MEKETA
INVESTMENT GROUP

Meketa Investment Group

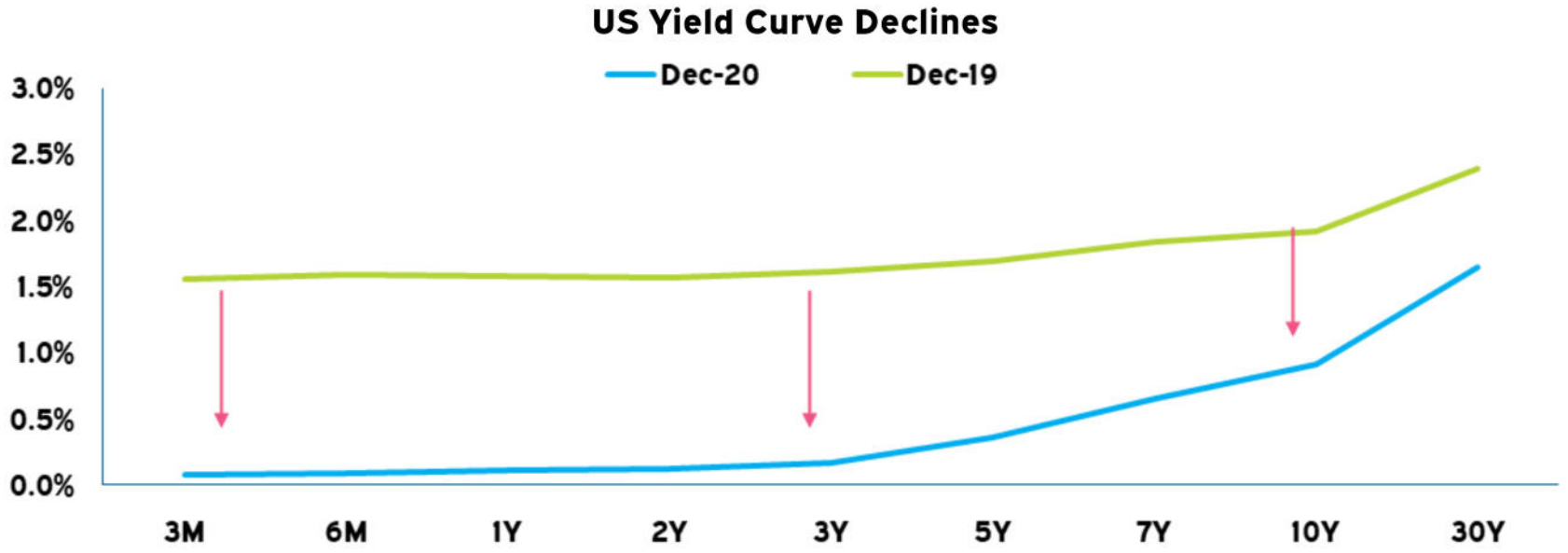
2021
Capital Markets Expectations

Executive Summary

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

Declining Interest Rates

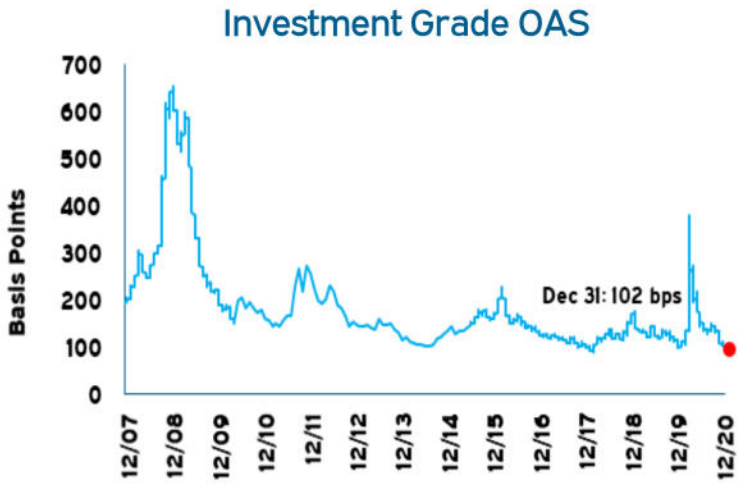
- The US Treasury yield curve declined materially during 2020, driven by demand for safe-haven assets (e.g., Treasuries), Federal Reserve polices (e.g., policy rate cuts and the quantitative easing program), and weak US economic fundamentals.
- The change was most dramatic at the shorter end of the curve,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

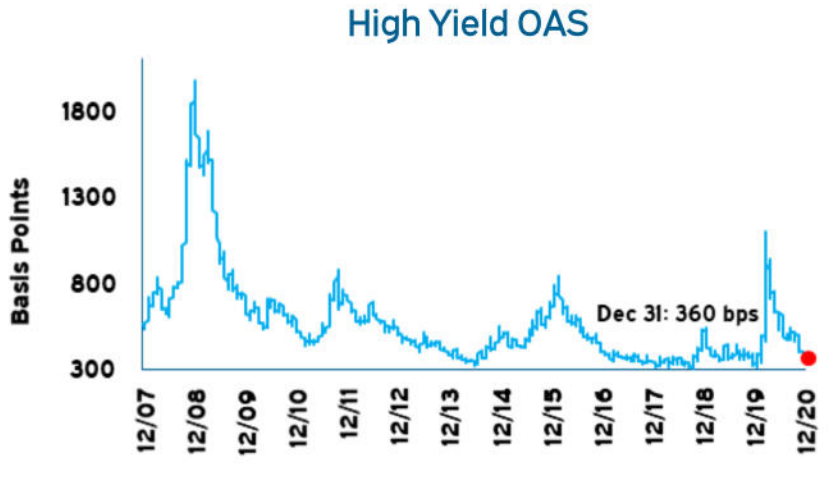


Source: Bloomberg. Data is as of December 31, 2020.

Tighter Credit Spreads

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





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

Declining Rates + Tighter Spreads = Lower Yields

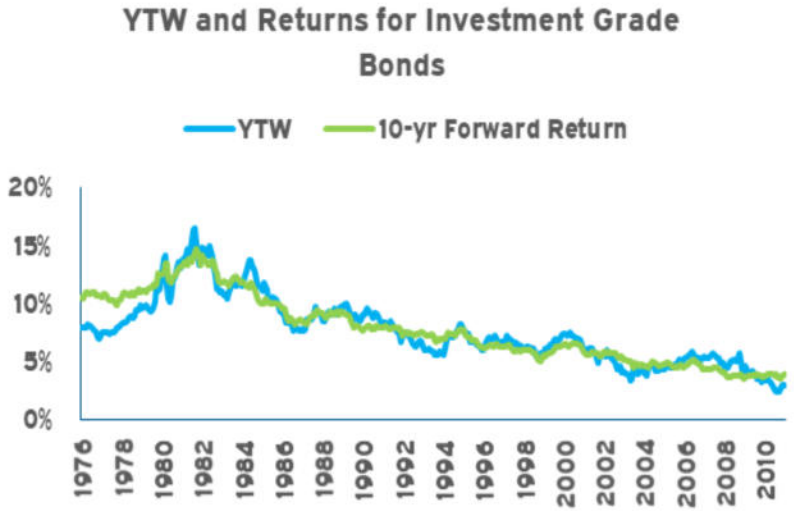
- The combination of declining rates and tight spreads resulted in lower yields across every major sector of the global bond market.

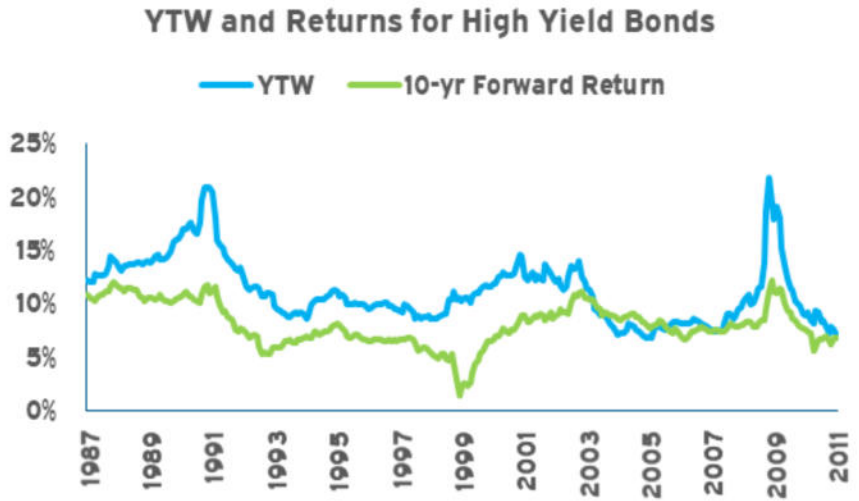
Index	Yield to Worst 12/31/20 (%)	Yield to Worst 12/31/19 (%)
Fed Funds Rate	0.1	1.6
10-year Treasury	0.93	1.92
Barclays Aggregate	1.12	2.31
Barclays Corporate	1.74	2.84
Barclays Securitized	1.24	2.53
Barclays Global Aggregate	0.83	1.45
Barclays EM Local Currency Government	3.20	3.72
Barclays EM Hard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

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

Lower Yields Means Lower Future Returns

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



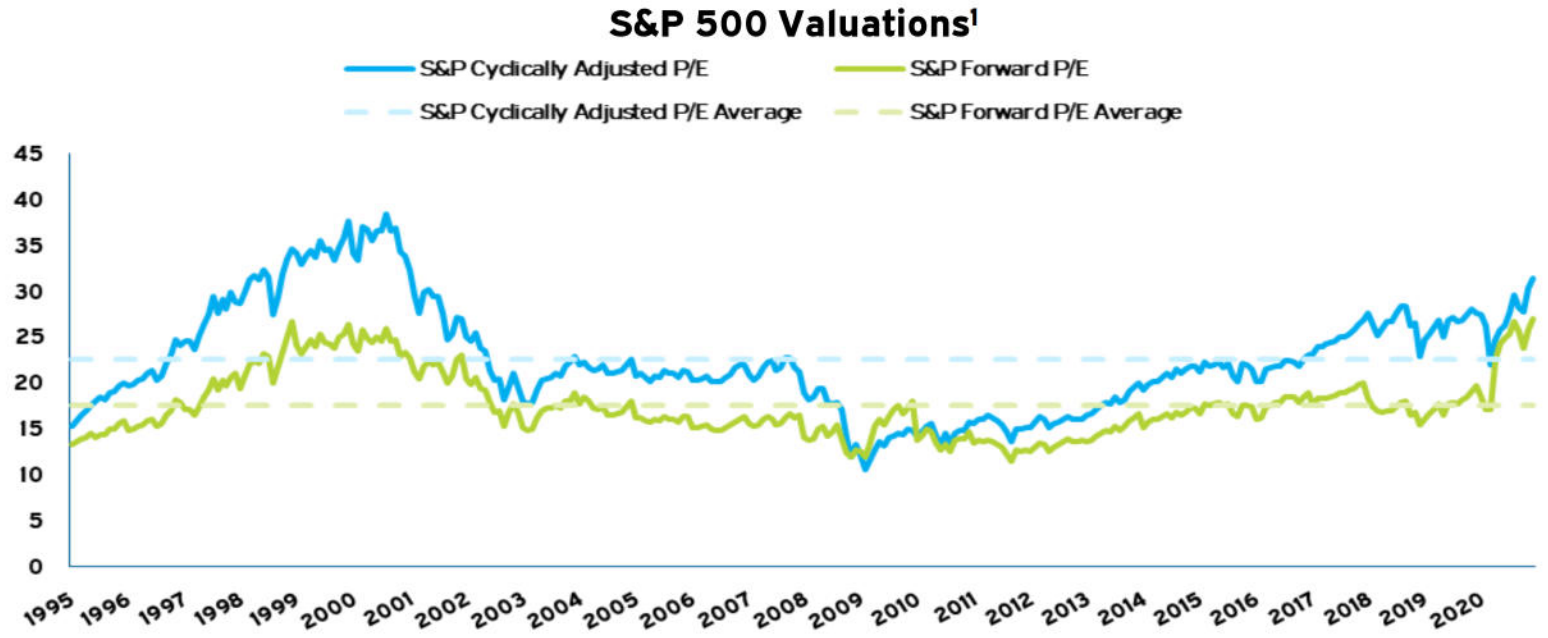


[1] When predicting returns for bonds, default risk should also be taken into account. For example, defaults are why the return for high yield bonds have generally been below the starting yield.

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

Higher Prices for Equities

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



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

Higher Prices in Non-US Equities, too

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

Developed International Equity Cyclically Adjusted P/E

Emerging Market Equity Cyclically Adjusted P/E

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

Impact of Low Rates on Equity Prices

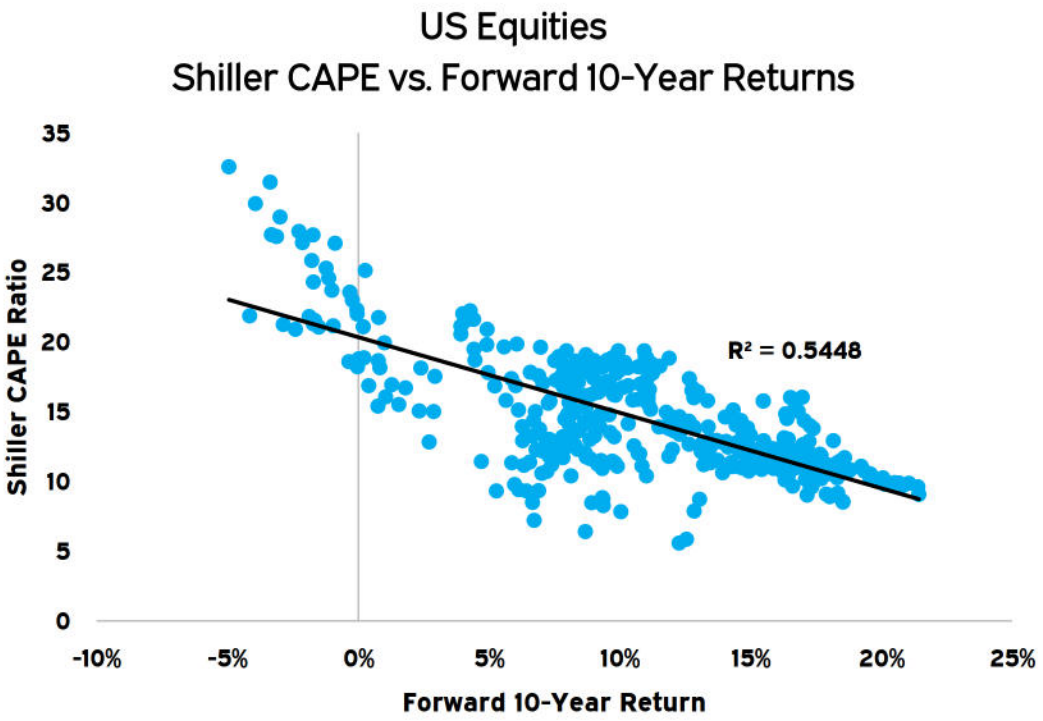
- Looking at Price-Earnings (or PE10, or PB) ratios alone results in most equity markets looking historically expensive.
- It is unclear how much of an impact low interest rates are having in supporting these elevated valuations and whether they will continue to provide that support if rates remain low.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

Correction in Prices Needed to Return to Historical Average

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

Higher Prices Imply Lower Returns for Equities

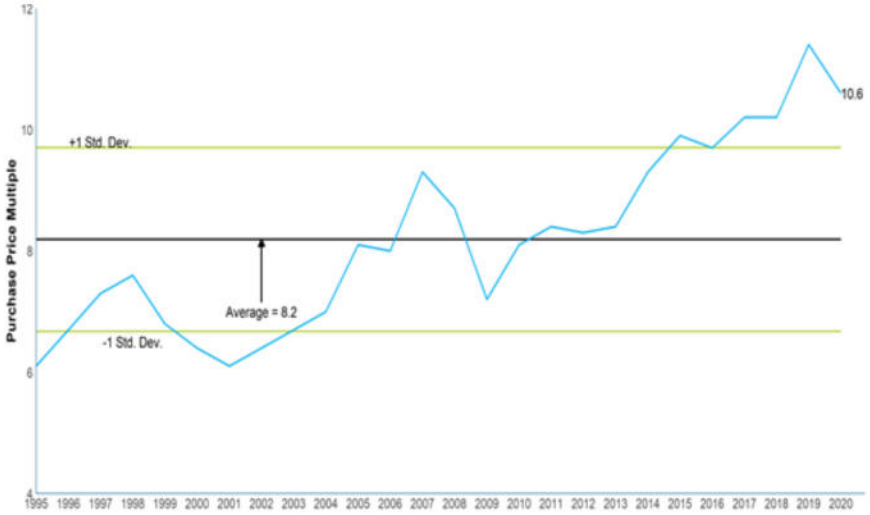
- Relative prices have been indicative of future equity returns.
- Higher prices have led to lower future returns, and vice versa.



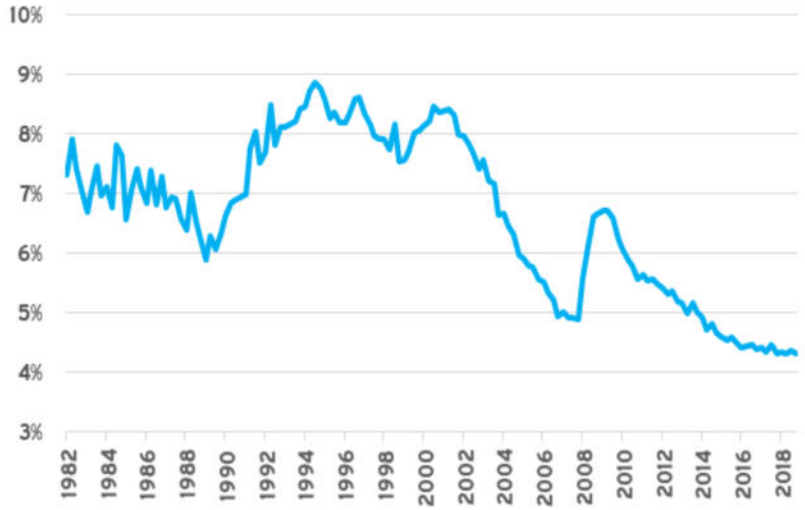
Higher Prices in Private Markets, too

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

Private Equity Multiples[1]



Core Real Estate Cap Rates[2]



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

20-year Geometric Expected Returns
Rate Sensitive

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

20-year Geometric Expected Returns
Credit

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

20-year Geometric Expected Returns
Equities

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

20-year Geometric Expected Returns
Real Assets

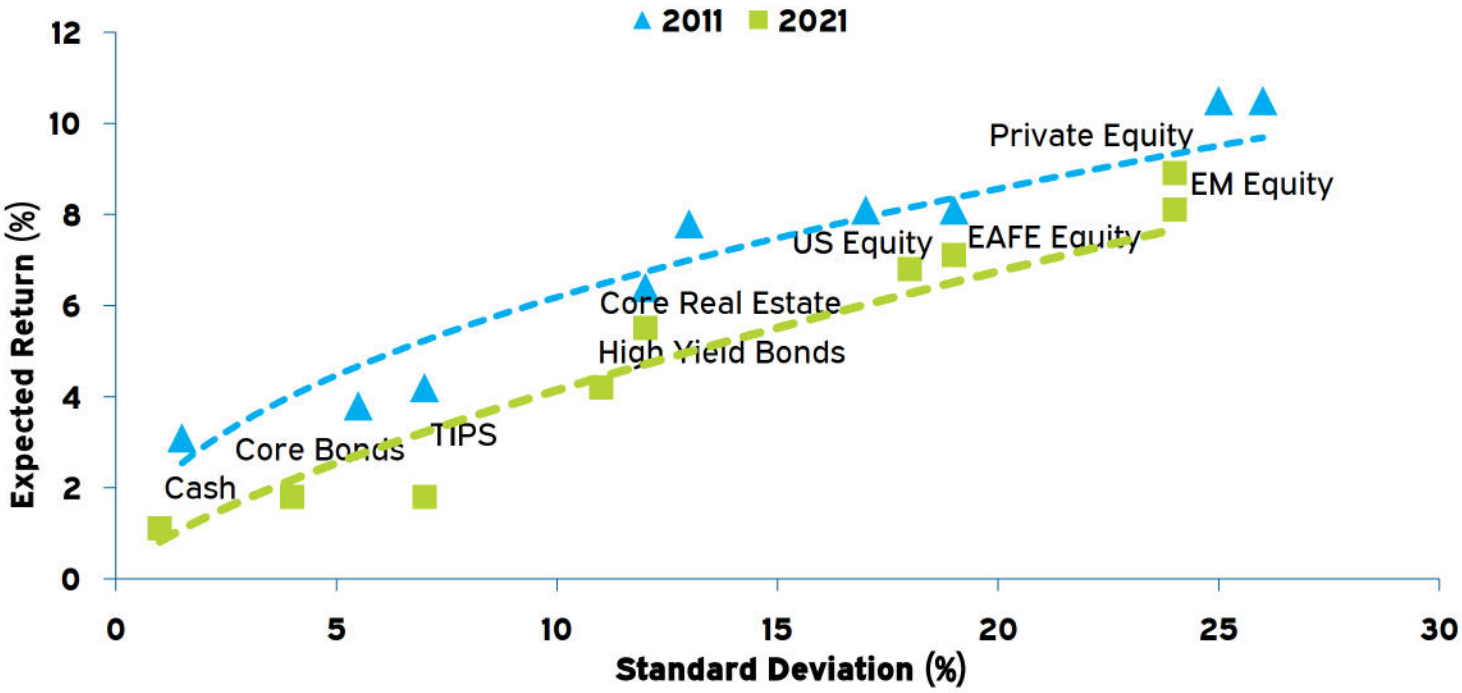
	2021 E(R) (%)	2020 E(R) (%)	Δ From 2020 (%)	Notes
Real Estate	6.9	7.5	-0.6	Lower cap rates
REITs	7.2	7.0	0.2	Higher yields
Core Private Real Estate	5.5	6.3	-0.8	Lower cap rate, partially offset by lower cost of borrowing
Value-Added Real Estate	7.7	8.4	-0.7	Lower cap rate, partially offset by lower cost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

20-year Geometric Expected Returns
Alternative Strategies (Other)

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

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

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



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

Structural Changes and FAQs

Structural Changes for 2021:

- We added the following assets (total now at 86):
  - Gold (metal)
  - Gold Mining
  - Alternative Risk Premia strategies (sometimes found in RMS portfolios)
  - Collateralized Loan Obligations (with a BBB bias)
  - Low Volatility Equity (global)
  - Opportunistic Green strategies (within natural resources)
- We consolidated first and second lien lending into a single Direct Lending category.
  - Most strategies utilized by our clients are now unitranche.

Model Changes for 2021

- Dividend Discount Model for Equities:
  - We changed the way we are modeling the mean reversion aspect for equities to use a form of the dividend discount model (DDM). This was based on the premise that low rates drive up valuations when discounting future cash flows (or earnings).
  - First, we figure out what the implied cost of equity (i.e., discount rate) has been historically, based on historical interest rates, growth rates, and prices. We then turn that into a "premium" over government bond rates that can be applied to the current level of (real) interest rates to arrive at a new, lower discount rate.
  - This can be used to calculate a present value for the market using the DDM. Taking this approach provided fairly intuitive results for US and non US equities (see caveat about earnings, next).

Model Changes for 2021 (cont.)

- Risk premia approach:
  - We changed the way we move from 10-year to 20-year projections. We are using a risk premia approach for years 11-20.
  - Previously, we tried to use the historical returns for an asset class for years 11-20. This worked reasonably well for an asset class like US equities, with its long history. But it did not work well for many other asset classes with shorter histories. And the historical returns for many fixed income asset classes is a poor predictor of future returns. This resulted in the need to make frequent qualitative adjustments or rely heavily on the 10-year model.
  - Instead, we will now start with an assumption (market informed, such as the 10-year forward rate) for what the risk free rate will be in ten years, and then add a risk premia for each asset class. We will use historical risk premia for each asset class as a guide, but many will differ from this. We will seek consistency with finance theory (i.e., riskier assets will have a higher risk premia assumption).

Model Changes for 2021 (cont.)

- The link between economic and earnings growth.
  - We have long assumed that earnings growth is linked to economic growth. However, we are now allowing earnings (per share) growth to exceed economic growth if we believe:
    - Corporate profits will grow faster than the rest of the economy.
    - Share buybacks will exceed new issuance, causing EPS to grow faster than earnings.
  - We believe both of these will be true for the US over the next decade, but to a lesser extent than they have for the past decade.
  - Conversely, earnings growth can be less than economic growth due to the opposite of the above, as well as other factors, such as state intervention (e.g., maximizing shareholder wealth not being a primary objective).
    - Most non-US markets fall in this category, but to varying extents.

FAQs for 2021

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

- To help evaluate this, we created a weighted average of expected returns for the asset classes that comprise a typical Meketa client portfolio. The value of the expected return for the portfolio is not a precise expected return (i.e., it has not been run via MVO), but the magnitude of the change is what is relevant. In short, the average of 20-year expected returns is 90 basis points lower than last January and 50 basis points lower than our July interim CMEs.
- Looking at past years' CMEs, this is the largest change in recent years. However, the volatility of late 2018 and early 2019 caused fairly large changes in the following years' CMEs as well.

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

FAQs for 2021 (cont.)

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

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

How do Meketa's CMEs compare to peers?

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

FAQs for 2021 (cont.)

Did volatility expectations increase?

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

Did Meketa make any qualitative adjustments?

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

FAQs for 2021 (cont.)

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

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

Are equity risk premiums rising?

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

Is Meketa assuming that interest rates will go up?

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

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

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

FAQs for 2021 (cont.)

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

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

Inflation Estimates

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

Source: IMF World Economic Outlook, October 2020.

FAQs for 2021 (cont.)

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

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

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

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

FAQs for 2021 (cont.)

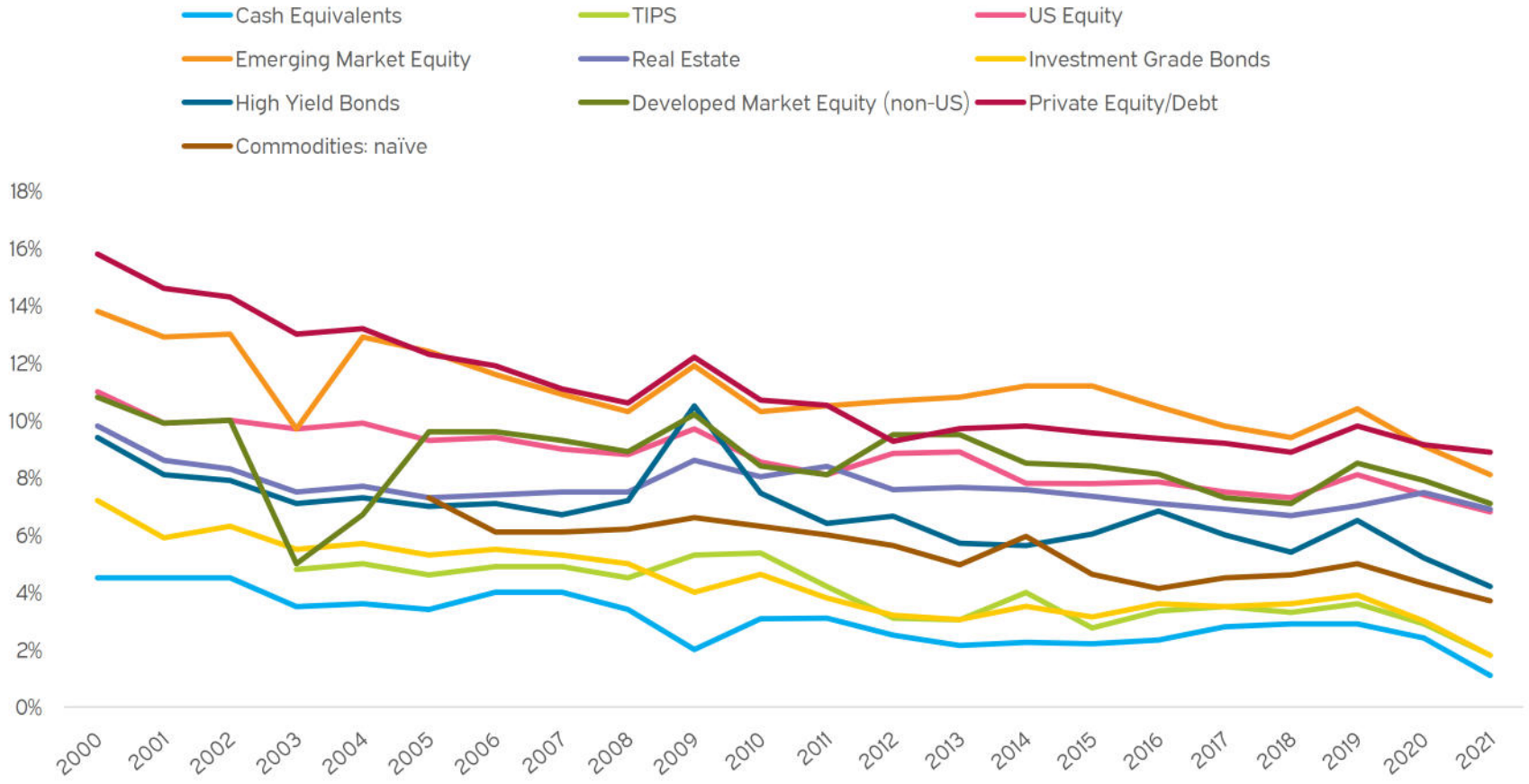
Why did the spread for private equity over public equity widen?

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

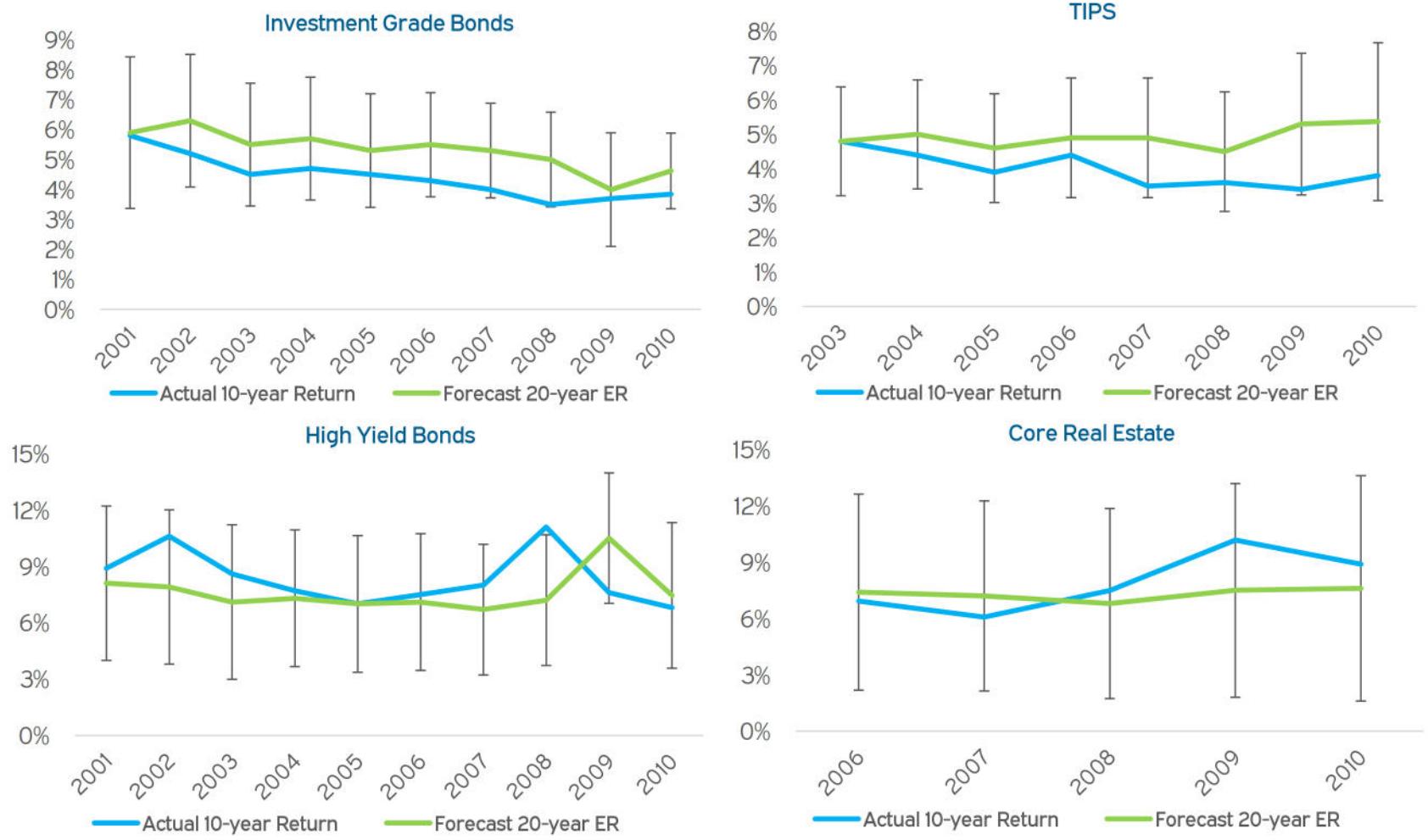
For venture capital, do the public tech sectors Meketa uses as a proxy for pricing really trade at a discount to the Russell 2000?

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

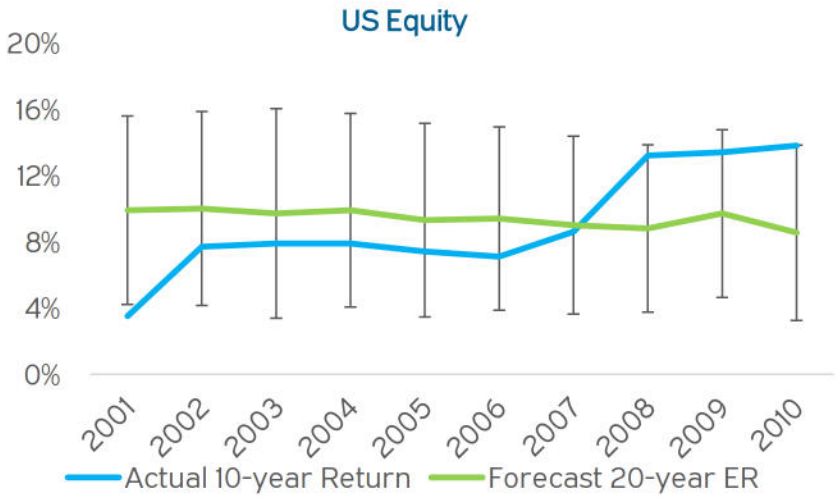
Our 20-year CMEs since 2000

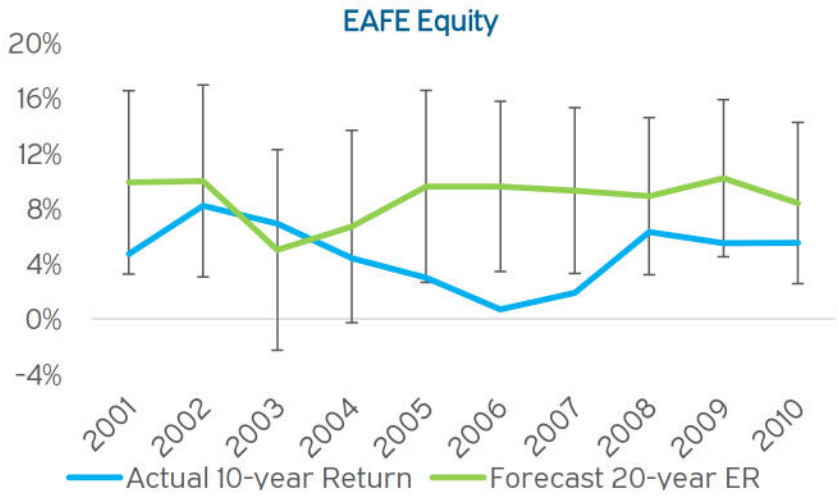


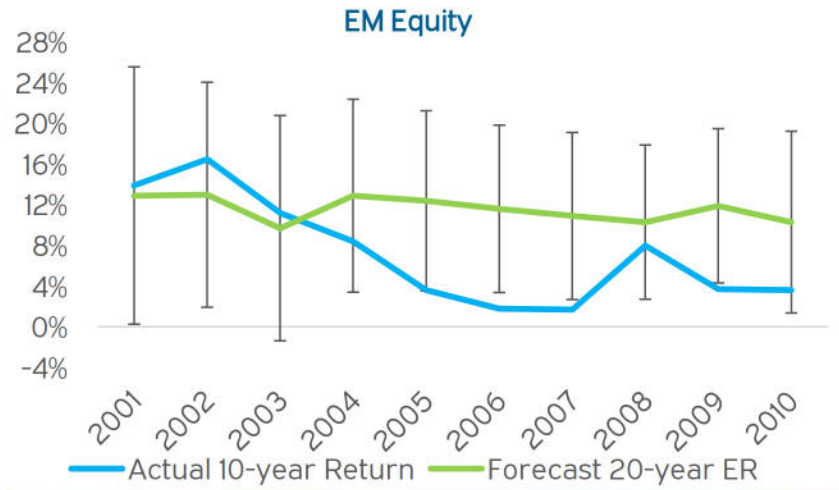
Our Track Record

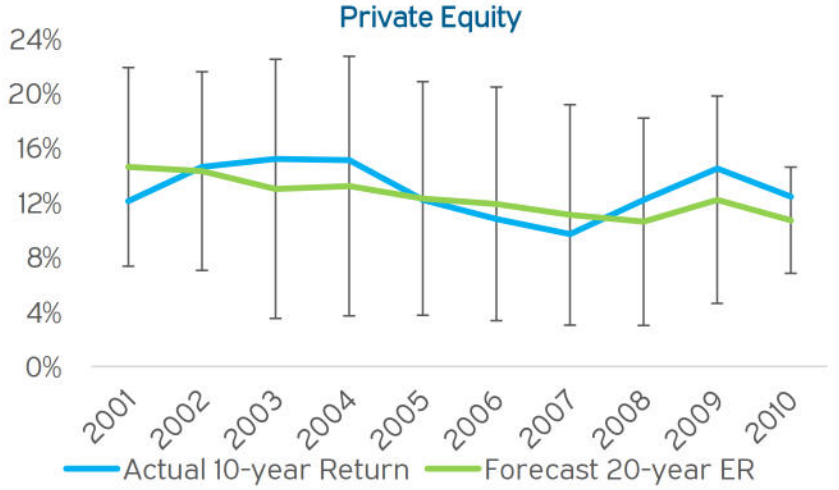


Our Track Record (cont.)









Our Process

Setting Capital Market Expectations

- Capital Markets Expectations are the inputs needed to conduct MVO.
  - MVO is the traditional starting point for determining asset allocation.
- Consultants (including Meketa) generally set them once a year.
  - Our results are published in January and based on December 31 data.
- This involves setting long-term expectations for a variety of asset classes 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 86 "asset classes" in 2021.

Building 10-year Forecasts

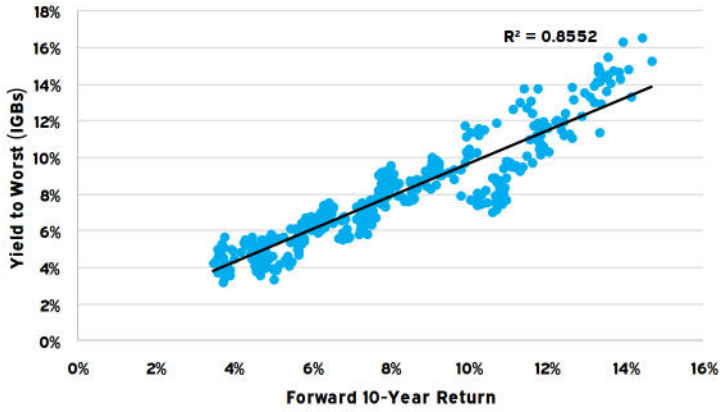
- Our first step is to develop 10-year forecasts based on fundamental models.
  - Each model is based on the most important factors that drive returns for that asset class:

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
Natural Resources	Price per Acre, Income, Public Market Valuation
Real Estate	Cap Rate, Yield, Growth
Private Equity	EBITDA Multiple, Debt Multiple, Public VC Valuation
Hedge Funds and Other	Leverage, Alternative Betas

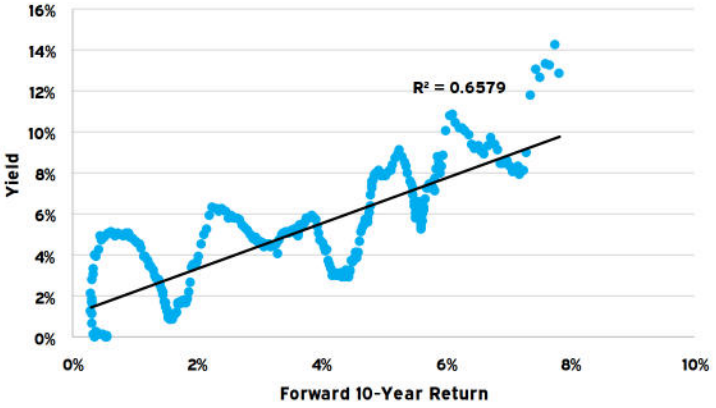
  - The common components are income, growth, and valuation.

Some factors are naturally more predictive than others

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

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

10-year Model Example: Bonds

- The short version for investment grade bond models is:

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

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

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

Moving from 10-Year to 20-Year Forecasts

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

Equities

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

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

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

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

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

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

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

Equities: Model [1]

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

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

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

Equities: Model 1 (cont.)

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

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

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

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

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

Equities: Model 1 (cont.)

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

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

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

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

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

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

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

Equities: Model 2

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

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

  - For projected earnings growth, we used a subjective growth rate.
    - For the US, we used a rate lower than the historical average due to our current assessment that we are nearer a peak than a trough in the earnings cycle.
- We multiply EPS by our projected PE ratio[1] to arrive at a ten-year price target.

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

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

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

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

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

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

Equities: Model 3

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

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

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

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

- The fair value can be calculated as:

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

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

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

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

Currency Effect

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

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

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

Equities: US Mid, Small & Micro

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

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

Bonds

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

Bonds (con't)

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

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

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

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

Private Credit

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

Private Credit (cont.)

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

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

Private Equity

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

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

Private Equity (cont.)

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

Real Estate

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

[1] Source: NCREIF.

Real Estate (cont.)

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

[1] Source: NCREIF, Townsend.

Real Estate (cont.)

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

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

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

[1] Source: NAREIT.

Real Estate (cont.)

- To arrive at the aggregate RE assumption, we took a weighted average of our expectations for each of the five components.
  - These reflect the weights of a typical client portfolio.

Component	Weight (%)	E(R) (%)
REITs	10	6.9
Core Private RE	40	5.0
Value-added RE	20	7.8
Opportunistic RE	20	8.9
High Yield RE Debt	10	6.0
	Aggregate Real Estate	6.6

Infrastructure

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

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

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

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

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

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

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

Infrastructure (con't)

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

Natural Resources

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

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

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

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

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

Natural Resources (cont.)

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

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

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

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

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

Natural Resources (cont.)

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

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

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

Natural Resources (cont.)

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

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

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

[1] Source: RISI.

Natural Resources (cont.)

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

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

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

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

Natural Resources (cont.)

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

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

Commodities

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

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

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

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

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

Commodities (cont.)

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

Hedge Funds

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

Hedge Funds (cont.)

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

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

Risk Parity

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

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

Tactical Asset Allocation

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

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

The Other Inputs: Standard Deviation and Correlation

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

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

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

Summary Data

Return and Risk Data

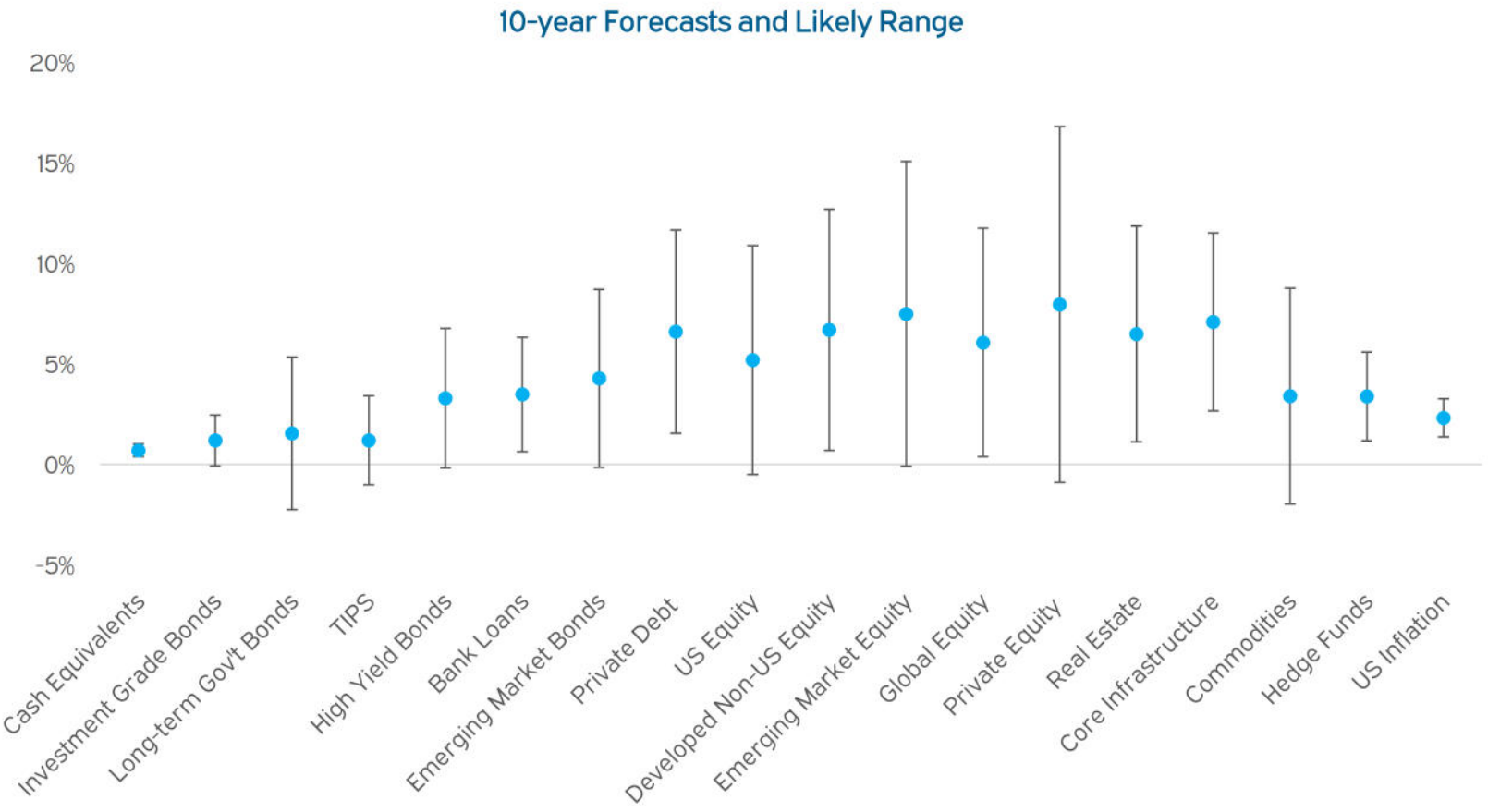
Asset Class	10-year Expected Return (%)	20-year Expected Return (%)	Standard Deviation (%)	20-year Risk Premia[1]
Cash Equivalents	0.7	1.1	1.0	-0.3%
Investment Grade Bonds	1.2	1.8	4.0	0.4%
Long-term Government Bonds	1.6	2.5	12.0	1.1%
TIPS	1.2	1.8	7.0	0.4%
High Yield Bonds	3.3	4.2	11.0	2.8%
Bank Loans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

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

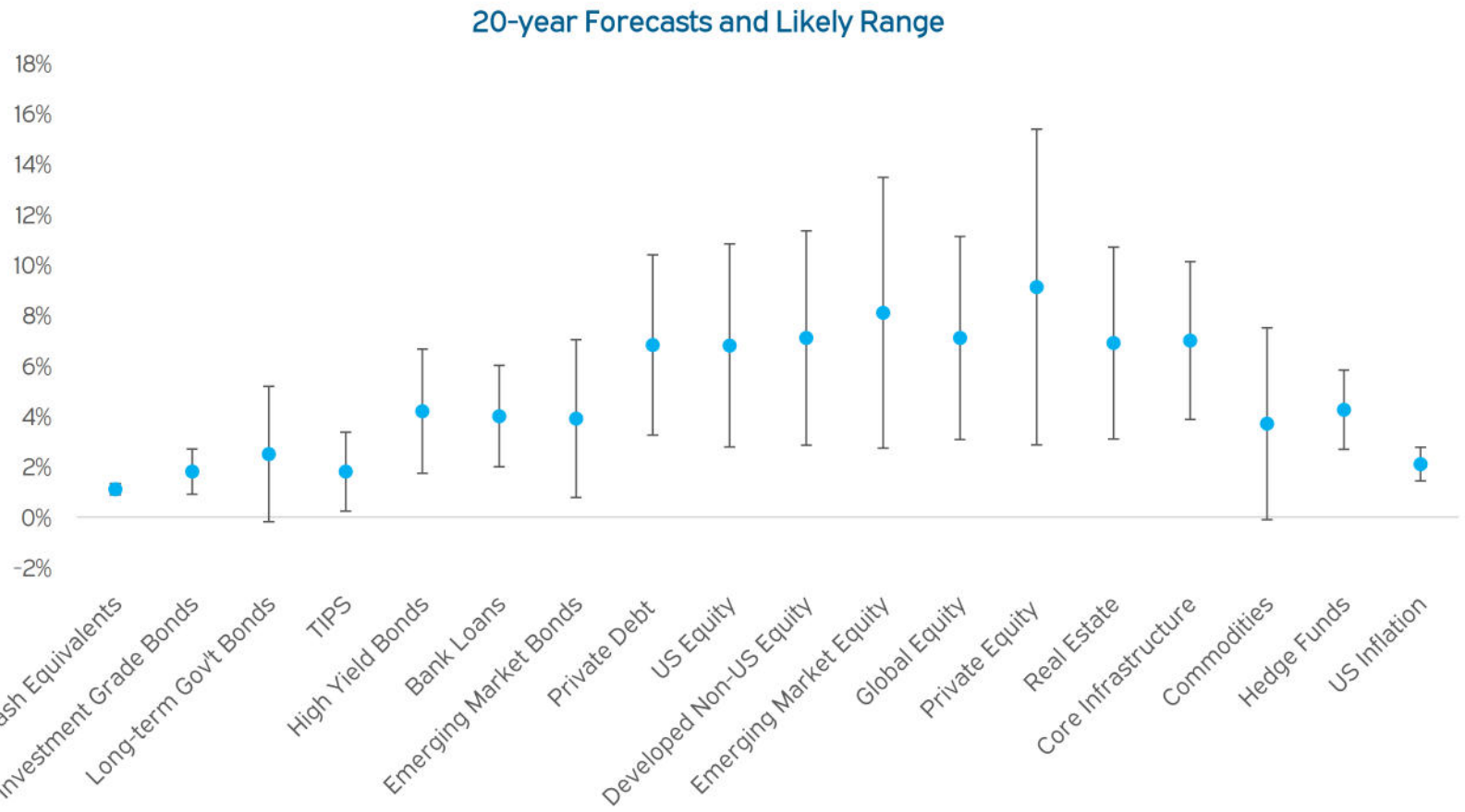
Correlation Data

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

10-Year Return Expectations



20-Year Return Expectations



2020 Peer Survey

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

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

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

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