MEKETA
INVESTMENT GROUP

Meketa Investment Group

2024

Capital Markets Expectations

Table of Contents

Executive Summary

Executive Summary

→ We update our capital markets expectations each year in January.

- Changes are driven by many factors, including interest rates, credit spreads, cap rates, and equity prices.

→ 2023 was a volatile year for most investors, but ultimately most asset classes experienced positive returns, including double-digit gains for many risky assets.

→ With the notable exception of China's markets, global bond and equity markets rallied at the end of the year, posting strong gains as inflation pressures eased and central banks appeared to be turning away from tightening policies.

- Despite short-term interest rates climbing, the yield on most Treasury bonds finished the year near where they started it.
- Credit spreads tightened, especially for lower quality credit such as high yield. The result is lower expected returns for many credit-oriented assets.
- Most equity markets rallied in 2023, generally at a much faster pace than the gain in earnings. Hence many equity markets were trading at higher valuations at year-end, thus reducing their forward-looking returns.

→ Our 10-year CMEs continue to be lower than our 20-year CMEs for the vast majority of asset classes, partly due to a higher assumed "risk-free" rate in the future.

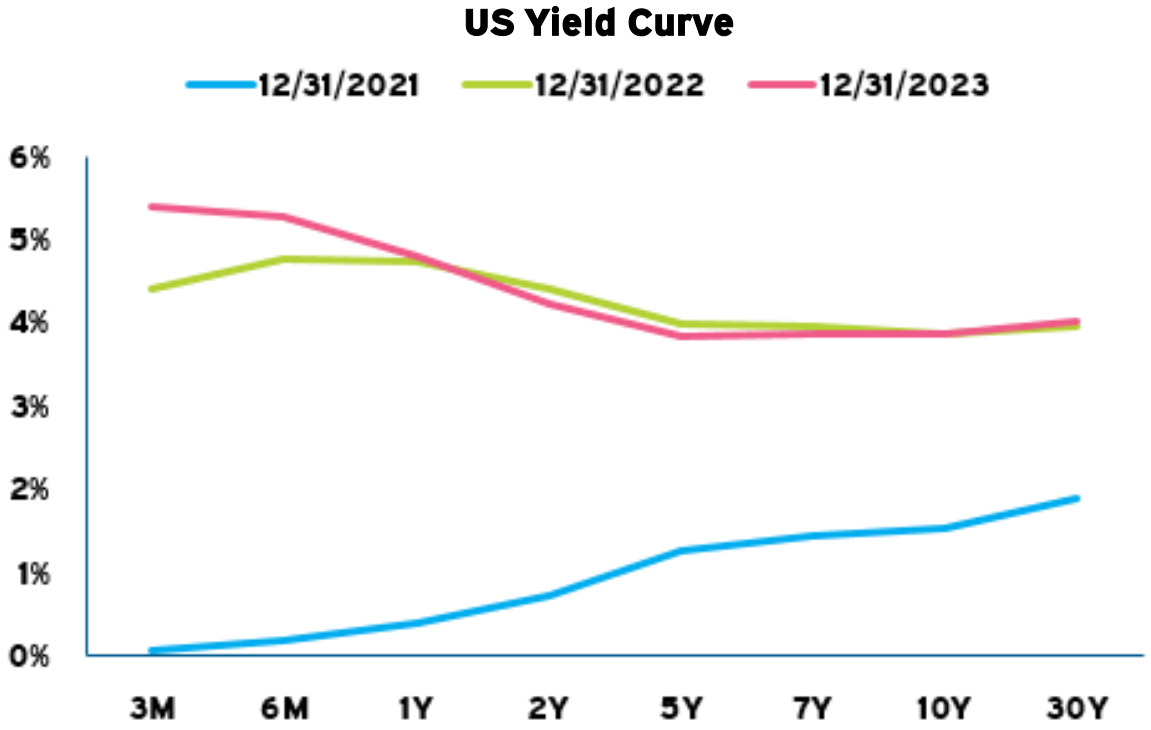
→ The net result is a meaningful decrease in return assumptions for most assets over the 10-year horizon, with much more mixed and modest changes at the 20-year horizon.

Market Overview

Rising Interest Rates

→ Except for the short end of the curve, the US Treasury yield curve was little changed in 2023 from where it began the year.

→ The market expects the Federal Reserve to reverse course and start lowering short-term rates in 2024, believing that the actions taken thus far to fight inflation have been sufficient.



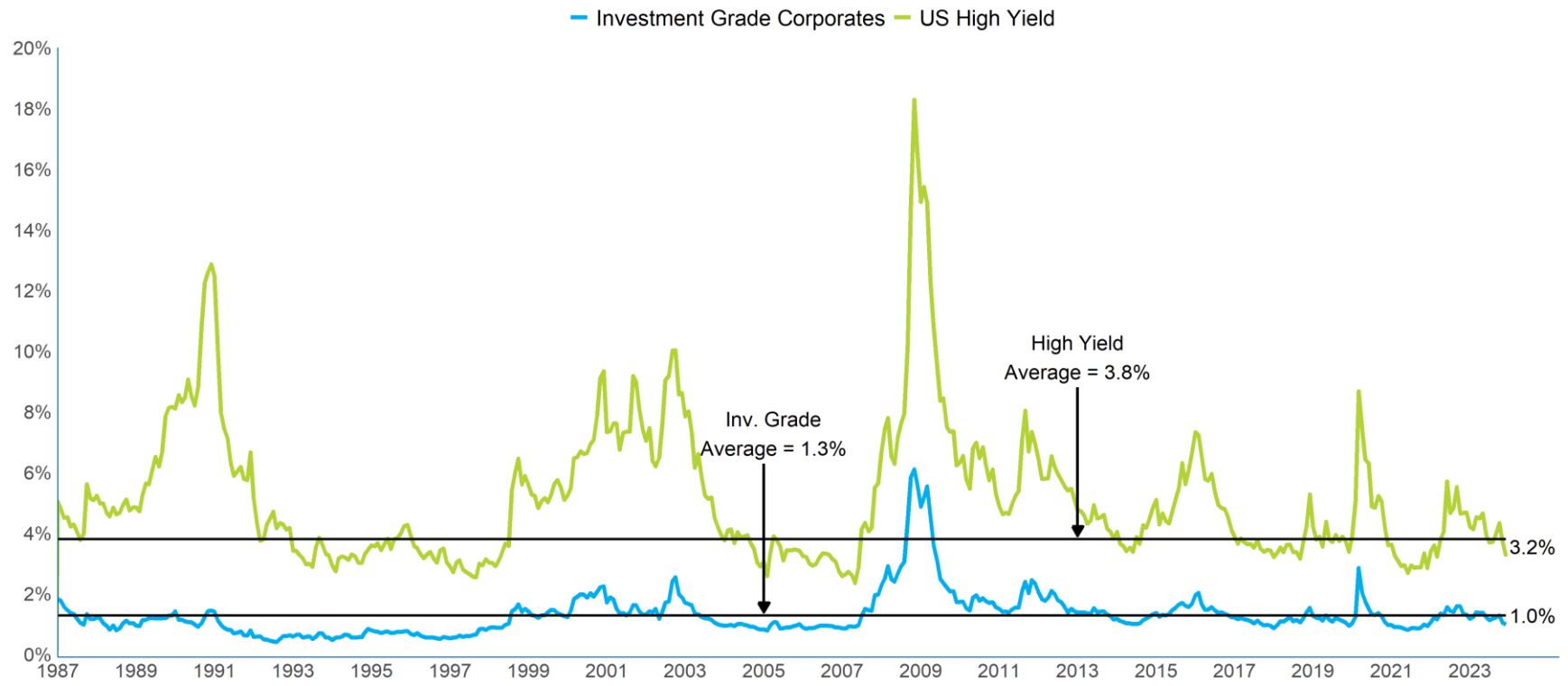
Source: Bloomberg. Data is as of December 31, 2023.

Narrower Credit Spreads

→ Credit spreads tightened slightly in 2023, though they remain close to their long-term averages.

- Lower quality credit spreads experienced a more substantial tightening. The spread for high yield bonds declined from 469 bp to 323 bp.

US Investment Grade and High Yield Credit Spreads



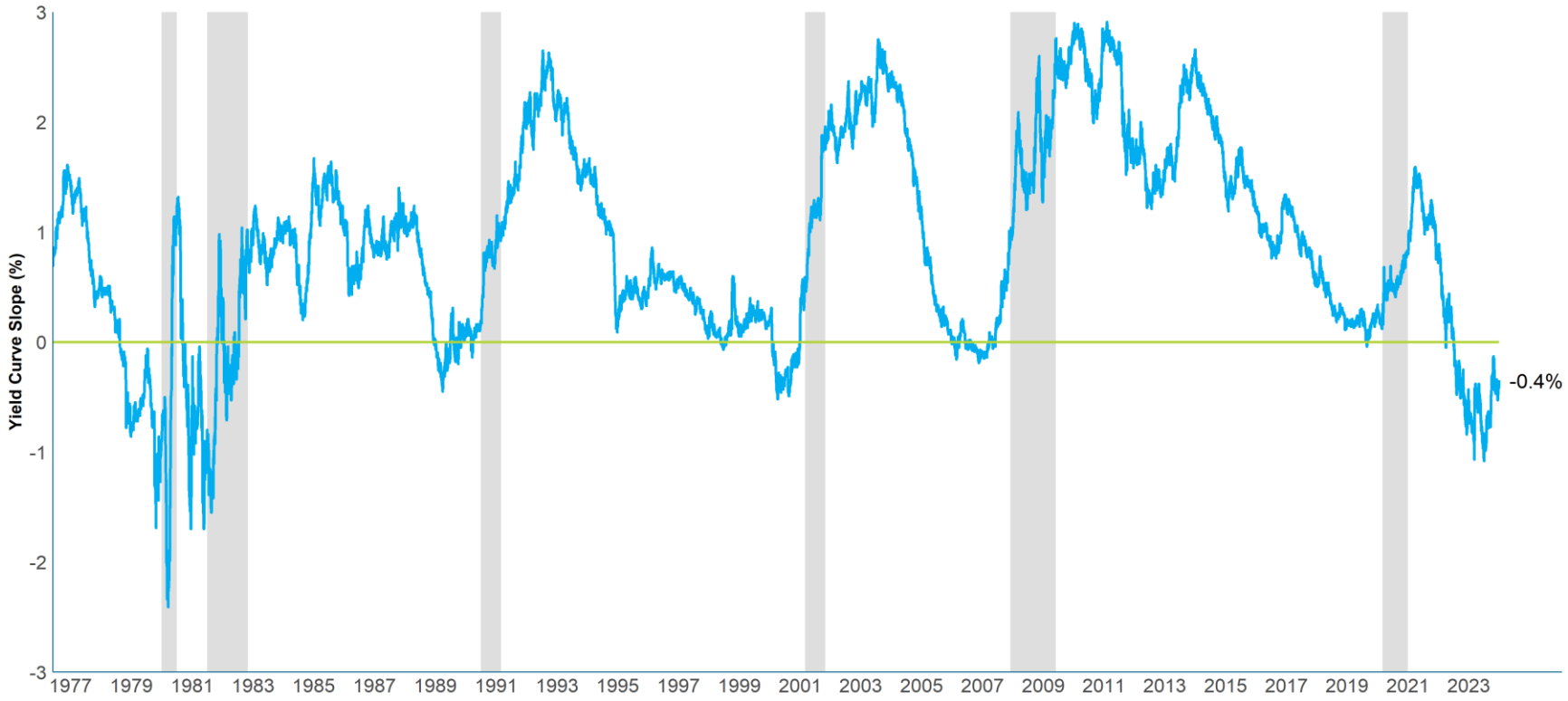
Source: Bloomberg. High Yield is proxied by the Bloomberg High Yield Index and Investment Grade Corporates are proxied by the Bloomberg US Corporate Investment Grade Index. Spread is calculated as the difference between the Yield to Worst of the respective index and the 10-Year US Treasury yield. Data is as of December 31, 2023.

Inverted Yield Curve

→ The yield curve began the year in inverted territory, and it remained there throughout the year.

- The 2-10 spread has not been inverted for such an extended period in over forty years.

Yield Curve Slope (Ten Minus Two)



Source: FRED. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield. Data is as of December 31, 2023.

Similar or Lower Yields

→ Short-term interest rates are higher than one year ago, while the 10-year Treasury yield ended the year where it started it.

→ Similar levels of interest rates combined with tighter credit spreads to result in slightly lower yields for most sectors of the global bond market.

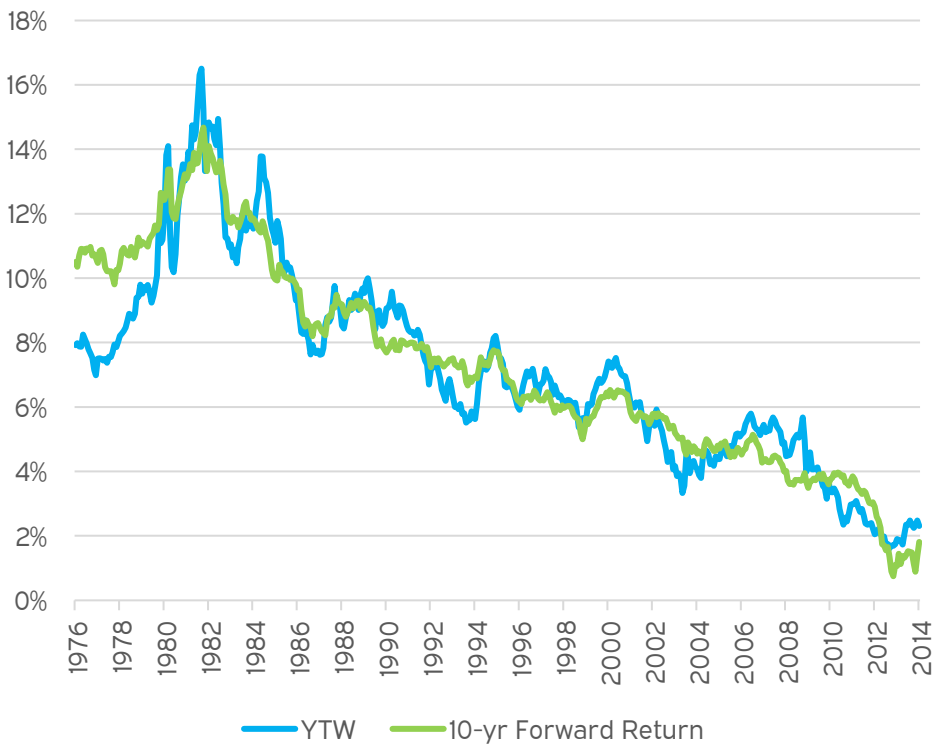
Index	Yield to Worst 12/31/23 (%)	Yield to Worst 12/31/22 (%)
Fed Funds Rate	5.25-5.50	4.25-4.50
10-year Treasury	3.88	3.88
Bloomberg Aggregate	4.53	4.68
Bloomberg Corporate	5.06	5.42
Bloomberg Securitized	4.72	4.75
Bloomberg Global Aggregate	3.51	3.73
Bloomberg EM Local Currency Government	4.08	4.42
Bloomberg EM Hard Currency Aggregate	6.77	7.26
Bloomberg US Corporate High Yield	7.59	8.96

Source: Bloomberg. Data is as of December 31, 2023 and December 31, 2022.

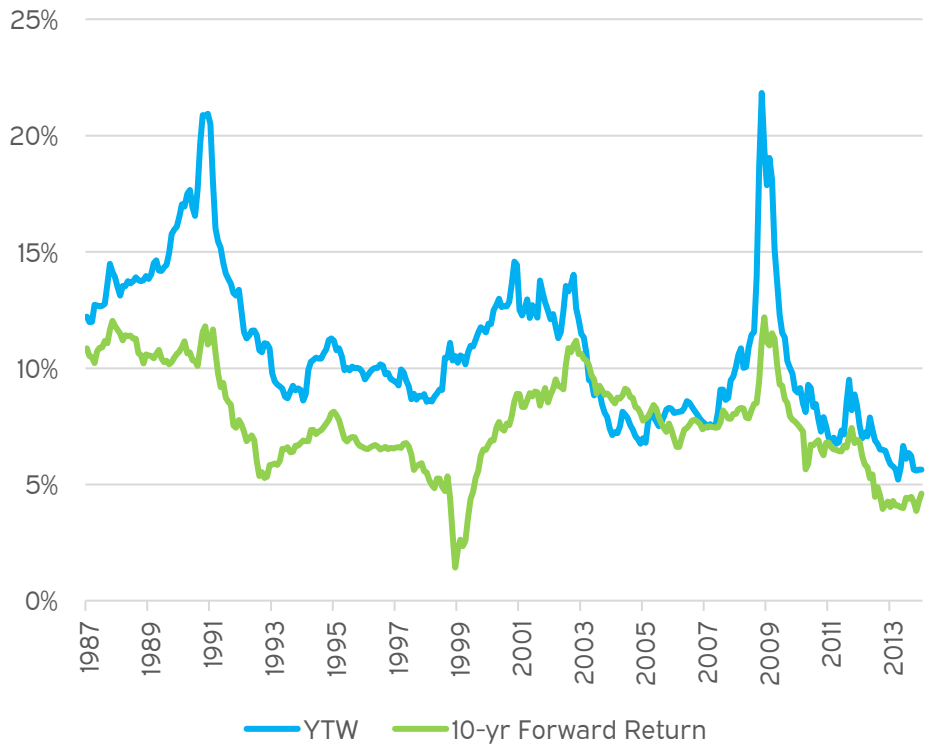
Yields Drive Future Returns

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

YTW and Returns for Investment Grade Bonds



YTW and Returns for High Yield Bonds



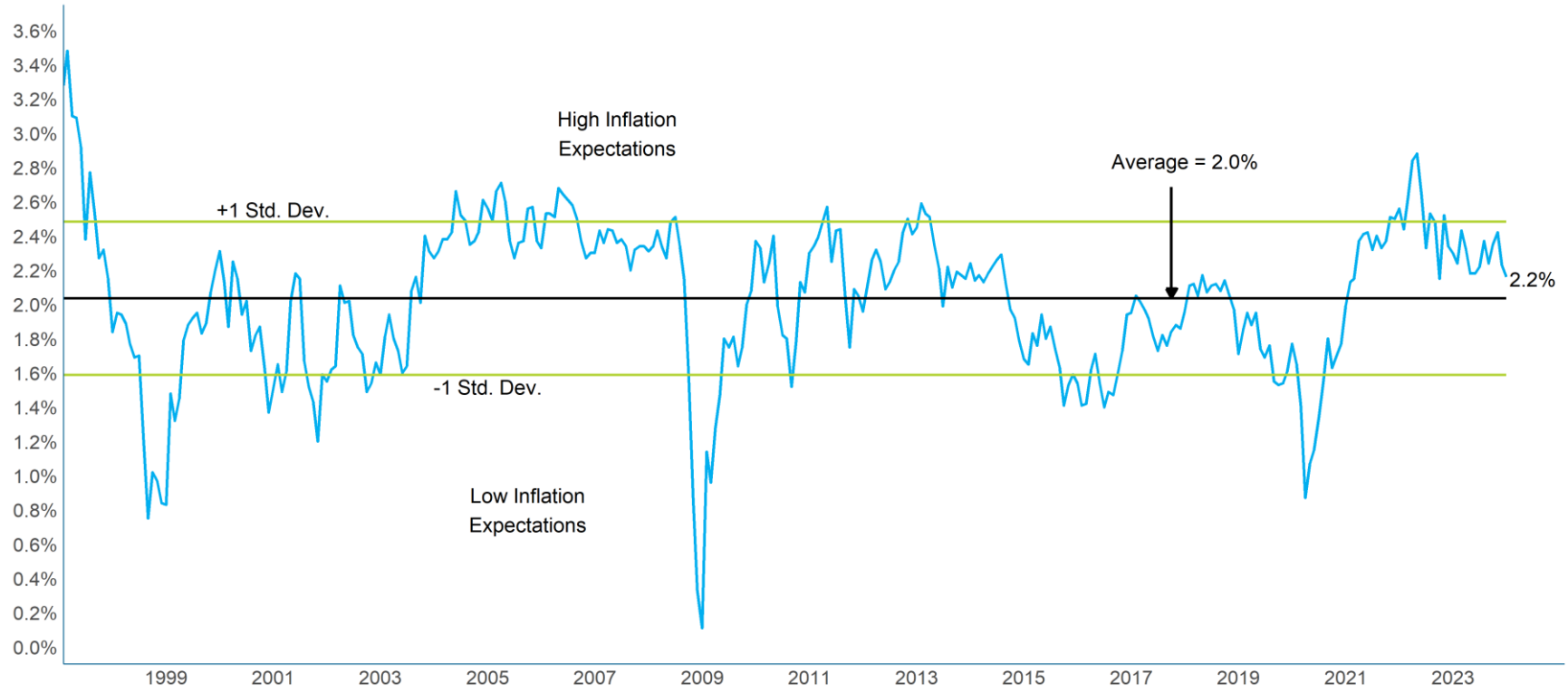
[1] When predicting returns for bonds, default risk should also be taken into account. For example, defaults are why the return for high yield bonds have generally been below the starting yield.
Source: Bloomberg Aggregate and Bloomberg High yield indices. Data is as of December 31, 2023.

Slightly Lower Inflation Expectations

→ After substantial changes in inflation expectations in recent years, the market's expectations for inflation were little changed at the end of 2023.

- The 10-year BEI rate dropped from 2.3% to 2.2%. The 5-year BEI was slightly lower, at 2.1%.

Ten-Year Breakeven Inflation



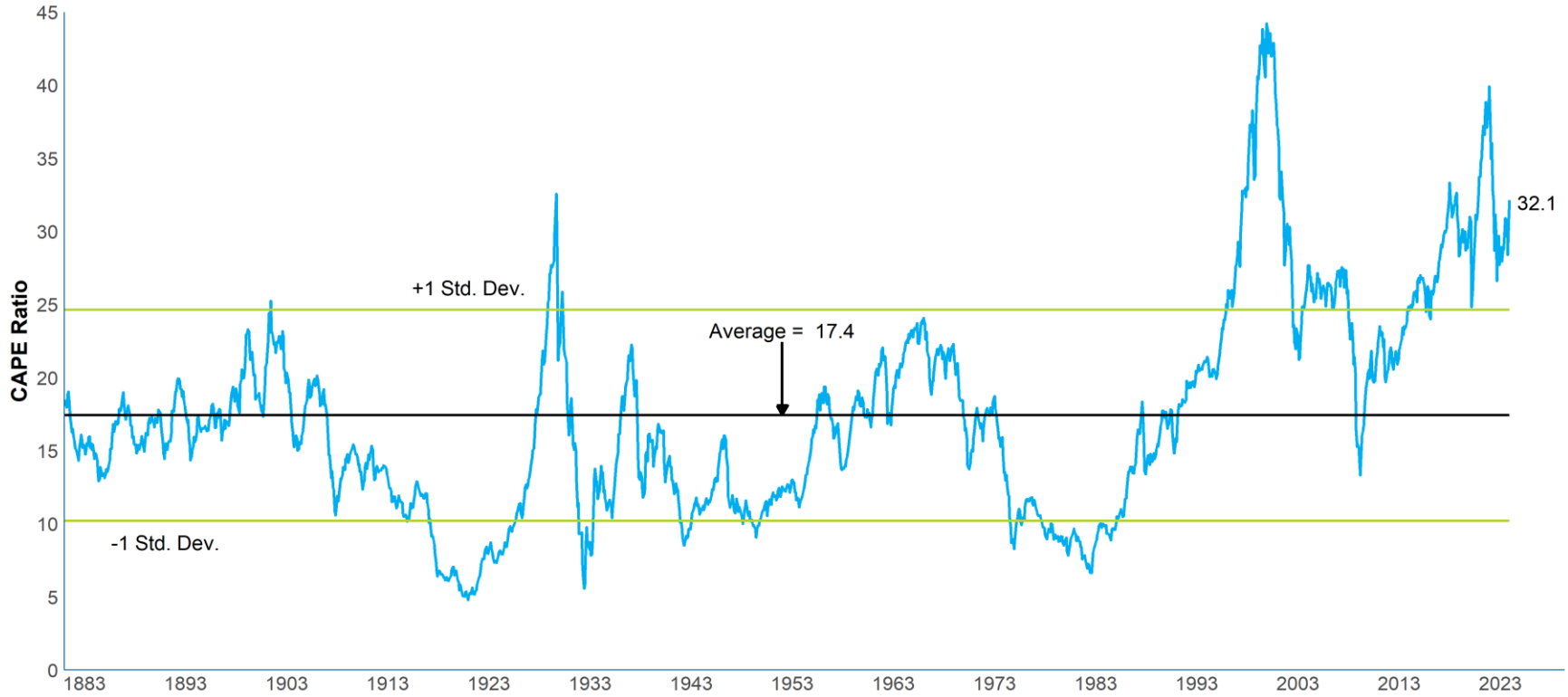
Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA). Data is as of December 31, 2023.

Higher Prices for US Equities

→ US stocks had a very good year, with the S&P 500 index gaining 26.3%.

→ Valuations increased and remain elevated relative to their long-term history, though they are much nearer their average for the past 30 years.

US Equity Cyclically Adjusted P/E



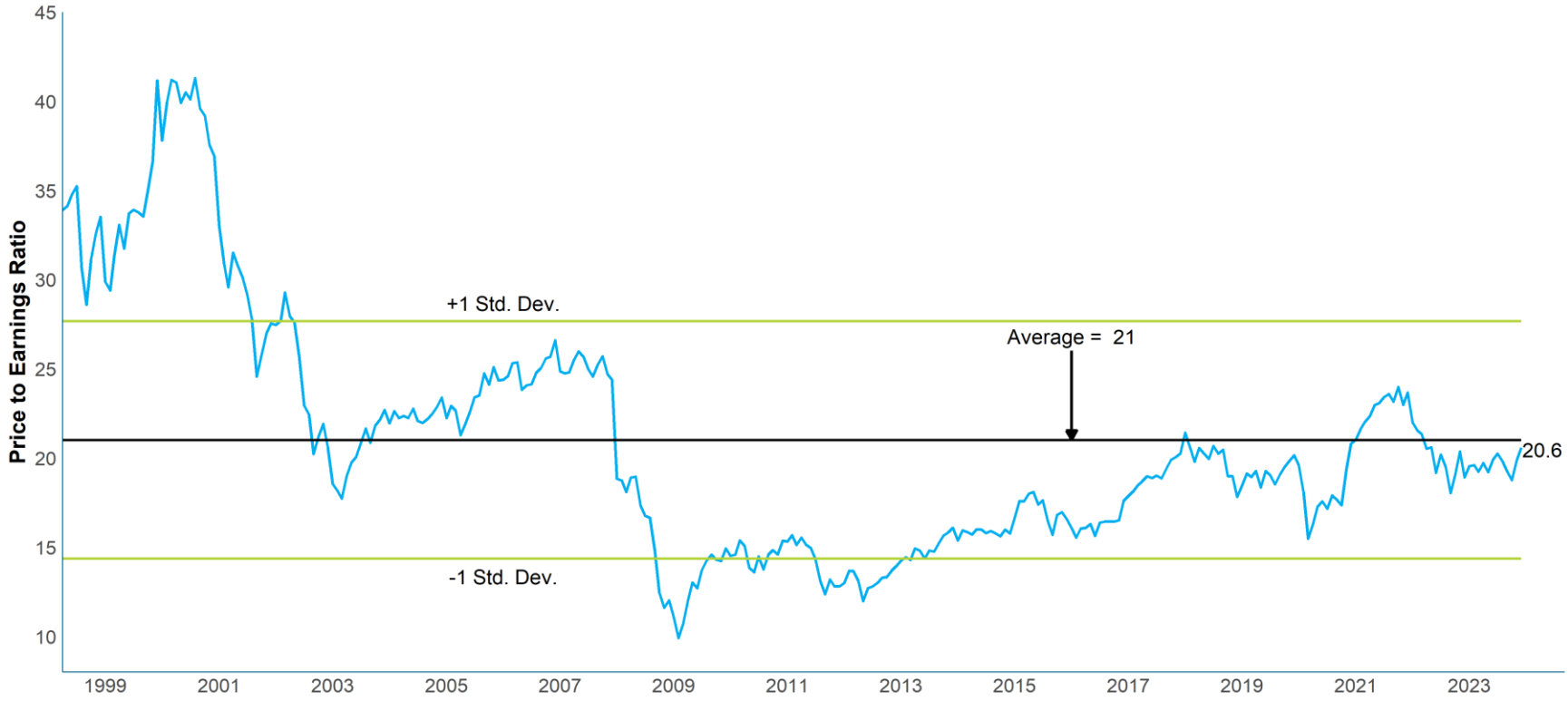
Source: Robert Shiller, Yale University, and Meketa Investment Group. Data is as of December 31, 2023 for the S&P 500 Index.

Slightly Higher Prices in Non-US Equities, too

→ EAFE equities gained 18.2% in USD terms in 2023, benefiting slightly from a currency tailwind.

→ Despite increasing from one year ago, EAFE valuations remain close to their 25-year historical average.

Developed International Equity Cyclically Adjusted P/E



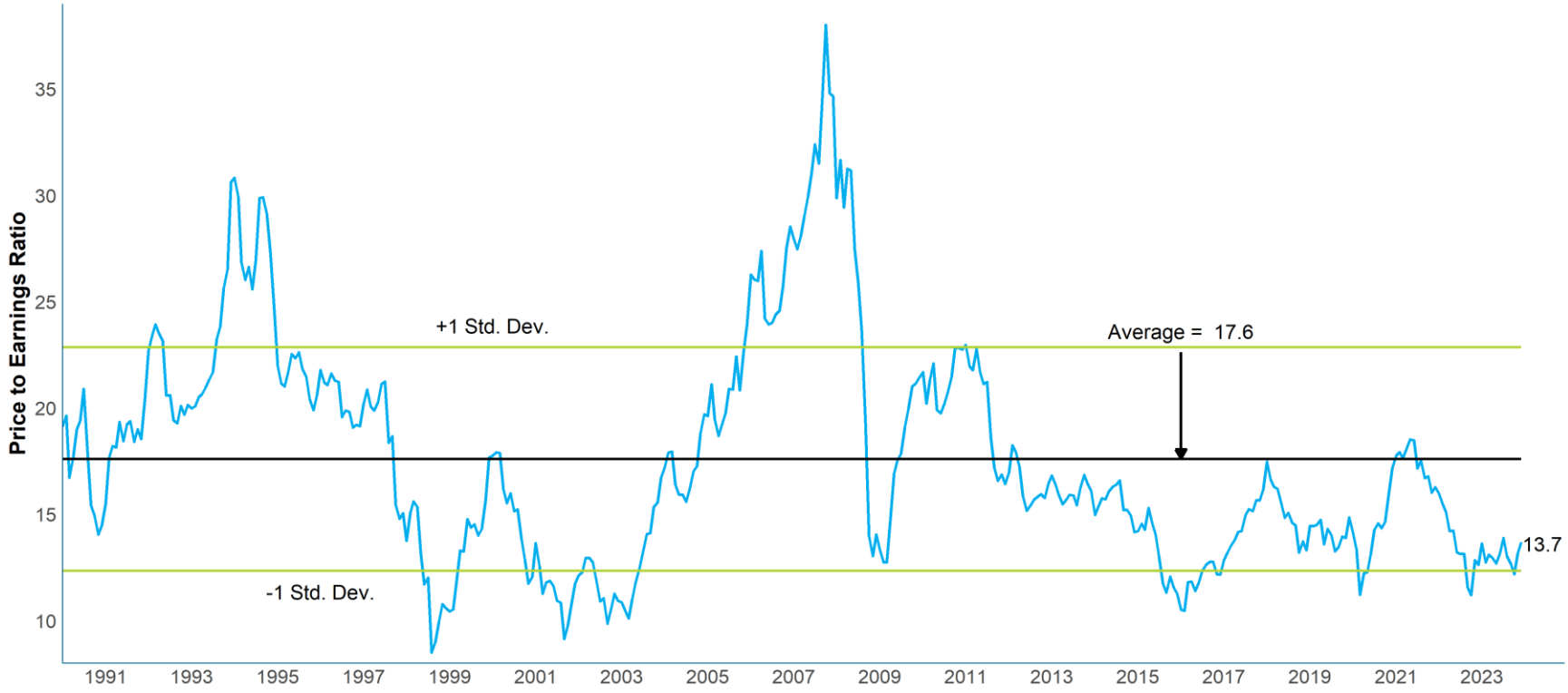
Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years. Data is as of December 31, 2023.

And Slightly Higher Prices in Emerging Market Equities

→ Emerging market equities gained 9.8% in 2023, despite Chinese equities declining 11.2%.

→ EM equity valuations remain well below their long-term average, though there is a significant difference between EM ex-China and China valuations.

Emerging Market Equity Cyclically Adjusted P/E

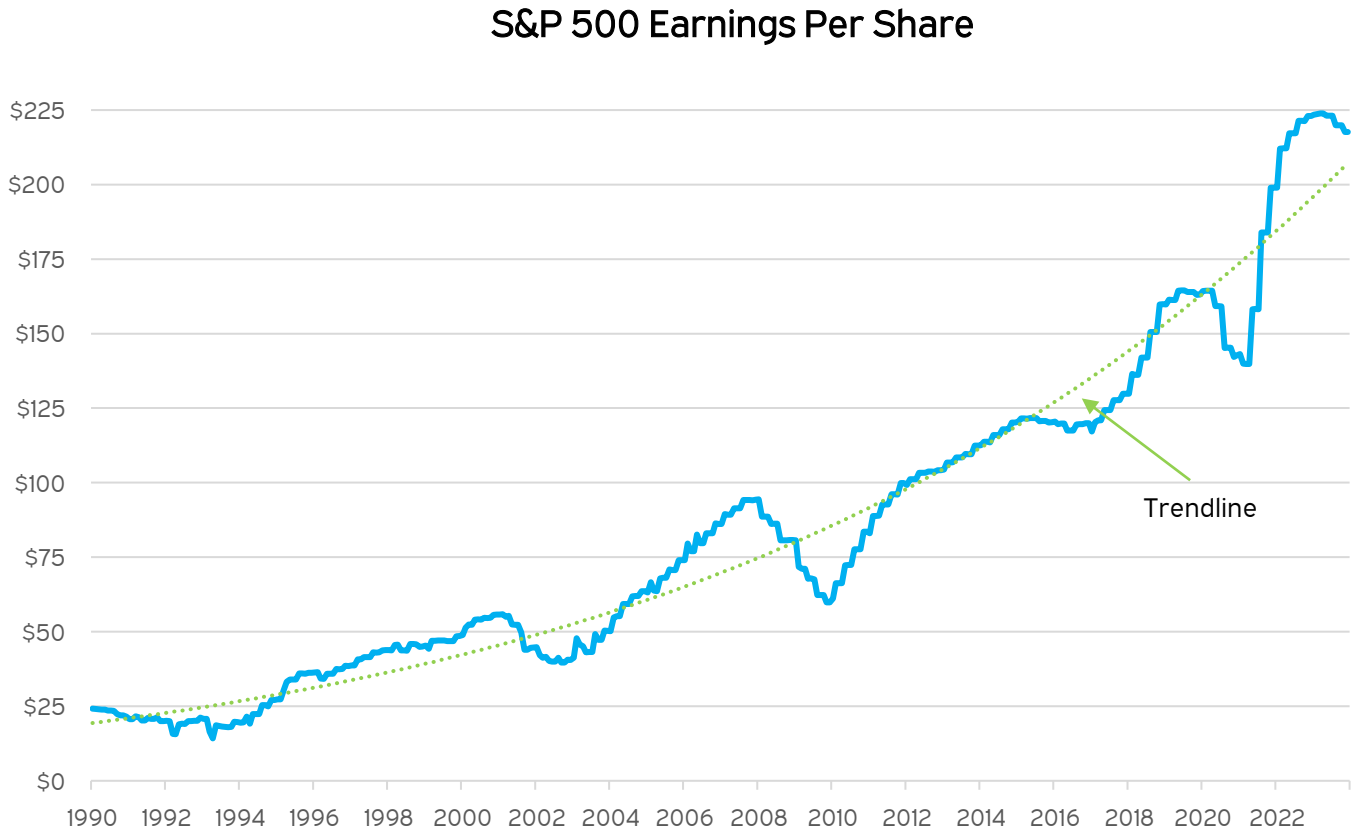


Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.. Data is as of December 31, 2023.

US Earnings Growth

→ S&P 500 earnings (EPS) growth was relatively flat for the year.

- EPS peaked in 2q23 and appears to have declined slightly since.



Source: S&P 500 Index data from Bloomberg. Represents trailing 12-month "as reported" earnings per share. Data is as of December 31, 2023.

The Link between Economic Growth and Expected Returns

→ We have long assumed that long-term earnings growth is linked to economic growth.

- However, either one can exceed the other.

	US Nominal GDP Growth Per Annum	US Corporate Earnings Growth Per Annum	S&P 500 EPS Growth Per Annum
Since 1990	4.8%	6.9%	6.8%
Since 2010	4.7%	5.2%	9.9%

→ Corporate profits can comprise a higher or lower share of the GDP pie.

- In the US, corporate profits have grown faster than the rest of the economy.

→ Net issuance vs buybacks affects EPS.

- In the US, net shareholder buybacks have resulted in EPS growing faster than earnings.

→ Intervention by the state & structural inefficiencies also affect earnings growth.

- The degree to which maximizing shareholder wealth is a primary motivation varies by market.
  - This can take many different forms, such as state-owned enterprises, state-controlled enterprises, and direct intervention by the state (see China).
- Corruption, graft, nepotism, lack of property rights or clear rule of law, can all affect the link between economic growth and earnings growth.

Source: Federal Reserve Economic Data, S&P. Corporate earnings defined as Corporate Profits After Tax (with IVA and CCAdj). Seasonally Adjusted Annual Rate for Nominal GDP. Data is as of September 30, 2023.

Earnings Growth

→ EPS has grown faster than earnings in the US in recent years, acting as a tailwind.

→ This is primarily due to companies using excess cash to buy back their shares.[1]

EPS with no change in shares	EPS with 2% reduction in shares
$1,578 bil / 10.5 mil shares	$1,578 bil / 10.3 mil shares
= $150.3 per share	= $153.2 per share

→ Over ten years, this can have a significant compounding effect.

EPS with 2% reduction in shares for ten years
$1,578 bil / 8.6 mil shares
= $183.9 per share[2]

→ Data shows that this trend is almost two decades long.[3]

→ This bucks the longer-term trend (still common in non-US markets) of companies being net issuers of shares.

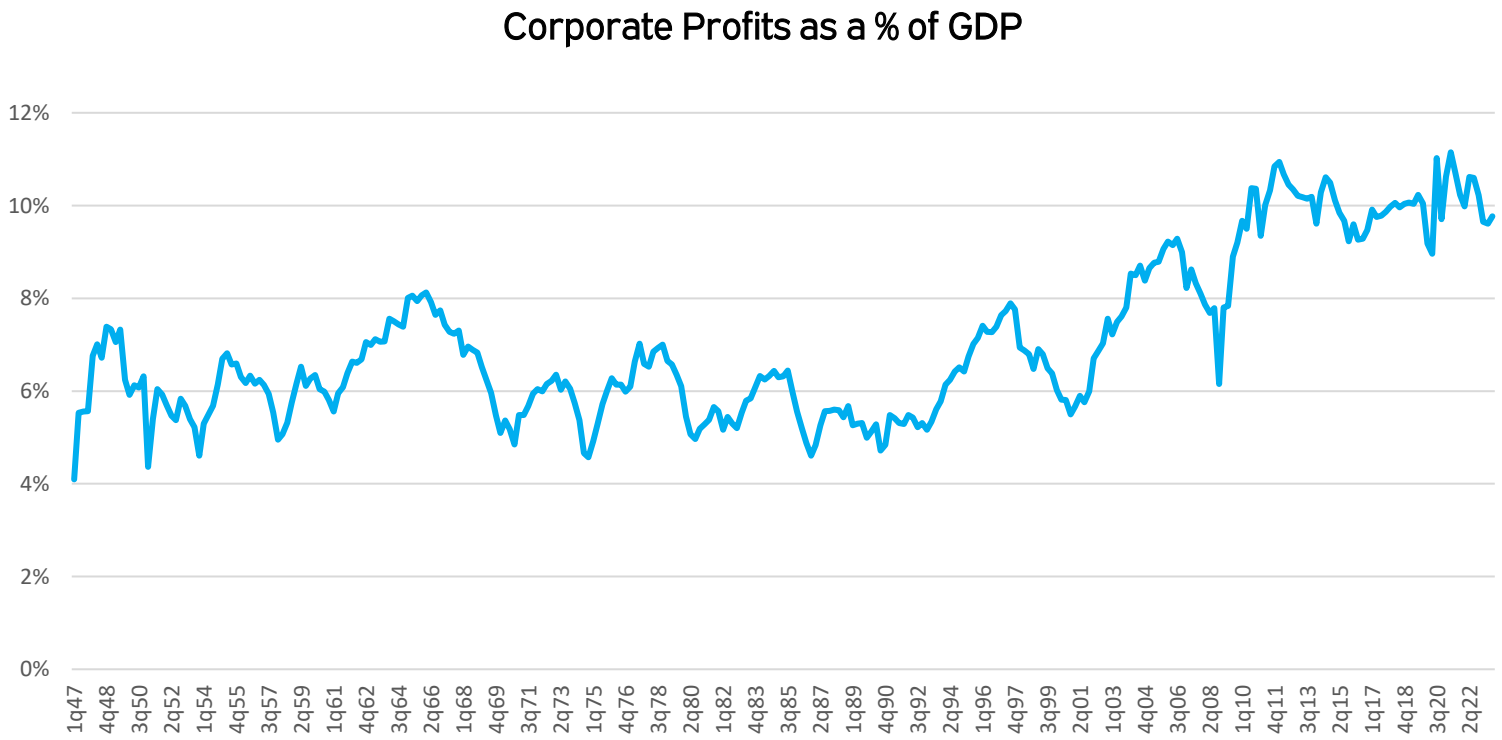
[1] Buying back shares reduces the denominator in the Earnings per Share equation, thus increasing the result of the calculation. The example shown is illustrative.
[2] Throughout this document, numbers may not sum due to rounding
[3] Source: Yardeni research

US Profitability

→ The strong post-2000 growth in US earnings is linked in part to profits consuming a greater proportion of the economic pie.

- Since 2000, corporate profits averaged 9.1% of GDP, vs 6.1% prior to that.

→ Justifying higher future earnings growth implies that profits will continue to comprise a higher percentage of GDP.



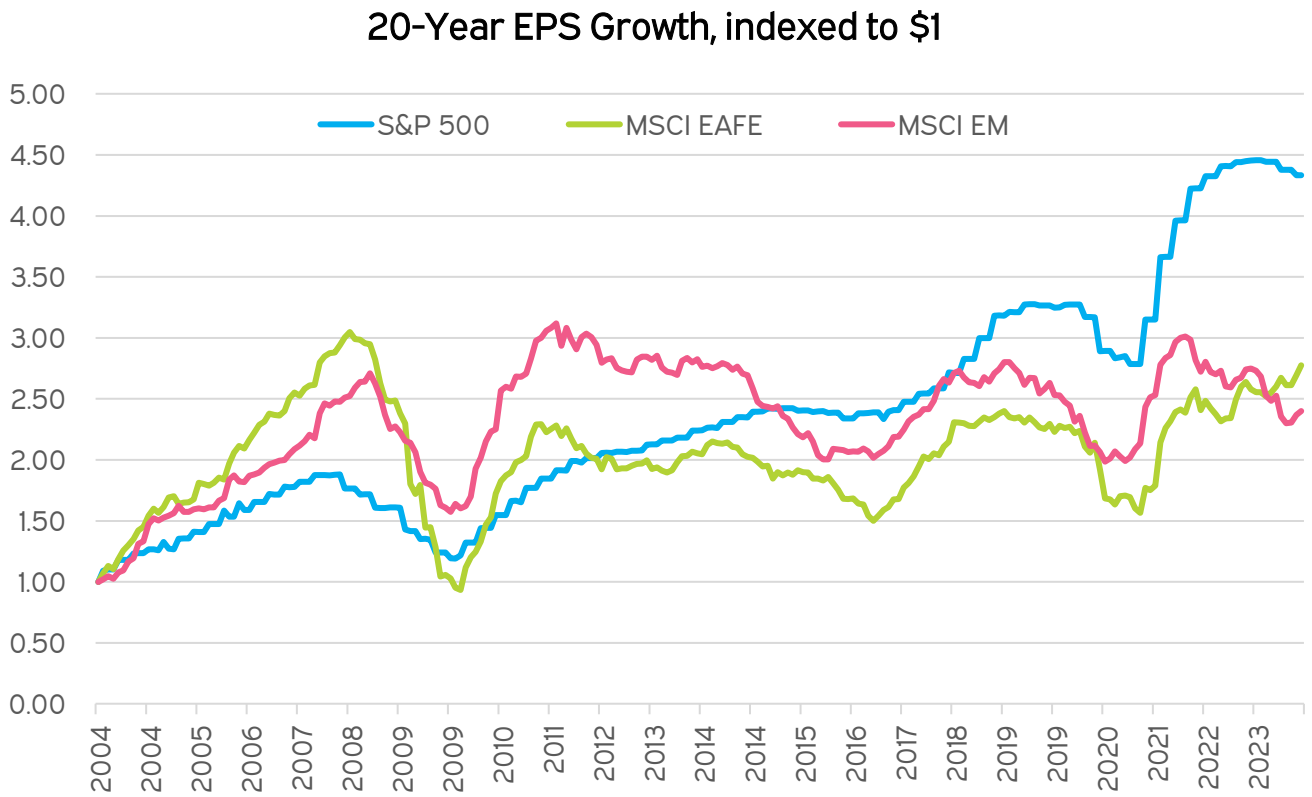
Source: Meketa analysis of FRED data. Series uses Seasonally Adjusted Annual Rate for Nominal GDP and Corporate Profits After Tax with Inventory Valuation Adjustment (IVA) and Capital Consumption Adjustment (CCAdj). Data is from 1q1947 through 3q2023.

EPS Growth

→ EPS growth for the EAFE and Emerging Markets indices has been essentially zero since 2011.

- Meanwhile, US EPS growth has been strong over the past two decades.

→ There has been a meaningful difference in EPS growth for the US versus other global markets, and it has not been due to a difference in GDP growth.



Source: Meketa analysis of MSCI and Bloomberg data. Series uses Trailing 12-month earnings per share in local currency. As of December 31, 2023.

Impact of Interest Rates on Equity Valuations

→ Looking at price-earnings (or PE10, or PB) ratios alone results in many equity markets looking expensive, at least relative to their historical average.

- The picture may look somewhat different when accounting for interest rates.

→ The level of interest rates affects valuations when discounting future cash flows (or earnings).

→ This time value of money concept can be quantified by using the dividend discount model (DDM).

- The DDM calculates a present value for the stock market based on interest rates.

→ The low rates of the 2010's drove up valuations, a trend that was reversed by the sharp increase in rates in 2022.

→ Using the DDM approach, developed equity markets look more attractively priced than they do from a PE10 perspective, despite the higher rates of the last two years.

Correction in Prices Needed to Return to Historical Average

	US Equities (%)	EAFE Equities (%)	EM Equities (%)
Using PE10	-21.2	-10.3	3.9
Adjusting for Rates	-6.1	-7.9	-6.9

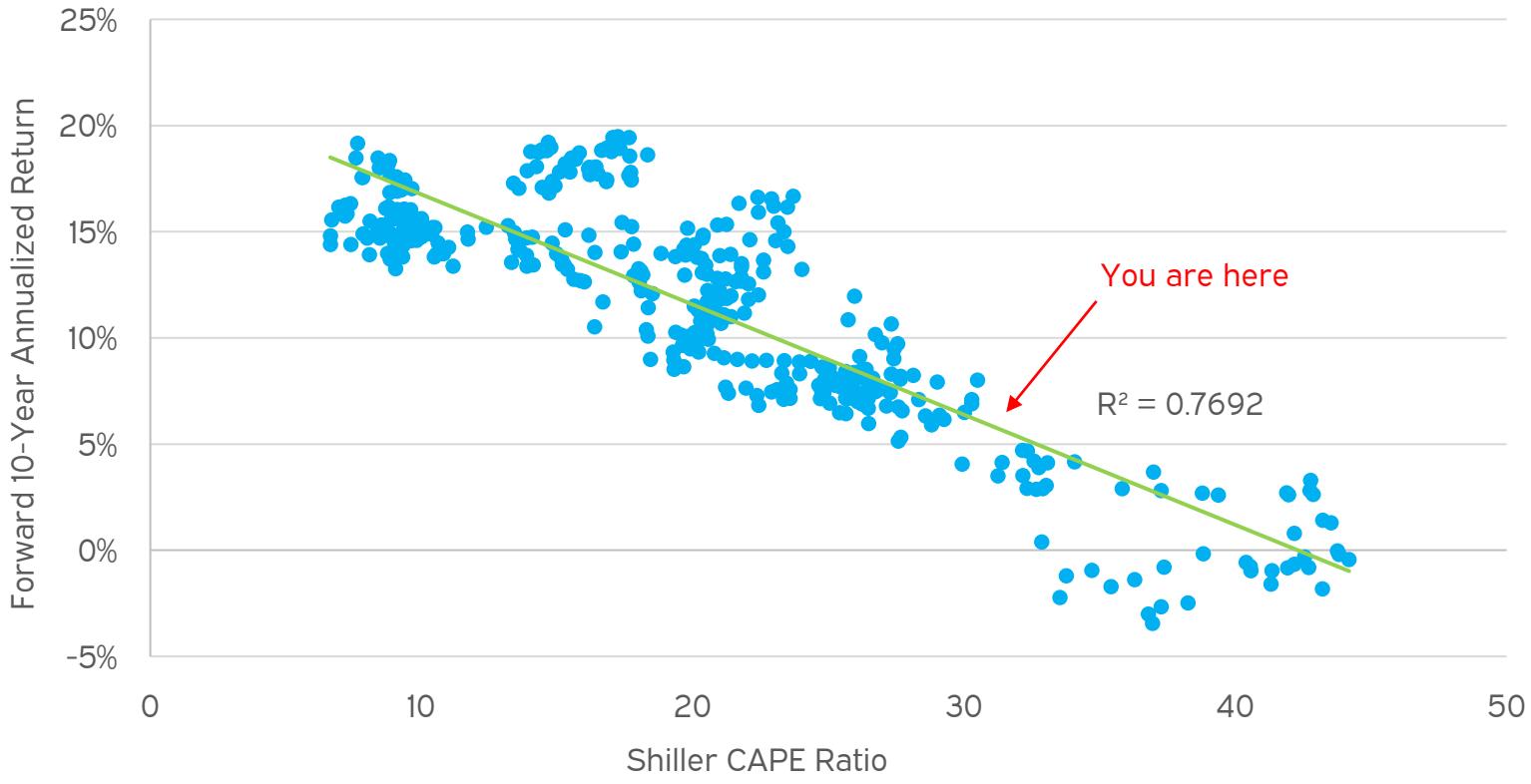
Source: Meketa analysis of MSCI and Bloomberg data.

Impact of Equity Prices on Returns

→ Relative prices have been indicative of future equity returns.

→ Higher prices have led to lower future returns, and vice versa.

US Equities: Shiller CAPE vs. Forward 10-Year Returns



Source: Robert Shiller, Yale University, and Meketa Investment Group. Data is based on monthly returns and Cyclically Adjusted P/E ratio on S&P 500 Index for the period from January 1980 through December 2023.

Valuations High for Growth Stocks

→ After a reversal of the trend in 2022, large growth stocks outperformed large value by more than 30% in 2023.

→ Value stocks appear to have better relative valuations, though the gap in pricing is still far from the peaks of the dot-com bubble.

US Growth P/E vs. Value P/E

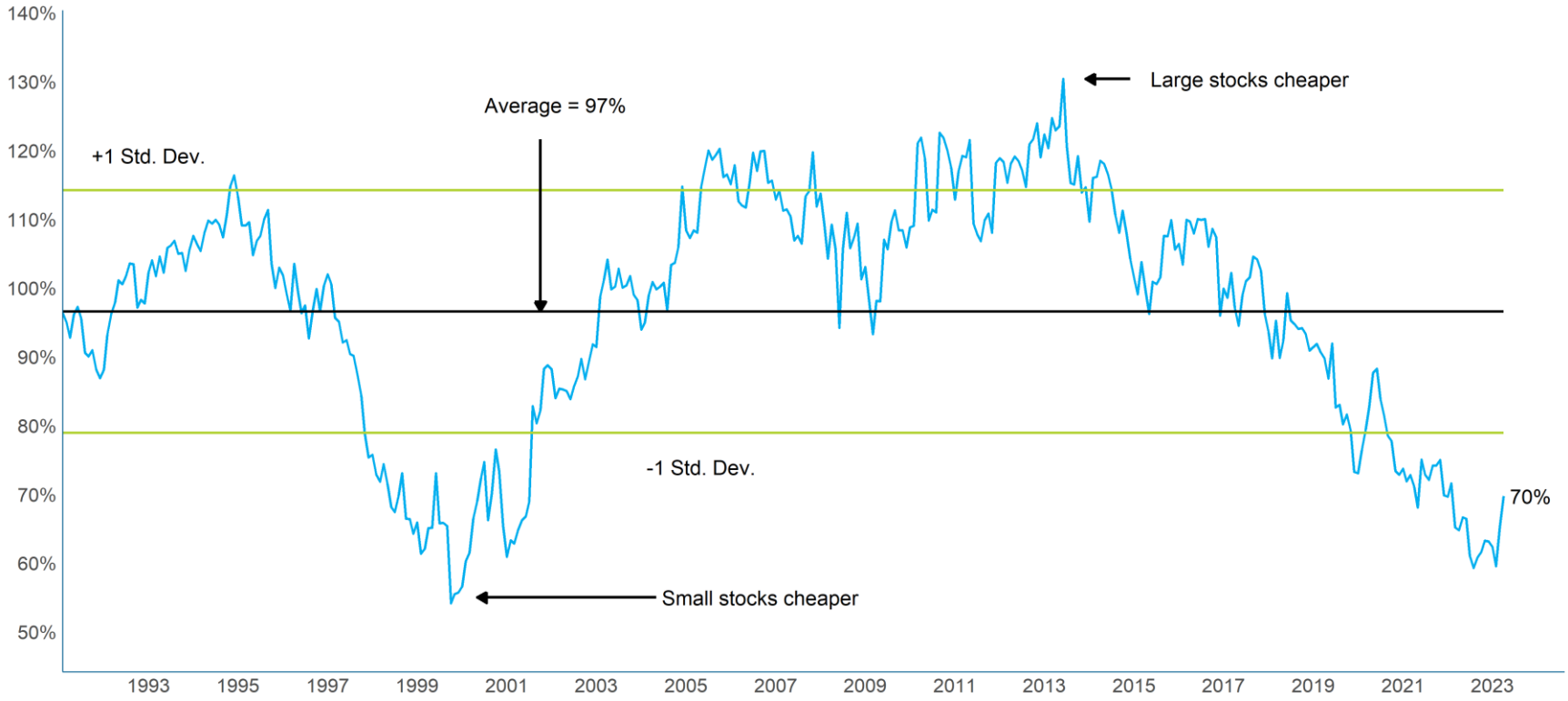
Source: Bloomberg, Russell, and Meketa Investment Group. Growth P/E (Russell 3000 Growth Index) vs. Value P/E. (Russell 3000 Value Index). Earnings figures represent 12-month "as reported" earnings. Data as of December 31, 2023.

Small Cap Valuations Remain Low

→ Large cap stocks outperformed small cap stocks in 2023.

→ Small cap stocks continue to trade at low valuations relative to their long-term history versus large cap stocks.

US Small Cap P/E vs. Large Cap P/E



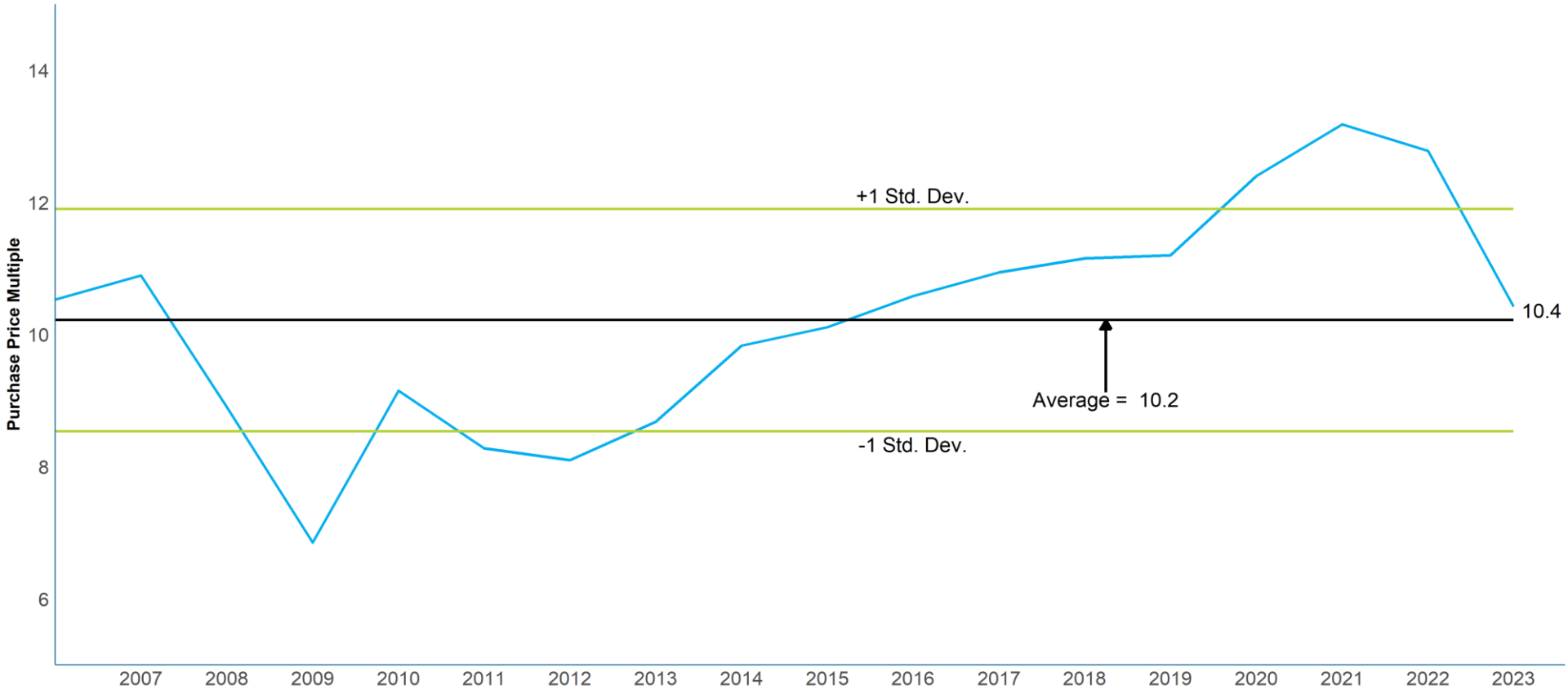
Source: Bloomberg, Russell, and Meketa Investment Group. Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index). Earnings figures represent 12-month "as reported" earnings. Data as of December 31, 2023.

Higher Prices in Private Equity, too

→ EBITDA multiples fell in the first half of 2023 for Buyouts.

- Valuations remained above their post-GFC average.

Private Equity Multiples



Source: Preqin Median EBITDA Multiples Paid in All LBOs, as of June 30, 2023.

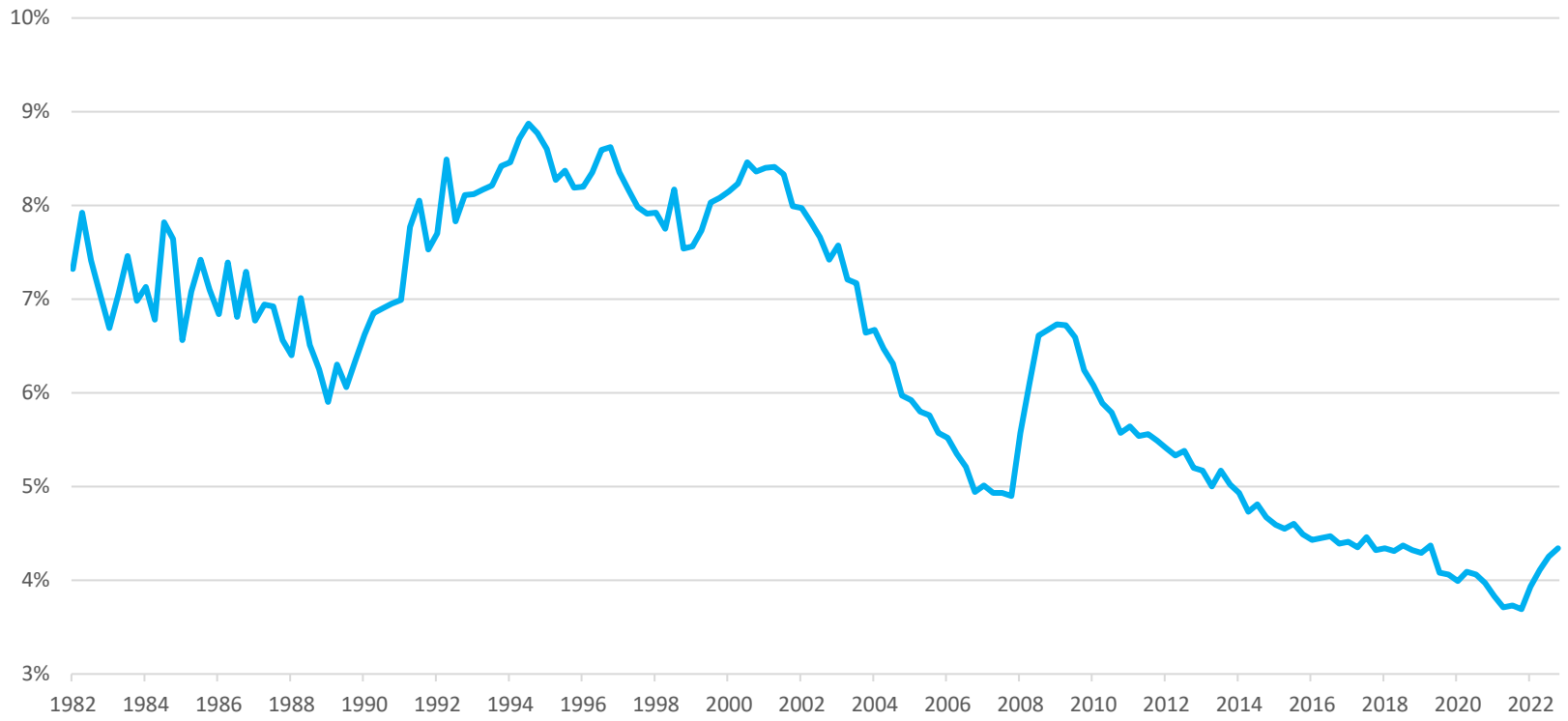
Real Estate Valuations Improving

→ After a nearly 30-year decline, cap rates for core real estate appear to have bottomed in 2022.

- Cap rates rebounded in 2023, reflecting changes in valuations.

→ Cap rates are similar to an earnings yield for equities in that they may be indicative of future returns.

Core Real Estate Cap Rates



Source: NCREIF NPI value-weighted cap rates. As of September 30, 2023.

2024 Expected Returns and Changes from Prior Years

10-year Geometric Expected Returns
Rate Sensitive

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Cash Equivalents	2.4	3.1	-0.7	Lower projected short-term rates
Short-term Investment Grade Bonds	3.8	3.8	0.0	
Investment Grade (Core) Bonds	4.6	4.8	-0.2	Slightly lower yields
Intermediate Government Bonds	4.0	3.7	0.3	Slightly higher yields
Long-term Government Bonds	4.3	4.3	0.0	
Mortgage-Backed Securities	4.7	4.7	0.0	
Investment Grade Corporate Bonds	5.2	5.6	-0.4	Tighter spreads
Long-term Corporate Bonds	5.2	5.3	-0.1	Tighter spreads
Short-term TIPS	3.8	3.9	-0.1	Slightly lower inflation expectations
TIPS	4.3	4.3	0.0	
Long-term TIPS	4.7	4.7	0.0	
Global ILBs	4.3	4.7	-0.4	Slightly lower inflation expectations
Foreign Bonds	3.1	3.8	-0.7	Slightly lower yields
US Inflation	*2.4*	*2.5*	*-0.1*	*Slightly lower near-term economist and market projections*

10-year Geometric Expected Returns
Credit

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
High Yield Bonds	6.5	8.0	-1.5	Tighter spreads
Higher Quality High Yield	6.0	7.1	-1.1	Tighter spreads
Bank Loans	6.5	7.6	-1.1	Tighter spreads
Collateralized Loan Obligations(CLOs)	8.1	8.0	0.1	Slightly higher yields
Convertible Bonds	5.2	6.1	-0.9	Tighter spreads
Emerging Market Bonds (major)	7.0	6.7	0.3	Higher yields
Emerging Market Bonds (local)	6.3	6.4	-0.1	
Private Debt	9.2	9.4	-0.2	Less extreme distressed pricing
Direct Lending	8.2	8.5	-0.3	Lower assumed leverage
Asset Based Lending	9.7	9.4	0.3	Lower average fees
Special Situations Lending	9.7	10.8	-1.1	Less extreme distressed pricing

10-year Geometric Expected Returns
Equities

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
US Equity	6.9	7.8	-0.9	Higher valuations
US Small Cap	8.4	8.7	-0.3	Higher valuations
Developed Non-US (EAFE) Equity	7.7	10.1	-2.4	Higher valuations, lower projected earnings growth
Dev. Non-US Small Cap	8.8	10.5	-1.7	Higher valuations
Emerging Market Equity	7.6	10.3	-2.7	Higher valuations, lower projected earnings growth
Emerging Market Small Cap	7.4	10.0	-2.6	Higher valuations, lower dividend yields
Emerging Market ex-China	7.8	10.7	-2.9	Higher valuations, lower projected earnings growth
China Equity	7.1	9.0	-1.9	Lower projected earnings growth
Frontier Market Equity	9.6	11.2	-1.6	Higher valuations, lower projected growth & dividends
Global Equity	7.2	8.8	-1.6	Higher valuations
Low Volatility Equity	6.5	7.9	-1.4	Higher valuations
Private Equity	9.9	9.7	0.2	Mixed valuations and slightly lower borrowing costs
Buyouts	9.5	9.4	0.1	Mixed valuations and slightly lower borrowing costs
Growth Equity	10.4	10.1	0.3	Mixed valuations and slightly lower borrowing costs
Venture Capital	10.8	10.4	0.4	Lower valuations

10-year Geometric Expected Returns
Real Estate & Infrastructure

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Real Estate	6.3	5.9	0.4	Higher cap rates
US REITs	5.6	6.4	-0.8	Lower yields, some price reversion expected
Core Private Real Estate	4.8	4.3	0.5	Higher cap rates
Value-Added Real Estate	7.3	6.5	0.8	Higher cap rates
Opportunistic Real Estate	8.4	7.6	0.8	Higher cap rates
Infrastructure	7.4	6.9	*0.5*	Lower borrowing costs, model changes
Infrastructure (Public)	8.0	8.0	0.0	
Infrastructure (Core Private)	6.5	6.4	0.1	
Infrastructure (Non-Core Private)	8.0	7.4	0.6	Lower borrowing costs

10-year Geometric Expected Returns
Natural Resources & Commodities

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Natural Resources	7.8	NA		90% private, 10% public
Natural Resources (Public)	8.3	7.8	0.5	Improved relative valuations
Natural Resources (Private)	7.7	8.6	-0.9	Higher valuations
Energy	9.1	9.3	-0.2	
Mining	8.6	9.8	-1.2	Higher valuations
Timberland	5.5	5.7	-0.2	Slightly higher valuations
Farmland	5.0	3.9	1.1	Improved valuations, higher income expectations
Sustainability	8.4	9.2	-0.8	Higher valuations
MLPs	6.6	5.2	1.4	Improved relative valuations
Gold Mining	8.0	9.0	-1.0	Higher valuations
Gold (Metal)	2.4	2.5	-0.1	Slightly lower inflation expectations
Commodities	4.9	6.3	-1.4	Lower projected cash yield, negative roll return

10-year Geometric Expected Returns
Alternative Strategies (Other)

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Hedge Funds	4.5	5.4	-0.9	Lower cash/credit yield, higher valuations
Long-Short	3.2	4.2	-1.0	Higher valuations, lower projected cash yield
Event Driven	7.0	7.7	-0.7	Higher valuations, lower projected cash yield
Global Macro	4.2	5.2	-1.0	Higher valuations, lower yield, tighter spreads
CTA – Trend Following	3.8	3.9	-0.1	
Fixed Income/L-S Credit	5.0	6.3	-1.3	Tighter spreads
Relative Value/Arbitrage	5.6	6.2	-0.6	Lower projected cash yield
Long Vol	0.7	1.0	-0.3	
Insurance Linked Strategies	5.3	5.7	-0.4	Lower yield
Alternative Risk Premia	4.8	5.5	-0.7	Lower projected cash yield
Risk Parity (10% vol)	6.3	7.8	-1.5	Higher equity valuations, tighter spreads
TAA	5.3	5.6	-0.3	Higher equity valuations, tighter spreads
Digital Currencies	2.4	2.4	0.0	

20-year Geometric Expected Returns
Rate Sensitive

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Cash Equivalents	2.5	2.9	-0.4	Lower projected short-term rates
Short-term Investment Grade Bonds	3.7	3.5	0.2	
Investment Grade (Core) Bonds	4.8	4.7	0.1	
Intermediate Government Bonds	4.1	3.7	0.4	Slightly higher yields
Long-term Government Bonds	5.0	5.0	0.0	
Mortgage Backed Securities	4.9	4.6	0.3	
Investment Grade Corporate Bonds	5.4	5.4	0.0	
Long-term Corporate Bonds	6.0	5.7	0.3	
Short-term TIPS	3.7	3.6	0.1	
TIPS	4.7	4.5	0.2	
Long-term TIPS	5.2	5.2	0.0	
Global ILBs	4.7	4.7	0.0	
Foreign Bonds	3.9	4.0	-0.1	Slightly lower yields
US Inflation	*2.8*	*2.6*	*0.2*	Higher long-term inflation expectations

20-year Geometric Expected Returns
Credit

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
High Yield Bonds	6.8	7.3	-0.5	Tighter spreads
Higher Quality High Yield	6.4	6.7	-0.3	Tighter spreads
Bank Loans	6.6	7.0	-0.4	Tighter spreads
Collateralized Loan Obligations (CLOs)	7.2	7.2	0.0	
Convertible Bonds	6.2	6.4	-0.2	Tighter spreads
Emerging Market Bonds (major)	6.8	6.4	0.4	Higher yields
Emerging Market Bonds (local)	6.2	6.0	0.2	
Private Debt	9.2	9.0	0.2	
Direct Lending	8.4	8.3	0.1	Lower assumed leverage
Asset Based Lending	9.4	9.0	0.4	Lower average fees
Special Situations Lending	9.9	10.2	-0.3	Less extreme distressed pricing

20-year Geometric Expected Returns
Equities

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
US Equity	8.5	8.7	-0.2	Higher valuations
US Small Cap	9.4	9.3	0.1	
Developed Non-US (EAFE) Equity	8.9	9.8	-0.9	Higher valuations, lower projected earnings growth
Dev. Non-US Small Cap	9.5	10.1	-0.6	Higher valuations
Emerging Market Equity	8.9	10.0	-1.1	Higher valuations, lower projected earnings growth
Emerging Market Small Cap	8.9	10.0	-1.1	Higher valuations, lower dividend yields
Emerging Market ex-China	9.0	10.3	-1.3	Higher valuations, lower projected earnings growth
China Equity	8.6	9.3	-0.7	Lower projected earnings growth
Frontier Market Equity	10.0	10.7	-0.7	Higher valuations, lower projected growth & dividends
Global Equity	8.7	9.2	-0.5	Higher valuations
Low Volatility Equity	7.8	8.3	-0.5	Higher valuations
Private Equity	11.2	11.0	0.2	Mixed valuations and slightly lower borrowing costs
Buyouts	10.8	10.7	0.1	Mixed valuations and slightly lower borrowing costs
Growth Equity	11.5	11.2	0.3	Mixed valuations and slightly lower borrowing costs
Venture Capital	12.0	11.6	0.4	Lower valuations

20-year Geometric Expected Returns
Real Estate & Infrastructure

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Real Estate	8.0	7.8	0.2	Higher cap rates
US REITs	7.8	8.0	-0.2	Lower yields
Core Private Real Estate	6.9	6.5	0.4	Higher cap rates
Value-Added Real Estate	9.0	8.3	0.7	Higher cap rates
Opportunistic Real Estate	10.3	9.6	0.7	Higher cap rates
Infrastructure	9.0	8.3	0.7	Lower borrowing costs, model changes
Infrastructure (Public)	9.1	8.8	0.3	
Infrastructure (Core Private)	8.0	7.8	0.2	
Infrastructure (Non-Core Private)	10.0	9.5	0.5	Lower borrowing costs

20-year Geometric Expected Returns
Natural Resources & Commodities

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Natural Resources	9.3	NA		90% private, 10% public
Natural Resources (Public)	9.2	8.7	0.5	Improved relative valuations
Natural Resources (Private)	9.3	9.8	-0.5	Higher valuations
Energy	10.4	10.4	0.0	
Mining	9.9	10.2	-0.3	Higher valuations
Timberland	7.3	7.4	-0.1	
Farmland	7.0	6.5	0.5	Improved valuations, higher income expectations
Sustainability	10.0	10.3	-0.3	Higher valuations
MLPs	8.4	7.4	1.0	Improved relative valuations
Gold Mining	9.5	9.7	-0.2	Higher valuations
Gold (Metal)	3.5	3.3	0.2	Slightly higher long-term inflation expectations
Commodities	5.3	5.7	-0.4	Lower cash yield

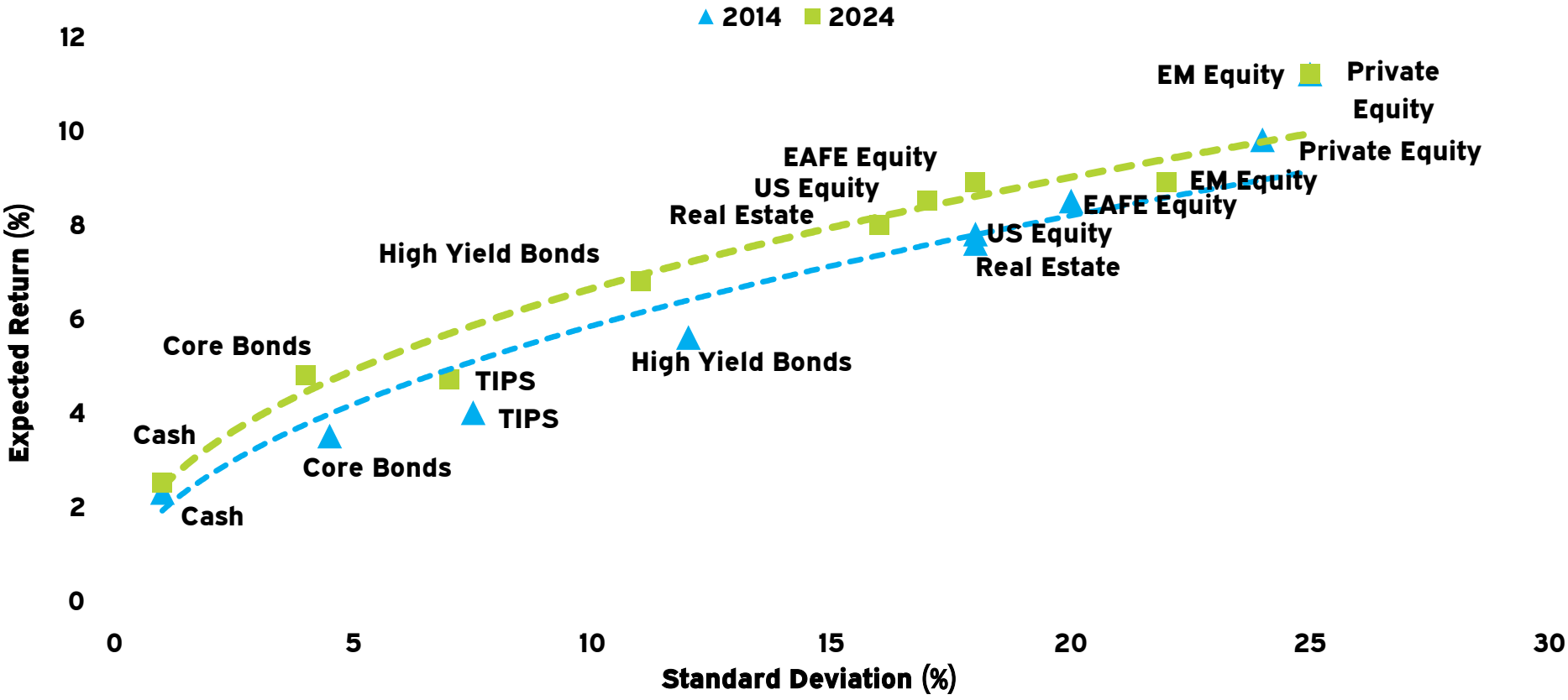
20-year Geometric Expected Returns
Alternative Strategies (Other)

	2024 E(R) (%)	2023 E(R) (%)	Δ From 2023 (%)	Notes
Hedge Funds	5.8	6.1	-0.3	Lower cash/credit yield, higher equity valuations
Long-Short	5.3	5.6	-0.3	Higher valuations, lower projected cash yield
Event Driven	7.6	7.7	-0.1	Higher valuations, lower projected cash yield
Global Macro	5.4	5.7	-0.3	Higher valuations, lower cash yield, tighter spreads
CTA – Trend Following	4.7	4.8	-0.1	
Fixed Income/L-S Credit	6.1	6.5	-0.4	Tighter spreads
Relative Value/Arbitrage	6.5	6.7	-0.2	Lower projected cash yield
Long Vol	1.2	1.1	0.1	
Insurance Linked Strategies	6.2	6.2	0.0	
Alternative Risk Premia	5.2	5.6	-0.4	Lower projected cash yield
Risk Parity (10% vol)	7.2	7.7	-0.5	Higher equity valuations, tighter credit spreads
TAA	6.1	5.7	0.4	Model changes
Digital Currencies	3.5	3.3	0.2	

The Big Picture: Higher Return for Similar Risk[1]

→ The relationship between long-term return expectations and the level of risk accepted is not static.

→ The higher interest rates of the last two years mean that many investors should be able to take on less risk than they have over the past decade if they want to achieve their target returns.



[1] Expected return and standard deviation are based upon Meketa Investment Group's 2014 and 2024 20-year capital market expectations.

Structural Changes and FAQs

Structural Changes for 2024

→ We added the following "asset classes" (total now at 109):

- Short-term government bonds
- Municipal bonds

→ We added several private market "aggregates" to distinguish between those that include and exclude a public markets component:

- Real estate (private)
- Natural resources
- Infrastructure (private)

Model Changes for 2024

→ We reweighted multiple composites to reflect a blend of the market opportunity and a typical Meketa portfolio.

→ New weightings for Infrastructure composite.

- Decreased core and increased non-core.

→ New weightings for Private Debt composite.

- Decreased direct lending, increased asset based lending.

→ New weightings for Real Estate composite.

- Decreased opportunistic, increased debt.

→ New weightings for Natural Resources composite.

- Decreased Energy, increased timber and farmland.

→ New weightings for TAA composite.

- Added bank loans and foreign bonds
- Increased US equity, decreased non-US equities, high yield, and TIPS.

Model Changes for 2024 (continued)

→ We reduced the cap for the magnitude of currency impact from 100 bp to 50 bp per annum.

- Currency movements are the portion of our CME's that we probably have the least confidence in (hence why we have capped them historically).
- This affects any asset class that has foreign currency exposure. There are a few asset classes (e.g., foreign bonds, foreign equities, EMD local) that are 100% non-USD and hence feel the full 50 bp impact.
- There are ~25 other asset classes that have some sort of global component (e.g., global equities, buyouts, natural resources) and hence experienced a more modest impact of 0-20 bp.

→ We increased the % of GDP growth that translates to EPS growth for the US (which flowed through to a smaller increase for global equities) and for EAFE small cap, while decreasing it for all other equity markets.

- Over the past twenty years, most markets have seen EPS growth keep pace with GDP growth.
- However, this has not been the case for the past ten years, and the US has been an outlier in this regard.
  - Over the past ten years, US earnings per share has continued to grow faster than nominal GDP (6.8% per annum versus 5.0%).
  - Annualized EPS growth over the ten years for EAFE was 3.1% and for EM was -1.4% (with China at -2.8%).

→ We added fintech to our VC valuation model.

→ We added Taiwan and deleted Russia from our currency impact models.

→ For measuring historical volatility (and correlations), we extended our look-back period from 15 years to 20 years, so as to continue to include the GFC in our analysis.

→ In addition, Bloomberg changed the way they calculated earnings, which resulted in varied impacts on our equity models.

FAQs for 2024

How do these CMEs compare to prior years' assumptions?

→ To help evaluate this, we created a weighted average of expected returns for the asset classes that comprise a typical institutional portfolio.[1]

→ The value of the expected return for the portfolio is not a precise expected return (i.e., it has not been run via MVO), but the magnitude of the change is what is relevant.

→ In short, the average of 20-year expected returns is 20 basis points lower than last January.

Year	Weighted Average Expected Return (%)	Change from Prior Year (%)
2024	8.0	-0.2
2023	8.2	+1.7
2022	6.5	+0.4
2021	6.1	-0.7
2020	6.8	-0.6
2019	7.4	+0.7
2018	6.7	-0.2

[1] The weights are as follows: 10% investment grade bonds, 3% LT government bonds, 4% TIPS, 3% high yield, 2% bank loans, 3% EM debt, 3% private debt, 25% US equity, 12% EAFE equity, 8% EM equity, 10% private equity, 10% real estate, 2% natural resources, 3% infrastructure, 2% hedge funds.

FAQs for 2024 (continued)

What is driving the changes from last year?

→ The changes relative to last year are being driven by what happened in the market.

→ Credit spreads tightened, leading to lower yields, thus decreasing expected returns for fixed income assets.

→ Most equity markets rallied, pushing them to higher valuations, thus reducing their forward-looking returns.

→ Lower anticipated borrowing costs had a positive impact on assets that use leverage.

→ Lower anticipated cash yields hurt expected returns for hedge funds and related asset classes.

→ The long downward trend in cap rates for real estate reversed, pushing up their expected returns.

→ Higher anticipated long-term interest rates also provide a tailwind in our 20-year projections, as the bridge from 10 to 20 years is made via a risk premium being added to a (higher) future risk-free rate.

- The risk-free rate jumped from 4.17% to 4.64%.

How do Meketa's CMEs compare to peers?

→ We believe our CMEs are in the same ballpark as our peers.

→ We generally cite the survey conducted each year by Horizon Actuarial Services for making peer comparisons, as it is the most comprehensive survey of CMEs of which we are aware.

- However, this survey is usually not published until July or August.

→ It is important to distinguish between intermediate term assumptions (e.g., 7-10 years) and long-term assumptions (e.g., 20-30 years) when making these comparisons.

FAQs for 2024 (continued)

Did volatility expectations change?

→ Not systematically, though many public equity asset classes saw a 1% drop in expected volatility.

→ The biggest change was a 5% increase in the broad infrastructure category. This was entirely due to our change in the composite weighting that substantially increased non-core versus core infrastructure.

→ Our methodology includes a 20-year look back, which includes the volatile years of 2022, 2020 and 2008.

Did Meketa make any qualitative adjustments?

→ As usual, we made some qualitative adjustments to the CMEs.

→ We made a decrease to high yield real estate debt, as our model relies upon public markets data that is limited and perhaps not fully representative.

→ We made an adjustment to farmland as the high inflation of the last two years was causing the real income portion of our model to predict long-term income that seemed unrealistic.

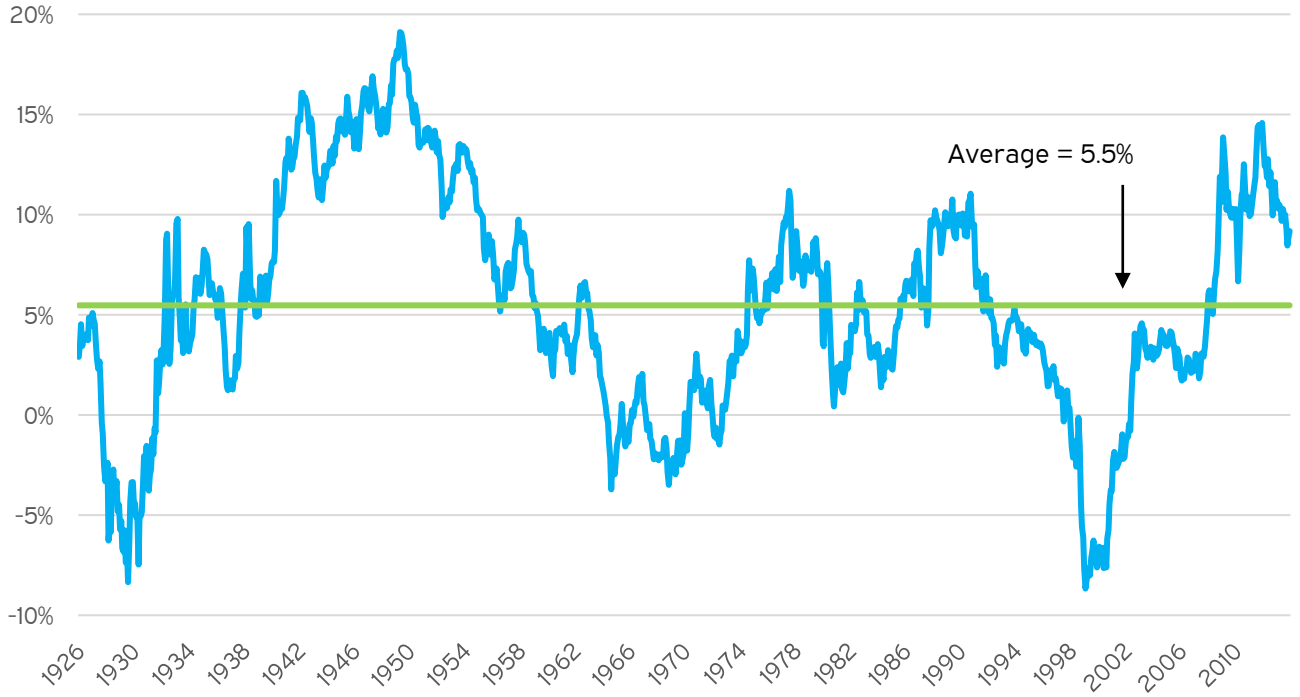
FAQs for 2024 (continued)

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

→ Yes. We assume a 5.5% risk premium for US equities over 10-year Treasuries.

→ Historically, the risk premium for the S&P 500 over the yield for the 10-year Treasury has averaged 5.5%, though the range has varied considerably.

US Equity Risk Premium over 10-year Treasury[1]



[1] Represents the ten-year risk premium for the S&P 500 index over the 10-year Treasury yield at the start of the period. Data is through December 31, 2023.

FAQs for 2024 (continued)

Is Meketa assuming that interest rates will go up or down?

→ We use the market's projections for future rates, based on what was priced in at the time of our analysis.

→ For example, the market is projecting that the ten-year Treasury will be yielding approximately 4.6% in ten years, versus 4.2% as of 12/31/23.

→ By contrast, the FOMC is expecting the Fed Funds Rate to fall to ~2.9% by 2026, implying a return to a more normally shaped yield curve.

What is the steepness of the yield curve you imply?

→ Just as our equity models assume mean reversion in pricing, our bond models assume a kind of mean reversion in the shape of the yield curve over the next ten years.

- The yield on the 10-year Treasury has averaged 150 bp over that for T-bills since 1934.
- The 2-10 spread has averaged 88 bp since 1976.

Why is the expected return for cash dropping when short-term rates increased during 2023?

→ Our expected returns are long-term projections, not just what we are projecting for the next year or two.

→ Many economists (and futures markets) are expecting short-term rates to drop rather significantly over the next 18-24 months.

→ Most of the horizon will be at these new, lower rates (i.e., rates that are lower than they were one year ago).

FAQs for 2024 (continued)

Why do longer duration fixed income assets have a higher 20-year versus 10-year expected return, while the reverse is the case for shorter duration bonds?

→ The majority of asset classes have a higher return assumption for the 20-year period due to the increase in the risk-free rate (recall that we use a risk premia approach for years 11-20).

→ This tends not to be the case for our shorter duration fixed income assets due to the return to a more normally shape yield curve over the next ten years that is implied by the model.

- That is, the higher risk premia we use for longer duration bonds implies a more normal term structure to the yield curve in years 11-20.

Why did the 10-year expected returns for private real estate increase while it went down for REITs?

→ For the second year in a row, cap rates and REIT yields moved in opposite directions.

- Cap rates are now back above REIT yields.

→ Higher cap rates pushed up our expected returns for core and non-core real estate, while lower yields pushed down our expected returns for REITs.

FAQs for 2024 (cont.)

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

→ Most of our economic projections come from the IMF's World Economic Outlook. Their inflation projections are in the table below.

- They are projecting slightly elevated inflation for the US in 2024, followed by benign levels thereafter.

→ We combine the five-year average for the US with the 5-year-5 inflation swap (i.e., what the market is projecting 5-year inflation will be five years from now), to arrive at our 10-year number.

Inflation Estimates

	2024	2025	2026	2027	2028	5-Year Average	5-yr-5 Inflation Swap	10-year Inflation Estimate
US	2.8	2.4	2.2	2.1	2.1	2.3	2.5	2.4
Euro Area	3.7	2.4	2.2	2.0	2.0	2.5	2.3	2.4
UK	3.7	2.1	2.0	2.0	2.0	2.4	3.4	2.8
Japan	2.9	1.9	1.6	1.6	1.6	1.9		1.6
China	1.7	2.2	2.2	2.2	2.2	2.1		2.9

Sources: IMF World Economic Outlook, October 2023; Bloomberg.

FAQs for 2024 (continued)

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

→ Valuations increased to a greater extent for public equities (e.g., PE ratios) than they did for private equity (e.g., EBITDA multiples).

→ Of note, the private equity data (as always) is through 9/30.

- It is possible that buyout multiples will "catch up" with public equity valuations in 2024, but this has not always been the case historically.

How does Meketa look at valuations for venture capital?

→ Venture capital tends to be focused on a smaller part of the broad economy, concentrating mostly on a few sectors such as technology and healthcare.

→ To get a feel for how VC is currently priced, we create a proxy composed of public market indices that focus on these sectors.

→ The proxy is currently composed of: the NASDAQ; Pharma, Biotech & Life Sciences; IT Services; financial technology; and Clean Tech/Environment. The composition and weightings have changed over time.

→ That said, we take our VC model with a large grain of salt, as there is very little private market data available.

FAQs for 2024 (continued)

Do we still expect US earnings to grow faster than the broad economy?

→ Yes, until/unless there is a structural shift, perhaps due to political events, US companies are likely to earn a greater share of economic growth than they have over the post-WWII era.

What is causing the significant decrease in 10-year expected returns for non-US equities?

→ First, the reduction in our cap on foreign exchange impact is effectively cutting 50 bp from each asset class that is primarily denominated in a currency other than USD.

→ There was a bit of a disconnect in most overseas markets this past year, with prices rising much more than earnings grew. Hence valuations are higher, which lowers expected returns.

→ We also reduced the % of GDP growth that we expect to translate to EPS growth by varying degrees for foreign markets (many have produced little to no EPS growth over the past ten years).

How is your outlook on China affecting your expected returns?

→ Our outlook for China has continued to decline due to a number of factors, including:

- The lack of a post-Covid re-opening economic rebound
- A shift in prioritization by the CCP to favor Marxism over growth
- Geopolitical tensions and "de-risking" by Western investors
- Real estate and debt challenges

→ As a result, we are placing a greater discount on Chinese (and hence, emerging market) growth translating to EPS growth.

- This serves as a drag on expected returns for EM and Chinese equities.

FAQs for 2024 (continued)

What effect do we expect net buybacks to have, if any?

→ We believe US companies will continue to be net buyers of their shares over the next decade, but to a lesser extent than they have for the past decade. This will be a net tailwind.

→ We expect other markets to be net issuers of shares (i.e., this will be dilutive to shareholder wealth). This is most pronounced in emerging markets, due to their anticipated growth.

Why do we believe US companies will be net buyers of their stock for an extended period, and why does that matter?

→ There are several reasons why we can/should believe US companies will be net buyers of their stock for an extended period (e.g., the next ten years), and why that may change.

→ First, it would be a continuation of a nearly two-decade trend that CFOs have decided it is in their interest to prioritize buybacks over dividends or other uses of cash.

- This could obviously change, but the catalyst for this is not obvious nor apparently on the horizon.

→ The second factor is if labor finally starts clawing back a larger portion of GDP.

- This clearly could happen, but despite an incredibly tight labor market, it is not happening (at least not yet). Rather, companies have had success passing on their higher labor costs to their customers and hence maintaining their profitability.

→ This matters in our models because it impacts what portion of GDP growth translates to EPS growth.

- If companies are more profitable and they are buying back shares, this will be much more beneficial to EPS than if companies are less profitable and are diluting their shares (e.g., via new issuance).

FAQs for 2024 (continued)

Do we consider inflation when building expected returns for real assets like real estate, infrastructure, and natural resources?

→ Yes, inflation is a component for the vast majority of these assets, and their growth is generally linked to inflation in our models.

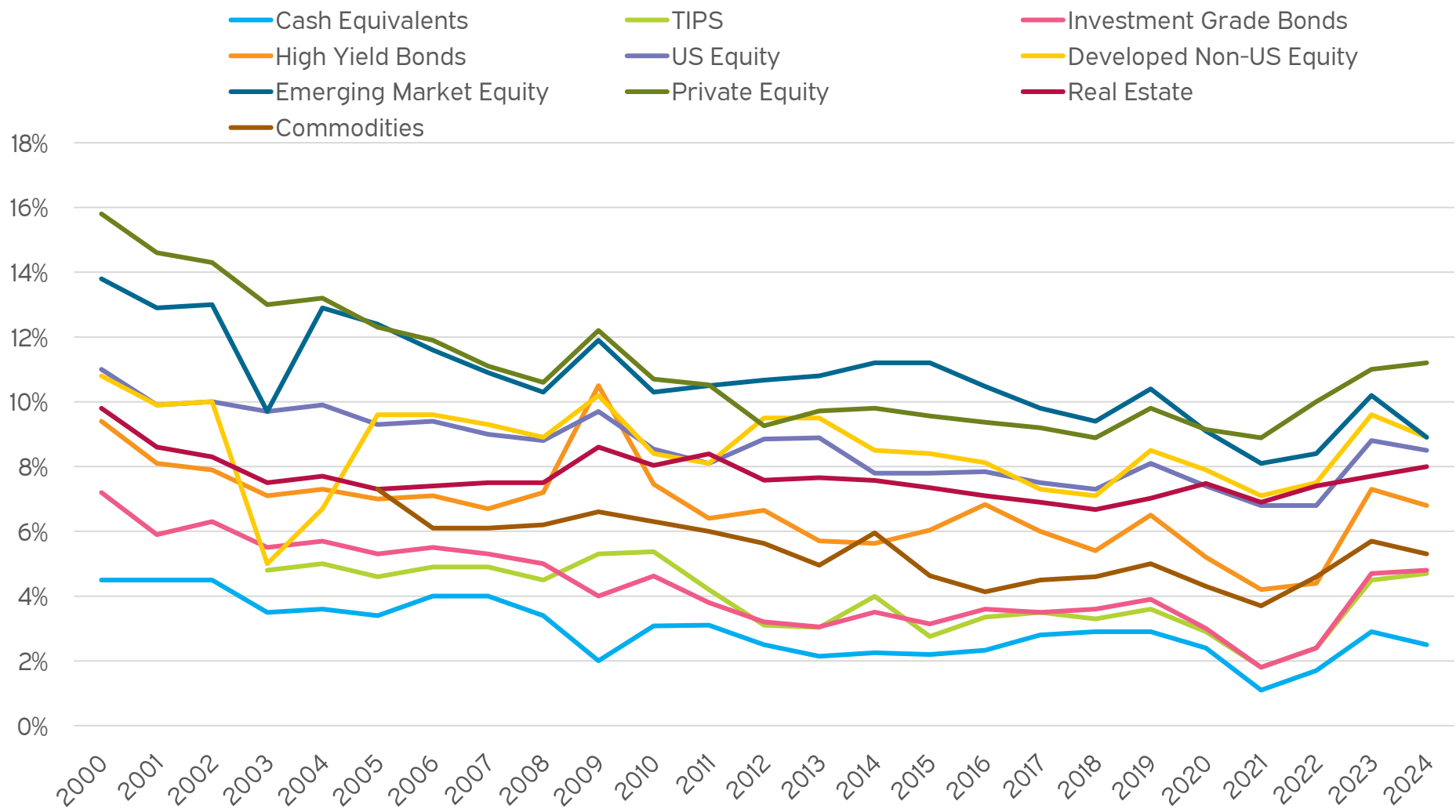
How are you accounting for the distinctly non-linear return profile of Long Vol?

→ We assume that the payoff of a long vol strategy is significantly and positively skewed during periods of poor equity market returns.

- In particular, we analyze the historical distribution of returns during periods when equity markets increase or decrease by 10%.

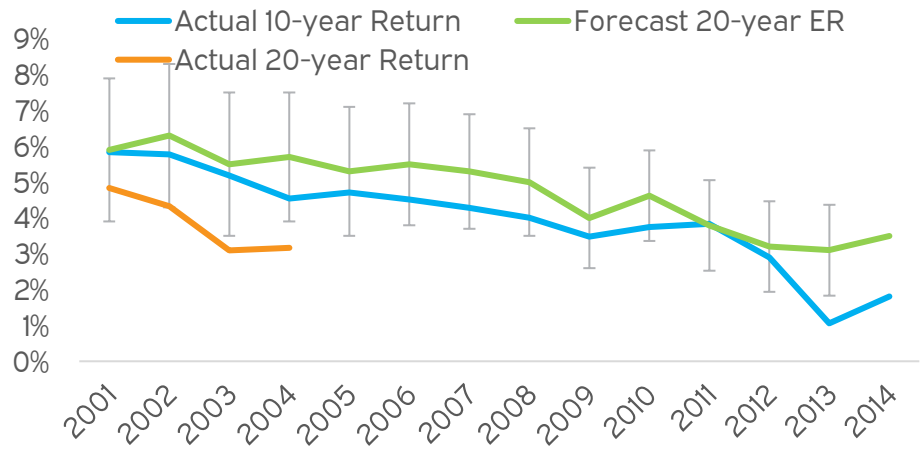
→ However, the average return in most years is driven by the effective "insurance premium" investors pay for this strategy.

Our 20-year CMEs since 2000

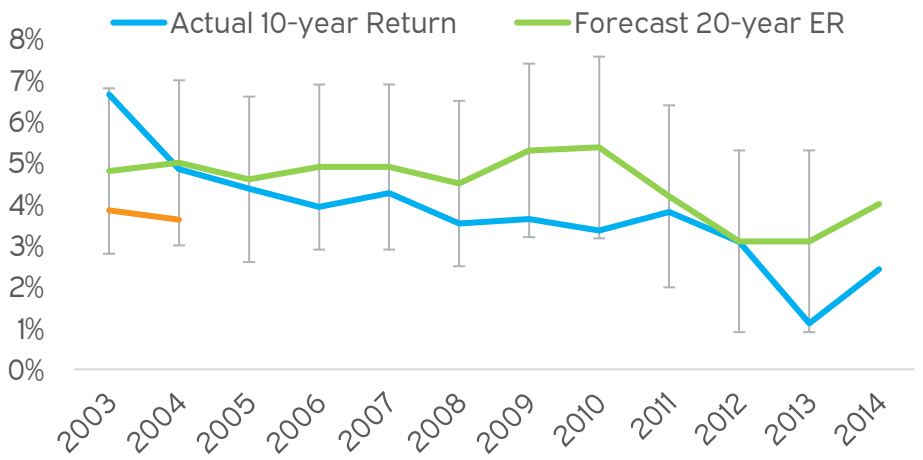


Our Track Record

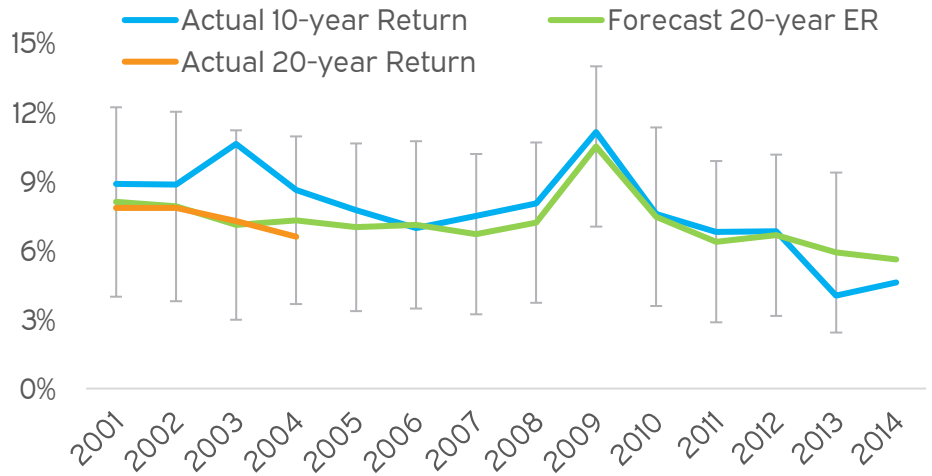
Investment Grade Bonds



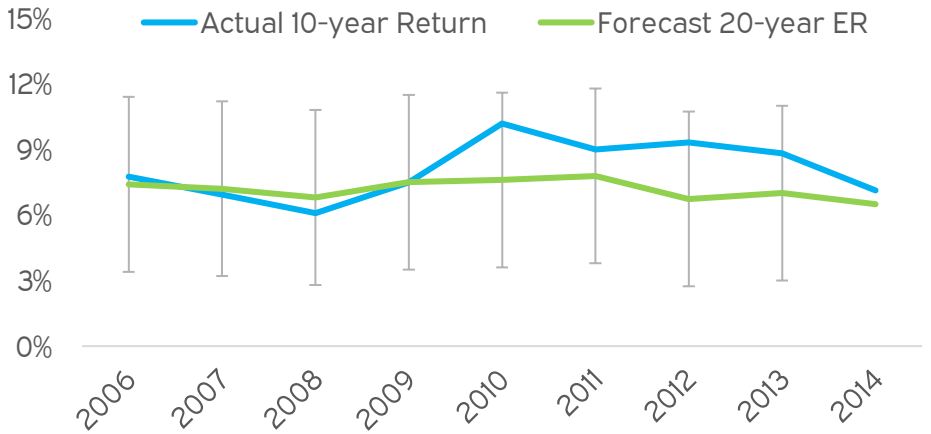
TIPS



High Yield Bonds



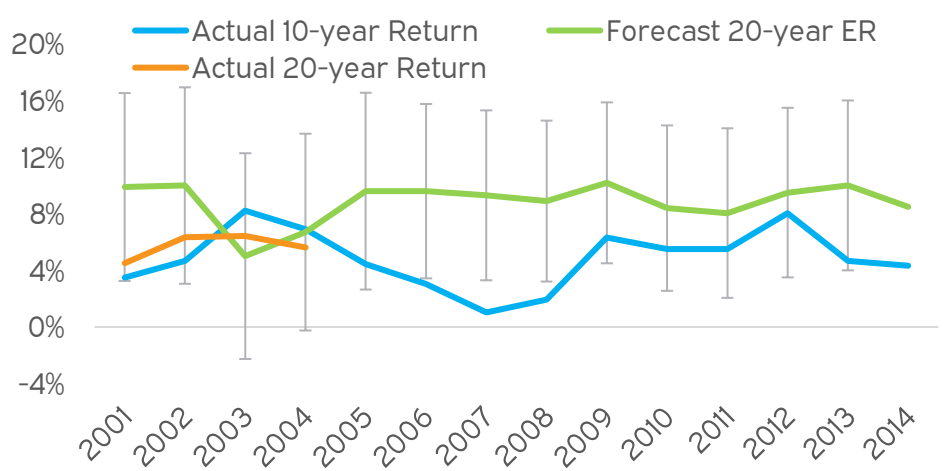
Core Real Estate



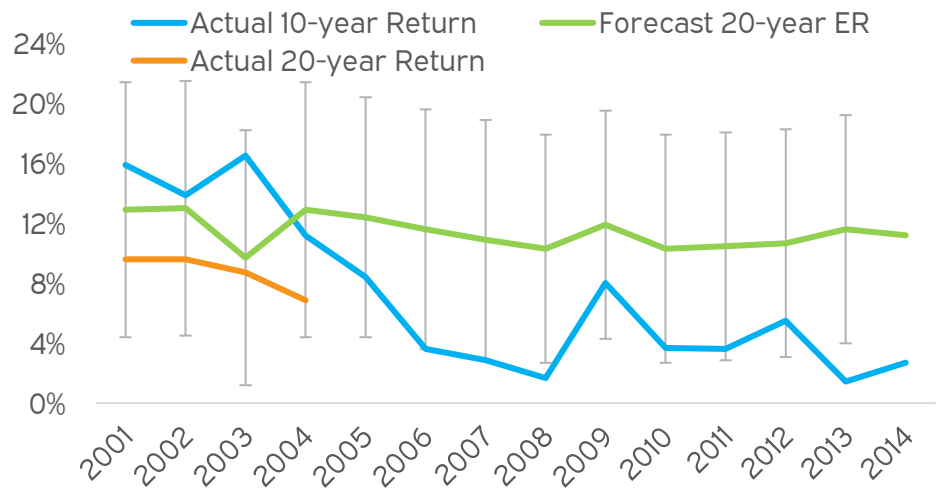
Our Track Record (continued)

US Equity

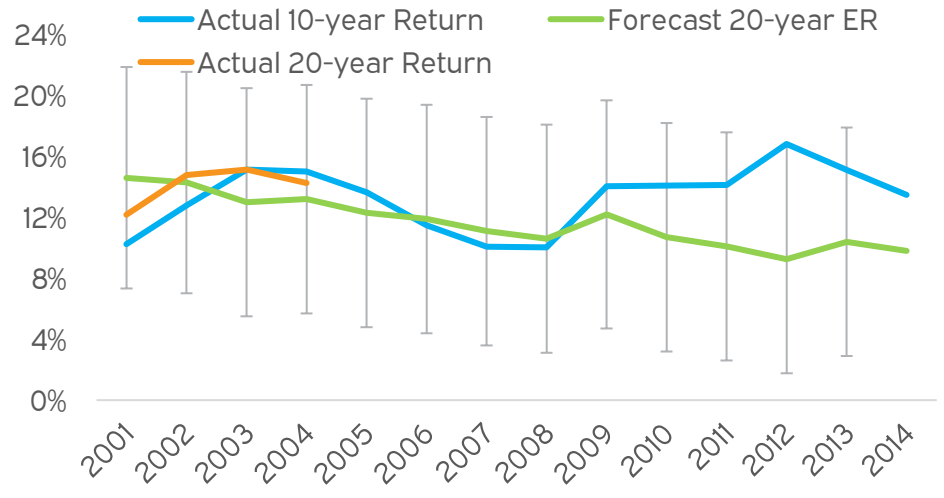
EAFE Equity



Emerging Markets Equity



Private Equity



Our Process

Setting Capital Market Expectations

→ Capital markets expectations (CMEs) are the inputs needed to determine the long-term risk and returns expectations for a portfolio.

- They serve as the starting point for determining asset allocation.

→ Consultants (including Meketa) generally set them once a year.

- Our results are published in January and based on data as of December 31 for public markets and September 30 for private markets.
- Changes are driven by many factors, including interest rates, credit spreads, cap rates, and equity prices.

→ Setting CMEs involves crafting long-term forecasts for:

- 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 both investable and appropriate for the long-term allocation of funds.

→ Several considerations influence this process:

- Unique return behavior,
- Observable historical track record,
- A robust market,
- And client requests.

→ We then make forecasts for each asset class.

- We created inputs for 109 “asset classes” for our 2024 Capital Markets Expectations.

Building 10-year Forecasts

→ Our first step is to develop 10-year forecasts based on fundamental models.

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

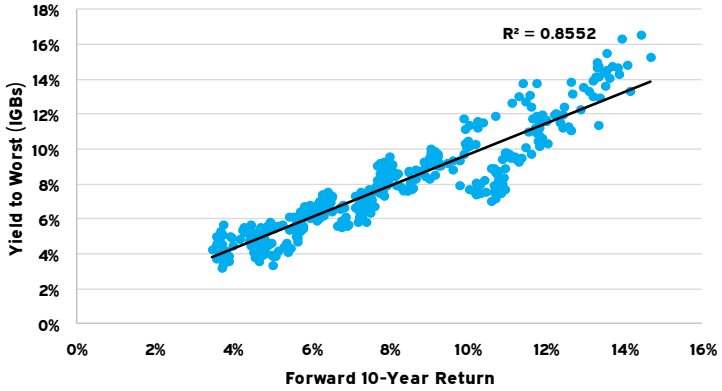
Asset Class Category	Major Factors
Equities	Dividend Yield, GDP Growth, Valuation
Bonds	Yield to Worst, Default Rate, Recovery Rate
Commodities	Collateral Yield, Roll Yield, Inflation
Infrastructure	Public IS Valuation, Income, Growth, Leverage
Natural Resources	Price per Acre, Income, Public Market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

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

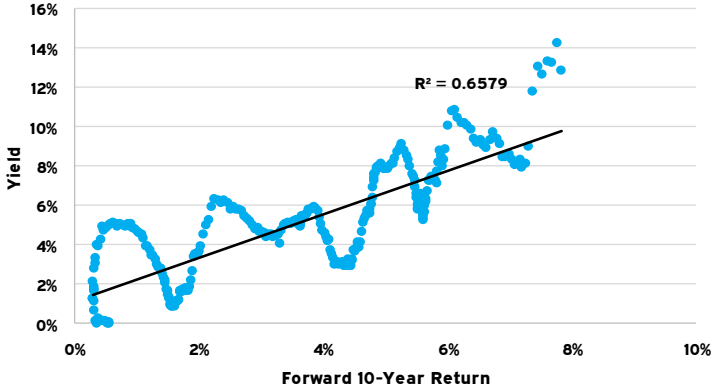
- Leverage and currency impact are also key factors for many strategies.

Some factors are naturally more predictive than others

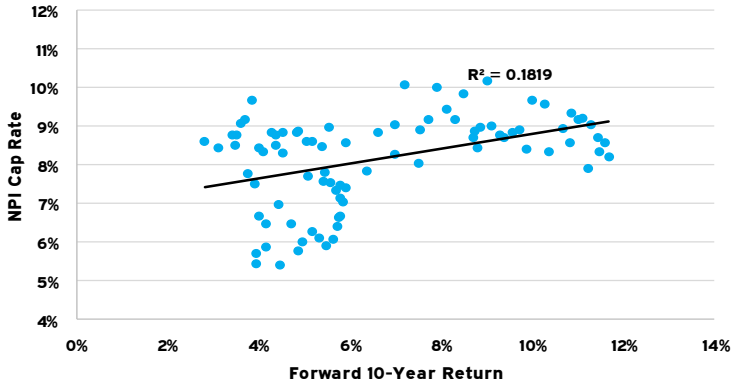
Investment Grade Bonds
Yield to Worst vs. Forward 10-Year Returns



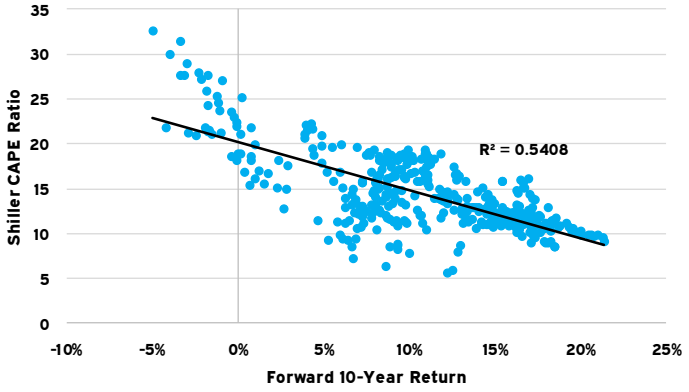
Cash (90-day T-Bill)
Yield vs. Forward 10-Year Returns



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



US Equities
Shiller CAPE vs. Forward 10-Year Returns



Sources: Bloomberg, FRED, NCREIF, S&P, Robert Shiller (Yale University), and Meketa Investment Group. As of December 31, 2022.

10-year Model Example: 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:

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

10-year Model 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 evaluates historical data to develop expectations for dividend yield, earnings growth, the multiple effect, and currency effect.

- Earnings growth is a function of real GDP growth, inflation, and exposure to foreign revenue sources.
- We assume that long-term earnings growth is linked to economic growth.
- However, many factors can cause differences between economic growth and EPS growth.

→ Our models assume that there is a reversion toward mean pricing over this time frame.

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.

Equities

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

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

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

→ We use the current dividend yield on the respective index.[1]

→ Earnings growth is a function of Real GDP growth, inflation, and exposure to foreign revenue sources.

→ We use three approaches to calculate the multiple effect.

→ The models assume reversion to the mean or fair value.

→ We arrive at our preliminary 10-year assumption (in local currency)

$$US\ Equity\ E(R) = 1.5\% + [(1 + 6.4\%)\ x\ (1 - 1.0\%) - 1] = 6.9\%$$

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

[1] The source for dividend yields is S&P 500 for the US and MSCI for non-US equities. Note that in multiple places in this presentation, we display rounded values in the inputs, which may result in minor discrepancies in the results.

Equities: Model[1]

→ To calculate the price return, we estimate the fair value of the index in ten years.

- We first calculate future Earnings Per Share (EPS) by compounding current EPS[1] at our projected earnings growth rate.
- We average the next ten years of projected EPS to arrive at an EPS 10.

Year	US	EAFE	EM	EAFE Sm	EM Small	Frontier
2023	217.6	151.8	70.4	15.9	64.1	47.3
2024	231.6	158.2	74.1	16.6	68.0	49.7
2025	246.5	164.8	78.0	17.3	72.1	52.2
2026	262.3	171.8	82.0	18.0	76.5	54.8
2027	279.1	179.0	86.3	18.8	81.1	57.6
2028	297.0	186.6	90.8	19.6	86.0	60.5
2029	316.1	194.4	95.6	20.4	91.2	63.5
2030	336.4	202.6	100.6	21.3	96.8	66.7
2031	358.0	211.2	105.8	22.2	102.7	70.0
2032	381.0	220.1	111.4	23.1	108.9	73.6
2033	405.4	229.4	117.2	24.1	115.5	77.2
Average EPS10 in 10 years	*311.3*	*191.8*	*94.2*	*20.1*	*89.9*	*62.6*

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

Equities: Model 1 (continued)

→ For projected earnings growth, we add expected real GDP and expected inflation to arrive at nominal GDP.[1]

- We assume that GDP growth is a close long-term proxy for earnings growth.
- We assume that the amount of economic growth that translates to EPS growth varies.[2]

	US	EAFE	EM	Frontier
% of Growth Translating to EPS	128%	85%	68%	60%

→ The model is based on the theory that a region's companies will grow at roughly the same rate as its economy, as defined by GDP, over the long term.

- We also adjust for the percentage of earnings that is derived from foreign countries.[3]

	Earnings from US	Earnings from EAFE	Earnings from EM	Earnings from Frontier
S&P 500	62.6%	16.9%	18.9%	1.6%
MSCI EAFE	22.0%	52.5%	23.4%	2.2%
MSCI Emerging Markets	13.1%	8.1%	77.4%	1.3%

[1] We constructed 5-year GDP based on the IMF World Economic Outlook as of October 2023 and Oxford Economics projections, and then use Oxford Economics projections for the remaining five years to arrive at a ten-year forecast for each. We constructed inflation projections based on the IMF World Economic Outlook as of October 2023, historical averages and 5-year Inflation swaps maturing 5 years from now where available (e.g., US, Euro Area, UK).
[2] We believe the percentage of GDP growth translating to earnings growth varies due to net issuance, state intervention, etc.
[3] Source: MSCI Economic Exposure indices for USA, EAFE, Emerging Markets, and Frontier Markets as of December 31, 2023.

Equities: Model 1 (continued)

→ We multiply EPS10 by our projected PE10 ratio to arrive at a ten-year price target.

- We assume investors will pay slightly different ratios for earnings in different regions.[1]

$$US\ Price\ Target = 311.3 \times 25.9 = 8{,}074$$

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

$$US\ Price\ Return = (8074 \div 4770)\ \hat{}\ 1/10 - 1 = 5.4\%$$

→ We subtract the projected earnings growth from the price change to arrive at the Multiplier Effect.

$$Multiplier\ Effect_{Model\ 1} = 5.4\% - 6.4\% = -1.0\%$$

[1] We assume that PE10 reverts 75% of the way back to its historical median. We use the median PE10 for the trailing 20 years. Throughout this document, numbers may not sum due to rounding.

Equities: Model 2

→ To calculate the price return, we estimate the fair value of the index in ten years.

→ We first calculate future EPS by multiplying current EPS by projected earnings growth.

$$US\ EPS = 217.6 \times (1 + 6.4\%) \wedge 10 = 405.4$$

→ We multiply EPS by our projected PE ratio[1] to arrive at a ten-year price target.[2]

$$US\ Price\ Target = 405.4 \times 18.4 = 7{,}455$$

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

$$US\ Price\ Return = (7455 \div 4770) \wedge 1/10 - 1 = 4.6\%$$

→ We subtract the projected earnings growth from the US Price return to arrive at the Multiplier Effect.

$$Multiplier\ Effect_{Model2} = 4.6\% - 6.4\% = -1.9\%$$

[1] We assume that PE reverts 75% of the way back to its historical median. We use a historical PE (trailing twelve months) that is consistent with the median for the past twenty years.
[2] Throughout this document, numbers may not sum due to rounding.

Equities: Model 3

→ Our third equity model uses a form of the dividend discount model (DDM).

→ This is based on the premise that low rates drive up valuations when discounting future cash flows (or earnings).

→ First, we determine what the implied cost of equity (i.e., discount rate) has been historically.

- This is based on historical interest rates, growth rates, inflation, and prices.

→ We then turn that into a "premium" over government bond rates that can be applied to the current level of interest rates to arrive at a new discount rate.

→ This can be used to calculate a present value for the market using the DDM.

Equities: Model 3 (continued)

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

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

- For earnings (E), we use EPS10
- For the growth rate (G), we use our projected earnings growth rate
- For the discount rate (D), we add the current level of short-term interest rates to an expected premium over this rate[1]

$$\text{US Implied Discount Rate} = 5.2\% + 5.0\% = 10.2\%$$

→ The fair value can be calculated as:

$$Fair\ Value = 154.7 \times (1 + 6.4\%) \div (10.2\% - 6.4\%) = 4{,}355$$

→ We find the difference between fair value and current value, and we assume 75% reversion to fair value is achieved over a ten-year period.

$$Multiplier\ Effect_{Model\ 3} = 0.75 \times [(1 + (4355 - 4770) \div 4770) \wedge (1/10) - 1] = -0.7\%$$

[1] We use the historical discount rate as a starting point, but projected discount rates can vary. For example, in 2024 we are using discount rates slightly below the historical average, with the exception of China.

Currency Effect

→ For non-US equities, we calculate an adjustment for the expected impact of currency movements.

- We use a three-factor model that weights 40% on PPP theory, 30% on IRP theory, and 30% on current account differential theory.
  - PPP posits that money will flow to the currency with lower cost of goods and services[1]
  - IRP posits that money will flow to the currency with the lower interest rate[2]
  - Current account differential posits that money will flow to the currency with the lower current account deficit[3]

Market	PPP Impact	Interest Rates	IRP Impact	Current Account Impact	Net Effect	Adjusted Net Effect[4]
EAFE	2.6%	3.1%	-2.1%	1.8%	1.0%	0.5%
EM	5.8%	5.7%	0.5%	1.4%	2.9%	0.5%
US	NA	5.2%	NA	NA	NA	NA

[1] Sources for PPP data: World Bank (PPP Conversion Factor) and The Economist (Big Mac Index).
[2] We use the central bank discount rate or equivalent for the major countries of each region (source: FRED). Due to lack of data for frontier markets, we used yield-to-worst on longer-term bonds and then adjusted the yield down subjectively (to adjust for term structure).
[3] We use the differential between each region's current account as a % of global trade (source: FRED & The World Fact Book)
[4] We cap the currency adjustment at +/- 0.5% per annum, given the unpredictable nature of currency markets.

Equities: US Mid, Small & Micro

→ The models are similar to that used for the overall equity model.

→ To calculate the price return, we estimate the fair value of the index in ten years. We do this using both price-earnings and price-book ratios.

→ We calculate future EPS by looking at a similar ratio of historical earnings growth for each index vs. the R1k.

- We assume earnings will grow 1.1x faster for midcap, 1.15x faster for small cap, and 1.2x faster for microcap (this is subjective yet fairly consistent with their respective relationships since 1978).
- We multiply EPS by our projected PE ratio[1] to arrive at a ten-year price target.

→ We take a similar approach for price-book, comparing current ratios to historical ratios.

- Price-book can be particularly helpful for small and micro cap, as short-term earnings volatility can distort PE comparisons.

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

→ We add the price change to the dividend yield to arrive at the expected return.

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

Bonds

→ The short version for most investment grade bond models is: E(R) = current YTW.

→ The longer version accounts for the expected term structure in the future, as well as credit risk.

- If the average duration is roughly five years, we calculate the expected yield in five years.
- The net effect tends to be minimal; for example, if rates rise, higher income in years 5 to 10 is offset by price declines in years 1 to 5.

→ For cash, we use an average of the current rate and the rate suggested by the Taylor Rule (inputs are current & potential GDP, current & desired inflation).

→ For TIPS, we add the real yield for the TIPS index to the expected Inflation rate.

→ As with equities, we also make currency adjustments when necessary.

- This currently provides a tailwind to foreign and EM local currency debt.

Bonds (continued)

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

	Inv. Grade Corporate (%)	LT Corporate (%)	Foreign Debt (%)	EM Debt (major) (%)	EM Debt (local) (%)	High Yield (%)	Bank Loans (%)
Default Rate	0.08	0.08	0.09	1.78	0.40	2.50	2.50
Loss Rate	50	50	50	50	50	45	40

- As a guide, we use historical global default & recovery data for each bucket as it is currently rated.
  - Example: EM Debt local currency (based on the JPM GBI EM Global Diversified index):

Rating	Weighting	Default Rate	Weighted Default
Aa	6.2%	0.06%	0.00%
A	29.3%	0.09%	0.03%
Baa	44.1%	0.27%	0.12%
Ba	18.9%	1.06%	0.20%
B	1.5%	3.40%	0.05%
<B	0.00%	10.00%	0.00%
Total Weighted Average Default Rate:			*0.40%*

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

Private Credit

→ For direct lending & asset based lending, we use a building blocks approach that is based on income and loss thereof.

- For income, we make an estimate based on our private credit team's assessment of what the current average coupon rate is.
- We add an upfront fee (paid by the borrower) or original issue discount if applicable.
  - This usually ranges between 1% and 3%.
- We incorporate default & recovery rates.
  - We use a default rate and recovery rate roughly the same as for bank loans.
  - These are subjective, as no long-term data exists on private credit defaults.
- Where applicable, we add leverage and subtract the cost of borrowing.
- We add an equity kicker (more applicable in asset based lending), adjusted for defaults.
  - Managers expect 2.5% to 5% return from warrants, co-invests or other equity structures.
- We subtract estimated management fees and carried interest.

Private Credit (continued)

→ For Special Situations Lending, we use a combination of models for capital solutions and more traditional distressed debt.

- The capital solutions model resembles that for direct lending, but with higher equity kickers, coupons, and default rates.
- The distressed debt model resembles that for public high yield bonds and is based on data for the Bloomberg US CCC and Ca-D indices.
  - It uses a much higher default rate than high yield bonds (often in the range of 15-20%).
- We subtract estimated management fees and carried interest.

→ For aggregate private credit, we take a weighted average based on a mix of the broad opportunity set and a typical client allocation to private debt.

Component	Weight (%)	E(R) (%)
Direct Lending	35	8.2
Asset Based Lending	35	9.7
Special Situations	30	9.7
Private Debt Composite		9.2

Private Equity

→ For Buyouts, we start with public equity expected returns.

→ We add a premium or discount based on the pricing of buyouts relative to stocks.

- EBITDA multiples provide an indication of pricing.
  - 2022 and 2023 have seen the first meaningful reduction in multiples since the GFC.[1]

→ We add a premia for control (e.g., for greater operational efficiencies) and leverage.

- We assume leverage of 1.4x - 1.6x.

→ We subtract borrowing costs and estimated fees.

- We assume borrowing costs are consistent with the yield on bank loans.

→ We also look at how closely valuations (through September 30) compared to price changes occurring in the public markets, given that buyouts pricing often lags that of public equities.

[1] Source: Preqin.

Private Equity (continued)

→ For Venture Capital (VC), we create a public market proxy that we can compare through time.

- The composite is composed of: traditional technology, biotech, pharmaceuticals, life sciences, IT services, internet, and clean tech & environmental stocks.
  - The weighting to each sector varies through time.
  - The data is an imperfect proxy and the correlation with future returns is not high.
  - Still, this proxy provides some indication of pricing relative to small cap stocks.
- We also look at how VC valuations (through September 30) compared to price changes for public markets.

→ For Growth Equity, we infer a return that is between that of buyouts and venture capital.

- The relative weightings place the return closer to that of VC than buyouts.

Private Equity (continued)

→ For aggregate private equity, we take a weighted average based on a mix of the broad opportunity set and a typical client allocation to private equity.

Component	Weight	E(R)
Buyouts	65%	9.5%
Growth Equity	10%	10.4%
Venture Capital	25%	10.8%
Private Equity Composite		9.9%

Real Estate

→ For Core Real Estate (RE), we use two models.

- The first model adds a premium to the Cap Rate[1].
  - Core RE has historically returned approximately 1.3% more than its value-weighted cap rate at the start of the period over the subsequent ten years.
- The second model combines income with capital appreciation potential.
  - The income for core RE has historically been the cap rate minus 2-3% (for Cap Ex).
  - We assume income (NOI) grows at the rate of inflation.
  - We assume there is some measure of fair value for cap rates relative to bond yields.
    - We make a price adjustment based on the forward yield curve.
- We adjust for leverage, borrowing costs, and estimated fees.

→ For High Yield Real Estate Debt, we used our high yield bond model.

- Data is sparse on default rates and spreads.
  - We typically use the same default rate as high yield bonds.
    - In 2024, we increased the projected default rate and loss rate given market conditions.
  - We use the YTW on the Bloomberg CMBS BBB index and then add a "high yield" spread on top of this.
  - We adjust for leverage, borrowing costs, and estimated fees.

[1] Source: NCREIF.

Real Estate (continued)

→ For Non-Core Real Estate, we start with historical premiums versus core RE.

- This includes the effect of greater control, development, buying at distress, etc.

→ We add a non-US component (e.g., premium for lower cap rates) and a currency effect.

- We assume 10% to 30% of non-core commitments will be ex-US (with the majority in Europe).

→ We lever the portfolio and then subtract the cost of borrowing.

- Value-added leverage ranges 50-70% while opportunistic ranges 60-80%.
- The cost of debt is higher for value added than core, and higher still for opportunistic.

→ Finally, we subtract estimated management fees and carried interest.

Real Estate (continued)

→ For REITs, we focus on historical pricing and yields.

- We first look at current REIT Yields.[1]
  - REITs have historically returned 2.6% more per year than their yield at the start of the period over the subsequent ten years.
- We next look at spreads versus Treasuries and Baa corporates.
  - REITs have yielded 1.8% more than 5-year Treasuries since 1990.
  - REITs have historically yielded 1.1% less than Baa corporate bonds since 1990.
- We also look at the price change required for REITs to return to the REIT yield spread implied in 5 years.

REIT Yield (%)	Price Change implied by spread vs 5-year Treasury Yield (%)	Price Change implied by spread vs Baa Yield (%)
3.9	-7.4	-3.2

- We average the impact of these pricing factors and then add this to the yield and projected income growth.[2]

[1] Source: FTSE NAREIT.
[2] We use our inflation projections as the estimated income growth rate.

Real Estate (continued)

→ To arrive at the aggregate private real estate assumption, we take a weighted average of our expectations for each of the four components.

- These reflect the weights of a typical client portfolio, balanced with the market opportunity set.

Component	Weight (%)	E(R) (%)
Core Private RE	55	4.8
Value-added RE	25	7.3
Opportunistic RE	10	8.4
High Yield RE Debt	10	10.5
Private Real Estate		6.4

→ The aggregate real estate composite is 90% private real estate and 10% REITs.

Infrastructure

→ For public infrastructure, we first take the weighted average of the regional public equity expected returns.[1]

Region	Weighting (%)	Weighted E(R) (%)
US	51	3.5
Developed	43	3.3
EM	6	0.5
Weighted Equity E(R):		7.3

→ We then look at the P-E and P-B ratios of the various public infrastructure indices vs. the global equity market to derive a signal as to how discounted or expensive infrastructure stocks may be.[2]

- We assume reversion in pricing to half the difference between the two.

	MSCI P-E	MSCI P-B	S&P P-E	DJB P-E	MSCI Core P-E
Price Adjustment	0.0%	9.8%	8.7%	8.3%	12.2%

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

$$E(R) = 7.3\% + 0.8\% = 8.0\%$$

[1] We used an equal weight of the MSCI World Core Infrastructure index and the S&P Global Infrastructure index.
[2] We used the MSCI World Infrastructure, S&P Global Infrastructure, DJ Brookfield Global Infrastructure, MSCI Core Infrastructure, and MSCI World indices. Throughout this document, numbers may not sum due to rounding.

Infrastructure (continued)

→ For private infrastructure, our model combines income and capital appreciation.

→ For income, we used our best estimate of expected yield.

- We assume a range of 4-6% for core and 2-4% for non-core.

→ We assume asset prices keep up with inflation and/or GDP growth.

- We use inflation for core IS and GDP for non-core, since the latter is more economically sensitive.

→ We then make a qualitative judgment based on our infrastructure team's assessment of current market pricing.

- There is a paucity of publicly available data on pricing for private infrastructure.

→ We add a control premium for non-core IS (as these more closely resemble buyouts).

→ We lever the portfolios and then subtract the cost of borrowing.

- Core levered at 1.8:1, non-core at 1.7:1
- Cost of debt for non-core is similar to buyouts, while the cost for core is slightly lower.

→ Finally, we add any currency effect and subtract estimated management fees and carry.

Infrastructure (continued)

→ To arrive at the aggregate private infrastructure assumption, we take a weighted average of our expectations for each of the two components.

- These reflect the weights of a typical client portfolio, balanced with the market opportunity set.

Component	Weight (%)	E(R) (%)
Core Infrastructure	50	6.5
Non-Core Infrastructure	50	8.0
Private Infrastructure		7.3

→ The aggregate infrastructure composite is 90% private infrastructure and 10% public infrastructure.

Natural Resources

→ For public Natural Resources (NR), we take the weighted average of the regional public equity expected returns.

Region	Weighting (%)	Weighted E(R) (%)
US/Canada	48	3.3
Developed	44	3.4
EM	8	0.6
Expected Equity Return:		7.3

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

Price Adjustment	P-E	EBITDA	P-B
S&P Global NR vs. S&P Global BMI	44%	48%	36%
S&P North American NR vs S&P 500	48%	50%	59%

→ We add the price adjustment (per annum) to the expected equity return to arrive at our preliminary expected return for public NR.

- We cap the price adjustment at +/- 1% per annum.

[1] We used the trailing 12-month P-E ratio for the S&P Global Natural Resource to the S&P Global BMI indices and the S&P NA Natural Resources to the S&P 500, respectively. We assume reversion to half of the historical difference. Throughout this document, numbers may not sum due to rounding.

Natural Resources (continued)

→ Most "private" mining partnerships consist of investments in "junior" mining stocks.

- We again take the weighted average of the regional public equity markets & mining stocks.
  - We use a 50/50 split between USA/Canada and Australia.
- We then look at the P-E, P-B and EV/EBITDA ratios of the indices vs. their own history and their local market to derive a signal as to how discounted or expensive mining stocks may be.

	Current PE	Avg. PE	Current P-B	Avg. P-B	Current EV/EBITDA	Avg. EV/EBITDA
MSCI Australia Small Met/ Min	13.4	13.0	2.6	2.3	6.8	6.1
S&P TSX Div. Met /Min	16.3	23.8	1.3	1.0	8.6	NA

- We add a control premium (as these resemble buyouts) and subtract estimated fees & carry.

→ For energy, we use a similar approach.

- We again take the weighted average of the regional public equity returns.
  - 80% in US/Canada, 15% EAFE, and 5% EM
- We then look at the relative pricing of large and small cap energy stocks.
- We add a control premium (and subtract estimated management fees & carry).

Natural Resources (continued)

→ For Timberland, we combine land pricing with income potential.

→ We examine the average price per acre of timberland transactions since 1995, excluding the highest and lowest numbers for each year[1].

- We then adjust these prices for inflation and derive a long-term average.

Current Price/Acre	Inflation-Adjusted Average	Price Adjustment
$1,342	$1,631	21%

- We assume that prices move halfway back toward their historical inflation-adjusted average.

→ We assume that property values grow in the future at the rate of inflation.

→ We assume that real income will be consistent with its trailing 10-year average of 0.3% and then add this to our inflation assumption to arrive at expected income.

→ We add a non-US component (premium for lower cap rates) and a currency effect.

- We assume ~25% of commitments will be ex-US (e.g., Latin America and Australasia).

→ We lever the portfolio at 1.15:1 and then subtract the cost of borrowing.

→ Finally, we subtract estimated management fees and carried interest.

[1] Source: RISI, NCREIF

Natural Resources (continued)

→ For Farmland, we use essentially the same model as Timberland.

→ We looked at the average price per acre of farmland and cropland[1].

- We then adjusted these prices for inflation and derived a long-term average.

	Current Price/Acre ($)	Inflation-Adjusted Average ($)	Price Adjustment (%)
Farmland	4080	2469	-20
Cropland	5460	3935	-4

- We assume that prices move halfway back toward their historical inflation-adjusted average.

→ We again assume that property values grow in the future at the rate of inflation.

→ We assume that real income will be consistent with its trailing 10-year average of 2.1% and then add this to our inflation assumption to arrive at expected income.

→ We add a non-US component (premium for lower cap rates) and a currency effect.

- We assume ~20% of commitments will be ex-US (e.g., Latin America and Australasia).

→ We lever the portfolio at 1.4:1 and then subtract the cost of borrowing.

→ Finally, we subtract estimated management fees and carried interest.

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

Natural Resources (continued)

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

Component	Weight (%)	E(R) (%)
Timberland	15	5.5
Farmland	15	5.0
Sustainability	20	8.4
Energy	35	9.1
Mining	15	8.6
Aggregate Private Natural Resources		7.7

→ The aggregate natural resources composite is 90% private NR and 10% public NR.

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

Gold and Gold Mining

→ For Gold, we assume an investment would most likely be made via futures.

- Holding physical gold would likely incur additional security and storage costs.

→ Gold does not offer a yield or cash flow of any kind; however, it has a very long history of preserving purchasing power.

- Therefore, our model is anchored to inflation, and the expected return will be very close to our expected inflation rate.

→ Our model for gold mining starts with our expected return for the broader mining category.

- We then add or subtract a premium depending on the pricing of gold mining stocks relative to the broader mining category.

Commodities

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

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

$$E(R) = 2.4\% - 0.3\% + 0.7\% + 2.1\% = 4.9\%$$

- The collateral yield represents our expected return from cash.
- The roll return should vary based on how backwardated or contagoed the market is
  - However, this state could change quickly, so our assumption is anchored near zero
- For the spot return, we use the market's expectation for inflation minus average productivity growth for advanced economies.
- The diversification return is the result of regular rebalancing between commodity futures.
  - The diversification return rises as the average variance of the securities in a portfolio rises, as the average correlation in the portfolio falls and as the number of securities in the portfolio rises.
  - However, we use a lower than historical number (2.1%) since correlations among commodities have risen since the academic research was originally conducted.[1]

[1] De Chiara and Raab (2002) documented a 2.8% diversification return for the rebalanced Dow Jones AIG Commodities index during the time period 1991 to 2001. Gorton and Rouwenhorst suggested a diversification return of between 3.0% and 4.5% for an equally-weighted basket of commodity futures (this paper was updated in 2015).

Commodities (continued)

→ In addition, we have models for several more complex strategies, specifically risk parity and real return.

→ For Commodities Risk Parity, we use a strategy with a target volatility of 15%.

- The basic inputs are the same as for a naïve portfolio, except we assume a higher diversification return (2.6%) as risk parity strategies tend to be better diversified than the broad index.
- We lever the portfolio at 1.5:1, which is in line with the average for managers using this strategy.
- We then subtract the cost of borrowing as well as estimated management fees.

→ For Commodities Real Return, we use a "portable alpha" approach.

- We add the return of TIPS on top of the return for the naïve commodities portfolio.
- We then subtract the cost of borrowing as well as estimated management fees.

Hedge Funds

→ To construct the hedge fund models, we use a variety of traditional and alternative betas[1]:

- Traditional betas:
  - Equities, distressed debt, credit, commodities, bonds
- Alternative betas:
  - Carry trade, convert arb, currency, momentum

→ We also add leverage (where appropriate) and subtract the cost of debt and estimated fees.

→ For example, our long-short equity model is fairly straight forward.

- We assume the average fund is 50-60% net long and has an equivalent beta to the global stock market.
- We multiply this beta times our expected return for global equities, then add this to our cash expected return for the portion that is not invested.

$$\text{Gross } \mathrm{E}(R) = 0.6 * 7.2\% + 0.4 * 2.4\% = 5.3\%$$

- We then subtract estimated management fees and carried interest to arrive at a net return.

[1] Note that we do not assume "alpha" for hedge funds nor any other asset class.

Hedge Funds (continued)

→ To arrive at the aggregate Hedge Fund assumption, we take a weighted average of our expectations for each of six components.

→ The weightings are occasionally revised based on the approximate allocation of each category in the broad hedge fund universe.

Component	Weight (%)	E(R) (%)
Long-Short	32	3.2
Event-Driven	11	7.0
Global Macro	16	4.2
CTAs	7	3.8
Fixed Income/L-S Credit	24	5.0
Relative Value/Arbitrage	10	5.6
Aggregate Hedge Funds (net)		4.5

Throughout this document, numbers may not sum due to rounding

Alternative Risk Premia

→ We model Alternative Risk Premia (ARP) using a build-up method of individual premia which assumes a 1/3rd risk weighting to single stock premia and 2/3rd risk weighting to macro asset class premia.

- Single stock premia is modeled with an equal risk weight to value, cross-sectional momentum, and defensive risk premia.
- Macro asset class premia is modeled with an equal risk weight to equity indices, fixed income indices, currencies, and commodities.
  - Each asset class has an equal weight to value, carry, and momentum risk premia.

→ We use conservative estimates for the Sharpe ratios for individual premia that are approximately one-third that of 10-year global equity risk premia.

→ Correlation assumptions across the premia are also adjusted to be more conservative, particularly for those premia that historically have had significant negative correlations.

→ The target volatility is assumed to be 10%, which is in-line with core manager offerings.

→ We subtract estimated management / transaction fees as there is no passive option.

Risk Mitigating Strategies

→ We include expectations for a Risk Mitigating Strategies (RMS) aggregate as well as for one of the potential underlying categories, RMS Diversifiers.

→ The RMS Aggregate is composed of three categories that we refer to as first responders, second responders, and diversifiers.[1]

- The composition represents a typical client weight, though many clients use different allocations.

Composite	Long-term Government Bonds	Long Volatility	CTAs (trend following)	RMS Diversifiers
RMS Aggregate	1/6th	1/6th	1/3rd	1/3rd

→ The RMS Diversifiers Aggregate is composed of strategies that are designed to have a modestly positive expected return without being highly correlated with a broader (growth-driven) portfolio.

- Again, the composition represents a typical client weight.

Composite	Global Macro	Alternative Risk Premia	Market Neutral	Insurance Linked Strategies	Relative Value	Event Driven
RMS Diversifiers	30%	40%	10%	10%	5%	5%

[1] Note that we combine long-term government bonds and long volatility strategies to form the "first responders" category.

Risk Parity

→ To build our model we used the five most common risk parity betas.

- We weight each factor such that their contribution to risk (volatility) is equal.
- This requires optimization (due to correlations being less than one).

→ We leverage the group (at ~1.4:1) such that the aggregate standard deviation is at the target (10%).

Component	Weight (%)	Contribution to Levered E(R) (%)	Std Dev (%)
Equities	14	1.4	18
Credit	27	2.1	9
Commodities	14	1.0	17
Currencies	20	0.9	12
Interest Rates	24	1.5	10
Aggregate Risk Parity (gross)		6.8	

→ We subtract estimated management fees as there is no passive option.

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

Tactical Asset Allocation

→ To build our model, we use a compilation of many common traditional betas.

- The weightings reflect a rough average of the Tactical Asset Allocation (TAA) managers employed by our clients.

Component	Weight (%)	E(R) (%)
US Equities	30	6.9
EAFE Equities	12	7.7
EM Equities	8	7.6
Commodities	5	4.9
Cash	5	2.4
Investment Grade Bonds	15	4.6
TIPS	5	4.3
Foreign Bonds	5	3.1
EM Debt (local)	5	6.3
High Yield	5	6.5
Bank Loans	5	6.5
Aggregate TAA (gross)		6.0

→ We subtract estimated management fees as there is no passive option.

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

Digital Currencies

→ This model is quite different than our others, as cryptocurrencies do not derive value from income, some future stream of cash flows, or a risk premium.

→ The model assumes that cryptocurrencies garner their value from taking advantage of speculative asset pricing.

→ Using the price and volume of bitcoin, we create two sets of expected buy and sell values for two pricing bubbles based on two separate selling behaviors.

- We consider a possibility whereby speculative behavior during a bubble is beneficial as well as a possibility where it is harmful.

→ These expected gains and losses are averaged and spread across ten years to create the 10-year horizon assumption.

The Other Inputs: Standard Deviation and Correlation

→ Standard deviation:

- We review the trailing twenty-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[1] (%)
Bank Loans	6.5	-2.9	10.0
FI / L-S Credit	5.8	-2.7	9.0

- We also adjust for private market asset classes with "smoothed" return streams.

→ Correlation:

- We use trailing twenty-year correlations as our guide.
- Again, we make adjustments for "smoothed" return streams.

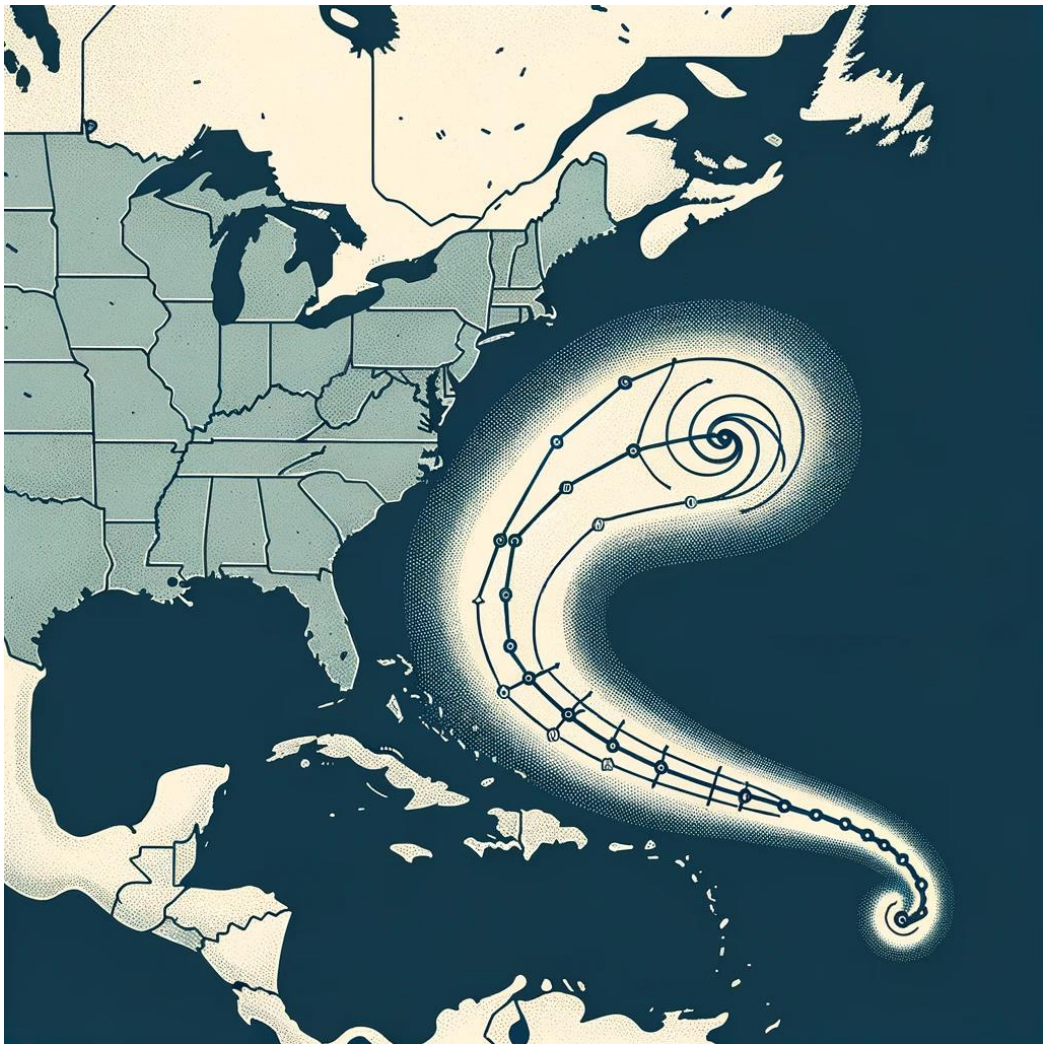
→ Most of our adjustments are conservative in nature (i.e., they increase the standard deviation and correlation).

[1] Note that we round our standard deviation assumptions to whole numbers.

Three Long-term Themes:
The Impact of AI,
China and
Deglobalization

Thinking about Broad AI Impacts

Prepare for Multiple Futures



Note: this graphic was created using generative AI.

- → Developments in AI since 2017 have been occurring at a rapid pace and with unexpected discoveries (i.e., "emergent capabilities").
- → Predicting what the actual developments will be and their corresponding impacts on economies/societies will be very challenging.
- → Staying up-to-date on major developments and preparing for multiple futures is prudent.
- → Research and predictions from industry insiders, economists, political scientists, etc., all indicate a high degree of uncertainty regarding impacts of AI.

"Automation Anxiety"

- → History is full of examples of workers fearing their jobs would be displaced by technology.
- → While this fear has been a continual occurrence, research has shown that it tends to be overstated, especially during the initial introduction of the technology.[1]
- → This is not to say that all jobs will be safe – any form of technological advance will displace certain jobs.
- → The difference with generative AI, however, is that it is the first technology that will likely impact "white collar" jobs and possibly even the arts and other creative industries.

[1] For example, a 2016 paper by a Boston University economist examined 271 occupations that were listed in the 1950 census. Only one was eliminated by 2010. "*How Computer Automation Affects Occupations: Technology, Jobs, and Skills,*" *James Bessen, Boston University School of Law, Revised Working Paper, October 2016*

Replacement vs. Augmentation

→ While job replacement is an understandable fear, it is better to think of it as a spectrum of replacement to augmentation.

→ *"Our findings indicate that approximately 80% of the U.S. workforce could have at least 10% of their work tasks affected by the introduction of GPTs, while around 19% of workers may see at least 50% of their tasks impacted. The influence spans all wage levels, with higher-income jobs potentially facing greater exposure."*[1]

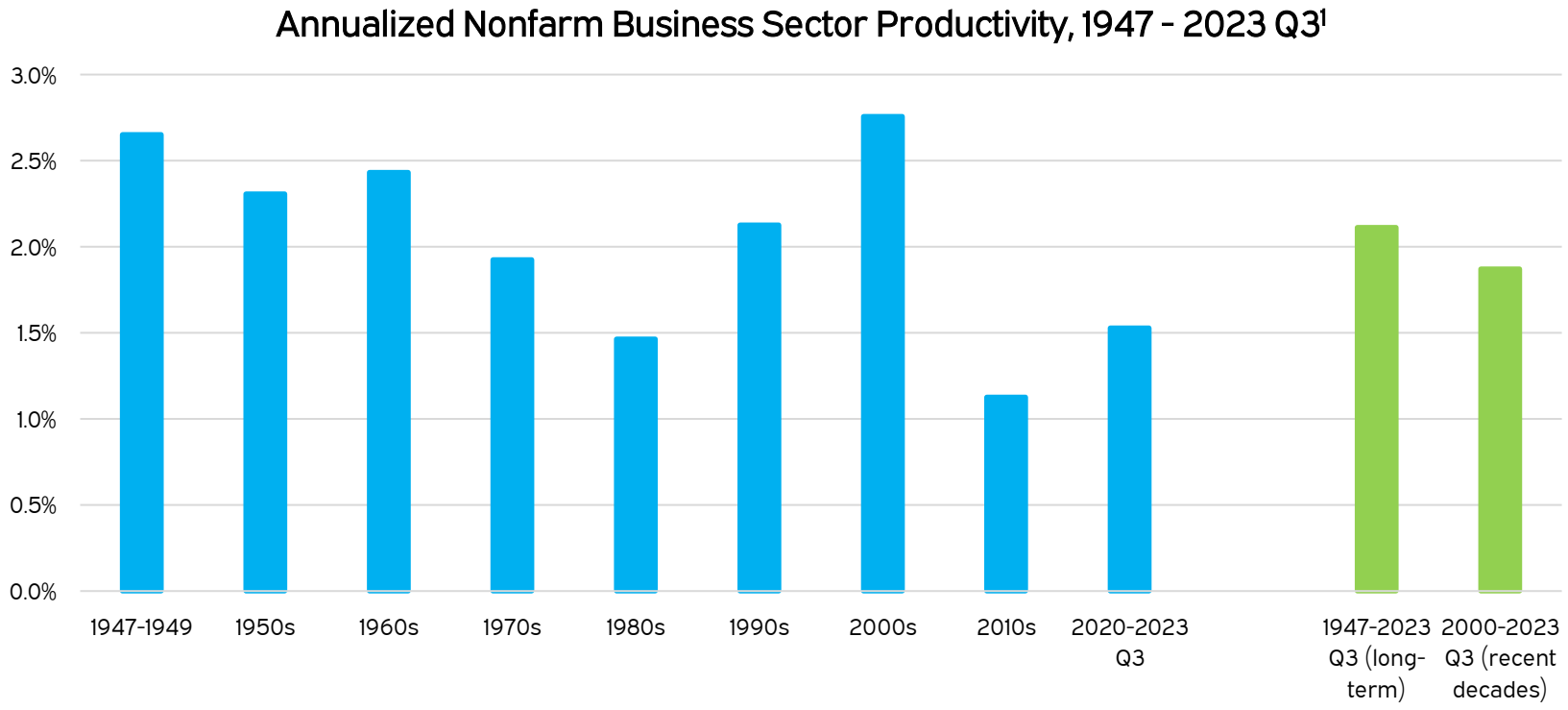
- Routine and repetitive work
- Rules-based decision making
- Data/document processing
- Information retrieval
- Translation/conversion

- Leadership/management
- Complex problem solving
- Unstructured environments
- Ethical/moral judgement
- Strategy design/setting
- Crisis management

[1] Source: OpenAI (creator of ChatGPT), GPTs are GPTs: An early look at the labor market impact potential of large language models, Open AI, March 2023.
[2] Concepts regarding replacement and augmentation are adapted from presentations from Toffler Associates.

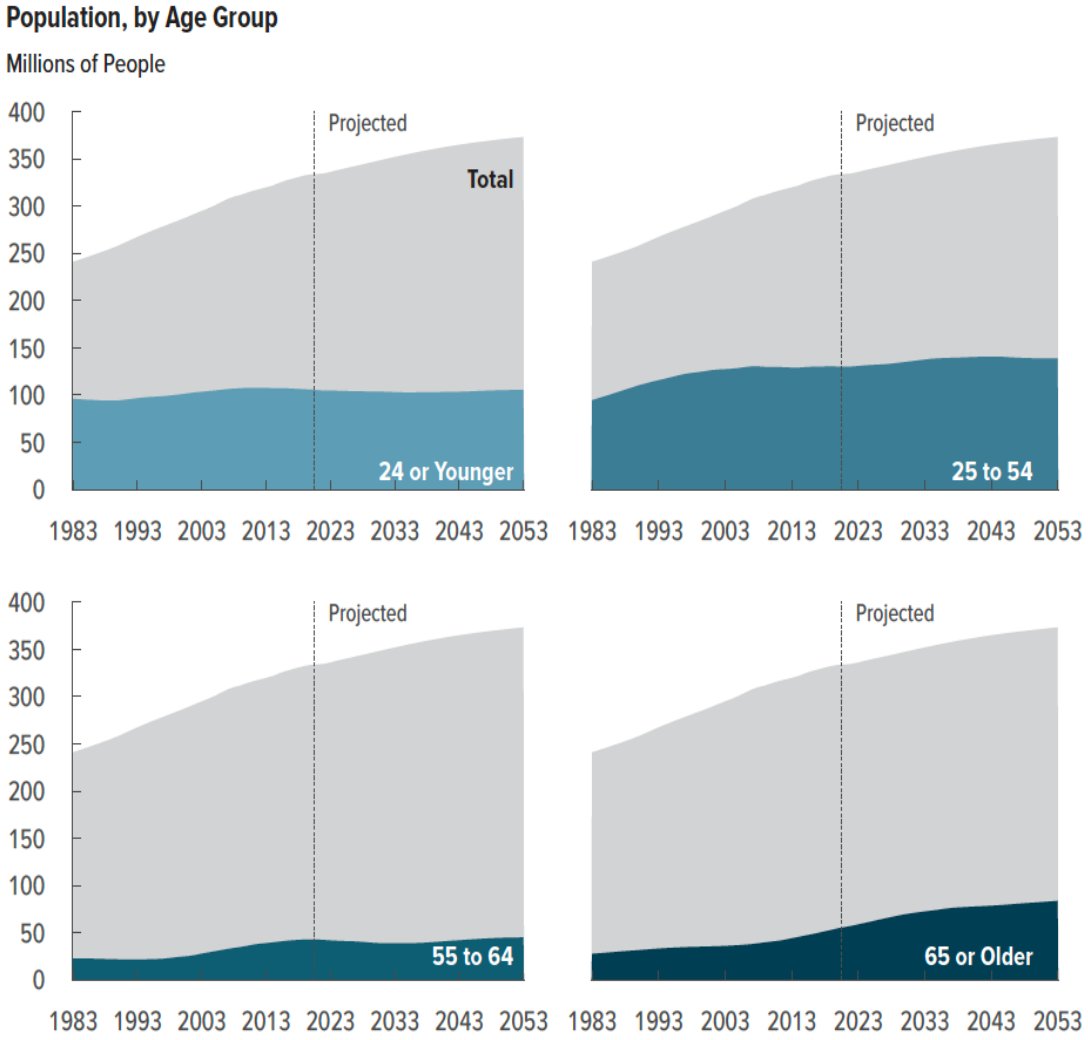
Impact on Productivity

- → Any form of automation/labor savings inherently improves productivity.
- → As discussed earlier, accurate forecasts for the impact of AI are challenging.
- → Example productivity forecast impacts are currently in the 0-1% range, per annum.
- → This would represent a meaningful increase from the long-term historical average (~2.1%).



[1]Source: FRED. Represents Nonfarm Business Sector: Labor Productivity (Output per Hour) for All Workers, Index 2012=100, Quarterly, Seasonally Adjusted.

Silver Lining of AI Potential



→ Even excluding potential discoveries that may benefit society (e.g., healthcare, biotech, climate emissions, etc.), there is an underdiscussed benefit of AI: mitigating the demographic headwinds faced by many developed nations.

→ For example, the aging population of the United States (highlighted in the graphics on the left) will require a reconfiguration of the nation's workforce.

→ AI can help fill positions/tasks that societies may be unable to fill otherwise.

Source: Congressional Budget Office and US Census Bureau, as of January 2023

China

Why the Pessimism on China?

- → The anticipated economic rebound from exiting zero-COVID did not materialize.
- → Real estate bubble is getting worse, not better.
- → Investors have responded by voting with their feet.
- → Xi's policies seem to be backfiring.

Chinese Growth Disappointed in 2023

- → China exited their zero-COVID policy in late 2022.
- → Many investors and economists alike anticipated a surge in growth as the economy re-opened.
- → But the economic rebound did not materialize.
- → Growth projections are being ratcheted down.
- → Major causes include:
  - → Debt overhang in the property sector – nearly ¼ of China's economy.
  - → Exports are lagging.

Source: FactSet as of December 31,2023. Represents quarter-over-quarter Real GDP growth, seasonally adjusted, provided by the China National Bureau of Statistics.

Property Market Turns from Tailwind to Headwind

- The issue is systemic.
- Both the private and public sectors are heavily indebted.
- The worst problems are with property developers and local governments.
- In 2021, it was Evergrande; in 2023, it is Country Garden.
- Old model:
  - CCP sold land to developers, filling local government coffers in the process.
  - This allowed CCP to spend freely while taking on more debt themselves.
  - Local governments are responsible for ~85% of expenditures.
  - Developers borrowed heavily and pre-sold properties to finance their acquisitions.
  - No other good savings options, so ~70% of household wealth is tied up in the property market.
- Current status:
  - Housing prices falling.
  - Some property owners now refusing to make payments on unfinished properties.
  - This can turn into a vicious cycle where developers do not have the cash flow to complete projects.

CCP Reaction Has Not Been Helpful

- → Focus has become national security, not growth.
- → Emphasizing nationalistic policies and self-sufficiency.
- → CCP has clamped down on foreign businesses (e.g., office raid, iPhone restrictions).
- → Wants to reign in the debt bubble, so little/no support for property developers.
- → PBoC providing minimal stimulus.
- → Relationships with trading partners and neighbors are becoming increasingly strained.
- → Many investors and business have responded by seeking to reduce their ties to China.
- → Missing and replaced ministers signal challenges at the top of party leadership.

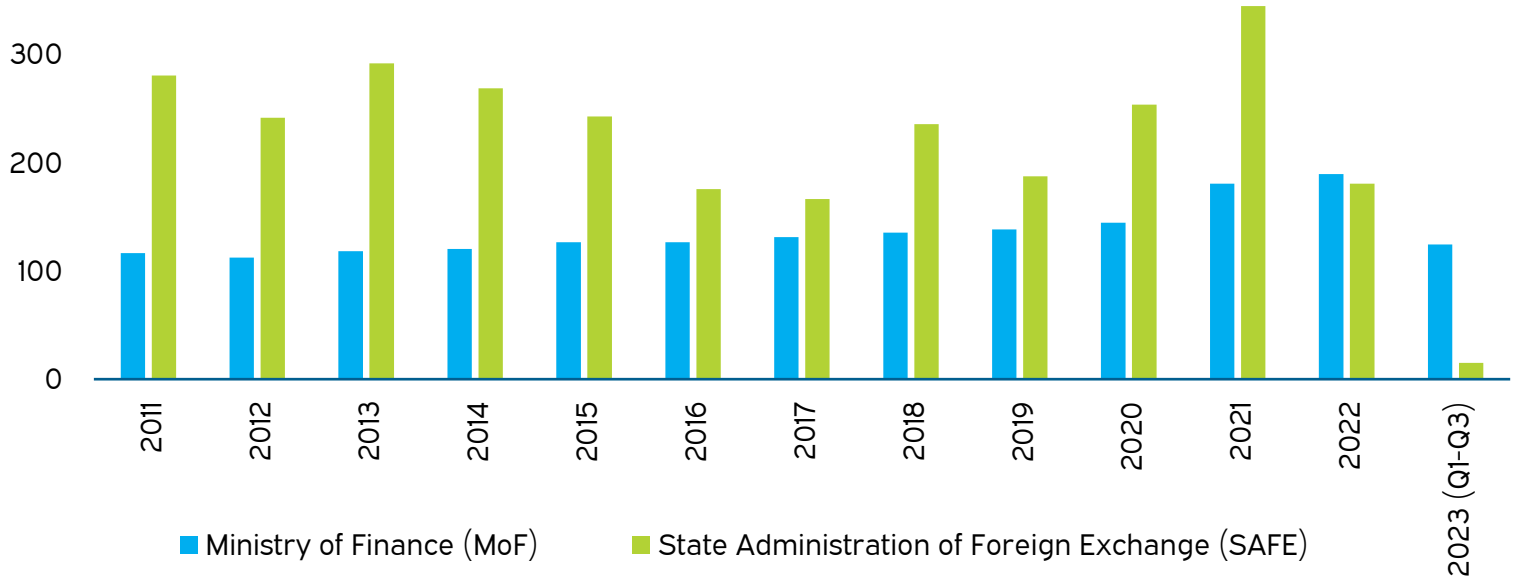
If growth continues to falter, China will face a choice:

backtrack or double down on security and repression

Investor Concerns turn into Portfolio Flows

→ In Q3 2023, China recorded its first quarterly decline in direct investments since 1998 (-$11.8B).[1]

Foreign Direct Investment Inflows to China 2011-2023 (USD in Billions)[2]



[1] Source: Reuters, "West's de-risking starts to bite China's prospects," November 27, 2023. Article based on preliminary balance of payment data as of September 30, 2023.
[2] Source: Peterson Institute for International Economics, N. Lardy "Foreign direct investment is exiting China, new data show," November 17, 2023. SAFE tracks net FDI while the Ministry of Finance tracks gross inflows.

Cheap…for a Reason?

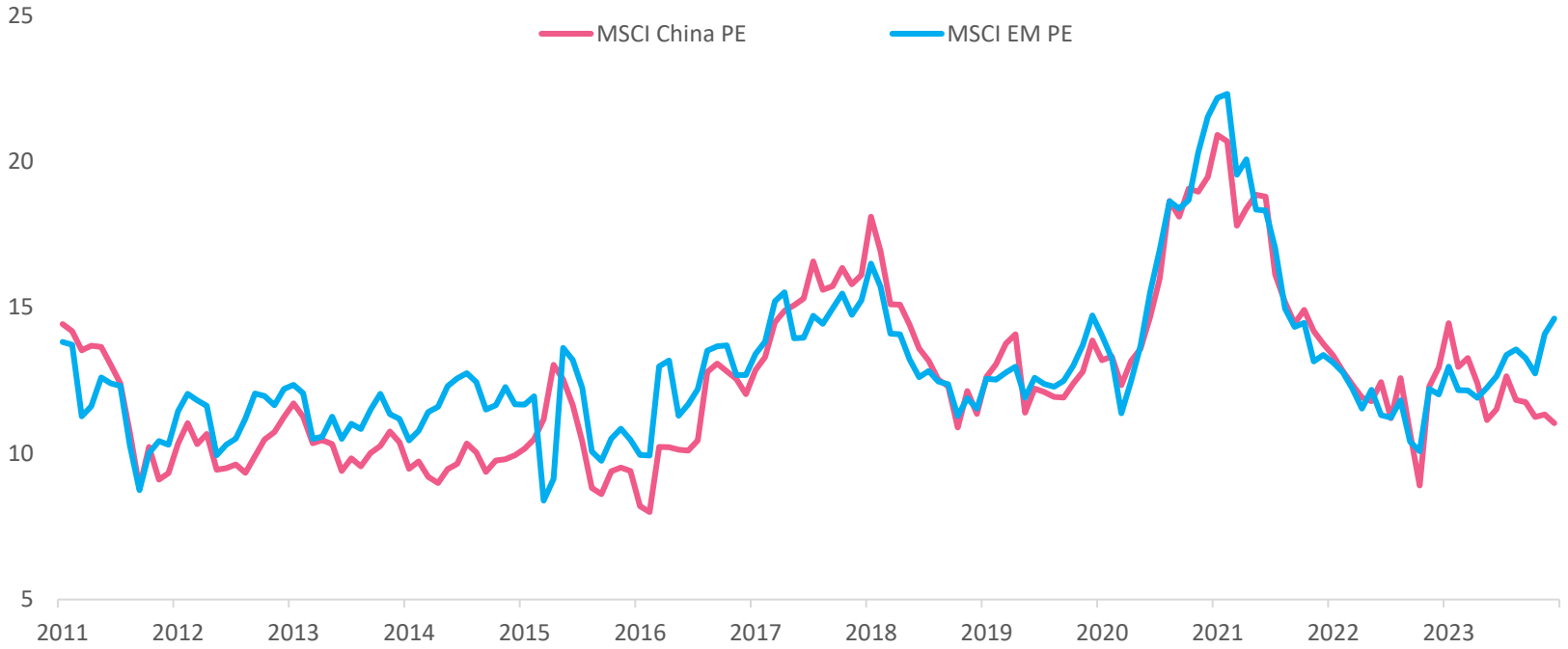
→ Investors' lack of confidence in the economy and CCP policies continues to weigh on Chinese asset prices.

→ While the general mood has clearly soured on Chinese equities, pricing has grown more attractive.

→ P-E ratios for China and the broader emerging market index diverged in 2023.

→ An important question is: Do valuations fairly represent the risks?

Emerging Market and Chinese P-E Ratios[1]



[1] Source: Bloomberg, as of December 31, 2023. Indices used: MSCI China, MSCI Emerging Markets.

Deglobalization

Introduction: Deglobalization

→ We may be entering a period of deglobalization.

→ The primary catalysts were COVID and the war in Ukraine.

- Corporations and countries want to better secure their interests.
- Many are seeking to "de-risk" their supply chains.
- They are doing so both by limiting and changing with whom they trade.

→ More recently, national security policy is placing limits on trade, particularly of technology.

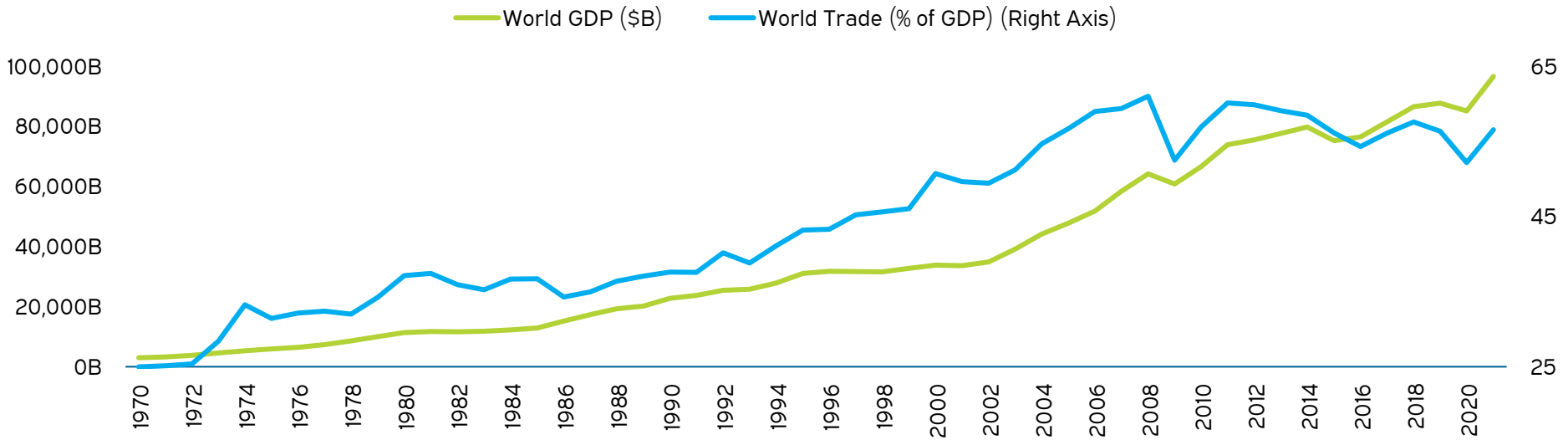
→ The result may be a halt or even an outright reversal of the globalization.

- The historical benefits of globalization included higher growth and lower prices.

→ Hence, deglobalization may affect price stability, interest rates, economic growth, and investment returns.

Historical Impact of Globalization: Trade & Growth

Annual Global Trade and GDP (1970 – 2021)

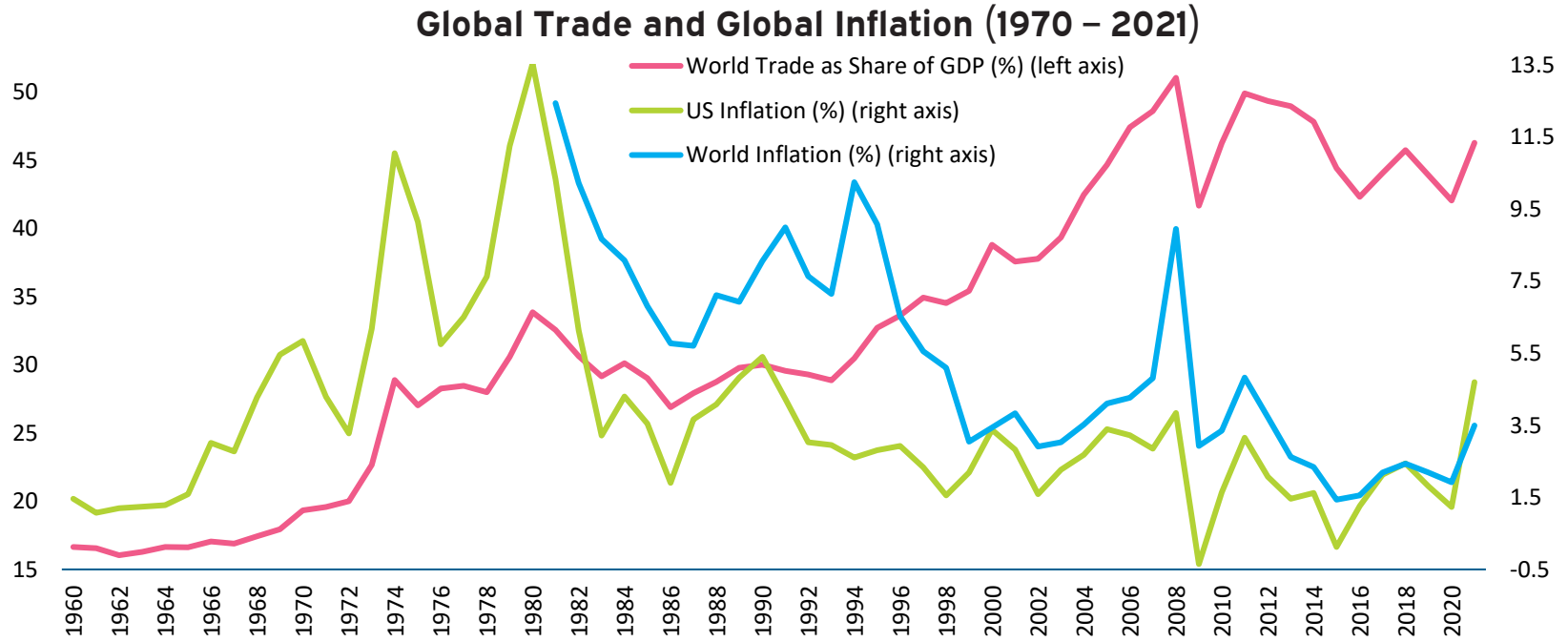


→ The fifty-year period that started in 1970 saw extraordinary growth in trade and GDP.

- Global trade grew from 20% of global GDP in 1970 to a peak of over 50% in 2008.
  - Trade accelerated in the 1990s as countries adopted trade liberalization policies.
- Global GDP grew from $2.9 T to $85.1 T between 1970 and 2020.
  - Developing nations were able to compete on the basis of comparative advantage.
  - Multinationals took advantage of low-cost goods and labor, as well as new markets.

Sources: World Bank and United Nations Conference on Trade & Development Trade Analysis Information System ("UNCATD TRAINS") and FRED as of December 2022.

Historical Impact of Globalization: Inflation & Global Capital Markets



→ Globalization increased competition across borders and helped drive down prices for labor and goods.

- Between 1980 and 2021, the US enjoyed its longest period of low and stable inflation in modern history.
- Between 2000 and 2020, global inflation averaged just 3.4% well below its post-WWII levels.

→ Economic stability and falling inflation helped foster global capital markets.

- The MSCI ACWI index grew from 2,187 companies in 2000 to 2,966 companies in 2021.

Sources: World Bank and United Nations Conference on Trade & Development Trade Analysis Information System ("UNCATD TRAINS") and FRED. Inflation, consumer prices for the World. Annual data as of September 2022.

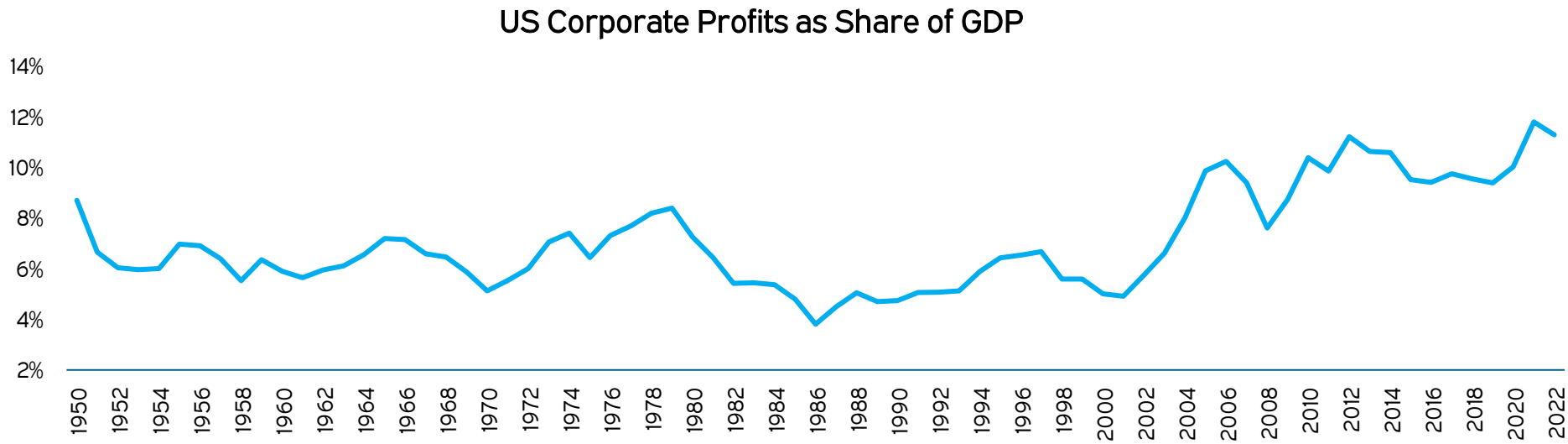
Historical Impact of Globalization: Growth & Profitability

→ Globalization helped increase living standards and reduce global poverty.

- The percent of the global population living on less than $2 a day declined from 42% to less than 10% .
- China saw over 400 million people move out of extreme poverty between 1980 and 2013.

→ Global corporate profits also rose, due in large part to the lower relative costs for materials and labor.

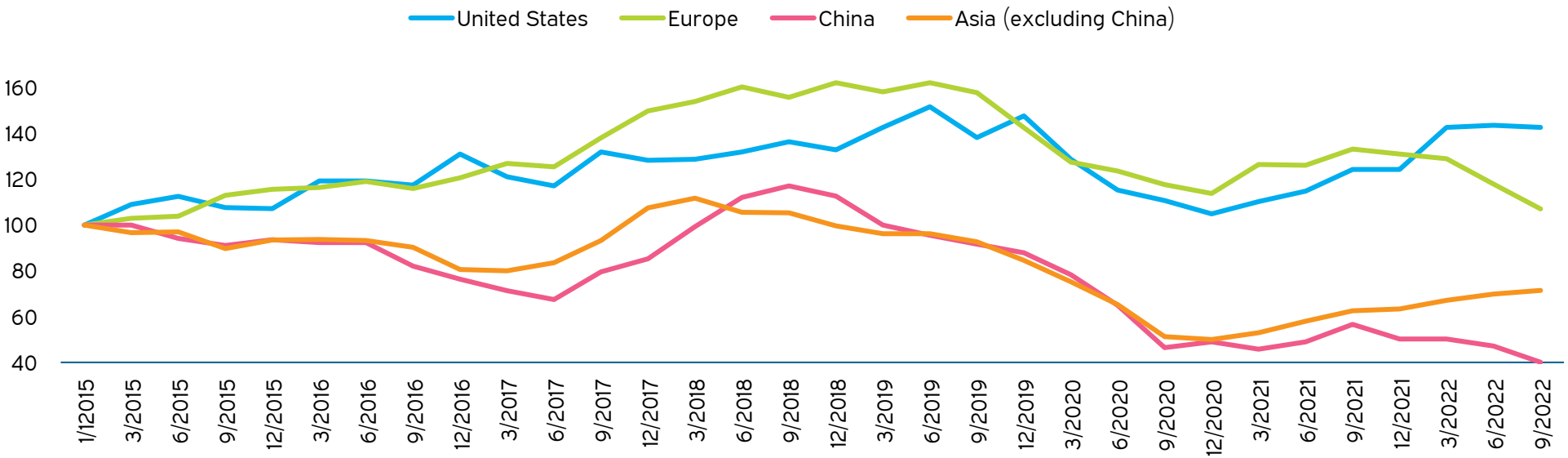
- US corporate profits increased from 5% of US GDP in the early 1980s to over 10% of US GDP in 2022.



Source: World Bank UNCATD TRAINS as of March 2023. Annual data through 2019.
Source: IMF, S. Jain-Chandra et al., "Inequality in China - Trends, Drivers, and Policy Remedies," June 2018. Between 1980 and 2015 the number of Chinese people in the lowest decile of income declined by 86%.
Source: Meketa analysis of data from FRED. Corporate Profits After Tax (without IVA and CCAdj), Seasonally Adjusted Annual Rate, and Gross Domestic Product, Seasonally Adjusted Annual Rate.

Shift Away From China

Number of Global Foreign Direct Investments By Region (2015 – 2022)



→ The global pandemic revealed dependence on China for critical supplies and goods.

→ Global corporations shift to China +1, China +2, and friend-shoring strategies.

- Prioritizing supply chain resiliency over low-cost suppliers.

→ Much of the relocated distribution has remained in Southeast Asia.

Source: IMF World Economic Outlook April 2023. Chapter 4. Geoeconomic Fragmentation and Foreign Direct Investment. Number of investments with four-quarter moving average.

Resource Security & National Security

→ Specialization and efficiency dominated corporate and public investment decisions since the 1990s.
- But this also introduced fragility, leaving supply chains vulnerable to shocks.

→ Russia's invasion created food and energy insecurity.

→ Nations reacted by focusing on self-sufficiency.
- Europe decoupled itself from Russian natural gas.

→ Nations are also re-drawing trade and political relationships based on shared security concerns.

→ The Russian invasion re-invigorated NATO.

→ The US attitude to China's rise has shifted from engagement and cooperation to strategic decoupling.
- China's trade practices reduced the US appetite for diplomatic and economic engagement.
- Protectionist policies that were implemented during the Trump administration were extended by Biden.

→ The Biden administration has gone further by embracing policies that re-shoring.
- The CHIPS Act and Inflation Reduction Act (IRA) mark re-emergence of US national industrial policies.

Deglobalization's Likely Economic Ramifications

→ A reversal in the half-century trend toward globalization is likely to have major consequences.

→ The tailwinds that drove down costs for labor and raw materials might turn into headwinds.

→ Companies are increasingly willing to trade efficiency for greater resiliency in their supply chains.

- Further, geopolitical tensions and sanctions are guiding investment decisions.
- New supply chain configurations demand new investment and sourcing from friendly suppliers.

→ Reconfiguring supply chains can be costly.

- Reshoring or friend-shoring production may incur additional labor and capex costs.
- It may also result in lower return on investment for corporations.

→ The higher cost of capital and higher wages could negatively impact corporate earnings.

- Likewise, they could lead to higher levels of global inflation.

Deglobalization's Risks to Investment Returns

→ The pace and depth of deglobalization is unknowable.

→ We modeled possible outcomes of deglobalization using scenario analysis.

→ We considered four potential deglobalization scenarios.

- Our most optimistic scenario is that governments will rediscover their pro-trade multilateralism, which could reboot globalization.
- Our next scenario resembles the current situation, extending the current drift of regionalism and rerouting of global trade and capital flows within trade blocs.
- Our third scenario considers what might happen if outright deglobalization becomes prevalent.
- Our final scenario is the most bearish, as it ponders the consequences of a military blockade and embargoes related to a military conflict over Taiwan.

→ Based on our analysis, a well-diversified institutional portfolio might experience a decline in expected returns of between -0.5% and -1.5% per annum in all but the worst-case scenario.

Conclusions

→ A reversal in the half-century trend toward globalization is likely to have major consequences.

→ Deglobalization could have significant impacts on global growth, inflation, and politics.

- Reduced economic integration could lead to a decline in trade, investment, and innovation.
  - This could ultimately lead to slower economic growth.
- Reduced economic integration could lead to higher prices.
  - Companies will likely face higher production costs and trade barriers.
- Deglobalization could lead to a rise in nationalism and protectionism.
  - Countries may seek to protect domestic industries and reduce dependence on foreign trade.

→ The combination of lower growth and higher inflation would pose challenges for investors.

Summary Data

Return and Risk Data

Asset Class	10-year Expected Return (%)	20-year Expected Return (%)	Standard Deviation (%)	11-20 year Risk Premia[1] (%)
Cash Equivalents	2.4	2.5	1.0	-2.0
Investment Grade Bonds	4.6	4.8	4.0	0.4
Long-term Government Bonds	4.3	5.0	12.0	1.0
TIPS	4.3	4.7	7.0	0.4
High Yield Bonds	6.5	6.8	11.0	2.5
Bank Loans	6.5	6.6	10.0	2.0
Emerging Market Debt (local)	6.3	6.2	12.0	1.5
Private Debt	9.2	9.2	15.0	4.6
US Equity	6.9	8.5	17.0	5.5
Developed Non-US Equity	7.7	8.9	18.0	5.4
Emerging Non-US Equity	7.6	8.9	22.0	5.5
Global Equity	7.2	8.7	17.0	5.5
Private Equity	9.9	11.2	25.0	7.8
Real Estate	6.3	8.0	16.0	5.3
Infrastructure	7.4	9.0	18.0	6.1
Commodities	4.9	5.3	17.0	1.0
Hedge Funds	4.5	5.8	7.0	2.5
Inflation	2.4	2.8		-1.5

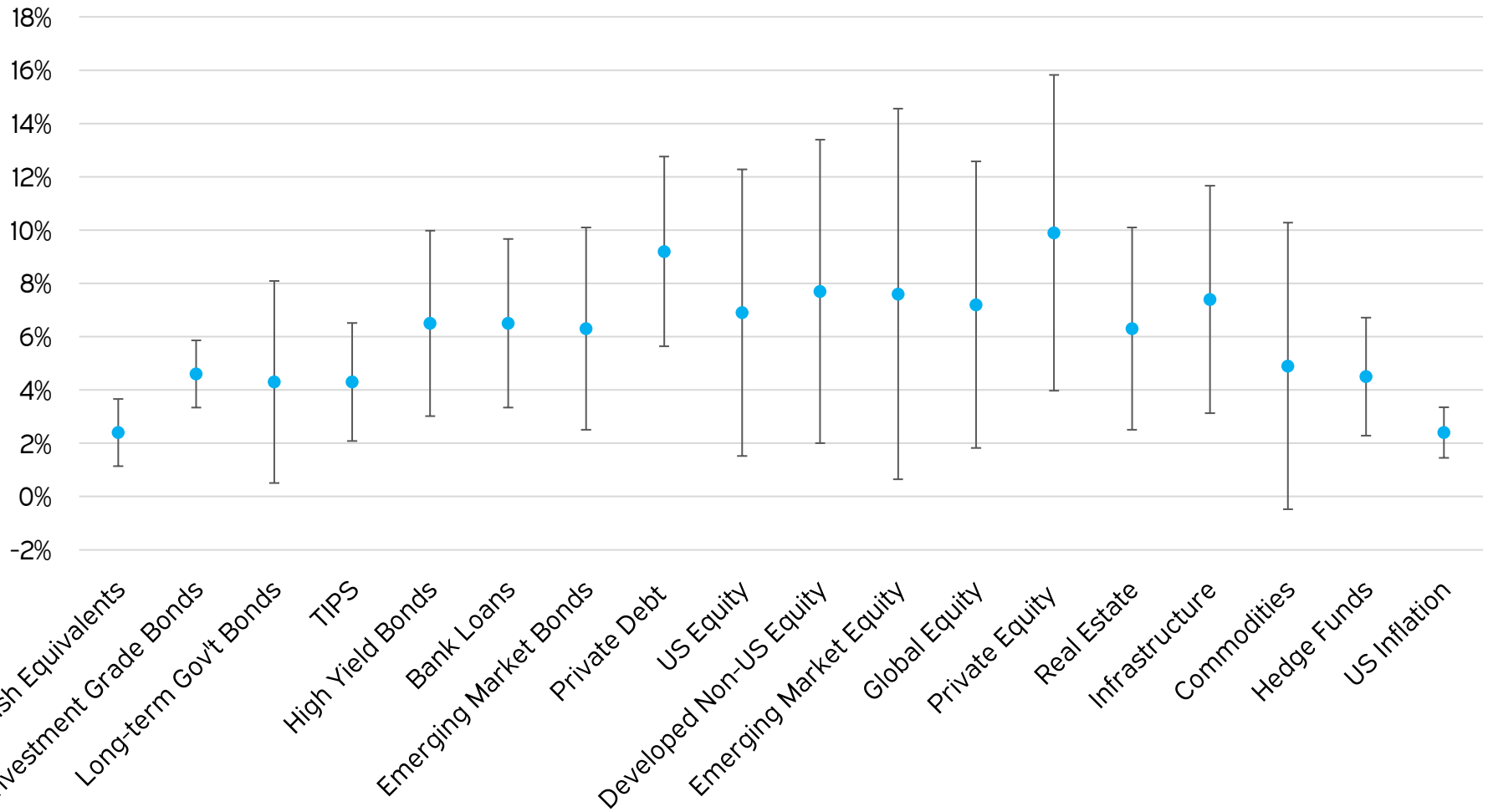
[1] Risk Premia are calculated relative to the market's projection for the yield on the 10-year Treasury in ten years..

Correlation Data

	Inv. Grade Bonds	Long-term Gov't Bonds	TIPS	High Yield Bonds	US Equity	Dev. Non-US Equity	Em. Market Equity	Private Equity	Real Estate	Commod.	Infra.	Hedge Funds
Investment Grade Bonds	1.00											
Long-term Government Bonds	0.86	1.00										
TIPS	0.77	0.61	1.00									
High Yield Bonds	0.35	-0.04	0.46	1.00								
US Equity	0.22	-0.10	0.30	0.76	1.00							
Developed Non-US Equity	0.26	-0.09	0.33	0.76	0.88	1.00						
Emerging Market Equity	0.27	-0.05	0.36	0.72	0.74	0.86	1.00					
Private Equity	0.00	-0.10	0.03	0.66	0.90	0.83	0.79	1.00				
Real Estate	0.26	0.06	0.17	0.56	0.53	0.49	0.43	0.49	1.00			
Commodities	0.00	-0.23	0.28	0.47	0.46	0.55	0.58	0.23	0.15	1.00		
Infrastructure	0.31	0.14	0.32	0.65	0.64	0.68	0.60	0.51	0.61	0.41	1.00	
Hedge Funds	0.12	-0.20	0.30	0.78	0.80	0.83	0.81	0.53	0.47	0.64	0.61	1.00

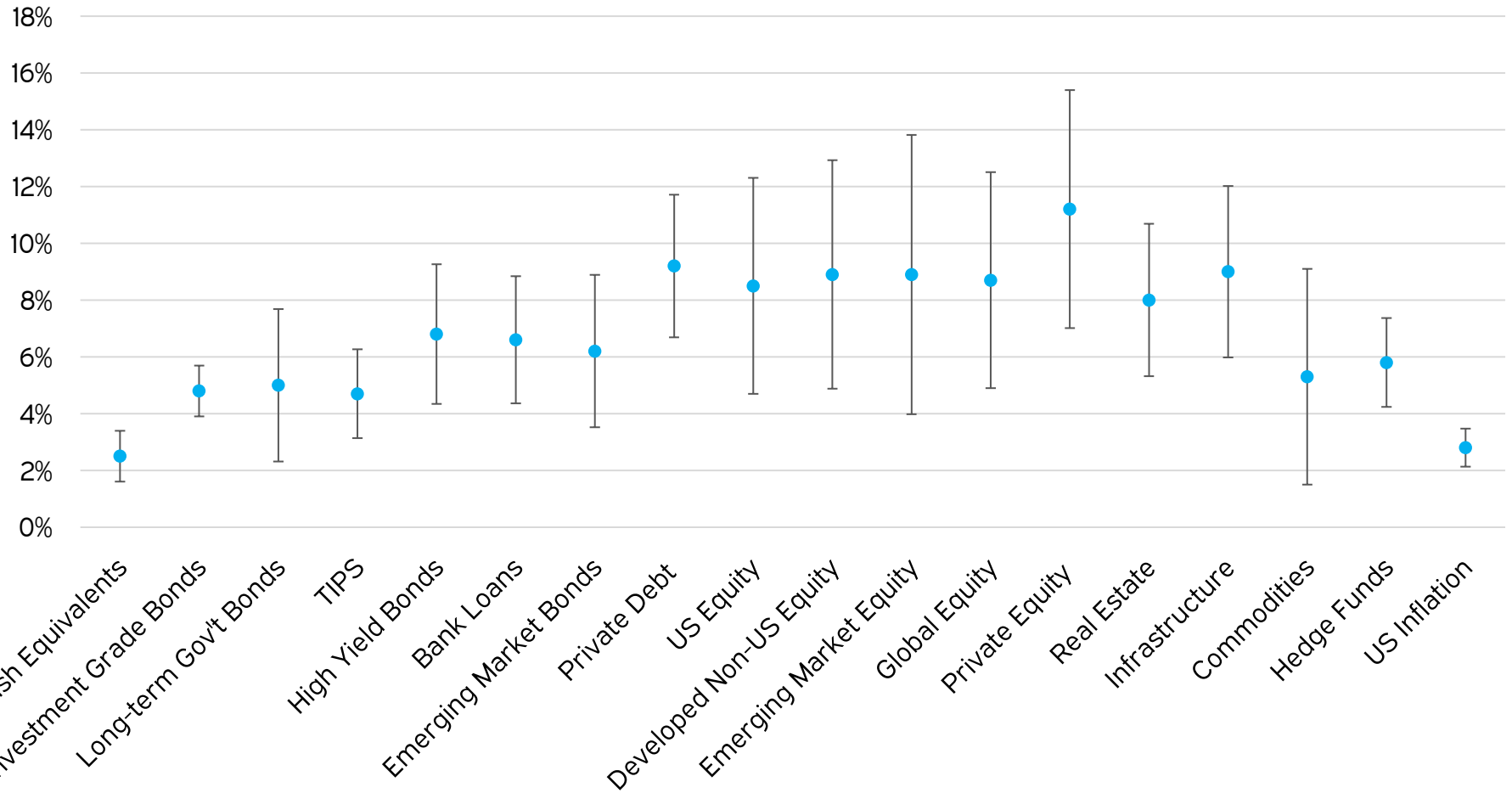
10-Year Return Expectations

10-year Forecasts and Likely Range



20-Year Return Expectations

20-year Forecasts and Likely Range



2023 Peer Survey

→ Annually, Horizon Actuarial Services, LLC publishes a survey of capital market assumptions that they collect from various investment advisors.[1]

→ The Horizon survey is a useful tool to determine whether a consultant's expectations for returns (and risk) are reasonable.

Asset Class	Horizon 10-Year Average (%)	Meketa 10-Year (%)	Horizon 20-Year Average (%)	Meketa 20-Year (%)
Cash Equivalents	3.4	3.1	3.2	2.9
TIPS	4.1	4.3	4.1	4.5
US Core Bonds	4.7	4.8	4.8	4.7
US High Yield Bonds	6.4	8.0	6.5	7.3
Emerging Market Debt	6.3	6.5	6.4	6.2
Private Debt	8.2	9.4	8.2	9.0
US Equity (large cap)	6.9	7.8	7.4	8.7
Developed Non-US Equity	7.5	10.1	7.8	9.8
Emerging Non-US Equity	8.2	10.3	8.6	10.0
Private Equity	9.5	9.7	10.1	11.0
Real Estate	6.0	5.9	6.3	7.8
Infrastructure	7.0	6.9	7.1	8.3
Commodities	5.0	6.3	4.9	5.7
Hedge Funds	6.0	5.4	6.2	6.1
Inflation	2.6	2.5	2.5	2.6

[1] The 10-year horizon included all 42 respondents to the survey, and the 20-year horizon included 27 respondents. Figures are based on Meketa's 2023 CMEs.

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