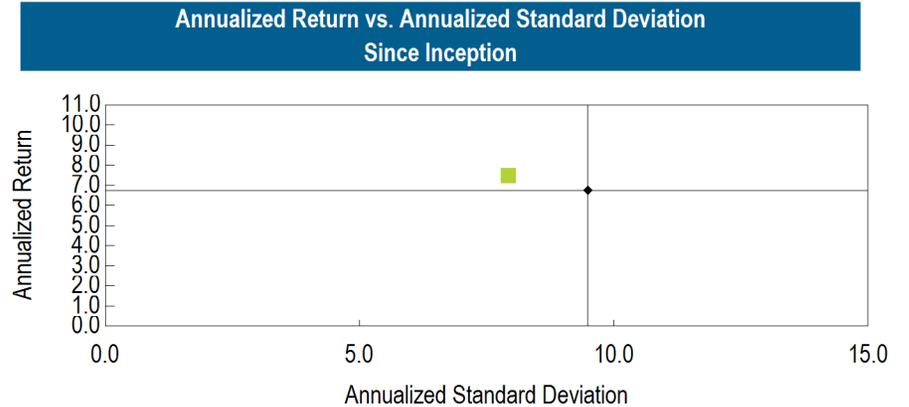
- Total Retirement System
- ◆ 60% MSCI World & 40% Barclays Aggregate



- Total Retirement System
- ◆ 60% MSCI World & 40% Barclays Aggregate

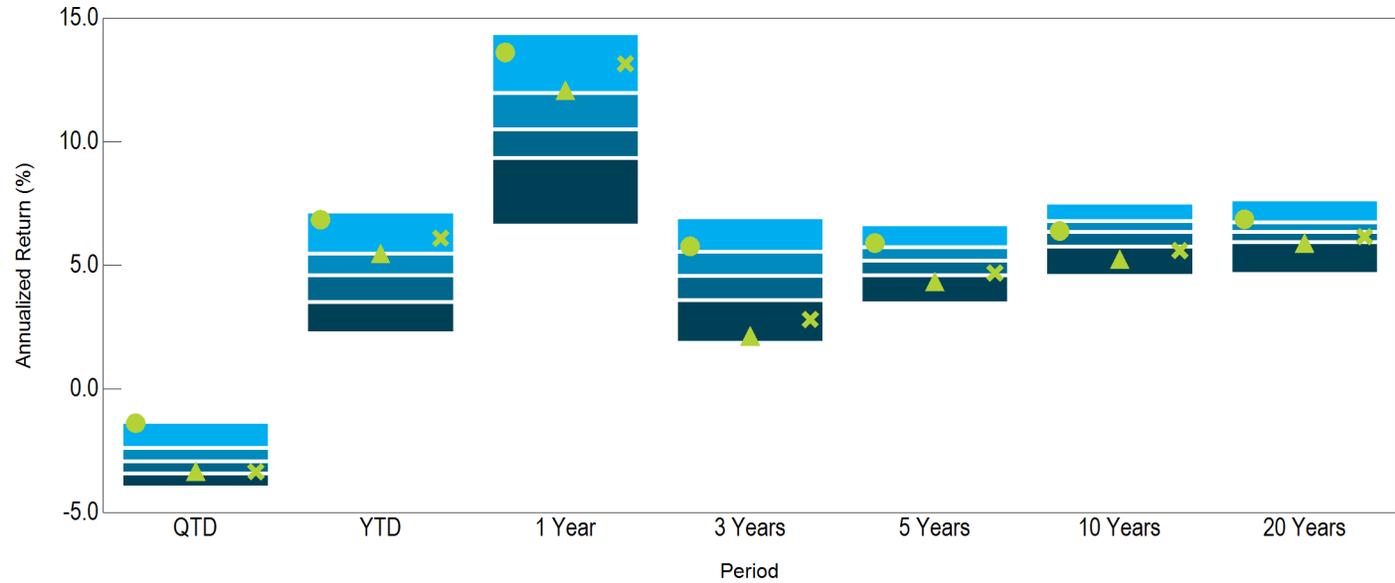


- Total Retirement System
- ◆ 60% MSCI World & 40% Barclays Aggregate



- Total Retirement System
- ◆ 60% MSCI World & 40% Barclays Aggregate

**InvMetrics Public DB \$50mm-\$250mm Net Return Comparison
Ending September 30, 2023**



	Return (Rank)													
	QTD		YTD		1 Year		3 Years		5 Years		10 Years		20 Years	
5th Percentile	-1.3		7.2		14.4		6.9		6.7		7.5		7.7	
25th Percentile	-2.4		5.5		12.0		5.6		5.8		6.8		6.8	
Median	-2.9		4.6		10.5		4.6		5.2		6.4		6.4	
75th Percentile	-3.4		3.5		9.4		3.6		4.6		5.8		6.0	
95th Percentile	-4.0		2.3		6.6		1.9		3.5		4.6		4.7	
# of Portfolios	154		153		153		149		143		122		62	
● Total Retirement System	-1.4	(6)	6.8	(9)	13.6	(10)	5.8	(21)	5.9	(19)	6.4	(50)	6.9	(22)
▲ 55% MSCI World & 45% Barclays Aggregate	-3.3	(71)	5.5	(26)	12.1	(22)	2.1	(94)	4.3	(80)	5.2	(90)	5.9	(80)
✕ 60% MSCI World & 40% Barclays Aggregate	-3.3	(73)	6.1	(15)	13.2	(12)	2.8	(88)	4.7	(71)	5.6	(84)	6.2	(65)

Statistics Summary						
5 Years Ending September 30, 2023						
	Anlzd Return	Anlzd Standard Deviation	Information Ratio	Beta	Sharpe Ratio	Tracking Error
Total Retirement System	5.9%	11.4%	0.7	1.0	0.4	2.1%
55% MSCI World & 45% Barclays Aggregate	4.3%	11.5%	--	1.0	0.2	0.0%
Equity Assets	6.0%	18.8%	-0.8	0.9	0.2	3.7%
Russell 3000	9.1%	19.6%	--	1.0	0.4	0.0%
Domestic Equity Assets	7.6%	20.2%	-0.6	1.0	0.3	2.8%
Russell 3000	9.1%	19.6%	--	1.0	0.4	0.0%
RhumbLine S&P 500 Index	9.9%	18.9%	-1.3	1.0	0.4	0.0%
S&P 500	9.9%	19.0%	--	1.0	0.4	0.0%
Frontier Capital Appreciation	5.5%	27.1%	0.2	1.1	0.1	9.3%
Russell 2500 Growth	4.0%	23.7%	--	1.0	0.1	0.0%
RhumbLine HEDI	--	--	--	--	--	--
Russell 1000 HEDI Moderate GR USD	10.8%	17.6%	--	1.0	0.5	0.0%
International Developed Markets Equity Assets	3.5%	17.9%	0.8	1.0	0.1	0.3%
MSCI EAFE	3.2%	18.0%	--	1.0	0.1	0.0%
RhumbLine MSCI EAFE Index	3.5%	17.9%	0.8	1.0	0.1	0.3%
MSCI EAFE	3.2%	18.0%	--	1.0	0.1	0.0%
International Emerging Markets Equity Assets	3.4%	18.2%	0.9	0.9	0.1	3.2%
MSCI Emerging Markets	0.6%	19.2%	--	1.0	-0.1	0.0%

RhumbLine HEDI funded on 10/5/2020. Statistics will be reflected after first full five calendar years.

	Anlzd Return	Anlzd Standard Deviation	Information Ratio	Beta	Sharpe Ratio	Tracking Error
DFA Emerging Markets	3.2%	19.7%	0.7	1.0	0.1	3.9%
MSCI Emerging Markets	0.6%	19.2%	--	1.0	-0.1	0.0%
Driehaus Emerging Market Equity	3.3%	17.4%	0.5	0.9	0.1	5.3%
MSCI Emerging Markets	0.6%	19.2%	--	1.0	-0.1	0.0%
Investment Grade Bonds Assets	0.0%	5.6%	-0.4	1.0	-0.3	0.1%
Bloomberg US Aggregate TR	0.1%	5.6%	--	1.0	-0.3	0.0%
SSgA U.S. Aggregate Bond Index	0.0%	5.6%	-0.4	1.0	-0.3	0.1%
Bloomberg US Aggregate TR	0.1%	5.6%	--	1.0	-0.3	0.0%
High Yield Bond Assets	3.3%	8.3%	0.2	0.9	0.2	1.2%
Bloomberg US High Yield TR	3.0%	9.3%	--	1.0	0.1	0.0%
Shenkman Capital	3.3%	8.3%	0.3	0.9	0.2	1.2%
Bloomberg US High Yield TR	3.0%	9.3%	--	1.0	0.1	0.0%
TIPS Assets	2.0%	6.1%	-0.7	1.0	0.1	0.1%
Bloomberg US TIPS TR	2.1%	6.1%	--	1.0	0.1	0.0%
SSgA TIPS Index-NL	2.0%	6.1%	-0.7	1.0	0.1	0.1%
Bloomberg US TIPS TR	2.1%	6.1%	--	1.0	0.1	0.0%
Emerging Market Debt Assets	-0.3%	12.7%	0.0	1.1	-0.2	2.5%
JP Morgan EMBI Global Diversified	-0.4%	11.2%	--	1.0	-0.2	0.0%
Payden Emerging Market Bond	-0.3%	12.7%	0.0	1.1	-0.2	2.5%
JP Morgan EMBI Global Diversified	-0.4%	11.2%	--	1.0	-0.2	0.0%

	Anlzd Return	Anlzd Standard Deviation	Information Ratio	Beta	Sharpe Ratio	Tracking Error
Open-Ended Real Estate	5.6%	8.3%	0.0	1.1	0.5	2.3%
NCREIF ODCE	5.7%	7.2%	--	1.0	0.6	0.0%
Clarion Partners	5.6%	8.3%	0.0	1.1	0.5	2.3%
NCREIF ODCE	5.7%	7.2%	--	1.0	0.6	0.0%
Total Closed End Real Estate	-9.0%	22.2%	-0.7	0.6	-0.5	22.0%
NCREIF ODCE	5.7%	7.2%	--	1.0	0.6	0.0%
Rockwood Capital Real Estate Partners Fund XI, L.P.	--	--	--	--	--	--
NCREIF-ODCE	5.7%	7.2%	--	1.0	0.6	0.0%
IFM Global Infrastructure	--	--	--	--	--	--
CPI + 3%	7.2%	1.4%	--	1.0	4.0	0.0%
EB Temporary Investment Fund	48.0%	143.4%	0.3	85.7	0.3	143.3%
91 Day T-Bills	1.6%	0.5%	--	1.0	0.0	0.0%

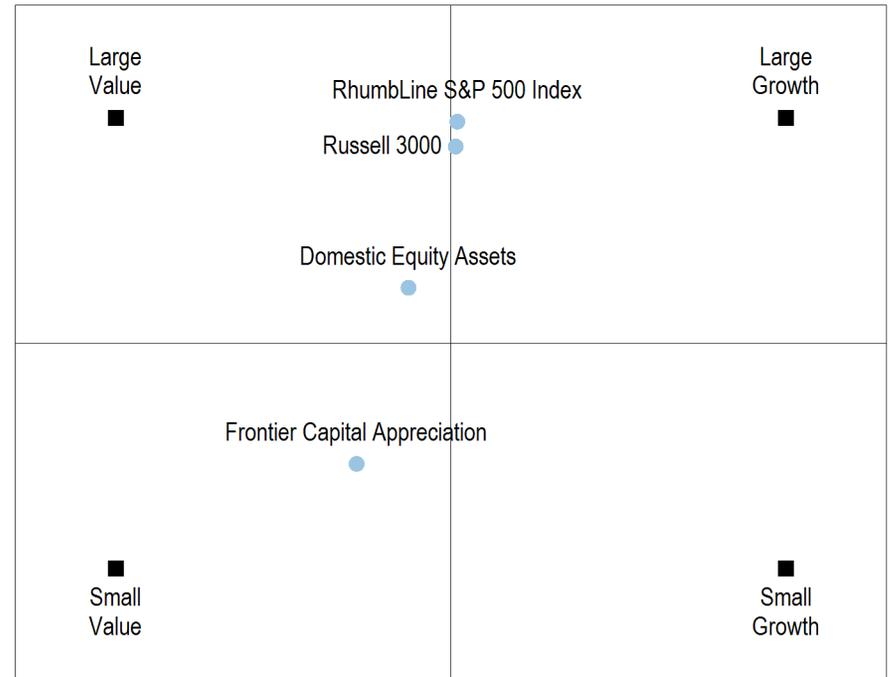
Rockwood Capital XI and IFM Global Infrastructure statistics will be reflected after first full five calendar years.

Retirement System Detail

Asset Allocation on September 30, 2023

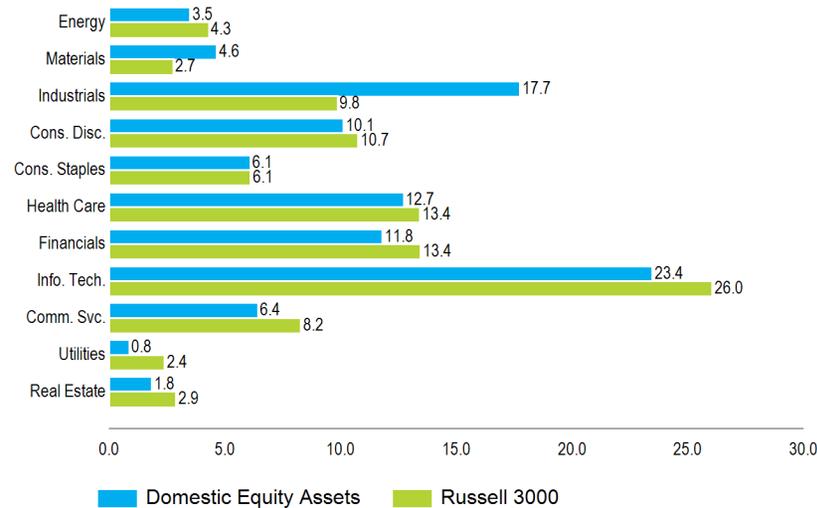
	Actual	Actual
Frontier Capital Appreciation	\$22,077,857	32.1%
RhumbLine HEDI	\$23,327,939	33.9%
RhumbLine S&P 500 Index	\$23,410,333	34.0%
Total	\$68,816,129	100.0%

Domestic Equity Assets Style Map 3 Years Ending September 30, 2023



Domestic Equity Assets Characteristics			
	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	68.8	--	73.3
Number Of Holdings	665	2994	661
Characteristics			
Weighted Avg. Market Cap. (\$B)	405.0	549.4	428.8
Median Market Cap (\$B)	23.4	2.3	26.5
P/E Ratio	21.2	21.0	22.9
Yield	1.3	1.6	1.3
EPS Growth - 5 Yrs.	17.4	16.5	17.0
Price to Book	3.7	3.9	4.0

Sector Allocation (%) vs Russell 3000



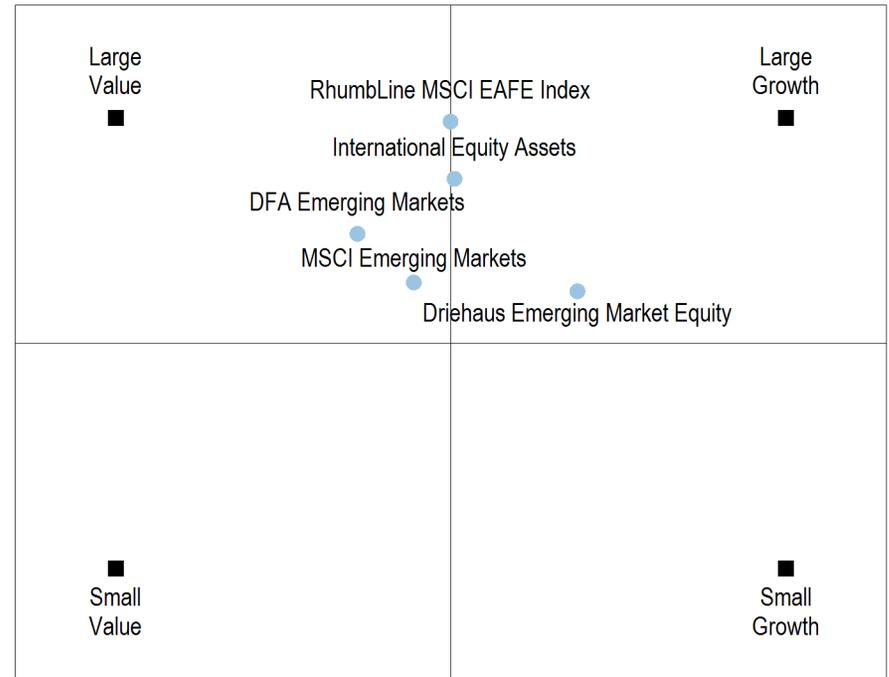
Top 10 Holdings

APPLE INC	4.5%
MICROSOFT CORP	4.3%
AMAZON.COM INC	1.7%
NVIDIA CORPORATION	1.5%
ALPHABET INC	1.4%
ALPHABET INC	1.4%
BERKSHIRE HATHAWAY INC	1.0%
META PLATFORMS INC	1.0%
UNITEDHEALTH GROUP INCORPORATED	1.0%
TESLA INC	0.8%
Total	18.6%

Asset Allocation on September 30, 2023

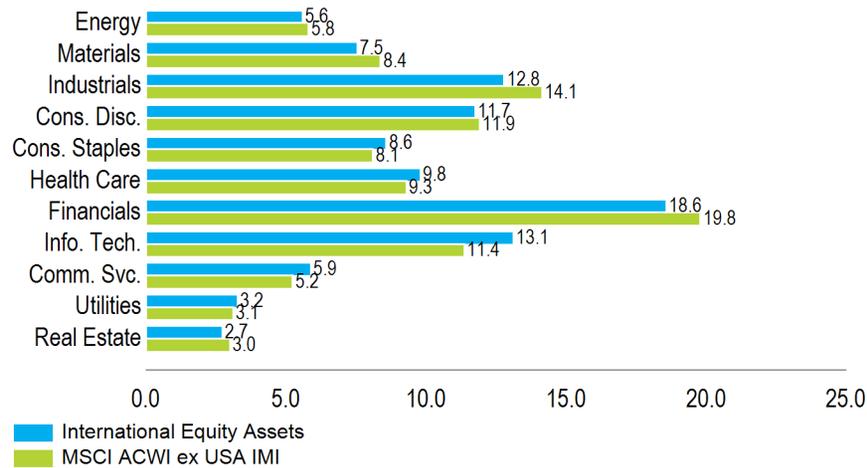
	Actual	Actual
DFA Emerging Markets	\$10,988,253	21.9%
Driehaus Emerging Market Equity	\$9,646,103	19.2%
RhumbLine MSCI EAFE Index	\$29,568,871	58.9%
Total	\$50,203,228	100.0%

International Equity Assets Style Map 3 Years Ending September 30, 2023



International Equity Characteristics			
	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	50.2	--	46.1
Number Of Holdings	7323	6730	7289
Characteristics			
Weighted Avg. Market Cap. (\$B)	87.4	73.8	93.6
Median Market Cap (\$B)	0.8	1.6	0.7
P/E Ratio	13.0	13.5	13.1
Yield	3.4	3.4	3.3
EPS Growth - 5 Yrs.	11.0	9.7	11.3
Price to Book	2.4	2.3	2.5

Sector Allocation (%) vs MSCI ACWI ex USA IMI



Top 10 Holdings

SAMSUNG ELECTRONICS CO LTD	1.6%
TENCENT HOLDINGS LTD	1.6%
NESTLE SA, CHAM UND VEVEY	1.3%
NOVO NORDISK A/S	1.2%
TAIWAN SEMICONDUCTOR MANUFACTURING CO LTD	1.2%
ASML HOLDING NV	1.0%
SHELL PLC	0.9%
LVMH MOET HENNESSY LOUIS VUITTON SE	0.8%
ASTRAZENECA PLC	0.8%
NOVARTIS AG	0.8%
Total	11.2%

Country Allocation Report

As of 9/30/2023

Region	% of Total	% of Bench	% Diff
North America ex U.S.	0.4%	7.5%	-7.1%
United States	1.4%	0.0%	1.4%
Europe Ex U.K.	32.5%	30.6%	1.9%
United Kingdom	7.3%	9.8%	-2.4%
Pacific Basin Ex Japan	8.5%	7.5%	0.9%
Japan	13.8%	15.6%	-1.8%
Emerging Markets	35.3%	28.1%	7.2%
Other	0.9%	0.9%	0.0%
Total	100.0%	100.0%	0.0%

International Equity Country Allocation

vs MSCI ACWI ex USA IMI

Country	% of Total	% of Bench	% Diff
ARGENTINA	0.2%	0.0%	0.2%
AUSTRALIA	4.2%	4.9%	-0.8%
AUSTRIA	0.1%	0.2%	-0.1%
BAHRAIN	0.0%	0.0%	0.0%
BANGLADESH	0.0%	0.0%	0.0%
BELGIUM	0.5%	0.7%	-0.2%
BRAZIL	2.6%	1.5%	1.1%
CANADA	0.4%	7.5%	-7.1%
CHILE	0.1%	0.2%	0.0%
CHINA	7.1%	7.6%	-0.5%
COLOMBIA	0.0%	0.0%	0.0%
CROATIA	0.0%	0.0%	0.0%
CZECH REPUBLIC	0.0%	0.0%	0.0%
DENMARK	2.0%	2.0%	0.0%
EGYPT	0.0%	0.0%	0.0%
ESTONIA	0.0%	0.0%	0.0%
FINLAND	0.7%	0.6%	0.1%
FRANCE	6.7%	7.0%	-0.3%
GERMANY	4.9%	5.0%	-0.2%
GREECE	0.3%	0.1%	0.2%
HONG KONG	3.2%	1.4%	1.8%
HUNGARY	0.0%	0.1%	0.0%
INDIA	7.3%	4.9%	2.4%
INDONESIA	1.0%	0.6%	0.4%

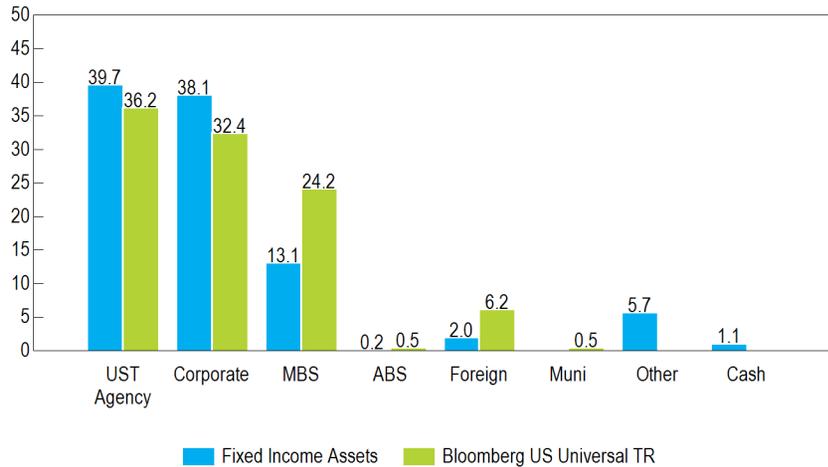
Country	% of Total	% of Bench	% Diff
IRELAND	0.7%	0.3%	0.4%
ISRAEL	0.2%	0.6%	-0.4%
ITALY	1.4%	1.8%	-0.4%
JAPAN	13.8%	15.6%	-1.8%
JORDAN	0.0%	0.0%	0.0%
KAZAKHSTAN	0.0%	0.0%	0.0%
KENYA	0.0%	0.0%	0.0%
KOREA	4.3%	3.5%	0.7%
KUWAIT	0.0%	0.2%	-0.2%
LEBANON	0.0%	0.0%	0.0%
LITHUANIA	0.0%	0.0%	0.0%
LUXEMBOURG	0.4%	0.0%	0.4%
MALAYSIA	0.3%	0.4%	-0.1%
MAURITIUS	0.0%	0.0%	0.0%
MEXICO	1.6%	0.7%	0.9%
MOROCCO	0.0%	0.0%	0.0%
NETHERLANDS	4.7%	2.5%	2.2%
NEW ZEALAND	0.2%	0.2%	0.0%
NIGERIA	0.0%	0.0%	0.0%
NORWAY	0.4%	0.6%	-0.2%
OMAN	0.0%	0.0%	0.0%
OTHER	0.4%	0.0%	0.4%
PAKISTAN	0.0%	0.0%	0.0%
PERU	0.1%	0.1%	0.1%
PHILIPPINES	0.3%	0.2%	0.2%
POLAND	0.2%	0.2%	0.0%
PORTUGAL	0.1%	0.1%	0.0%

Country	% of Total	% of Bench	% Diff
QATAR	0.3%	0.3%	0.0%
ROMANIA	0.0%	0.0%	0.0%
SAUDI ARABIA	1.2%	1.2%	0.1%
SERBIA	0.0%	0.0%	0.0%
SINGAPORE	0.9%	1.0%	-0.1%
SLOVENIA	0.0%	0.0%	0.0%
SOUTH AFRICA	0.8%	0.9%	-0.1%
SPAIN	1.8%	1.6%	0.2%
SRI LANKA	0.0%	0.0%	0.0%
SWEDEN	1.7%	2.2%	-0.5%
SWITZERLAND	6.2%	5.9%	0.3%
TAIWAN	6.0%	4.5%	1.5%
THAILAND	0.7%	0.6%	0.1%
TUNISIA	0.0%	0.0%	0.0%
TURKEY	0.5%	0.3%	0.2%
UNITED ARAB EMIRATES	0.9%	0.4%	0.5%
UNITED KINGDOM	7.3%	9.8%	-2.4%
UNITED STATES	1.4%	0.0%	1.4%
VIETNAM	0.0%	0.0%	0.0%
Total	100.0%	100.0%	0.0%

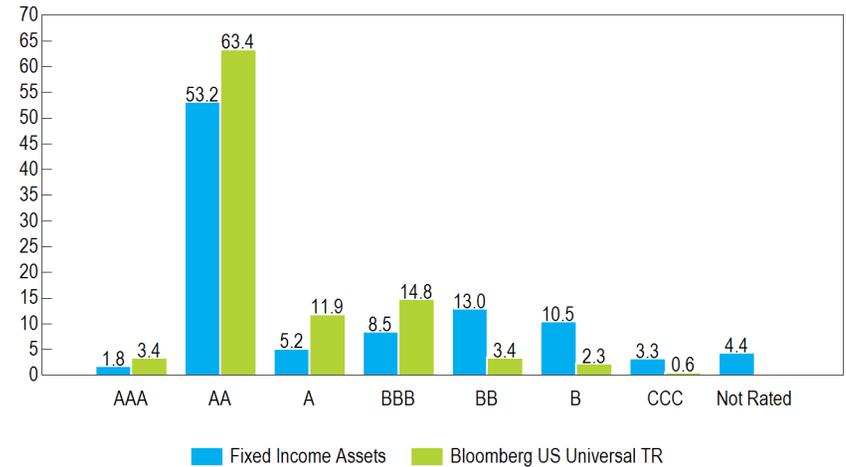
Asset Allocation on September 30, 2023		
	Actual	Actual
Payden Emerging Market Bond	\$4,758,984	8.1%
Shenkman Capital	\$18,041,307	30.8%
SSgA TIPS Index-NL	\$11,195,881	19.1%
SSgA U.S. Aggregate Bond Index	\$24,506,702	41.9%
Total	\$58,502,874	100.0%

Fixed Income Characteristics vs. Bloomberg US Universal TR			
	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Fixed Income Characteristics			
Yield to Maturity	6.3	5.7	6.2
Average Duration	4.9	5.8	5.1
Average Quality	A	A	A
Weighted Average Maturity	8.1	8.2	7.6

Sector Allocation



Credit Quality Allocation



Portfolio Reviews

Account Information

Account Name	RhumbLine S&P 500 Index
Account Structure	Commingled Fund
Investment Style	Passive
Inception Date	3/01/99
Account Type	US Equity
Benchmark	S&P 500
Universe	eV US Passive S&P 500 Equity Net

Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
RhumbLine S&P 500 Index	-3.3	21.6	10.1	9.9	11.9	7.2	Mar-99
S&P 500	-3.3	21.6	10.1	9.9	11.9	7.2	Mar-99

Top 10 Holdings

APPLE INC	7.0%
MICROSOFT CORP	6.5%
AMAZON.COM INC	3.2%
NVIDIA CORPORATION	3.0%
ALPHABET INC	2.1%
TESLA INC	1.9%
META PLATFORMS INC	1.8%
ALPHABET INC	1.8%
BERKSHIRE HATHAWAY INC	1.8%
EXXON MOBIL CORP	1.3%
Total	30.4%

RhumbLine S&P 500 Index Equity Characteristics vs S&P 500

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	23.4	--	24.8
Number Of Holdings	504	503	503
Characteristics			
Weighted Avg. Market Cap. (\$B)	623.2	626.7	673.4
Median Market Cap (\$B)	30.4	30.4	31.3
P/E Ratio	22.0	22.1	23.8
Yield	1.7	1.6	1.6
EPS Growth - 5 Yrs.	16.7	16.7	16.2
Price to Book	4.2	4.2	4.5
Sector Distribution			
Energy	4.7	4.6	4.1
Materials	2.4	2.4	2.5
Industrials	8.2	8.2	8.5
Consumer Discretionary	10.6	11.0	10.6
Consumer Staples	6.5	7.1	6.6
Health Care	13.2	13.1	13.2
Financials	13.4	13.0	12.9
Information Technology	27.3	27.0	28.1
Communication Services	8.8	9.1	8.3
Utilities	2.3	2.3	2.5
Real Estate	2.4	2.3	2.4

RhumbLine HEDI | As of September 30, 2023

Account Information	
Account Name	RhumbLine HEDI
Account Structure	Separate Account
Investment Style	Passive
Inception Date	11/01/20
Account Type	US Equity
Benchmark	Russell 1000 HEDI Moderate GR USD
Universe	eV US Large Cap Core Equity Gross

Portfolio Performance Summary							
	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
RhumbLine HEDI	-3.4	20.4	--	--	--	10.5	Nov-20
Russell 1000 HEDI Moderate GR USD	-3.4	20.7	9.4	10.8	12.9	10.6	Nov-20

Top 10 Holdings	
APPLE INC	6.3%
MICROSOFT CORP	6.2%
ALPHABET INC	2.2%
ALPHABET INC	2.0%
AMAZON.COM INC	1.7%
UNITEDHEALTH GROUP INCORPORATED	1.5%
NVIDIA CORPORATION	1.5%
BERKSHIRE HATHAWAY INC	1.3%
VISA INC	1.3%
MASTERCARD INC	1.3%
Total	25.2%

Rhumbline HEDI Characteristics		
	Portfolio Q3-23	Portfolio Q2-23
Market Value		
Market Value (\$M)	23.3	24.8
Number Of Holdings	226	222
Characteristics		
Weighted Avg. Market Cap. (\$B)	530.9	549.1
Median Market Cap (\$B)	33.6	37.2
P/E Ratio	23.9	26.0
Yield	1.6	1.5
EPS Growth - 5 Yrs.	15.8	15.3
Price to Book	5.0	5.3
Sector Distribution		
Energy	1.4	1.0
Materials	2.8	2.5
Industrials	17.3	18.0
Consumer Discretionary	9.3	8.8
Consumer Staples	10.9	13.0
Health Care	13.2	11.3
Financials	13.3	12.4
Information Technology	22.4	22.5
Communication Services	7.8	8.9
Utilities	0.2	0.2
Real Estate	1.5	1.4

Russell 1000 HEDI benchmark characteristic data is unavailable.

Frontier Capital Appreciation | As of September 30, 2023

Account Information

Account Name	Frontier Capital Appreciation
Account Structure	Commingled Fund
Investment Style	Active
Inception Date	2/01/13
Account Type	US Equity
Benchmark	Russell 2500 Growth
Universe	eV US Small-Mid Cap Growth Equity Net

Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Frontier Capital Appreciation	-6.8	22.5	11.7	5.5	8.6	10.1	Feb-13
<i>Russell 2500 Growth</i>	-6.8	10.6	1.0	4.0	8.4	9.8	Feb-13

Top 10 Holdings

JABIL INC	2.6%
ARRAY TECHNOLOGIES INC	1.9%
ATI INC	1.8%
MRC GLOBAL INC	1.8%
BEACON ROOFING SUPPLY INC	1.7%
XPO INC	1.7%
BANCORP INC (THE)	1.7%
PERMIAN RESOURCES CORP	1.5%
CAESARS ENTERTAINMENT INC	1.5%
AZUL SA	1.4%
Total	17.6%

Frontier Capital Appreciation Characteristics

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	22.1	--	23.7
Number Of Holdings	141	1278	136
Characteristics			
Weighted Avg. Market Cap. (\$B)	7.7	6.0	8.4
Median Market Cap (\$B)	5.0	1.6	4.9
P/E Ratio	17.1	21.9	18.9
Yield	0.7	0.8	0.6
EPS Growth - 5 Yrs.	21.6	17.9	22.1
Price to Book	2.6	4.5	2.9
Sector Distribution			
Energy	4.3	5.2	3.4
Materials	8.9	3.6	10.0
Industrials	28.2	19.3	27.3
Consumer Discretionary	10.5	12.9	11.0
Consumer Staples	0.5	3.9	0.5
Health Care	11.6	20.4	12.1
Financials	8.5	8.7	8.3
Information Technology	20.4	21.4	18.7
Communication Services	2.4	2.0	2.7
Utilities	0.0	1.1	0.0
Real Estate	1.6	1.4	1.4

Account Information	
Account Name	RhumbLine MSCI EAFE Index
Account Structure	Commingled Fund
Investment Style	Passive
Inception Date	8/01/14
Account Type	Non-US Stock Developed
Benchmark	MSCI EAFE
Universe	eV EAFE All Cap Equity Net

Rhumbline MSCI EAFE Index Characteristics			
	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	29.6	--	26.9
Number Of Holdings	778	795	781
Characteristics			
Weighted Avg. Market Cap. (\$B)	83.0	81.8	87.8
Median Market Cap (\$B)	11.8	12.1	12.3
P/E Ratio	14.1	13.9	14.9
Yield	3.5	3.5	3.2
EPS Growth - 5 Yrs.	8.4	8.4	8.7
Price to Book	2.4	2.4	2.5

Portfolio Performance Summary							
	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
RhumbLine MSCI EAFE Index	-4.0	25.7	6.0	3.5	--	3.4	Aug-14
MSCI EAFE	-4.1	25.6	5.8	3.2	3.8	3.2	Aug-14

Sector Distribution			
Energy	4.9	4.8	4.2
Materials	7.3	7.5	7.3
Industrials	15.9	16.0	16.2
Consumer Discretionary	12.1	12.0	12.7
Consumer Staples	9.6	9.8	9.8
Health Care	13.3	13.4	13.2
Financials	19.2	19.1	18.3
Information Technology	7.6	7.7	8.1
Communication Services	4.1	4.1	4.2
Utilities	3.4	3.4	3.5
Real Estate	2.3	2.3	2.3

Top 10 Holdings	
NESTLE SA, CHAM UND VEVEY	2.1%
NOVO NORDISK A/S	2.1%
ASML HOLDING NV	1.6%
SHELL PLC	1.5%
LVMH MOET HENNESSY LOUIS VUITTON SE	1.4%
ASTRAZENECA PLC	1.4%
NOVARTIS AG	1.4%
ROCHE HOLDING AG	1.3%
TOYOTA MOTOR CORP	1.3%
HSBC HOLDINGS PLC	1.1%
Total	15.2%

Account Information

Account Name	DFA Emerging Markets
Account Structure	Mutual Fund
Investment Style	Active
Inception Date	1/01/15
Account Type	Non-US Stock Emerging
Benchmark	MSCI Emerging Markets
Universe	eV Emg Mkts All Cap Equity Net

Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
DFA Emerging Markets	-1.5	18.3	4.7	3.2	--	3.8	Jan-15
MSCI Emerging Markets	-2.9	11.7	-1.7	0.6	2.1	2.4	Jan-15

Top 10 Holdings

TAIWAN SEMICONDUCTOR MANUFACTURING CO LTD	2.9%
SAMSUNG ELECTRONICS CO LTD	2.8%
TENCENT HOLDINGS LTD	2.6%
ALIBABA GROUP HOLDING LTD	1.3%
TAIWAN SEMICONDUCTOR MANUFACTURING CO LTD	1.2%
SK HYNIX INC	0.7%
CHINA CONSTRUCTION BANK CORP	0.7%
ALIBABA GROUP HOLDING LTD	0.6%
PETROLEO BRASILEIRO S.A.- PETROBRAS	0.6%
INFOSYS LTD	0.6%
Total	14.0%

DFA Emerging Markets Characteristics

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	11.0	--	10.2
Number Of Holdings	6522	1437	6486
Characteristics			
Weighted Avg. Market Cap. (\$B)	64.9	103.6	71.3
Median Market Cap (\$B)	0.5	6.7	0.5
P/E Ratio	11.2	12.5	10.8
Yield	3.7	3.2	3.9
EPS Growth - 5 Yrs.	13.5	13.0	14.0
Price to Book	2.2	2.4	2.2
Sector Distribution			
Energy	5.4	5.2	5.2
Materials	11.4	8.0	11.8
Industrials	10.0	6.7	9.7
Consumer Discretionary	11.6	13.7	11.3
Consumer Staples	6.2	6.2	6.2
Health Care	4.5	3.8	4.3
Financials	17.4	22.2	16.9
Information Technology	19.6	20.2	20.8
Communication Services	7.3	9.6	7.2
Utilities	2.9	2.6	3.0
Real Estate	2.8	1.7	2.9

Account Information

Account Name	Driehaus Emerging Market Equity
Account Structure	Commingled Fund
Investment Style	Active
Inception Date	1/01/15
Account Type	Non-US Stock Emerging
Benchmark	MSCI Emerging Markets
Universe	eV Emg Mkts All Cap Equity Net

Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Driehaus Emerging Market Equity	-2.9	7.2	-2.2	3.3	--	4.4	Jan-15
MSCI Emerging Markets	-2.9	11.7	-1.7	0.6	2.1	2.4	Jan-15

Top 10 Holdings

SAMSUNG ELECTRONICS CO LTD	5.4%
TENCENT HOLDINGS LTD	5.4%
TAIWAN SEMICONDUCTOR MANUFACTURING CO LTD	5.2%
ICICI BANK LTD	2.5%
PT BANK MANDIRI (PERSERO) TBK	2.1%
DELTA ELECTRONICS INC	2.0%
SK HYNIX INC	1.7%
TRIP COM GROUP LTD	1.6%
GPO FINANCE BANORTE	1.6%
LARSEN AND TOUBRO LTD	1.5%
Total	28.9%

Driehaus Emerging Market Equity Characteristics

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Market Value			
Market Value (\$M)	9.6	--	9.0
Number Of Holdings	121	1437	114
Characteristics			
Weighted Avg. Market Cap. (\$B)	129.4	103.6	136.8
Median Market Cap (\$B)	16.4	6.7	17.1
P/E Ratio	13.2	12.5	12.8
Yield	2.7	3.2	2.9
EPS Growth - 5 Yrs.	16.9	13.0	16.5
Price to Book	2.4	2.4	2.6
Sector Distribution			
Energy	8.1	5.2	7.3
Materials	3.3	8.0	2.0
Industrials	5.9	6.7	6.5
Consumer Discretionary	10.9	13.7	10.8
Consumer Staples	8.3	6.2	7.9
Health Care	4.7	3.8	4.5
Financials	18.1	22.2	20.6
Information Technology	23.1	20.2	21.9
Communication Services	9.7	9.6	8.9
Utilities	3.3	2.6	3.5
Real Estate	3.8	1.7	2.4

Account Information

Account Name	SSgA U.S. Aggregate Bond Index
Account Structure	Commingled Fund
Investment Style	Passive
Inception Date	5/01/01
Account Type	US Fixed Income Investment Grade
Benchmark	Bloomberg US Aggregate TR
Universe	eV US Core Fixed Inc Net

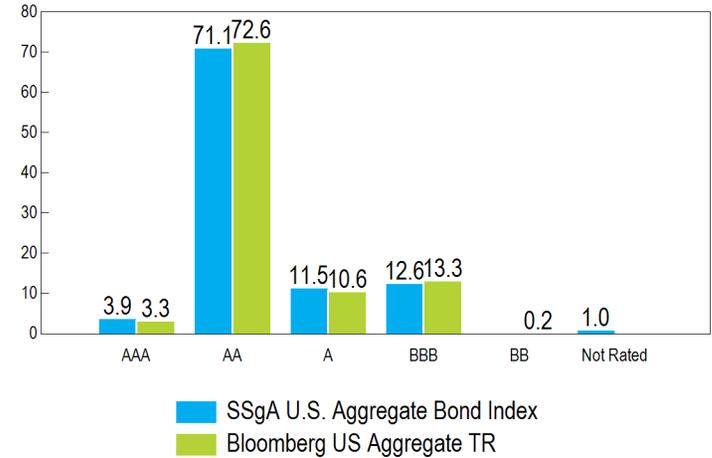
Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
SSgA U.S. Aggregate Bond Index	-3.2	0.6	-5.3	0.0	1.1	3.4	May-01
Bloomberg US Aggregate TR	-3.2	0.6	-5.2	0.1	1.1	3.4	May-01

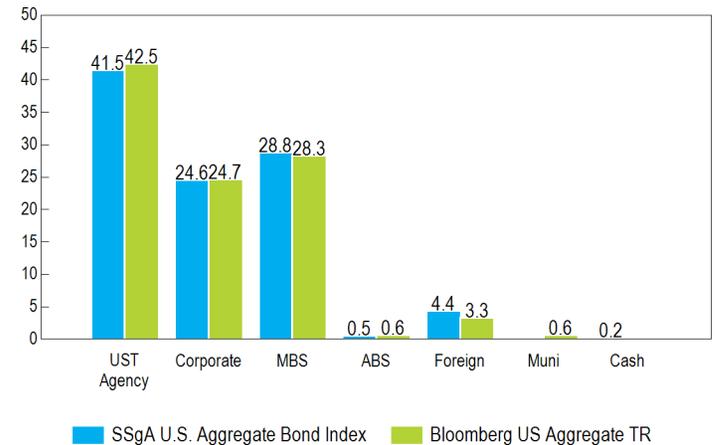
SSgA U.S. Aggregate Bond Index Characteristics vs. Bloomberg US Aggregate TR

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Fixed Income Characteristics			
Yield to Maturity	5.4	5.4	4.8
Average Duration	6.1	5.9	6.3
Average Quality	AA	AA	AA
Weighted Average Maturity	8.6	8.5	8.8

Credit Quality Allocation



Sector Allocation



Shenkman Capital | As of September 30, 2023

Account Information

Account Name	Shenkman Capital
Account Structure	Commingled Fund
Investment Style	Active
Inception Date	4/01/06
Account Type	US Fixed Income High Yield
Benchmark	Bloomberg US High Yield TR
Universe	eV US High Yield Fixed Inc Net

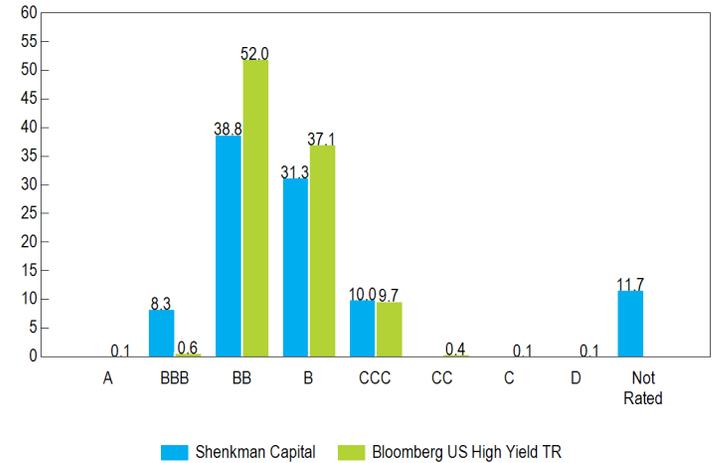
Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Shenkman Capital	0.7	10.3	2.2	3.3	4.1	5.7	Apr-06
Bloomberg US High Yield TR	0.5	10.3	1.8	3.0	4.2	6.2	Apr-06

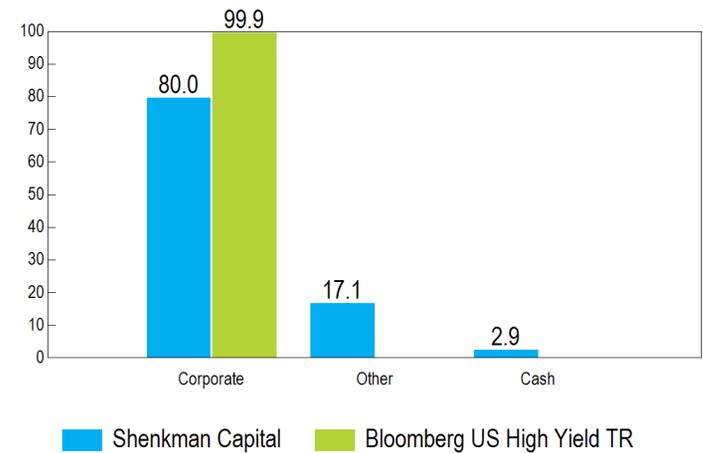
Shenkman Capital Characteristics vs. Bloomberg US High Yield TR

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Fixed Income Characteristics			
Yield to Maturity	8.3	8.9	8.0
Average Duration	3.1	3.9	3.3
Average Quality	BB	B	BB
Weighted Average Maturity	--	5.0	4.9

Credit Quality Allocation



Sector Allocation



SSgA TIPS Index-NL | As of September 30, 2023

Account Information

Account Name	SSgA TIPS Index-NL
Account Structure	Commingled Fund
Investment Style	Passive
Inception Date	10/01/05
Account Type	US Inflation Protected Fixed
Benchmark	Bloomberg US TIPS TR
Universe	eV US TIPS / Inflation Fixed Inc Net

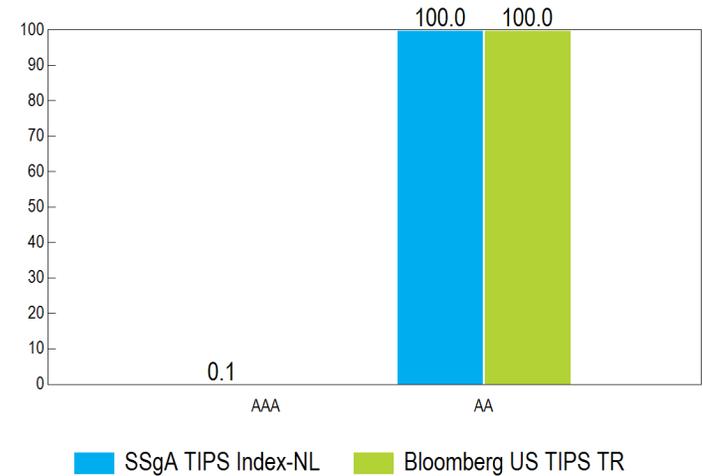
Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
SSgA TIPS Index-NL	-2.6	1.1	-2.1	2.0	1.7	3.1	Oct-05
Bloomberg US TIPS TR	-2.6	1.2	-2.0	2.1	1.7	3.2	Oct-05

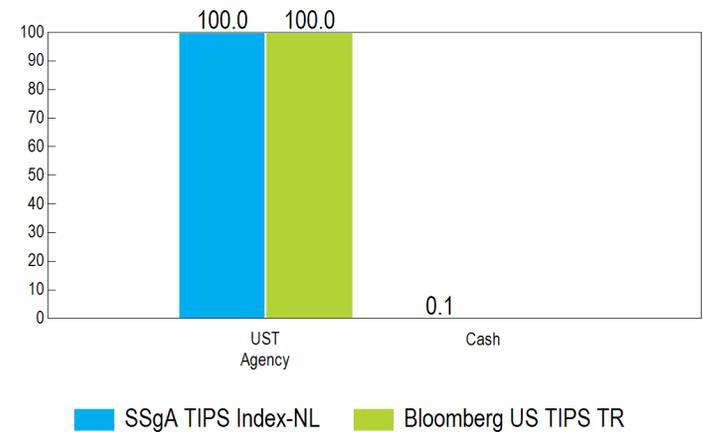
SSgA TIPS Index-NL Characteristics vs. Bloomberg US TIPS TR

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Fixed Income Characteristics			
Yield to Maturity	5.0	4.8	4.6
Average Duration	5.0	6.5	4.5
Average Quality	AAA	AA	AAA
Weighted Average Maturity	7.1	7.1	7.2

Credit Quality Allocation



Sector Allocation



Account Information

Account Name	Payden Emerging Market Bond
Account Structure	Mutual Fund
Investment Style	Active
Inception Date	1/01/15
Account Type	International Emerging Market Debt
Benchmark	JP Morgan EMBI Global Diversified
Universe	

Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Payden Emerging Market Bond	-2.7	12.5	-3.9	-0.3	--	1.8	Jan-15
JP Morgan EMBI Global Diversified	-2.2	10.0	-4.6	-0.4	2.5	1.8	Jan-15

Fund Characteristics as of June 30, 2023

Versus JP Morgan EMBI Global Diversified

Sharpe Ratio (3 Year)	-0.3
Average Duration	6.9
Average Coupon	5.8%
Average Effective Maturity	11.9
R-Squared (3 Year)	1.0
Alpha (3 Year)	0.1%
Beta (3 Year)	1.1

Payden Emerging Market Bond Characteristics vs. JP Morgan EMBI Global Diversified

	Portfolio Q3-23	Index Q3-23	Portfolio Q2-23
Fixed Income Characteristics			
Yield to Maturity	10.3	8.6	9.7
Average Duration	6.7	6.5	6.9
Average Quality	BB	BB	BB
Weighted Average Maturity	12.1	11.3	11.9

Fixed Income Sectors as of June 30, 2023

GOVERNMENT	59.6%
MUNICIPAL	0.0%
CORPORATE	11.3%
SECURITIZED	0.2%
CASH & EQUIVALENTS	6.1%
DERIVATIVE	22.8%

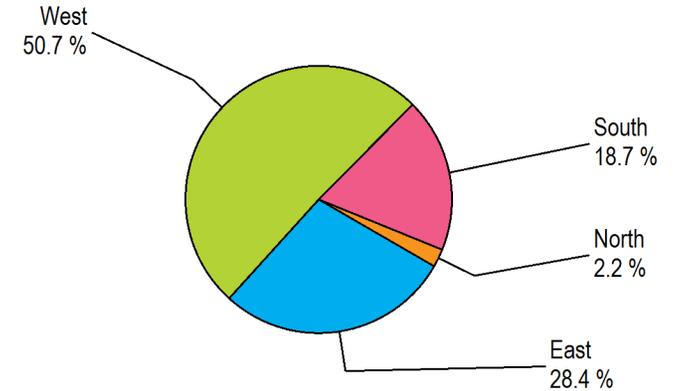
Credit Quality as of June 30, 2023

AAA	4.0%
AA	4.0%
A	7.0%
BBB	32.0%
BB	28.0%
B	15.0%
Below B	9.0%
Not Rated	1.0%

Account Information

Account Name	Clarion Partners
Account Structure	Commingled Fund
Investment Style	Active
Inception Date	10/01/02
Account Type	Real Estate
Benchmark	NCREIF ODCE
Universe	

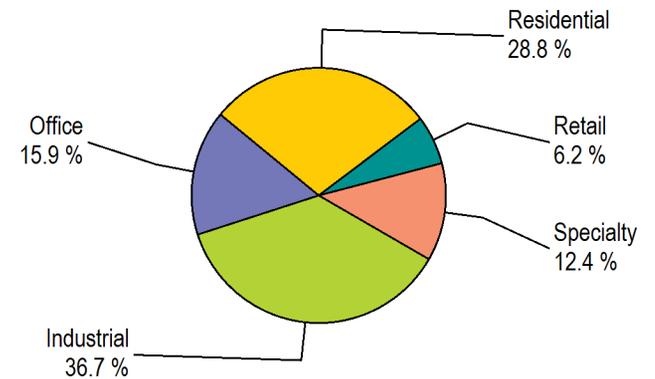
Geographic Diversification



Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Clarion Partners	-2.0	-16.9	6.5	5.6	8.4	7.0	Oct-02
NCREIF ODCE	-1.9	-12.1	7.1	5.7	8.2	7.7	Oct-02

Property Type Allocation



Clarion Partners characteristics are as of 9/30/2023.

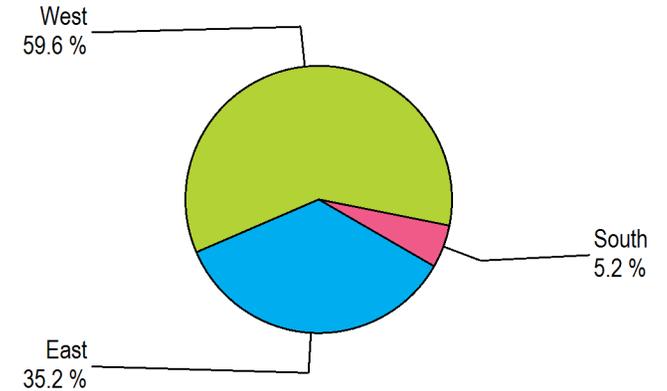
Account Information

Account Name	Rockwood Capital Real Estate Partners Fund XI, L.P.
Account Structure	Other
Investment Style	Passive
Inception Date	12/01/19
Account Type	Real Estate
Benchmark	NCREIF-ODCE
Universe	

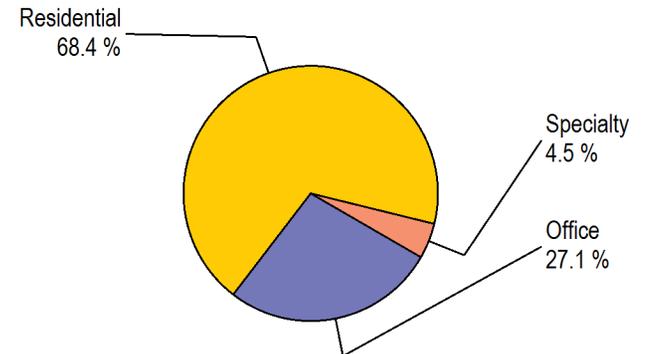
Portfolio Performance Summary

	QTD (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Rockwood Capital Real Estate Partners Fund XI, L.P.	-6.3	-8.9	4.3	--	--	3.3	Dec-19
NCREIF-ODCE	-1.9	-12.1	7.1	5.7	8.2	5.9	Dec-19

Geographic Diversification



Property Type Allocation



Rockwood Real Estate characteristics are as of 6/30/2023.

Non-Marketable Securities Overview						
As of September 30, 2023						
Account	Vintage Year	Commitment	Cumulative Takedown	Cumulative Distributions	Value (RV)	IRR (%)
North American Strategic Partners 2006	2006	\$4,539,998	\$4,411,659	\$2,094,251	\$14,091	6.4
Ironsides Partnership Fund IV	2015	\$2,500,000	\$1,544,324	\$1,609,619	\$2,550,424	29.6
Ironsides Direct Investment Fund IV	2015	\$2,500,000	\$2,419,534	\$3,126,965	\$1,294,237	15.5
Ironsides Partnership Fund V, L.P.	2019	\$2,000,000	\$1,525,955	\$0	\$2,172,398	25.0
Ironsides Direct Investment Fund V, L.P.	2019	\$2,000,000	\$2,730,292	\$436,888	\$3,304,376	17.7
HarbourVest 2019 Global Fund	2019	\$4,000,000	\$2,747,632	\$564,538	\$3,734,816	26.4
Total Account		\$17,539,998	\$15,379,396	\$3,643,758	\$13,070,341	

IRRs are as of 6/30/2023. Exceptions include North American Strategic Partners 2006 which is as of 12/31/2022.

Non-Marketable Securities Overview							
As of September 30, 2023							
Account Type	Account	Vintage Year	Commitment	Cumulative Takedown	Cumulative Distributions	Value (RV)	IRR (%)
Private Debt	NB Private Debt Fund IV	2021	\$5,000,000	\$4,250,000	\$1,200,822	\$3,538,542	--
	Total Account		\$5,000,000	\$4,250,000	\$1,200,822	\$3,538,542	

IRRs for investments less than 2 years are not shown.

Annual Investment Expense Analysis				
As Of September 30, 2023				
Name	Fee Schedule	Market Value	Estimated Fee Value	Estimated Fee
Equity Assets		\$119,019,357		
Domestic Equity Assets		\$68,816,129		
RhumbLine S&P 500 Index	0.07% of First 25.0 Mil, 0.05% of Next 25.0 Mil, 0.04% Thereafter	\$23,410,333	\$16,387	0.07%
Frontier Capital Appreciation	0.79% of Assets	\$22,077,857	\$174,415	0.79%
RhumbLine HEDI	0.05% of Assets	\$23,327,939	\$11,664	0.05%
International Equity Assets		\$50,203,228		
International Developed Markets Equity Assets		\$29,568,871		
RhumbLine MSCI EAFE Index	0.08% of First 25.0 Mil, 0.07% of Next 25.0 Mil, 0.05% Thereafter	\$29,568,871	\$23,198	0.08%
International Emerging Markets Equity Assets		\$20,634,357		
DFA Emerging Markets	0.39% of Assets	\$10,988,253	\$42,854	0.39%
Driehaus Emerging Market Equity	0.90% of Assets	\$9,646,103	\$86,815	0.90%
Fixed Income Assets		\$58,502,874		
Investment Grade Bonds Assets		\$24,506,702		
SSgA U.S. Aggregate Bond Index	0.04% of Assets	\$24,506,702	\$9,803	0.04%
High Yield Bond Assets		\$18,041,307		
Shenkman Capital	0.45% of Assets	\$18,041,307	\$81,186	0.45%
TIPS Assets		\$11,195,881		
SSgA TIPS Index-NL	0.04% of Assets	\$11,195,881	\$4,478	0.04%
Emerging Market Debt Assets		\$4,758,984		
Payden Emerging Market Bond	0.69% of Assets	\$4,758,984	\$32,837	0.69%
Real Estate Assets		\$9,945,871		
Open-Ended Real Estate		\$6,207,400		
Clarion Partners	1.10% of Assets	\$6,207,400	\$68,281	1.10%

Name	Fee Schedule	Market Value	Estimated Fee Value	Estimated Fee
Total Closed End Real Estate		\$3,738,471		
Rockwood Capital Real Estate Partners Fund XI, L.P.	1.4% of committed capital during investment period; 1.4% on invested equity thereafter	\$3,738,471		
Private Equity Assets		\$13,070,341		
North American Strategic Partners 2006	0.8% on drawn and undrawn capital less investments sold or written off 5% carried interest, 8% preferred return	\$14,091		
Ironsides Partnership Fund IV	0% Management fee, 8% Preferred Return, 5% Carried Interest	\$2,550,424		
Ironsides Direct Investment Fund IV	0.5% Management fee, 8% Preferred Return, 15% Carried Interest	\$1,294,237		
Ironsides Partnership Fund V, L.P.		\$2,172,398		
Ironsides Direct Investment Fund V, L.P.	0.5% Management fee, 8% preferred return, 15% carried interest	\$3,304,376		
HarbourVest 2019 Global Fund	0.69% average annual management fee; 8.0% preferred return on secondary and direct investments and with corresponding carried interest of 12.5% on secondary and direct investments	\$3,734,816		
Private Debt Assets		\$3,538,542		
NB Private Debt Fund IV	1.0% on invested capital	\$3,538,542		
Infrastructure		\$10,866,259		
IFM Global Infrastructure	0.77% Management fee, 8% Preferred Return, 10% Carried Interest	\$10,866,259		
Cash		\$9,956		
EB Temporary Investment Fund		\$9,956		
Total		\$214,953,200	\$551,919	0.26%

Meketa has negotiated a 50% discount on fees for NB Private Debt Fund IV through June 2022. After June 2022, depending on Meketa's aggregate investment, the fee will become 0.7% or return to 1%.

Current Issues

Asset Allocation Discussion

Introduction

Introduction

- This document evaluates the current asset allocation policy and presents alternative asset allocation options for the System.
- We provide various approaches to assessing risk in order to provide a “mosaic” of the risks faced by the System.
- The goal of this review is not to declare one portfolio the “right” choice or the only prudent choice, but to highlight the risk and return tradeoffs of different policy portfolios.
- This year’s asset allocation review differs from other recent years’ reviews due to the vast change in market- circumstances, primarily the large increase in interest rates during 2022.
 - The abrupt increase of investment grade yields alongside relatively consistent credit spreads has meaningfully increased long-term expected returns across fixed income instruments.
 - As a result, pension investors seeking mid-to-high single digit levels of nominal return are able to realistically consider lower equity asset allocations for the first time in over a decade.

Asset Allocation Overview

Mean Variance Optimization

- MVO is the traditional starting point for determining asset allocation.
- MVO mathematically determines an “efficient frontier” of policy portfolios with the highest risk-adjusted returns.
- All asset classes exhibit only three characteristics, which serve as inputs to the model:
 - Expected return
 - Expected volatility
 - Expected covariance with all other assets
- The model assumes:
 - Normal return distribution
 - Stable volatility and covariances over time
 - Returns are not serially correlated
- The MVO model tends to underestimate the risks of large negative events.

Proposed Policy Options

Asset Allocation Policy Options¹

	Current Policy (%)	Actual Allocation (%)	Option A (%)	Option B (%)	Option C (%)
Growth/Equity	55	61	60	60	65
US Equity	17	34	15	10	10
US Small Cap	0	0	5	5	10
Developed Market Equity (non-US)	14	12	15	15	15
Developed Market Small Cap	0	0	5	5	5
Emerging Market Equity	14	9	10	10	10
Private Equity	10	6	10	15	15
Credit	15	11	18	18	15
High Yield Bonds	5	8	5	5	5
Private Debt	8	1	8	8	5
Emerging Market Bonds (major)	2	2	5	5	5
Rate Sensitive	10	18	12	12	10
Investment Grade Bonds	5	12	7	7	5
TIPS	5	5	5	5	5
Real Assets	20	10	10	10	10
Real Estate	10	5	5	5	5
Infrastructure (Core Private)	10	5	5	5	5
Expected Return (20 years)	9.1	8.5	9.1	9.2	9.3
Standard Deviation	14.3	13.4	14.6	14.9	15.5
Probability of Achieving 7.5% over 20 Years	68.9	63.1	68.3	69.4	69.7

¹ Based upon Meketa Investment Group's 2023 Annual Asset Study for 20 year expected returns, state expected return estimated based on publicly available information. Throughout document, returns for periods longer than one year are annualized.

Review of Proposed Asset Allocation Policies

- The System's expected portfolio return has increased drastically due primarily to an increase in returns for fixed income instruments.
- We prepared portfolios with the following aims in mind:
 - Maintaining expected returns.
 - Maintaining protection against other risks to the portfolio, primarily but not limited to, inflation.
 - Reducing implementation lag for private market asset classes.
 - The asset allocation policies outlined incorporate various changes.
 - Moving toward global equity weight in public equity (contrast with emerging overweight)
 - Increasing public fixed income exposure.
 - Adding dedicated small cap exposure.
 - Decreasing targets to private asset classes with significant implementation lag.
- Ultimately, the three alternative policy portfolios on the previous page were selected for presentation to the Board.

Diversification and Risk Analysis

Diversification

- The primary motive for diversifying a portfolio is to reduce risk.
- Diversification is the sole “free lunch” available to investors. That is, it represents the only way to reduce risk without reducing expected returns.
- Therefore, investments should be allocated across multiple classes of assets, based in part on the expected correlation of their returns.
- Within each asset type, investments should be distributed across strategies and risk factors to further reduce volatility.

Types of Risk Analysis Addressed

→ Risk budgeting¹

- Attributes overall portfolio risks to specific asset classes
- Highlights the source and scale of portfolio-level risk

→ MVO-based risk analytics

- Includes worst-case return expectations and Value at Risk (VaR)²
- Relies on assumptions underlying MVO

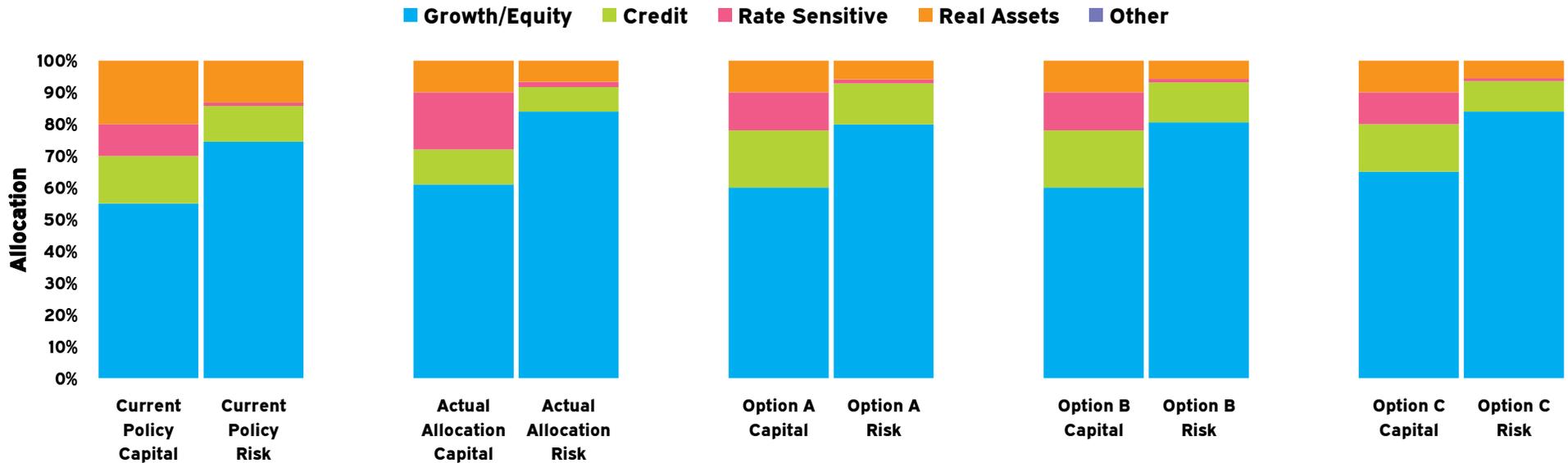
→ Scenario analysis

- Stress tests policy portfolios using actual historical examples
- Stress tests policy portfolios under specific hypothetical scenarios.

¹ Risk budgeting seeks to decompose the aggregate risk of a portfolio into different sources (in this case, by asset class), with risk defined as standard deviation.

² VaR is a risk measure that estimates the maximum loss on a portfolio over a given time horizon and a given confidence level (usually 95% or 99%).

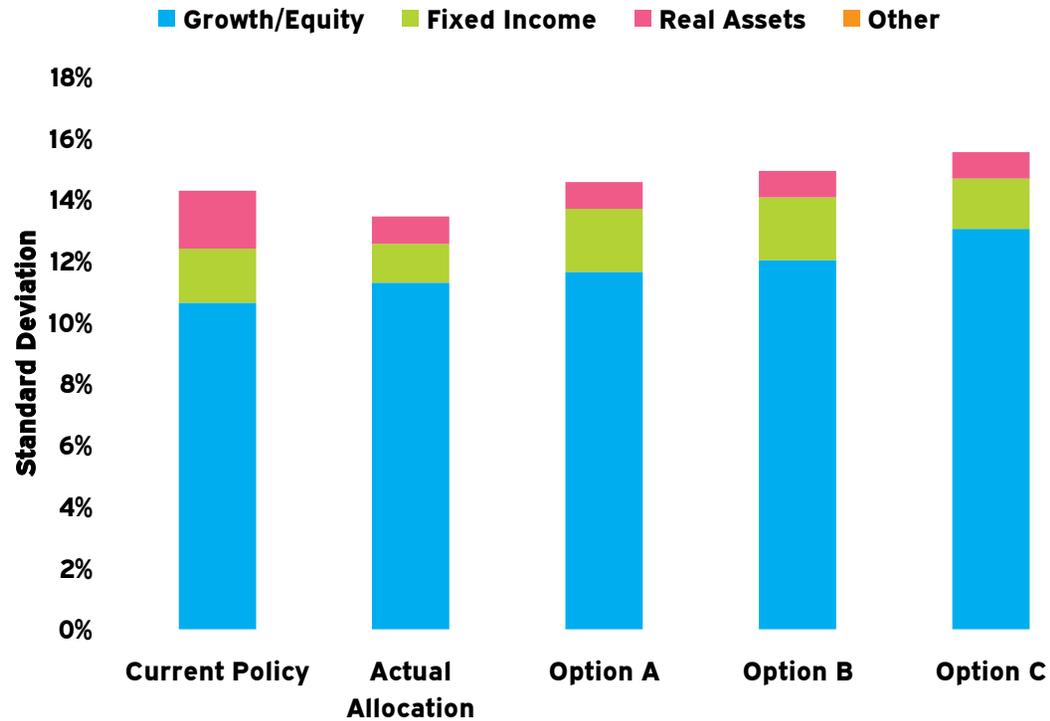
Risk Budgeting Analysis¹ (Capital Allocation vs. Risk Allocation)



→ Assets with low relative volatility, such as rate sensitive fixed income, contribute less to risk than their asset weighting implies.

¹ Risk allocation is calculated by multiplying the weight of the asset class by its standard deviation and its correlation with the total portfolio and then dividing this by the standard deviation of the total portfolio.

Risk Budgeting Analysis¹ (Absolute Contribution to Risk)



In each policy option, equity risk dominates the risk profile of the portfolio.

¹ Contribution to risk is calculated by multiplying the weight of the asset class by its standard deviation and its correlation with the total portfolio.

MPT-Based Risk Analysis

Scenario	Current Policy (%)	Actual Allocation (%)	Option A (%)	Option B (%)	Option C (%)
Worst Case Returns					
One Year (annualized)	-19.3	-18.4	-19.8	-20.2	-21.1
Three Years (annualized)	-8.3	-8.0	-8.7	-8.9	-9.5
Five Years (annualized)	-4.7	-4.5	-5.0	-5.1	-5.6
Ten Years (annualized)	-0.9	-0.9	-1.1	-1.2	-1.5
Twenty Years (annualized)	1.9	1.8	1.8	1.8	1.6
Probability of Experiencing Negative Returns					
One Year	25.2	25.3	25.6	25.8	26.4
Three Years	12.3	12.5	12.8	13.0	13.7
Five Years	6.7	6.9	7.2	7.3	7.9
Ten Years	1.7	1.8	1.9	2.0	2.3
Twenty Years	0.1	0.1	0.2	0.2	0.2
Probability of Achieving at least a 7.5% Return					
One Year	54.4	53.0	54.2	54.5	54.6
Three Years	57.6	55.2	57.3	57.8	57.9
Five Years	59.7	56.6	59.4	60.0	60.2
Ten Years	63.6	59.3	63.1	64.0	64.2
Twenty Years	68.9	63.1	68.3	69.4	69.7

Conditional Value at Risk¹

Scenario	Current Policy	Actual Allocation	Option A	Option B	Option C
CVaR (%):					
1 month	-10.2	-9.6	-10.4	-10.6	-11.1
3 months	-16.5	-15.6	-16.9	-17.4	-18.1
6 months	-21.9	-20.7	-22.5	-23.1	-24.1

→ According to the cVaR model, the Fund could lose roughly 10% in a single month and 22% in 6 months with the current policy.

→ cVar rises in the alternative portfolios due to their higher forecast standard deviation.

Historical Negative Scenario Analysis¹
(Cumulative Return)

Scenario	Current Policy (%)	Actual Allocation (%)	Option A (%)	Option B (%)	Option C (%)
COVID-19 Market Shock (Feb 2020-Mar 2020)	-17.9	-21.3	-20.6	-19.2	-21.0
Taper Tantrum (May - Aug 2013)	-0.7	-0.7	-0.7	-0.5	-0.2
Global Financial Crisis (Oct 2007 - Mar 2009)	-30.2	-30.3	-31.3	-30.4	-32.2
Popping of the TMT Bubble (Apr 2000 - Sep 2002)	-14.4	-18.3	-17.1	-16.3	-18.3
LTCM (Jul - Aug 1998)	-9.3	-10.0	-10.6	-10.0	-11.3
Asian Financial Crisis (Aug 97 - Jan 98)	0.1	0.8	0.3	1.0	0.8
Rate spike (1994 Calendar Year)	0.8	0.2	1.0	1.7	1.4
Early 1990s Recession (Jun - Oct 1990)	-6.7	-8.2	-7.9	-7.1	-8.6
Crash of 1987 (Sep - Nov 1987)	-11.0	-14.2	-12.2	-10.8	-12.5
Strong dollar (Jan 1981 - Sep 1982)	0.3	2.1	-0.9	-1.0	-1.6
Volcker Recession (Jan - Mar 1980)	-3.5	-4.4	-4.7	-4.6	-5.0
Stagflation (Jan 1973 - Sep 1974)	-22.8	-25.0	-24.5	-23.3	-25.6

¹ See the Appendix for our scenario inputs. In periods where the ideal benchmark was not yet available we used the next closest benchmark(s) as a proxy.

Stress Testing: Impact of Market Movements
(Expected Return under Stressed Conditions)¹

Scenario	Current Policy (%)	Actual Allocation (%)	Option A (%)	Option B (%)	Option C (%)
10-year Treasury Bond rates rise 100 bps	4.8	4.5	5.0	5.0	5.4
10-year Treasury Bond rates rise 200 bps	-1.1	-2.0	-1.7	-1.6	-1.6
10-year Treasury Bond rates rise 300 bps	-2.8	-2.5	-3.0	-3.5	-2.5
Baa Spreads widen by 50 bps, High Yield by 200 bps	0.1	0.2	-0.2	-0.1	-0.5
Baa Spreads widen by 300 bps, High Yield by 1000 bps	-23.2	-23.7	-24.4	-23.9	-25.0
Trade Weighted Dollar gains 10%	-5.2	-4.6	-5.8	-5.8	-6.1
Trade Weighted Dollar gains 20%	-2.7	-1.3	-3.4	-3.8	-3.6
US Equities decline 10%	-6.2	-6.6	-6.7	-6.7	-7.2
US Equities decline 25%	-18.5	-18.6	-19.1	-19.0	-20.2
US Equities decline 40%	-28.3	-29.4	-29.6	-28.7	-30.9

→ Each policy portfolio has a different sensitivity to four major risk factors: interest rates, credit spreads, currency fluctuations, and equity values.

→ The Fund’s primary risk factors would continue to be an equity market decline and a widening of credit spreads, no matter the policy.

¹ Assumes that assets not directly exposed to the factor are affected nonetheless. See the Appendix for further details.

Appendices

Setting Capital Market Expectations

Overview of Annual Asset Study Methodology

- In order to construct an optimal portfolio from a risk-return standpoint, conventional financial wisdom dictates that one develop return, volatility, and correlation expectations over the relevant investing horizon.
- Given the uncertainty surrounding financial and economic forecasts, expectations development is challenging, and any of several methodological approaches may meaningfully contribute to this complex task.
- Meketa Investment Group's process relies on both quantitative and qualitative methodologies.
- First, we employ a large set of quantitative models to arrive at a set of baseline expected ten-year annualized returns for major asset classes.
- These models attempt to forecast a gross "beta" return for each public market asset class; that is, we specifically do not model "alpha," nor do we apply an estimate for management fees or other operational expenses.¹
- Our models are fundamentally based (based on some theoretically defined return relationship with current observable factors).
- Some of these models are more predictive than others. For this reason, we next overlay a qualitative analysis, which takes the form of a data-driven deliberation among the research team and our Investment Policy Committee.
- Return assumptions for hard-to-predict asset classes as well as those with limited data will be influenced more heavily by our qualitative analysis.

¹ Our expectations are net of fees where passive management is not available (e.g., private markets and hedge funds).

Overview of Annual Asset Study Methodology (continued)

- As a result of this process, we form our ten-year annualized return expectations, which serve as the primary foundation of our longer-term, twenty-year expectations.
- We form our twenty-year annualized return expectations by systematically considering historical returns on an asset class by asset class level. Specifically, we construct a weighted average of our ten-year expectations and average historical returns in each asset class.
- The weights are determined by a qualitative assessment of the value of the historical data. Generally, if we have little confidence that the historical average return is representative of what an investor can expect,¹ we will weight our ten-year forecast more heavily. Therefore, the weight on our ten-year forecasts ranges from 0.5 to 0.9.
- We develop our twenty-year volatility and correlation expectations differently. We rely primarily on historical averages, with an emphasis given to the experience of the trailing fifteen years.
- Qualitative adjustments, when applied, usually serve to increase the correlations and volatility over and above the historical estimates (e.g., using the higher correlations usually observed during a volatile market).
- We also make adjustments to the volatility based on the historical skewness of each asset class (e.g., increasing the volatility for an asset class that has been negatively skewed).

¹ For example, we have less confidence in historical data that do not capture many possible market scenarios or that are overly polluted by survivorship bias.

Overview of Annual Asset Study Methodology (continued)

- In the case of private markets and other illiquid asset classes where historical volatility and correlations have been artificially dampened, we seek public market equivalents on which to base our estimates before applying any qualitative adjustments.
- These volatility and correlation expectations are then combined with our twenty-year return expectations to assist us in subsequent asset allocation work, including mean-variance optimization and scenario analyses.
- Capital Markets Expectations are the inputs needed to conduct MVO.
 - MVO is the traditional starting point for determining asset allocation.
- Consultants (including Meketa) generally set them once a year.
 - Our results are published in January, based on December 31 data.
- This involves setting long-term expectations for a variety of asset classes for the following.
 - Returns.
 - Standard Deviation.
 - Correlations(i.e., covariance).
- Our process relies on both quantitative and qualitative methodologies.

Asset Class Definitions

- We identify asset classes and strategies that are appropriate for long-term allocation of funds, and that also are investable.
- Several considerations influence this process.
 - Unique return behavior.
 - Observable historical track record.
 - A robust market.
 - Client requests.
- We then make forecasts for each asset class.
 - We created inputs for 97 “asset classes” in 2022.

Building 10-Year Forecasts

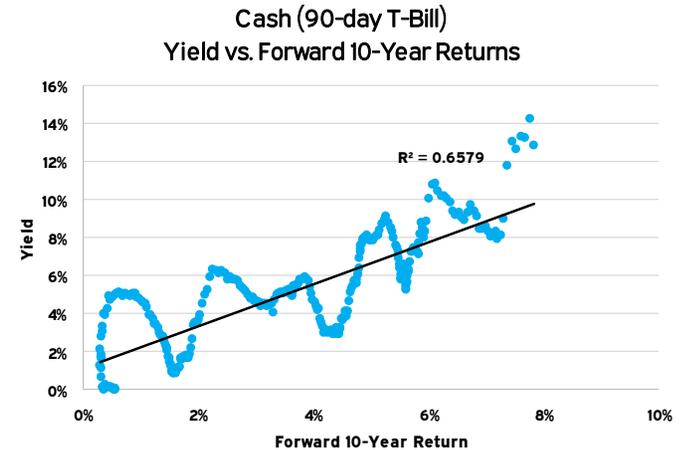
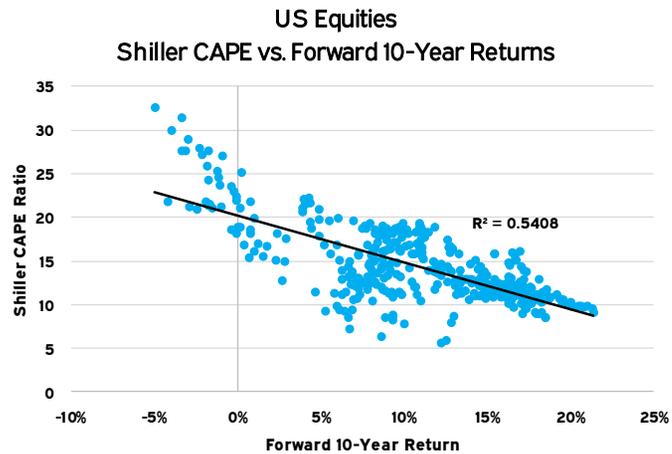
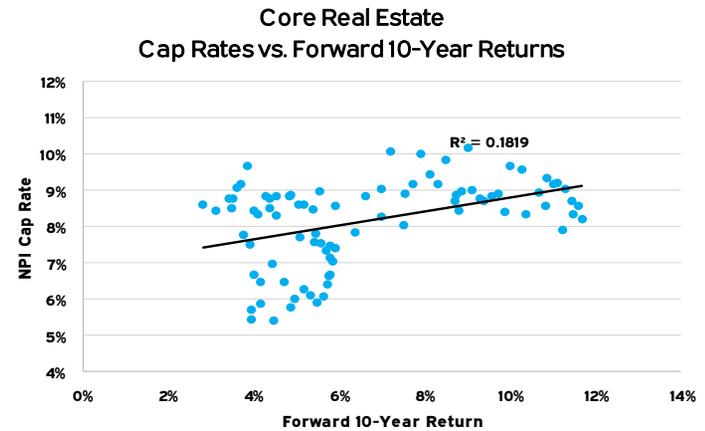
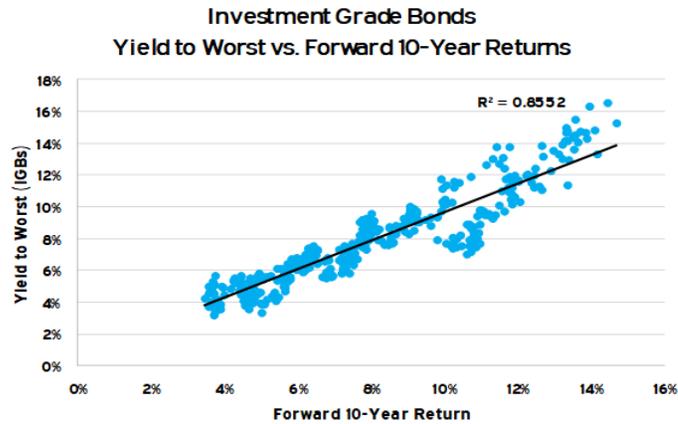
→ The first step is to build our 10-year forecasts based on fundamental models.

- Each model is based on the most important factors that drive returns for that asset class.

Asset Class Category	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
Hedge Funds and Other	Leverage, Alternative Betas

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

Some factors are naturally more predictive than others.



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.

Capital Market Assumption Development Example

Equities

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

$$E(R) = \text{Dividend Yield} + \text{Expected Earnings Growth} + \text{Multiple Effect} + \text{Currency Effect}$$

→ Meketa Investment Group evaluates historical data statistically to develop expectations for dividend yield, earnings growth, the multiple effect, and currency effect.

→ Our models assume that there is a reversion to the mean over long time periods.

Bonds

→ The short version for investment grade bond models is:

$$E(R) = \text{Current YTW (yield to worst)}$$

→ 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:

$$E(R) = \text{YTW} - (\text{Annual Default Rate} * \text{Loss Rate})$$

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	Historical Standard Deviation (%)	Skewness	Assumption (%)
Bank Loans	7.7	-2.7	10.0
FI/L-S Credit	6.8	-2.5	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).

Horizon Study

- Annually, Horizon Actuarial Services, LLC publishes a survey of capital market assumptions that they collect from various investment advisors.
- In the 2021¹ survey there were 39 respondents.
- The Horizon survey is a useful tool for Board members to determine whether their 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	1.2	0.7	1.9	1.1
TIPS	1.6	1.2	2.4	1.8
US Core Bonds	2.1	1.2	3.2	1.8
US High Yield Bonds	3.8	3.3	5.0	4.2
Emerging Market Debt	4.2	3.9	5.3	3.8
Private Debt	6.5	6.6	6.9	6.8
US Equity (large cap)	5.8	5.2	6.7	6.8
Developed Non-US Equity	6.4	6.7	7.1	7.1
Emerging Non-US Equity	7.2	7.5	7.8	8.1
Private Equity	8.8	8.0	9.6	9.1
Real Estate	5.5	6.5	6.2	6.9
Infrastructure	6.2	7.1	6.8	7.0
Commodities	3.1	3.4	4.0	3.7
Hedge Funds	4.5	3.4	5.3	4.3
Inflation	2.1	2.3	2.2	2.1

¹ The 10-year horizon includes all 39 respondents and the 20-year horizon includes 24 respondents. Figures are based on Meketa's 2021 CMEs.

Notes and Disclaimers

- ¹ The returns shown in the Policy Options and Risk Analysis sections rely on estimates of expected return, standard deviation, and correlation developed by Meketa Investment Group. To the extent that actual return patterns to the asset classes differ from our expectations, the results in the table will be incorrect. However, our inputs represent our best unbiased estimates of these simple parameters.
- ² The returns shown in the Policy Options and Risk Analysis sections use a lognormal distribution, which may or may not be an accurate representation of each asset classes' future return distribution. To the extent that it is not accurate in whole or in part, the probabilities listed in the table will be incorrect. As an example, if some asset classes' actual distributions are even more right-skewed than the lognormal distribution (i.e., more frequent low returns and less frequent high returns), then the probability of the portfolio hitting a given annual return will be lower than that stated in the table.
- ³ The standard deviation bars in the chart in the Risk Analysis section do not indicate the likelihood of a 1, 2, or 3 standard deviation event—they simply indicate the return we expect if such an event occurs. Since the likelihood of such an event is the same across allocations regardless of the underlying distribution, a relative comparison across policy choices remains valid.

Scenario Return Inputs

Asset Class	Benchmark Used
Investment Grade Bonds	Barclays Aggregate
TIPS	Barclays US TIPS
Intermediate-term Government Bonds	Barclays Treasury Intermediate
Long-term Government Bonds	Barclays Long US Treasury
EM Bonds (local)	JPM GBI-EM Global Diversified Composite
Bank Loans	CSFB Leveraged Loan
High Yield Bonds	Barclays High Yield
Direct Lending	Cliffwater Direct Lending Index
Mezzanine Debt	Preqin Associates Mezzanine
Distressed Debt	Preqin Distressed Debt Index
Core Real Estate	NCREIF Property
Value-Added RE	NCREIF Townsend Value Added
Opportunistic RE	NCREIF Townsend Opportunistic
REITs	NAREIT Equity
Infrastructure (private)	S&P Global Infrastructure
Natural Resources (private)	S&P Global Natural Resources
Timber	NCREIF Timberland
Commodities	Bloomberg Commodity Index
US Equity	Russell 3000
Public Foreign Equity (Developed)	MSCI EAFE
Public Foreign Equity (Emerging)	MSCI Emerging Markets
Private Equity	Preqin Private Equity Composite
Long-short Equity	HFRI Equity Hedge
Global Macro	HFRI Macro
Hedge Funds	HFRI Fund Weighted Composite
Private Debt	Weighted average of Distressed Debt, Mezzanine Debt and Direct Lending (2nd Lien)

Negative Historical Scenario Returns - Sample Inputs

	Covid-19 Market Shock (Feb 2020-Mar 2020)	Taper Tantrum (May - Aug 2013)	Global Financial Crisis (Oct 2007 - Mar 2009)	Popping of the TMT Bubble (Apr 2000 - Sep 2002)	LTCM (Jul - Aug 1998)
Cash Equivalents	0.4	0.0	2.6	9.9	0.8
Short-term Investment Grade Bonds	0.4	-0.1	7.9	21.9	1.6
Investment Grade Bonds	-0.9	-3.7	8.5	28.6	1.8
Long-term Corporate Bonds	-18.4	-9.3	-10.3	26.9	-0.6
Long-term Government Bonds	12.7	-11.6	24.2	35.5	4.1
TIPS	-0.4	-8.5	8.2	37.4	0.7
Global ILBs	-6.5	-7.4	-3.9	39.7	0.7
High Yield Bonds	-20.8	-2.0	-22.8	-6.3	-5.0
Bank Loans	-20.3	0.8	-23.7	6.3	0.7
Direct Lending	-4.8	2.6	-3.3	-2.6	-2.3
Foreign Bonds	-4.5	-3.2	2.1	8.5	3.5
Mezzanine Debt	-4.8	4.6	-26.4	-2.0	-2.6
Distressed Debt	-12.2	4.6	-26.4	-2.0	-2.6
Emerging Market Bonds (major)	-15.3	-11.5	-5.0	6.3	-28.2
Emerging Market Bonds (local)	-13.9	-14.3	-7.9	7.2	-34.1
US Equity	-35.0	3.0	-45.8	-43.8	-15.4
Developed Market Equity (non-US)	-32.7	-2.2	-52.1	-46.7	-11.5
Emerging Market Equity	-31.2	-9.4	-51.2	-43.9	-26.7
Global Equity	-33.6	-0.7	-49.3	-46.7	-14.0
Private Equity/Debt	-7.8	5.7	-27.7	-23.4	-3.2
Private Equity	-7.4	5.8	-28.2	-26.0	-3.3
Private Debt Composite	-10.1	4.6	-22.3	-1.7	-2.3
REITs	-41.0	-13.3	-63.0	45.4	-15.3
Core Private Real Estate	0.7	3.6	-10.6	23.6	2.3
Value-Added Real Estate	-3.5	3.8	-20.2	177.0	1.8
Opportunistic Real Estate	-8.6	4.0	-25.7	21.4	1.5
Natural Resources (Private)	-22.1	2.5	-31.2	-3.9	-16.9
Timberland	0.1	1.3	20.7	-1.5	0.5
Farmland	-0.1	3.3	26.7	11.4	0.8
Commodities (naïve)	-18.9	-2.4	-36.9	18.5	-12.0
Core Infrastructure	-1.3	3.7	-0.8	24.8	-0.3
Hedge Funds	-9.1	-0.4	-17.8	-2.1	-9.4
Long-Short	-10.9	1.0	-26.4	-8.8	-8.3
Hedge Fund of Funds	-7.6	-0.5	-19.5	-0.4	-7.7

Negative Historical Scenario Returns-Sample Inputs (Continued)

	Rate spike (1994 Calendar Year)	Crash of 1987 (Sep-Nov 1987)	Strong dollar (Jan 1981-Sep 1982)	Volcker Recession (Jan-Mar 1980)	Stagflation (Jan 1973-Sep 1974)
Cash Equivalents	3.9	1.4	24.4	2.9	13.5
Short-term Investment Grade Bonds	0.5	2.3	29.9	-2.6	4.3
Investment Grade Bonds	-2.9	2.2	29.9	-8.7	7.9
Long-term Corporate Bonds	-5.8	1.5	29.6	-14.1	-12.0
Long-term Government Bonds	-7.6	2.6	28.4	-13.6	-1.8
TIPS	-7.5	2.8	15.6	-7.8	4.3
Global ILBs	-7.9	2.9	16.5	-8.3	4.5
High Yield Bonds	-1.0	-3.6	6.9	-2.3	-15.5
Bank Loans	10.3	-1.7	3.3	-1.1	-7.5
Direct Lending	7.6	-2.3	3.2	-1.0	-7.2
Foreign Bonds	5.3	-0.3	34.8	-6.5	-1.4
Mezzanine Debt	7.6	-2.3	3.2	-1.0	-7.2
Distressed Debt	7.6	-2.3	3.2	-1.0	-7.2
Emerging Market Bonds (major)	-18.9	-9.2	-1.6	-2.6	-20.2
Emerging Market Bonds (local)	-22.8	-11.0	-2.0	-3.2	-23.9
US Equity	1.3	-29.5	-2.3	-4.1	-42.6
Developed Market Equity (non-US)	7.8	-14.5	-18.0	-7.0	-36.3
Emerging Market Equity	-7.3	-25.3	-12.1	-6.6	-44.2
Global Equity	5.0	-21.5	-11.2	-5.8	-39.3
Private Equity/Debt	13.2	-0.7	-2.7	-2.5	-18.2
Private Equity	14.2	-0.5	-3.9	-2.7	-20.1
Private Debt Composite	6.2	-1.8	3.0	-1.0	-6.9
REITs	-3.5	-19.5	2.5	-3.6	-33.9
Core Private Real Estate	6.4	2.5	23.9	5.5	-4.4
Value-Added Real Estate	11.2	4.3	44.2	9.6	-7.6
Opportunistic Real Estate	18.8	3.1	30.7	7.0	-5.6
Natural Resources (Private)	12.6	-9.9	-9.5	-9.1	19.3
Timberland	15.4	9.2	23.6	-7.4	5.5
Farmland	9.4	5.3	13.3	-4.2	3.1
Commodities (naïve)	16.6	1.8	-16.0	-9.6	139.5
Core Infrastructure	-11.5	-0.1	-0.2	-0.1	-0.5
Hedge Funds	4.1	-7.8	-3.8	-1.9	-15.7
Long-Short	2.6	-10.0	-4.9	-2.5	-19.8
Hedge Fund of Funds	-3.5	-5.7	-2.7	-1.4	-11.5

Stress Test Return Assumptions-Sample Inputs¹

	10-year Treasury Bond rates rise 100 bps	10-year Treasury Bond rates rise 200 bps	10-year Treasury Bond rates rise 300 bps	Baa Spreads widen by 50 bps, High Yield by 200 bps	Baa Spreads widen by 300 bps, High Yield by 1000 bps	Trade Weighted Dollar gains 10%	Trade Weighted Dollar gains 20%	US Equities decline 10%	US Equities decline 25%	US Equities decline 40%
Cash Equivalents	-0.2	-0.4	-0.5	2.8	1.1	4.0	1.3	3.1	2.3	0.4
Short-term Investment Grade Bonds	-1.2	-2.5	-3.7	2.2	1.5	1.2	1.4	1.3	0.7	0.8
Investment Grade Bonds	-4.3	-8.3	-11.9	3.9	-0.4	1.7	4.2	2.4	0.7	-1.0
Long-term Corporate Bonds	-8.9	-16.2	-20.9	2.6	-13.4	0.8	8.1	0.5	-8.3	-12.3
Long-term Government Bonds	-10.6	-18.8	-23.6	7.8	7.3	3.7	12.8	3.0	2.6	2.4
TIPS	-4.9	-9.8	-13.7	2.8	-6.1	-2.1	-0.2	2.6	-2.3	-8.7
Global ILBs	-1.6	-7.9	-11.9	2.4	-11.1	-3.1	-4.8	2.8	-5.4	-16.3
High Yield Bonds	2.7	-3.4	-3.6	-1.8	-23.0	-3.5	-0.6	-4.9	-15.5	-21.2
Bank Loans	1.4	-0.8	-5.1	-2.8	-20.8	-3.2	-0.6	-3.7	-13.2	-17.4
Direct Lending	0.0	-3.7	-6.3	-1.8	-9.1	-4.3	-0.6	-4.1	-7.6	-5.7
Foreign Bonds	-4.6	-9.8	-15.7	6.6	-2.9	-3.3	-8.8	1.8	-4.6	-9.2
Mezzanine Debt	3.8	-0.9	-6.1	-1.9	-19.4	-2.8	-6.4	-4.9	-15.6	-20.4
Distressed Debt	4.4	-1.1	-6.4	-2.2	-21.4	-3.5	-9.0	-5.4	-17.3	-21.8
Emerging Market Bonds (major)	1.0	-4.9	-3.6	-0.1	-14.7	-1.4	-4.2	-3.3	-12.5	-15.4
Emerging Market Bonds (local)	1.8	-5.1	-3.0	0.1	-12.8	-1.4	-12.2	-2.8	-13.3	-20.5
US Equity	7.2	0.9	2.8	-1.2	-32.0	-2.5	1.6	-10.6	-26.5	-42.4
Developed Market Equity (non-US)	9.2	3.1	-5.6	0.3	-35.1	-12.9	-9.0	-8.7	-23.4	-41.4
Emerging Market Equity	10.3	5.5	0.1	-1.1	-42.8	-15.1	-15.7	-11.9	-30.8	-46.9
Global Equity	7.8	2.1	-0.5	-0.7	-33.6	-8.3	-5.9	-9.8	-25.3	-41.5
Private Equity/Debt	6.4	0.9	-5.5	-0.2	-22.5	-4.3	-7.2	-10.1	-22.5	-25.3
Private Equity	6.8	1.0	-5.3	0.0	-22.8	-4.1	-6.4	-10.9	-23.3	-25.7
Private Debt Composite	2.5	-2.0	-6.2	-1.8	-15.8	-3.5	-4.3	-4.6	-12.8	-15.0
REITs	4.1	-3.5	1.2	-3.8	-37.3	-1.0	12.4	-6.5	-32.8	-55.7
Core Private Real Estate	2.4	2.7	5.0	2.0	-7.1	1.2	9.7	-0.2	-8.5	-14.0
Value-Added Real Estate	4.8	7.4	14.1	7.2	-13.5	13.8	6.4	1.3	-13.6	-23.1
Opportunistic Real Estate	4.1	6.5	9.9	1.1	-20.6	0.8	15.6	-1.5	-17.1	-26.3
Natural Resources (Private)	13.1	5.8	-3.5	-0.9	-27.5	-6.5	-21.5	-5.4	-20.9	-35.9
Timberland	1.4	1.6	-9.9	5.0	6.9	2.5	8.6	0.1	2.7	3.9
Farmland	2.4	-0.1	-9.2	3.9	10.1	0.8	8.0	0.6	4.9	10.3
Commodities (naïve)	9.6	5.3	-6.6	-4.3	-25.0	-5.6	-24.0	4.8	-11.1	-37.8
Core Infrastructure	0.3	-6.4	-6.1	1.2	0.1	-1.8	3.6	-1.1	-5.0	-7.8
Hedge Funds	3.0	-1.4	-5.1	-0.6	-14.5	-2.1	-1.7	-4.3	-12.2	-15.7
Long-Short	5.3	-0.7	-4.2	-0.1	-21.0	-3.0	-4.3	-7.3	-17.7	-23.5
Hedge Fund of Funds	2.2	-2.1	-5.7	-1.3	-14.8	-2.7	-2.4	-4.9	-12.5	-16.0

¹ Assumptions are based on performance for each asset class during historical periods that resembled these situations.

Meketa Investment Group 2023 Annual Asset Study
 Twenty-Year Annualized Return and Volatility Expectations for Major Asset Classes

Asset Class	10-year Expected Return (%)	20-year Expected Return (%)	Standard Deviation (%)	11-20 year Risk Premia ¹ (%)
Cash Equivalents	3.1	2.9	1.0	-1.5
Investment Grade Bonds	4.8	4.7	4.0	0.4
Long-term Government Bonds	4.3	5.0	12.0	1.5
TIPS	4.3	4.5	7.0	0.5
High Yield Bonds	8.0	7.3	11.0	2.5
Bank Loans	7.6	7.0	10.0	2.2
Emerging Market Debt (local)	6.4	6.0	12.0	1.5
Private Debt	9.4	9.0	15.0	4.6
US Equity	7.8	8.7	18.0	5.5
Developed Non-US Equity	10.1	9.8	19.0	5.4
Emerging Non-US Equity	10.3	10.0	23.0	5.6
Global Equity	8.8	9.2	18.0	5.5
Private Equity	9.7	11.0	27.0	8.0
Real Estate	5.9	7.8	16.0	5.5
Infrastructure	6.9	8.3	15.0	5.6
Commodities	6.3	5.7	17.0	1.0
Hedge Funds	5.4	6.1	7.0	2.6
Inflation	2.5	2.6	3.0	-1.5

Meketa Investment Group 2023 Annual Asset Study: Correlation Expectations

	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.	Infra.	Hedge Funds
Investment Grade Bonds	1.00											
Long-term Government Bonds	0.83	1.00										
TIPS	0.76	0.53	1.00									
High Yield Bonds	0.22	-0.22	0.41	1.00								
US Equity	0.02	-0.31	0.20	0.74	1.00							
Developed Non-US Equity	0.09	-0.28	0.26	0.76	0.89	1.00						
Emerging Market Equity	0.14	-0.23	0.34	0.76	0.77	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	0.00	-0.29	0.31	0.55	0.53	0.61	0.65	0.30	0.15	1.00		
Infrastructure	0.29	0.09	0.31	0.64	0.63	0.65	0.58	0.50	0.57	0.41	1.00	
Hedge Funds	0.03	-0.34	0.26	0.77	0.86	0.87	0.85	0.60	0.45	0.69	0.65	1.00

Appendix

Disclaimer, Glossary, and Notes

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PERFORMANCE DATA CONTAINED HEREIN REPRESENT PAST PERFORMANCE. PAST PERFORMANCE IS NO GUARANTEE OF FUTURE RESULTS.

Credit Risk: Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security).

Duration: Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. A bond with a duration of six years will exhibit twice the percentage price change of a bond with a three-year duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

Information Ratio: This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

Jensen's Alpha: A measure of the average return of a portfolio or investment in excess of what is predicted by its beta or "market" risk. $\text{Portfolio Return} - [\text{Risk Free Rate} + \text{Beta} * (\text{market return} - \text{Risk Free Rate})]$.

Market Capitalization: For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

Market Weighted: Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

Maturity: The date on which a loan, bond, mortgage, or other debt/security becomes due and is to be paid off.

Prepayment Risk: The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

Price-Book Value (P/B) Ratio: The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

Price-Earnings (P/E) Ratio: A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about its future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

Quality Rating: The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

Sharpe Ratio: A commonly used measure of risk-adjusted return. It is calculated by subtracting the risk free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

STIF Account: Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

Standard Deviation: A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

Style: The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

Tracking Error: A divergence between the price behavior of a position or a portfolio and the price behavior of a benchmark, as defined by the difference in standard deviation.

Yield to Maturity: The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a “basis book.” For example, a 5% bond pays \$5 a year interest on each \$100 par value. To figure its current yield, divide \$5 by \$95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay \$100 for the bond that can be bought now for \$95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{5\% \text{ (discount)}}{5 \text{ (yrs. to maturity)}} = 1\% \text{ pro rata, plus } 5.26\% \text{ (current yield)} = 6.26\% \text{ (yield to maturity)}$$

Yield to Worst: The lowest potential yield that can be received on a bond without the issuer actually defaulting. The yield to worst is calculated by making worst-case scenario assumptions on the issue by calculating the returns that would be received if provisions, including prepayment, call, or sinking fund, are used by the issuer.

NCREIF Property Index (NPI): Measures unleveraged investment performance of a very large pool of individual commercial real estate properties acquired in the private market by tax-exempt institutional investors for investment purposes only. The NPI index is capitalization-weighted for a quarterly time series composite total rate of return.

NCREIF Fund Index - Open End Diversified Core Equity (NFI-ODCE): Measures the investment performance of 28 open-end commingled funds pursuing a core investment strategy that reflects funds' leverage and cash positions. The NFI-ODCE index is equal-weighted and is reported gross and net of fees for a quarterly time series composite total rate of return.

Sources: [Investment Terminology](#), International Foundation of Employee Benefit Plans, 1999.

[The Handbook of Fixed Income Securities](#), Fabozzi, Frank J., 1991

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Throughout this report, numbers may not sum due to rounding.

Returns for periods greater than one year are annualized throughout this report.

Values shown are in millions of dollars, unless noted otherwise.