County Employees Retirement System
Kentucky Retirement Systems
Board of Trustees – Special Investment Training Meeting
January 19, 2023, at 2:00 pm ET (1:00 pm CT)
1270 Louisville Road, Frankfort, KY and
Live Video Conference/Facebook Live

AGENDA

1.	**Call to Order**	**Dr. Merl Hackbart**
2.	**Opening Statement**	**Office of Legal Services**
3.	**Roll Call**	**Sherry Rankin**
4.	**Public Comment**	**Sherry Rankin**
5.	**Investment Training**	**KPPA Investment Staff** **Wilshire Consulting**
	• Capital Market Assumptions • Asset Allocations • Private Markets • Carried Interest • Real Return Markets	
6.	**Adjourn**	**Dr. Merl Hackbart**

Prepared For:

Wilshire

CERS
County Employees Retirement System

Trustee Investment Training

Asset Class Assumptions and Asset Allocation Modelling

January 19, 2023

Wilshire

Roles and Considerations for Institutional Investors

- Focus on the **decisions that matter**
  - Plan’s strategic objective, asset allocation, etc.
- **Time horizon** and **liquidity** considerations are key to the asset mix decision
- Control risk through **diversification**
  - *“Diversification is the only free lunch in finance*” – Harry Markowitz, Nobel Prize winning economist, best known for his work in Modern Portfolio Theory (1952)
- Establish an **Investment Policy**, and stick to it through market volatility
- Focus on the “big picture” when monitoring **investment performance**
  - Past performance can often be a poor indicator of future performance
- **Market timing** does not consistently work
- Pay attention to **management fees** and other **expenses**

Wilshire

Investment Decision Making Framework

- Establish investment philosophy
- Establish appropriate asset allocation policy
- Determine investment objectives for each asset class
  - Target value-add
  - Active risk level
- Select appropriate investment strategies and tactics to achieve investment objectives
  - Asset class benchmarks
  - Structures for asset classes, sub-asset classes, and managers
  - Implementation activities
- Establish monitoring and evaluation procedures to evaluate the success of investment program strategies and tactics
- Risk management should play a role in each step

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Risk Assessment Framework

Wilshire's multi-dimensional view of risk integrates organizational and investment considerations into a comprehensive framework for evaluating strategic decisions.

Shortfall: Support distributions and long-term growth

Behavioral: Instill strong governance

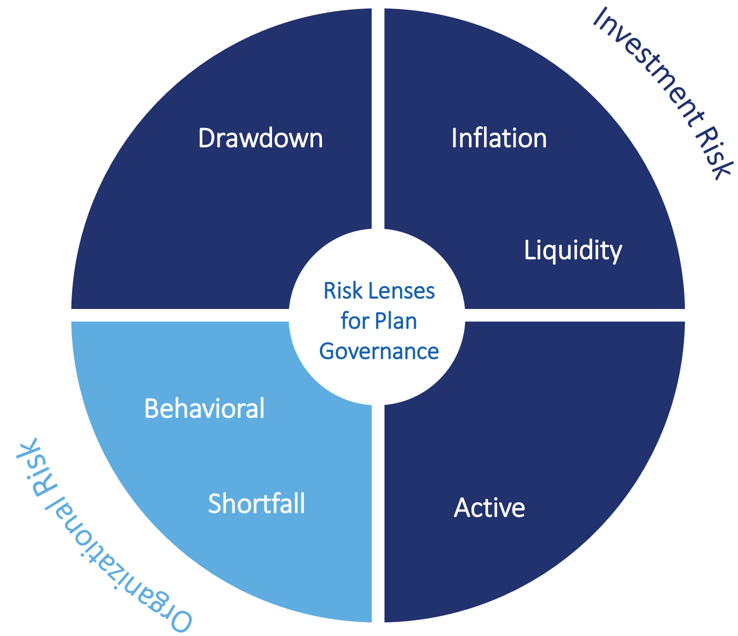
Drawdown: Limit portfolio losses

Inflation: Preserve long-term purchasing power

Liquidity: Balance near-term needs, long-term opportunities

Active: Ensure unique exposures

Emerging & Long-Term: Environmental, Social & Governance risks, such as externalities, intangibles and reputation may be linked to various risk lenses



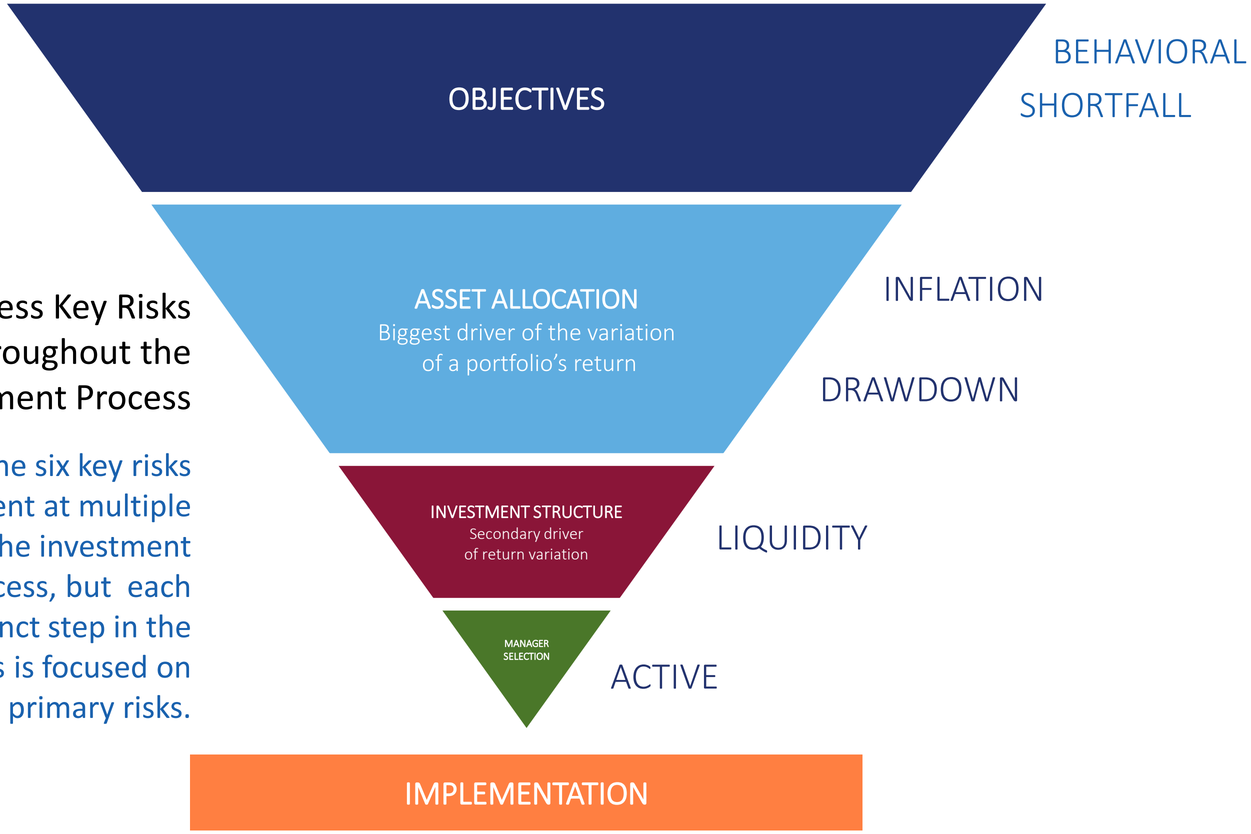
Emerging & Long-term Risks

Wilshire

Focus on Decisions that Matter

Address Key Risks Throughout the Investment Process

Many of the six key risks are present at multiple points in the investment process, but each distinct step in the process is focused on one or two primary risks.



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Capital Market Return Assumptions

Wilshire

Introduction

- Wilshire approach to forecasting returns
  - Forecasting asset class return, risk and correlation assumptions is the first step in the asset allocation process
  - Estimates are long-term; 10-year return assumption
  - Combines historical data with forward-looking analysis
  - Assumptions are updated quarterly

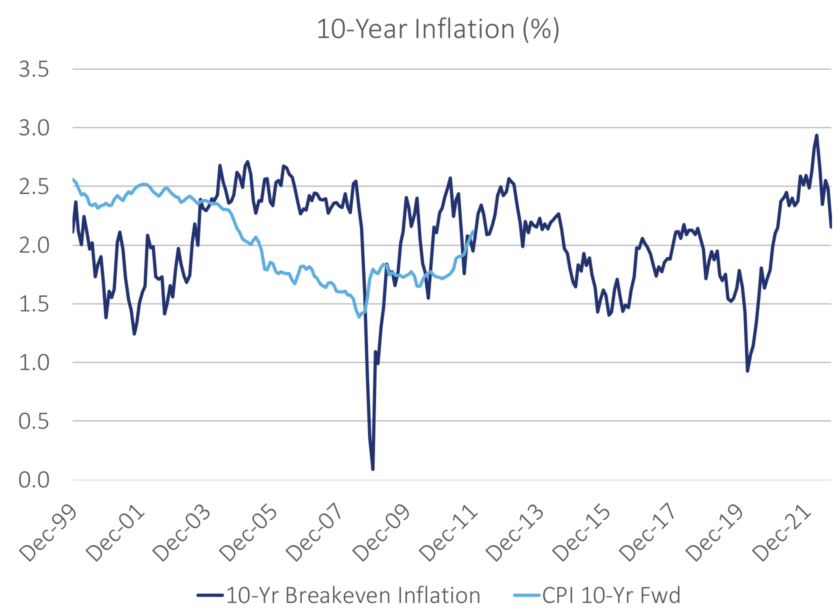
- Risk & Correlation
  - Relies heavily (but not exclusively) on historical risk and correlation data
  - Analyze various rolling standard deviations; 5-year risk, 10-year risk, etc.
  - For some asset classes, particularly private equity, need to rely on proxies and other cross-correlation assumptions

Wilshire

Inflation Assumption

- Market-based inflation forecast
  - TIPS are the starting point in forecasting inflation
  - Subtract TIPS yield from nominal Treasury yield with same maturity
  - Difference is “breakeven inflation rate”

- Increased volatility in breakeven will sometimes cause Wilshire to temporarily move away from accepting a single point-in-time inflation forecast
  - December 2008 – breakeven inflation went to zero during the depths of the global financial crisis
  - March 2020 – breakeven inflation fell below 1% while the coronavirus pandemic caused global shutdowns

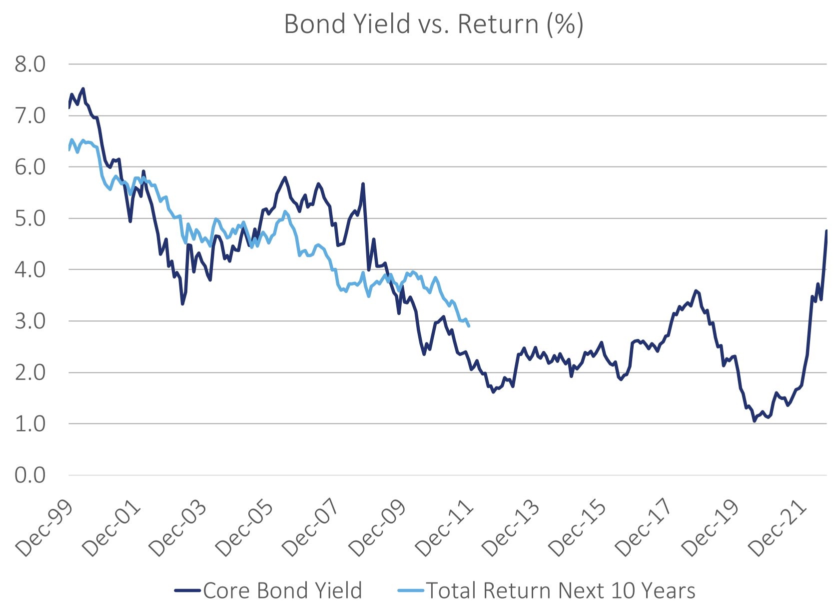


Data Source: Bloomberg

Wilshire

Fixed Income Model Framework

- Forecasting fixed income involves two major components
  - Current Treasury yields and current credit spread levels
  - Expectations for changes in both of those inputs during the next 10 years
- Wilshire's fixed income return assumptions build off key inputs
  - Inflation assumption
  - Current observed yields/spreads, historical relevant relationships and forward yield curve
  - Forecasts for the pace and timing of yield and spread changes



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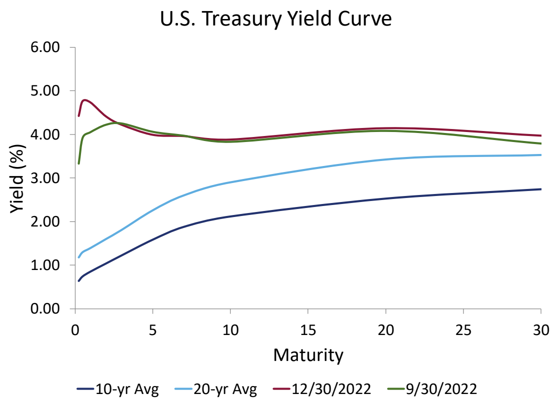
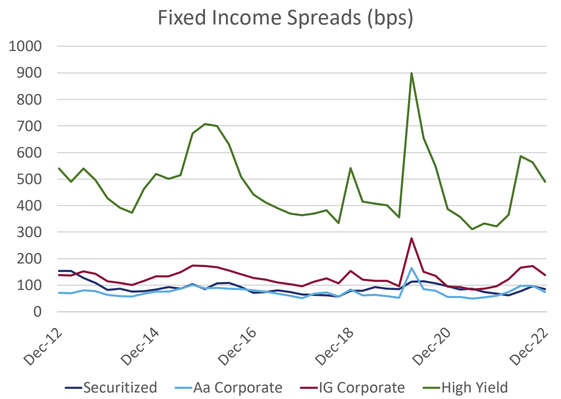
Wilshire

Fixed Income Update





Inflation & Fixed Income		Sep 2022	Change	Dec 2022
Inflation	10-Year Treasury Yield	3.83	0.05	3.88
	10-Year Real Yield	1.68	(0.10)	1.58
	Breakeven Inflation	2.15	0.15	2.30
	Inflation Forecast	**2.25**	**0.00**	**2.25**
Cash	91-Day T-Bill Yield	3.33	1.09	4.42
	T-Bill Yield in 10 Yrs	3.65	0.20	3.85
	Cash Forecast	**3.65**	**0.35**	**4.00**
Treasury	U.S. Treasury Idx Yield	4.13	0.05	4.18
	Treasury Idx Yield in 10 Yrs	4.30	0.15	4.45
	Treasury Idx Forecast	**4.20**	**0.10**	**4.30**
	U.S. LT Treasury Idx Yield	4.00	0.08	4.08
	LT Treasury Idx Yield in 10 Yrs	3.88	0.27	4.15
	LT Treasury Idx Forecast	**4.05**	**0.00**	**4.05**
Spread	U.S. Corporate Idx OAS	1.72	(0.34)	1.38
	Corporate Idx OAS in 10 Yrs	1.55	(0.01)	1.54
	Corporate Idx Forecast	**5.65**	**(0.20)**	**5.45**
	U.S. Core Bond Forecast	**4.90**	**0.00**	**4.90**
	U.S. LT Core Bond Forecast	**5.10**	**(0.20)**	**4.90**
	U.S. High Yield Idx OAS	5.62	(0.73)	4.89
	High Yield Idx OAS in 10 Yrs	5.46	(0.06)	5.40
	High Yield Bond Forecast	**6.85**	**(0.30)**	**6.55**

Wilshire

U.S. Stocks

Utilize 3 return forecasting models that we evaluate and blend on a qualitative basis

- IGV: Income, Growth, Valuation component model
  - Formally introduced during the global financial crisis (2009)
  - Stands as an important signal that does not rely on sometimes volatile earnings estimates

- DDM: Dividend Discount Model
  - Legacy/Single model used until 2009
  - Less sensitivity to market moves/valuations
  - Elegant and well-understood framework, but highly dependent on key inputs

- CAPE: Cyclically-Adjusted Price/Earnings (a.k.a. Shiller P/E)
  - Introduced more recently (2019); uses approach formulated by Professor Robert Shiller
  - Can serve as a “tie-breaker” for USE forecast and premium/discount signal for Non-USE forecasts

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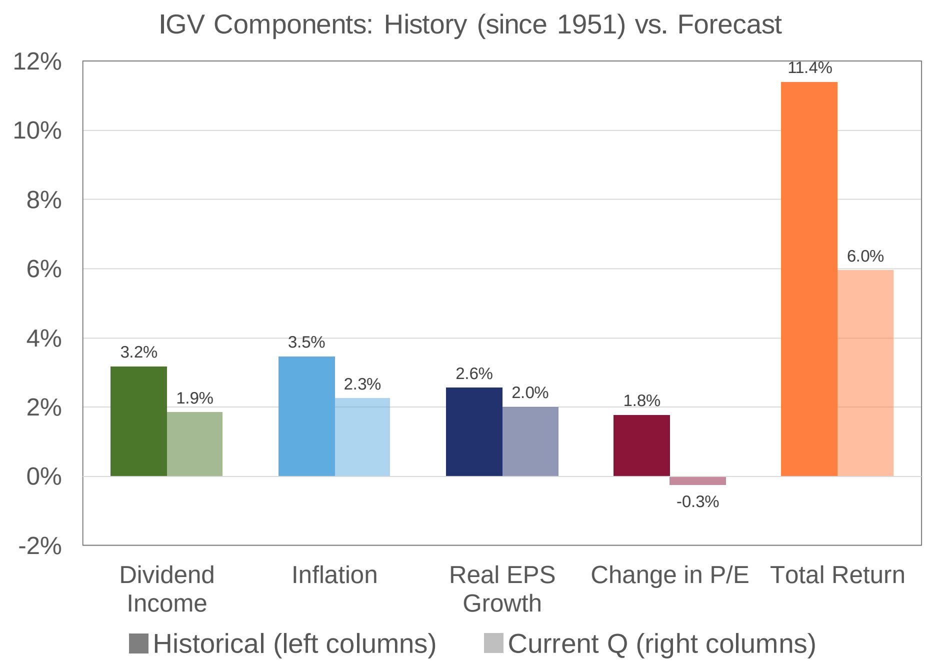
IGV Model

- Simple (few heroic assumptions) and intuitive
- Clearly separates the drivers of return, focusing questions on return levels
  - If the assumption is “wrong,” where is it off, which return driver
  - And then by how much is it off



Data Source: Bloomberg

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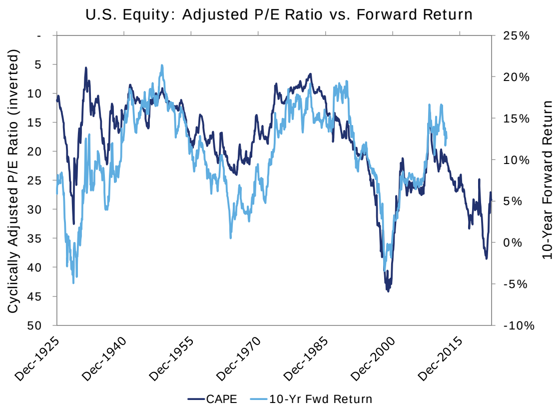
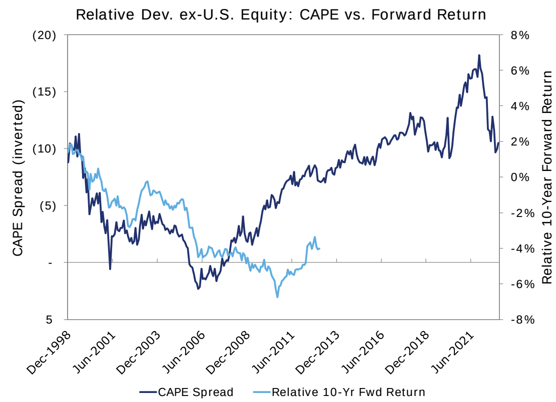
Equity Markets Update

Equity: Public & Private		Sep 2022	Change	Dec 2022
Equity	DDM	7.25	(0.40)	6.85
	IGV	6.50	(0.55)	5.95
	CAPE	6.70	0.25	6.95
	U.S. Equity Forecast	6.75	(0.25)	6.50
	Dev-ex-US Equity Forecast	7.50	(0.25)	7.25
	EM Equity Forecast	7.75	(0.25)	7.50
Private	Cost of Debt (Public)	5.65	0.00	5.65
	Cost of Debt (Private)	7.60	0.35	7.95
	Private Market Basket Forecast	10.25	(0.35)	9.90





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Private Equity

- Employ more than one forecasting approach to buyouts given the difficulty in accurately observing performance within private equity
  - Complex signal that identifies all the components driving private equity, such as beta and financial leverage
  - Direct signal that builds off the public market assumption, while adjusting for any relative pricing differences between public and private markets

- Final assumption is compared to a public markets-plus corridor as a reasonableness check – currently equal to the U.S. equity assumption + 2% (low end) and then + 6%

- Forecast both buyouts (U.S. & Non-U.S.) and venture capital and then combine them to arrive at a “typical,” diversified private equity portfolio assumption

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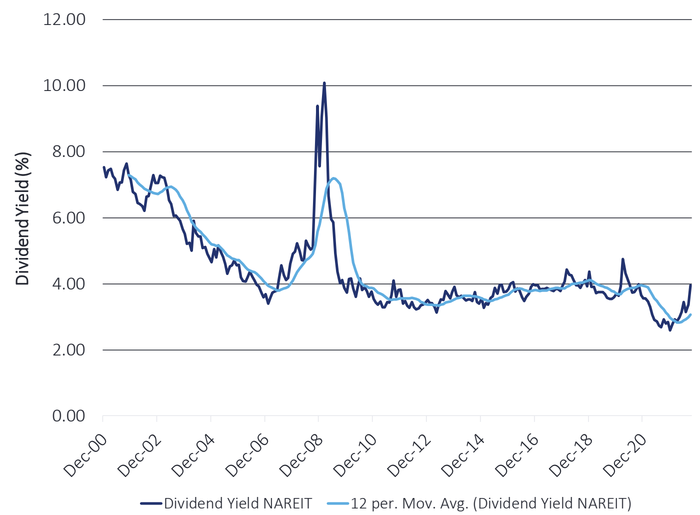
Real Estate

- REIT assumption based on dividend yield + dividend growth
  - Yields have recently recovered from a substantial drop, equaling 3.95% in September
  - Expected growth equals 75% of Wilshire's 2.25% inflation forecast (1.70%)

- Private real estate takes a similar approach except to include the private market capitalization rate, rather than a market yield



Data Source: Bloomberg

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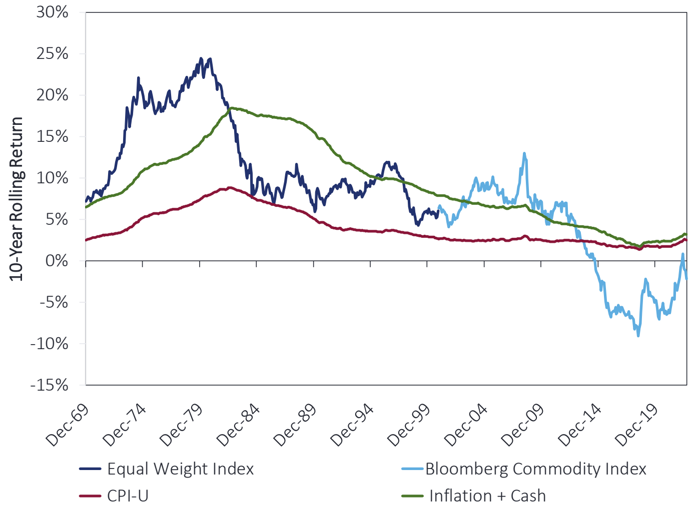
Additional Real Assets

- Infrastructure – public and private
  - Forecast for Global Listed Infrastructure begins with the current yield on the market and assumes an expected dividend growth rate equal to 75% of long-run inflation
  - Private Infrastructure mirrors our private real estate model with two modifications
    - Yields reflective of the infrastructure market
    - Leverage typical of private infrastructure funds



- Forecasting a return for a basket of commodity futures focuses on three components of total return
  - Changes in spot prices – represented by our inflation assumption
  - Collateral yield – equal to our forecast on cash
  - Contract roll yield – Currently zero as its history contains mixed results, both positive and negative

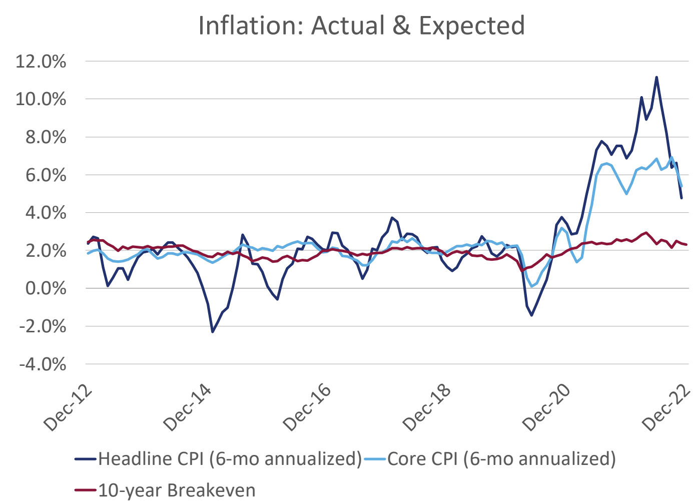
Data Source: Bloomberg

Wilshire

Real Assets

- Inflation assumption of 2.25% is unchanged, but just below breakeven, given the volatility in the signal during the quarter
- Real asset yields are generally lower
- Commodity assumption is up on higher cash

Asset Class Assumption	Total Return (%) Sep 2022	Change	Dec 2022	Risk (%)
U.S. TIPS	4.05	-0.10	3.95	6.00
Global RE Securities	5.80	0.00	5.80	16.45
Private Real Estate	6.35	-0.15	6.20	14.00
Commodities	5.90	0.35	6.25	16.00
Inflation	2.25	0.00	2.25	1.75



	Real Assets	Sep 2022	Change	Dec 2022
Listed	Inflation Capture (75%)	1.70	0.00	1.70
	REIT Yield	3.95	0.02	3.97
	Midstream Energy Yield	6.25	(0.31)	5.94
	Global Infrastructue Yield	3.71	(0.13)	3.58
Private	Real Estate Cap Rate	4.00	(0.10)	3.90
	Cost of Debt (Private)	6.10	0.10	6.20
	Infra. v RE Cap Rate Differential	(0.24)	(0.15)	(0.39)
	Infra. Leverage / RE Leverage	2.5	0.0	2.5

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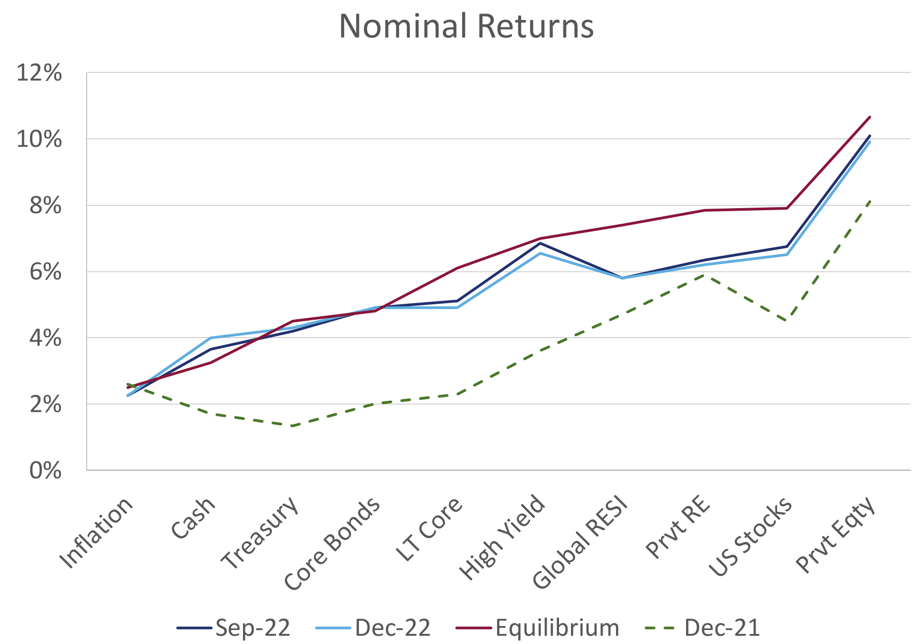
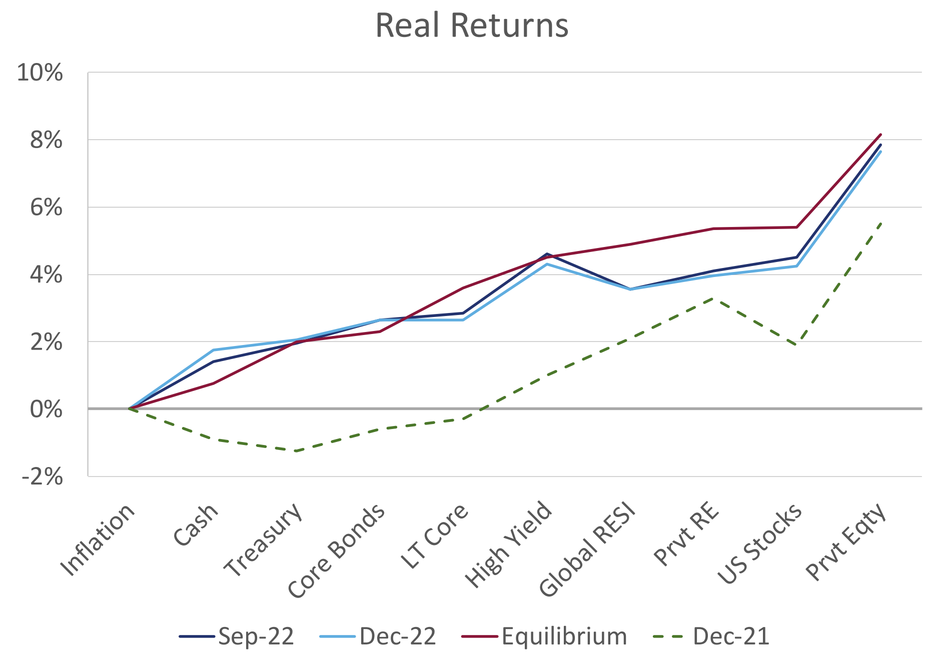
Equilibrium Assumptions

Current versus Equilibrium Asset Class Assumptions





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Q4 2022 Correlation Matrix

	Equity						Fixed Income							Real Assets					
														Real Estate					
	US Stock	Dev ex-US Stock	Emg Stock	Global ex-US Stock	Global Stock	Private Equity	Cash	Core Bond	LT Core Bond	TIPS	High Yield	Private Credit	Dev ex-US Bond (Hdg)	US RES	Global RES	Private RE	Cmdty	Real Assets	US CPI
Compound Return (%)	6.50	7.25	7.50	7.60	7.05	9.90	4.00	4.90	4.90	3.95	6.55	8.85	3.05	5.65	5.80	6.20	6.25	6.65	2.25
Expected Risk (%)	17.00	18.00	26.00	19.10	17.10	29.00	0.75	4.70	9.80	6.00	10.00	12.75	4.00	17.50	16.45	14.00	16.00	12.35	1.75
Cash Yield (%)	1.75	3.25	2.80	3.10	2.25	0.00	4.00	5.10	5.25	4.40	9.65	5.10	3.75	3.95	3.95	2.25	4.00	3.15	0.00
Growth Exposure	8.00	8.00	8.00	8.00	8.00	14.00	0.00	-0.95	-2.40	-3.00	4.00	5.10	-1.00	6.00	6.00	3.50	0.00	2.70	0.00
Inflation Exposure	-3.00	0.00	5.00	1.45	-1.30	-3.75	0.00	-2.50	-6.80	2.50	-1.00	-1.50	-3.00	1.00	1.80	1.00	12.00	5.25	1.00
Correlations																			
US Stock	1.00																		
Dev ex-US Stock (USD)	0.81	1.00																	
Emerging Mkt Stock	0.74	0.74	1.00																
Global ex-US Stock	0.84	0.95	0.89	1.00															
Global Stock	0.95	0.91	0.84	0.94	1.00														
Private Equity	0.72	0.63	0.61	0.67	0.73	1.00													
Cash Equivalents	-0.05	-0.09	-0.05	-0.08	-0.06	0.00	1.00												
Core Bond	0.28	0.13	0.00	0.08	0.20	0.30	0.18	1.00											
LT Core Bond	0.31	0.15	0.01	0.11	0.24	0.31	0.11	0.94	1.00										
TIPS	-0.05	0.00	0.15	0.06	-0.01	-0.03	0.20	0.60	0.48	1.00									
High Yield Bond	0.54	0.39	0.49	0.46	0.53	0.31	-0.10	0.24	0.32	0.05	1.00								
Private Credit	0.68	0.55	0.58	0.60	0.68	0.44	0.00	0.24	0.30	0.00	0.76	1.00							
Dev ex-US Bond (Hdg)	0.16	0.25	-0.01	0.16	0.17	0.26	0.10	0.68	0.66	0.39	0.26	0.22	1.00						
US RE Securities	0.58	0.47	0.44	0.49	0.57	0.49	-0.05	0.17	0.22	0.10	0.56	0.62	0.05	1.00					
Global RE Securities	0.64	0.57	0.54	0.60	0.65	0.55	-0.05	0.17	0.21	0.11	0.61	0.68	0.04	0.96	1.00				
Private Real Estate	0.55	0.45	0.45	0.49	0.54	0.50	-0.05	0.19	0.25	0.09	0.58	0.63	0.05	0.79	0.78	1.00			
Commodities	0.25	0.34	0.39	0.38	0.32	0.28	0.00	-0.03	-0.03	0.25	0.29	0.29	-0.10	0.25	0.28	0.25	1.00		
Real Assets	0.62	0.63	0.65	0.69	0.67	0.57	-0.03	0.22	0.24	0.30	0.64	0.69	0.04	0.78	0.84	0.76	0.64	1.00	
Inflation (CPI)	-0.10	-0.15	-0.13	-0.15	-0.13	-0.10	0.10	-0.12	-0.12	0.15	-0.08	0.00	-0.08	0.05	0.04	0.05	0.44	0.22	1.00

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Alternative Investment Assumptions

Private Equity	Weight	Expected Return (%)	Expected Risk (%)
U.S. Buyouts	55.0%	8.50	30.00
Non-U.S. Buyouts	25.0%	9.20	32.00
Venture Capital	20.0%	9.70	44.00
Private Equity Basket	**100.0%**	**9.90**	**29.00**

Private Credit	Weight	Expected Return (%)	Expected Risk (%)
Direct Lending	50.0%	8.50	10.00
Mezzanine/Opportunistic Credit	30.0%	8.50	20.00
Distressed Debt	20.0%	8.25	20.00
Private Credit Basket	**100.0%**	**8.85**	**12.75**

Private Real Estate	Weight	Expected Return (%)	Expected Risk (%)
Core RE	70.0%	4.95	12.00
Value-Added RE	15.0%	7.95	17.50
Oppertunistic RE	15.0%	8.95	25.00
Private Real Estate Basket	**100.0%**	**8.85**	**12.75**

Public Real Assets	Weight	Expected Return (%)	Expected Risk (%)
Global REITs	30.0%	5.80	16.45
Global Listed Infrastructure	8.5%	5.25	17.00
Midstream Energy Infrastructure	1.5%	7.65	19.00
TIPS	45.0%	3.95	6.00
Commodites	36.0%	6.25	16.00
Gold	9.0%	6.25	18.00
Cash	-30.0%	4.00	0.75
Public Real Assets Basket	**100.0%**	**6.25**	**11.35**

Private Real Assets	Weight	Expected Return (%)	Expected Risk (%)
Real Estate	50.0%	6.20	14.00
Infrastructure	30.0%	5.45	25.00
Energy	20.0%	7.75	18.00
Private Real Assets Basket	**100.0%**	**6.85**	**14.90**

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Asset Allocation

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Overview & Considerations

The asset allocation decision is the most important decision an investor can make

- The asset allocation decision drives 90% of return variability among portfolios

Wilshire recommends revisiting the asset allocation decision every three to five years, or sooner, as market conditions warrant

- CERS last reviewed asset allocation November 2021
- The last full asset-liability study was conducted in November 2020

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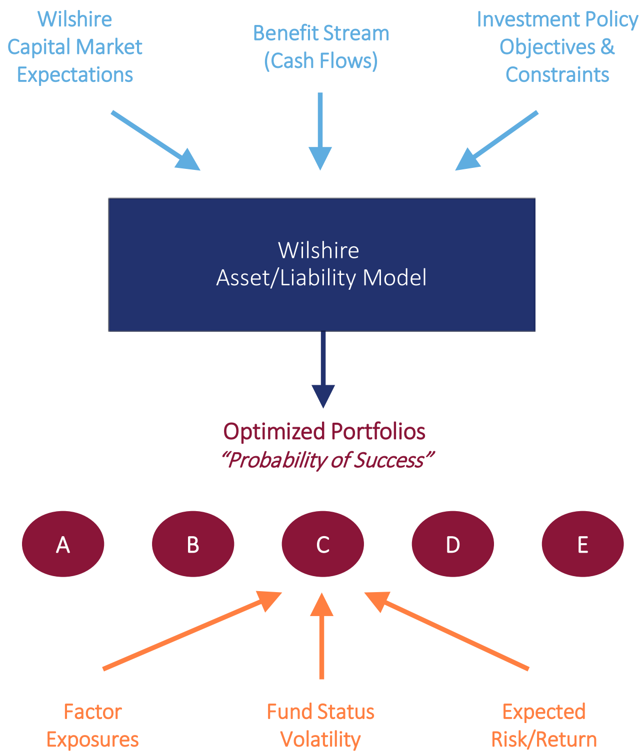
Asset Allocation Process



- Wilshire believes the mission of a defined benefit plan is to fund benefits promised to participants
- The role of asset allocation is to manage risk in order to fulfill that core mission
  - Maximize safety of promised benefits
  - Minimize cost of funding these benefits
- Wilshire's Asset Liability Model provides methodology for selecting a target portfolio that considers both goals
- Rigorously developed capital market assumptions for risk and return
- Given that short-term volatility is also important, we identify the impact of the asset allocation decision on funded ratios, annual contribution requirements, and other metrics
- Strategic asset allocation is not a guide to outperforming in every market…but it should provide a roadmap for success over a market cycle

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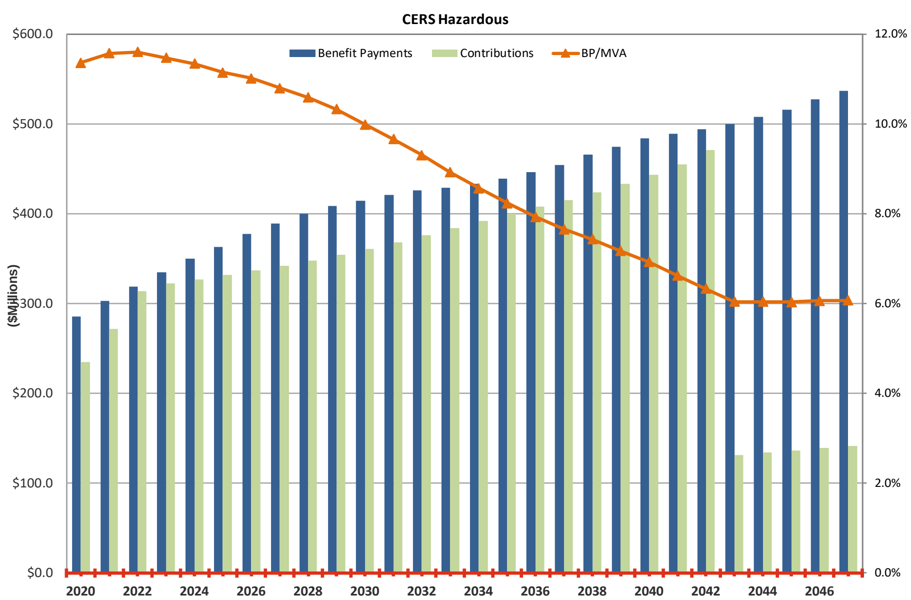
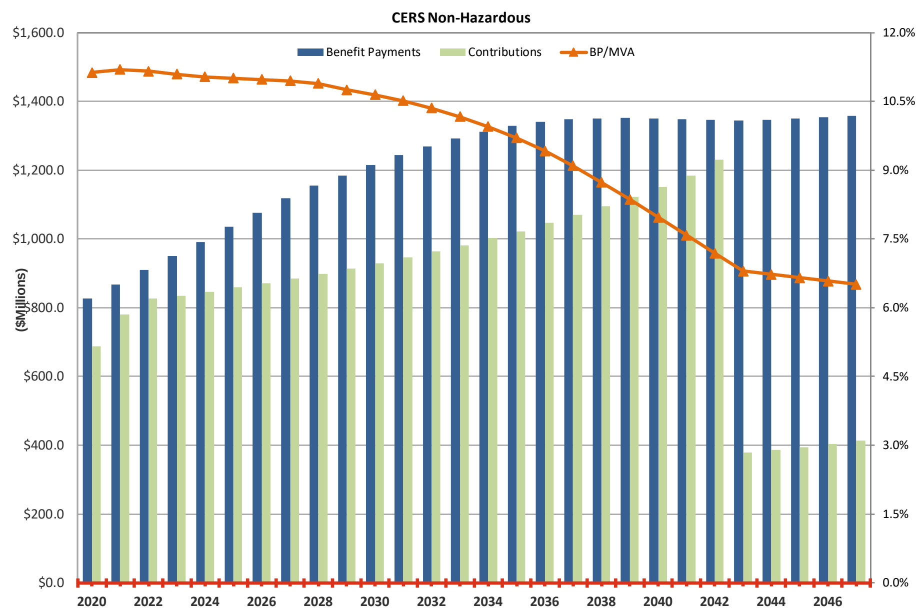
Projected Cash In and Outflows





Pension Plan Data from 2020 Asset Liability Study

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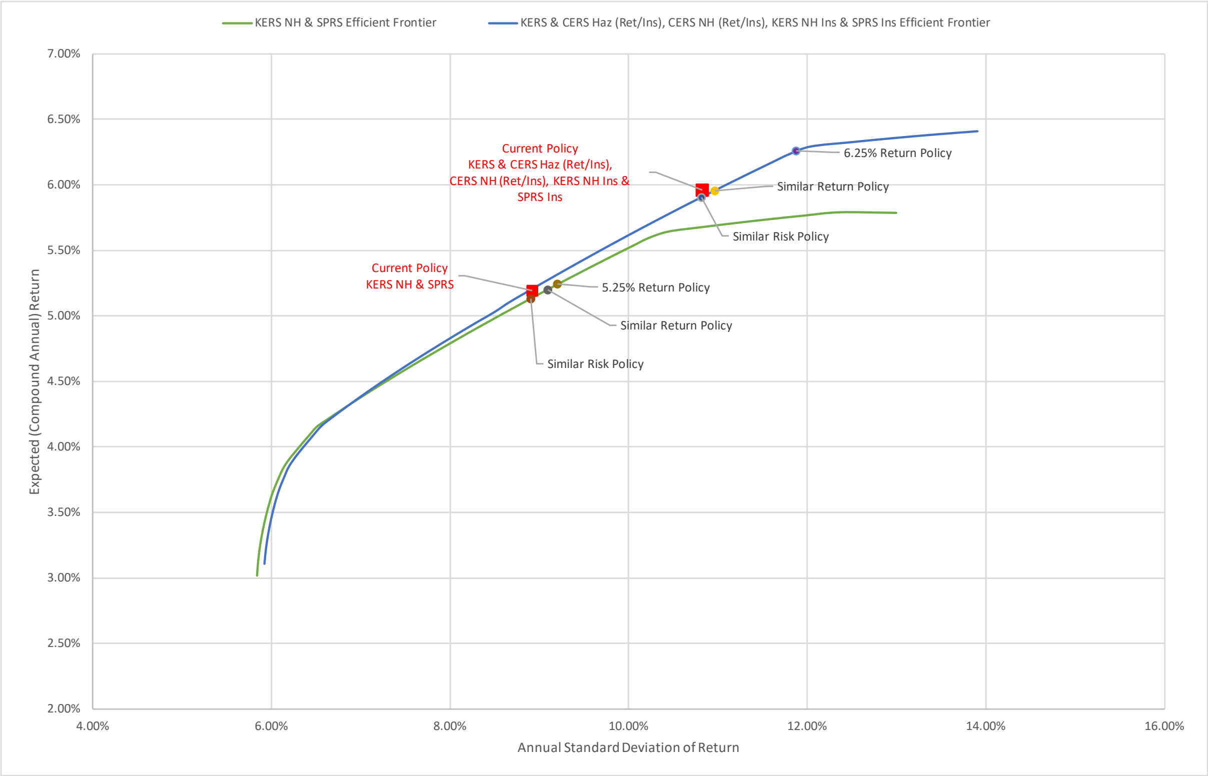
Asset Only Efficient Frontier



From 2020 Asset Liability Study

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Portfolios Modeled

Asset Class	Current Policy KERS NH & SPRS	Optimization Constraints	Similar Risk Policy	Similar Return Policy	5.25% Return Policy	Current Policy KERS & CERS Haz, CERS NH & KERS NH Ins.	Optimization Constraints	Similar Risk Policy	Similar Return Policy	6.25% Return Policy
U.S. Equity	15.75%	10% - 100% [1]	15.75%	16.00%	16.25%	18.75%	10% - 100% [1]	18.25%	18.75%	21.75%
Non-U.S. Equity	15.75%	10% - 100% [1]	15.75%	16.00%	16.25%	18.75%	10% - 100% [1]	18.25%	18.75%	21.75%
High Yield / Specialty Credit	15.00%	0% - 15%	15.00%	15.00%	15.00%	15.00%	0% - 15%	15.00%	15.00%	15.00%
Private Equity	0.00%	0.0%	0.00%	0.00%	0.00%	10.00%	0% - 10%	10.00%	10.00%	10.00%
Private Equity (Revised)	7.00%	0% - 7% [3]	6.00%	6.75%	7.00%	0.00%	0.0%	0.00%	0.00%	0.00%
Total Growth Assets	**53.50%**	**20% - 70%**	**52.50%**	**53.75%**	**54.50%**	**62.50%**	**20% - 70%**	**61.50%**	**62.50%**	**68.50%**
Core Fixed Income	20.50%	15% - 100%	22.50%	21.25%	20.50%	13.50%	10% - 100%	15.50%	14.50%	10.00%
Cash	3.00%	3% - 5%	5.00%	5.00%	5.00%	1.00%	1% - 3%	3.00%	3.00%	1.50%
Total Fixed Income	**23.50%**		**27.50%**	**26.25%**	**25.50%**	**14.50%**		**18.50%**	**17.50%**	**11.50%**
Real Estate	5.00%	5% - 10%	10.00%	10.00%	10.00%	5.00%	5% - 10%	10.00%	10.00%	10.00%
Opportunistic	3.00%	0.0%	0.00%	0.00%	0.00%	3.00%	0.0%	0.00%	0.00%	0.00%
Real Return	15.00%	5% - 10%	10.00%	10.00%	10.00%	15.00%	5% - 10%	10.00%	10.00%	10.00%
Total Diversifying	**23.00%**	**10% - 20%**	**20.00%**	**20.00%**	**20.00%**	**23.00%**	**10% - 20%**	**20.00%**	**20.00%**	**20.00%**
Total Assets	**100.0%**		**100.0%**	**100.0%**	**100.0%**	**100.0%**		**100.0%**	**100.0%**	**100.0%**
Total Illiquid Assets [2]	**21.75%**		**21.50%**	**22.25%**	**22.50%**	**24.75%**		**25.50%**	**25.50%**	**25.50%**
Expected Return - 10 Years (%)	**5.19**		**5.13**	**5.20**	**5.24**	**5.96**		**5.90**	**5.95**	**6.26**
Expected Return - 30 Years (%)	**6.44**		**6.37**	**6.43**	**6.46**	**7.16**		**7.09**	**7.13**	**7.38**
Standard Deviation of Return (%)	**8.92**		**8.91**	**9.09**	**9.20**	**10.83**		**10.82**	**10.96**	**11.88**
(bps)			**(6)**	**1**	**5**			**(6)**	**(1)**	**30**
(bps)			**(7)**	**(1)**	**2**			**(7)**	**(3)**	**22**
+/(-) in SD of Return (bps)			**(1)**	**17**	**28**			**(1)**	**13**	**105**
Value At Risk (Year 1, 95th%) *	**-9.48**		**-9.52**	**-9.75**	**-9.90**	**-11.85**		**-11.89**	**-12.08**	**-13.28**
Sharpe Ratio	**0.50**		**0.49**	**0.49**	**0.49**	**0.48**		**0.48**	**0.47**	**0.46**

[1] *Non-U.S. Equity is constrained to be no more than U.S. Equity.*

[2] *Illiquid Assets are comprised of 20% of High Yield / Specialty Credit, Private Equity, Real Estate, Opportunistic and 25% of Real Return.*

[3] *Private Equity is assumed to be 80% U.S. Equity and 20% of Private Equity (standard assumption).*

From 2020 Asset Liability Study

Wilshire

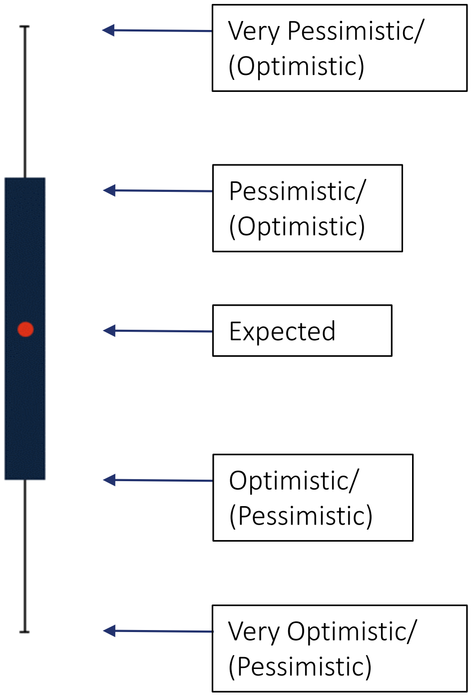
Portfolios Modeled

Asset Class	Current Policy KERS NH & SPRS	Similar Risk Policy	Similar Return Policy	5.25% Return Policy	Current Policy KERS & CERS Haz, CERS NH & KERS NH Ins.	Similar Risk Policy	Similar Return Policy	6.25% Return Policy
Total Growth Assets	53.50%	52.50%	53.75%	54.50%	62.50%	61.50%	62.50%	68.50%
Total Fixed Income	23.50%	27.50%	26.25%	25.50%	14.50%	18.50%	17.50%	11.50%
Total Diversifying	23.00%	20.00%	20.00%	20.00%	23.00%	20.00%	20.00%	20.00%
Total Assets	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Expected Return - 10 Years (%)	5.19	5.13	5.20	5.24	5.96	5.90	5.95	6.26
Expected Return - 30 Years (%)	6.44	6.37	6.43	6.46	7.16	7.09	7.13	7.38
Standard Deviation of Return (%)	8.92	8.91	9.09	9.20	10.83	10.82	10.96	11.88
(bps)		(6)	1	5		(6)	(1)	30
(bps)		(7)	(1)	2		(7)	(3)	22
+/(-) in SD of Return (bps)		(1)	17	28		(1)	13	105
Contribution to Asset Volatility (%):								
Growth	79.7	77.6	78.5	79.0	85.1	83.4	83.8	86.0
Fixed Income	4.2	4.7	4.2	4.0	2.0	2.4	2.2	1.3
Diversifying	16.1	17.7	17.3	17.0	12.9	14.2	14.0	12.7
Cash Yield	2.7	2.8	2.8	2.8	2.6	2.7	2.7	2.7
Growth Factor	4.2	4.2	4.4	4.4	5.5	5.6	5.6	6.2
Inflation Factor	1.3	1.0	1.0	1.1	1.7	1.4	1.4	1.7
Liquidity (%)								
Market	54.3	57.4	56.7	56.4	51.0	53.2	53.1	52.8
Stressed	23.6	27.3	26.3	25.7	16.2	19.8	19.1	14.4
Probability of Reaching								
Actuarial Return of 5.25%								
Year 10	49.2	48.3	49.3	49.9	58.3	57.7	58.1	60.7
Year 30	77.1	75.7	76.3	76.7	83.7	82.8	83.0	84.1
Actuarial Return of 6.25%								
Year 10	35.4	34.6	35.7	36.4	46.6	46.0	46.6	50.1
Year 30	54.8	53.0	54.3	55.0	67.9	66.7	67.2	70.1

From 2020 Asset Liability Study

Wilshire

Box and Whisker Graphs



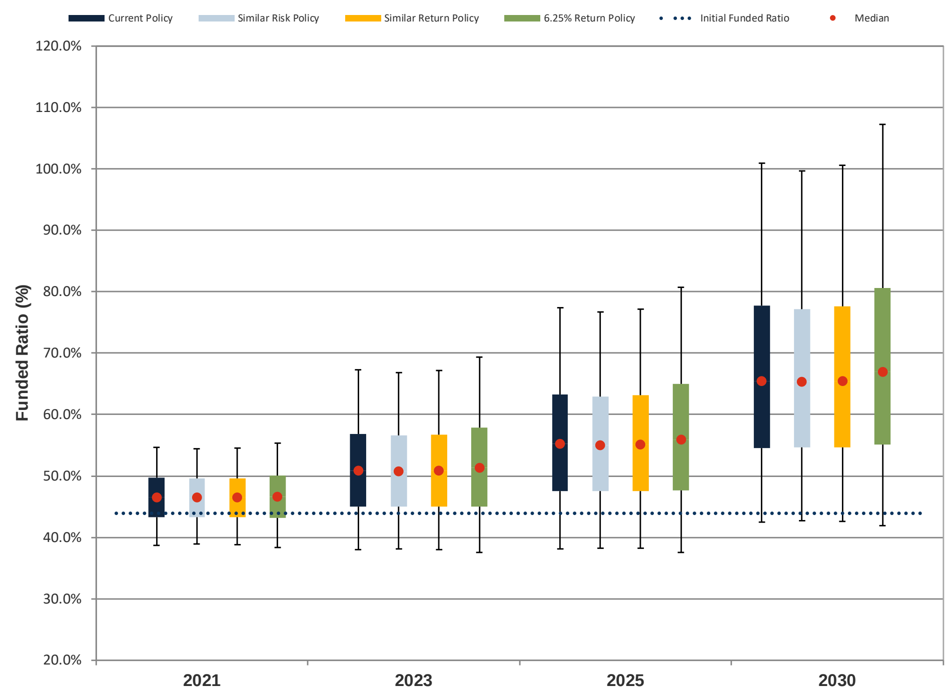
In each year of the simulation, there are 5,000 independent economic trial results. We summarize these trial results by percentiles and use the following labeling (return and funded ratio labeling in parentheses):

- Very Pessimistic (Optimistic): 95th percentile
- Pessimistic (Optimistic): 75th percentile
- Expected: 50th percentile
- Optimistic (Pessimistic): 25th percentile
- Very Optimistic (Pessimistic): 5th percentile

Wilshire

MVA Funded Ratio

- Shortfall Risk:
  - The potential for the alternatives to have a lower median funded ratio than the current policy.
- Drawdown Risk:
  - The potential for the alternatives to have a lower "very pessimistic" funded ratio than the current policy.
- Initial Funded Ratio = 43.96%



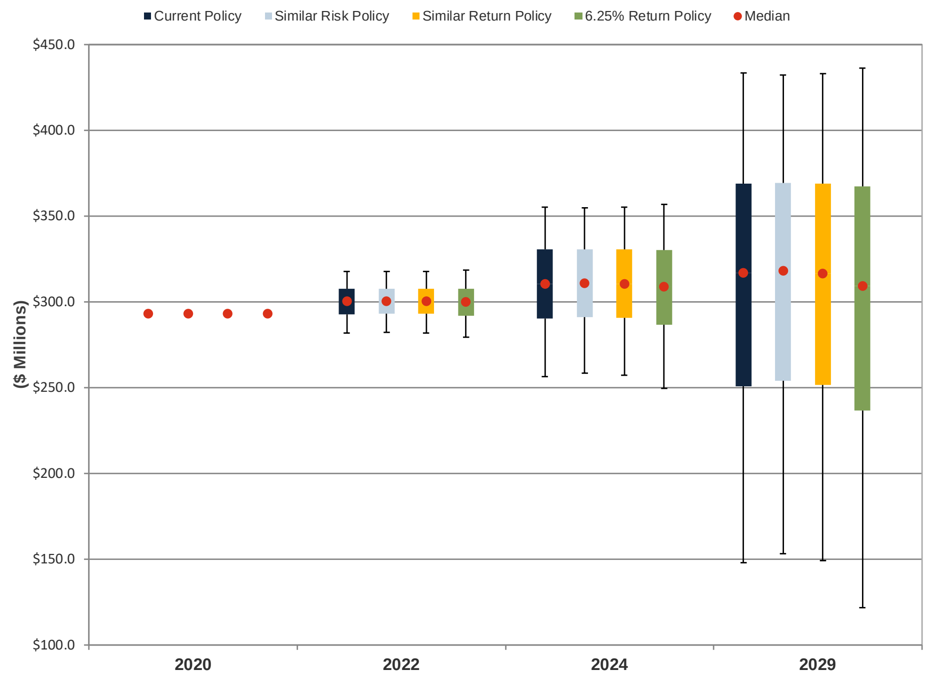
(%)	2021				2023				2025				2030			
	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy
Very Optimistic	54.61	54.40	54.50	55.37	67.25	66.78	67.14	69.34	77.34	76.66	77.15	80.70	100.96	99.60	100.58	107.25
Optimistic	49.67	49.60	49.66	50.04	56.79	56.59	56.77	57.83	63.31	62.88	63.14	64.97	77.75	77.20	77.60	80.55
Median (Expected)	**46.49**	**46.46**	**46.49**	**46.64**	**50.90**	**50.80**	**50.87**	**51.37**	**55.18**	**55.00**	**55.15**	**55.91**	**65.44**	**65.28**	**65.49**	**66.95**
Pessimistic	43.29	43.30	43.29	43.19	45.06	45.05	45.04	45.04	47.55	47.52	47.56	47.66	54.60	54.60	54.68	55.16
Very Pessimistic	38.75	38.88	38.80	38.38	37.99	38.12	38.04	37.54	38.12	38.29	38.19	37.60	42.50	42.70	42.59	41.87

CERS Hazardous Pension – From Nov 2020 Asset Liability Study

Wilshire

Plan Year Contributions

- Shortfall Risk:
  - The potential for the alternatives to have a lower median funded ratio than the current policy.
- Drawdown Risk:
  - The potential for the alternatives to have a lower "very pessimistic" funded ratio than the current policy.



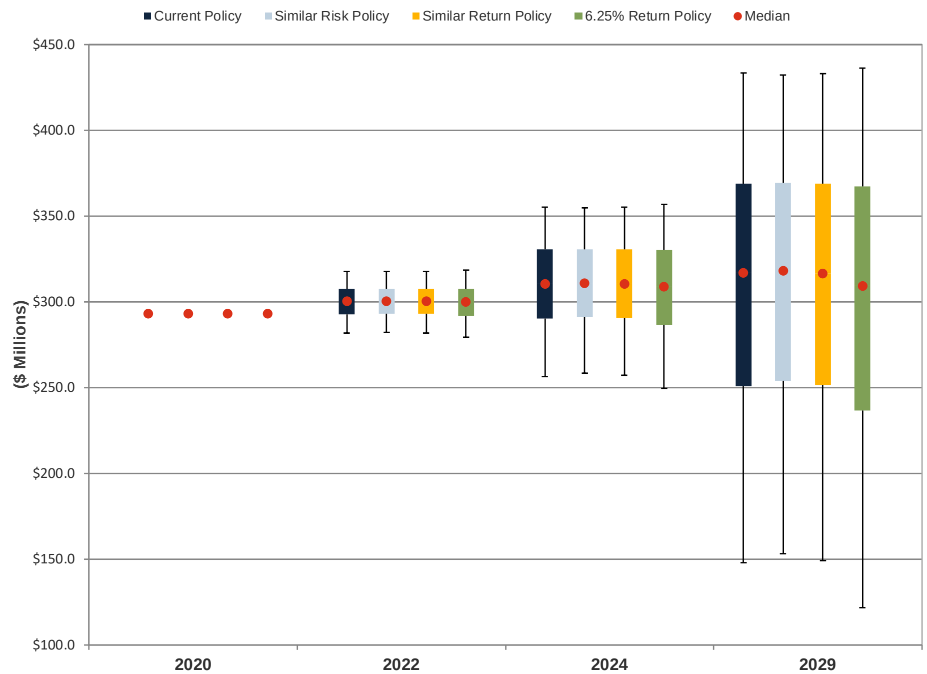
($ Millions)	2020				2022				2024				2029			
	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy
Very Pessimistic	293.1	293.1	293.1	293.1	317.8	317.5	317.7	318.6	355.2	354.9	355.1	356.9	433.6	432.1	433.0	436.2
Pessimistic	293.1	293.1	293.1	293.1	307.6	307.6	307.6	307.8	330.4	330.5	330.5	330.1	369.0	369.3	368.9	367.3
Median (Expected)	**293.1**	**293.1**	**293.1**	**293.1**	**300.2**	**300.4**	**300.3**	**299.8**	**310.5**	**310.8**	**310.6**	**308.6**	**316.9**	**317.9**	**316.6**	**309.3**
Optimistic	293.1	293.1	293.1	293.1	292.8	293.1	292.9	291.7	290.2	291.0	290.5	286.7	250.8	254.0	251.6	236.5
Very Optimistic	293.1	293.1	293.1	293.1	281.6	282.1	281.8	279.5	256.5	258.3	257.1	249.6	147.8	153.2	149.2	121.7

CERS Hazardous Pension – From Nov 2020 Asset Liability Study

Wilshire

MVA Economic Cost

- Shortfall Risk:
  - The potential for the alternatives to have a lower median funded ratio than the current policy.
- Drawdown Risk:
  - The potential for the alternatives to have a lower "very pessimistic" funded ratio than the current policy.
- EROA – 6.25%



Economic Cost is defined as the present value of contributions plus contributions necessary to fully fund the plan at the end of the projection period.

($ Millions)	2020				2022				2024				2029			
	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy	Current Policy	Similar Risk Policy	Similar Return Policy	6.25% Return Policy
Very Pessimistic	293.1	293.1	293.1	293.1	317.8	317.5	317.7	318.6	355.2	354.9	355.1	356.9	433.6	432.1	433.0	436.2
Pessimistic	293.1	293.1	293.1	293.1	307.6	307.6	307.6	307.8	330.4	330.5	330.5	330.1	369.0	369.3	368.9	367.3
Median (Expected)	**293.1**	**293.1**	**293.1**	**293.1**	**300.2**	**300.4**	**300.3**	**299.8**	**310.5**	**310.8**	**310.6**	**308.6**	**316.9**	**317.9**	**316.6**	**309.3**
Optimistic	293.1	293.1	293.1	293.1	292.8	293.1	292.9	291.7	290.2	291.0	290.5	286.7	250.8	254.0	251.6	236.5
Very Optimistic	293.1	293.1	293.1	293.1	281.6	282.1	281.8	279.5	256.5	258.3	257.1	249.6	147.8	153.2	149.2	121.7

CERS Hazardous Pension – From Nov 2020 Asset Liability Study

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Why Introduce Factors?

- **Risk Assessment:** Including factors within the asset allocation process provides an opportunity to measure asset class (and portfolio) exposures to key economic factors

- **Economic Efficiency:** If the underlying economic activity that drives asset performance can be identified, perhaps it can be used to assist in building economically-efficient portfolios

- **Portfolio Stability:** Macroeconomic risk factors – when separated from the valuation component inherent in investment pricing – may exhibit more stable correlations and, therefore, can better inform the allocation process

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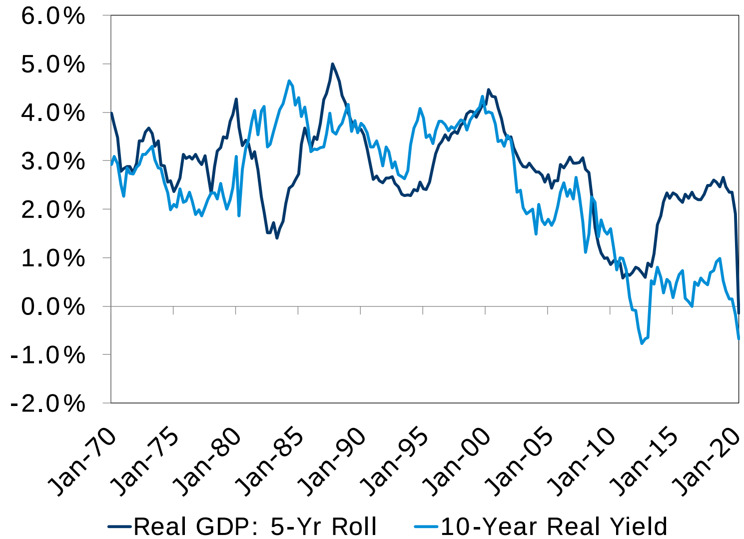
Growth Proxy

- Interest rates contain information and can reflect economic factors
- Nominal yields aggregate two important and distinct sources of economic information – real yields and expected inflation
- Disaggregating these factors should prove beneficial in developing a set of factors with improved explanatory power



Data Source: Federal Reserve, Bridgewater

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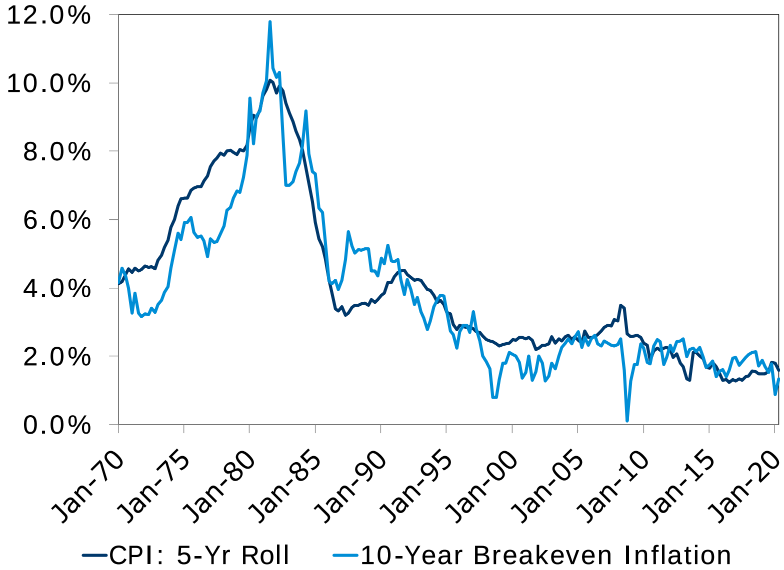
Inflation Proxy

- Breakeven inflation is the market's expectation for inflation
- Tends to follow closely with actual, recent inflation and can act as a timely signal of trends in consumer prices



Data Source: Federal Reserve, Bridgewater

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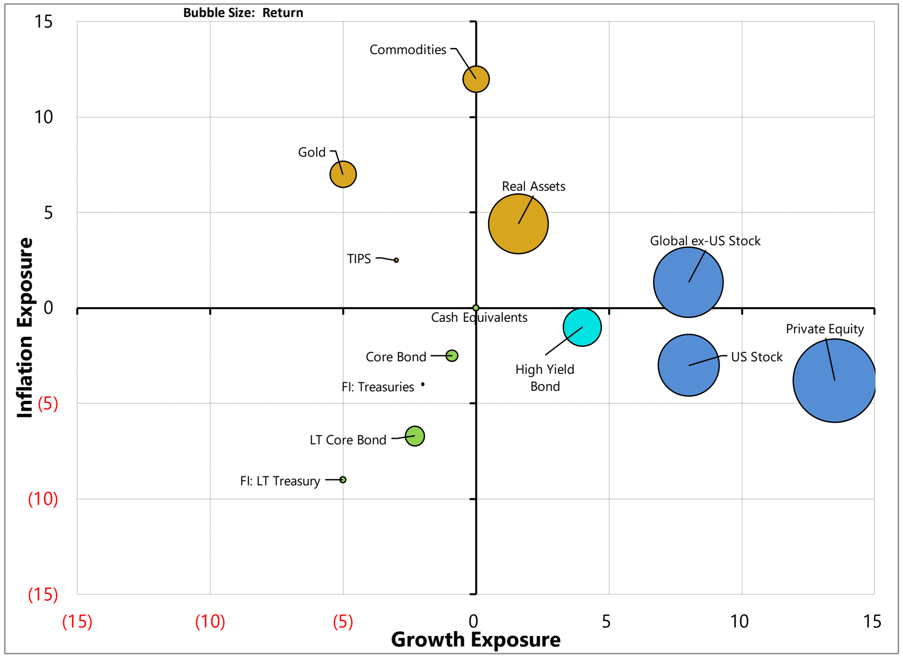
Wilshire's Approach

- Employ a 2-factor regression model (growth and inflation) to formulate factor assumptions
- Growth proxy is enhanced by high yield bond spreads to better capture shifts in growth forecasts



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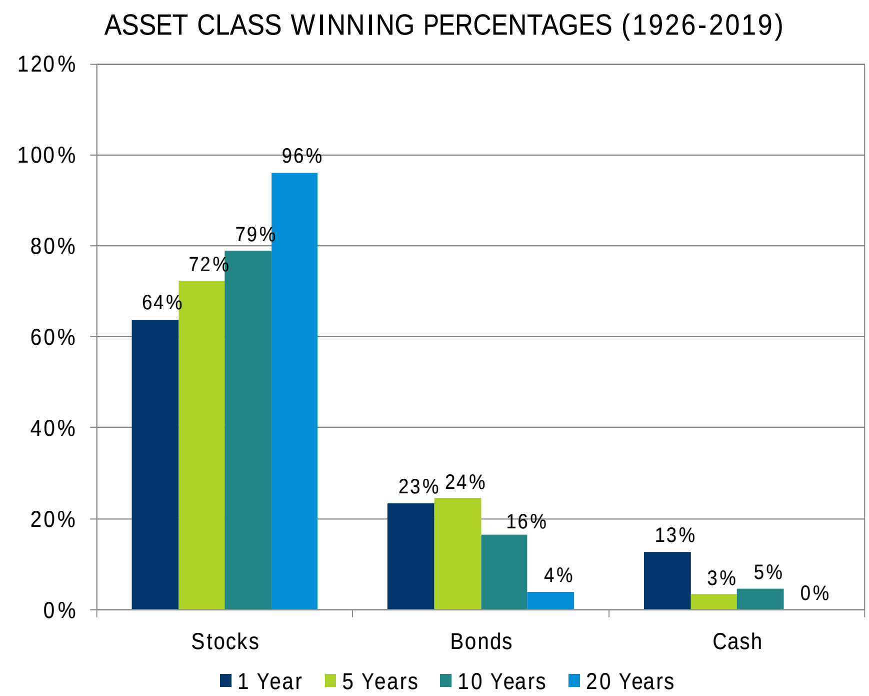
Liquidity Risk: What Are The Consequences?

Default/Insolvency is the most severe outcome from having insufficient liquidity, but…
There are many other, more likely, disruptive impacts that a lack of liquidity can impose on an investment portfolio

- Liquidity breaches can rob an investor of their biggest advantage: a long-term investment horizon
- The timing and price of such sales dictated by liquidity needs rather than by explicit investment rationale
- Can destroy portfolio value and effectively strip a portfolio from its ability to recover from market sell-offs



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Wilshire Liquidity Metric

Wilshire's Liquidity Metric framework has two levels:

- **Market Level of Liquidity**
- **Overall Level of Liquidity**

Market Level of Liquidity

- Quantified on scale from 0% (low liquidity) to 100% (high liquidity)
- Designed to capture general notion of marketable versus private/off-market transactions
  - Marketable asset classes typically reflect a 90% or 100%
  - Private asset classes reflect 0%
- Goal is to reflect the tradability of assets, which is helpful in connecting these values back to our definitional framework (i.e., to quantify the differences between Convertible Liquidity and Delayed Liquidity)

Wilshire Liquidity Metric

Wilshire's Liquidity Metric framework has two levels:

- **Market Level of Liquidity**
- **Overall Level of Liquidity**

Overall Liquidity Metric

Includes a penalty process to reflect the loss in practical liquidity due to asset class volatility and sensitivity to particular economic environments

Penalty components:

1. Growth Penalty:
   - Impacts asset classes with vulnerability to slowing growth
   - Recognizes the hit to liquidity that can occur during growth related bear markets
2. Inflation Penalty:
   - Impacts asset classes with vulnerability to rising inflation
   - Recognizes the hit to liquidity that can occur during inflation driven bear markets
3. Volatility Penalty:
   - Impacts higher volatility asset classes
   - Recognizes the hit to liquidity that can occur from any form of volatility

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Wilshire Stressed Liquidity Metric

Stressed Level of Liquidity Metric

	Market	Liquidity Penalty Components			Applied	Stressed
Asset Class	Liquidity	Growth	Inflation	Volatility	Penalty	Liquidity
US Equity	100	50		24	50	0
Dev ex-US Equity	100	50		26	50	0
EM Equity	90	50		40	50	0
Private Equity	0	50		40	0	0
Cash Equivalents	100				0	100
Core Bonds	100		8		8	86
High Yield Bonds	80	40		10	40	0
US Real Estate Securities	90	50		24	50	0
Private Real Estate	0	50		18	0	0
Commodities	90			20	20	55

Applied Penalty = Min(Max(Growth + Inflation, Volatility), Market Liquidity)

Stressed Liquidity * = Market Liquidity - (1.75 x Applied Penalty)

** If less than 20, Stressed Liquidity is assumed to be 0*

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Allowable Asset Allocation Ranges

Wilshire's Asset Allocation Committee (WAAC) maintains standard asset allocation parameters which reflect generally observed market practices for institutional asset owners. While Wilshire expects most client portfolios will fall within these asset allocation ranges. Wilshire recognizes and occasionally recommends portfolio allocations that may diverge from these general ranges based on a client's particular circumstances, goals or needs.

Asset Segment	Corporate DB	Public DB	E&F
Total Equity (Public+Private)		0% - 80%	
Private Equity (Aggregate)	0% - 15%	0% - 20%	0% - 30%
Fixed Income (Core/High-quality - Liquid IG)	10% - 100%	10% - 50%	
Other Fixed Income/Credit (Aggregate)		0% - 25%	
Private/Illiquid Credit (Aggregate)		0% - 15%	
High Yield		0% - 10%	
Other: EMD, Loans, Convertibles		0% - 7.5%	
Total Real Assets (Public + Private)		0% - 25%	
Total Real Estate (Public + Private)		0% - 25%	
RA Other: Commodities, Gold, Infra, GLI, MLPs, O&G, Timber		0% - 5%	
Marketable Alternatives (Aggregate)	0% - 12.5%		0% - 20%
Cash		0% - 5%	
Leverage		0% - 20%	
Total Private/Illiquid	0% - 25%	0% - 35%	0% - 50%

These thresholds were informed by allocation information from Greenwich Associates, and Wilshire Advisors, LLC, universe data and will be reviewed for reasonableness from time to time.
**Last Updated 12/2021*

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Prepared For:

Education Session

Private Markets Overview – Real Assets, Private Equity, Fees & Expenses

January 19, 2023

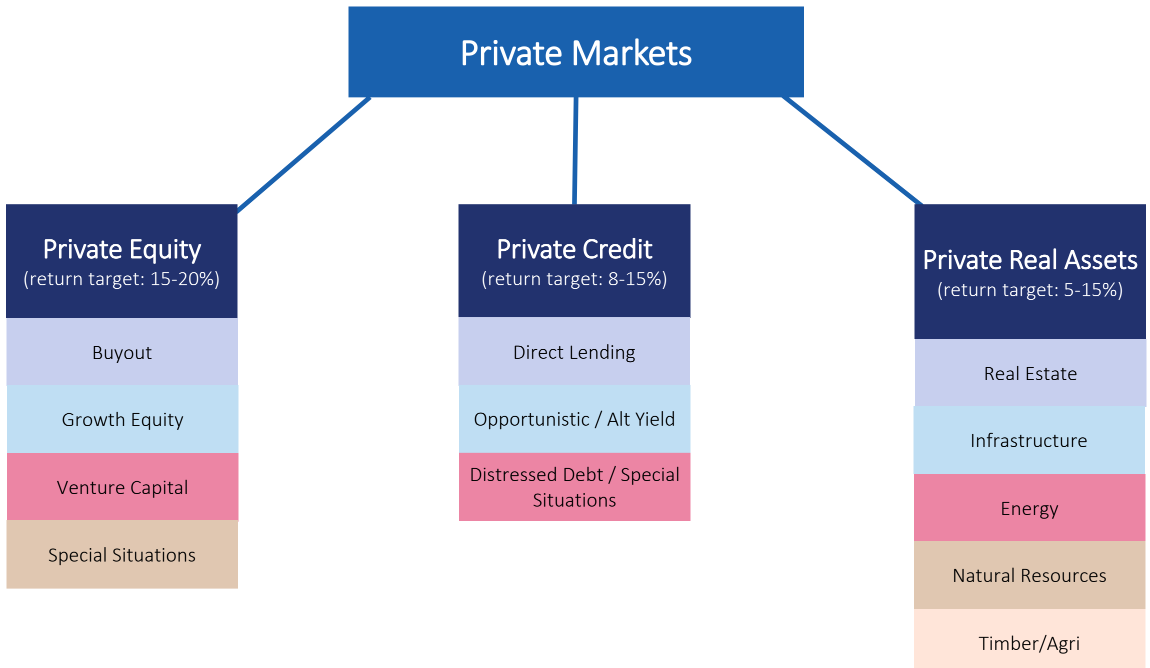
Wilshire

Agenda

- Private Markets Overview
- Private Equity
- Real Assets
- Wilshire Investment Philosophy and Process

What is Private Markets?

- Private markets refers to investments in non-publicly traded assets covering three main areas:



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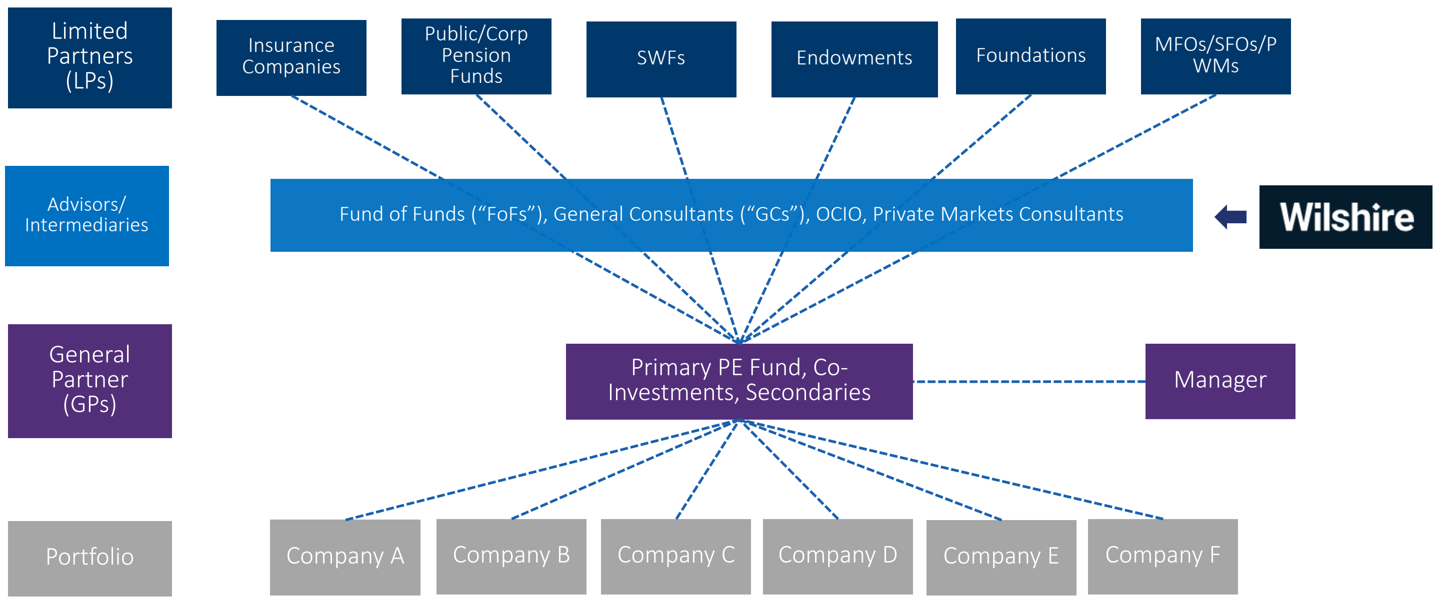
Private Markets Institutional Landscape

- The industry is set up to solve the "few to many" issue: many LPs (1000s), many more GPs (10,000s) and even *more* companies (100,000s)
- Wilshire is an Advisor/Intermediary, helping our Clients (LPs) with access



SWF = Sovereign Wealth Fund MFO = Multi-Family Office SFO = Single Family Office PWM = Private Wealth Manager LP = Limited Partner GP = General Partner

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Private Markets Investment Structures

- Private Markets are accessed by investors through four main mechanisms:

Primary Fund Investing (aka "Primaries")	– Invest in the fund of a manager, or GP, as a non controlling partner, or LP – Provides exposure to (typically) 8-15 underlying private portfolio companies
Co-Investments (aka "Co's" or "Coinvs")	– Invest alongside a GP in one of their deals – Provides exposure to (typically) 1 private portfolio company – Typically lower fees, more of a "narrower focus" approach
Secondaries → solves for the illiquidity of private markets investments	– Buy "pre-owned" positions in any of the above sometime after the initial investments have been made (may be years, even a decade+) – Typically can be bought at a discount, or sell existing positions to other buyers
Direct Investing (aka "Directs")	– Invest directly in a private company (w/o a GP) – Only the GPs are typically capable of this due to complexity → *Not offered by Wilshire*

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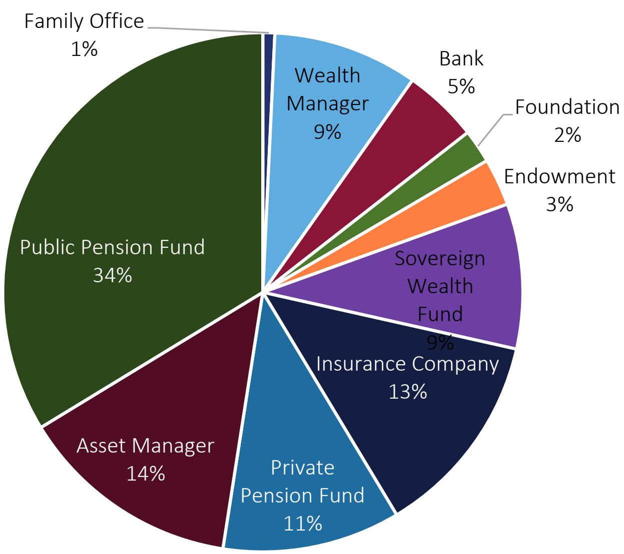
Who Invests in Private Markets?

- Investors allocating capital to the private markets span a broad spectrum:



Source: Total current allocation to private markets based on Preqin data as of January 11, 2022.

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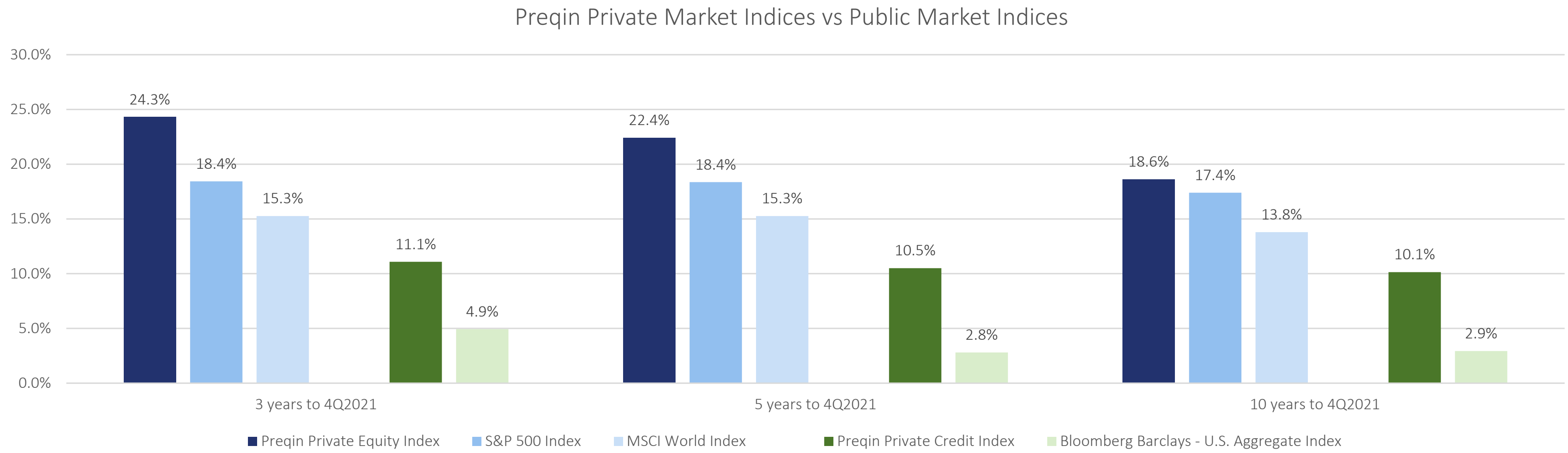
Private investments have shown differentiated sources of returns



Past performance is not indicative of future results. Indices are provided for illustrative purposes only and do not represent Fund performance as the Fund will not have exposure to many investments comprising the indices. No assurance can be given that the Fund will be successful or that investors will not lose some or all of their investment. Investors should be aware of limitation of the comparison which provides only one approach to comparing returns and volatility; prospective investors should consider comparisons to other indices and benchmarks. **The Preqin indices are created from quarterly data as supplied by managers that may be audited or unaudited. The indices are not transparent and cannot be independently verified and may be recalculated by Preqin each time a new fund is added, the historical performance of the index is not fixed, cannot be replicated, and will differ over time from the data presented in this communication. The funds included in the private capital data shown report their performance voluntarily and therefore the data may reflect a bias towards funds with track records of success.** Sources: Preqin and Wilshire as of December 31, 2021, which represents the most recent data available from Preqin due to the nature of private markets. Public market indices used include the MSCI ACWI (All Country World Index), the S&P 500 Index, and the Bloomberg Barclays US Aggregate Index. The Preqin Private Equity Index and the Preqin Private Credit Index quarterly returns include the both the impact of cash flows (cash contributions and distributions) and gains (change in net asset value (NAV) for each quarter and are net of management fees and carried interest charged by the general partners or sponsors of the underlying investments. Average annual compounded return calculations for both the private capital and public markets indices are time-weighted measures and are shown for reference and directional purposes only. Investors cannot invest directly in an index, and even if they had, there is no guarantee that investments could have been realized at any particular time or value to match a given index's results (including through the private secondary market). The Preqin Private Equity Index and the Preqin Private Credit Index are subsets of the overall Private Capital data set and are derived from the Preqin Private Capital Quarterly Index using the same methodology.

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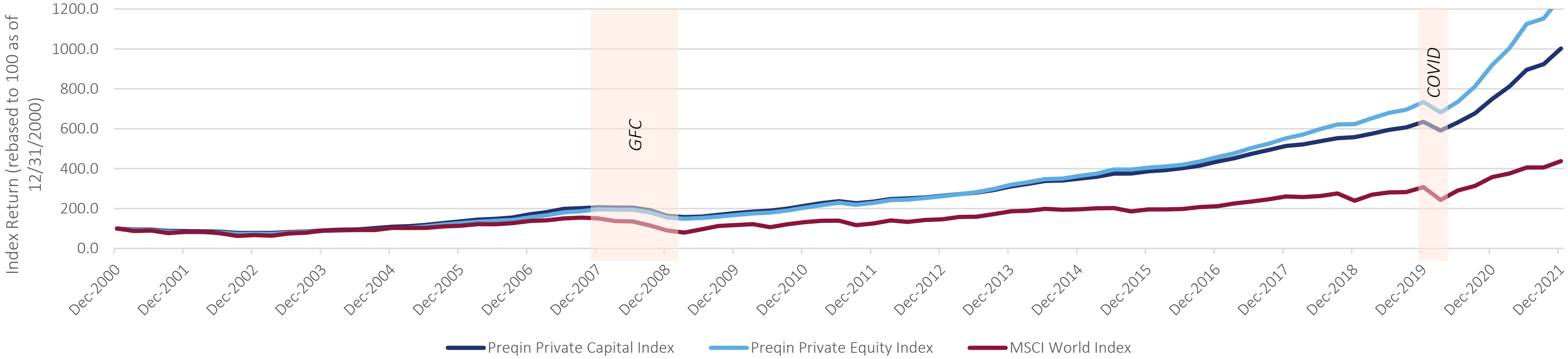
… and have been resilient through recessions/cycles…

Annualized Period Returns	Pre-GFC (4Q2000 - 4Q2007)	GFC (4Q2007 - 1Q2009)	Post-GFC (1Q2009 – 2Q2021)	COVID (4Q2019 - 1Q2020)
Preqin Private Capital	11.0%	-15.4%	15.6%	-24.5%
Preqin Private Equity	9.7%	-14.1%	18.3%	-25.4%
MSCI World	9.2%	-35.8%	14.3%	-60.9%



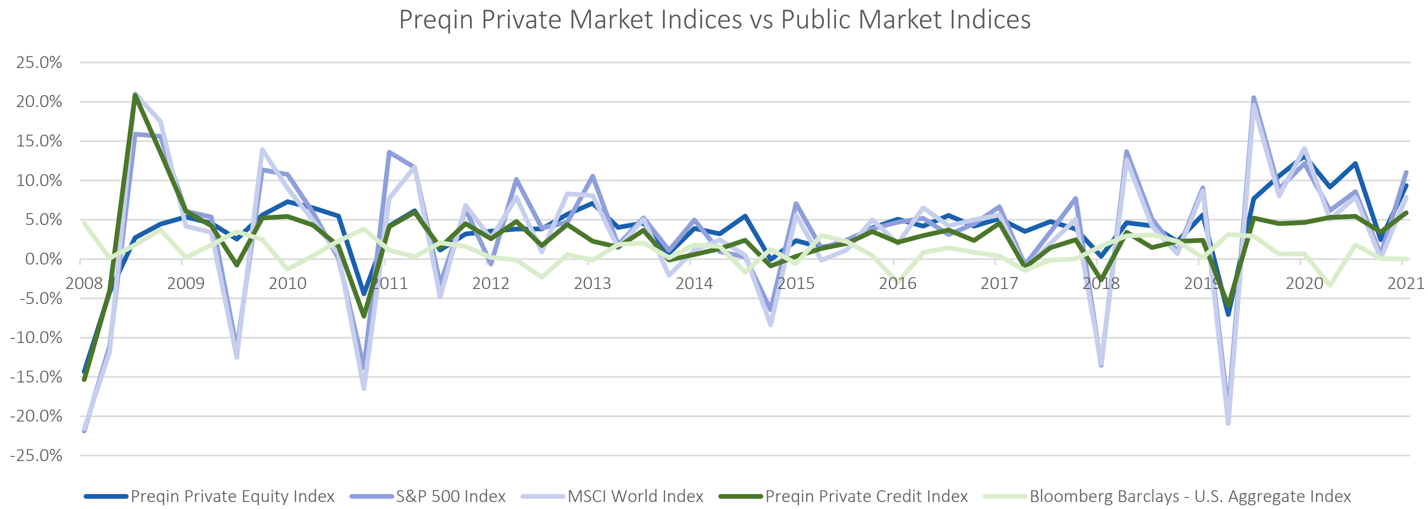
Indexes shown are based on quarterly time-weighted returns beginning December 31, 2000, and ending December 31, 2021.

Preqin Private Capital and Private Equity Indices include the both the impact of cash flows (cash contributions and distributions) and gains (change in NAV) for each quarter and are net of management fees and carried interest charged by the general partners or sponsors of the underlying investments. Investors cannot invest directly in an index, and even if they had, there is no guarantee that investments could have been realized at any particular time or value to match a given index's results (including through the private secondary market).

The Preqin Private Capital and Private Equity Indices are created from quarterly data as supplied by managers that may be unaudited. The indexes are not transparent and cannot be independently verified and may be recalculated by Preqin each time a new fund is added, and the results may differ over time from the data presented herein. The Preqin indexes rely on voluntary reporting by managers and thus may reflect a bias towards funds with track records of success. Past performance is not indicative of future results.

Wilshire

…while experiencing less volatility



Annualized Volatility

Preqin Private Equity Index	8.6%
S&P 500 Index	17.0%
MSCI - AC World Index	17.6%
Preqin Private Credit Index	9.5%
Bloomberg Barclays - U.S. Aggregate Index	3.3%

Past performance is not indicative of future results. Indices are provided for illustrative purposes only and do not represent Fund performance as the Fund will not have exposure to many investments comprising the indices. No assurance can be given that the Fund will be successful or that investors will not lose some or all of their investment. Investors should be aware of limitation of the comparison which provides only one approach to comparing returns and volatility; prospective investors should consider comparisons to other indices and benchmarks. **The Preqin indices are created from quarterly data as supplied by managers that may be audited or unaudited. The indices are not transparent and cannot be independently verified and may be recalculated by Preqin each time a new fund is added, the historical performance of the index is not fixed, cannot be replicated, and will differ over time from the data presented in this communication. The funds included in the private capital data shown report their performance voluntarily and therefore the data may reflect a bias towards funds with track records of success.** Sources: Preqin and Wilshire as of December 31, 2021, which represents the most recent data available from Preqin due to the nature of private markets. Public market indices used include the MSCI ACWI (All Country World Index), the S&P 500 Index, and the Bloomberg Barclays US Aggregate Index. The Preqin Private Equity Index and the Preqin Private Credit Index quarterly returns include the both the impact of cash flows (cash contributions and distributions) and gains (change in net asset value (NAV) for each quarter and are net of management fees and carried interest charged by the general partners or sponsors of the underlying investments. Average annual compounded return calculations for both the private capital and public markets indices are time-weighted measures and are shown for reference and directional purposes only. Investors cannot invest directly in an index, and even if they had, there is no guarantee that investments could have been realized at any particular time or value to match a given index's results (including through the private secondary market). The Preqin Private Equity Index and the Preqin Private Credit Index are subsets of the overall Private Capital data set and are derived from the Preqin Private Capital Quarterly Index using the same methodology.

Wilshire

Building & Managing a Private Markets Allocation

- Develop expectations
- Create long-term optimal portfolio
- Investment type – primary, secondary, co-investment
- Utilize pacing model

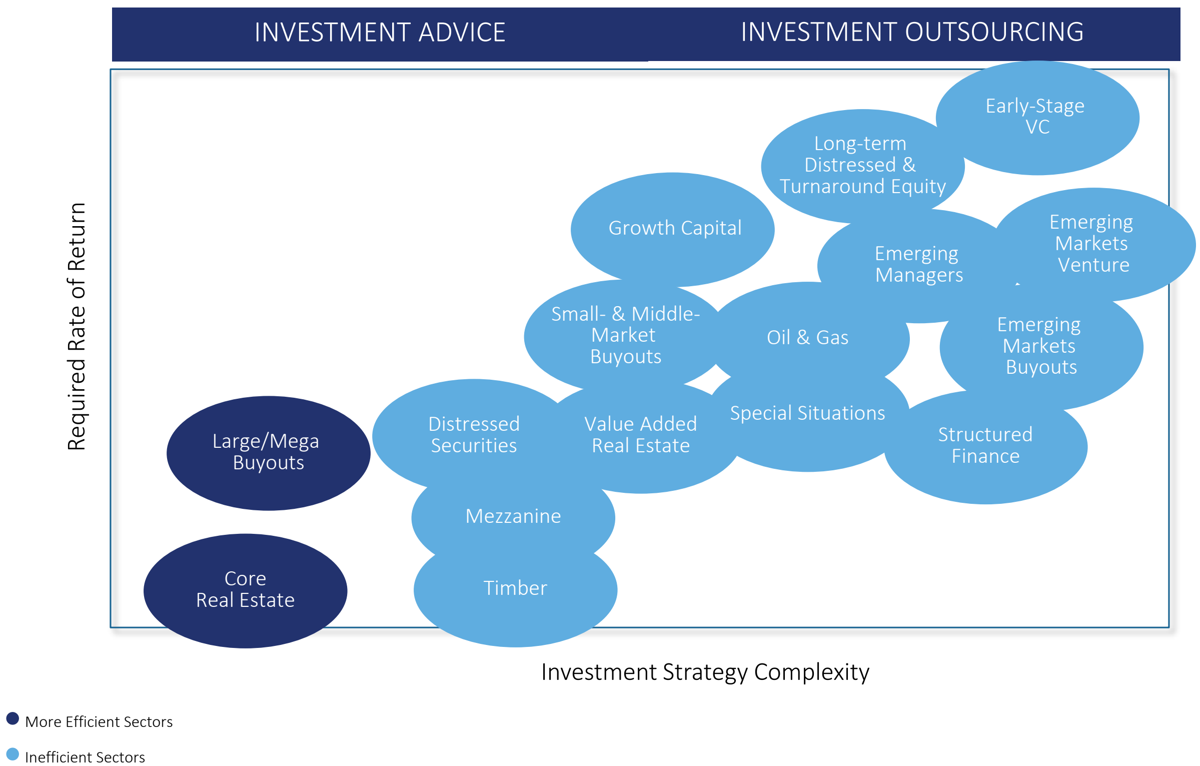
- Geographical diversification
- Vintage year diversification
- Diversification by sector / industry

- Performance measurement and reporting
- Portfolio monitoring
- Partnership amendments

- Develop forward calendar of opportunities
- Initial screening
- In-depth investment due diligence
- Operations due diligence
- Legal review
- Portfolio construction

Wilshire

Private Markets Opportunity Set



Wilshire

Common Private Market Terms

- ACCREDITED INVESTOR
  Individuals with at least a $1 million net worth or an individual with annual income of at least $200,000.
- QUALIFIED PURCHASER
  Individual investors that have at least $5 million in investable net worth in order to be eligible to invest in private equity.
- COMMITTED CAPITAL
  The amount of a limited partner's financial obligation to a fund.
- DRAWDOWN
  Also referred to as a capital call. Fund manager's request for capital from limited partners.
- VINTAGE YEAR
  The year of a fund's first capital call (drawdown).
- J-CURVE
  The illustration of the fund's IRR over time. Returns are often negative in a fund's first few years due to management fees.
- FUND OF FUNDS
  A fund that invests in other underlying portfolio funds.
- CARRIED INTEREST ("CARRY")
  The percentage of realized gains (generally 20%) that general partners receive after returning investors' capital. For example, if a $100 million fund sells its investments for $250 million, the GP would receive a carry of $30 million (20% of the $150 million gain).
- SECONDARY SALE
  The sale of an established private equity fund or portfolio company to another limited partner.

Wilshire

Private Equity

Wilshire

What is Private Equity?

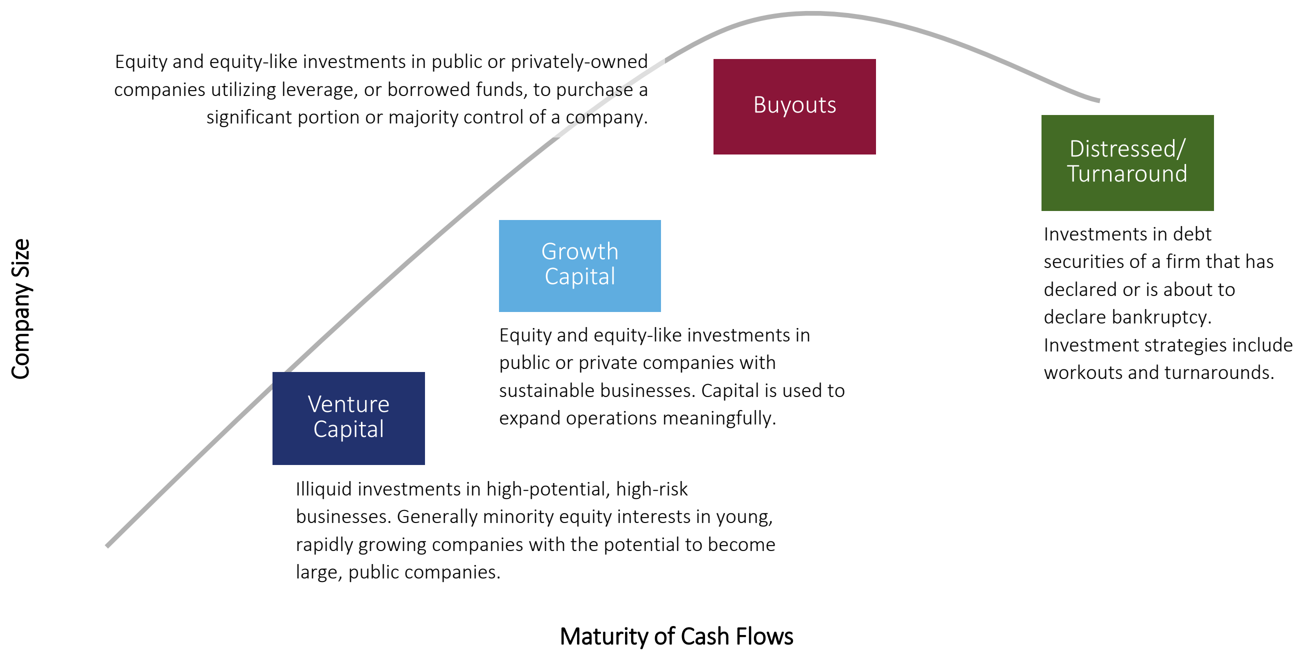
Private equity is any investment representing an ownership interest where there is no readily tradable or public market.

	PUBLIC EQUITY	PRIVATE EQUITY
AVAILABLE INVESTMENTS	• Approximately 63,000 public companies worldwide (Bloomberg).	• 65,000,000 private companies worldwide (Hoovers).
INVESTMENT SECURITY	• Minority equity participation with limited control or influence.	• Often control or influential minority equity ownership, with greater ability to effectuate change, manage risk and create value.
ACCESS	• Typically larger, more mature companies are eligible to be public.	• Ability to invest in any phase of the company life cycle (seed investments through distressed).
BARRIER TO ACCESS	• Can be accessed through a registered broker.	• Invitation only (available only to qualified investors as defined by the relevant regulation
LIQUIDITY	• Often provide for daily liquidity options.	• Return of capital investment and returns over 10-12 year period, with no discretionary interim liquidity option.
VALUATIONS	• Daily valuations based on market pricing.	• Quarterly valuations on unrealized investments.
RETURNS	• Expected return of 4.5%[1].	• Expected return of 8.1%[1].
FEES	• 15-70 bps on average[2]	• Typically 200 bps management fee, 20% carried interest

[1]Based on Wilshire's 2022 Risk and Return Assumptions. These assumptions are forward-looking and there is no guarantee these returns will be realized.
[2]Source: Morningstar, asset-weighted average fees for active and passive mutual and exchange-traded funds
Incorporating alternative investments, such as private equity and debt into a portfolio presents the opportunity for losses as well as gains, including, in some cases, loss of the entire principal. Some alternative investments have experienced periods of extreme volatility which may not be reflected in the valuation of the investment and in general, are not suitable for all investors. Asset allocation and diversification strategies do not ensure profit or always protect against loss.

Wilshire

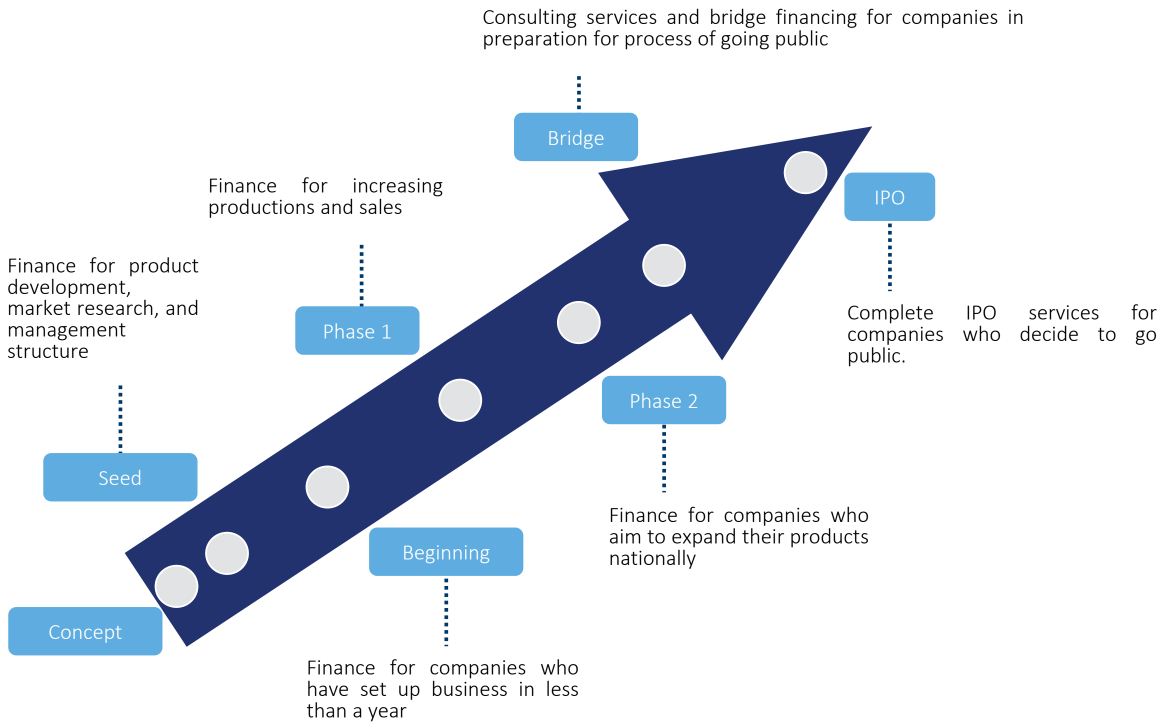
Private Equity Investments During Company Lifecycle



Wilshire

Venture Capital Financing Stages

Investment Stages and Consulting Services for SMEs



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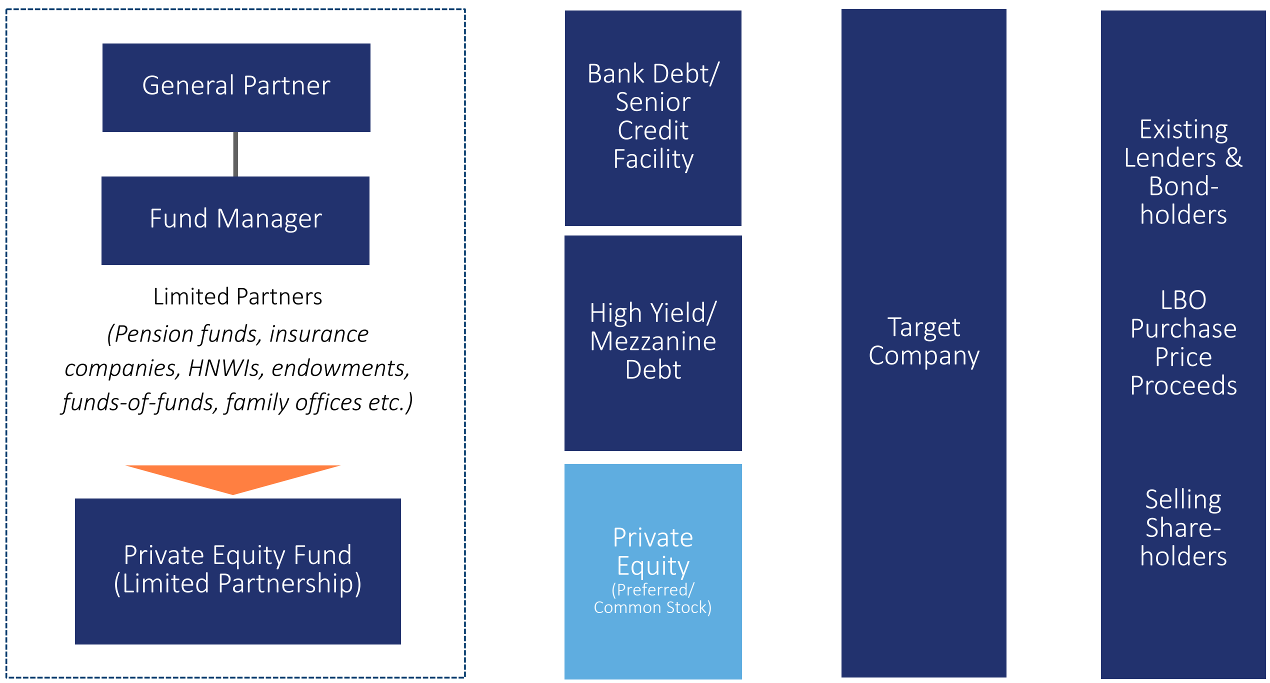
Anatomy of a Buyout Fund



Wilshire

Different Characteristics

	VENTURE CAPITAL	GROWTH EQUITY	BUYOUT	SPECIAL SITUATIONS
Portfolio Company Stage	Early-Late	Expansion	Mature	Little to no growth
Revenues	None / low but growing	Substantial growth	Self-sustaining	Flat or eroding
Number of Fund Investors	Multiple	One or multiple	One or multiple	One or multiple
Manager Involvement	Moderate	Moderate	Heavy	Heavy
Financing Rounds by Investors	3 -5	1-3	Often 1	Often 1
Use of Debt	Rarely	Rarely	Almost always	Rarely
Source of Quarterly Valuations	New financing rounds, Fair market value (FMV)	New financing rounds, Comparables, FMV	Comparables, FMV	Comparables, FMV
Failure Rate	Moderate	Sometimes	Infrequent	Moderate

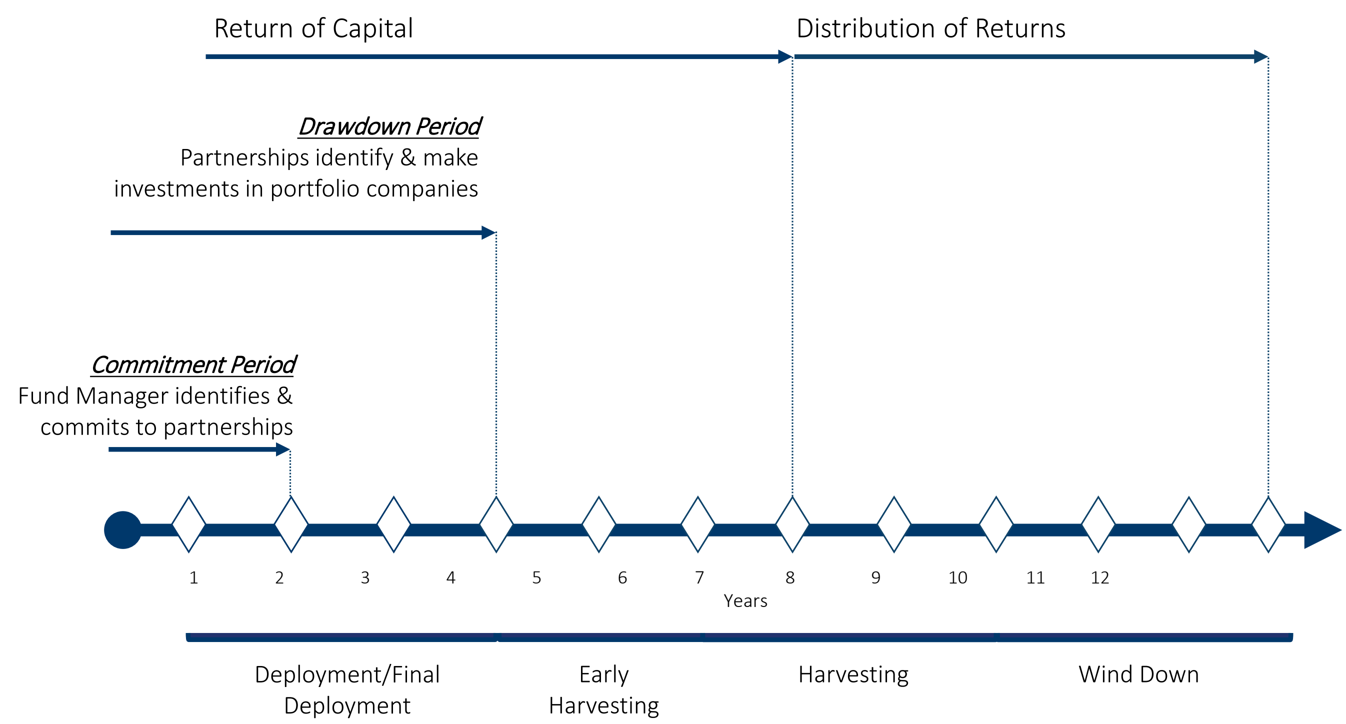
Wilshire

Partnership Structures & Fees

- Structure
  - The primary vehicle is the private limited partnership that is not registered with the SEC.
  - Limited partnership is managed by the general partner.
  - Partnerships are long lived, ranging from 10–12 years.
  - The partnership draws capital from LPs to fund investments over a specified investment period, then distributes capital back to LPs as investments are liquidated or sold.
- Fees
  - Typically, the manager charges the limited partner an annual management fee along with performance fees, or "carried interest" which represents a portion of the profits above a stated hurdle rate.
  - Management fees on direct fund investments typically range from 1.5-2.5% annually, and are charged on committed capital. Fees are reduced after the investment phase.
  - Hurdle rates can range from 8-15% with carry ranging from 5-20%.

Wilshire

Private Equity Cash Flow Cycle



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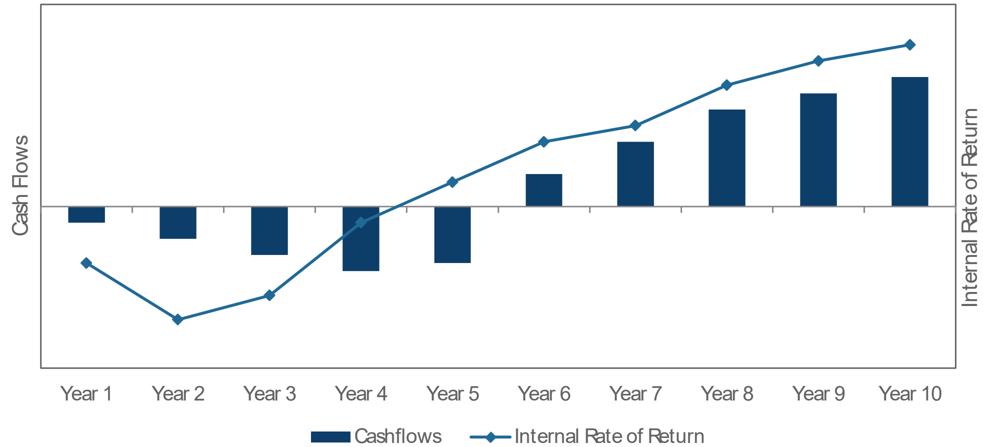
Implementation

- Understanding the "J-Curve" Effect
  - The investment cycle of a private equity investment is long and exhibits a pattern referred to as the "J-Curve".
  - Investors can expect early losses in the first few years of each investment.
  - Losses are largely the result of manager fees.
  - It stresses the importance of portfolio construction modeling to mitigate risk.



The chart shown here is for illustrative purposes and is not meant to represent any specific investment or the returns of any specific investment.

Wilshire

How Does Private Equity Create Value?

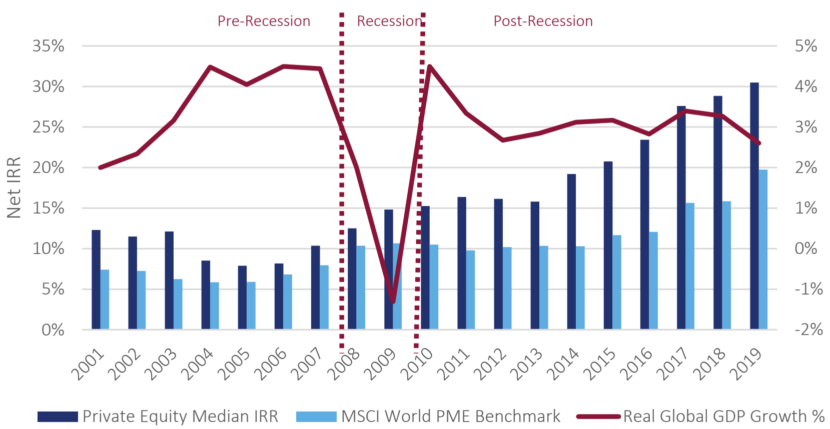
- Historical excess return over the indexed return for public equity, driven by:
  - Control: The ability of professional managers to provide strategic direction, allocate investment capital, increase operational efficiency of a business or asset, and determine timing of exit
  - Alignment: The direct management ownership of private equity-backed businesses aligns management and shareholder economic interests more closely than is typically possible in publicly traded companies.
  - Information Advantage: The private equity buyer generally has more time and greater access to information when performing due diligence on a private investment than a publicly traded stock.
- Expanded opportunity set
- Potentially reduced correlation with traditional benchmarks

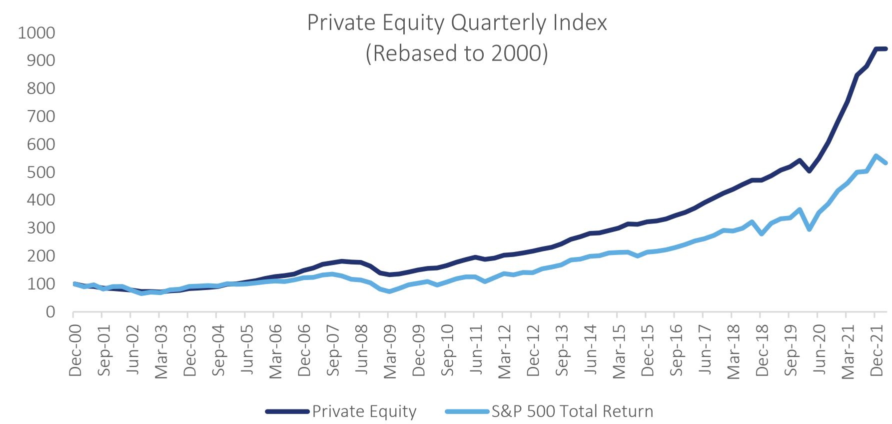
 |

Wilshire

The Benefits of Private Equity Investing

- Private equity as an asset class has generated returns, net of all fees and expenses, in excess of diversified public market alternatives over a range of different time periods.
- Portfolio diversification with lower volatility than public equity market exposure
- Ability to invest at various stages of company development from early-stage venture capital through expansion, to later-stage investments in mature buyouts or distressed companies



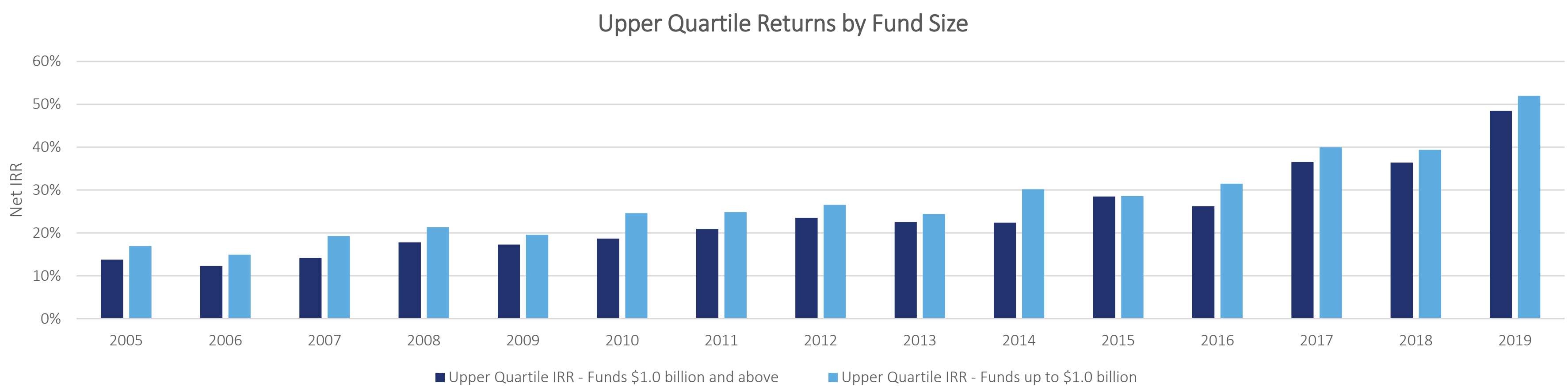


Source: Preqin. Private Equity Median IRR reflects returns for each vintage year shown through March 31, 2022; vintage years after 2019 are not meaningful. PME benchmark based on Long Nickels methodology as of most up-to-date, March 31, 2022. Past performance is not indicative of future results.

Wilshire

The Private Equity Market Opportunity

- The dispersion of private equity returns is significantly larger than that of other asset classes, highlighting the importance of manager selection.
- Top-quartile managers in smaller funds continue to outperform other managers in larger funds.

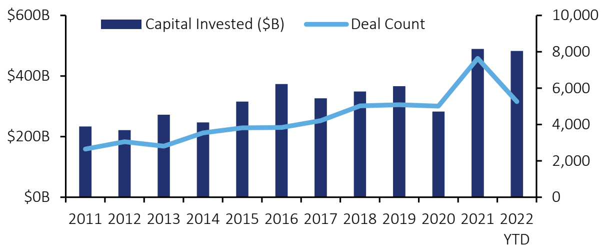


Source: Preqin custom benchmark, as of most up-to-date (January 12, 2022). Custom benchmark includes buyout, venture, growth, and special situations funds (2005 – 2019 vintages).

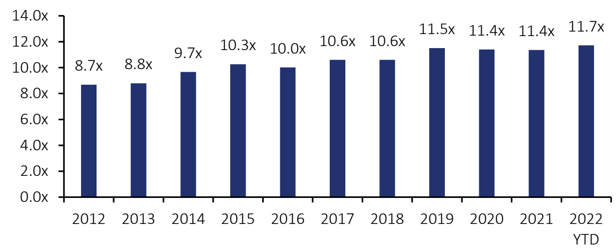
Wilshire

U.S. Buyout Outlook: Neutral

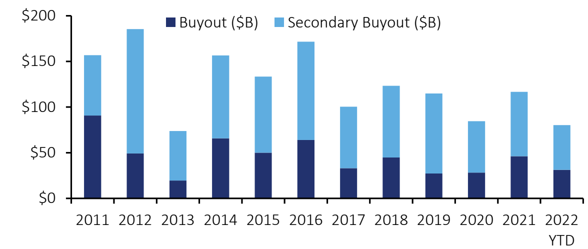
U.S. Buyout Investment Activity[1]



Purchase Price Multiples[2]



U.S. Buyout Exit Environment By Exit Type[3]



Regional Influences

- \+ Expansionary fiscal policy through infrastructure & renewables spending as well as the CHIPS bill
- \+ Strong labor market (3.6% unemployment as of June '22) and healthy consumer balance sheets
- \+ Local abundant energy resources
- ± Wealth disparity
- ± Increased dry powder from robust fundraising in recent years & increased interest in non-traditional, illiquid investments
- ± Continuing secular COVID-19 impact on sectors
- \- Elevated purchase price multiples
- \- Increases in debt financing costs
- \- Real GDP growth slowing
- \- High inflation
- \- Potential corporate tax rates hike & rising minimum tax rate
- \- Global geopolitical tensions
- \- Supply chain, labor, and material shortages
- \- Increased regulatory scrutiny

Local Considerations

- Proportion of exits to strategic buyers remains high as sponsor-to-sponsor exits and public listings decline
- Favor shifting towards companies with predictable, recurring revenue with profitability and ability to withstand volatile market conditions
- Onshoring to provide resiliency to supply chains
- Shifting retail spending habits including shift to e-Commerce
- Health awareness and healthcare access trends in post-pandemic "new normal"
- Increased adoption of technology and automation across numerous sectors
- Digital content, entertainment and online collaboration and content moderation

Industry / Sector Outlook

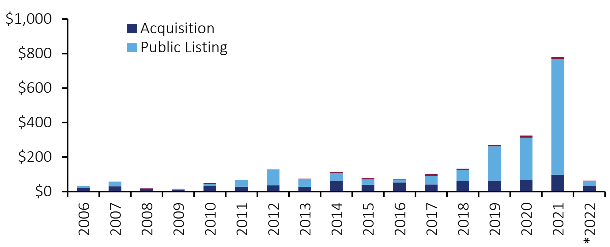
Sector	Investment Opportunity
Industrial	◐
Consumer	◐
Healthcare	●
Financials	◐
Technology	◕
Diversified	◐

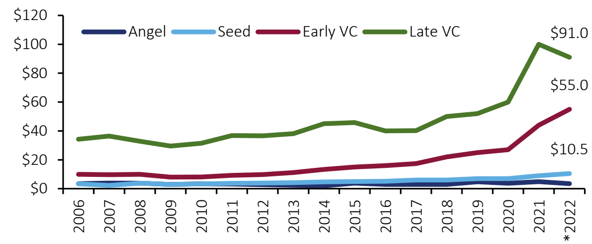
[1] Source: Pitchbook, US Investment Activity by Year as of October 28, 2022. [2] Source: S&P LBO Review, Purchase Price Multiples as of Q3 2022.[3] Source: Pitchbook, US Buyout (PE-backed) exits (per invested capital) as of October 28, 2022.

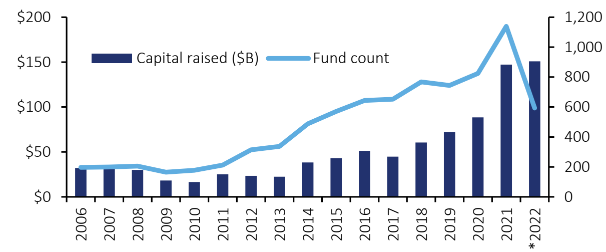
Wilshire

U.S. Venture Capital Outlook: Neutral

Exit Activity ($B)[1]	Median Pre-money Valuations ($M)[1]	Fundraising Activity[1]







Regional Influences

+ Acceleration of tech-driven sector disruption and long-term tech tailwinds
+ Resilience of venture as an asset class during COVID and relative insulation in early-stage venture vs late-stage
+ Companies focusing on capital efficiency and unit economics
+ Expectation for improving transaction and pricing dynamics
± Dry powder from strong fundraising in recent years (help existing portfolio companies and take advantage of opportunities vs still competitive)
- Weak exit environment and IPO window closed

Local Considerations

- Focus on business models (unit economics; sources of revenue – e.g. ads)
- Supply chain tech including last-mile delivery services and e-commerce
- Emergence of technology "hubs" outside of Silicon Valley
- Cybersecurity, AI, BI and analytics
- Biotechnology and healthcare tech
- Baby boomers, millennials and gen Z
- Fintech: losers and winners, evolving regulations
- ESG-focused funds and new administration's favorable policy towards sustainable investing; climate tech reaching an inflection point
- Rise of diverse managers
- Shifting consumer preferences and innovation in consumer products
- Blockchain, digital assets, and build-out of Web 3.0.

Industry / Sector Outlook

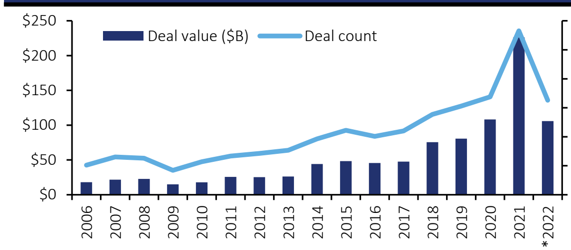
Sector	Investment Opportunity
Industrial	
Consumer	
Healthcare	
Financials	
Technology	
Diversified	

[1] PitchBook/NVCA Venture Monitor *as of Q3 2022

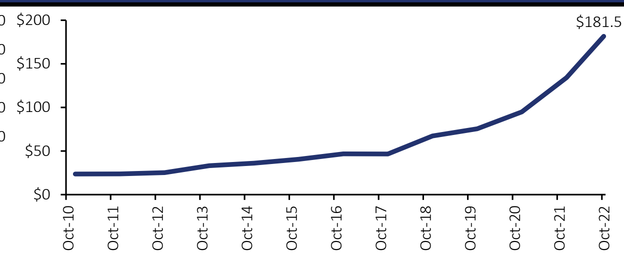
Wilshire

U.S. Growth Equity Outlook: Cautious

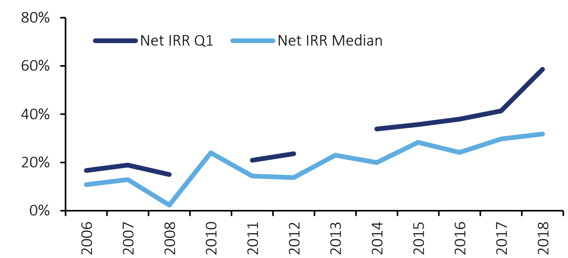
Investment Activity[1]



Growth Equity Dry Powder[2]



Vintage Year Performance[3]



Regional Influences

+ Continued pipeline of venture activity
+ Acceleration of tech-driven sector disruption long-term tech tailwinds
+ Increased need for manager selection to discern between luck vs skill
+ Larger and more mature companies staying private longer
+ Larger addressable technology markets
+ Emphasis on cash/profitability over strict growth
+ Repricing of valuations for unprofitable, high-growth companies
+ Non-traditional investors shifting focus outside growth sector
± Elevated levels of dry powder from strong fundraising in recent years
- Lengthened exits and difficulty closing funds
- Inflation concerns with the backdrop of falling US GDP
- Unfavorable IPO environment
- Increased interest rate risk exposure for public and private growth tech companies
- Longer stretches between raises & smaller funding rounds

Local Considerations

- Prioritizing capital efficiency and unit economics for robust revenue-based business models
- Data privacy and antitrust concerns
- Sustainability and ESG focus across industries
- Energy transition supply chain risk shifting upstream
- Increased exposure to the volatile geopolitical environment
- Energy transition and renovated climate tech investment focus
- Supply chain technology & tech-enabled services
- Healthcare technology & consumer wellness
- Fintech innovation centralized around blockchain and DeFi infrastructure resiliency
- Cybersecurity and industry-agnostic security focus (i.e. energy security, consumer privacy protection)
- Business model innovation (e.g., D2C, omnichannel, Substack)

Industry / Sector Outlook

Sector	Investment Opportunity
Industrial	
Consumer	
Healthcare	
Financials	
Technology	
Diversified	

[1] PitchBook/NVCA Venture Monitor – Growth Equity, *as of Q3 2022. [2] Preqin, as of October 28, 2022. [3] Preqin North America Growth benchmark, as of most up-to-date (April 11, 2022).

Wilshire

Fees and Expenses in Private Markets

Wilshire

Management Fees

- During Investment Period
  - Predominantly calculated as a percentage fee (rate) applied to LP commitment (base)
  - Discounts are sometimes offered for size, overall commitment to a sponsor’s funds and/or “initial” or “early bird” close discounts
  - The management fee should encompass all normal operations of a GP to include, at a minimum, overhead, staff compensation, travel, deal sourcing and other general administrative items as well as interactions with LPs
- Following Investment Period
  - May step down using one or more different mechanisms implicating rate and/or base

 |

Wilshire

Incentive Fees

- Carried Interest – Percentage of the profits the GP will receive as a performance-based fee.
  - Mechanism to align the LP's return objective with that of the GP
  - Ideally, a GP will make the bulk of its wealth from its share of the carried interest
  - For most private equity structures, this figure ranges between 15%-25%
  - Since its existence may motivate a manager to take greater risk to achieve higher returns, it is balanced with the expectation that the GPs will be investing their own capital alongside the LPs. This is known as a GP commitment.

- Hurdle Rate – The target return which the GP needs to reach before the performance fee is triggered.
  - For most private equity structures, this figure ranges between 6% - 8%
  - Common fee structure nomenclature includes "2% / 20% over 8." This translates into a 2% management fee, 20% carried interest and an 8% hurdle rate

Incentive Fee Distribution Example

*Does Not Include Hurdle Rate	
Total Capital Invested	$10,000,000
Proceeds Upon Full Realization	$20,000,000
Profits	$10,000,000
Carried Interest Allocation to GP (20%)*	$2,000,000
Distributions (Net Proceeds) to LP	$8,000,000
Net MOIC	1.8x

Wilshire

Waterfalls

- Waterfalls – Refer to the structure of the fund’s distributions
  - Defining the structure is necessary, as available cash is distributed as it is generated throughout the life of a fund
  - There are a myriad of ways that a distribution waterfall can be structured. They are typically categorized as either European or American Style.

- European-Style Waterfall
  - Typically used by most GPs (in Europe and elsewhere) and is widely considered the most LP-friendly structure
  - Entails the payment of the carried interest after all capital is drawn and returned to investors

- American-Style Waterfall
  - Employs a deal-by-deal structure and may not take other portfolio losses into consideration
  - There are several variations to these structures which involve various additional types of investor protection from overpayment of carried interest

Wilshire

Catch-Up

- Catch-Up – A provision that accompanies how the carried interest is paid after the hurdle rate is achieved.
  - Cited as a percentage of distributions received by the GP to get “caught up” to the full carried interest percentage after the hurdle rate is achieved
- 100% Catch-up
  - After 8% is achieved and distributed, 100% of the following distributions will accrue to the GP until they achieve their target percentage of carried interest.
- 0% Catch-Up
  - After 8%, the following profits are simply distributed based on the carried interest percentage (e.g. 80% to L.Ps / 20% to the GP). In this circumstance, the GP only shares in the incremental profits above the hurdle rate, rather than the full profits.

Return Distribution	100% Catch-Up		No-Catch-Up	
	LPs / Investor	GP / Manager	LPs / Investor	GP / Manager
First 8%	8.0%	0.0%	8.0%	0.0%
Next 2%	0.0%	2.0%	1.6%	0.4%

Wilshire

Common Negotiated Terms

- Primary
  - Management Fees
  - Level of Profit Sharing / Carried Interest
  - Hurdle Rates of Return
  - GP Commitment
  - Key person provisions
  - For-cause removal/removal without cause of GP
- Secondary
  - Co-Investment Rights
  - Advisory Board Seats
  - Fund Size / Hard Cap
  - ROFR on Secondaries (Right of First Refusal on Future Secondaries)
  - Conflicts of Interest (e.g., new partnerships formed by general partner)

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Real Assets

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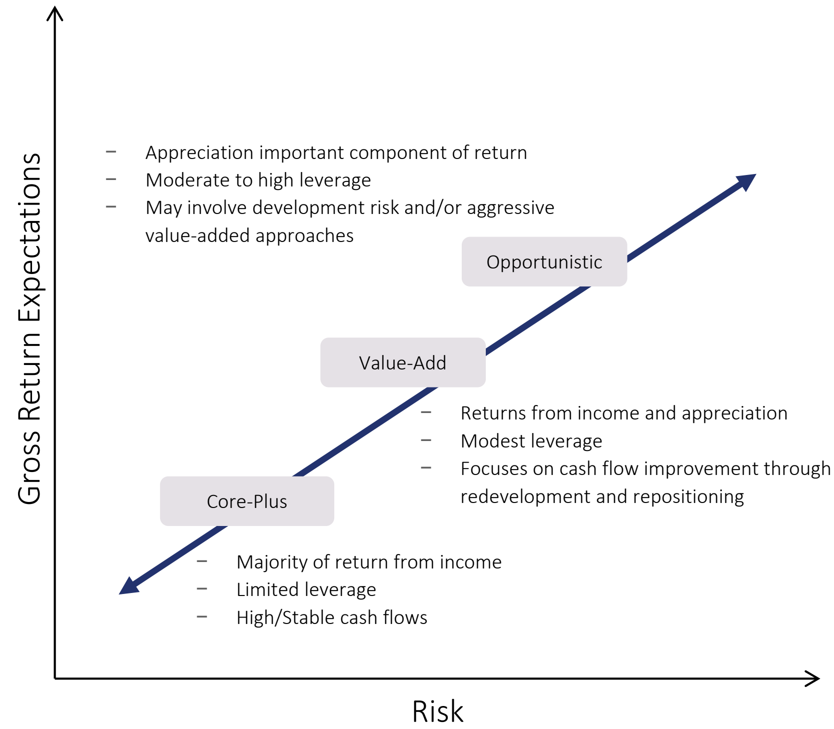
Private Real Assets – Sector Overview

Sector
Real Estate
Infrastructure
Natural Resources Energy Timber/Ag Renewables Other

Risk/Return Target



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Real Assets Network

Global

Energy	Energy Investors Funds; Pine Brook; EnCap Investments L.P.; Merit Capital Partners; Avista Capital Partners; HitecVision; ArcLight; NGP; Energy Spectrum Capital; Cresta Energy Capital; Kayne Anderson Capital Advisors, L.P.; Hastings Equity Partners; Quantum Energy Partners; First Reserve Corporation
Infrastructure	EQT; Brookfield Infrastructure Partners; Arcus Infrastructure Partners; KKR; Fortress; Oaktree; The Carlyle Group
Timberland	The Campbell Group LLC; GFP Global Forest Partners LP; RMS; Hancock Timber Resource Group (A Manulife Asset Management Company); The Lyme Timber Company; Olympic Resource Management; FIA Timber Partners; Global Environment Fund; The Forestland Group, LLC
Real Estate	Woodbourne; Harrison Street; Kennedy Wilson; TA Realty; Savanna; HMC; Principal Global Investors; Berkshire; Blackstone; Long Wharf Real Estate Partners; Carmel Partners

Manager names represent firms tracked in Wilshire's investment database with corresponding contact notes.

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Real Assets – Real Estate

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Real Estate Return Characteristics

Real estate as an asset class can also be classified by objective, strategy and liquidity

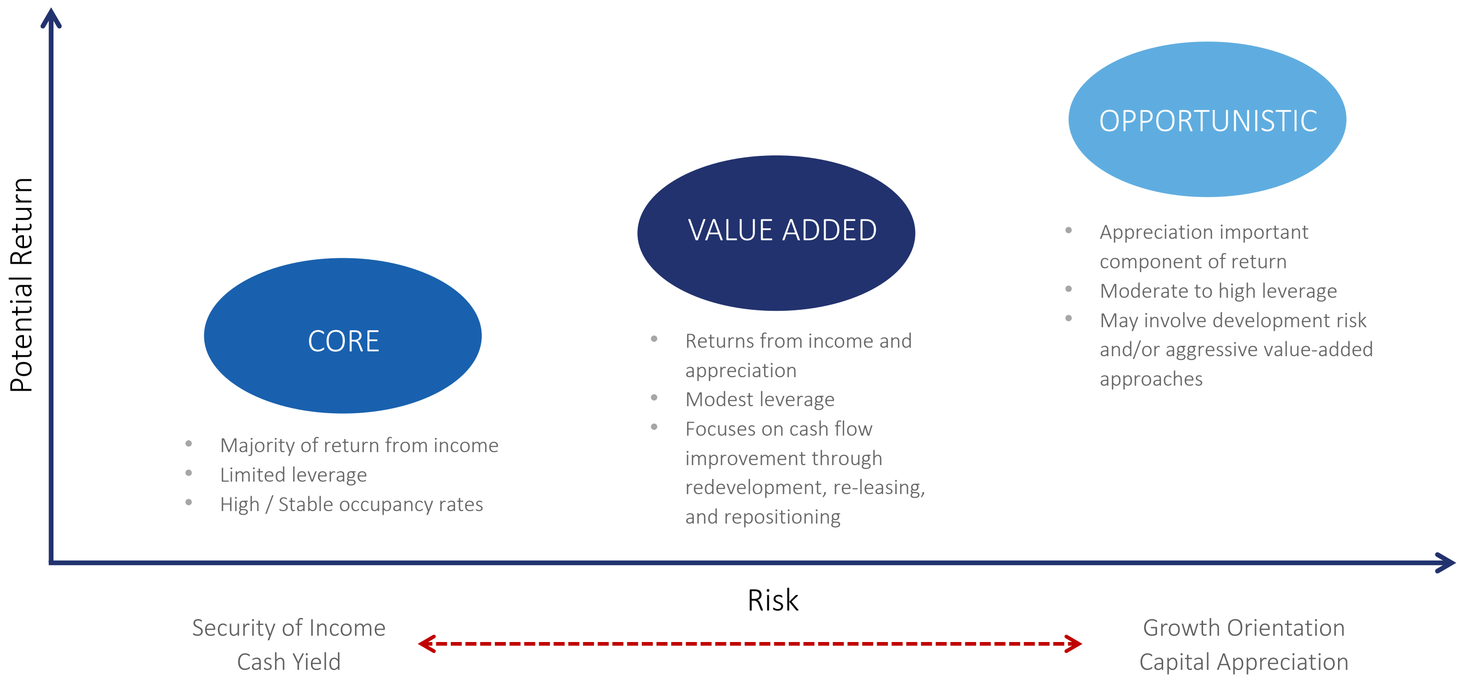
PRIMARY OBJECTIVE	STRATEGY	EXPECTED RETURN* (% P.A.)	RETURN COMPONENTS	LIQUIDITY	VOLATILITY / RISK	TYPICAL LEVERAGE
INCOME	Core	6% - 10%	70% income 30% growth	Moderate	Low	~30%
	Core Plus	9% - 11%	60% income 40% growth		Moderate	~50%
ASSET APPRECIATION	Value-Add	10% - 18%	40% income 60% growth	Low	High	<65%
	Opportunistic	15% - 20%+	10% income 90% growth		Very High	> 65%

*There is no guarantee investments will achieve the Expected Return.

Wilshire

Real Estate – Opportunity Set

PRIVATE REAL ESTATE STRATEGIES FALL INTO THREE CATEGORIES:



Wilshire

Real Estate – Opportunity Set

	APARTMENT	HOTEL	INDUSTRIAL	OFFICE[1]	RETAIL
SUBTYPES	High-Rise Elevator Projects Low-Rise Projects Garden-Type Projects	Hotel and Hospitality Properties	Flex Space R&D Warehouse Manufacturing Office Showroom	Central Business District (“CBD”) Suburban	Neighborhood Center Community Center Regional Center Super Regional Center Fashion/Specialty Power Center Theme/Festival Center Outlet Center
SPECIALTY	Student Housing Senior Housing		Self Storage	Medical Office	

[1] Geographic classifications as defined by zip code areas

Data source: National Council of Real Estate Investment Fiduciaries

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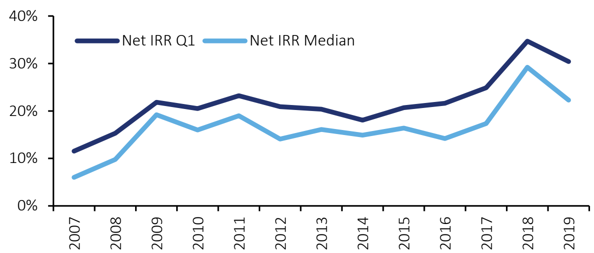
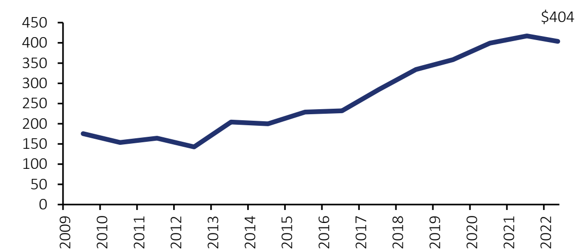
Wilshire

U.S. Real Estate Outlook: Neutral

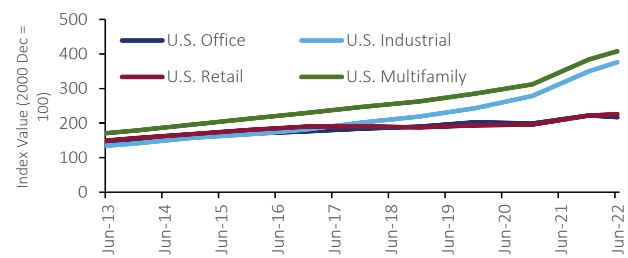
Vintage Year Performance[1]



Real Estate Dry Powder ($B)[2]



U.S. Property Type Pricing Indices[3]



Regional Influences

+ Demographic shifts due to growth of millennial population and aging baby boomers
+ Positive attributes during a higher inflationary period
+ Increasing emphasis on meeting ESG standards
± Secular COVID-19 impact on sectors
- Rising interest rate environment's impact on yields
- Slowed transaction activity and renewed price discovery period amidst macroeconomic backdrop
- Rising labor and construction costs due to supply chain disruption and current workforce trends
- Record-breaking fundraising in 2021 and resulting dry powder
- Pullback of lenders / financing for certain sectors and deals

Local Considerations

- Less competitive lower middle market opportunities
- Flexible portfolio construction and investment structuring
- Historical resiliency of multifamily and demand for industrial
- Select deep distressed opportunities in office and retail
- Increased outpatient care and aging population creating demand for medical properties
- Growth in single family rental opportunities amidst supply / demand imbalance and record high cost of homeownership
- Retail conversions to logistics or mixed-use assets
- Niche sub-sectors with short-term leases (including self-storage and student housing) in high inflationary environment

Industry / Sector Outlook

Sector	Investment Opportunity
Core	
Core Plus	
Value-Added	
Opportunistic	
Debt	

[1] Preqin North America Real Estate benchmark, as of most up-to-date (October 5, 2022). Note: inadequate number of funds prevents quartile analysis in certain vintage years.

[2] Preqin Real Estate Quarterly Update. Data as of October 5, 2022.

[3] CoStar Commercial Repeat-Sale Indices (CCRSI), CoStar Group. Value weighted data. Data through June 2022.

Wilshire

Real Assets – Infrastructure

Wilshire

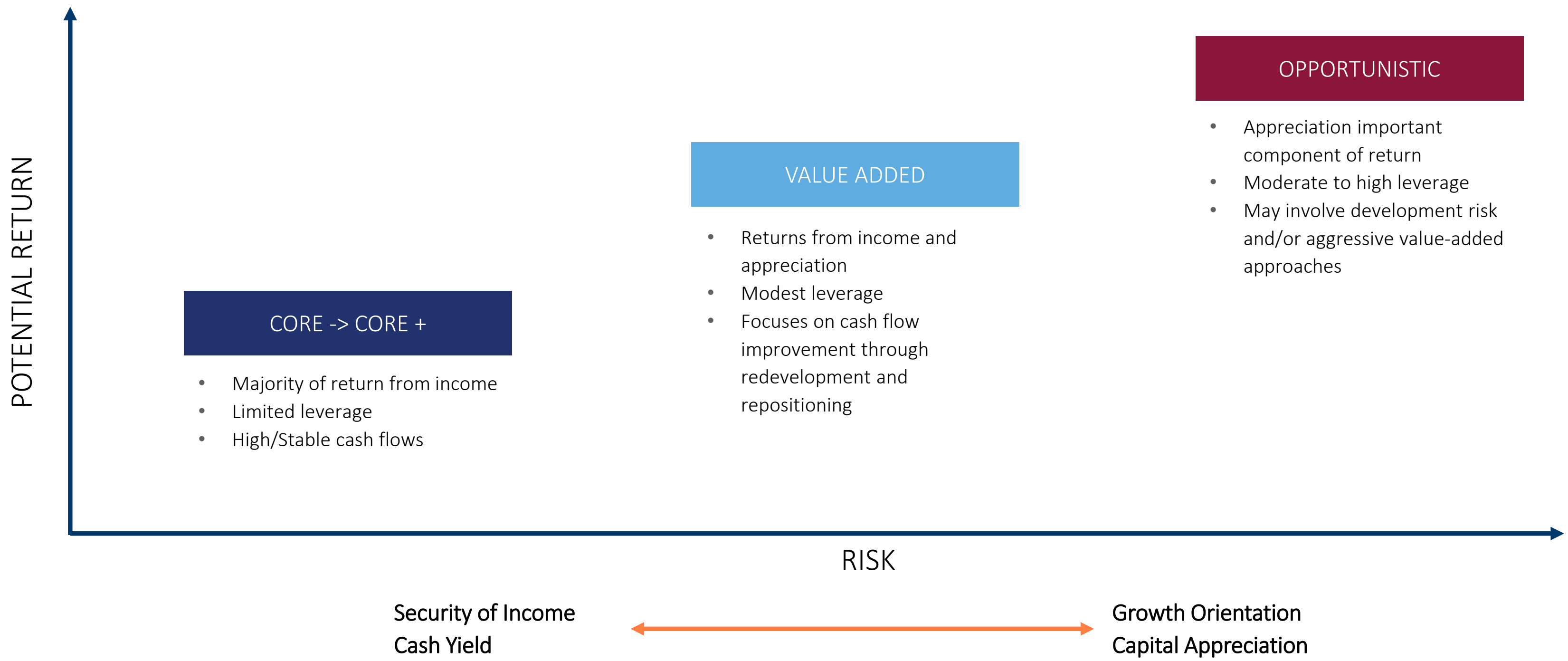
Infrastructure Overview

- Investment Merits
  - Low sensitivity to macro-economic swings
  - Low correlation with other asset classes
  - High income yield
  - Stable and predictable cash flows
  - Good inflation protection
  - Long-term return potential with limited downside risk
  - Diversification

- Return Drivers
  - Steady population growth
  - Long-term economic growth
  - Increased trade and business activity

Wilshire

Private Infrastructure Strategies



Infrastructure Assets

TRANSPORTATION

- Airports
- Ports
- Train stations
- Toll roads
- Train lines

UTILITIES

- Power generation
- Power distribution
- Water treatment
- Transmission pipelines

ENERGY

- Power generation
- Renewables
- Mid-stream operations

OTHER

- Transmission towers
- Cell towers
- Cable networks
- Waste management
- Industrial infrastructure

Infrastructure assets

- Typically long-lived and capital intensive projects with a relatively inelastic demand

Key characteristics

- Essential services
- High barriers to entry (capital expenditure requirement, regulation)
- Long duration
- High operating margins and inflation linked cash flows

Wilshire

Infrastructure Drivers of Return

INFRASTRUCTURE CATEGORY	EXAMPLES	RETURN DRIVERS	RETURN PROFILE*
Regulated - Return stipulated by a regulatory authority	• Utilities (e.g. water and electricity supply) • Airports • Telecommunication	• Ability to operate within regulatory parameters • Market movements in cost of equity which are reflected by regulator	• 5% – 12% p.a. • Significant cash yield • Limited upside
Contracted – Long-term contractual arrangement with a purchaser of the services	• Contracted power generation • Water treatment • Waste management • Energy infrastructure	• Ability to meet service levels in the contract • Inflation escalation • Re-contracting opportunities • Midstream development	• 8% – 20% p.a. • Significant cash yield • Moderate upside • May be additional return from investing pre-construction and/or pre-contract
Market – Performance linked to the economy or specific market	• Ports • Toll roads • Freight rail	• Economic growth • Trade • Business activity	• 8% – 16% p.a. • Moderate cash yield • Strong capital gains • Significant upside • May be additional return from investing pre-construction or prior to established market position

*Nominal equity returns assuming typical leverage. Figures shown represent projected performance range post project-tax, pre investor tax and fees. Estimate based on recent market transactions. Will vary over time due to movements in bond rates, jurisdiction and asset risk profile.

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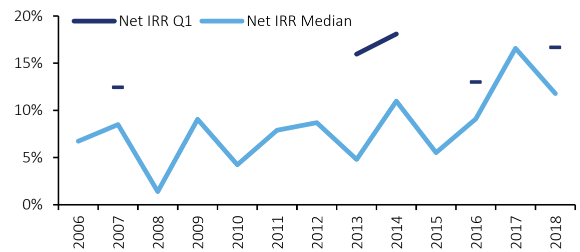
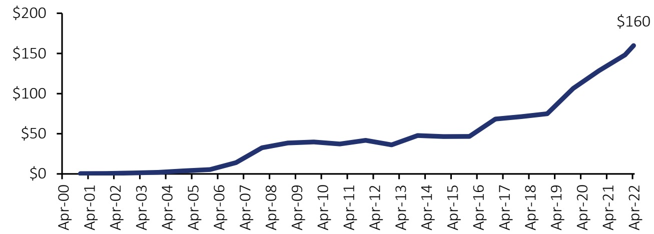
U.S. Infrastructure Outlook: Favorable

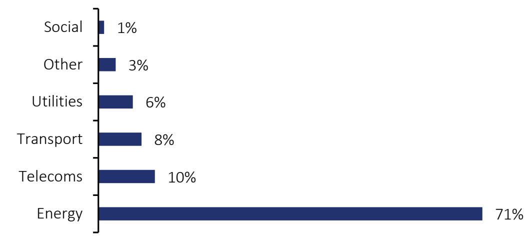
Vintage Year Performance[1]



Historical Infrastructure Dry Powder ($B)[2]



Completed Infrastructure Deals (in Q1 2022)[3] *



Regional Influences

+ Large and growing gap between long term infrastructure capital needs and current investment levels
+ U.S. government's $1 trillion infrastructure spending plan
+ Greater demand for private capital due to government budget constraints
+ Increasing significance of renewables sector
+ Tailwinds caused by an inflationary environment
± Growing interest in infrastructure debt
± More attractive investment environment resulting from recent market dislocation
- Robust fundraising environment and record levels of dry powder

Local Considerations

- Increased need for digital infrastructure
- Continuing transition to renewable energy
- Deteriorating transportation infrastructure
- Growing market for public-private partnerships

Industry / Sector Outlook

Sector	Investment Opportunity
Core	
Core Plus	
Value-Added	
Opportunistic	
Debt	

[1] Preqin North America Infrastructure benchmark, as of most up-to-date (April 11th. 2022) Note: inadequate number of funds prevents quartile analysis in certain vintage years.

[2] Preqin North America Infrastructure Dry Powder, as of April 11th, 2022.

[3] Preqin North American completed Infrastructure deals, as of April 11th, 2022.

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Real Assets – Natural Resources

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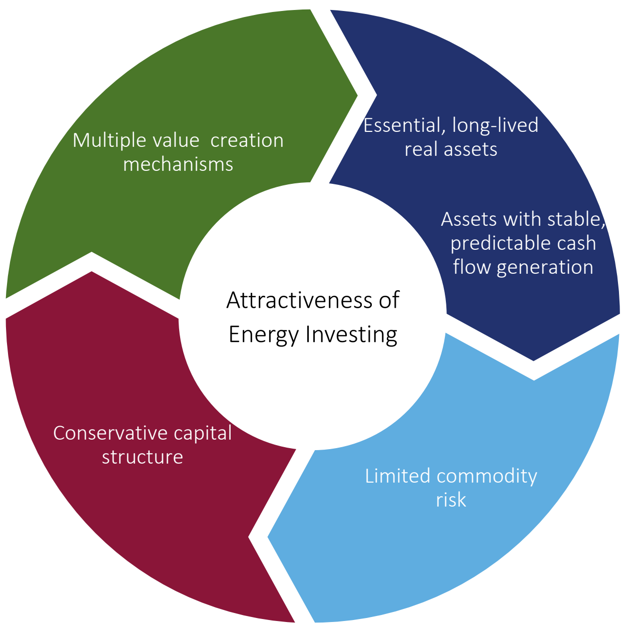
Natural Resources – Private Energy



KEY INVESTMENT DRIVERS[1]		
Significant Growth Prospects	Climate Change and Regulatory Concerns	Investment Activity Perpetuated By Industry Dynamics
Accelerating global population expected to grow by 2.1 billion by 2050.	Regulatory mandates for rapid build-out of new power generation resources.	Capital intensity intrinsically high.
Expanding global middle class.	Natural gas benefits from challenged coal assets.	Asset volatility generates long-term investment opportunities.
Economic development driving demand.	Global food and water supplies stressed under changing conditions.	Access to high growth regions capped by resource nationalism.

[1]Source: NGP Energy Partners

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Natural Resources – Private Energy Investment Drivers

UPSTREAM

OPPORTUNITY SET

- Oil and Gas Acquisition
- Oil and Gas Drilling and Exploration
- Oil Wellheads

FUNDAMENTAL DRIVERS

- Liquid North American market with approximately $70 billion[1] of property trades annually.
- Breakthrough, technology-driven advancements in established fields.
- Highly fragmented industry with active consolidators.
- Accelerating global growth spurring new venture opportunities.
- Steep decline in rates ensures steady capex needs.

MIDSTREAM

OPPORTUNITY SET

- Refined Products and Natural Gas Storage
- Oil and Gas Pipelines
- Asset Compression, Gathering and Processing
- Transportation, including Rail, Truck, Marine Barges and Tankers

FUNDAMENTAL DRIVERS

- New supply areas requiring new gathering and transportation assets.
- Changing demographics, industrial base and weather altering demand centers.
- Unexecuted commercial opportunities in select legacy assets.
- Producers divesting infrastructure to focus on core activities.
- Strategics willing to partner to fund organic growth and M&A.

DOWNSTREAM

OPPORTUNITY SET

- Power Generation and Investor-Owned Utilities
- Substation Operations and Systems Control
- Regulated Power Distribution and Transmission
- Power Retailers, End-Users and Retail Stations

FUNDAMENTAL DRIVERS

- World's largest electricity market at approximately 1,084 GW[2] generating capacity.
- Capacity shortages and transmission constraints persisting in key markets.
- Fragmented industry with over 18,000 power generating facilities across 100 regional markets.[2]
- Grid inefficiencies and expansion opportunities.
- Deregulation-led growth of liquid secondary market for generation assets.

[1]NGP Energy Partners.

[2]EIA Electric Power Annual

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Natural Resources – Timber/Farmland Investment Drivers

GROWING DEMAND

- By 2050, 70% more food will be required to feed 2.1 billion more individuals.
- Meat and protein consumption is expected to more than double by 2050 with rising GDP per capita.
- Biofuels mandates are expected to utilize 13% of all global cereal production.
- Demand from larger, more urban and richer population will require annual gross investment of $209 billion*.

→ Land scarcity will lead to increased valuations of productive land. Water scarcity will increase even more than land.

PRODUCTION INNOVATION

- Global farm productivity must increase by 75% by 2050.
- Yield improvements through technological advancements, improved fertilizers and efficient irrigation methods.
- Marginal acreage expansion through use of technology, improved farming practices and crop shift to most productive regions.
- Value chain efficiency via packaging, storage and transportation improvements.

→ Placing more land into production and improving yield are the only two levers to increase supply.

ASSET VOLATILITY

- Climate change including shift in precipitation patterns and weather severity.
- Diminishing supply and quality of water in most regions.
- Environmental degradation prompting limits on nitrogen runoff, sanitation, pesticides.
- Increased demand and limited local production capacity drives prices higher over long-term.

→ Patient, opportunistic capital can exploit short-term volatility and capitalize on long-term trend.

*Food and Agriculture Organization of the United Nations 2009 estimate

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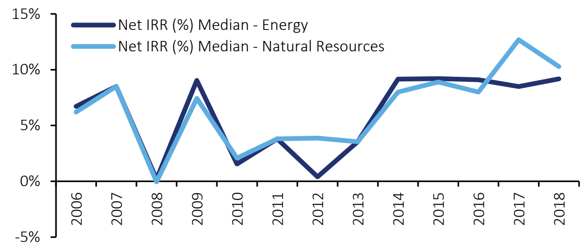
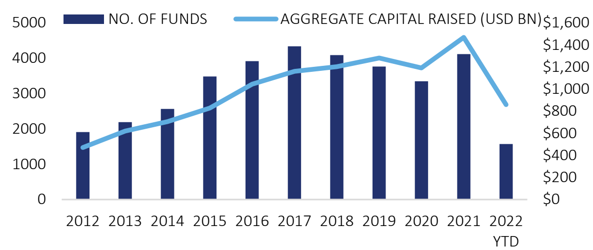
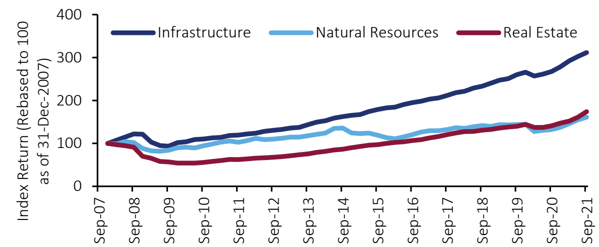
U.S. Natural Resources Outlook: Favorable

Vintage Year Performance[1]	Natural Resources Fundraising ($B)[2]	Index Returns – NR Vs. Re & Infra[3]







Regional Influences

- \+ Rising interest rate & inflationary environment
- \+ Energy outperforming in public markets
- \+ Increased expenditures in green initiatives, which are metal-intensive
- \+ Increased growth in natural gas and renewables
- ± Technological advances are impacting both the demand for and supply of energy
- ± Limited capital supply in traditional energy markets
- ± Increased emphasis from Biden administration on energy transition & decarbonization
- ± Volatility in commodity prices

Local Considerations

- Growing global population
- Capital constraints on natural resources businesses
- ESG questions surrounding metals & mining and oil & gas
- Natural gas to play important role in energy transition
- Continued geopolitical tensions impacting all sectors
- Increasing consumption of water and ongoing global drought
- Divestitures of non-core energy assets
- Ongoing consolidation in energy production companies
- Decarbonization across all aspects of society
- Various factors increasing commodity prices

Industry / Sector Outlook

Sector	Investment Opportunity
Carbon-Based Energy	
Sustainable Energy	
Agriculture/Farmland	
Metals/Mining	
Timberland	
Water	

[1] Preqin North America Natural Resources benchmark, as of most up-to-date (April 11th, 2022). Note: inadequate number of funds prevents quartile analysis in certain vintage years.

[2] Preqin Private Capital Fundraising Update as of August 27th, 2022.

[3] Preqin Quarterly Index , most up to date as of April 11th, 2022.

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Wilshire Investment Philosophy & Process

Private Markets

wilshire.com |

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Defined Private Markets Approach

INEFFICIENT MARKETS

- Smaller companies
- Scarcity of capital
- Distressed assets
- Emerging strategies

DIFFERENTIATED INVESTMENTS

- Deep value focus
- Specialized expertise
- Management of complexity
- Advantaged access

MANAGED PORTFOLIO RISK

- Prudent diversification
- Consistent macro thesis
- Developed PM infrastructure
- Manager alignment

 |

Value-Add Sourcing

Proactive Calling & In Person Meeting Effort

Open Door Policy

Tracking General Partners

Proprietary Research

Investment Themes

Market Mapping

Multiple Channels

- Data-driven, systematic approach
- 3,142 investable private markets opportunities sourced in 2021

Centralized Database

- Institutional knowledge since 1998
- Database of best-in-class managers

Private Markets Forward Calendar

- Full transparency
- Filtered for clients/mandates

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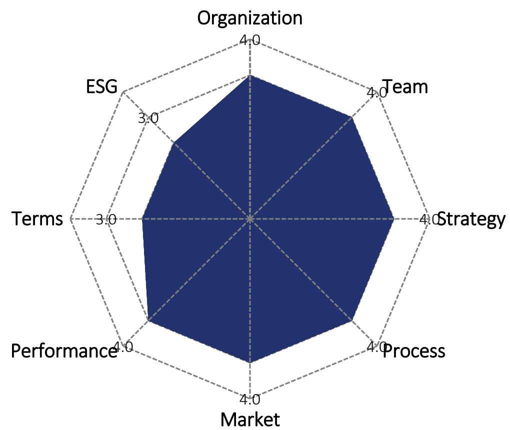
Private Markets Adaptive Radar Framework

Primary Fund Radar



Key	
Top Decile	5
Top Quartile	4
Average	3
Bottom Half	2
Bottom Decile	1
No Information	0

PROCESS	RATING	DESCRIPTION
Sourcing Advantage	5	• Evaluate the Firm's deal sourcing capabilities and the process used to identify attractive investment opportunities. How is the sourcing process staffed, conducted, and documented? What criteria are used to assess an investment's attractiveness? Assess the robustness and sustainability of the Firm's proprietary network of contacts used to identify opportunities. • Evaluate the Fund's ability to leverage its sourcing advantage to create preferred access and/or advantaged pricing.
Due Diligence Insight	5	• Evaluate the Firm's screening and due diligence processes. How is each process staffed, conducted, and documented? How long is the due diligence process? Will the deal team be in charge of the investment until exit, or will other professionals be assigned post-acquisition? Assess the appropriateness of any due diligence checklists internal reports, financial models, and investment committee documents prepared. • Evaluate the key inputs and outputs of the Firm's due diligence process, including details on value creation plans and other post-investment activities as appropriate.
Third Party Outsourcing	3	• Evaluate any functions performed by third parties in the sourcing, screening, and ... determining if a third party is used/not used

Example provided for demonstration purposes only and is not to be relied upon.

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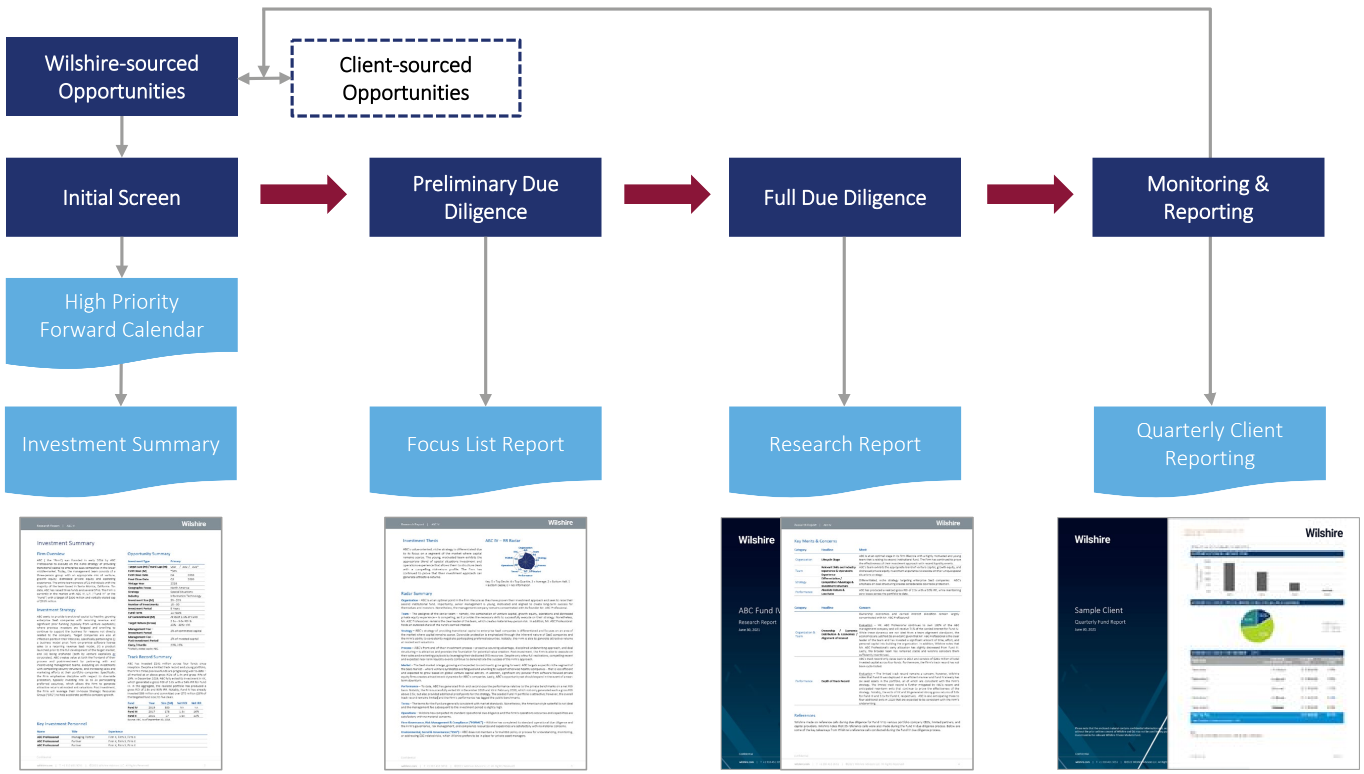
Private Markets Investment Process



Simplified process flowcharts for illustrative purposes only; detailed process documentation available on request.

Indicates non-discretionary role

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Operations Capabilities, Client Reporting & Communications

- Fully integrated operations and risk management team
- A customized central data room for all reporting and communications which includes:
  - Research, presentations and newsletters
  - Capital calls and distributions
  - Tax documents
  - Manager reports
  - Fund due diligence materials
  - Fund monitoring materials

Third-Party Operations Support

Data room images are for illustrative purposes only and are not intended to convey relevant information or be relied upon for any purposes.

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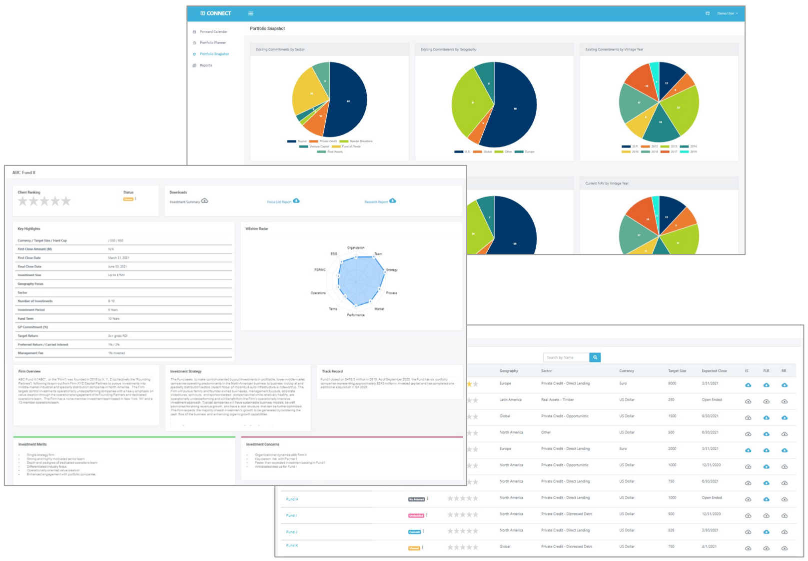
Wilshire Connect

WILSHIRE CONNECT PLATFORM

a curated list of diligenced fund opportunities across the private markets spectrum

Buyout	Venture Capital	Growth Equity	Special Situations
Specialized Direct Lending	Opportunistic	Distressed Debt / Special Situations	
Real Estate	Energy	Infrastructure	Natural Resources



Includes

- Research library
- Manager due diligence on Wilshire approved opportunities*
- Portfolio construction tools
- Online access

Advantages

- Client specific flexibility
- Wilshire advisory support
- Provides extension of staff resources

*Wilshire may offer individual co-investments within a Wilshire managed vehicle

Database images are for illustrative purposes only and are not intended to convey relevant information or be relied upon for any purposes.

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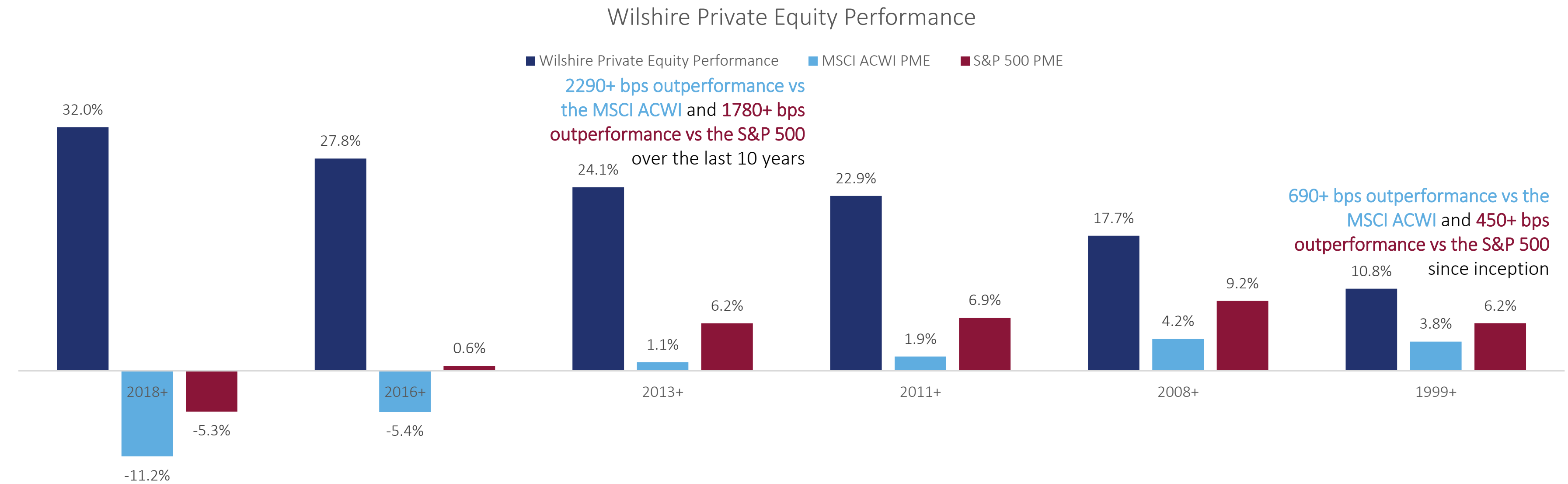
Wilshire Private Equity Performance



As of September 30, 2022.

Includes all private equity assets investments held in Wilshire's discretionary private funds for the vintage years denoted in the proportion that they were made based on allocated contributed capital. Performance values include realized funds.

Vintage year is defined as the year the underlying fund had its first takedown for investment purposes.

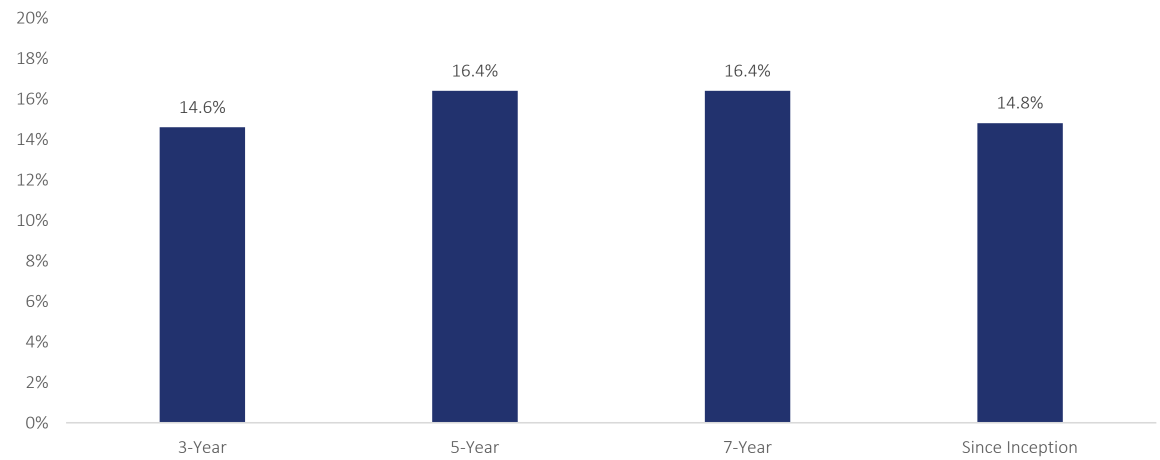
Returns represented are Net IRR of the underlying investments, with the added deduction of a 75bps management fee that would be applicable to a new account or fund established with Wilshire to invest in these type of investments. The performance shown reflects the deduction of management fees and carried interested charged by the general partner or sponsors of the underlying investment, but does not include the deduction of Wilshire's carried interest, taxes, transaction costs or other fund-level expenses that would have been borne at the Wilshire investment vehicle level. These aggregated returns are not representative of any single fund or investment and as such would only be replicable by an investor who invested in all of the funds represented. Past performance is not indicative of future results.

The benchmark shown is a Public Market Equivalent ("PME") benchmark calculated utilizing matching cash flows into the MSCI ACWI and S&P 500. This benchmark is calculated using the PME+ methodology. The PME+ methodology matches contributions from the private markets fund and buys index units at each transaction date, and scales interim distributions by a constant factor so that the NAV used to calculate the Public Benchmark is equivalent to the NAV of the private fund.

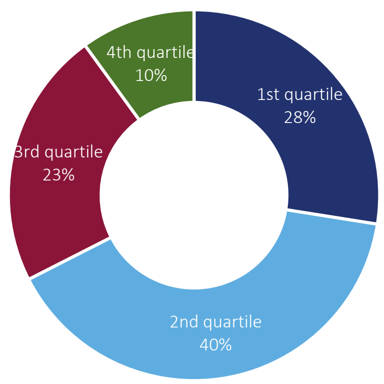
Wilshire

Wilshire Private Real Assets Performance

Wilshire Private Real Assets Performance[1]



TVPI Quartile Distribution[2]



As of September 30, 2022.

[1]Includes all private real assets investments held in Wilshire's discretionary private funds for the vintage years denoted in the proportion that they were made based on allocated contributed capital.

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[2]Preqin benchmarks matched to underlying vintage year, strategy and geography are as of Most Up-to-Date. Past performance is not indicative of future returns.

Comprises 40 unique underlying investments made by Wilshire on behalf of its active discretionary across private real assets strategies and geographies for which benchmark information is available.

Wilshire

Important Information

Wilshire Advisors LLC (“Wilshire”) is a global financial services firm providing diverse services to various types of investors and intermediaries. Wilshire’s products, services, investment approach and advice may differ between clients and all of Wilshire’s products and services may not be available to all clients. For more information regarding Wilshire’s services, please see Wilshire’s ADV Part 2 available at www.wilshire.com/ADV.

This material is for information only and is being provided exclusively to recipients reasonably believed to be qualified to invest, as defined in the relevant jurisdiction of the prospective investor, in the types of investments discussed. These materials do not disclose all the risks and other significant issues related to an investment in any proposed transactions described herein. Prior to entering into any such transactions, potential investors should ensure that they fully understand the terms of that proposed transaction and any applicable risks, some, but not all, of which are described in more detail in any offering documents, if applicable, and may be discussed with representatives of Wilshire. **This is not an offer to sell or a solicitation of an offer to buy any securities and may not be relied upon in connection with the purchase or sale of any security.**

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This material may include estimates, projections, assumptions and other "forward-looking statements." Forward-looking statements represent Wilshire's current beliefs and opinions in respect of potential future events. These statements are not guarantees of future performance and undue reliance should not be placed on them. Such forward-looking statements necessarily involve known and unknown risks and uncertainties, which may cause actual events, performance, and financial results to differ materially from any projections. Forward-looking statements speak only as of the date on which they are made and are subject to change without notice. Wilshire undertakes no obligation to update or revise any forward-looking statements.

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Kentucky Public Pensions Authority

Carried Interest

What is carried interest?

- Share of investment profits earned by general partners – pre-defined and typically 15-25%
- Also known as performance fees, incentive fees, or profit sharing
- Often in the news because it is taxed at significantly lower rates than ordinary income

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Why would we pay that?!?!

- A mechanism to align the LP's return objective with that of the GP – who invest their own capital alongside KPPA (known as the GP commitment)
- Provides KPPA access to attractive and diversifying investment strategies
- Before any carried interest is paid to the general partner, KPPA typically must first receive
    1. Its invested capital
    2. Its fees and expenses
    3. Minimum annualized rate of return (hurdle) on its investment

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Carried Interest Distribution Example

Total Capital Invested	$10,000,000
Proceeds Upon Full Realization	$20,000,000
Profits	$10,000,000
Carried Interest Allocation to GP (20%)*	$2,000,000
Distributions (Net Proceeds) to LP	$8,000,000
Net MOIC	1.8x

*Example does not include hurdle rate

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Three methods for reporting

- Accrual
- Cash
- Profit sharing

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Carried Interest Example

Statement of Partner's Capital
As of June 30, 2022
(Unaudited)

Investor: Kentucky Retirement Systems

	Quarter to Date	Year to Date	Inception to Date
Beginning balance	**$ 11,965,922**	**$ 10,600,098**	**$ -**
Capital contributions	-	1,232,102	11,556,428
Placement fees	-	-	-
Net investment income/(loss)	(151,701)	(219,804)	(670,642)
Realized gain/(loss)	1,216,279	1,216,279	1,216,279
Net change in unrealized appreciation/(depreciation) on investment	4,632,089	4,833,914	5,560,524
Carried Interest (to)/from General Partner	(1,221,233)	(1,221,233)	(1,221,233)
Ending balance at June 30, 2022	**$ 16,441,356**	**$ 16,441,356**	**$ 16,441,356**

Based on the manager's valuations as of 6/30/22, they are due $1.22MM in carry. However, to date no cash has been paid to this manager for carried interest.

KPPA Kentucky Public Pensions Authority

Accrual method

- Method that KPPA uses to report fees as well

KRS Pension Private Equity - Assets, Fees, and Carry
FY 2019-22
($ millions)

Fiscal Year	Year End Balance	Management Fees	Carried Interest
6/30/2019	$1,181	$6.6	$15.7
6/30/2020	$1,052	$8.4	($2.5)
6/30/2021	$1,236	$8.1	$48.5
6/30/2022	$1,290	$7.3	$48.0

With the pandemic, valuations were written down – and thus so were accruals for carried interest. This negative fee was simply an accrual, not cash paid back to KPPA.

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Cash method

- Reflects what's actually been paid in cash
- Less dependent on manager valuations
- No negative fees reported – carry can be interpreted as an expense

KTRS Retirement Annuity Trust
Investment Counselor Fees and Admin. Expenses
FY 2019-22
($ millions)

	Real Estate		Alt. Investments	
Fiscal Year	YE Balance	Expense	YE Balance	Expense
6/30/2019	$799	$10.2	$1,359	$20.9
6/30/2020	$819	$11.1	$1,465	$21.1
6/30/2021	$1,003	$12.0	$1,758	$21.5
6/30/2022	$1,292	$13.6	$2,292	$15.8

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ILPA template

- Mandated for new managers by 2017’s Senate Bill 2
- Reports both accrued and paid carried interest

ilpa

		QTD (Apr-22 - Jun-22)	YTD (Jan-22 - Jun-22)	Since Inception (Jan-20 - Jun-22)
Change in Unrealized Gain / (Loss)		(3,702,973)	(3,185,764)	3,523,381
Ending NAV - Net of Incentive Allocation		$78,999,585	$78,999,585	$78,999,585
Reconciliation for Accrued Incentive Allocation	Accrued Incentive Allocation - Starting Period Balance	(2,043,988)	(1,755,207)	0
	Incentive Allocation - Paid During the Period	0	0	0
	Accrued Incentive Allocation - Periodic Change	74,482	(214,300)	(1,969,506)
	Accrued Incentive Allocation - Ending Period Balance	(1,969,506)	(1,969,506)	(1,969,506)
	Ending NAV - Gross of Accrued Incentive Allocation	$80,969,091	$80,969,09[illegible]	$80,969,091

Based on the manager’s valuations as of 6/30/22, they are due $1.97MM in carry.

However, to date no cash has been paid to this manager for carried interest.

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Profit sharing

- Emphasizes net returns to the investor
- Paid only if the investor makes money as well

Virginia Retirement System
Alternative Investment Manager Aggregate Profit Sharing Results [1]
Calendar Year 2021
(expressed in millions)

	Calendar Year 2021
Virginia Retirement System Portion	$10,205
Alternative Investment Manager Portion	1,818
Total Profits	$12,023

[1] *Based on available data for private investments with profit sharing arrangements for Calendar Year 2021.*

https://www.varetire.org/pdf/publications/manager-profit-sharing-results.pdf

Kentucky Public Pensions Authority

Associated Terms

Hurdle Rate –The target return which the GP needs to reach before the performance fee is triggered.

- For most private equity structures, this figure ranges between 6% -8%
- Common fee structure nomenclature includes “2% / 20% over 8.” This translates into a 2% management fee, 20% carried interest and an 8% hurdle rate

Waterfalls –Refer to the structure of the fund’s distributions

- Defining the structure is necessary, as available cash is distributed as it is generated throughout the life of a fund
- There are a myriad of ways that a distribution waterfall can be structured. They are typically categorized as either European or American Style.

Catch-Up –A provision that accompanies how the carried interest is paid after the hurdle rate is achieved.

- Cited as a percentage of distributions received by the GP to get “caught up” to the full carried interest percentage after the hurdle rate is achieved

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Real Return Markets

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How Are Real Return Markets Tied to Inflation?

- Real Estate / Infrastructure
  - Income stream (lease, rents, tolls) periodically adjusted by property owners – inflation escalation provisions often "built-in"
  - Capital appreciation of assets indirectly linked to GDP and population growth and/or inflation
- Timberland / Farmland
  - Like commodities, provide final and raw material in production of consumer goods
  - Like real estate and infrastructure, potential increase in property value exists based on supply and demand
- Natural Resources / Energy
  - Supply and demand factors affect prices of commodities, which typically lead inflation
  - Higher commodities prices lead to increased prices of goods and services (i.e., higher CPI)

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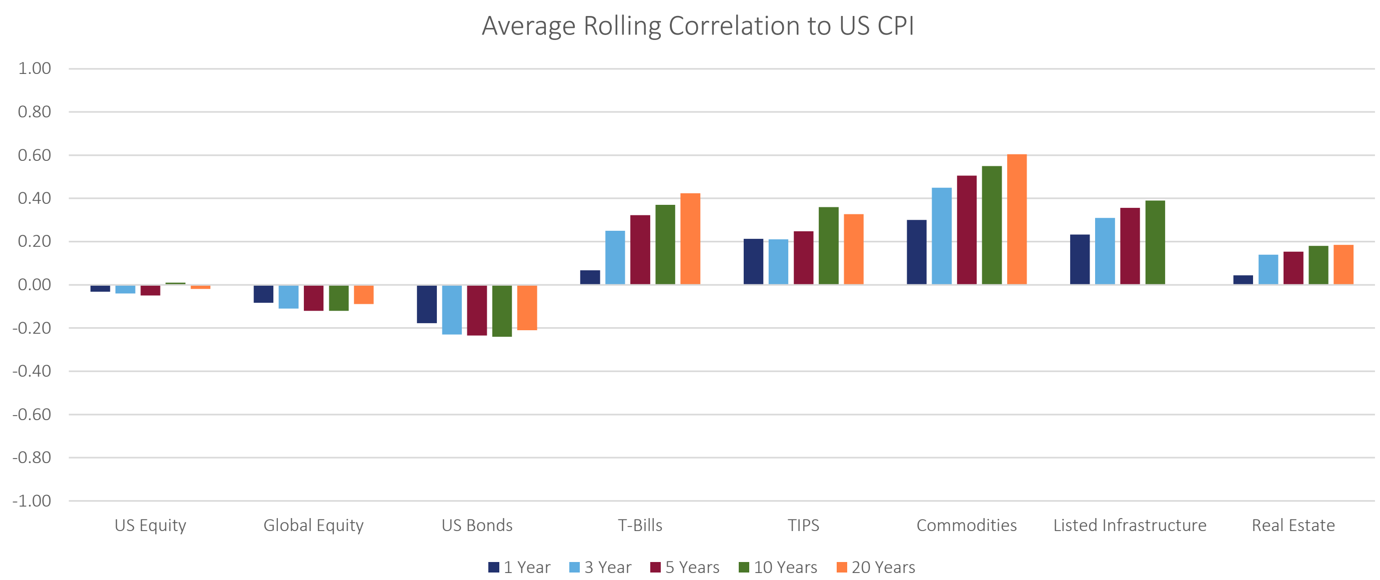
Correlation to Inflation

Unlike financial assets, which generally exhibit negative correlation with inflation, real assets display positive correlation with inflation, particularly over longer holding periods.



Source: Wilshire Compass – 40 Years ended 9/30/2022 except for TIPS (1999), Commodities (1991), Infrastructure (2003)

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Infrastructure Assets

TRANSPORTATION

- Airports
- Ports
- Train stations
- Toll roads
- Train lines

UTILITIES

- Power generation
- Power distribution
- Water treatment
- Transmission pipelines

ENERGY

- Power generation
- Renewables
- Mid-stream operations

OTHER

- Transmission towers
- Cell towers
- Cable networks
- Waste management
- Industrial infrastructure

Infrastructure assets

- Typically long-lived and capital intensive projects with a relatively inelastic demand

Key characteristics

- Essential services
- High barriers to entry (capital expenditure requirement, regulation)
- Long duration
- High operating margins and inflation linked cash flows

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Infrastructure Drivers of Return

INFRASTRUCTURE CATEGORY	EXAMPLES	RETURN DRIVERS	RETURN PROFILE*
Regulated - Return stipulated by a regulatory authority	• Utilities (e.g. water and electricity supply) • Airports • Telecommunication	• Ability to operate within regulatory parameters • Market movements in cost of equity which are reflected by regulator	• 5% – 12% p.a. • Significant cash yield • Limited upside
Contracted – Long-term contractual arrangement with a purchaser of the services	• Contracted power generation • Water treatment • Waste management • Energy infrastructure	• Ability to meet service levels in the contract • Inflation escalation • Re-contracting opportunities • Midstream development	• 8% – 20% p.a. • Significant cash yield • Moderate upside • May be additional return from investing pre-construction and/or pre-contract
Market – Performance linked to the economy or specific market	• Ports • Toll roads • Freight rail	• Economic growth • Trade • Business activity	• 8% – 16% p.a. • Moderate cash yield • Strong capital gains • Significant upside • May be additional return from investing pre-construction or prior to established market position

*Nominal equity returns assuming typical leverage. Figures shown represent projected performance range post project-tax, pre investor tax and fees. Estimate based on recent market transactions. Will vary over time due to movements in bond rates, jurisdiction and asset risk profile.

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Real Estate Return Characteristics

Real estate as an asset class can also be classified by objective, strategy and liquidity

PRIMARY OBJECTIVE	STRATEGY	EXPECTED RETURN* (% P.A.)	RETURN COMPONENTS	LIQUIDITY	VOLATILITY / RISK	TYPICAL LEVERAGE
INCOME	Core	6% - 10%	70% income 30% growth	Moderate	Low	~30%
	Core Plus	9% - 11%	60% income 40% growth		Moderate	~50%
ASSET APPRECIATION	Value-Add	10% - 18%	40% income 60% growth	Low	High	<65%
	Opportunistic	15% - 20%+	10% income 90% growth		Very High	> 65%

*There is no guarantee investments will achieve the Expected Return.

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Natural Resources – Private Energy Investment Drivers

UPSTREAM

OPPORTUNITY SET

- Oil and Gas Acquisition
- Oil and Gas Drilling and Exploration
- Oil Wellheads

FUNDAMENTAL DRIVERS

- Liquid North American market with approximately $70 billion[1] of property trades annually.
- Breakthrough, technology-driven advancements in established fields.
- Highly fragmented industry with active consolidators.
- Accelerating global growth spurring new venture opportunities.
- Steep decline in rates ensures steady capex needs.

MIDSTREAM

OPPORTUNITY SET

- Refined Products and Natural Gas Storage
- Oil and Gas Pipelines
- Asset Compression, Gathering and Processing
- Transportation, including Rail, Truck, Marine Barges and Tankers

FUNDAMENTAL DRIVERS

- New supply areas requiring new gathering and transportation assets.
- Changing demographics, industrial base and weather altering demand centers.
- Unexecuted commercial opportunities in select legacy assets.
- Producers divesting infrastructure to focus on core activities.
- Strategics willing to partner to fund organic growth and M&A.

DOWNSTREAM

OPPORTUNITY SET

- Power Generation and Investor-Owned Utilities
- Substation Operations and Systems Control
- Regulated Power Distribution and Transmission
- Power Retailers, End-Users and Retail Stations

FUNDAMENTAL DRIVERS

- World's largest electricity market at approximately 1,084 GW[2] generating capacity.
- Capacity shortages and transmission constraints persisting in key markets.
- Fragmented industry with over 18,000 power generating facilities across 100 regional markets.[2]
- Grid inefficiencies and expansion opportunities.
- Deregulation-led growth of liquid secondary market for generation assets.

[1]NGP Energy Partners.

[2]EIA Electric Power Annual

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Natural Resources – Timber/Farmland Investment Drivers

GROWING DEMAND

- By 2050, 70% more food will be required to feed 2.1 billion more individuals.
- Meat and protein consumption is expected to more than double by 2050 with rising GDP per capita.
- Biofuels mandates are expected to utilize 13% of all global cereal production.
- Demand from larger, more urban and richer population will require annual gross investment of $209 billion*.

→ Land scarcity will lead to increased valuations of productive land. Water scarcity will increase even more than land.

PRODUCTION INNOVATION

- Global farm productivity must increase by 75% by 2050.
- Yield improvements through technological advancements, improved fertilizers and efficient irrigation methods.
- Marginal acreage expansion through use of technology, improved farming practices and crop shift to most productive regions.
- Value chain efficiency via packaging, storage and transportation improvements.

→ Placing more land into production and improving yield are the only two levers to increase supply.

ASSET VOLATILITY

- Climate change including shift in precipitation patterns and weather severity.
- Diminishing supply and quality of water in most regions.
- Environmental degradation prompting limits on nitrogen runoff, sanitation, pesticides.
- Increased demand and limited local production capacity drives prices higher over long-term.

→ Patient, opportunistic capital can exploit short-term volatility and capitalize on long-term trend.

*Food and Agriculture Organization of the United Nations 2009 estimate

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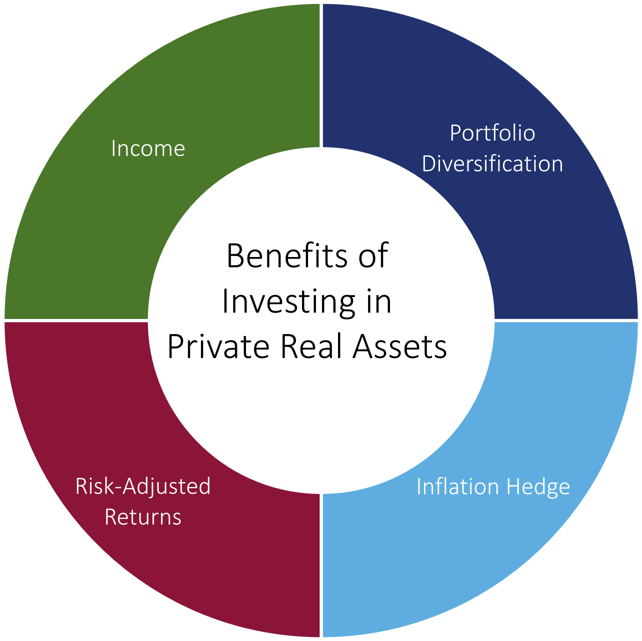
Conclusion

- Near-term inflation is highly uncertain. Longer-term inflation is even more uncertain.
  - Private Real Assets can provide the following benefits:
    - Higher income and risk-adjusted total return, including Beta and Alpha opportunities
    - Insurance against high or unexpected inflation, particularly over the long-term.
    - A diversified approach can increase the effectiveness of the real assets portfolio over time.



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Important Information