Verus⁷⁷

PERSPECTIVES
THAT DRIVE
ENTERPRISE
SUCCESS

NOVEMBER 2022
2023 Capital Market Assumptions

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Summary

Methodology

CORE INPUTS

— We use a fundamental building block approach based on several inputs, including historical data and academic research to create asset class return forecasts.
— For most asset classes, we use the long-term historical volatility after adjusting for autocorrelation.
— Correlations between asset classes are calculated based on the last 10 years. For illiquid assets, such as private equity and private real estate, we use BarraOne correlation estimates.

Asset	Return Methodology	Volatility Methodology*
Inflation	25% weight to the University of Michigan Survey 5-10 year ahead inflation expectation and the Survey of Professional Forecasters (Fed Survey), and the remaining 50% to the market's expectation for inflation as observed through the 10-year TIPS breakeven rate	-
Cash	75% * current federal funds rate + 25% * U.S. 10-year Treasury yield	Long-term volatility
Bonds	Nominal bonds: current yield; Real bonds: real yield + inflation forecast	Long-term volatility
International Bonds	Current yield	Long-term volatility
Credit	Current option-adjusted spread + U.S. 10-year Treasury – effective default rate	Long-term volatility
International Credit	Current option-adjusted spread + foreign 10-year Treasury – effective default rate	Long-term volatility
Private Credit	Levered gross return (LIBOR + spread + original issuance discounts) – management fees – carried interest	Estimated volatility
Equity	Current yield + real earnings growth (historical average) + inflation on earnings (inflation forecast) + expected P/E change	Long-term volatility
Intl Developed Equity	Current yield + real earnings growth (historical average) + inflation on earnings (intl. inflation forecast) + expected P/E change	Long-term volatility
Private Equity	US large cap domestic equity forecast * 1.85 beta adjustment	1.2 * Long-term volatility of U.S. small cap
Commodities	Collateral return (cash) + spot return (inflation forecast) + roll return (assumed to be zero)	Long-term volatility
Hedge Funds	Return coming from traditional betas + 15-year historical idiosyncratic return	Long-term volatility
Core Real Estate	Cap rate + real income growth – capex + inflation forecast	65% of REIT volatility
REITs	Core real estate	Long-term volatility
Value-Add Real Estate	Core real estate + 2%	Volatility to produce Sharpe Ratio (g) equal to core real estate
Opportunistic Real Estate	Core real estate + 3%	Volatility to produce Sharpe Ratio (g) equal to core real estate
Infrastructure	Current yield + real income growth + inflation on earnings (inflation forecast)	Long-term volatility
Risk Parity	Expected Sharpe Ratio * target volatility + cash rate	Target volatility

*Long-term historical volatility data is adjusted for autocorrelation (see Appendix)

10-year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)	10-Year Historical Sharpe Ratio (g)	10-Year Historical Sharpe Ratio (a)
		Geometric	Arithmetic					
Equities								
U.S. Large	S&P 500	6.5%	7.6%	15.6%	0.21	0.28	0.76	0.79
U.S. Small	Russell 2000	5.4%	7.5%	21.5%	0.10	0.20	0.42	0.49
International Developed	MSCI EAFE	9.1%	10.5%	17.8%	0.33	0.40	0.21	0.27
International Small	MSCI EAFE Small Cap	9.2%	11.3%	22.1%	0.27	0.36	0.29	0.36
Emerging Markets	MSCI EM	8.5%	11.2%	25.2%	0.21	0.31	0.02	0.10
Global Equity	MSCI ACWI	7.4%	8.7%	17.1%	0.23	0.32	0.47	0.52
Global Equity ex-US	MSCI ACWI ex-US	9.0%	10.7%	19.9%	0.29	0.37	0.16	0.23
Private Equity	CA U.S. Private Equity	9.2%	12.1%	25.8%	0.23	0.34	-	-
Private Equity Direct	CA U.S. Private Equity	10.2%	13.0%	25.8%	0.27	0.38	-	-
Private Equity (FoF)	CA U.S. Private Equity	8.2%	11.1%	25.8%	0.19	0.30	-	-
Fixed Income								
Cash	30 Day T-Bills	3.3%	3.3%	1.2%	-	-	-	-
U.S. TIPS	Bloomberg U.S. TIPS 5-10	4.1%	4.3%	5.6%	0.14	0.18	0.06	0.08
U.S. Treasury	Bloomberg Treasury 7-10 Year	3.8%	4.0%	7.1%	0.07	0.10	(0.02)	0.01
Long U.S. Treasury	Bloomberg Treasury 20+ Year	3.8%	4.6%	13.2%	0.04	0.10	(0.01)	0.05
Global Sovereign ex U.S.	Bloomberg Global Treasury ex U.S.	2.2%	2.7%	10.0%	(0.11)	(0.06)	(0.47)	(0.44)
Global Aggregate	Bloomberg Global Aggregate	3.0%	3.2%	6.7%	(0.05)	(0.01)	(0.30)	(0.28)
Core Fixed Income	Bloomberg U.S. Aggregate Bond	4.3%	4.4%	4.6%	0.22	0.24	0.05	0.07
Core Plus Fixed Income	Bloomberg U.S. Universal	4.6%	4.7%	4.6%	0.28	0.30	0.17	0.14
Short-Term Gov't/Credit	Bloomberg U.S. Gov't/Credit 1-3 Year	3.9%	4.0%	3.7%	0.16	0.19	0.11	0.11
Short-Term Credit	Bloomberg Credit 1-3 Year	4.3%	4.4%	3.7%	0.27	0.30	0.40	0.40
Long-Term Credit	Bloomberg Long U.S. Credit	5.3%	5.9%	11.0%	0.18	0.24	0.11	0.16
High Yield Corp. Credit	Bloomberg U.S. Corporate High Yield	6.4%	7.0%	11.2%	0.28	0.33	0.44	0.47
Bank Loans	S&P/LSTA Leveraged Loan	6.8%	7.2%	9.2%	0.38	0.42	0.53	0.54
Global Credit	Bloomberg Global Credit	4.5%	4.8%	7.9%	0.15	0.19	0.00	0.03
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	8.9%	9.4%	10.7%	0.52	0.57	0.05	0.09
Emerging Markets Debt (Local)	JPM GBI-EM Global Diversified	7.0%	7.7%	12.3%	0.30	0.36	(0.28)	(0.23)
Private Credit	S&P LSTA Leveraged Loan Index	8.2%	9.0%	13.0%	0.38	0.44	-	-
Private Credit (Direct Lending - Unlevered)	S&P LSTA Leveraged Loan Index	6.8%	7.2%	9.2%	0.38	0.42	-	-
Private Credit (Direct Lending - Levered)	S&P LSTA Leveraged Loan Index	9.1%	10.1%	15.3%	0.38	0.44	-	-
Private Credit (Credit Opportunities)	S&P LSTA Leveraged Loan Index	8.5%	9.4%	13.8%	0.38	0.44	-	-
Private Credit (Junior Capital / Mezzanine)	S&P LSTA Leveraged Loan Index	9.0%	10.0%	15.1%	0.38	0.44	-	-
Private Credit (Distressed)	S&P LSTA Leveraged Loan Index	9.1%	12.7%	29.1%	0.20	0.32	-	-

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

10-year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast		Standard Deviation Forecast	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)	10-Year Historical Sharpe Ratio (g)	10-Year Historical Sharpe Ratio (a)
		Geometric	Arithmetic					
Other								
Commodities	Bloomberg Commodity	5.7%	6.9%	16.3%	0.15	0.22	(0.20)	(0.13)
Hedge Funds	HFRI Fund Weighted Composite	4.6%	4.9%	7.7%	0.17	0.21	0.70	0.71
Hedge Fund of Funds	HFRI Fund of Funds Composite	3.6%	3.9%	7.7%	0.04	0.08	-	-
Hedge Funds (Equity Style)	Custom HFRI Benchmark Mix*	7.4%	8.4%	14.6%	0.28	0.35	-	-
Hedge Funds (Credit Style)	Custom HFRI Benchmark Mix*	7.1%	7.5%	9.8%	0.39	0.43	-	-
Hedge Funds (Asymmetric Style)	Custom HFRI Benchmark Mix*	4.8%	4.9%	4.8%	0.31	0.33	-	-
Real Estate Debt	Bloomberg CMBS IG	5.2%	5.5%	7.5%	0.25	0.29	0.26	0.28
Core Real Estate	NCREIF Property	5.8%	6.5%	12.6%	0.20	0.25	1.94	1.87
Value-Add Real Estate	NCREIF Property + 200bps	7.8%	8.9%	15.5%	0.29	0.36	-	-
Opportunistic Real Estate	NCREIF Property + 300bps	8.8%	10.8%	21.3%	0.26	0.35	-	-
REITs	Wilshire REIT	5.8%	7.5%	19.4%	0.13	0.22	0.32	0.40
Global Infrastructure	S&P Global Infrastructure	7.8%	9.1%	17.3%	0.26	0.34	0.28	0.35
Risk Parity**	S&P Risk Parity 10% Vol Index	8.3%	8.8%	10.0%	0.50	0.55	-	-
Currency Beta	MSCI Currency Factor Index	1.6%	1.7%	3.4%	(0.49)	(0.46)	0.20	0.21
Inflation		2.5%	-	-	-	-	-	-

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

*To represent hedge fund styles, we use a combination of HFRI benchmarks: Equity Style = 33% HFRI Fundamental Growth, 33% HFRI Fundamental Value, 33% HFRI Activist. Credit Style = 20% HFRI Distressed/Restructuring, 20% HFRI Credit A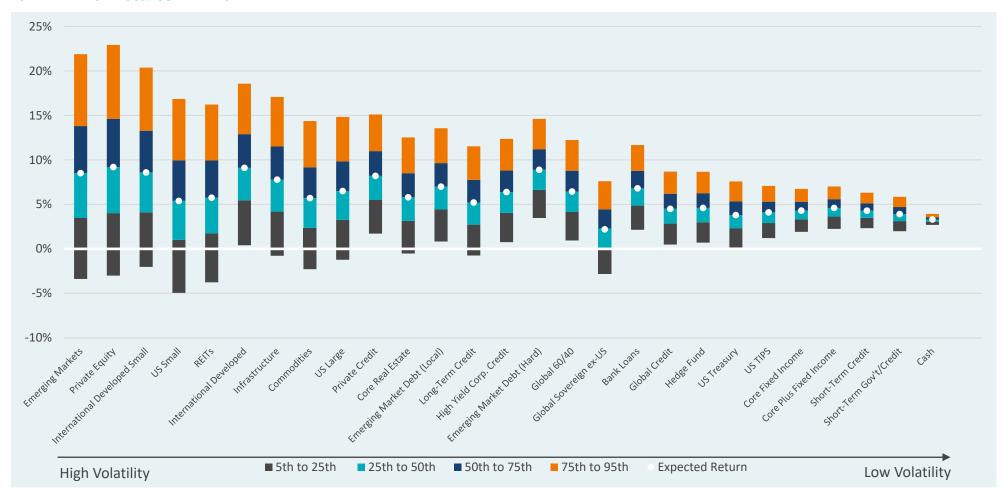rbitrage, 20% HFRI Fixed Income-Corporate, 20% HFRI Fixed Income-Convertible Arbitrage, 20% HFRI Fixed Income-Asset Backed. Asymmetric Style = 50% HFRI Relative Value, 50% HFRI Macro

**The Risk Parity forecast shown here assumes a 10% target volatility strategy. We recommend customizing this forecast to the target volatility specifications of the risk parity strategy that an investor wishes to model. Please speak with your Verus consultant for customization needs.

Correlation assumptions

	Cash	US Large	US Small	Intl Large	Intl Small	EM	Global Equity	PE	US TIPS	US Treasury	Global Sovereign ex-US	US Core	Core Plus	Short-Term Gov't/Credit	Short-Term Credit	Long-Term Credit	US HY	Bank Loans	Global Credit	EMD USD	EMD Local	Commodities	Hedge Funds	Real Estate	REITs	Infrastructure	Risk Parity	Currency Beta
Cash	1.0																											
US Large	-0.2	1.0																										
US Small	-0.2	0.9	1.0																									
Intl Large	-0.2	0.9	0.8	1.0																								
Intl Small	-0.3	0.9	0.8	1.0	1.0																							
EM	-0.2	0.7	0.6	0.8	0.8	1.0																						
Global Equity	-0.2	1.0	0.9	1.0	0.9	0.8	1.0																					
PE	-0.2	0.7	0.6	0.6	0.6	0.6	0.7	1.0																				
US TIPS	0.0	0.4	0.3	0.4	0.4	0.4	0.4	0.2	1.0																			
US Treasury	0.2	0.0	-0.1	0.0	0.0	0.0	0.0	-0.2	0.8	1.0																		
Global Sovereign ex-US	0.1	0.0	-0.2	-0.1	-0.1	0.0	-0.1	-0.2	0.7	0.9	1.0																	
US Core	0.0	0.3	0.2	0.4	0.4	0.5	0.4	0.1	0.7	0.6	0.5	1.0																
Core Plus	0.1	0.3	0.2	0.3	0.3	0.3	0.3	0.0	0.8	0.9	0.9	0.7	1.0															
Short-Term Gov't/Credit	0.0	0.4	0.3	0.4	0.4	0.4	0.4	0.1	0.9	0.8	0.8	0.7	1.0	1.0														
Short-Term Credit	0.2	0.1	0.1	0.2	0.2	0.2	0.2	-0.1	0.7	0.8	0.6	0.6	0.8	0.8	1.0													
Long-Term Credit	0.0	0.4	0.4	0.5	0.5	0.5	0.5	0.0	0.7	0.5	0.4	0.6	0.8	0.8	0.8	1.0												
US HY	0.0	0.5	0.4	0.5	0.5	0.5	0.5	0.1	0.7	0.6	0.7	0.6	0.8	0.9	0.6	0.7	1.0											
Bank Loans	-0.2	0.8	0.8	0.8	0.8	0.7	0.8	0.5	0.5	0.1	0.1	0.5	0.4	0.6	0.3	0.7	0.6	1.0										
Global Credit	-0.3	0.6	0.7	0.6	0.7	0.6	0.7	0.5	0.3	-0.2	-0.2	0.2	0.1	0.3	0.0	0.5	0.4	0.8	1.0									
EMD USD	-0.1	0.6	0.5	0.7	0.7	0.7	0.7	0.4	0.6	0.3	0.3	0.6	0.6	0.7	0.4	0.7	0.7	0.8	0.7	1.0								
EMD Local	0.0	0.5	0.4	0.7	0.6	0.8	0.6	0.4	0.5	0.2	0.1	0.6	0.4	0.5	0.3	0.5	0.5	0.7	0.5	0.8	1.0							
Commodities	-0.2	0.4	0.4	0.5	0.5	0.5	0.5	0.3	0.2	-0.3	-0.3	0.2	-0.1	0.0	-0.1	0.2	0.1	0.5	0.5	0.3	0.4	1.0						
Hedge Funds	-0.2	0.8	0.9	0.9	0.9	0.8	0.9	0.6	0.3	-0.2	-0.2	0.3	0.1	0.3	0.0	0.5	0.4	0.8	0.8	0.7	0.6	0.5	1.0					
Real Estate	-0.2	0.6	0.5	0.5	0.5	0.4	0.6	0.4	0.2	-0.1	-0.1	0.2	0.0	0.1	-0.1	0.1	-0.1	0.4	0.4	0.4	0.4	0.3	0.5	1.0				
REITs	-0.2	0.7	0.6	0.6	0.6	0.5	0.7	0.5	0.6	0.3	0.3	0.4	0.5	0.5	0.2	0.5	0.6	0.6	0.5	0.6	0.5	0.3	0.6	0.7	1.0			
Infrastructure	-0.2	0.8	0.7	0.8	0.8	0.7	0.8	0.7	0.5	0.1	0.0	0.5	0.3	0.5	0.2	0.5	0.6	0.8	0.7	0.7	0.7	0.5	0.8	0.3	0.7	1.0		
Risk Parity	-0.2	0.7	0.7	0.8	0.7	0.7	0.8	0.6	0.6	0.1	0.1	0.4	0.4	0.5	0.2	0.6	0.6	0.8	0.7	0.8	0.6	0.6	0.8	0.4	0.7	0.8	1.0	
Currency Beta	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	1.0

Note: as of 9/30/22 - Correlation assumptions are based on the last ten years. Private Equity and Real Estate correlations are especially difficult to model – we have therefore used BarraOne correlation data to strengthen these correlation estimates.
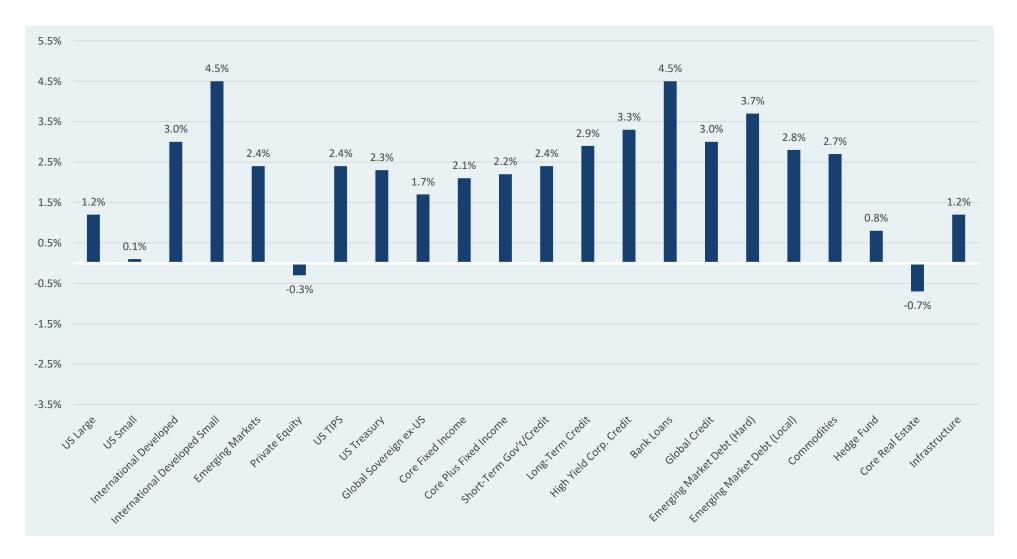
Range of likely 10-year outcomes

10-YEAR RETURN 90% CONFIDENCE INTERVAL

High Volatility ← → Low Volatility

Legend: ■ 5th to 25th ■ 25th to 50th ■ 50th to 75th ■ 75th to 95th ○ Expected Return

Source: Verus, MPI

2023 vs. 2022 return forecast

Chart showing return forecast percentages by asset class:

Asset Class	Value
US Large	1.2%
US Small	0.1%
International Developed	3.0%
International Developed Small	4.5%
Emerging Markets	2.4%
Private Equity	-0.3%
US TIPS	2.4%
US Treasury	2.3%
Global Sovereign ex-US	1.7%
Core Fixed Income	2.1%
Core Plus Fixed Income	2.2%
Short-Term Gov't/Credit	2.4%
Long-Term Credit	2.9%
High Yield Corp. Credit	3.3%
Bank Loans	4.5%
Global Credit	3.0%
Emerging Market Debt (Hard)	3.7%
Emerging Market Debt (Local)	2.8%
Commodities	2.7%
Hedge Fund	0.8%
Core Real Estate	-0.7%
Infrastructure	1.2%

Source: Verus, as of 9/30/22

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Relevant forecast changes

— The year 2022 may later be recognized as the turning point to the *low return environment* narrative of the past decade. As global central banks have hiked interest rates fairly aggressively, risk asset valuations have fallen closer to long-term average levels, and inflation picked up, the prospective returns of many asset classes improved substantially. These dynamics are on display within the Verus 2023 Capital Market Assumptions. Readers will notice large gains in the expected returns of fixed income assets, moderate gains in equity forecasts, and improvements in some real assets, given the greater risk premiums offered by markets today.

— Inflation expectations increased mid-year but later receded as markets, households, and economists generally believed inflation would fall back to normal levels. The U.S. TIPS breakeven inflation rate fell from 2.37% to 2.15%, as inflation expectations suggest a quick return to normalcy. Household inflation expectations (University of Michigan) began and ended the year at 2.7%. The Survey of Professional Forecasters also increased from 2.4% to 2.8%. This resulted in our inflation forecast remaining unchanged at 2.5%.

— Credit spreads were mixed over the year. Higher risk bond spreads steadily marched upward as the Federal Reserve took a more aggressive stance on rate hikes and its fight against inflation, which has generated concerns around an imminent recession. High yield spreads jumped from 323 bps to 517 bps. Core fixed income spreads tightened over the year from 81 bps to 57 bps.

— The long end of the yield curve increased substantially, as the 10-year U.S. Treasury yield moved from 1.49% to 3.83%. The curve is now flat or slightly inverted (depending on the measure), with the effective federal funds rate at 2.6%. An inverted curve has historically suggested recession is near.

— Emerging market hard and local currency debt forecasts moved higher. Hard currency-denominated debt spreads to U.S. Treasury yields rose from 392 to 523 bps. The yield of local-denominated debt increased from 4.5% to 7.3%.

All data cited above is as of 9/30/22

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Inflation

Inflation

We use a weighted average of market expectations (50%), consumer expectations (25%), and professional forecasts (25%) to create a 10-year inflation forecast. The market's expectations for 10-year inflation can be inferred by taking the difference between the U.S. 10-year Treasury yield and the 10-year Treasury Inflation-Protected (TIPS) yield (referred to as the breakeven inflation rate).

Long term inflation expectations have been mixed throughout the year. Household inflation expectations (University of Michigan) have moderated along with market-priced inflation (U.S. TIPS Breakeven

Rates), though the Survey of Professional Forecasters which suggests an increase in long-term inflation expectations. At a broader level, all of these indicators agree in their assumption that inflation will fall to a relatively normal 2-3% for the next ten years.
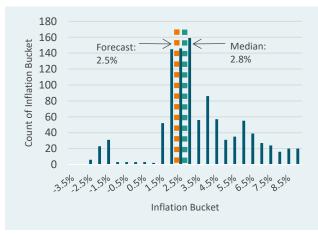
Our inflation forecast was unchanged at 2.5%.

INFLATION EXPECTATIONS

US Ten Year Breakeven Inflation Rate
University of Michigan Survey 5-10 Inflation Expectation (mean)
Survey of Profesional Forecasters

Source: U. of Michigan, Philly Fed, as of 9/30/22

U.S. 10-YR ROLLING AVERAGE INFLATION

Source: Bloomberg, as of 9/30/22 – since 1923

FORECAST

	10-Year Forecast
University of Michigan Survey *(25% weight)*	+2.7%
Survey of Professional Forecasters *(25% weight)*	+2.8%
US 10-Year TIPS Breakeven Rate *(50% weight)*	+2.2%
Inflation Forecast	2.5%

Source: Verus, as of 9/30/22

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Fixed income

Cash
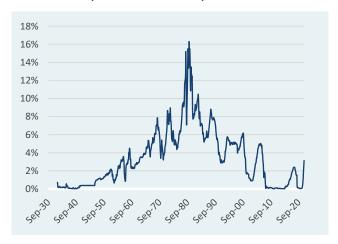
The U.S. Treasury yield ramped up significantly from late 2021 as the Federal Reserve became increasingly aggressive in its tightening efforts. The Federal Funds Rate range was lifted from 0-0.25% to 3.00-3.25% during this time.

Throughout 2021 it seemed that the yield of cash had decoupled from the rate of inflation in many developed markets as near-zero interest rates and relatively high inflation resulted in deeply negative rates on an inflation-adjusted basis. Central banks have now hiked cash rates to levels not seen in nearly fifteen years.
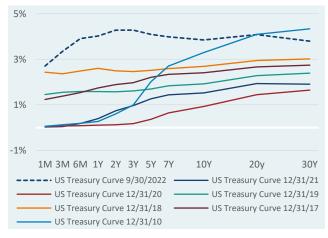
We believe that the current federal funds rate, as well as the steepness of the U.S. Treasury yield curve, may provide guidance regarding the future longer-term cash return. We place a 75% forecasting weight on the current federal funds rate and a 25% weight to the 10-year U.S. Treasury.

Applying these relationships result in a 10-year cash forecast of 3.3%.

CASH YIELD (3-MONTH T-BILL)

Source: FRED, as of 9/30/22

U.S. TREASURY YIELD CURVE

Source: Bloomberg, as of 9/30/22

FORECAST

	10-Year Forecast
Cash	+3.3%
Inflation Forecast	-2.5%
Real Return	0.8%

Source: Verus, as of 9/30/22

Rates

We forecast the return of 10-year U.S. Treasuries and 30-year U.S. Treasuries based on the current yield of 10- and 30-year U.S. Treasuries, assuming all cash flows are reinvested at the current yield. While the current yield of 10-year Treasuries has historically been a strong predictor of next ten-year performance, it is important to note that 30-year Treasury return is highly dependent on the future path of interest rates, given the very high bond duration of this exposure. In other words, a ten-year forecast of 30-year U.S. Treasuries is accompanied by more forecasting uncertainty.
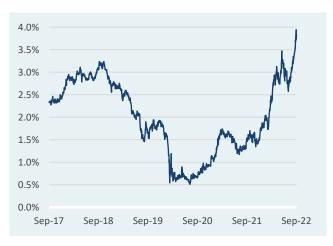
U.S. Treasury yields are no longer materially higher than other developed nations as central banks work to stamp out high inflation in their local economies.

Developed world central banks have pivoted away from extremely loose policies that were enacted to fight the pandemic-induced recession to tighter policies. For the first time in a long time, central banks are removing liquidity from the global financial system and in many cases unwinding their very large balance sheets.

Our expectations are for a 3.8% return over the next ten years, in line with the current U.S. 10-year Treasury yield.

U.S. 10-YR TREASURY YIELD

Source: Bloomberg, as of 9/30/22

U.S. TREASURY YIELD CURVE

Source: Bloomberg, as of 9/30/22

FORECAST

	10-Year Forecast		10-Year Forecast
U.S. 10-Year Treasury	+3.8%	U.S. 30-Year Treasury	+3.8%
Inflation Forecast	-2.5%	Inflation Forecast	-2.5%
Real Return	+1.4%	Real Return	+1.4%

Source: Verus, as of 9/30/22

Real rates

TIPS provide high sensitivity to duration (interest rate risk) over short periods and track inflation (CPI) fairly well over longer periods. Changing inflation expectations, demand for inflation protection, and rate movements contribute to the price movement of TIPS. Currently, investors appear to expect higher inflation to be temporary, but also expect that inflation will be higher in the next decade than the most recent decade.

The long end of the yield curve increased substantially as the 10-year U.S. Treasury climbed from 1.5% to 3.8%. As inflation has begun to

moderate, inflation expectations have fallen significantly. The breakeven inflation rate rose from 2.37% to nearly 3.0% in April, but ended September at 2.15%—now effectively pricing in a quick return to normalcy.

To arrive at a nominal 10-year forecast, we add the current real TIPS yield to our 10-year inflation forecast. Our real rates forecast remains in negative territory as both Treasury yields and priced inflation has risen.

NOMINAL YIELD VS. REAL

U.S. Treasury yield
U.S. breakeven inflation rate
U.S. real yield

Source: Bloomberg, as of 9/30/22

INFLATION EXPECTATIONS

U.S. CPI
US Breakeven 10 Year
UMich Expected Change in Price

Source: Bloomberg, as of 9/30/22

FORECAST

	10-Year Forecast
U.S. 10-Year TIPS Real Yield	+1.7%
Inflation Forecast	+2.5%
Nominal Return	4.1%

Source: Verus, as of 9/30/22
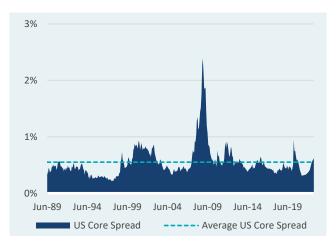
Core fixed

Credit fixed income return is composed of a bond term premium (duration) and credit spread. The bond term premium is represented by the 10-year U.S. Treasury yield.

We use default rates and credit spreads for each respective fixed income category to provide our 10-year return forecast. Our default rate assumption is derived from a variety of sources, including historical data and academic research. The effective default that is subtracted from the return forecast is based on our assumed default and recovery rates.

Core fixed income spreads contracted from 81 bps to 57 bpx over the year and remain materially below the 30-year average of 1.25%. Higher interest rates have substantially increased our core fixed income expectations, while slightly tighter credit spreads had an opposing effect. Our forecast increased from 2.2% to 4.3% during the year.

U.S. CORE CREDIT SPREAD

Source: Bloomberg, as of 9/30/22

ROLLING EXCESS RETURN (10-YR)

Source: Bloomberg, as of 9/30/22

FORECAST

	10-Year Forecast
Bloomberg U.S. Option-Adjusted Spread	+0.6%
Effective Default	-0.1%
U.S. 10-Year Treasury	+3.8%
Nominal Return	4.3%
Inflation Forecast	-2.5%
Real Return	1.8%

Source: Verus, as of 9/30/22
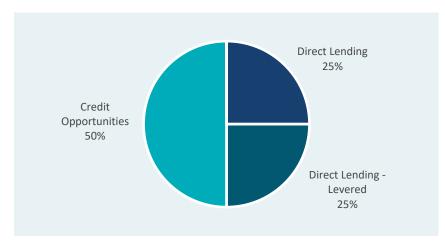
Private credit

The spectrum of private credit is broad and the types of investments in this asset class can differ considerably in terms of return expectations and risks involved. To reflect the disparate characteristics of this asset class, our private credit forecast assumes a diversified portfolio comprised of 25% direct lending, 25% direct lending with fund-level leverage, and 50% credit opportunities strategies. Our resulting private credit forecast is a result of our combined expectations for each of these exposure types.

We follow a building block approach to build return expectations.

Direct lending expected return is a product of interest rates, a floating rate, loss adjusted credit spread above SOFR, plus original issuance discounts, minus management fees and carried interest. Direct lending with fund-level leverage includes these same building blocks but is adjusted for the added spread from leverage and the costs of that leverage. The expected return of credit opportunities strategies is a result of interest rates (U.S. Treasury yield), credit spread, original issuance discounts, minus management fees and carried interest, with an adjustment for added spread from leverage and the costs of that leverage. Further details of this methodology is provided on the next page.

PRIVATE CREDIT WEIGHTS

Direct Lending 25%

Direct Lending - Levered 25%

Credit Opportunities 50%

Source: Verus

FORECAST

	10-Year Forecast
Credit Opportunities *(50% weight)*	8.5%
Direct Lending – Unlevered *(25% weight)*	6.8%
Direct Lending – Levered *(25% weight)*	9.1%
Private Credit Weighted Return Forecast	8.2%
Inflation Forecast	-2.5%
Real Return	5.7%

Source: Verus, as of 9/30/22 – assuming universe weights as indicated by left-hand chart
Please reach out to your Verus consultant for Private Credit universe forecast methodology

Private credit

Below we illustrate the specific building blocks of our private credit forecasts. The build up method is used to calculate a gross investment level return, which is adjusted to account for fund level leverage, management fees, and carried interest.

	Direct Lending –Unlevered	Direct Lending – Levered		Credit Opportunities*		Junior Capital / Mezzanine		Distressed
Base Interest Rate	2.5%	2.5%	Base Interest Rate	2.5% - 3.2%	Fixed Rate Coupon	8.5%		Return expectations for distressed have been developed on a range bound basis given the diversity of strategies included in the asset class:
Spread	5.5%	5.5%	Spread	4.5% - 9.0%	Paid-In-Kind Coupon	3.5%		
Original Issuance Discount *Amortized over 3 years*	2.3%	2.3%	Original Issuance Discount *Amortized over 3 years*	2.0% - 2.5%	Annualized Equity Upside	0.8%		Distressed strategies are highly opportunistic by nature and returns are primarily, if not entirely, driven by capital appreciation limiting the ability to use a build up method.
Gross Return	*8.8%*	*8.8%*	*Gross Return*	*7.7% - 13.0%*	*Gross Return*	*12.8%*		
Leverage Cost	NA	5.3%	Leverage Cost	5.3%	Leverage Cost	NA		Distressed strategies typically target 10%+ net returns, but market conditions often weigh heavily into the overall performance.
Leverage Level	0.0x	1.0x	Leverage Level	0.3x – 0.5x	Leverage Level	0.0x		
Levered Gross Return	*8.8%*	*12.3%*	*Levered Gross Return*	*8.9% - 15.4%*	*Levered Gross Return*	*12.8%*		Periods of market volatility, dislocation, and economic downturns generally provide a more attractive investment environment for distressed strategies where outperformance may be expected.
Effective Management Fees	1.0%	1.8%	Effective Management Fees	1.5% - 2.0%	Effective Management Fees	1.5%		
Carried Interest	0.7%	1.3%	Carried Interest	1.1% - 2.7%	Carried Interest	2.3%		Historically, median fund level net returns have ranged between 9-10% although top to bottom quartile dispersion is has been wide historically.
Total Net Return	**6.8%**	**9.1%**	**Total Net Return**	**8.5%**	**Total Net Return**	**9.0%**	**Total Net Return**	**9.1%**

Return expectations for credit opportunities have been developed on a range-bound basis given the diversity of strategies included in the asset class. Values represent the mid-point estimate of those ranges. For Credit Opportunities, our return assumption is the midpoint of the total net return range of 6.3% - 10.7%.

Source: Verus

Credit summary

	Core	Long-Term Credit	Global Credit*	High Yield*	Bank Loans*	EM Debt (USD)	EM Debt (Local)	Private Credit	Real Estate Debt
Index	Bloomberg U.S. Aggregate	Bloomberg U.S. Long Credit	Bloomberg Global Credit	Bloomberg U.S. High Yield	S&P LSTA	JPM EMBI	JPM GBI-EM	N/A	N/A
Method	OAS + U.S. 10-Year	OAS + U.S. 10-Year	OAS + Global 10-Year Treasuries	OAS + U.S. 10-Year	LIBOR + Spread	OAS + U.S. 10-Year	Current Yield	Build up method using Direct Lending (unlevered), Direct Lending (levered), Opportunistic Credit**	LIBOR + Spread***
Spread to	Intermediate U.S. Treasury	Long-Term U.S. Treasury	Global Long-Term Treasuries	Intermediate U.S. Treasury	LIBOR	Intermediate U.S. Treasury	-	-	LIBOR
Default Assumption	-0.5%	-4.5%	-	-	-	-0.5%	-0.5%	-	-3.7%
Recovery Assumption	80%	95%	-	-	-	60%	40%	-	47%
Spread	0.6%	1.8%	2.0%	5.2%	6.0%	5.2%	-	-	4.0%
Yield	-	-	-	-	-	-	7.3%	-	-
Risk Free Yield	3.8%	3.8%	3.5%	3.8%	3.8%	3.8%	-	-	3.1%
Effective Default	-0.1%	-0.2%	-1.0%	-2.6%	-3.0%	-0.2%	-0.3%	-	-2.0%
Nominal Return	4.3%	5.4%	4.5%	6.4%	6.8%	8.9%	7.0%	8.2%	5.2%
Inflation Forecast	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Real Return	1.8%	2.9%	2.1%	4.0%	4.3%	6.4%	4.6%	5.7%	2.6%

*We assume half of the spread of higher risk credit will be lost to defaults, as this has roughly been the case throughout history.

**We assume 25% Direct Lending (Unlevered), 25% Direct Lending (Levered), 50% Credit Opportunities – please refer to the previous page for more information.

***Spread is determined based on a survey of real estate debt managers

Equities

Equities
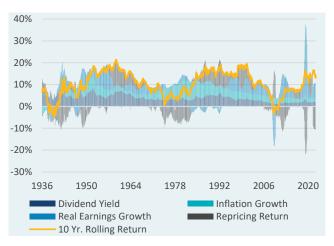
Investment returns in the equity space can be broken down into earnings growth, dividend yield, inflation, and repricing. Over the very long-term, repricing represents a small portion of return to equity investors, but over shorter time frames, the impacts on return can vary considerably.

If investors are willing to pay more for earnings, it could signal that investors are more confident in positive earnings growth going forward, while the opposite is true if investors pay less for earnings. It is somewhat surprising that investor confidence varies so much given that the long-term earnings growth is relatively stable.
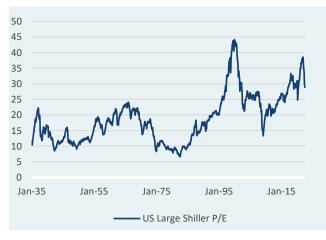
Investor confidence in earnings growth can be measured using both the Shiller P/E ratio and the trailing 12-month P/E ratio. We take an average of these two valuations metrics when determining our repricing assumption. In short, if the P/E ratio is too high (low) relative to history, we expect future returns to be lower (higher) than the long-term average. Implicit in this analysis is the assumption that P/E multiples will exhibit mild mean reversion over 10 years.

We make a conservative repricing estimate given how widely repricing can vary over time. We then skew the repricing adjustment because the percentage change in index price is larger with each incremental rise in valuations when P/E multiples are low, compared to when they are high.

TRAILING 10-YR S&P 500 RETURN COMPOSITION

Source: Shiller, Standard & Poor's, as of 6/30/22

U.S. LARGE SHILLER P/E

Source: Shiller, S&P 500, as of 7/31/22

P/E REPRICING ASSUMPTION

Average P/E Percentile Bucket	Lower P/E	Upper P/E	Repricing Assumption
Lower 10%	-	10	2.00%
10% - 20%	10	13	1.50%
20% - 30%	13	15	0.75%
30% - 45%	15	18	0.50%
45% - 55%	18	19	0.0%
55% - 70%	19	21	-0.25%
70% - 80%	21	22	-0.50%
80% - 90%	22	24	-0.75%
Top 10%	24	-	-1.00%

Source: Verus

Global equity

Global Equity is a combination of U.S. large, international developed, and emerging market equities. We can therefore combine our existing return forecasts for each of these asset classes to arrive at our global equity return forecast.

We use the MSCI ACWI Index as our benchmark for global equity and apply the country weights of this index to determine the weightings for our global equity return calculation. As with other equity asset classes, we use the historical standard deviation of the benchmark (MSCI ACWI Index) for our volatility forecast.

The valuation of global equities are driven by the richness/cheapness of the underlying markets, as indicated by the current price-to-earnings ratio.

Our return building blocks produce a local return forecast for international equities. For investors who wish to incorporate market implied currency movements into the return forecast, please see the adjustments and explanation in the Appendix.

GLOBAL EQUITY P/E RATIO HISTORY

Source: MSCI, Bloomberg, as of 9/30/22

MARKET PERFORMANCE (3-YR ROLLING)

Source: MSCI, Standard & Poor's, as of 9/30/22

FORECAST

Market	Weight	CMA return
U.S. Large	64%	6.5%
Developed Large	25%	9.1%
Emerging Markets	10%	8.5%
Global Equity Forecast		7.4%

Source: Verus, weights rescaled to equal 100%, as of 9/30/22

Equity summary

	U.S. Large	U.S. Small	EAFE	EAFE Small	EM
Index	S&P 500	Russell 2000	MSCI EAFE Large	MSCI EAFE Small	MSCI EM
Method	Building Block Approach: current dividend yield + historical average real earnings growth + inflation on earnings + repricing				
Current Shiller P/E Ratio	28.5	45.1	14.1	-	8.8
Regular P/E Ratio	17.6	107.5	11.6	12.0	9.8
2022 Shiller P/E Change	-25.6%	-29.1%	-33.9%	-	-30.8%
2022 Regular P/E Change	-30.0%	-40.8%	-39.2%	-76.8%	-35.9%
Current Shiller P/E Percentile Rank	80%	88%	12%	-	7%
Current Regular P/E Percentile Rank	54%	97%	10%	4%*	2%
Average of P/E Methods' Percentile Rank *(lower percentile = cheaper valuations)*	67%	88%	11%	4%*	5%
2022 YTD Return	-23.9%	-25.1	-27.1%	-32.1%	-27.2%
Shiller PE History	1982	1988	1982	Not Enough History	2005
Long-Term Average Shiller P/E	23.6	33.0	22.3	-	14.5
Current Dividend Yield	1.8%	1.5%	3.8%	3.4%	3.6%
Long-Term Average Real Earnings Growth	2.4%	2.4%**	1.6%	1.6%**	0.5%
Inflation on Earnings	2.5%	2.5%	2.2%	2.2%	2.5%
Repricing Effect (Estimate)	-0.3%	-1.0%	1.5%	2.0%	2.0%
Nominal Return	6.5%	5.4%	9.1%	9.2%	8.5%
Inflation Forecast	2.5%	2.5%	2.5%	2.5%	2.5%
Real Return	4.0%	2.7%	6.6%	6.7%	6.0%

Data as of 9/30/22

*Average trailing P/E from previous 12 months (25% weight) and current P/E (75% weight) are blended into one P/E metric, which is then percentile ranked relative to long-term history. This is done to reduce reliance on a single price multiple, as insufficient data history is available to calculate Shiller P/E for this asset class.

**Due to data limitations, we assume small cap earnings growth will equal the earnings growth of large cap in each respective market

NOTE: For all equities, we exclude data prior to 1972, which allows for a more appropriate comparison between data sets

Private equity

Private equity and public equity returns have been correlated historically because the underlying economic forces driving these asset class returns are quite similar. The return relationship between the two can vary in the short-term, but over the long-term investors have received a premium, driven by leverage, concentrated factor exposure (smaller and undervalued companies), skill, and possibly illiquidity. Historically, the beta of private equity relative to public equity has been high. We use a beta assumption of 1.85 to U.S. large cap equities in our forecast.

Readers may notice that our private equity return forecast fell slightly in 2022 while other equity forecasts increased. Given the recent notable rise

in cash rates, the cost of leverage for private equity strategies has jumped considerably. The higher cost of leverage was the reason for this change.

Private equity performance typically differs based on the implementation approach. We provide a 10-year forecast for the entire private equity universe of 9.5%. Direct private equity programs have historically outperformed the broader universe by approximately 1.0%, so we add 1.0% to our direct private equity forecast to reflect this historical outperformance. Private equity fund-of-fund (FoF) programs have historically lagged the universe by 1.0%, so we subtract 1.0% from our forecast accordingly to arrive at this forecast.

**PRIVATE EQUITY EXCESS RETURN
(PE – U.S. SMALL CAP EQUITY)**

U.S. Private Eequity Return - U.S. Small Cap Equity Return

Source: CA, Russell, as of 3/31/22

PRIVATE EQUITY IMPLEMENTATION FORECASTS*

	10-Year Forecast
Private Equity Universe Forecast	9.2%
Private Equity FoF Forecast*	8.2%
Private Equity Direct Forecast*	10.2%

Source: Verus, as of 9/30/22

PRIVATE EQUITY UNIVERSE FORECAST

	10-Year Forecast
U.S. Large Cap Forecast	+6.5%
1.85 Beta Multiplier	+2.7%
Nominal Return	9.2%
Inflation Forecast	-2.5%
Real Return	6.7%

Source: Verus, as of 9/30/22

*Private Equity FoF and Private Equity Direct forecasts are based off the _actual_ historical return difference between these strategies and the overall Private Equity Universe. Fund of Funds have historically underperformed the overall Private Equity Universe by 1%, and Direct funds have historically outperformed the overall Private Equity Universe by 1%. Please reach out for more details around this methodology.

Real assets / alternatives
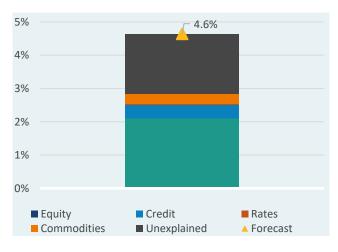
Hedge funds

Hedge fund performance variation through time can be partly explained by public market betas (ex: equity, rates, credit, etc.) and partly explained by non-public sources of return (ex: alternative betas, skill, luck). Certain hedge funds can be mostly explained by public market betas, while others are driven mostly by non-public sources of return. We do not believe hedge funds should be thought of as an asset class, and in most cases we recommend benchmarking and modeling individual hedge funds in line with the underlying asset class exposure set (equity hedge funds modeled as equity exposure, fixed income hedge funds modeled as fixed income exposure, etc.) Our forecast for "hedge funds" that we show here can be thought of as a forecast of the broad universe of hedge funds.

To forecast hedge fund returns, we identified the portion of historical hedge fund performance that can be attributed to public market betas, and the portion of hedge fund returns that cannot be attributed to public market beta. This means our forecast has two components: the public market return (explained return) and the non-public market return (unexplained return).

To forecast the public market beta portion of hedge funds, we take the historical sensitivity of hedge funds to equity, rates, credit, and commodities and pair these with our current 10-year public market forecasts for each asset class. To forecast the non-public market return portion of hedge funds (unexplained return) we simply assume the historical performance contribution of these sources will continue.

HEDGE FUND FORECAST

Source: Verus, as of 9/30/22

HEDGE FUND PUBLIC MARKET SOURCES OF RETURN (EXPLAINED RETURN)

Equity
Rates
Credit
Commodities

HEDGE FUND NON-PUBLIC SOURCES OF RETURN (UNEXPLAINED RETURN)

Alternative betas
Skill
Luck

Source: Verus

FORECAST

	10-Year Forecast
Public Market % of Return	+2.8%
Non-Public Market % of Return	+1.8%
Nominal Return	+4.6%
Inflation Forecast	-2.5%
Real Return	2.2%

Source: Verus, as of 9/30/22
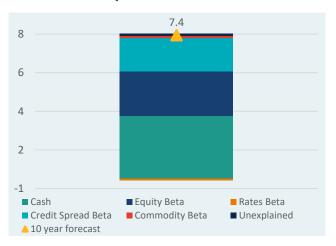
Hedge fund styles
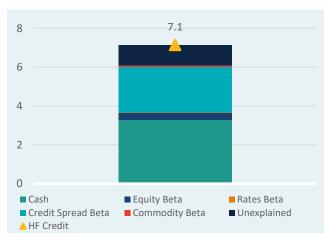
As mentioned, we do not believe hedge funds should be thought of as an asset class, and in most situations we recommend benchmarking and modeling individual hedge funds in line with the underlying asset class exposure set. In line with this view, we forecast three broad hedge fund categories - equity hedge funds, credit hedge funds, and asymmetric hedge funds. To forecast hedge fund returns, we identified the portion of historical hedge fund performance that can be attributed to public market betas, and the portion of hedge fund returns that cannot be attributed to public market beta. This means our forecast has two components: the public market return (explained return) and the non-public market return (unexplained return).

In practice, we believe hedge funds that have both identifiable core capabilities and persistent high correlations to equities fit equity sleeves. We take a similar approach with credit hedge funds and fixed income sleeves. Funds designed to have little persistent relationship with public market exposures while exhibiting a high degree of tactical or opportunistic trading behaviors fall into a third category, which we call Asymmetric hedge funds. Our forecast for "hedge funds" that we show here match the use cases outlined above as opposed to a broad universe approach.

HEDGE FUND: EQUITY

Source: Verus

HEDGE FUND: CREDIT

Source: Verus
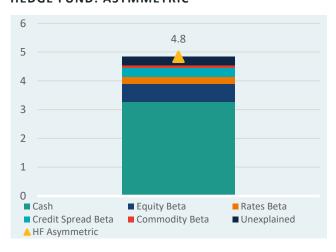
HEDGE FUND: ASYMMETRIC

Source: Verus

Private core real estate/REITS

Performance of the NCREIF property index can be decomposed into an income return (cap rate) and capital return. The return coming from income has historically been more stable than the return derived from capital changes.

The cap rate is the ratio of earnings less expenses to price and does not include extraordinary expenses. A more accurate measure of the yield investors receive should include non-recurring capital expenditures; we assume a 2.0% capex expenditure. We also assume income growth will roughly equal the rate of broad economic growth, and we use GDP forecasts as an estimate for future income growth.

Private real estate and REITs have provided very similar returns over the long-term. Investors should be careful when comparing risk-adjusted returns of publicly traded assets to returns of appraisal priced assets, due to data problems and smoothing effects. While private real estate appears to be less volatile than REITs, the true risks to investors are likely very similar.

We assume the effects of leverage and liquidity offset each other. Therefore, our return forecast is the same for private real estate and REITs.

TRAILING 10-YR NCREIF RETURN COMPOSITION

- 10 Year NCREIF Property Capital Return
- 10 Year NCREIF Property Income Return
- 10 Year NCREIF Property Total Return

Source: NCREIF, as of 6/30/22

PRIVATE REAL ESTATE

	Private Real Estate 10-Year Forecast
Current Cap Rate	+3.7%
Real Income Growth	+1.6%
Capex Assumption	-2.0%
Inflation	+2.5%
Nominal Return	5.8%
Inflation Forecast	-2.5%
Real Return	+3.3%

Source: Verus, as of 9/30/22

REITS

	10-Year Forecast
Nominal Return Forecast	5.8%
Inflation Forecast	-2.5%
Real Return	3.3%

Source: Verus, as of 9/30/22

Value-add & opportunistic real estate

Value-add real estate includes properties which are in need of renovation, repositioning, and/or lease-up. Properties may also be classified as value-add due to their lower quality and/or location. Opportunistic real estate can also include development and distressed or very complex transactions. Greater amounts of leverage are usually employed within these strategies. Leverage increases beta (risk) by expanding the purchasing power of property managers via a greater debt load, which magnifies gains or losses. Increased debt also results in greater interest rate sensitivity. An increase/decrease in interest rates may result in a write-up/write-down of fixed rate debt, since debt holdings are typically marked-to-market.

Performance of value-add real estate is composed of the underlying private

real estate market returns, plus a premium for additional associated risk, which is modeled here as 200 bps above our core real estate return forecast. Performance of opportunistic real estate strategies rests further out on the risk spectrum, and is modeled as 300 bps above the core real estate return forecast.

Additional expected returns above core real estate are justified by the higher inherent risk of properties which need improvement (operational or physical), price discounts built into properties located in non-core markets, illiquidity, and the ability of real estate managers to potentially source attractive deals in this less-than-efficient marketplace.

CAP RATE SPREADS

Source: NCREIF, Bloomberg, as of 6/30/22

FORECAST

	Value-Add 10-Year Forecast	Opportunistic 10-Year Forecast
Premium above core	+2.0%	+3.0%
Current Cap Rate	+3.7%	+3.7%
Real Income Growth	+1.6%	+1.6%
Capex Assumption	-2.0%	-2.0%
Inflation	+2.5%	+2.5%
Nominal Return	7.8%	8.8%
Inflation Forecast	-2.5%	-2.5%
Real Return	5.3%	6.3%

Source: Verus, as of 9/30/22

Infrastructure

Infrastructure includes a variety of investment types across a subset of industries. There is not one definition for what can be included within infrastructure. Due to the availability of data, we use publicly-traded infrastructure to build up an infrastructure forecast. We believe this forecast can reasonably be used for both private- and publicly-traded infrastructure investments.

The asset class has grown dramatically during the last decade as investors sought assets that might provide more attractive yield relative to fixed income along with the potential for inflation protection.

Similar to real estate investment, income plays a significant role in the returns which investors receive. Income yields jumped during 2022 as prices fell alongside the broad market selloff.
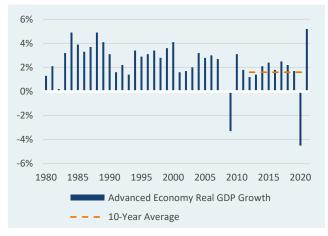
This asset class is generally believed to provide investors with exposure to broad economic growth. Therefore, we use past ten year developed economy real GDP growth as a proxy for future expected infrastructure income growth.

5-YR ROLLING RETURN COMPOSITION

Source: S&P Global Infrastructure Index, as of 9/30/22

ADVANCED ECONOMY REAL GDP GROWTH

Source: IMF, as of 9/30/22

FORECAST

	10-Year Forecast
Global Inflation	+2.4%
Yield	+3.9%
Income Growth	+1.6%
Nominal Return	7.8%
U.S. Inflation Forecast	-2.5%
Real Return	5.4%

Source: Verus, as of 9/30/22

Commodities

Commodity returns can be decomposed into three sources: collateral return (cash), spot changes (inflation), and roll yield.

Roll return is generated by either backwardation or contango present in futures markets. Backwardation occurs when the futures price is below the spot price, which results in positive yield. Contango occurs when the futures price is above the spot price, and this results in a loss to commodity investors. Historically, futures markets have fluctuated between backwardation and contango but with a net-zero effect over the very long-term (since 1877). Therefore, roll return is assumed to

be zero in our forecast. Over the most recent 10-year period, roll return has been negative, though this is likely the result of multiple commodity crises and a difficult market environment.

Our 10-year commodity forecast combines collateral (cash) return with spot return (inflation) to arrive at the nominal return, and subtracts out inflation to arrive at the real return.

TRAILING 10YR BLOOMBERG COMMODITY RETURN COMPOSITION (%)

Source: MPI, Bloomberg, as of 9/30/22

BLOOMBERG COMMODITY RETURN COMPOSITION (%)

Source: MPI, Bloomberg, as of 9/30/22

FORECAST

	10-Year Forecast
Collateral Return (Cash)	+3.3%
Roll Return	+0.0%
Spot Return (Inflation)	+2.5%
Nominal Return	5.7%
Inflation Forecast	-2.5%
Real Return	3.3%

Source: Verus, as of 9/30/22

Currency beta
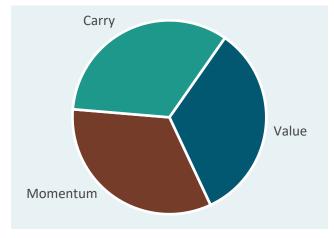
Currency beta is a long-short portfolio of G10 currencies constructed by investing in three equally weighted factors: carry, momentum, and value. A significant amount of academic research has concluded that these factors demand a risk premium in the currency market. Studies have also shown that currency beta explains a high portion of active currency managers' returns, indicating it may be a good neutral starting point or benchmark for currency investing. Currency beta portfolios gain exposure to the carry, momentum, and value factors in a systematic and transparent manner. For more detailed information on currency beta, please contact your consultant.

We model each factor in the currency beta portfolio separately, and then take a weighted average to get an overall return forecast. For the carry portfolio, the main driver of returns is the yield an investor receives from holding currencies with relatively higher interest rates. We therefore use a 12-month average of the portfolio's yield as the expected return. For value, our return forecast assumes a certain level of mean reversion to PPP fair value based on historical data. Lastly, for momentum, we simply assume the average historical return due to lack of long-term fundamental return drivers. Short-term volatility levels typically drive returns in the momentum portfolio, which is difficult to model in a 10-year return forecast.

3-YEAR ROLLING PERFORMANCE

Source: MSCI, as of 9/30/22

CURRENCY BETA CONSTRUCTION

Source: Verus

RETURN FORECAST

Factor	Weight	Return Forecast	Weighted return
Carry	33.3%	1.73%	0.6%
Momentum	33.3%	-0.25%	-0.1%
Value	33.3%	2.93%	1.0%
Currency Beta			**1.6%**

Source: Verus, as of 9/30/22

Risk parity

Risk parity is built upon the philosophy of allocating to risk premia rather than to asset classes. Because risk parity by definition aims to diversify risk, the actual asset allocation can appear very different from traditional asset class allocation.

We model risk parity using an assumed Sharpe Ratio of 0.5, which considers the historical performance of risk parity. This assumed Sharpe Ratio is higher than other asset class forecasts, but is consistent with these forecasts because *portfolios* of assets tend to deliver materially higher Sharpe Ratios than individual assets. An assumed Sharpe Ratio of 0.5 brings us to an expected return of 8.3%.

The expected return of Risk Parity is determined by this Sharpe Ratio

forecast, along with a 10% volatility assumption.

We used the S&P Risk Parity 10% Volatility Index to represent risk parity correlations relative to the behaviors of each asset class. Risk parity funds are suggested to be better able to withstand various difficult economic environments - reducing volatility without sacrificing return, over longer periods.

It is difficult to arrive at a single model for risk parity , since strategies can differ significantly across firms/strategies. Risk parity almost always requires explicit leverage. The amount of leverage will depend on the specific strategy implementation style, as well as expected correlations and volatility.
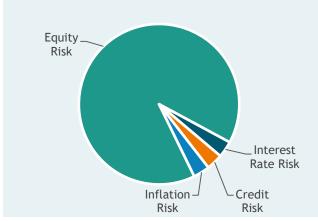
VS. TRADITIONAL ASSET CLASSES (3YR ROLLING)

Source: MPI, as of 9/30/22
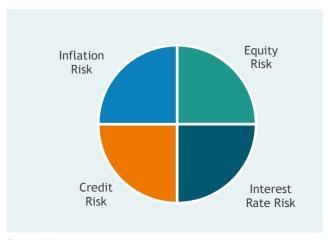
Note: Risk parity is modeled here as S&P Risk Parity 10% Vol Index

TRADITIONAL ASSET ALLOCATION

Source: Verus

RISK PARITY

Source: Verus

Appendix

Verus

30-year return & risk assumptions

— Occasionally investors may have a specific need for longer-term capital market forecasts. We have developed a set of 30-year assumptions to meet those needs.

— The return forecasts below have been constructed using our existing building block approach, but with longer-term inputs. Risks and correlations are estimated using the same approach as our 10-year forecasts, using full-history autocorrelation-adjusted realized risk and past 10 year realized correlations.

— These return figures must be thought of separately from our 10-year forecasts, and are not meant to imply performance for the 20 years *beyond* our 10-year forecasts.

— Please reach out to your Verus consultant with questions regarding whether 30-year Capital Market Assumptions might be appropriate for your needs.

Asset Class	Index Proxy	Thirty Year Return Forecast		Standard Deviation		
		Geometric	Arithmetic	Forecast	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)
Equities						
U.S. Large	S&P 500	6.3%	7.4%	15.6%	0.19	0.26
U.S. Small	Russell 2000	5.7%	7.8%	21.5%	0.11	0.21
International Developed	MSCI EAFE	8.1%	9.5%	17.8%	0.27	0.35
International Small	MSCI EAFE Small Cap	7.9%	10.1%	22.1%	0.21	0.31
Emerging Markets	MSCI EM	6.9%	9.7%	25.2%	0.14	0.25
Global Equity	MSCI ACWI	8.5%	9.8%	17.1%	0.30	0.38
Global Equity ex-US	MSCI ACWI ex-US	7.9%	9.6%	19.9%	0.23	0.32
Private Equity	CA U.S. Private Equity	8.8%	11.7%	25.8%	0.21	0.33
Private Equity (Direct)	CA U.S. Private Equity	9.8%	12.7%	25.8%	0.25	0.36
Private Equity (Fund of Funds)	CA U.S. Private Equity	7.8%	10.7%	25.8%	0.17	0.29
Fixed Income						
Cash	30 Day T-Bills	3.3%	3.3%	1.2%	-	-
U.S. TIPS	Bloomberg U.S. TIPS 5 - 10	3.8%	4.0%	5.6%	0.09	0.13
U.S. Treasury	Bloomberg Treasury 7-10 Year	3.8%	4.0%	7.1%	0.07	0.10
Long U.S. Treasury	Bloomberg U.S. Treasury 20+ Year	3.8%	4.6%	13.2%	0.04	0.10
Global Sovereign ex U.S.	Bloomberg Global Treasury ex U.S.	2.6%	3.1%	10.0%	(0.07)	(0.02)
Global Aggregate	Bloomberg Global Aggregate	3.0%	3.2%	6.7%	(0.04)	(0.01)
Core Fixed Income	Bloomberg U.S. Aggregate Bond	4.6%	4.7%	4.6%	0.28	0.30
Core Plus Fixed Income	Bloomberg U.S. Corporate IG	5.1%	5.2%	4.6%	0.39	0.41
Short-Term Gov't/Credit	Bloomberg U.S. Gov't/Credit 1 - 3 year	3.9%	4.0%	3.7%	0.16	0.19
Short-Term Credit	Bloomberg Credit 1-3 Year	4.6%	4.7%	3.7%	0.35	0.38
Long-Term Credit	Bloomberg Long U.S. Credit	5.3%	5.9%	11.0%	0.18	0.24
High Yield Corp. Credit	Bloomberg U.S. Corporate High Yield	6.5%	7.1%	11.2%	0.29	0.34
Bank Loans	S&P/LSTA Leveraged Loan	5.9%	6.3%	9.2%	0.28	0.33
Global Credit	Bloomberg Global Credit	2.8%	3.1%	7.9%	(0.06)	(0.03)
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	8.2%	8.7%	10.7%	0.46	0.50
Emerging Markets Debt (Local)	JPM GBI EM Global Diversified	7.0%	7.7%	12.3%	0.30	0.36
Private Credit	S&P LSTA Leveraged Loan Index	8.2%	9.0%	13.0%	0.38	0.44
Private Credit (Direct Lending - Unlevered)	S&P LSTA Leveraged Loan Index	6.8%	7.2%	9.2%	0.38	0.42
Private Credit (Direct Lending - Levered)	S&P LSTA Leveraged Loan Index	9.1%	10.1%	15.3%	0.38	0.44
Private Credit (Credit Opportunities)	S&P LSTA Leveraged Loan Index	8.5%	9.4%	13.8%	0.38	0.44
Private Credit (Junior Capital / Mezzanine)	S&P LSTA Leveraged Loan Index	9.0%	10.0%	15.1%	0.38	0.44
Private Credit (Distressed)	S&P LSTA Leveraged Loan Index	9.1%	12.7%	29.1%	0.20	0.32

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

30-year return & risk assumptions

— Occasionally investors may have a specific need for longer-term capital market forecasts. We have developed a set of 30-year assumptions to meet those needs.

— The return forecasts below have been constructed using our existing building block approach, but with longer-term inputs. Risks and correlations are estimated using the same approach as our 10-year forecasts, using full-history autocorrelation-adjusted realized risk and past 10 year realized correlations.

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— Please reach out to your Verus consultant with questions regarding whether 30-year Capital Market Assumptions might be appropriate for your needs.

Asset Class	Index Proxy	Thirty Year Return Forecast		Standard Deviation	Sharpe Ratio Forecast (g)	Sharpe Ratio Forecast (a)
		Geometric	Arithmetic	Forecast		
Other						
Commodities	Bloomberg Commodity	5.3%	6.5%	16.3%	0.12	0.20
Hedge Funds	HFRI Fund Weighted Composite	4.9%	5.2%	7.7%	0.21	0.25
Hedge Fund of Funds	HFRI Fund of Funds Composite	3.9%	4.2%	7.7%	0.08	0.12
Hedge Fund (Equity Style)	Custom HFRI Benchmark Mix*	8.2%	9.2%	14.6%	0.34	0.40
Hedge Fund (Credit Style)	Custom HFRI Benchmark Mix*	7.4%	7.8%	9.8%	0.42	0.46
Hedge Fund (Asymmetric Style)	Custom HFRI Benchmark Mix*	5.0%	5.1%	4.8%	0.35	0.38
Real Estate Debt	Bloomberg IG CMBS	5.2%	5.5%	7.5%	0.25	0.29
Core Real Estate	NCREIF Property	5.7%	6.4%	12.6%	0.19	0.25
Value-Add Real Estate	NCREIF Property + 200bps	7.7%	8.8%	15.5%	0.28	0.35
Opportunistic Real Estate	NCREIF Property + 400bps	8.7%	10.7%	21.3%	0.25	0.35
REITs	Wilshire REIT	5.7%	7.4%	19.4%	0.12	0.21
Global Infrastructure	S&P Global Infrastructure	8.1%	9.4%	17.3%	0.28	0.35
Risk Parity**	Risk Parity	8.3%	8.8%	10.0%	0.50	0.55
Currency Beta	MSCI Currency Factor Mix Index	1.6%	1.7%	3.4%	(0.49)	(0.46)
Inflation		2.1%	-	-	-	-

Investors wishing to produce expected geometric return forecasts for their portfolios should use the arithmetic return forecasts provided here as inputs into that calculation, rather than the single-asset-class geometric return forecasts. This is the industry standard approach, but requires a complex explanation only a heavy quant could love, so we have chosen not to provide further details in this document – we will happily provide those details to any readers of this who are interested.

*To represent hedge fund styles, we use a combination of HFRI benchmarks: Equity Style = 33% HFRI Fundamental Growth, 33% HFRI Fundamental Value, 33% HFRI Activist. Credit Style = 20% HFRI Distressed/Restructuring, 20% HFRI Credit Arbitrage, 20% HFRI Fixed Income-Corporate, 20% HFRI Fixed Income-Convertible Arbitrage, 20% HFRI Fixed Income-Asset Backed. Asymmetric Style = 50% HFRI Relative Value, 50% HFRI Macro

**The Risk Parity forecast shown here assumes a 10% target volatility strategy. We recommend customizing this forecast to the target volatility specifications of the risk parity strategy that an investor wishes to model. Please speak with your Verus consultant for customization needs.

10-year return forecasts with currency adjustment

Asset Class	Index Proxy	Ten Year Return Forecast (Geometric)			
		Pre-Currency Adjustment	Currency Adjustment	CMA Forecast	Standard Deviation Forecast
Equities					
International Developed Equity Unhedged	MSCI EAFE	9.1%	1.7%	10.8%	17.8%
International Developed Equity Hedged	MSCI EAFE Hedged	9.1%	1.7%	10.8%	15.6%
International Small Equity Unhedged	MSCI EAFE Small Cap	9.2%	1.7%	10.9%	22.1%
International Small Equity Hedged	MSCI EAFE Small Cap Hedged	9.2%	1.7%	10.9%	19.1%
Fixed Income					
Global Sovereign ex U.S. Unhedged	Bloomberg Global Treasury ex U.S.	2.2%	1.7%	3.9%	10.0%
Global Sovereign ex U.S. Hedged	Bloomberg Global Treasury ex U.S. Hedged	2.2%	1.7%	3.9%	4.6%
Global Credit Unhedged	Bloomberg Global Credit	4.5%	0.2%	4.7%	7.9%
Global Credit Hedged	Bloomberg Global Credit Hedged	4.5%	0.2%	4.7%	5.6%
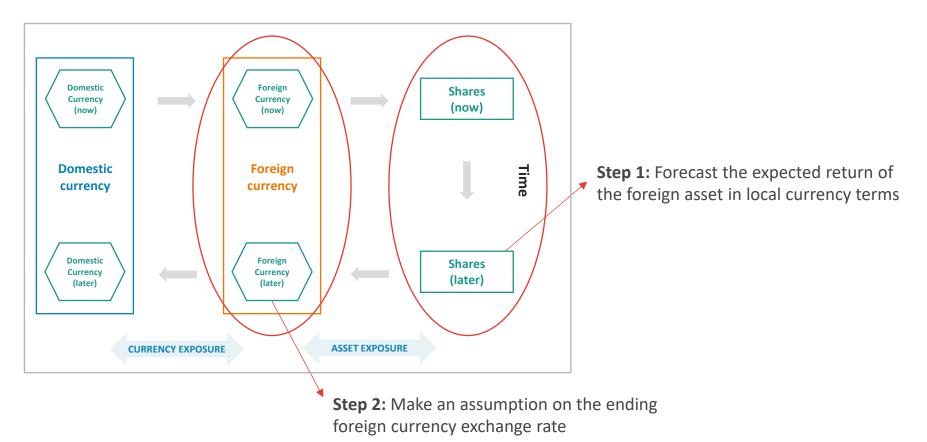
The currency adjustment is the market implied price change for major currency pairs based on forward contract pricing. Since the market implied spot price change and the cost/gain from hedging are both derived from pricing in the forward market, they are one and the same. Therefore, the currency adjustment is the same for both unhedged and hedged forecasts. See the following slides for the more detail on the currency adjustment methodology.

Explanation of the currency adjustment

Our fundamental building block approach produces a return forecast in local currency. In order to create useable forecasts for non-U.S. dollar-denominated assets, we must make an assumption about future foreign exchange rates.

Step 1: Forecast the expected return of the foreign asset in local currency terms

Step 2: Make an assumption on the ending foreign currency exchange rate
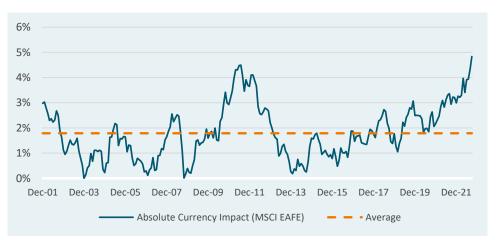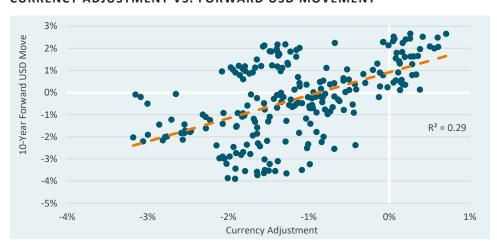
Explanation of the currency adjustment

— There are two options to adjust a local currency return forecast to a U.S. dollar forecast: make a specific exchange rate forecast or take market pricing based on the forward curve

  ▪ It is important to note that ignoring currency is making a specific assumption that the current exchange rate will be unchanged over the next 10 years, which has rarely been the case throughout history

— Markets price future exchange rates in the forward market, which represents the SPOT currency price for FORWARD delivery

— Forward currency contracts are priced based on the interest rate differential between two currencies – interest rate differentials reflect a significant amount of information, including growth, inflation, and monetary policy expectations

— A currency with a higher interest rate is priced to depreciate relative to a currency with a lower interest rate

— We adjust our local currency return forecasts based on forward market pricing because we believe this is the neutral, "no opinion" position, rather than making a specific forecast

— Historically, this currency adjustment has had a positive relationship with 10-year forward exchange rate movements

10-YEAR ROLLING ABSOLUTE CURRENCY PERFORMANCE IMPACT

Source: Verus, MSCI, as of 9/30/22

CURRENCY ADJUSTMENT VS. FORWARD USD MOVEMENT

Source: Verus, Bloomberg, using data since 1989, based on the MSCI EAFE Index

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Autocorrelation adjustment

— We adjust all volatility forecasts that use the long-term historical volatility for autocorrelation.

— Autocorrelation occurs when the future returns of a time series are described (positively correlated) by past returns.

— Time series with positive autocorrelation exhibit artificially low volatility, while time series with negative autocorrelation exhibit artificially high volatility.

— Many asset classes that we tested showed positive autocorrelation, meaning the volatility forecasts that we use in the forecasting process are too low for those asset classes.

— The result of this process was that several asset classes have higher volatility forecasts than if we had made no adjustment for autocorrelation.

Autocorrelation has been shown to be statistically significant across many asset classes, which implies an adjustment is appropriate

Hedge fund style regression details

— We forecast hedge fund styles by assuming that historical exposure to market "betas" will hold in the future. Historical beta exposure is calculated using a 10-year regression, which is displayed below.

— The "unexplained" component below is the portion of historical hedge fund returns that were not explained by public betas. This portion of return is likely comprised of a combination of unique/alternative betas, hedge fund alpha, and idiosyncratic return.

HEDGE FUND EQUITY

	Beta Coefficients
Intercept	0.08
Equity Beta	0.55
Rates Beta	-0.15
Credit Spread Beta	0.69
Commodity Beta	0.05
Unexplained return	0.11

HEDGE FUND CREDIT

	Beta Coefficients
Intercept	0.26
Equity Beta	0.09
Rates Beta	0.03
Credit Spread Beta	0.90
Commodity Beta	0.04
Unexplained	1.05

HEDGE FUND ASYMMETRIC

	Beta Coefficients
Intercept	0.02
Equity Beta	0.15
Rates Beta	0.42
Credit Spread Beta	0.13
Commodity Beta	0.04
Unexplained	0.30

Note: We have trimmed the "unexplained" component of Hedge Fund Credit by 50%. We assume that the secular falling interest rate environment has resulted in a historic tailwind to credit performance which will not persist in the future as it is unlikely that interest rates head into deeply negative territory.

Notices & disclosures