MINNESOTA STATE BOARD OF INVESTMENT

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DATE: January 17, 2020

TO: Legislative Reference Library

FROM: Mansco Perry III MP3
Executive Director and Chief Investment Officer

SUBJECT: Report on Investment Consultant Activities

The provisions of Minnesota Statutes, Section 11A.27 require the State Board of Investment to file with the Legislative Reference Library a report on investment consultant activities.

The State Board of Investment (SBI) contracts with Aon Hewitt Investment Consulting, Inc. (AON), Chicago, Illinois and Meketa Investment Group, LLC (Meketa), Portland, Oregon. AON serves as the SBI's general consultant and the annual contract fees are $515,000. Meketa serves as the SBI's special projects consultant and the contract fees are $285,000 per year.

As part of their consultant services, AON and Meketa are available to the Board, staff and Investment Advisory Council to provide perspective, counsel and input on relevant investment related issues.

During the period July 1, 2018 through June 30, 2019, AON and Meketa were involved in the following projects:

- AON provided research and implementation considerations in the Return-Seeking Fixed Income asset group.
- Meketa reviewed the potential impact that climate change may have on long-term investment risks to the SBI's investment portfolio and indicate approaches that the SBI may take to address and mitigate identified investment risks.
- Periodic background information for evaluating SBI investment managers.

Attached is an example of the work product each has provided.

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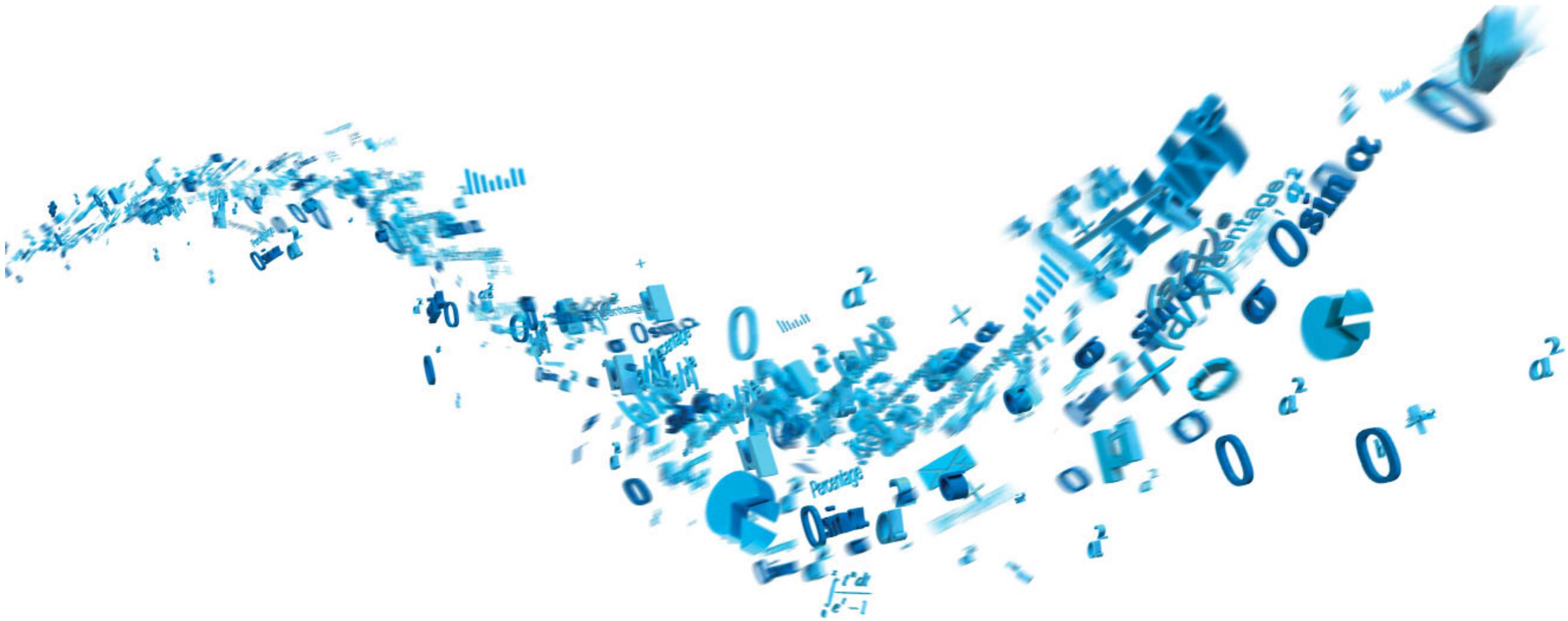

Growth Income – Return-Seeking Fixed Income

Minnesota State Board of Investment | June 2019

Aon Hewitt
Retirement & Investment

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Contents

Return-Seeking Fixed Income: Opportunity Set and Portfolio Modeling

MSBI Strategic Allocation Category Framework

- The Board approved the following Strategic Asset Allocation Framework
- Most recently, the Protection category was fully funded with U.S. Treasuries
- Constructing the Growth-Income-oriented category is among the next priorities, which includes:
  - Core Fixed Income
  - Private Credit
  - Return-Seeking Fixed Income
- The following analysis focuses on potential construction of the Return-Seeking Fixed Income component

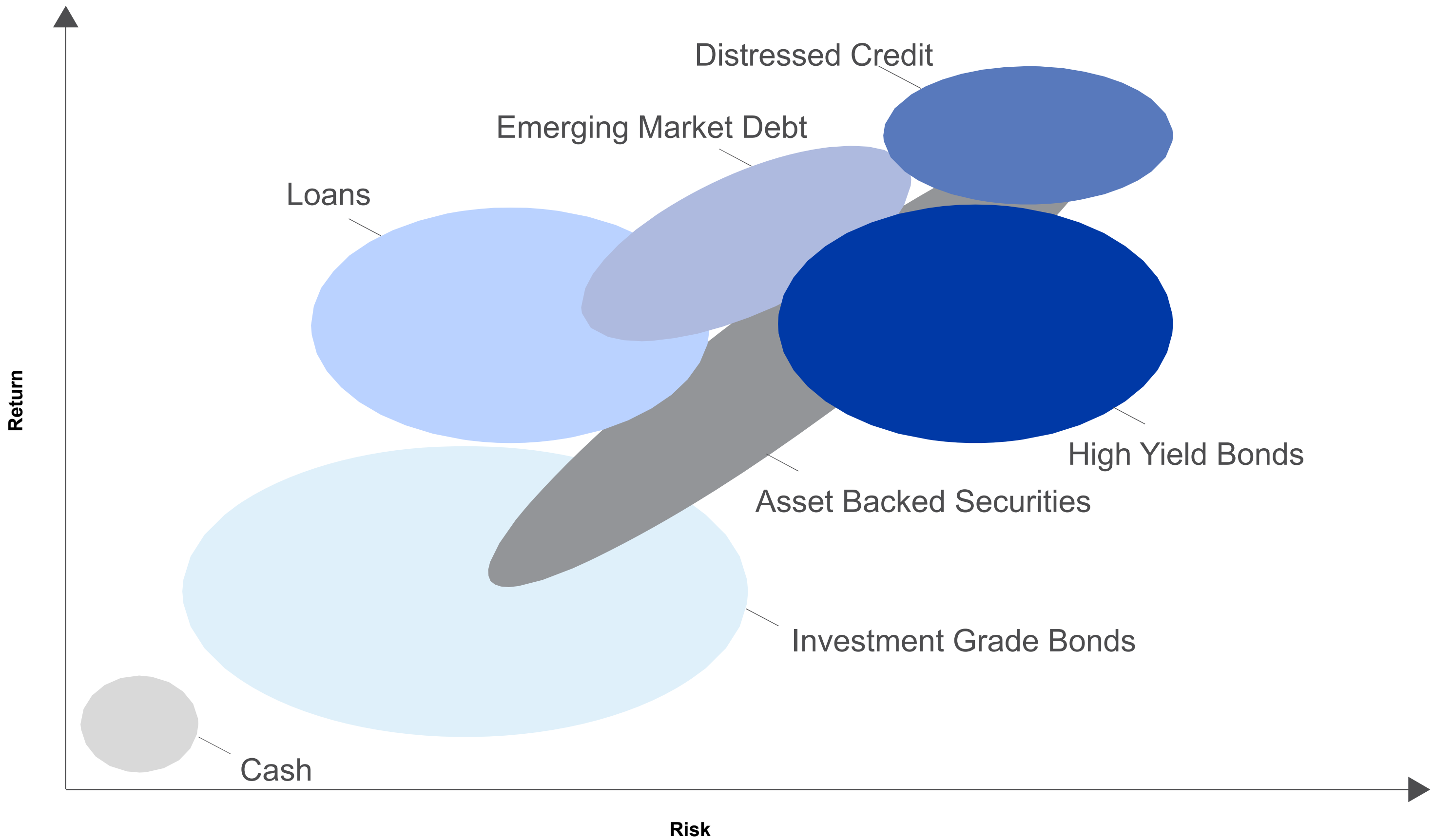
	3/31/19 ($ millions)	3/31/19 Weights	Category Ranges	
Growth - Appreciation				
Public Equity	$ 43,593.78	63.3%		
Private Equity	$ 5,325.65	7.7%		
Non-Core Real Assets	$ 2,419.17	3.5%		
Distressed/Opportunistic	$ 1,172.16	1.7%		
	$ 52,510.76	**76.3%**	*50%*	*75%*
Growth - Income-oriented				
Core Fixed Income	$ 7,870.10	11.4%		
Private Credit	$ 580.30	0.8%		
Return-Seeking Fixed Income		0.0%		
	$ 8,450.40	**12.3%**	*15%*	*30%*
Real Assets				
Core Real Estate		0.0%		
Real Assets	$ 517.76	0.8%		
	$ 517.76	**0.8%**	*0%*	*10%*
Inflation Protection				
TIPS		0.0%		
Commodities		0.0%		
		0.0%	*0%*	*10%*
Protection				
U.S. Treasuries	$ 6,203.01	9.0%		
	$ 6,203.01	**9.0%**	*5%*	*20%*
Liquidity				
Cash	$ 1,133.23	1.6%		
	$ 1,133.23	**1.6%**	*0%*	*5%*
Opportunity				
Opportunity	$ -	0.0%	*0%*	*10%*
Total	**$ 68,815.51**	**100.0%**		
Illiquid Asset Exposure	**$ 10,015.03**	**14.6%**	*0%*	*30%*

Return-Seeking Fixed Income: Broad Opportunity Set

High Yield	Contingent Convertibles (CoCos)
Bank Loans	Securitized
Emerging Market Debt	Structured Credit/CLOs
Distressed Opportunistic	Taxable High Yield Municipals
Convertibles	Global Credit

Credit Sector Risk vs. Return

Example Risk/Return Profiles



Source: Aon Hewitt, illustrative only

- Credit sectors exhibit different risk and return characteristics
- Combining sectors can result in superior risk/return characteristics, potentially offering reduced volatility per unit of return on the portfolio

Return-Seeking Fixed Income Portfolio Analysis: Background

- Considered broad return-seeking fixed income (FI) opportunity set
- Utilized Aon's applicable Capital Market Assumptions* (CMA's) to project risk and return expectations for various Return-Seeking FI portfolios
  - Modelled 5 portfolios with different risk levels (Standard Deviation) ranging from 5% to 9%
- Optimized allocations to return-seeking FI asset classes across risk targets to generate expected 10-year:
  - Returns
  - Sharpe Ratios
  - 5th Percentile (pessimistic case) 1-year returns
- Included expectations for Aon's Model Portfolio** return-seeking fixed income allocation which is modelled as solely multi-asset credit and represented as 1/3 each to high yield, bank loans and emerging market debt
- The following page summarized the return and Sharpe Ratio outcomes across the various return-seeking fixed income portfolio risk profiles

*Aon's Capital Market Assumptions (CMAs) are 10 and 30-year risk, return and correlation assumptions. Please see appendix or additional detail
**See Appendix for details on Aon's Model Portfolios

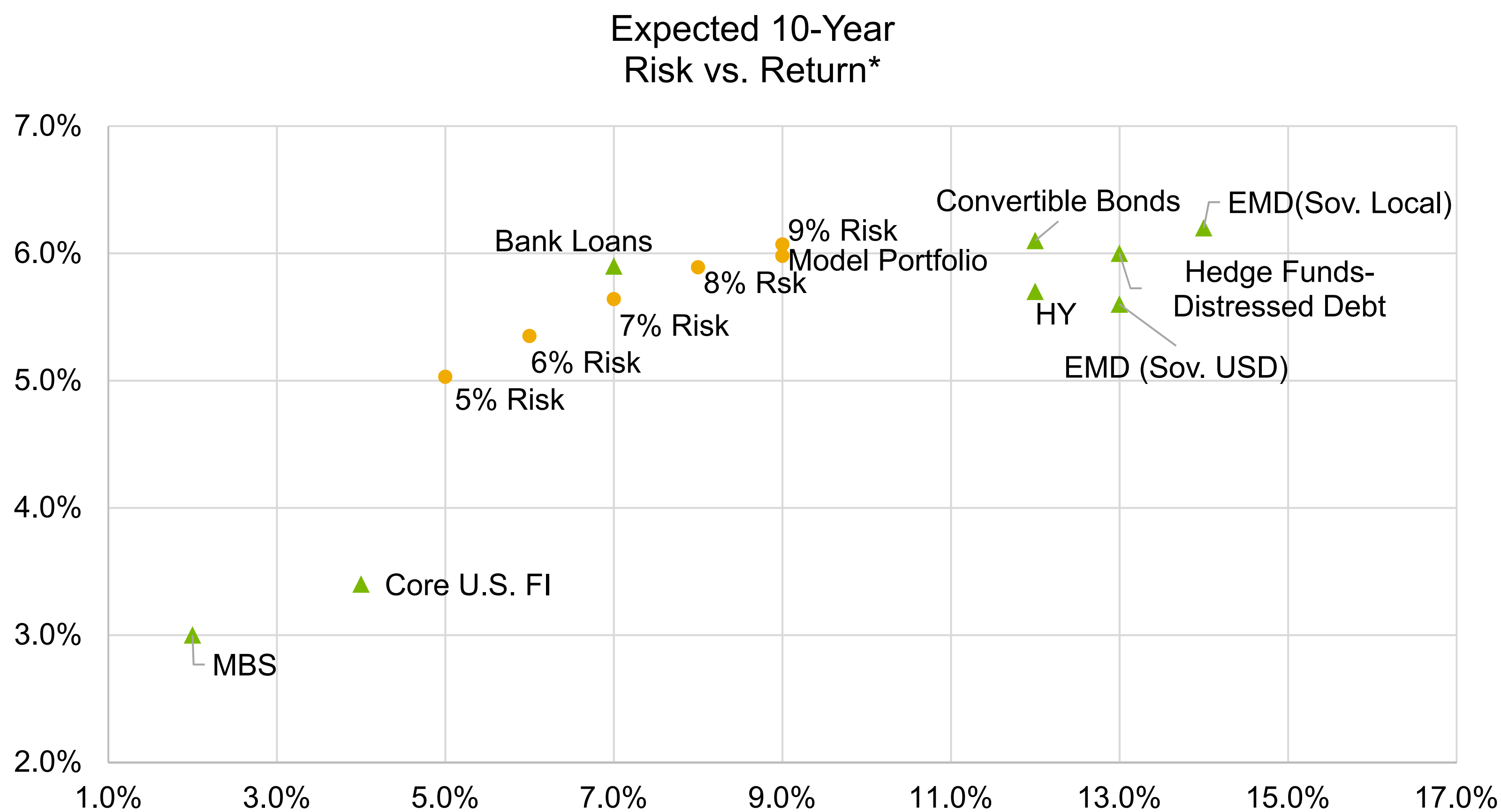
Return-Seeking Fixed Income Portfolio Analysis: Summary

	Optimization					Public Fund	
	5% Risk	6% Risk	7% Risk	8% Risk	9% Risk	Model Portfolio[1]	Contraints
High Yield	5%	5%	5%	11%	23%	33%	5% - 30%
Bank Loans	30%	30%	30%	30%	27%	33%	5% - 30%
Convertibles	10%	10%	10%	10%	10%	0%	0% - 10%
Hedge Fund - Distressed Debt	1%	4%	8%	10%	10%	0%	0% - 10%
Emerging Market Debt	16%	23%	29%	30%	30%	33%	0% - 30%
MBS	28%	18%	8%	0%	0%	0%	0% - 30%
IG Credit	10%	10%	10%	9%	0%	0%	0% - 10%
Total	100%	100%	100%	100%	100%	100%	
Expected 10-yr Return	**5.03%**	**5.35%**	**5.64%**	**5.89%**	**6.07%**	**5.98%**	
Expected Risk	**5.00%**	**6.00%**	**7.00%**	**8.00%**	**9.00%**	**9.00%**	
Sharpe Ratio	**0.51**	**0.47**	**0.45**	**0.42**	**0.40**	**0.39**	
5th Percentile 1-Yr Return	**-2.87%**	**-4.05%**	**-5.24%**	**-6.43%**	**-7.68%**	**-7.77%**	

1) Exposures based on MAC CMA. Model portfolio (highly liquid) only has MAC exposure for return-seeking FI.

*Aon's Capital Market Assumptions (CMAs) are 10 and 30-year risk, return and correlation assumptions. Please see appendix or additional detail

Return-Seeking Fixed Income Portfolio Analysis: Risk vs. Return



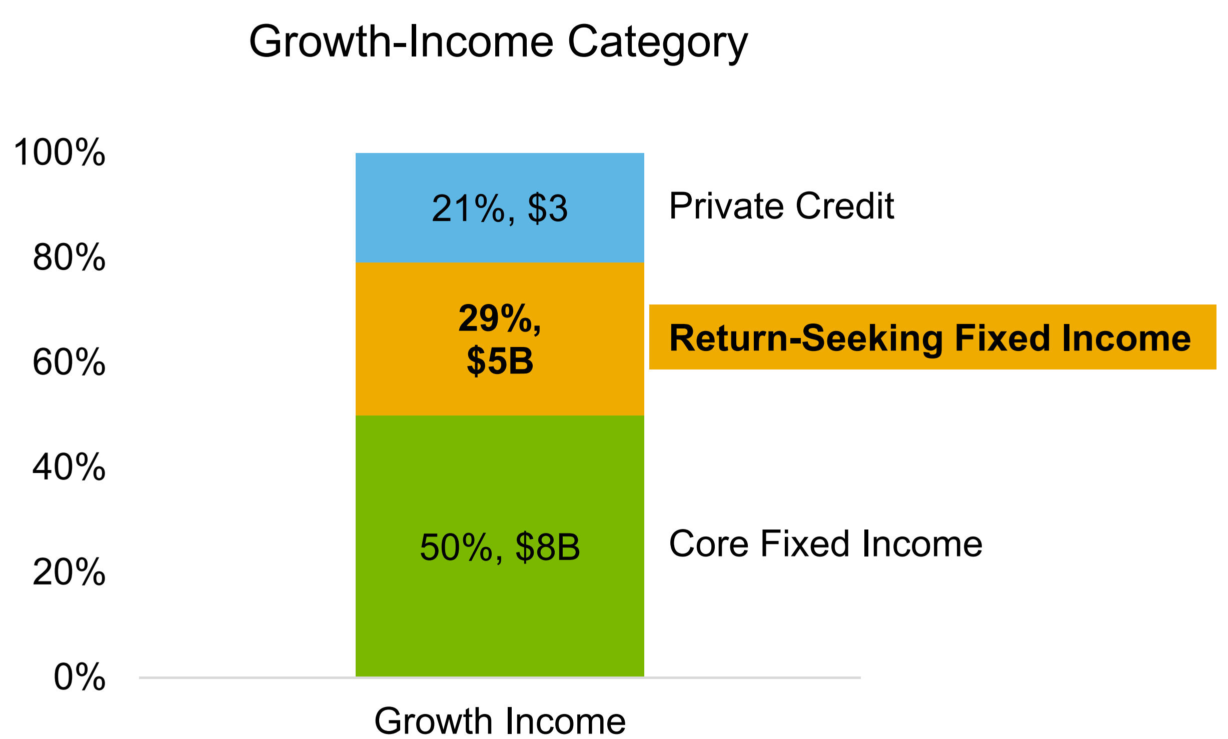
There is a spectrum of asset types within return-seeking fixed income that have varying risk/return characteristics, which provides the opportunity to maximize return per unit of risk when utilizing the full opportunity set

*Based on Aon's 1Q 2019 Capital Market Assumptions

Implementation Considerations

MN SBI Growth-Income: Return-Seeking Fixed Income

- Growth-Income: 15% - 30% of Total Fund
- Dollar values assume middle of range allocation: Approx. 22.5%, or $16B in assets
- Below sub-category allocations are general assumptions and not set Policy



Implementation Considerations

- Risk and return goals and expectations
- Liquidity profile
- Control vs. discretion
  - i.e. tactically shifting within preset underlying strategic ranges vs. investment manager discretion to invest across the return-seeking FI opportunity set
- Number, type and size of mandates
- Implementation and monitoring resources
- Overlap exposures across core fixed income and private debt

Multi-Asset Credit (MAC): Idea Overview and Value

Increase return by widening the opportunity set within credit

Reduce volatility by actively diversifying across credit sectors

Multi Asset Credit (MAC)

MAC products typically have less sensitivity to interest rate changes than core fixed income products and can protect returns in a rising interest rate environment

Multi-Asset Credit (MAC) Idea Overview and Value:
Sectors Perform Differently Year on Year

- MAC strategies seek to add value by capturing the credit premium across different credit sectors
  - Either by finding better companies, or by exposure to different credit sectors at different times, managers hope to enhance return, above a traditional core credit approach confined to one sector
  - No one credit sector will consistently outperform over time and there is value in sector rotation

Credit Sector	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Global Investment Grade	5.48	3.51	3.57	3.15	-5.09	16.60	7.25	4.79	10.92	0.07	7.59	-0.23	6.22	5.70	-0.99
Global High Yield	11.29	3.26	12.02	1.73	-27.01	60.70	15.39	3.18	18.89	7.10	2.53	-2.03	16.21	8.02	-1.90
Loans	5.60	5.69	7.33	1.88	-28.75	44.87	9.97	1.82	9.43	6.15	2.06	-0.38	9.88	4.25	1.14
EMD HC	11.62	10.25	9.86	6.16	-12.03	29.82	12.24	7.34	17.44	-5.25	7.43	1.18	10.15	10.26	-4.26

Key	Best performing sector	Worst performing sector

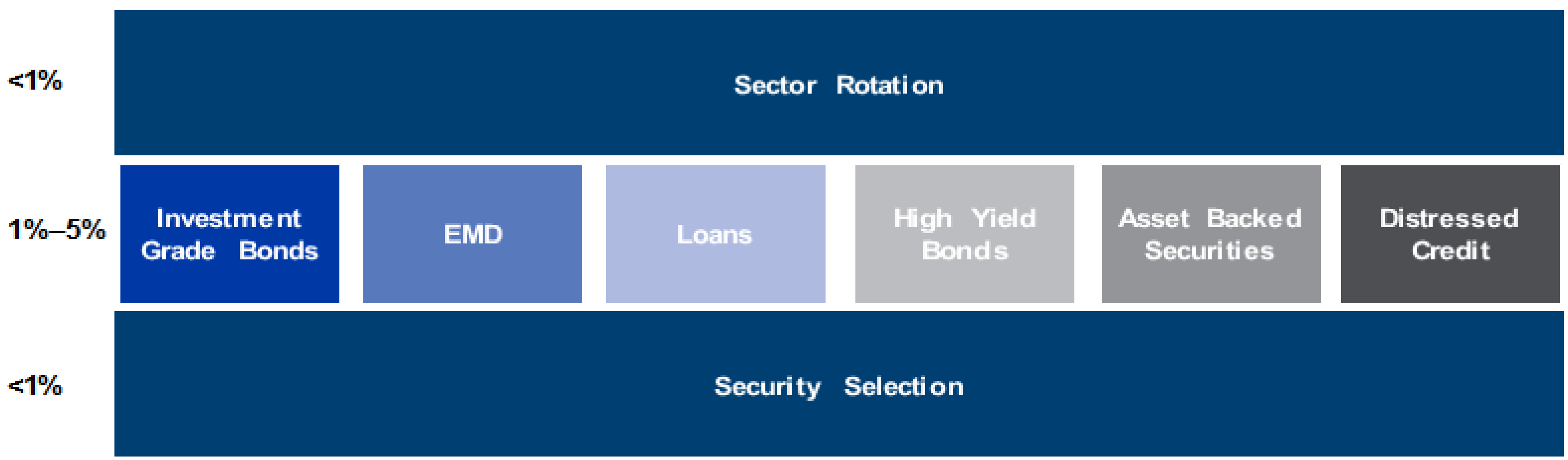
Source: eVestment, Bloomberg Barclays Global Aggregate Corporate Hedged (USD) Index, ICE BofA Merrill Lynch Global High Yield Hedged (USD) Index, Credit Suisse Leveraged Loan Index, JPMorgan EMBI Global Diversified Index. Total returns shown.

Table shows annual performance of that credit asset class. Source: eVestment, Bloomberg Barclays Global Aggregate Corporate Hedged (USD) Index, ICE BofA Merrill Lynch Global High Yield Hedged (USD) Index, Credit Suisse Leveraged Loan Index, JPMorgan EMBI Global Diversified Index. Total USD returns shown, reflecting both credit and interest rate returns where appropriate. **Past performance is no guarantee of future results.**

MAC Idea Overview and Value:
Portfolio Construction

- The MAC sandwich illustrates a typical approach to portfolio construction by asset managers seeking to rotate across credit sectors:
  - The beta of the underlying assets is structured to provide a large portion of overall returns
  - Value may be added by both sector rotation across the sectors and security selection within the sectors
  - Depending on the type of MAC strategy, more of the potential added value can come from either sector rotation (more top down economic focus) or security selection (bottom up company value)

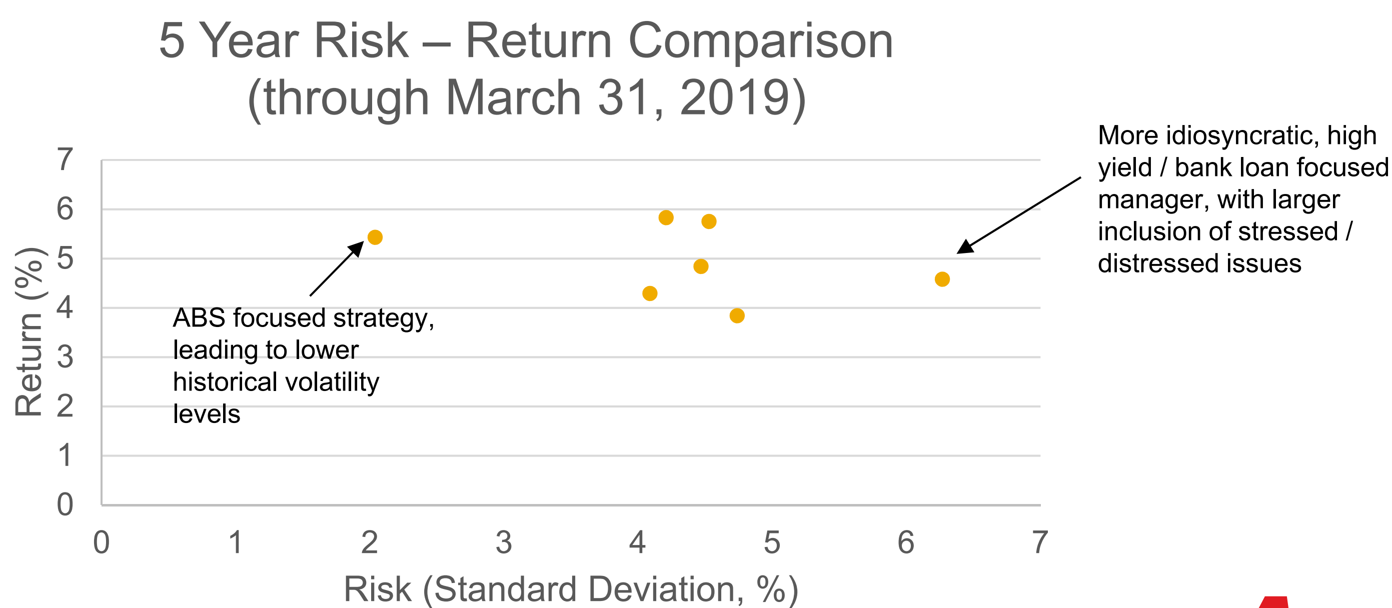
Example Returns



Source: Aon Hewitt, illustrative only

MAC Investment Manager Landscape

- The MAC space includes a variety of different objective that managers look to achieve with their strategies.
  - Some strategies will state an objective of providing a certain level of return above that of a risk free rate (typically LIBOR) over a full market cycle
  - Others may compare themselves relative to a blended market benchmark that more aligns with the opportunity set they invest in
  - Across high yield / bank loan focused mandates, a common goal is to provide high yield-like returns with roughly half the volatility of that market
  - Different strategies result in different expected risk and return levels



MAC Investment Manager Landscape (cont'd)

- MAC strategy universe is very diverse in terms of the opportunity sets available to any one manager
  - Typically aligns with those areas a manager views themselves as having an expertise in
  - In many cases, these managers have a sizeable, integrated credit team which will form the core of the strategy
  - Consistent with this is the fact that a good portion of our strategies start with a high yield / bank loan focus and then may allocate to other areas of the market in order to provide return enhancement or risk reduction benefits to the portfolio

	High Yield	Bank Loans	Emerging Market Debt	Investment Grade	Convertibles	Distressed	Securitized/ Structured Credit
Manager A	X	X					X
Manager B	X	X	X	X	X		X
Manager C	X	X				X	X
Manager D	X	X		X			X
Manager E	X	X				X	X
Manager F	X		X	X	X		X
Manager G	X	X				X	X

Summary Considerations

- Given size of return-seeking fixed income portfolio (~$5B), consider a blend of dedicated/strategic allocations combined with a core allocation to MAC and/or unconstrained mandates
  - Strategic allocations provide dedicated exposures to key return-seeking fixed income sectors, such as high yield, bank loans, emerging market debt, etc.
  - MAC/Unconstrained mandates offer potential for value-add through tactical rotation among return-seeking sectors over time
- Identifying risk and return objectives will drive portfolio construction
- Return-seeking fixed income portfolios discussed today are highly liquid (quarterly liquidity)
- Other considerations:
  - Overlap exposure with core fixed income and potential private credit allocations
  - Correlation to equity risk

Appendix

MAC and Global Unconstrained Buy-Rated Strategies

Current Buy-Rated MAC/Global Unconstrained Strategies

- **Barings Global High Yield Credit Strategies** – Mostly global high yield and global loans but will include a reasonable allocation to CLOs, and may have a very small position in EMD, but mostly high yield/loan/CLO focused, would be among the more globally focused strategies whereas most below have a heavier US bias (generally these markets stray more to the US since the US high yield and loan markets are the largest globally)
- **BlueBay Total Return Diversified Credit** – Fairly diversified MAC strategy with largest portfolio weights to global high yield, global loans, and EMD – hard/local/corporates – although will also include IG credit, convertibles, CoCos, and at times tactically to cash
- **Brigade Opportunistic Credit** – 50% HY / 50% Loan benchmark, mostly US focused, although will also include structured/CLOs and distressed debt, among our MAC strategies likely the most aggressive in taking very idiosyncratic risk and likely have a larger distressed/opportunistic allocation compared to those that include this allocation (can include stressed municipal issues in this bucket)
- **Guggenheim Multi-Credit Strategy** – US focused strategy investing heavily across non-agency ABS/MBS securities although will include some IG credit, high yield, and bank loans, will have a sizeable allocation to below investment grade securities although more than half of the portfolio will be in investment grade issues
- **Oak Hill Diversified Credit Strategies** – 50% HY / 50% Loan benchmark, more US focused, will include CLOs to a reasonable extent (10+%) and some distressed exposure, will allocate to cash on a tactical basis at time (can go around 10% or so)

MAC and Global Unconstrained Buy-Rated Strategies (cont'd)

Current Buy-Rated MAC/Global Unconstrained Strategies (cont'd)

- **PIMCO Diversified Income** – 1/3 each to global IG credit, global high quality high yield, hard currency sovereign/quasi-sovereign benchmark, but besides those areas will also include mortgages/securitized and municipals and to a lesser extent could have convertibles and preferreds
- **Bain High Income** – 50% HY / 50% Loan benchmark, and will mostly stick to those areas (more US focused) with CLOs included to a reasonable size alongside the loan allocation, can also include some to RMBS/equity and have some distressed exposure, will also incorporate credit hedging positions (CDS/CDX) so normally keeps a net market exposure below 100%
- **Western Macro Opportunities** – Does not manage to a benchmark but rather takes a unique approach in targeting an absolute volatility figure (800-1000 bps annually) and then looks to maximize the level of return at that vol figure, looks to evenly split returns from top-down and bottom-up best ideas, duration can range from -5 to +10 years, notional exposure can be above 100% with an opportunity set including global IG and HY credit (although has lied more in US than Europe historically), sizeable allocation to FX and EMD at times (each have been around 30-40% past 5 years), MBS/ABS, and municipals
- **Brandywine Global Unconstrained Fixed Income (GUFI)** – Absolute return focused strategy using long/short exposures mostly in global developed sovereign interest rates and currencies although will also add global IG and HY credit, MBS, and EMD, with duration ranging from -5 to +5 years
- **Recent additions: Schroders Multi Sector Securitized and KKR Opportunistic Credit**

Characteristics of Largest Fixed Income Classes*

Security Type	Ratings	Spread to LIBOR (bps)	Seniority	Secured	Liquidity	Complexity
Cash	AAA	-	✓	-	Excellent	Low
Government Bonds	AAA-AA	-	✓	-	Excellent	Low
IG Credit	AAA-BBB	50 – 150	✓	Varies	Good	Low
Senior Mortgages	A	150 – 225	✓	✓	Weak	High
ABS	AAA-B	25 – 450	Varies	✓	Good	High
Leveraged Loans	BB-CCC	250 – 450	✓	✓	Weak	High
High Yield	BB-CCC	250 – 450	Varies	Varies	Average	Medium
EMD (Sovereign)	AA-BBB	200 – 350	✓	-	Good	Medium

*Please note, the above chart is for informational purposes only, and may not represent the actual characteristics of the fixed income asset class listed as these are applicable on an issuance by issuance basis, and are subject to market conditions.

High Yield Bonds

- High yield bonds are defined as bonds with a credit rating of below investment grade
  - Rating below BBB- by S&P and below Baa3 by Moody's is considered below-investment grade
- Because they have greater credit/default risk, high yield bonds typically carry a higher coupon than high grade bonds and offer a higher yield
  - Empirically, high yield bonds have overcompensated investors for the risk of default
- Seniority in capital structure relative to equities
- Cyclical asset class

Opportunities	Risks
▪ Attractive yields relative to investment grade securities ▪ Provide diversification benefits over time during normal market environments ▪ Low positive correlation with investment grade bonds ▪ Attractive risk/return attributes (over the past 10 years, high yield bonds have generated similar returns as equities with less volatility)	▪ Additional credit risk relative to investment grade securities ▪ Contribute to volatility, rather than provide downside protection, during periods of economic stress relative to investment grade bonds ▪ Less liquid than investment grade bonds

Bank Loans

- Bank loans are loans made to businesses with credit ratings that are below investment grade, the same universe as high yield bonds
- Bank loans are usually secured by the assets of the company and rank first in priority of payment in event of default. As a result, default rates tend to be slightly lower than those from high yield bonds and recovery rates significantly higher
- Bank loans have a maturity of between 5 and 7 years. However, issuers have the option to repay the loan at a price of 100 prior to maturity. This feature shortens the typical life of a loan to around 3 years
- An actively traded secondary bank loan market only exists in the US and Europe. The US bank loan market is large and mature. Its market value is more than 3 times as big as in Europe
- Borrowers (loan issuers) are diversified across a range of industries. Credit exposure is to the borrowing company rather than the banks that underwrite them. Exposure to the financial sector is actually quite low and lower than in the high yield market
- Bank loans are also called leveraged loans as borrowers tend to have leveraged balance sheets

Opportunities	Risks
▪ At a time when interest rates are at historically low levels, bank loans offer an attractive return ▪ Diversification benefits ▪ The bank loans market has undergone structural changes since the financial crisis in 2008 resulting in toughened loan terms and a more stable investor base ▪ Protection against the expected fall in bond prices due to lack of duration ▪ Protection against sharp drop in oil price as the loan market does not have much exposure to the energy sector	• Expected rise in default rate due to refinancing worries of loans originated in 2006 to 2007 • Slowdown in economic growth puts downward pressure on bank loan prices • Liquidity risk

Emerging Market Debt

- Emerging markets: a term first introduced by World Bank economist Antoine van Agtmael to describe countries in a transitional phase between developing and developed status
- IMF grouped 153 countries as emerging and developing and 36 as developed in its World Economic Outlook in April 2014
- Emerging Market Debt: bonds issued by emerging markets
  - Issuing bodies: sovereign, quasi-sovereign (state-owned corporate) and corporate
  - Issuing currencies: external hard currency such as U.S. dollars or Euros or local currencies
- Historically, only a small part of the global bond market, but issuance increased dramatically since the 1990s

Opportunities	Risks
▪ Diversification benefits ▪ Emerging market corporate debt provide extra return from credit spread, on top of sovereign credit spreads over U.S. Treasuries ▪ Investing in local currency can be a large source of alpha as well as active risk ▪ Superior growth opportunities relative to the developed countries	• High correlation between EMD corporate and U.S. high yield • Currency risk can increase portfolio volatility • Geopolitical risk can add to the credit spread volatility • Inflation a greater concern in emerging vs. developed economies

Multi Asset Credit

- A Multi Asset Credit (MAC) strategy is a fixed income strategy seeking to add value by capturing the credit premium by rotating freely across different credit sectors, throughout the credit cycle
- MAC strategy is normally focused on credit premium of a bond such as a yield for credit risk, i.e. potential credit deterioration and/or default, and a yield for liquidity risk
- Its opportunity set includes: High yield, loans, EMG, IG credit, ABS, cash derivatives
- Typical Duration: 0-5 years
- Typical return target: 2-4% over benchmark or 5-9% absolute
- Typical benchmark: generally a High Yield/Loan blend benchmark and 'LIBOR plus' as a secondary benchmark

Opportunities	Risks
• Potential value adding by both sector rotation and security selection within sectors • MAC's flexibility to shorten duration represents a protection from rising interest rates • As a blend across credit spectrum, the volatility of a MAC is lessened compared to the e underlying individual credit sleeves • Diversification of assets can be achieved with the skilful manager	• The beta of the underlying assets provides a large portion of overall returns • MAC strategy is exposed to credit risk – such as credit deterioration or default and potential drawdown • MAC returns could suffer during market stress period for credit • MACs with larger portions in High Yield tend to correlate more highly with their equity • MAC volatility is expected to be higher than Absolute Return or Total Return strategy • MAC investing down the credit curve might offer only weekly or even monthly liquidity, or longer notice periods for an intended redemption

Hedge Funds

- Hedge Funds are investment vehicles structured to take advantage of diverse or unique opportunity sets, often using broad guidelines that are benchmark agnostic. While hedge funds are not an asset class, rather structures to implement strategies across a diverse range of asset classes, they do have sensitivities to underlying factors that drive asset class returns and risk.
- The term “hedge fund” really refers to the legal and operational structure
  - It tells us nothing about the underlying investment strategies, which vary by asset type, leverage, market exposure, and other important characteristics
- Effectively, hedge funds are private funds investing in public markets
- While the exact nature of any particular hedge fund can vary widely, one trait common to all is that investors rely primarily on manager skill (i.e., alpha) rather than market returns (i.e., beta)

Opportunities	Risks
• Enhanced return • Diversification benefit • Downside protection • Volatility reduction • Absolute return • Addresses the structural inefficiencies of long-only, traditional managers • Emphasis on added value (“alpha”), not market returns (“beta”) • Broader opportunity set • Access to “best in class” talent • Alignment of investors’ and managers’ interests	• Leverage • Headline risk • Complexity/Access • Fees • Transparency/Operational risks • Beta exposures • Key Man Risk/Less regulated • Illiquidity • Asset growth/capacity • Fat tails • Attrition

Capital Market Assumptions

- What are they?
  - Aon's asset class return, volatility and correlation assumptions
  - Long-term (10-year), forward-looking assumptions
    - These are separate from our Medium Term views
  - Best estimates (50/50 probability of better or worse long-term results than expected)
  - Market returns: no active management value added or fees (other than hedge funds and private equity, where traditional passive investments are not available)
  - Produced quarterly by Global Asset Allocation Team

Fees

- Objective is to develop return assumptions that reflect the cost of implementing an investment program
- Liquid, publicly traded asset classes are investable passively at very low cost
  – Fee assumption is zero
- For asset classes such as emerging market debt which cannot be invested in passively at very low cost, it is assumed for modeling purposes that manager alpha is offset by fees
- For real estate there is an allowance for the unavoidable costs associated with investing in a real estate portfolio. These include property management costs, trading costs and investment management expenses.
- For hedge funds, private equity and infrastructure, explicit fee assumptions are subtracted from expected returns; include base and performance-based fee/carry as appropriate

Coverage

Fixed Income	Equities	Alternatives	Macro Variables
Nominal Government Bonds	All major regions covered including Emerging Markets	Hedge Funds (7 Single Strategies; Fund of Hedge Funds; Broad Hedge Funds)	Inflation
Inflation-linked Government Bonds	U.S. Large and Small Cap	Real Estate (Total Market, Core and U.S. REITs)	Currency Movements
Corporate Bonds	Non-U.S. Developed and Emerging Markets	Private Equity	
High Yield Debt	Global Equity	Infrastructure	
Bank Loans	Equity Insurance Risk Premium (High Beta)	Commodities	
Emerging Market Debt (Hard, Local, Corporate)		Equity Insurance Risk Premium (Low Beta)	
Multi-Asset Credit			
Private Debt (Direct Lending)			

- Continually expanding coverage
- Equities and Bond assumptions formed at regional level for the U.S., U.K., Europe ex-U.K., Japan, Canada, Australia, Switzerland and Emerging Markets. Real estate assumptions for U.S., U.K., Canada and Europe

Q1 2019 Assumptions (10-Year): Expected Returns and Risks

		10-yr Expected Real Return[1]	10-yr Expected Nominal Return[1]	10-yr Expected Volatility
	Equity			
1	Large Cap U.S. Equity	4.4%	6.8%	17.0%
2	Small Cap U.S. Equity	4.6%	7.0%	23.0%
3	Global Equity	5.2%	7.6%	18.5%
4	International Developed Equity	5.4%	7.8%	20.0%
5	Emerging Markets Equity	5.9%	8.3%	27.0%
	Fixed Income			
6	Cash (Gov't)	0.2%	2.5%	1.0%
7	Cash (LIBOR)	0.5%	2.8%	1.0%
8	TIPS	1.1%	3.4%	4.5%
9	Core Fixed Income (Market Duration)	1.1%	3.4%	4.0%
10	Long Duration Bonds – Gov't / Credit	1.7%	4.0%	9.5%
11	Long Duration Bonds – Credit	2.2%	4.5%	11.0%
12	Long Duration Bonds – Gov't	1.0%	3.3%	9.0%
13	High Yield Bonds	3.3%	5.7%	12.0%
14	Bank Loans	3.5%	5.9%	7.0%
15	Non-US Developed Bonds (0% Hedged)	-0.7%	1.6%	10.0%
16	Non-US Developed Bonds (50% Hedged)	0.0%	2.3%	5.5%
17	Non-US Developed Bonds (100% Hedged)	0.4%	2.7%	2.5%
18	Emerging Market Bonds (Sovereign USD)	3.2%	5.6%	13.0%
19	Emerging Market Bonds (Corporate USD)	2.7%	5.1%	11.0%
20	Emerging Market Bonds (Sovereign Local)	3.8%	6.2%	14.0%
	Alternative Investments			
21	Hedge Fund-of-Funds[2]	1.9%	4.2%	9.0%
22	Hedge Fund-of-Funds[2] (Buy List)	3.0%	5.4%	9.0%
23	Broad Hedge Funds[3]	3.3%	5.7%	9.0%
24	Broad Hedge Funds[3] (Buy List)	4.6%	7.0%	9.0%
25	Real Estate (Core)	2.9%	5.3%	11.5%
26	U.S. REITs	4.4%	6.8%	18.5%
27	Commodities	2.7%	5.1%	17.0%
28	Private Equity	6.8%	9.3%	24.0%
29	Infrastructure	4.9%	7.3%	14.5%
30	Multi Asset Credit	4.6%	7.0%	9.5%
31	ILS	3.0%	5.4%	5.5%
32	Equity Insurance Risk Premium - High Beta	4.1%	6.5%	11.0%
33	Equity Insurance Risk Premium - Low Beta	3.6%	6.0%	5.0%
34	Private Debt -Direct Lending	6.9%	9.4%	16.0%
35	U.S. Inflation	0.0%	2.3%	1.0%

1) All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees
2) Fund of hedge funds
3) Diversified portfolio of Direct hedge fund investments

Q1 2019 Assumptions (10-Year): Expected Nominal Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1 Large Cap U.S. Equity	1.00	0.92	0.96	0.78	0.72	0.09	0.09	-0.05	0.04	-0.02	0.07	-0.12	0.62	0.42	-0.03	-0.02	0.01	0.43	0.41	0.46	0.68	0.55	0.67	0.54	0.38	0.66	0.32	0.69	0.38	0.58	0.02	0.91	0.51	0.34	0.06
2 Small Cap U.S. Equity		1.00	0.90	0.72	0.67	0.07	0.07	-0.05	0.03	-0.02	0.07	-0.12	0.57	0.39	-0.03	-0.02	0.01	0.40	0.38	0.41	0.62	0.50	0.62	0.50	0.36	0.61	0.27	0.64	0.36	0.53	0.02	0.84	0.46	0.32	0.05
3 Global Equity			1.00	0.91	0.84	0.08	0.07	-0.05	0.04	-0.02	0.08	-0.13	0.67	0.44	0.15	0.13	0.01	0.48	0.46	0.56	0.66	0.53	0.66	0.53	0.39	0.63	0.39	0.67	0.37	0.64	0.02	0.88	0.48	0.36	0.07
4 International Equity				1.00	0.75	0.05	0.04	-0.04	0.03	-0.01	0.07	-0.10	0.59	0.40	0.41	0.35	-0.01	0.44	0.44	0.60	0.57	0.46	0.57	0.46	0.35	0.53	0.44	0.56	0.32	0.60	0.01	0.72	0.39	0.33	0.08
5 Emerging Markets Equity					1.00	0.06	0.06	-0.04	0.04	0.00	0.09	-0.11	0.67	0.39	0.18	0.16	0.02	0.49	0.47	0.53	0.49	0.40	0.49	0.39	0.32	0.49	0.31	0.53	0.30	0.62	0.01	0.66	0.37	0.32	0.07
6 Gov Cash						1.00	0.98	0.45	0.47	0.23	0.20	0.25	0.14	0.13	0.13	0.30	0.61	0.16	0.07	0.01	-0.02	-0.02	-0.02	-0.02	0.16	0.09	0.22	0.09	0.11	0.12	0.26	0.17	0.39	-0.02	0.53
7 LIBOR Cash							1.00	0.44	0.47	0.23	0.20	0.24	0.15	0.14	0.13	0.29	0.60	0.16	0.08	0.01	-0.02	-0.02	-0.02	-0.02	0.16	0.09	0.22	0.09	0.11	0.13	0.27	0.17	0.38	-0.01	0.52
8 TIPS								1.00	0.51	0.32	0.29	0.33	0.11	-0.06	0.07	0.12	0.21	0.14	0.03	-0.02	-0.11	-0.09	-0.11	-0.09	0.03	-0.02	0.18	-0.04	0.01	0.05	0.11	-0.01	0.13	-0.10	0.41
9 Core Fixed Income (Market Duration)									1.00	0.86	0.86	0.78	0.30	0.08	0.20	0.36	0.61	0.46	0.19	0.13	0.02	0.02	0.02	0.02	0.07	0.04	0.09	0.03	0.05	0.25	0.12	0.08	0.18	0.01	0.16
10 Long Duration Bonds – Gov't / Credit										1.00	0.96	0.95	0.14	-0.07	0.19	0.33	0.53	0.34	0.09	0.08	-0.04	-0.03	-0.04	-0.03	0.02	0.00	-0.01	-0.02	0.01	0.11	0.06	0.00	0.07	-0.09	-0.09
11 Long Duration Bonds – Credit											1.00	0.83	0.35	0.17	0.18	0.32	0.51	0.49	0.22	0.17	0.14	0.11	0.14	0.11	0.06	0.06	0.01	0.06	0.05	0.31	0.05	0.09	0.11	0.12	-0.08
12 Long Duration Bonds – Gov't												1.00	-0.12	-0.35	0.18	0.31	0.51	0.14	-0.06	-0.04	-0.23	-0.18	-0.23	-0.18	-0.03	-0.08	-0.02	-0.11	-0.04	-0.14	0.06	-0.09	0.02	-0.32	-0.09
13 High Yield Bonds													1.00	0.76	0.19	0.20	0.13	0.73	0.62	0.57	0.64	0.52	0.63	0.51	0.27	0.41	0.39	0.46	0.27	0.91	0.04	0.58	0.35	0.62	0.20
14 Bank Loans														1.00	0.10	0.11	0.08	0.45	0.54	0.44	0.69	0.55	0.68	0.54	0.19	0.28	0.19	0.31	0.18	0.80	0.03	0.39	0.25	0.82	0.15
15 Non-US Developed Bond (0% Hedged)															1.00	0.96	0.31	0.22	0.21	0.50	0.03	0.02	0.02	0.02	0.00	-0.02	0.43	0.00	0.02	0.27	0.03	-0.01	0.03	0.07	0.13
16 Non-US Developed Bond (50% Hedged)																1.00	0.58	0.27	0.21	0.46	0.02	0.02	0.02	0.02	0.03	-0.01	0.40	0.00	0.03	0.27	0.08	0.01	0.09	0.06	0.17
17 Non-US Developed Bond (100% Hedged)																	1.00	0.25	0.11	0.08	-0.01	-0.01	-0.01	0.00	0.08	0.03	0.10	0.01	0.05	0.13	0.16	0.07	0.22	-0.01	0.20
18 Hard Emerging Market Bonds																		1.00	0.69	0.62	0.52	0.42	0.52	0.41	0.19	0.29	0.23	0.31	0.19	0.76	0.05	0.41	0.26	0.36	0.09
19 Corporate Emerging Market Bonds																			1.00	0.60	0.57	0.46	0.57	0.45	0.16	0.27	0.27	0.28	0.16	0.73	0.02	0.38	0.22	0.45	0.09
20 Local Emerging Market Bonds																				1.00	0.48	0.38	0.48	0.38	0.11	0.28	0.45	0.20	0.12	0.73	0.01	0.41	0.22	0.37	0.01
21 Hedge Funds Universe																					1.00	0.72	0.99	0.72	0.25	0.44	0.28	0.46	0.25	0.69	-0.01	0.62	0.32	0.58	0.03
22 Hedge Funds Buy List																						1.00	0.72	0.99	0.20	0.36	0.22	0.37	0.20	0.55	-0.01	0.50	0.25	0.46	0.02
23 Broad Hedge Funds - without fees (Universe)																							1.00	0.71	0.25	0.44	0.28	0.45	0.25	0.68	-0.01	0.61	0.32	0.58	0.03
24 Broad Hedge Funds - without fees (BuyList)																								1.00	0.20	0.36	0.22	0.36	0.20	0.55	-0.01	0.49	0.25	0.46	0.02
25 Core Real Estate																									1.00	0.46	0.09	0.33	0.19	0.23	0.04	0.38	0.24	0.14	0.10
26 REITs																										1.00	0.20	0.47	0.26	0.38	0.02	0.61	0.34	0.23	0.06
27 Commodities																											1.00	0.11	0.08	0.38	0.06	0.31	0.23	0.14	0.40
28 Private Equity																												1.00	0.32	0.39	0.02	0.64	0.36	0.25	0.06
29 Infrastructure																													1.00	0.23	0.03	0.37	0.23	0.14	0.07
30 Multi-Asset Credit																														1.00	0.03	0.53	0.32	0.66	0.14
31 ILS																															1.00	0.05	0.10	-0.01	0.14
32 EIRP - High Beta																																1.00	0.49	0.31	0.10
33 EIRP - Low Beta																																	1.00	0.16	0.22
34 Private Debt-Direct Lending																																		1.00	0.05
35 Inflation																																			1.00

Model Portfolios Overview

"Model Portfolios" reflect our best ideas for the typical U.S client

Diversified

- Well-diversified portfolios
- Efficient portfolios that balance growth with risk control
- Range of portfolios—at different levels of complexity and liquidity

Advanced

- Based on equilibrium asset pricing combined with forward-looking views
- Reflect our research teams' best thinking on expectations for asset classes

Customized

- Starting point for asset allocation analysis and decision-making
- Customized to your specific needs

Guidance on Choosing the Right Model Portfolio for Public DB Clients

	Efficiency	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4
Public DB	Appropriate for pension plans who intend to access markets in a simple, low cost manner	Public pension plans with modest governance structure and lower tolerance for complexity	Typical public pension plan	Public pension plans with strong governance structure and high tolerance for complexity	--

Public DB Model Portfolios (Assuming 20% Risk-Reducing Assets)

	Efficiency	Portfolio 1	Portfolio 2	Portfolio 3 (Opportunity)	All Publics (Peers)	World Market Portfolio (WMP)
Equity	***60.0%***	***55.0%***	***55.0%***	***50.0%***	***55.3%***	***40.4%***
Global Public Equity	60.0	50.0	35.0	25.0	46.3	36.0
Private Equity	--	5.0	10.0	15.0	9.0	3.7
Equity Insurance Risk Premium (EIRP)	--	--	5.0	5.0	--	--
Equity L/S HFs	--	--	5.0	5.0	--	0.8
Liquid Alternatives (Buy-List)	***--***	***10.0%***	***10.0%***	***10.0%***	***7.2%***	***1.8***
Conservative	--	--	--	--	3.6	--
Aggressive	--	10.0	10.0	10.0	3.6	--
Return-Seeking Fixed Income	***8.0%***	***5.0%***	***5.0%***	***5.0%***	***5.4%***	***5.5***
Multi-Asset Credit	8.0	5.0	2.5	--	5.4	5.5
Private Debt	--	--	2.5	5.0	--	--
Real Assets	***12.0%***	***10.0%***	***10.0%***	***15.0%***	***10.4***	***11.8***
Real Estate (core)	12.0	7.5	5.0	5.0	7.7	9.6
Real Estate (non-core)	--	2.5	2.5	5.0		
REITs	--	--	--	--	1.4	1.7
Commodities	--	--	--	--	1.0	0.1
Infrastructure/Farmland/Timberland	--	--	2.5	5.0	0.4	0.3
Opportunity	***n/a***	***0-10%***	***0-10%***	***0-10%***	***--***	***--***
Total Risk-Reducing	***20.0%***	***20.0%***	***20.0%***	***20.0%***	***21.7%***	***40.5%***
Interm. Govt Bonds[1]	10.0	5.0	5.0	5.0	10.8	20.3
Interm. Credit Bonds[1]	10.0	15.0	15.0	15.0	10.8	20.3
Total Assets	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***
10-Year Expected Return[2]	6.22%	6.49%	6.65%	6.81%	6.38%	5.49%
10-Year Volatility	11.70%	11.09%	9.93%	9.64%	11.05%	8.25%
Risk/Reward (Sharpe) Ratio	0.352	0.396	0.458	0.489	0.388	0.410

[1] AHIC generally prefers broad, combined fixed income mandates. The split between credit and government is provided to illustrate AHIC's preference of credit (over government) and isn't necessarily intended as a preference for separate/split mandates for the two categories.
[2] All expected returns are geometric (long-term compounded; rounded to the nearest decimal) and net of investment fees. Additionally, expected returns do not include alpha assumptions. Expected returns presented are models and do not represent the returns of an actual client account. This presentation is intended to document Aon Hewitt Investment Consulting, Inc.'s forward-looking expected returns based on a ten-year time horizon. The views expected in this report are AHIC's forward-looking expectations partially based on informed historical results. There can be no guarantee that any of these expectations will become actual results. This is not a managed portfolio and there are no actual assets associated with the model performance presented.

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MINNESOTA STATE BOARD OF INVESTMENTS (SBI)

CLIMATE RISK INVESTMENT DISCUSSION

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SBI Climate Risk Investment Discussion:

Executive Summary

INTRODUCTION

The Minnesota State Board of Investment ("SBI") engaged Meketa Investment Group ("Meketa") to review the potential impact that climate change may have on the long-term investment risks to the SBI's Investment portfolio and indicate approaches that the SBI may take to address and mitigate identified investment risks. In what follows, we discuss the potential impact of climate change on investments; highlight peer pension plan current approaches to climate risks and opportunities; review the SBI's current approach to climate issues; and provide insights on how the SBI's portfolio is currently exposed to the risks and opportunities of transition to a low carbon economy—specifically the Plan's exposure to fossil fuel companies, including the coal subsector, and exposure to energy transition opportunities. Finally, we offer recommendations for the SBI's evolution in its approach to climate change issues.

We thank the SBI Staff for their insights and information. We thank the SBI's investment managers for responding to Meketa's survey on climate energy transition risks and opportunities in the SBI investment portfolio.

KEY FINDINGS

Climate Risk and Investments

- Climate change investment risks and opportunities will continue to escalate, from both physical effects and from the transition toward a low carbon economy.
- We believe these factors pose potential material long-term investment risks to the Minnesota State Board of Investment ("SBI") investment portfolio and offer potentially material long-term investment opportunities.
- Measuring the low carbon economy is not simple. Low carbon growth opportunities are being successfully pursued by large established enterprises, including firms that offer carbon based products and services, and new firms.
- These facts make the low carbon economy a difficult pure-play investment for a large institutional investor. Often, low carbon products and services are intermingled with fossil fuel based energy products and services. The transportation and utilities sectors both exemplify such developments.
- Stand alone, financially desirable, low carbon economy investment opportunities are in relatively limited supply, though growing. Opportunities extend beyond the energy sector to utilities, transportation and many other goods and services.
- Corporate management of climate change risks vary widely geographically, by economic sector, and by company.

Climate Risk and the SBI Investments

- In our opinion, the SBI actions on climate change place them among the more engaged U.S. public pension plans.
- The SBI has taken multiple initial steps to analyze and address climate change risks across its investment portfolio, including:
  - adopted Investment Beliefs that include a belief regarding engagement on 'Environmental, Social and Governance' ("ESG") issues;
  - developed proxy voting guidelines and practices that encourage corporate reporting on climate change risks and opportunities;
  - engaged on climate change risk issues through active participation in prominent institutional investor organizations, including The Council of Institutional Investors ("CII"), the Principles for Responsible Investment ("PRI"), Ceres, the Institutional Limited Partners Association ("ILPA"), and Climate Action 100+;
  - signed institutional investor letters urging action on climate change.
- We find that, even if the SBI changes nothing in their investment strategy, their investment funds will likely be incorporating assessments of climate risks and opportunities.

- Meketa surveyed all of the SBI's investment funds across all asset classes. Please note that the some investment firms manage more than one fund for the SBI. Thus, some managers responded for more than one fund's investment strategy that they manage for the SBI. In Meketa's survey, we found that 91% and 87% respectively of the SBI's actively managed public domestic equity and international equity assets are currently managed with some accounting for climate risks (Figure 13).
- Because the SBI's passively managed equity funds are designed to replicate market cap weighted benchmarks, and thus invest solely based on market capitalization, the overall percent of the SBI's total public market assets that account for climate change material risks is lower: 44% of the SBI's public markets assets are currently managed with some accounting for climate change risks (Figure 14).
- SBI actively managed public markets funds that represent 83% of the SBI's public market assets responded that they account for low carbon investment opportunities in their normal analysis (Figure 13). These percentages reflect the diversification in the SBI's portfolio to include and fixed income. The SBI fixed income portfolio is approximately 70% government debt securities.
- Funds that manage 63% of SBI private market assets reported that these funds are managed with some degree of accounting for climate change risks. Investment funds representing 25% of the SBI's private markets portfolio responded that they account for low carbon investment opportunities (Figure 15).
- The SBI's actively managed International Equity funds reported the highest share of AUM (70%) reporting and disclosing carbon emissions among the SBI's public market assets (Figure 16. This compared to 48% in active Domestic Equity, and 26% in Fixed Income that disclose carbon emissions. Including passive equity, 28% of the SBI's total AUM in public markets funds disclose emissions. The Euro Zone has been an early adopter on climate change and moving to a low carbon economy.
- Funds representing 7% of the SBI's private markets assets stated that they disclose the carbon footprint of their portfolio companies (Figure 18).
- The SBI's investments include exposure to low carbon products and services, particularly in public markets. These range from automakers that sell electric and internal combustion vehicles, real estate with energy efficient attributes, utilities that use both renewable and non-renewable energy, and companies in the energy sector that offer renewable energy products and services
- We found 31 of the 45 investment funds in the SBI public markets had some exposure to fossil fuel exploration and extraction companies, including passively managed funds. In total, the share of SBI public market assets invested in companies with exploration and extraction of fossil fuels was 3% (Figure 14). This seems generally in line with the broad market, although there was no precise definition that each fund followed in answering the question.

- Among the 218 SBI private market funds that responded, 68 indicated that they have exposure to fossil fuel exploration and extraction companies. The SBI had 8% of its private markets investment in companies with fossil fuel extraction and exploration (Figure 17).
- The SBI private markets funds reported 6% invested in companies involved in renewable energy (Figure 17).
- In public markets, 1% of the SBI Domestic Equity assets were reported invested in renewable energy, 7% of international equity assets, and 1% of fixed income assets (figure 14).
- We find these results in keeping with the current evolution of the global economy.

RECOMMENDATIONS

To conduct this analysis, Meketa reviewed academic, manager, scientific, institutional investor organization, and market literature. Our review of other U.S. public pension plans that are active on climate change issues included but was not limited to California Public Employee Retirement System ("CalPERS"), California State Teachers Retirement System ("CalSTRS"), New York State Common Retirement System ("NYSCRS"), New York City Retirement Plans, San Francisco Employees Retirement System ("SFERS"), Vermont Pension Investment Committee ("VPIC"), and Washington State Investment Board ("WSIB"). Based upon our review, we recommend that the SBI consider:

Investment Fund due diligence and portfolio monitoring

- Continue to regularly update investment fund due diligence specific to each asset class to ensure that material physical and energy transition climate risks and opportunities are vetted.
- Consider incorporating key indicators on climate risk exposure into annual performance reports.
- Consider periodically generating a climate risk report, including climate scenario analysis, consistent with the Task Force on Climate Related Financial Disclosures ("TCFD") recommendations.

Proxy Voting and Engagement

- Continue annual review of the SBI's proxy voting guidelines for climate issues.
- Continue participation in coordinated institutional investor efforts.
- Consider improving the consistency of proxy voting in the SBI's international equity portfolio. This might be accomplished by retaining a proxy service provider to vote all international proxies on the SBI's behalf.
- Continue deepening the SBI's engagement on climate risk with its investment managers, companies and public policy regulators, when feasible, and in keeping with applicable fiduciary duty such as the SBI becoming an active member of Climate Action 100+.

Investment Allocations

- Be Proactive: Consider shifting a portion of the SBI assets to strategies that are expected to benefit from long-term shifts to a low carbon economy (e.g. carbon capture technology and many others), in keeping with applicable fiduciary duty.

In our opinion, divestment of fossil fuels: does not impact the demand for non-renewable energy and, therefore, does not directly impact carbon emissions; gives up the SBI's shareowner voting rights and transfers those rights to parties that may not share the SBI's investment beliefs and proxy voting policies; and risks divestment from firms that may be actively transitioning to renewable energy as they continue to own non-renewable assets.

SBI Resources Needed to Continue Acquiring Knowledge on Climate Change

The resources required to adjust the SBI's investment fund due diligence to incorporate material climate issues and to evolve its proxy voting policy, can vary depending on the level of activity. Taking additional steps to increase the SBI's engagement activities, develop portfolio reporting in line with TCFD recommendations, and possibly proactively allocate capital to low carbon/green alternatives, could require significant resources.

SBI Climate Risk Investment Discussion:

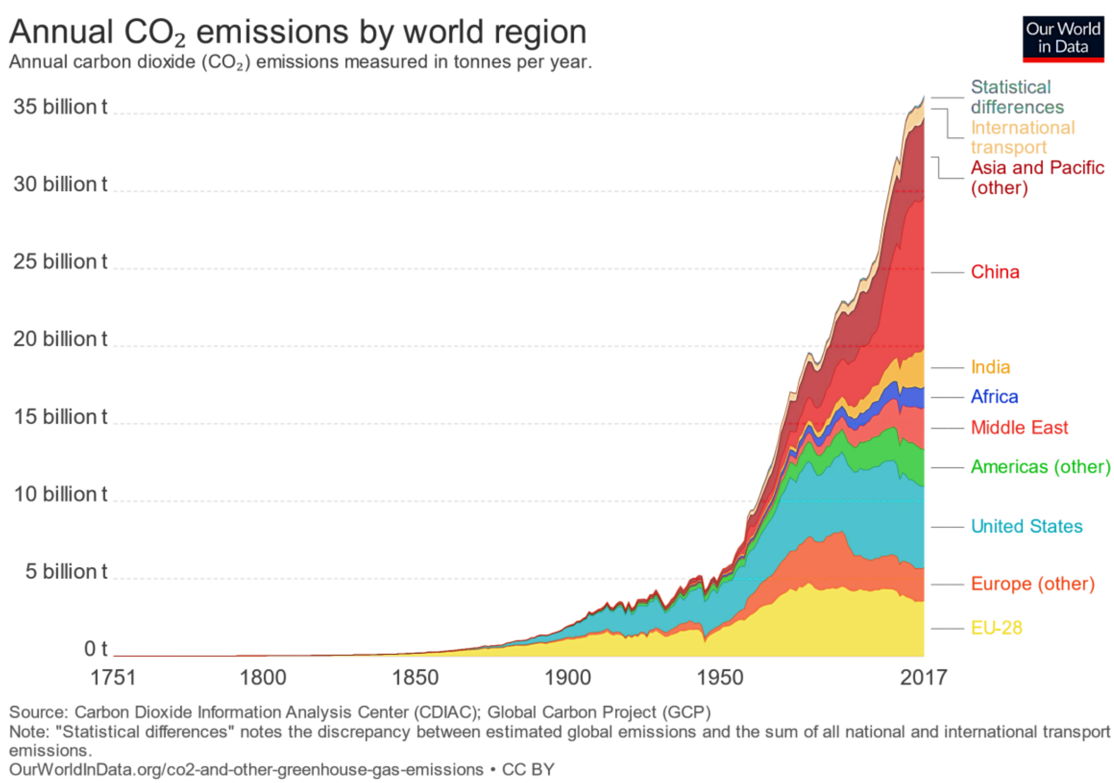
Report

CLIMATE CHANGE RISK AND INVESTMENT PORTFOLIOS

Climate change is generally defined as the statistical change in weather patterns and distribution that lasts for an extended period of time – decades to millions of years. Currently, there is nearly unanimous agreement in the global scientific community that human activity since the industrial revolution contributed to materially higher atmospheric carbon levels that trap additional heat and caused the appearance of the global warming trend. The Intergovernmental Panel on Climate Change ("IPCC") concluded in 2017 that it is extremely likely that human influence was the dominant cause of warming since the mid-20th century.[1]

The concentration of carbon dioxide in earth's atmosphere over the last 2,000 years illustrates a sudden and massive rise of atmospheric CO_2 since the Industrial Revolution. Today, China and the United States are by far the largest single country CO_2 emitters (Figure 1).

Figure 1:



Because CO_2 emissions remain in the atmosphere for generations, most of the CO_2 released since the 1800s by the United States and European countries remains in the atmosphere,

[1] *The IPCC established in 1988 under the auspices of the United Nations Environment Programme and the World Meteorological Organization to assess "the scientific, technical and socioeconomic information relevant for the understanding of the risk of human-induced climate change. It does not carry out new research nor does it monitor climate-related data. It bases its assessment mainly on published and peer reviewed scientific technical literature." The goal of these assessments is to inform international policy and negotiations on climate-related issues.*

contributing to the greenhouse effect responsible for climate change. Even if humanity ceased burning fossil fuels today, the effects of climate change would continue at current levels for decades to come. Because of the lag between CO_2 release and its physical impact, some effects, such as ocean acidification, are expected to rise for decades before stabilizing.[1]

The 2018 report by the IPCC warned that limiting the global mean temperature rise to less than 1.5 degrees Celsius is essential if humanity is to avoid the worst consequences of climate change. Should CO_2 emissions stay at their current level, it is most likely that we would reach a 1.5 degrees Celsius temperature increase by 2030. To stay within 1.5 degree C, CO_2 emissions would need to be cut dramatically by 2030 and achieve net zero by 2050.

Climate Change Investment Risks

Climate change investment risks include physical risk and transition risk toward a low carbon economy. Evidence indicates that both risks are escalating. Each broad climate risk affects economic sectors differently, and changes investment opportunities.

Physical Risks of Climate Change

Regardless of how successful humans are at limiting the causes of global warming, society faces significant physical impacts such as sea level rise, ocean warming and acidification, more frequent and severe flooding, cyclones, extended periods of drought, and extreme temperatures. These changes can increase disruptions to supply chains, real assets, health and movement of people, and incur legal liabilities. Investments are being impacted.

Real estate assets pose obvious physical risks of climate change. Increasingly powerful and destructive storms and wildfires are resulting in the damage and destruction of property. Coastal areas are likely to be more and more vulnerable to rising sea levels, affecting demand and pricing. The 2018 IPCC report indicates that the U.S. is expected to lose 1.2 percentage points of GDP for every 1 degree Celsius of warming. At 1.5 degrees Celsius of warming, the U.S. and other populous nations, including Japan, China, Indonesia, India, could see more than 50 million coastal residents displaced due to rising sea levels.

The financial costs of physical climate risks continue to escalate. In 2019, the Swiss Re Institute reported[2]:

> Global insured losses from natural catastrophe events in 2018 were $76 billion, the fourth highest on *sigma* records. More than 60% resulted from so-called "secondary" perils (Figure 2). The combined insurance losses from natural disasters in 2017 and 2018, meanwhile, were $219 billion, the highest-ever for a two-year period. Here too, more than half of the losses were due to secondary perils.

[1] Source: Candriam, and Archer, David, et. al. 2009.

[2] Swiss Re Institute (2019). "Sigma 2/2019: Natural catastrophes and man-made disasters in 2018: "secondary" perils on the frontline."

Figure 2: Defining Primary and Secondary Perils[1]

Primary Perils	Peak perils with known severe loss potential for the insurance industry. Traditionally well-monitored risks in developed re/insurance markets.	Examples: tropical cyclones, earthquakes, winter storms in Europe.
Secondary Perils	Independent secondary perils. Often not modelled and receive little monitoring by the industry.	Prominent examples: river floods, torrential rainfall, landslides, thunderstorms, winter storms outside of Europe, snow and ice storms, drought and wildfire outbreaks.
	Secondary-effect of a primary peril: not always well-captured in primary perils modelling, not in proportion to their severity potential.	Prominent examples: hurricane-induced precipitation, storm surges, tsunamis, liquefaction and fire following earthquake.

Losses from secondary perils have been rising due to rapid development in areas exposed to severe weather and warmer temperatures. The Swiss Re Institute expects this trend to continue, given ongoing urbanization in areas exposed to flooding and fire risk among others, and because of climate change.

Energy Transition Risks and Opportunities

The transition to a low carbon economy continues to accelerate. Market changes are more and more supported by policy and regulatory changes to reduce greenhouse gas ("GHG"), including carbon emissions, and encompass efforts such as introducing carbon pricing.

Developments in Minnesota provide examples of global efforts to support a shift to a low carbon economy in both energy for transportation and for stationary power sources, and more broadly, to a low greenhouse gas emissions economy. In 2007, Minnesota established its first greenhouse gas emissions-reduction goal: *"It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050. The levels shall be reviewed based on the climate change action plan study."* The January 2019 report highlights that emissions from electricity were down, Minnesota's utilities have committed to additional coal plant closures, transportation is now the largest source of Minnesota's GHG emissions, forest growth reduced total GHG emissions, and agricultural nutrient management is the largest source of nitrous oxide emissions, but many best management practices that protect water quality from nutrients and sediment also can help reduce GHG emissions.

Gov. Tim Walz set a goal in March 2019 for Minnesota to get 100 percent of its electricity from carbon-free sources by 2050. St Paul, Minnesota is committed to 100% renewable electricity community-wide by 2030. Rochester, Minnesota aims to achieve 100% renewable electricity by 2031.

[1] Source: Swiss Re Institute.

Regarding energy for transportation, Minnesota joined a coalition of 17 states and the District of Columbia in suing the U.S. Environmental Protection Agency (EPA) to preserve the greenhouse gas emission standards in place from the Obama Administration for model year 2022-2025 vehicles. The standards would save drivers money at the pump, reduce oil consumption, and curb greenhouse gases. This coalition represents approximately 44% of the U.S. population and 43% of the new car sales market nationally.

In July 2019, four automakers (Ford, Honda, Volkswagen, and BMW of North America) from three continents, entered into an agreement with the California Air Resources Board to adhere to the state's emissions standards, far exceeding the Federal EPA standards. The four automakers agreed to a fleet average of 51 mpg for light-duty vehicles by the 2026 model year. That's slightly lower and longer than the fuel economy standards of 54.5 miles per gallon by 2025 set by the Obama administration in 2012. The agreement can end conflicting state and federal standards for these four automakers, which represent 30% of the U.S. car market. Additional signees could bring an industry-driven new national standard.

The scale of climate change efforts continues to increase domestically and globally. For example, in July 2019, the European Investment Bank ("Bank"), the largest multilateral investment bank, announced that the Bank will focus its lending on decarbonizing the energy supply and increasing low carbon energy. By the end of 2020, the Bank will phase out support for energy projects reliant on fossil fuels: oil and gas production, infrastructure primarily dedicated to natural gas, power generation, or heat based on fossil fuels. The Bank provided loans for projects that involved fossil fuels for six decades.

July 2019 also marked a significant move forward for the world's biggest solar plant project when it won Major Project Status from the Australian Northern Territory (NT) government. The proposed Australia-Singapore Power Link is a $20 billion project. Australia's solar power will be transported via high voltage direct current submarine cables and cover 20% of Singapore's power demand.

Climate change now garners the attention of macroeconomic and finance policy makers. Research from the University of London examined the directives of over 100 Central Banks and found that 16 central banks explicitly mentioned a sustainability target. For example, the March 25, 2019 Economic Letter from the Federal Reserve Bank of San Francisco, states: "*To help foster macroeconomic and financial stability, it is essential for Federal Reserve policymakers to understand how the economy operates and evolves over time. In this century, three key forces are transforming the economy: a demographic shift toward an older population, rapid advances in technology, and climate change.*"

The energy transition affects industries differently. The energy sector and utilities are expected to be most strongly disrupted, particularly companies heavily dependent on the extraction, refinement, distribution and combustion of fossil fuels. Differences in potential financial risks and opportunities are widespread within each sector and sub-sector and are not uniform geographically.

Energy Sector

Figure 3 identifies the energy subsectors embedded in the SBI's passive domestic equity index, the Russell 3000.

Figure 3: Russell 3000 – Energy Sub-Sector Descriptions

Sector	Subsector	Industry
Energy	**Energy Equipment & Services**	Energy Equipment Oil Well Equipment & Services
	Non-Renewable Energy	Coal Oil: Refining & Marketing Offshore Drilling & Other Services Oil: Crude Producers Oil: Integrated Gas Pipeline
	Alternative Energy	Alternative Energy

Renewables growth surprised on the upside for most of the past decade. For example, in multiple years, the International Energy Agency ("IEA") revised upward its solar and wind capacity forecasts. The IEA's update in 2019 concludes that "solar PV is well on track to reach the Sustainable Development Scenario (SDS) level by 2030, which will require electricity generation from solar PV to increase 16% annually, from 570 TWh in 2018 to almost 3 300 TWh in 2030. Renewable energy double digit growth is projected to continue for multiple decades, through at least 2050.

The coal subsector, with its relatively more expensive cost structure, and status as the highest emitting fossil fuel, is experiencing the greatest declines in demand and market value. New bankruptcies are announced regularly in the U.S. Coal producing companies tend to be highly dependent on a single product - coal. Continued declines in demand for coal are expected to continue in developed countries. In developing countries with abundant coal supplies, undeveloped energy infrastructure, and rapidly growing populations improving their livelihoods, such as India and South Africa, coal may remain, and possibly increase in use for many decades.

The oil and gas sectors comprise companies with a wide range of resources and capability to thrive as the low carbon economy transition escalates. For example, oil well equipment and services companies, although they typically own no fossil fuel reserves, may be at high risk if they do not develop alternative sources of revenue. Stand-alone exploration and development companies may face financial challenges. In contrast, large integrated oil companies currently have much greater resources to adapt than smaller energy sector companies. Integrated oil companies often have stronger balance sheets, significant financial resources, and extensive knowledge of energy markets.

For example, Goldman Sachs (July 2019) contends that while integrated oil and gas businesses become more profitable on the back of reduced competition and higher barriers to entry, they can successfully transform into big energy, leveraging strong balance sheets and risk-taking capabilities, to play a leading role on the higher risk spectrum of power supply, biofuels, electric mobility, carbon capture and coal substitution. The report states that European Oils already spend approximately 50% of their capital expenditures in low carbon activities. Goldman Sachs' measure of low carbon capex includes capex for total gas (for power & retail), petrochemicals, biofuels, renewables and natural sinks (reforestation, carbon capture and storage). Integrated oil companies are investing multiple billions in clean energy. This still represents a small part of their overall capex. They are simultaneously shifting focus to become power companies to take advantage of the energy market transformations.

Over the long term gas is expected to become increasingly non-competitive, with continued falling costs of renewables, coupled with enhanced storage and other efficiency technologies. Even with strong renewables growth, current expectations indicate that oil is likely to remain important through 2050. For example, Barclay's May 2019 report: "Oil in 3D: the demand outlook to 2050" concludes that oil consumption is likely to peak between 2030-2035, and the peak could come earlier if controlling emissions is given a primary focus. Petrochemical demand is expected to increase, and oil is expected to remain a large part of the energy mix, even under the low emissions scenario through 2050.

There are a wide range of expectations on the timing of the energy transition. For example, Carbon Tracker's September 2018 report: "2020 vision: why you should see peak fossil fuels coming" argues that we should expect global peaking in the demand for fossil fuel energy in the 2020s, when the challenging technologies of solar PV and wind are expected to be around 6% of total energy supply and 14% of electricity supply. The Carbon Tracker analysis focuses on the peak in demand growth, rather than on the total share of renewables in the energy mix. The report applies the theory of diffusion of innovation to the energy transition. They discuss the four main phases in the global energy transition, which is moving at different paces in different geographies and sectors: innovation (up to around 2% penetration for new technology); peaking (at 5-10% penetration); rapid change (at 10-50% penetration); and the endgame (after 50% penetration). Carbon Tracker argues that the peaking phase - the point at which demand for the old energy source peaks - is the most important tipping point for financial markets and investors.

Assessments of company management and strategy can offer additional forward-looking indicators. Data is now being collected that includes more systematic assessments of management/governance of greenhouse gas emissions and the risks and opportunities arising from the energy transition, alongside carbon emissions reduction performance. For example, as shown in Figure 4, the Transition Pathway Initiative ("TPI"), established in January 2018, recently published "Management Quality and Carbon Performance of Energy Companies: September 2019", a report that analyzed 135 energy companies involved in coal mining, electricity, and oil and gas production. This TPI report found that: "Only four energy companies are…unaware of, or not acknowledging climate change as a business issue. Close to 60% of energy companies are on Level 3 – integrating climate change into operational decision-making or Level 4 – strategic assessment of climate change."

Figure 4: Management Quality Level

		Total Companies		Oil & Gas Companies	Coal Mining Companies	Electricity Utilities
Level	Level Description	Percent	Number	Number	Number	Number
Level 0	**Unaware**	3%	4	1	3	0
Level 1	**Awareness**	19%	25	5	11	9
Level 2	**Building Capacity**	21%	28	18	1	9
Level 3	**Integrating into operational decision-making**	27%	36	14	2	20
Level 4	**Strategic Assessment**	31%	42	12	6	24

Source: TPI, September, 2019 Report.

Utilities

Utilities (electric and natural gas) in the U.S. and globally have been and will continue to transition to low(er) carbon energy at varying rates, often in concert with local/regional regulatory mandates. Figure 5 illustrates the top 15 'dirtiest' and top 15 'cleanest' U.S. utilities, as calculated by Tortoise Advisors utilities research, as of 2017. The table reveals a wide range of carbon emissions/megawatt hours. The information shows that the dirtiest U.S. utilities, as of the 2017 data, used the highest amounts of coal to generate power.

Figure 5: The Cleanest and Dirtiest U.S. Power Generation Companies

The 2017 Top 15 "cleanest" and "dirtiest" US power generation companies (excluding pure renewable companies) Source: Tortoise Advisors					
	Ton of CO2 / MWh		Generation Source (Fossil fuel)		
Company Name	**Company**	**Grid***	**Coal (%)**	**Natrl Gas (%)**	**Oil & Deriv. (%)**
Dirtiest US Power Generation Companies					
Ppl Corp	0.87	0.46	85	14	0
Mge Energy Inc	0.82	0.46	79	17	0
Black Hills Corp	0.80	0.46	80	9	0
Nisource Inc	0.78	0.46	70	29	0
Otter	0.78	0.46	81	1	1
WEC	0.75	0.46	68	26	0
Cms	0.72	0.46	63	32	0
Ameren Corporation	0.72	0.46	75	1	0
Alliant Energy Corp	0.72	0.46	63	27	0
Oge Energy Corp	0.66	0.46	54	39	0
American Electric Power	0.65	0.46	64	11	0
VISTRA ENERGY CORP	0.65	0.46	59	21	0
Dte Energy Company	0.63	0.46	63	5	0
Allete Inc	0.61	0.46	63	0	0
Hawaiian Electric	0.58	0.46	0	17	72
Cleanest US Power Generation Companies					
Atlantic Power Corp	0.34	0.39	7	73	0
Entergy Corp	0.30	0.46	11	53	0
Dominion Resources Inc Va	0.28	0.46	15	37	0
Idacorp Inc	0.27	0.46	24	11	0
Nrg Yield	0.24	0.46	0	64	1
AVISTA CORP	0.24	0.46	13	31	0
El Paso Electric Co	0.21	0.46	0	58	0
Public Service Enterprise Gp	0.21	0.46	10	26	1
Consolidated Edison Inc	0.20	0.46	0	0	28
Nextera Energy Inc	0.20	0.45	2	46	0
Sempra	0.19	0.42	0	53	0
Edison International	0.10	0.46	0	28	0
Avangrid Inc	0.09	0.46	0	24	0
P G & E Corp	0.06	0.46	0	16	0
Exelon	0.04	0.46	0	12	0

* As some companies have non-US operations, their grid average emission numbers are different than a pure U.S. operating company

Individual U.S. utility companies are beginning to adopt more explicit energy transition targets. Xcel Energy Inc., a utility holding company based in Minneapolis, Minnesota, serves more than 3.3 million electric customers and 1.7 million natural gas customers in eight Western States. In December 2018, Xcel became the first major U.S. utility to set a goal of 100% carbon-free electricity by 2050, with an 80% reduction goal (from 2005 levels) by 2035. Xcel is actively closing coal plants and looking to invest in renewables. Duke Energy, headquartered in Charlotte, North Carolina, and serving multiple primarily Southeastern states, offers energy services to approximately 7.4 million customers, and retail natural gas services to over 1.5 million customers. Duke Energy's 2018 Sustainability Report indicated electricity generation came from: 34% natural gas/fuel oil, 33% nuclear, 31% coal, and 2% hydro and solar. In September of 2019, Duke Energy announced a long-term commitment to reach net zero carbon emissions by 2050.

From both an investment and carbon emissions perspective, each utility's mix of energy generation and carbon footprint will be less meaningful if compared to a global average rather than to the grid in which it participates. As 2017 research by Ecofin and CarbonAnalytics articulates, the main reason is that the impact of various types of energy generation is quite different depending on the type of power it displaces. For example, a new gas-fired power station in predominantly renewables-fueled New Zealand would have a negative impact on the carbon footprint of the grid, whereas the same asset in predominantly coal-fueled China could have a positive impact.

In the utilities sector, a primary focus in the global financial markets has been on the energy transition. Utilities can be significantly affected by physical climate risk issues. For example, Investors that focused only on the Pacific Gas & Electric Corporation's (PG&E) relative standing in the energy transition, would have found that it ranks as one of the leading, cleanest electricity utilities in the U.S. (Figure 5). However, this ranking does not assess physical climate risks. The escalation in wildfires in California, and related lawsuits filed against PG&E, resulted in PG&E filing for bankruptcy in January 2019. Increasing wildfire danger and damages spurred California utilities to invest in fire prevention efforts, such as the San Diego Gas and Electric's multi-front efforts, from replacing wooden poles with stronger metal poles to withstand high winds, improving electric wire insulation, to dramatic improvements in their climate monitoring technology.

The energy and utilities industries illustrate some of the energy transition and physical climate risks and opportunities that are unfolding globally.

Climate Change Investment Opportunities

Climate change investment opportunities are growing in nearly every asset class, in concert with the expansion of the 'green' economy. The 2019 academic article, "Estimating the scale of the U.S. green economy within the global context" (Georgeson, Lucien & Maslin, Mark, Palgrave Communications, 2019, 5:121) concludes that the U.S. low carbon and environmental goods and services sector is estimated to represent $1.3 trillion in annual sales revenue, and to employ nearly 9.5 million workers, or 4% of the U.S. working age population. This section offers some indications of this evolution in public equity and bond markets.

Public Equity

In public equity markets, climate related index choices continue to grow, and evolve. Today, the three major index providers – FTSE/Russell, MSCI and S&PDJI combined offer 21 distinct environmental indexes, and another 15 ESG indexes that incorporate environmental themes, as shown in Figure 6.

Figure 6: ESG Equity Indexes From Major Index Providers[1] (June 30, 2019)

Type of Index	ESG	E
FTSE/Russell	2	6
MSCI	9	12
S&PDJI	4	3
Total	15	21

Early environmental indexes primarily focused on excluding fossil fuel reserves owners from parent indexes. These were followed by low carbon indexes, which seek to reduce rather than eliminate carbon emissions and/or fossil fuel reserves exposure, while relatively closely tracking the performance of the parent index. Green revenue public equity indexes then came to market. For example, FTSE/Russell's green revenues index overweights companies throughout the economy whose green products and services represent 20% or more of that company's revenues. Specialized indexes, such as S&PDJI's REITS green index focus on energy efficiency in buildings. Today indexes are available that address both energy transition risks and opportunities, while tracking the parent index. We anticipate that, as financial markets and climate change dynamics evolve, additional environmental indexes will come to market that incorporate material physical climate risks and opportunities alongside material energy transition risks and opportunities.

1 Source: FTSE/Russell, MSCI, and S&PDJI .

Green bond issuance surpassed the $100 billion mark in June 2019 as shown in Figure 7. The concern of 'green-washing'—issuing green bonds that do not contribute environmentally—continues to surround the unregulated green bond market.

Figure 7: Green Bond Issuance USD 100 Billion Milestones 2017-19[1]

Year	$100bn Mark in Issuance	Annual Green Issuance: (Initial Figure) – Adjusted Current Figure
2017	November	(USD 154.886) **USD162.7bn**
2018	September	(USD 163.665) **USD169.6bn**
2019	June	Forecast: USD **180-250bn**

One recent study found a documented increase in environmental performance associated with green bonds. However, the conclusions were only significant for green bonds that were certified by independent third parties (The May 2019 NBER report by Caroline Flammer, Boston University: Green Bonds: Effectiveness and Implications for Public Policy). To scale up sustainable finance, The European Union Technical Expert Group ("EU TEG") has been working on recommendations for the development of an EU Green Bond Standard, with a view to increasing transparency and comparability of the green bond market, and to provide clarity to issuers on the steps to follow for an issuance. The organization - Climate Bonds - expects that the impact of the EU TEG process will help open the 2020s path towards the first trillion in annual green finance investment.

PEER PENSION PLAN APPROACHES TO CLIMATE CHANGE ISSUES

Approaches to climate change investment risks and opportunities vary widely among U.S. public pension plans. In Meketa's opinion, there is no one right approach to these issues. Climate change, and more broadly, overall ESG implementations may encompass any or all the following aspects of a plan's investment strategy: investment beliefs, investment policy, asset allocation, investment manager selection and monitoring, investment portfolio monitoring, portfolio climate risk report, proxy voting policy and procedures, and engagement with regulatory bodies, investment managers, and companies. Figure 8 outlines a range of approaches.

[1] Source: Climate Bonds Initiative.

Figure 8: Approaches to Addressing Climate Risk and Opportunity for Institutional Investors

Approach	Short-Term Financial Risk	Long-Term Investment Thesis	Costs
Monitor funds	None	Alert managers	Minimal
Monitor Portfolio	None	Improve understanding over climate risk exposures	Can be significant to conduct full climate risk report
Vote Proxies	None	Improve underlying fundamentals of individual public equity investments	Staff and board time; proxy service provider costs. Requires costly in-house or SMA passive management to control all votes
Engage Managers	None	Improve underlying fundamentals of specific investment mandates	Increased staff or delegated engagement services time
Engage Companies	None	Improve underlying fundamentals of individual public equity investments	Requires minimal to high staff and board time depending on the number and complexity of issues
Engage on Regulatory Issues	None	Improve regulatory fundamentals	Requires minimal to high staff and board time
Invest in Low Carbon, Green Tilted, or Paris Aligned Index Funds	Optimizes to reduce tracking error to parent index	Optimize to reduce carbon increase green, and retain full opportunity set	Typically, a few basis points more in fees than underlying benchmark
Invest in Active Focus on Climate Risks/Opportunities	Risk depends on fund strategy	Relies on active manager skills to outperform	ESG active manager fees in line with non-ESG active manager counterparts
Divest	Not considered	Based on individual security selection; or long-term stranded assets thesis; diversification risks not considered	Transaction costs, portfolio restructuring, and opportunity costs vary with assets being divested and with fund structure

Climate Change Due Diligence in Investment Fund Searches and Monitoring

Climate change due diligence questions for investment fund searches and fund monitoring continue to evolve from early questions of whether the fund manager is a signatory to PRI, to questions designed to gather more granular information regarding funds approach to, and results from addressing climate risks and opportunities. Questions include climate risk and opportunity approach, identifying material risks, reporting on key performance metrics, staffing, investment policy and guidelines, investment results, and proxy voting and engagement on climate change issues.

Climate change questions are designed specifically for distinct asset classes. For example, the institutional Limited Partners Association ("ILPA") includes ESG guidelines in ILPA Principles 3.0: Fostering Transparency, Governance and Alignment of Interests for General and Limited Partners. The guidelines state that GPs should consider maintaining and periodically updating an ESG policy, provided to all LPs or to potential LPs on request. The policy should include sufficient information to enable an LP to assess the degree to which the GP's investment strategy and operations are aligned with an individual LP institution's ESG policies, including how ESG is factored into due diligence as well as incident disclosures and performance reporting. The policy should identify procedures and protocols that can be verified and/or documented, rather than a vague commitment of behavior.

PRI and the Institutional Investors Group on Climate Change (IIGCC) both publish reporting guides on climate change impacts for private equity investments. The IIGCC guide comprises two sections, including: i) a summary of the rationale for incorporating climate change concerns in private equity investments and ii) a due diligence framework that LPs and GPs can use when engaging with their fund and portfolio company investments.

Climate Change Portfolio Monitoring

Climate risk and opportunity investment portfolio monitoring is evolving in two general ways. First, ESG, and climate risk metrics are beginning to be used alongside a pension plan's traditional performance reporting. Second, climate risk scenario analysis has emerged.

Metrics for Portfolio Monitoring

Climate change metrics include but are not limited to carbon footprint analysis, green revenues exposure, carbon reserves, climate policy approach indications and physical climate risk exposure. Some institutional investors use such metrics to assess the impact of the carbon exposure of portfolios and individual companies. Metrics targeting fossil fuel reserves companies, might include:

- **Fossil fuel reserve mix.** Measure of stranded assets, and, or projected capital expenditures expected to be stranded under different climate scenarios.

- **Operational efficiency**, including carbon emissions intensity (CO^2 emissions-scope 1 + 2/$mm revenue), carbon emissions (scope 1 + 2 trend), carbon emissions (scope 1 + 2)/ per barrel of oil equivalent trend.[1]
- **Green revenues metrics.** The percent of green revenues, and the trend in the percent of green revenues, capital expenditures and projected capital expenditures on renewable energy products.
- **Climate policy approach.** These efforts are traditionally more qualitative. More and more quantitative measures are being developed, such as Carbon Disclosure Project ("CDP") Participation. Another example comes from the UK based non-profit, InfluenceMap which compiles data to produce an influence score. The influence score includes an organizational score that ranks each corporation against a set of climate change policy and legislation related queries (e.g. position on a carbon tax, energy efficiency standards). This is combined with a relationship score, which reflects the links external influencing agents have with the corporation. Large ESG data providers offer metrics to capture a company's climate policy and regulatory approach.
- **Physical climate risk exposure.** For example, the company 427 (majority owned by Morningstar as of July 2019) produces an overall physical climate risk score associated with individual companies. Their analysis uses facility-level corporate data. With that data, 427 assesses physical climate risk exposures, including sea level rise, water stress, extreme weather events such as heat, drought, floods, and hurricanes for an entire company. They conduct similar analyses of individual securities and for aggregated equity, debt, or real estate portfolios.

We anticipate that as climate change data reporting quality and availability improve, and as climate changes and global responses evolve, new metrics will become available to address investor climate risks and opportunities.

Portfolio Climate Risk Analysis

Some large state pension plans and their global peers are developing their own unique approaches to climate risk monitoring and reporting. Generally, state plans including CalPERS, CalSTRS and NYSCRF intend to report within the TCFD framework. The TCFD provides suggested voluntary guidelines for asset owners to report climate risks. The TCFD guidelines were first released in June 2017, and include climate scenario analysis as an element of reporting on Strategy.

[1] The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes'. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 includes all other indirect emissions that occur in a company's value chain, through to use by the final consumer of the product or service.

The TCFD guidelines encompass:

- Governance – board oversight of climate risks
- Governance – management's responsibilities on climate issues
- Strategy – climate related risks and opportunities over the short, medium and long-term
- Strategy – impact on plan, strategy and financial planning
- Strategy – resilient strategy and scenario analysis
- Risk Management – processes for identifying and assessing risk
- Risk Management – processes for managing risks
- Risk Management – integration into overall risk management
- Metrics and Targets – metrics
- Metrics and Targets – scopes 1, 2 and 3 emissions related risks
- Metrics and targets – targets

PRI supports the TCFD guidelines and made them mandatory for PRI signatories as of 2020. As a member of PRI, we anticipate that the SBI will want to begin developing its approach to reporting in accordance with the TCFD guidelines.

Coordinated Institutional Investor Proxy Voting and Engagement

During the past 15 years, institutional investor organizations dedicated to coordinated efforts to improve ESG, and specifically to address climate change grew significantly. The SBI actively participates in many of the most influential investor organizations and efforts. Figure 9 illustrates U.S. public pension plan involvement, and the SBI's current participation in a number of these efforts.

Figure 9: U.S. Public Pension Plan Participants in Institutional Investor Climate Risk Efforts

Organization	CII	CERES	PRI	SASB	Climate Action 100+	TCFD	Global Statement to Governments on Climate Change	Net Zero Asset Owner Alliance
Year Launched	1985	1989	2006	2011	2017	2017	2018	2019
Total U.S. Public Fund Members/Signers	56	20	15	5	16 (9/7)[1]	7	13	1
SBI Member/Signer	Yes	Yes	Yes	-	Yes	Yes*	Yes	-

[1] 16 Total (9 Participants/7 Supporters). *The SBI will be applying TCFD guidelines through its PRI reporting by 2021.

The Council of Institutional Investors ("CII"), founded in 1985, was comprised of 56 U.S. public pension plan members as of June 2019. CII is a non-profit, nonpartisan association of U.S. asset owners, primarily pension funds, state and local entities charged with investing public assets and endowments and foundations. CII is a leading voice for effective corporate governance, strong shareowner rights and vibrant, transparent and fair capital markets. CII promotes policies that enhance long-term value for U.S. institutional asset owners and their beneficiaries.

Ceres, founded 30 years ago, in 1989, today includes 20 U.S. public pension plan members. Ceres is a sustainability non-profit organization working with the influential investors and companies to build leadership and drive solutions throughout the economy. Ceres aims to address the world's biggest sustainability challenges, including climate change, water scarcity and pollution, and inequitable workplaces, through networks and advocacy.

As of 2019, 15 U.S. public plans are signatories to the Principals for Responsible Investing ("PRI"), a global organization founded in 2006. The Sustainable Accounting Standards Board ("SASB"), founded in 2011, is dedicated to developing ESG accounting standards that are likely to be materially relevant in 79 distinct industries. Currently five U.S. public plans, or their State Treasurers, are members of SASB (CalPERS, CalSTRS, Maryland State Retirement and Pension, Oregon State Treasurer, and Vermont State Treasurers Office).

Recent climate specific actions include, for example, the Climate Action 100^{+} effort, which focuses on engagements with the 100^{+} largest global CO^2 emitters. Climate Action 100^{+} includes 16 U.S. public funds (9 participants/7 supporters), of which the SBI is a participant. Separately, seven U.S. public pension plans list their organizations as supporters of TCFD recommendations. In 2018, global investors sent a statement to governments urging action on climate change. As of June 2019, globally 792 organizations signed the letter, including 13 U.S. public pension plans. In September 2019, the U.N. backed Net Zero Asset Owner Alliance launched with 12 large global asset owners, including CalPERS. The stated goals are to reach Net Zero by 2050.

U.S. Public Pension Plan Climate Investment and/or Divestment

To date, institutional investor concern has typically concentrated on energy transition risk, outside of the real estate market where physical climate risk is prominent. Trends indicate that early investment approaches, in addition to increased attention to proxy voting and engagement, focused on divestment of fossil fuel energy producers. This evolved to a greater concentration on the low carbon emissions across the economy. Recently, as investors seek to understand both energy transition and physical climate risks and opportunities as systemic issues, attention is shifting to resilience – trying to look at the entire investment portfolio to build in more resilience in the face of climate change trends and their long-term investment risk and return implications.

These trends are also evident in the metrics used to assess portfolio climate change exposures. Such metrics are rapidly shifting from primary attention to fossil fuel reserves and potential stranded assets, to also look at:

- Carbon emissions economy wide
- Measures of climate opportunity, such as green revenue shares
- Physical climate risk exposure
- Seeking more forward looking understanding with
  - Climate scenario analysis
  - Management's governance and strategy for climate change

Today, we find there are public pension plans across the spectrum, from those trying to grapple with climate change resiliency to those who have not yet integrated climate change risk/opportunity into their investment portfolio analysis. Currently, U.S. public pension plans often choose to engage with the companies which they hold publicly listed equities, seeing divestment, or exclusion, as a final resort. Some seek to invest in carbon-constrained and renewable energy strategies in public and private markets. For example, CalPERS, CalSTRS, NYSCRF, NYC Retirement Systems and SFERS have each generally focused on engagement. They have also allocated capital to carbon-constrained and/or renewables investments, and. Some plans, such as CalPERS and CalSTRS exclude companies with majority revenues from thermal coal, (for CalPERS and CalSTRS as per state legislation).

Increasingly, public plans that consider divestment of fossil fuels companies, analyze the potential for financially stranded companies, taking into account potential financial risk and climate risk metrics, rather than just the potential for stranded fossil fuel reserves assets. In March 2019, the largest public pension plan in the world, the Norway Government Pension Fund Global ("GPFG"), announced that it would divest from 31 fossil fuel exploration and development companies in its portfolio. The GPFG elected to continue its investments in the large integrated oil companies, as the GPFG saw those companies as having the financial resources and capability to play a meaningful role in moving toward a lower carbon economy.

SBI CURRENT APPROACH TO CLIMATE CHANGE ISSUES

We find that the SBI has taken multiple initial steps to analyze and address climate change risks across its investment portfolio (Figure 10), including: adopted investment beliefs that include a belief regarding engagement on 'Environmental, Social and Governance ("ESG") issues; incorporated ESG into their standard public market investment guidelines, developed proxy voting guidelines and practices that encourage corporate reporting on climate change factors; conducted climate risk surveys of its private equity funds, engaged on climate change risk issues through active participation in key institutional investor organizations that support and foster coordinated efforts regarding addressing climate change investment risks, including CII, PRI, CERES, Climate Action 100+and ILPA, and by becoming a signatory to letters urging action to address climate change risks.

Figure 10: SBI Climate Risk Developments

ESG Investment Policy/Procedure	SBI Implementation
Investment beliefs	Yes
Investment policy	Yes
Asset allocation	-
Investment manager selection	Yes
Monitor investment managers	Work in progress
Monitor investment portfolio	Work in progress
Proxy voting policy	Yes
Engagement	Yes

The SBI staff includes in all public market actively managed fund guidelines for equities and fixed income a clause stating that: "The manager is expected to incorporate environmental, social and governance ("ESG") broadly into its portfolio or process." The SBI staff's approach to ESG/climate risk diligence in evaluating private markets funds includes the following steps:

- Review the diligence materials/questionnaires that funds provide.
- Staff preference is for funds to generally follow the ILPA DDQ template, which has a section on ESG considerations.
- Ask funds to provide to us their ESG policy (if they have one). SBI staff encourages funds to create a policy but does not give feedback to funds on what they consider to be a "good" or "bad" policy.
- For investments that are very clearly related to the energy industry (oil and gas extraction, transportation and storage of fossil fuels, power generation and renewable energy), or would clearly be subject to climate risk (example: real estate funds buying beachfront property in Miami), staff spends a significant amount of time during due diligence asking questions about how the fund manager is assessing and mitigating climate risk in their investments. The nature and extent of ESG diligence may vary among investment opportunities, based upon the how climate change impacts each specific opportunity.

Engagement on the Governance of Fossil Fuel Companies

The SBI, in concert with coordinated efforts of institutional investors in the U.S. and abroad, participates in regulatory engagements on climate change, such as its active membership in CII, Climate Action 100+, Ceres and PRI, and adding the SBI's name to the Global Statement to Governments on Climate Change.

SBI EXPOSURE TO FOSSIL FUELS, THERMAL COAL AND RENEWABLE ENERGY INVESTMENTS

The SBI's current efforts to address climate change risks and opportunities address the SBI's investments throughout the economy. For this report, we concentrate on energy transition investment risk, in particular for the fossil fuel companies, and the coal subsector, and renewable energy investment opportunities.

Public market equities comprise the largest asset class of the SBI's investment portfolio. These markets currently have the most readily available benchmark data on the share and performance of fossil fuels, including oil, gas and coal, and renewable energy investments. Meketa sought to gain insight into the SBI's exposure to non-renewable and renewable energy in two ways. First, we looked at the SBI's benchmarks for Domestic and International Equity (the Russell 3000 and the MSCI ACWI ex-US) compared to non-renewables, and renewables. Second, we conducted a climate risk survey of all SBI investment funds.

The SBI Public Markets Equity Benchmarks and Energy Sub-sectors

FTSE/Russell has under construction Russell 3000 ex-coal and ex-fossil fuel indexes. In lieu of comparing the Russell 3000 to ex-fossil fuel energy variants, Figure 11 presents information on the non-renewable and renewable energy sub-sector average weights and one-, three-, and five-year annualized trailing performance information compared to the Russell 3000.

Figure 11: Russell 3000 and Energy Sector Annualized Returns

(Periods Ending 12/31/2018)

	Number of Securities	1 Year		3 Year		5 Year	
Index	**12/31/2018**	**Avg Weight**	**Return (%)**	**Avg Weight**	**Return (%)**	**Avg Weight**	**Return (%)**
Russell 3000	**3,000**	**1.00**	**-5.2**	**1.00**	**9.0**	**1.00**	**7.9**
Russell 3000 Non-Renewable Energy	119	0.049	-16.0	0.0508	2.5	0.0565	-5.5
Russell 3000 Coal	9	0.0002	-18.3	0.0002	27.7	0.0004	-23.8
Russell 3000 Oil: Crude Producers	78	0.0151	-27.8	-0.4012	-3.2	0.0169	-12.7
Russell 3000 Oil: Integrated	7	0.0249	-11.1	-0.2898	4.1	0.0298	-2.8
Russell 3000 Alternative Energy	9	0.00011	8.4	0.00014	-5.4	0.00015	-15.6

For the trailing one-, three- and five-year periods ending December 31, 2018, the non-renewable energy sector trailed the overall Russell 3000 index annualized returns. Each non-renewables subsector also trailed the parent index, barring the three-year trailing for coal, which outperformed the parent index. The alternative energy subsector also materially underperformed the Russell 3000 for the trailing three- and five-year periods, and outperformed for the trailing one-year period.

The market share, and number of companies, for each subsector provides additional insight. In particular, the Russell 3000 coal sector is currently comprised of nine companies, which in aggregate accounted for two hundredths of one percent of the Russell 3000. The largest subsector by market share of the Russell 3000 is the seven integrated oil companies, with 2.49% of the Russell 3000 on average in the trailing 1-year period ending December 31, 2018. Alternative Energy is still a very small part of this investable index. Alternative energy accounted for the smallest subsector, with one one-hundredth of one percent of the Russell 3000.

MSCI publishes an MSCI ACWI ex-US ex-fossil fuels and an ex-coal index. As shown in Figure 12, for the trailing one- and three-year periods, both the ex-fossil fuels and the ex-coal indexes underperformed the MSCI ACWI ex-US. Both indexes outperformed the parent index for the trailing five-year period.

Figure 12: MSCI ACWI ex U.S. and ex-Fossil Fuel and ex-Coal

Annualized Returns
(Periods Ending 12/31/2018)

Index	1 Year (%)	3 Year (%)	5 Year (%)
MSCI ACWI ex-US	**-14.20**	**4.48**	**0.68**
MSCI ACWI ex-US ex Fossil Fuels	-14.94	3.60	0.92
MSCI ACWI ex-US ex Coal	-14.35	4.14	0.72

Climate Change Survey of SBI Investment Funds

Meketa conducted a survey of the SBI's investment funds to gain general insight into the SBI's current exposure to fossil fuels and to renewable energy investments. The survey asked fund managers questions regarding their exposure to fossil fuels and renewables, and their approach to managing potential material climate risks and opportunities. As shown in Figure 13, the managers of all 45 SBI public markets funds responded to the survey. Managers of 90% of the SBI's private markets funds (218 of 241 funds) responded. This high response rate resulted in the survey covering 96% of the SBI's total assets under management ("AUM") as of December 31, 2018, including 100% of the SBI's public markets assets, and funds representing 83% of the SBI's private market assets. Please note that the some investment manager firms manage more than one fund for the SBI. Thus, some managers responded for more than one fund's investment strategy that they manage for the SBI.

Figure 13: 2019 Climate Risk Survey of SBI Investment Funds

	Number of Investment Funds		Total Assets Under Management (12/31/2018) ($ Billions)	
Index	**Total**	**Total that Responded**	**Total**	**Total of Managers that Responded**
Total Portfolio	**289**	**266**	**$72.59**	**$69.61**
Public Markets	45	45	54.62	54.62
Private Markets	241	218	17.97	14.99

The SBI Public Markets Funds Climate Risk Survey Responses

The survey results indicate that over two thirds (31 of 45) of the SBI's public market funds report some exposure to investment in companies involved in the exploration and extraction of fossil fuels, as shown in Figure 14. These investments accounted for just 3% of the SBI's public markets AUM, including 2% of domestic equity AUM, 9% of international equity AUM, and 1% of fixed income assets. The total 3% share of the SBI's public market investments in companies involved in the exploration and extraction of fossil fuels reflects the SBI's dominant share of public markets assets invested in domestic equity relative to other asset classes.

Figure 14: 2019 Climate Survey Results from the SBI Public Markets Funds

Funds that Responded							
				Investments in companies with			
				Exploration and extraction of fossil fuels		Renewable energy	
Asset Class	Total Number of SBI Funds	Number of Funds	Total SBI Assets under Management ($ Millions)	Number of funds	Total % share of AUM (%)	Number of funds	Total % share of AUM (%)
Total Public Markets	**45**	**45**	**$54,620**	**31**	**3%**	**27**	**2%**
Domestic Equity	**19**	**19**	**26,989**	**15**	**2**	**10**	**1**
Active	16	16	6,319	12	5	7	1
Passive	3	3	20,670	3	1	3	1
International Equity	**16**	**16**	**11,889**	**11**	**9**	**12**	**7**
Active	14	14	4,450	9	7	10	2
Passive	2	2	7,439	2	10	2	5
Fixed Income	**10**	**10**	**15,742**	**5**	1	**5**	1

Domestic equity active funds reported 5%, and passive domestic equity funds reported 1% of assets in fossil fuel exploration and extraction. International equity active funds reported 7% of AUM invested in fossil fuel exploration and extraction, compared to 10% of international equity passively managed funds.

The survey asked funds four questions aimed at gaining a general understanding of how the SBI's investment funds approach climate risk and opportunity in the funds in which the SBI is invested. The answers to these questions were qualitative, not quantitative. To summarize the responses, we categorized answers as Yes, No, Conditionally, or Not Applicable. Some funds provided detailed in-depth responses, while others provided minimal explanation.

Figure 15: 2019 Climate Survey Results from the SBI Public Markets Actively Managed Funds that Responded

				Actively Managed Funds that responded YES to:							
				Account for climate change material risks?		Account for low carbon economy opportunities		Calculate and disclose portfolio company carbon footprints?		Engage with companies not reporting and managing GHG emissions?	
Asset Class	Total Number of SBI Funds	No of Funds	Total SBI AUM of responses ($ millions)	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds
Total Public Markets	**40**	**40**	**$26,511**	**88%**	**36**	**83%**	**33**	**39%**	**17**	**73%**	**22**
Domestic Equity	**16**	**16**	**6,319**	**91**	**15**	**71**	**12**	**48**	**5**	**56**	**8**
Active	16	16	6,319	91	15	71	12	48	5	56	8
International Equity	**14**	**14**	**4,450**	**87**	**12**	**87**	**12**	**70**	**9**	**49**	**6**
Active	14	14	4,450	87	12	87	12	70	9	49	6
Fixed Income	**10**	**10**	**15,742**	**87**	**9**	**87**	**9**	**26**	**3**	**86**	**8**

As shown in Figure 15, the responses from the SBI's actively managed public markets funds indicate that 88% of the SBI's public markets actively managed assets are currently managed with some degree of accounting for climate change risks, and for low carbon economy investment opportunities (83%).

Figure 16: 2019 Climate Survey Results from all SBI Public Markets Funds that Responded

All Funds that Responded											
				Funds that responded YES to:							
				Account for climate change material risks?		Account for low carbon economy opportunities?		Calculate and disclose portfolio company carbon footprints?		Engage with companies not reporting and managing GHG emissions?	
Asset Class	Total Number of SBI Funds	No of Funds	Total SBI AUM of responses ($ millions)	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds
Total Public Markets	**45**	**45**	**$54,620**	**44%**	**36**	**42%**	**33**	**28%**	**17**	**83%**	**27**
Domestic Equity	**19**	**19**	**26,989**	**29**	**15**	**28**	**12**	**11**	**5**	**85**	**11**
Active	16	16	6,319	91	15	71	12	48	5	56	8
Passive	3	3	20,670	0	0	0	0	0	0	100	3
International Equity	**16**	**16**	**11,889**	**87**	**12**	**87**	**12**	**70**	**9**	**90**	**8**
Active	14	14	4,450	87	12	87	12	70	9	49	6
Passive	2	2	7,439	0	0	0	0	0	0	100	2
Fixed Income	**10**	**10**	**15,742**	**87**	**9**	**87**	**9**	**26**	**3**	**86**	**8**

We also surveyed the SBI passively managed public market funds. These funds are mandated to invest based solely on market capitalization, with no other tilts or exclusions.

As shown in Figure 16, the responses from the SBI's public markets funds, even including passively managed funds, indicate that close to half (44%) of the SBI's public markets assets are currently managed with some degree of accounting for climate change risks, and for low carbon economy investment opportunities (42%). As noted, this total includes passive public equity funds, and it includes the SBI's entire fixed income portfolio, which includes less than one-third corporate bonds, with the bulk of securities being in government bonds. For example, the Barclays Aggregate's top five sectors are: treasuries (43%), mortgage-backed securities (27%), corporate industrials (15%), corporate financials (8%), non-corporates (5%).

Funds responsible for approximately one-fourth (28%) of the SBI's public markets assets under management calculate and disclose portfolio company carbon footprints. This includes bond markets and passive equity products.

The passive domestic equity asset category reported the lowest share of its AUM responding yes to the questions regarding integrating material climate risks (0%), low carbon opportunities (0%), and disclosing carbon emissions (0%).

The actively managed funds predominantly responded yes to these generic climate risk and opportunities questions. Common explanations for those who answered yes, state that their company analysts integrate ESG considerations into their research and provide qualitative overview of the significant ESG risks and opportunities that could have a potential impact on company earnings and cash flow prospects. Funds often provided the disclaimer that their duty as a fiduciary is to add value with a client's agreed risk parameters, so that a company with ESG concerns could still be viewed as an attractive investment.

International equity actively managed funds reported the highest share of AUM in the SBI's public markets (70%) that report and disclose carbon emissions.

Regarding engagement, most passive domestic and international equity, and fixed income investment funds responded yes to the question: If a portfolio company is not currently reporting and managing its greenhouse case emissions, do you encourage management to do so? One SBI fixed income fund stated that they work with bond issuers to bolster their Paris Agreement alignment and help them improve their management of the underlying credit risks. Those funds that responded that they do not encourage management to report or manage greenhouse gas emissions typically stated that they did not due to time constraints when meeting with senior management, or that they used industry peers as estimates.

The SBI Private Markets Funds Climate Risk Survey Responses

Among the SBI's private markets funds, the survey results indicate that 68 (31%) of the 218 private market funds that responded report some exposure to investment in companies involved in the exploration and extraction of fossil fuels, as shown in Figure 17. These investments accounted for 8% of the SBI's private markets AUM, including 18% of private equity AUM, 27% of real assets AUM, 17% distressed private markets AUM, and, 0% of private credit and real estate AUM. The 8% total share of the SBI's private market investments in companies involved in fossil fuel exploration and extraction reflects the SBI's dominant share of private markets assets invested in private equity relative to other private markets asset classes.

Figure 17: 2019 Climate Survey Results from the SBI Private Markets Funds

		Funds that Responded					
				Investments in Companies Involved in			
				Exploration and Extraction of Fossil Fuels		Renewable Energy	
Asset Class	Total Number of SBI Funds	Number of Funds	Total SBI AUM ($Millions)	Number of funds	Share of AUM (%)	Number of funds	Share of AUM (%)
Total Private Markets	**241**	**218**	**$14,989**	**68**	**8%**	**45**	**6%**
Private Equity	127	124	8,278	37	18	28	8
Private Credit	25	16	833	0	0	2	1
Real Assets	37	31	2,679	15	27	6	2
Real Estate	23	18	878	1	0	0	0
Distressed	29	29	2,321	15	17	9	3

The SBI's reported private markets exposure to renewable energy was 6% of the SBI's total private market assets. Twenty-one percent (45) of the 218 SBI private markets funds that responded to the survey reported exposure to renewable energy. The highest share was reported for private equity, with 8% of the SBI's private equity AUM invested in companies involved in renewable energy.

Figure 18 presents an overview of the qualitative responses from the SBI's private markets funds. In general, the responses reflect differences in segments of the economy, with some funds focused on investments in areas such as real estate or services that have very different climate risk exposures than, for example, energy sector investors. For each question we categorized the responses as: Yes, No, Conditional, and Not Applicable ("NA"). Below we summarize the responses to each question.

Figure 18: 2019 Climate Survey Results from the SBI Private Markets Funds

		Funds that Responded									
				Funds that Responded YES to:							
				Account for climate change material risks?		Account for low carbon economy opportunities?		Calculate and disclose portfolio company carbon footprints?		Engage with companies not reporting and managing GHG emissions?	
Asset Class	Total Number of SBI Funds	No of Funds	Total SBI AUM of responses ($ millions)	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds	Percent of Total AUM (%)	No of Funds
Total Private Markets	**241**	**218**	**$14,989**	**63%**	**141**	**25%**	**69**	**7%**	**14**	**34%**	**54**
Private Equity	127	124	8,278	52	66	20	33	0	1	40	35
Private Credit	25	16	833	97	14	67	10	0	0	0	0
Real Assets	37	31	2,679	82	27	28	8	28	8	45	10
Real Estate	23	18	878	83	14	60	10	30	4	37	5
Distressed	29	29	2,321	59	20	18	8	0	1	8	4

Climate Risk: *Do you take into account how climate change risk, including physical, litigation and regulatory risks, and the energy transition to a low carbon economy risk might present material risks for existing and new investments?*

When asked if they address potential material climate risks in their investment processes, 65% (141) of the 218 private markets funds, representing 63% of the total SBI Private Markets AUM responded Yes. Managers of 17 funds responded No, 39 funds responded Conditionally, and 22 funds responded Not Applicable. Most of the funds who responded Yes stated that they utilize a detailed ESG due diligence framework or checklist to analyze and assess the environmental risks and exposure specific to each company before committing to an investment. Funds mentioned that they are taking steps to understand the potential physical effects of climate change, while working on being well-positioned with respect to the opportunities that are to be expected with a low carbon economy. Roughly 70% of funds who said No to this question did not provide a reason. One real estate fund who responded No, said they did not believe global climate change would adversely impact their business.

Low Carbon Economy Opportunities: *Do you take into account the revenue and/or growth opportunities a low carbon economy might present for existing and new investments?*

The survey found that 69 of the SBI's 218 private markets funds, representing 25% of the SBI's total private market assets, assess potential low carbon economy investment opportunities. The remaining funds included 68 funds that responded No, 31 funds that said Conditionally, and 65 funds said that the question was Not Applicable to their investment strategy. Funds that responded Yes generally described their belief that managing ESG risks can result in tangible value creation and indicated that they use due diligence processes or financial projection models to assess the potential value creation. Explanations as to why some funds do not take low carbon economy potential opportunities into account included funds saying they only invest in service sectors of the economy and stay away from industries traditionally associated with the carbon economy.

Carbon Footprint Measurement: *Do you calculate and disclose the carbon footprint of your portfolio companies? If so, please identify how carbon footprint is measured.*

Managers of 14 funds (6%) of the SBI's 218 private markets funds, representing 7% of the SBI's private markets assets stated that they calculate and disclose the carbon footprint of their portfolio companies, 66% of the fund respondents said No, 2% said Conditionally (if requested to calculate) and 25% said it was not applicable to them due to the nature of their business or because their fund had been fully liquidated. The primary asset classes that reported calculating carbon footprints were real estate and real assets.

Engagement: *If a portfolio company is not currently reporting and managing its greenhouse gas emissions, do you encourage management to do so?*

Managers of 54 of the SBI's 218 private markets funds, representing 34% of the SBI's Private markets AUM, indicated that they would encourage management to report and manage greenhouse gas emissions. Managers of 65 funds responded that they would not; 17 funds responded Conditionally and 63 funds said it was not applicable to their investment strategy. Private funds who said Yes, stated that they encourage portfolio companies to focus on ESG factors by measuring Key Performance Indicators (KPIs) such as greenhouse gas emissions, carbon footprint, total energy consumption, and water consumption, which all relate to climate change. Funds that said No or Not Applicable gave varying reasons including: they are not explicitly ESG funds so they are not focused on reporting ESG factors by portfolio companies; they are currently working on enhancing social impact disclosures and not asking for greenhouse gas disclosure, or they are secondary funds which do not sit on boards or actively manager companies and therefore are not in the position to control company management reporting. Funds who responded Conditionally explained that they encourage management if it was material and aligned with shareholder interest in the long-term.

MEASURES THAT COULD ADDRESS POTENTIAL RISKS TO THE RETIREMENT FUNDS OF CONTINUED INVESTMENT IN COMPANIES HOLDING A LARGE CARBON FOOTPRINT

Based upon our review of academic, manager, scientific, institutional investor organization, and market literature, and the activities of other U.S. public pension plans, that are active on climate change issues, we recommend that the SBI consider:

Investment Fund Due Diligence and Portfolio Monitoring

- Continue to regularly update investment fund due diligence specific to each asset class to ensure that material physical and energy transition climate risks and opportunities are vetted.
- Consider incorporating key indicators on climate risk exposure into annual performance reports.
- Consider periodically generating a climate risk report, including climate scenario analysis, consistent with the Task Force on Climate Related Financial Disclosures (“TCFD”) recommendations.

Proxy Voting and Engagement

- Continue annual review of the SBI’s proxy voting guidelines for climate issues.
- Continue participation in coordinated institutional investor efforts.
- Consider improving the consistency of proxy voting in the SBI’s international equity portfolio. This might be accomplished by retaining a proxy service provider to vote all international proxies on the SBI’s behalf.
- Consider deepening the SBI’s engagement on climate risk with its investment managers, companies and public policy regulators, when feasible, such as the SBI’s recent joining of the Climate Action 100+.

Investment Allocations

- Be Proactive: Consider shifting a portion of the SBI assets to investment strategies that are expected to benefit from long-term shifts to a low carbon economy (e.g. carbon capture technology), in keeping with the applicable fiduciary duty.

In our opinion, divestment of fossil fuels: does not impact the demand for non-renewable energy and, therefore, does not directly impact carbon emissions; gives up the SBI’s shareowner voting rights and transfers those rights to parties that do not share the SBI’s investment beliefs and proxy voting policies; and risks divestment from firms that may be actively transitioning to renewable energy as they continue to own non-renewable assets.

SBI RESOURCES NEEDED TO CONTINUE ACQUIRING KNOWLEDGE ON CLIMATE CHANGE

The resources required to adjust the SBI's investment fund due diligence to incorporate material climate issues, and to evolve its proxy voting policy can be relatively minimal. Taking additional steps to increase the SBI's engagement activities, develop portfolio reporting in line with TCFD recommendations, and possibly proactively allocate some investments to low carbon/green alternatives, could require significant resources. Depending on the scope, they could require an additional dedicated ESG/climate staff person, and additional resources for analysis, engagement, and investment execution. At the low end, we estimate a minimum of $250,000 – 400,000. A deep and ongoing shift could add $1 million to $2 million in costs.

CONCLUSION

In our opinion, markets now offer meaningful tools to address climate risk other than divestment, from coordinated proxy voting and corporate and public policy engagement, to passive and active low carbon alternatives that avoid the broad market exit risk inherent in divestment approaches. We believe the SBI should continue its effort to address and manage climate and other material ESG risks and opportunities. In our opinion, the SBI should continue to stay abreast of, and consider, the ongoing changes in assessments of climate risks, and approaches to managing these risks.

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Market Environment

Third Quarter 2019

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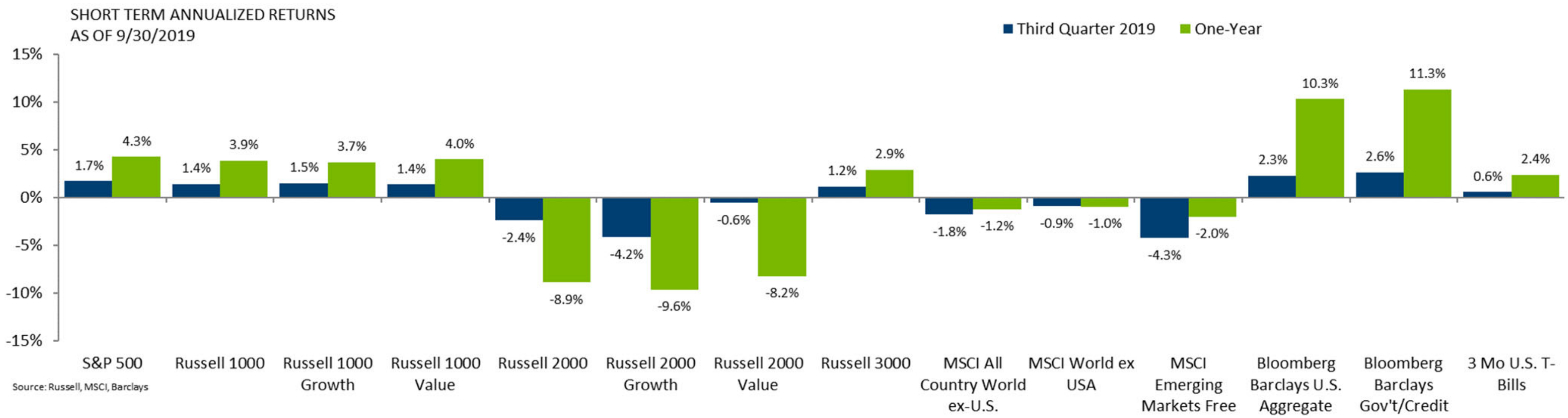
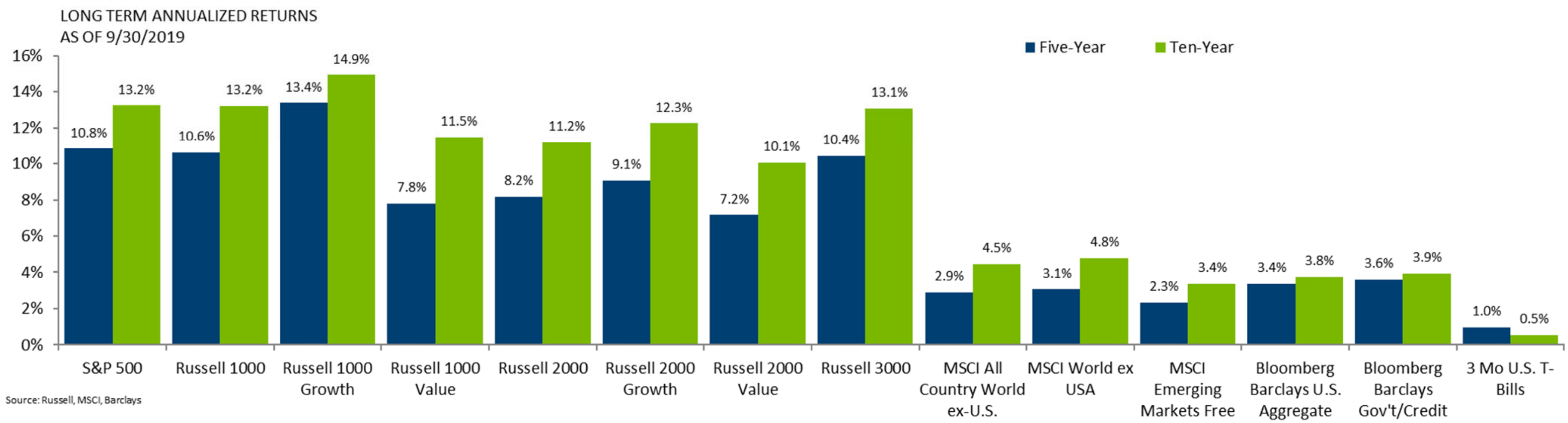
Market Highlights





Market Highlights

Returns of the Major Capital Markets

Periods Ending 9/30/2019

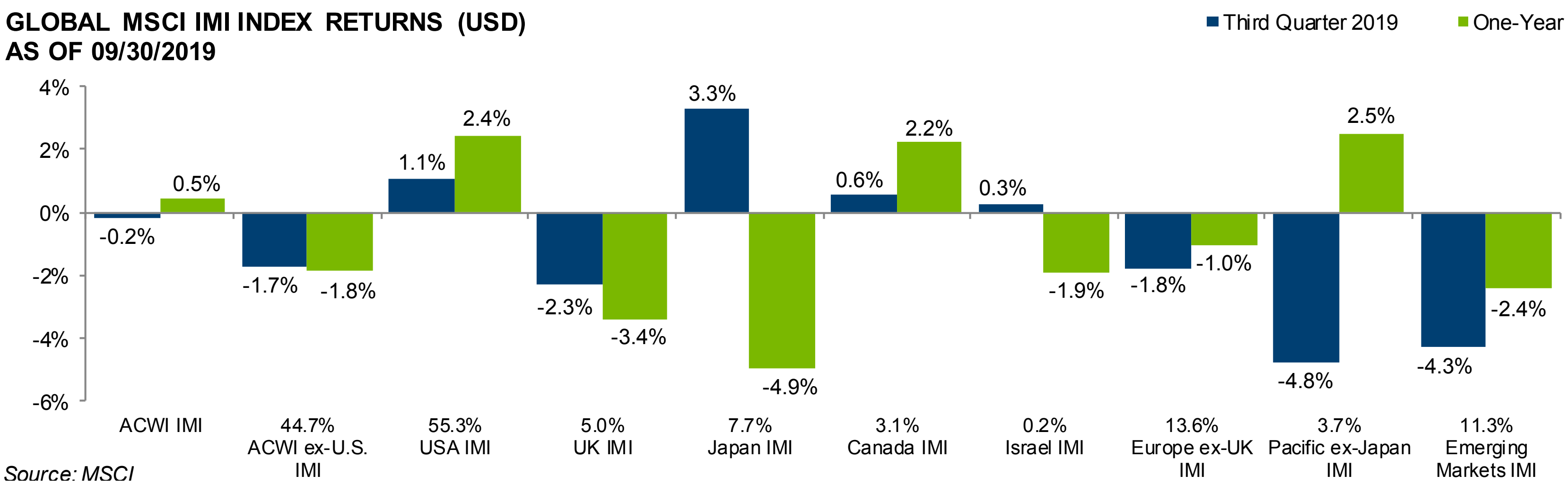
	Third Quarter	1-Year	3-Year[1]	5-Year[1]	10-Year[1]
Domestic Equity					
S&P 500	1.7%	4.3%	13.4%	10.8%	13.2%
Russell 1000	1.4%	3.9%	13.2%	10.6%	13.2%
Russell 1000 Growth	1.5%	3.7%	16.9%	13.4%	14.9%
Russell 1000 Value	1.4%	4.0%	9.4%	7.8%	11.5%
Russell 2000	-2.4%	-8.9%	8.2%	8.2%	11.2%
Russell 2000 Growth	-4.2%	-9.6%	9.8%	9.1%	12.3%
Russell 2000 Value	-0.6%	-8.2%	6.5%	7.2%	10.1%
Russell 3000	1.2%	2.9%	12.8%	10.4%	13.1%
International Equity					
MSCI All Country World ex-U.S.	-1.8%	-1.2%	6.3%	2.9%	4.5%
MSCI World ex USA	-0.9%	-1.0%	6.5%	3.1%	4.8%
MSCI Emerging Markets Free	-4.3%	-2.0%	6.0%	2.3%	3.4%
Fixed Income					
Bloomberg Barclays U.S. Aggregate	2.3%	10.3%	2.9%	3.4%	3.8%
Bloomberg Barclays Gov't/Credit	2.6%	11.3%	3.2%	3.6%	3.9%
3 Mo U.S. T-Bills	0.6%	2.4%	1.5%	1.0%	0.5%
Inflation					
CPI-U	0.4%	1.7%	2.1%	1.5%	1.7%

MSCI Indices show net returns.

All other indices show total returns.

[1] Periods are annualized.

Global Equity Markets

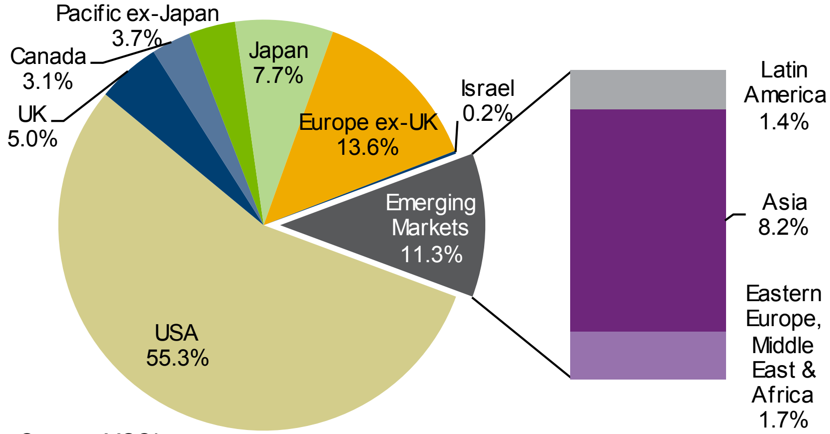


Source: MSCI

- Concerns of slowing global growth and trade wars ramped up significantly over the quarter before giving way to monetary stimulus that helped to bolster stocks. In local currency terms, the MSCI AC World Investable Market Index returned 1.1% but due to U.S. dollar appreciation, global equities returned -0.2% in USD terms.
- Japanese stocks were the strongest performers (3.3%) where significant multiple expansion saw cyclical sectors, such as the Consumer Discretionary sector, outperform strongly.
- Pacific ex-Japan was the worst performer with a return of -4.8%, significantly dragged down by double-digit decline in Hong Kong equity returns due to slowdown in China and heightened political unrest with growing protests triggered by a controversial extradition bill.
- Emerging Markets (EM) equities fell sharply at -4.3% as impact of trade concerns continues to be a strong headwind. In particular, a double-digit decline in Chinese stocks detracted from EM returns as both the rhetoric and size of tariffs increased. Much of the fall can be attributed however to the strong appreciation of the U.S. dollar with the MSCI EM IMI down by 1.9% in local currency terms.

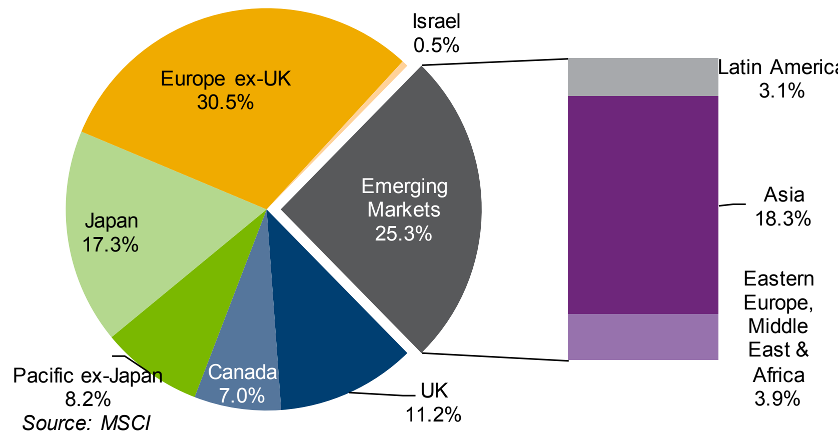
Global Equity Markets

MSCI ALL COUNTRY WORLD IMI INDEX GEOGRAPHIC ALLOCATION AS OF 09/30/2019



Source: MSCI

MSCI ALL COUNTRY WORLD EX-U.S. IMI INDEX GEOGRAPHIC ALLOCATION AS OF 09/30/2019

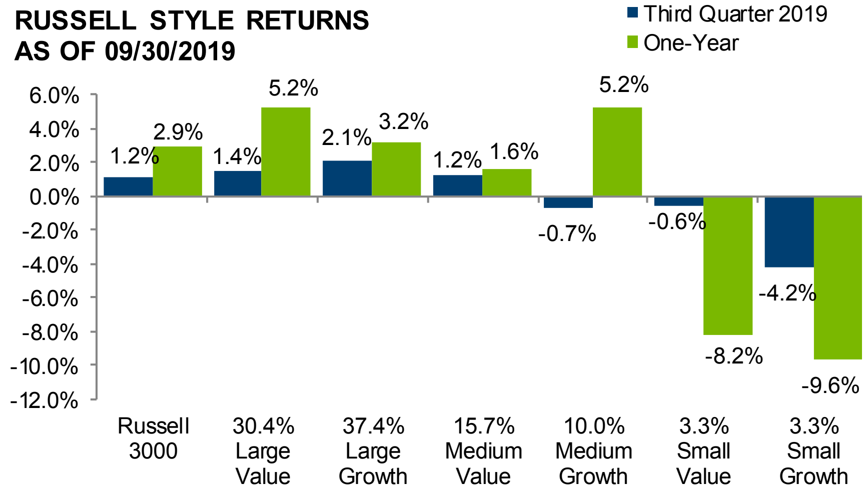


Source: MSCI

- The two exhibits on this slide illustrate the percentage that each country/region represents of the global and international equity markets as measured by the MSCI All Country World IMI Index and the MSCI All Country World ex-U.S. IMI Index, respectively.

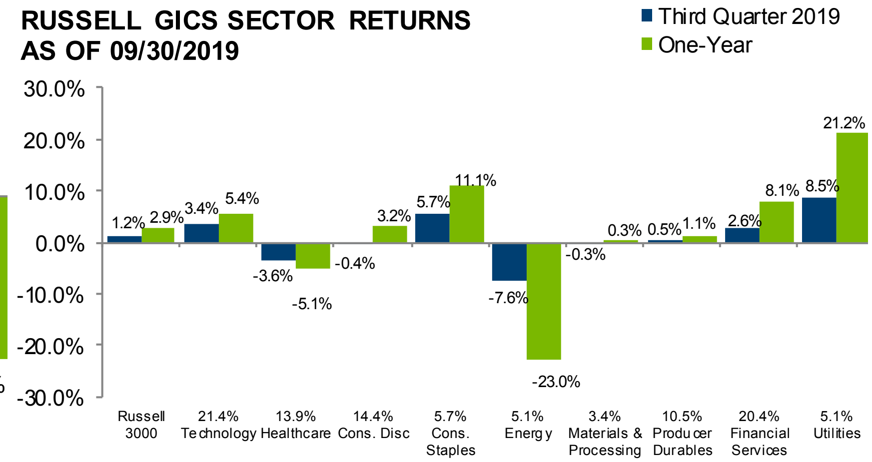
U.S. Equity Markets

RUSSELL STYLE RETURNS AS OF 09/30/2019



Source: Russell Indexes

RUSSELL GICS SECTOR RETURNS AS OF 09/30/2019

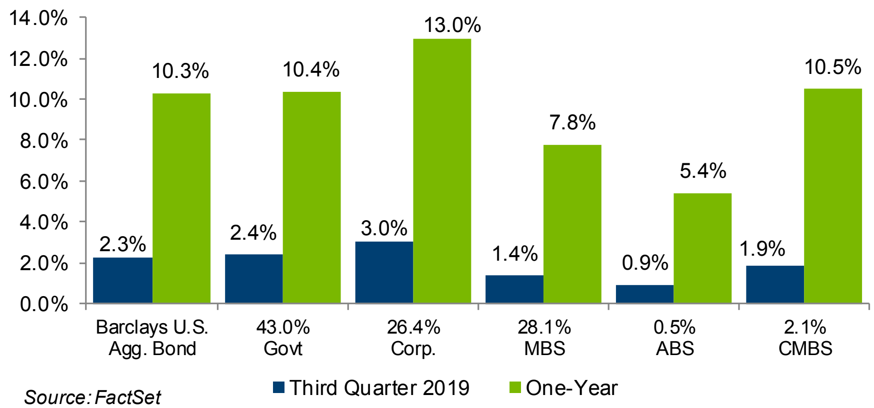


Source: Russell Indexes

- With expectations of corporate earnings turning lower, the positive return for U.S. equities was primarily driven by multiple expansion. In general, less economically-sensitive sectors outperformed which is not too surprising given the deteriorating outlook. The Russell 3000 Index rose 1.2% during the third quarter and 2.9% over the one-year period. Relative to their international peers, U.S. stocks broadly outperformed with particularly resilience from the Financials sector.
- Energy (-7.6%) and Healthcare (-3.6%) were the worst performers over the quarter. The former was affected by lower crude oil prices, while the latter despite its more defensive nature underperformed due to political headwinds. Meanwhile, Utilities (8.5%) and Consumer Staples (5.7%) were the best performing sectors in Q3 2019.
- Performance was mixed across the market capitalization spectrum over the quarter. In general, small cap stocks underperformed both large and medium cap stocks over the quarter. Small-cap stocks underperformed on a fairly broad basis, rather than any meaningful differences in sector allocations although the near double-digit decline in small-cap Health Care stocks was notable. Growth stocks generally underperformed their Value counterparts in Q3 2019 and over the last year.

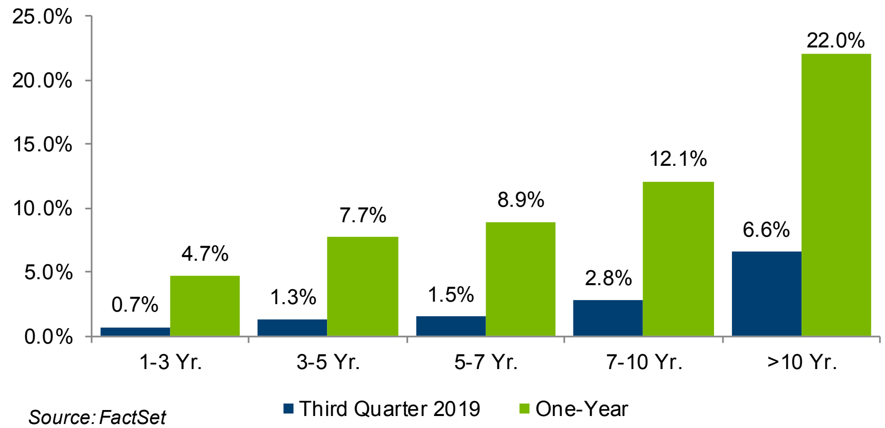
U.S. Fixed Income Markets

BLOOMBERG BARCLAYS AGGREGATE RETURNS BY SECTOR AS OF 09/30/2019



Source: FactSet

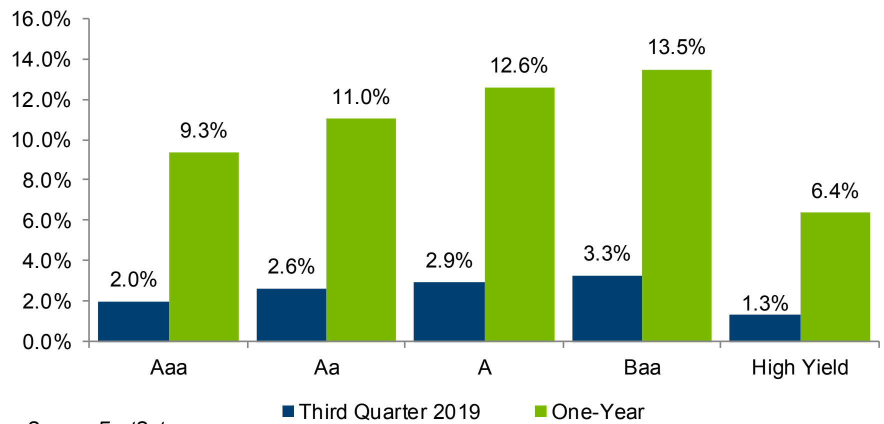
BLOOMBERG BARCLAYS AGGREGATE RETURNS BY MATURITY AS OF 09/30/2019



Source: FactSet

- The Bloomberg Barclays U.S. Aggregate Bond Index rose by 2.3% over the quarter. Corporate bonds were the best performers, returning 3.0%. Securitized debt underperformed other areas of the U.S. bond market with lower duration of the segment attributed to the more modest returns with a return of 0.9%.
- Strong underlying government bond returns supported corporate bonds returns across all credit grades. Within investment grade bonds, Baa bonds rose the most at 3.3%. High Yield bonds returned 1.3% with minimal movement in spreads over the quarter.
- As the U.S. yield curve flattened over the quarter, long-maturity bonds outperformed intermediate and short-maturity bonds. Long-maturity bonds returned 6.6% while short-maturity bonds returned only 0.7%.

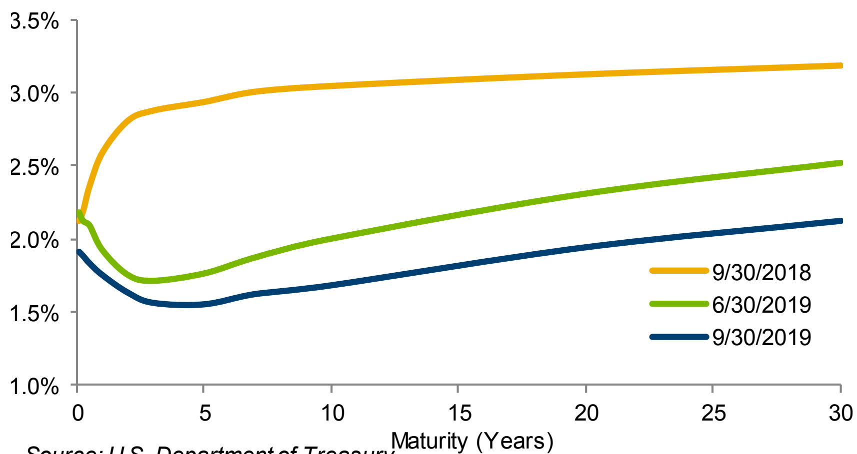
BLOOMBERG BARCLAYS AGGREGATE RETURNS BY QUALITY AND HIGH YIELD RETURNS AS OF 09/30/2019



Source: FactSet

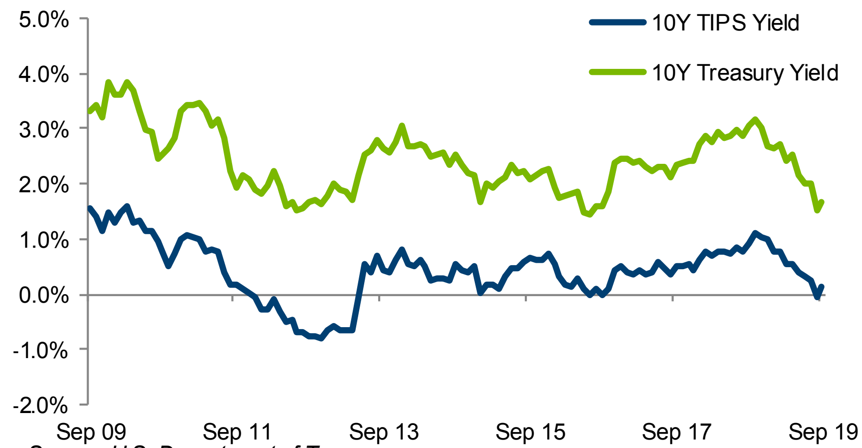
U.S. Fixed Income Markets

U.S. TREASURY YIELD CURVE



Source: U.S. Department of Treasury

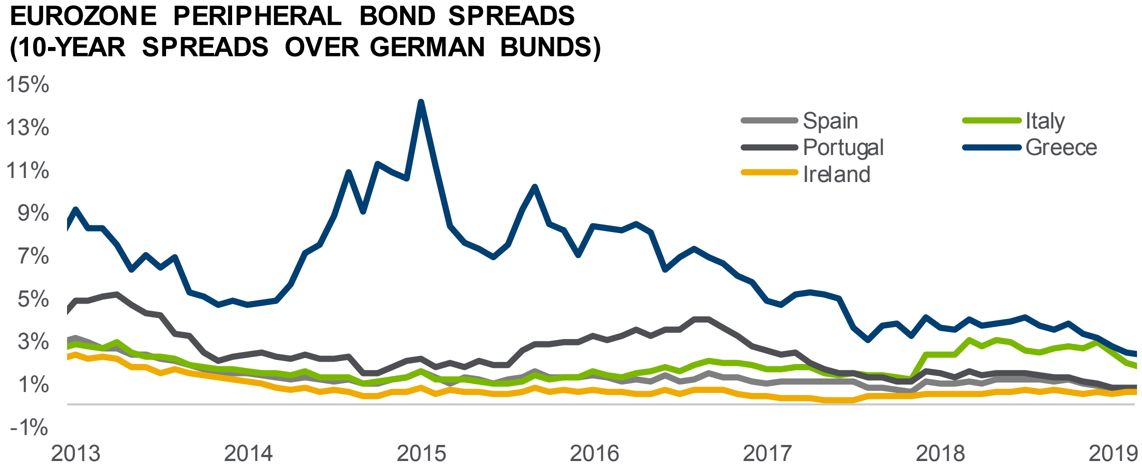
U.S. 10-YEAR TREASURY AND TIPS YIELDS



Source: U.S. Department of Treasury

- The U.S. nominal yields fell across all maturities with the yield curve flattening over the quarter as longer-term yields decreased by more than short-term yields. Over the quarter, the widely watched spread between 10 and 2-year U.S. Treasury yields briefly fell into negative territory for the first time since 2007, a concerning development as a recession has followed every yield curve inversion since the 1960s.
- The 10-year U.S. Treasury yield ended the quarter at 1.68%, 32bps lower than at the start of the quarter in which the U.S. Federal Reserve (Fed) twice cut the interest rate by 25bps each to 1.75%-2.00%. Despite the two rate cuts, the Fed made it clear that it was not the beginning of a sustained easing cycle. This more conservative messaging was maintained at the September Fed meeting although the Federal Open Market Committee (FOMC) appeared to be divided on the future direction of rates with a member arguing for more aggressive cuts to be made.
- The weaker economic outlook was reflected in the downward movements in TIPS yields by 16bps over the quarter and ended the period at 0.15%, while lower inflation expectations led breakeven inflation lower by 16bps to 1.54%.

European Fixed Income Markets



Source: FactSet

- European government bond spreads over 10-year German bunds generally fell across the Euro Area with the exception of Spanish and Irish government bonds. The European Central Bank (ECB) cut its deposit rate by 10bps to -0.5% and announced that its bond purchasing program will be restarted with the purchase of €20billion of bonds each month from November 2019. Furthermore, the ECB indicated that this policy would not be time limited but will be in place until their inflation target is reached.
- German government bond yields fell by 27bps to -0.58% over the quarter after the country's manufacturing sector dived deeper into contraction territory. Meanwhile, the 30-year German bund yield turned negative for the first time in history. Italian government bond yields fell by 129bps to a record low of 0.81% over the quarter as political uncertainty eased after a new coalition government was formally agreed.
- Greek government bond yields fell by 109bps over the quarter to a record low of 1.34%. Greece submitted a request to repay part of its expensive loans from the International Monetary Fund (IMF) early.

Credit Spreads

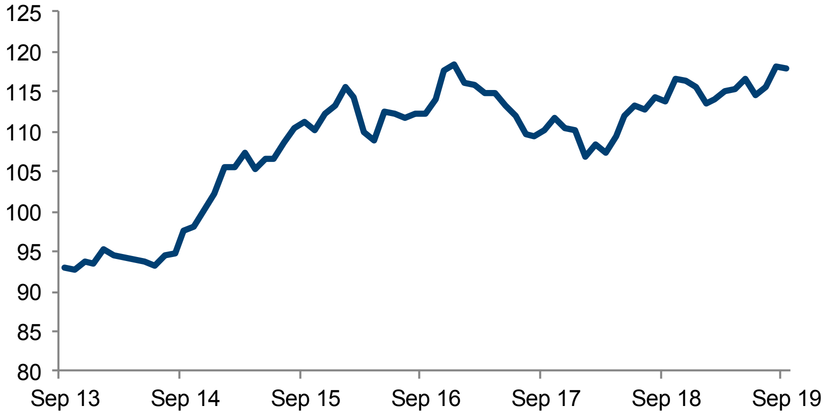
Spread (bps)	9/30/2019	6/30/2019	6/30/2018	Quarterly Change (bps)	1-Year Change (bps)
U.S. Aggregate	46	46	39	0	7
Gov't	0	0	0	0	0
Credit	109	109	100	0	9
Gov't/Credit	46	46	43	0	3
MBS	46	46	28	0	18
CMBS	70	69	60	1	10
ABS	37	41	38	-4	-1
Corporate	115	115	106	0	9
High Yield	373	377	316	-4	57
Global Emerging Market	312	282	273	30	39

Source: Barclays Live

- Movements in credit spreads over U.S. Treasuries were mixed over the quarter. There were fairly muted movements in U.S. credit with modest narrowing in U.S. high yield spreads while U.S. corporate spreads were unchanged.
- Emerging market bond spreads widened significantly by 30bps over the quarter. The ongoing trade war, U.S. dollar debt vulnerabilities among certain EM countries given the increase in the ‘greenback’ and less risk appetite weighed on emerging market debt in general.

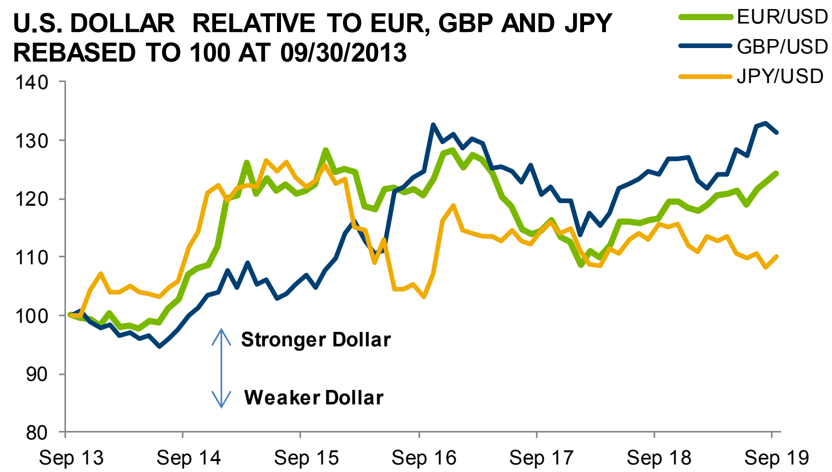
Currency

TRADE WEIGHTED U.S. DOLLAR INDEX
(1973 = 100)



Source: Federal Reserve

U.S. DOLLAR RELATIVE TO EUR, GBP AND JPY
REBASED TO 100 AT 09/30/2013

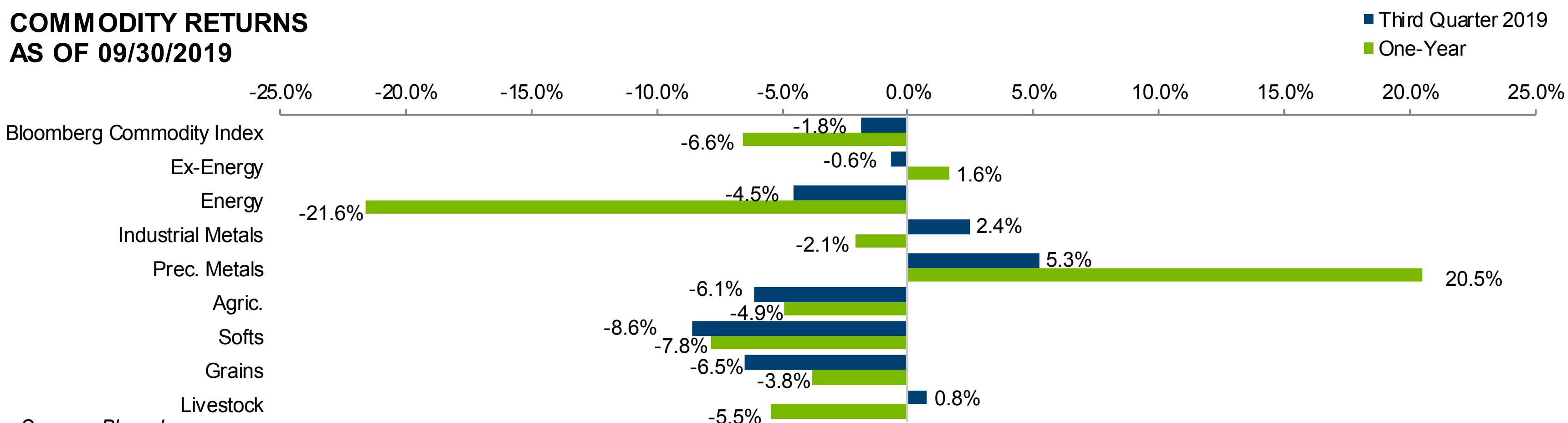


Source: FactSet

- The U.S. dollar continued on an upward trend with economic releases surprising to the upside in the U.S. and cyclical supports – a wide interest rate differential and relative economic strength – remaining intact. The U.S. dollar strengthened against major currencies over the quarter, rising by 2.8% on a trade-weighted basis over the quarter, supported by appreciation against sterling and the euro, up 3.3% and 4.5% respectively. The U.S. dollar appreciated less against the Japanese yen which benefited from some safe haven flows during bouts of market volatility over the quarter.
- Once again, closely tied to Brexit developments, sterling slipped by just 0.1% on a trade weighted basis but fell by considerably more to a post-EU referendum low against the U.S. dollar. Sterling depreciated by 3.2% against the U.S. dollar.
- The euro was weak over the quarter as economic releases disappointed with data pointing to near-recessionary conditions in the bloc. With the region exposed to global economic activity, the ongoing trade war and decelerating growth weighed on the region and the currency. Further headwinds pushed the euro lower later in the quarter as the ECB eased monetary policy and lowered interest rates. Against this backdrop, the euro slid by c.4% against the U.S. dollar.

Commodities

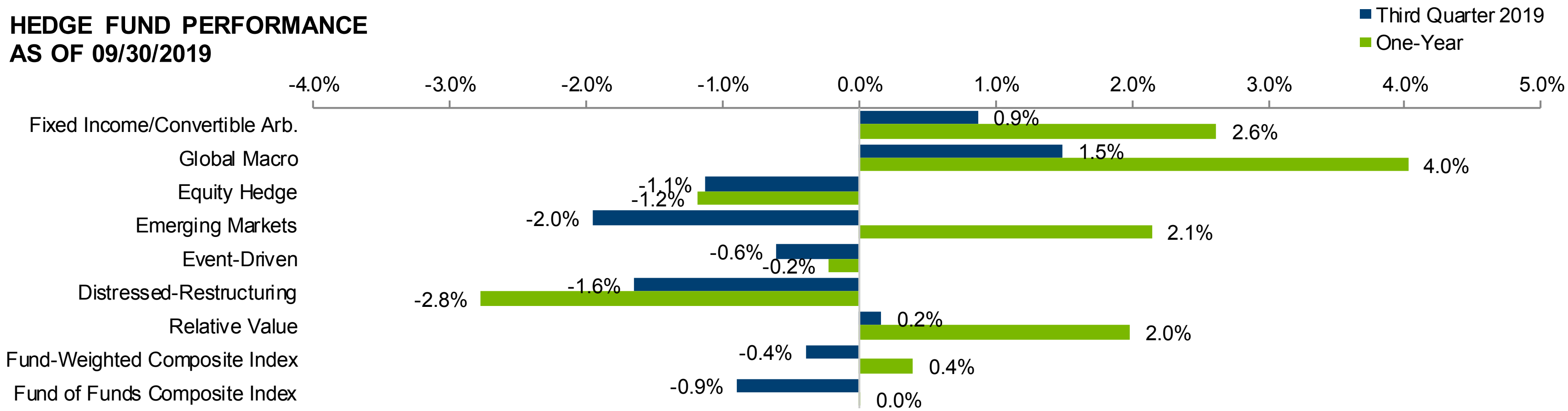
COMMODITY RETURNS
AS OF 09/30/2019



Source: Bloomberg
Note: Softs and Grains are part of the wider Agriculture sector

- Commodities fell over the quarter which saw the Bloomberg Commodity Index return -1.8%.
- Despite ongoing supply risks, exacerbated by the drone attacks on oil infrastructure in Saudi Arabia that accounts for nearly half of the Kingdom's production, crude oil prices ended the quarter lower. Weaker energy demand led to lower crude oil prices: the price of Brent crude oil fell by 8.7% to $61/bbl while WTI crude oil spot price fell by 7.5% to $54/bbl. Energy sector disappointed with a return of -4.5%.
- Supported partly by safe-haven buying over the quarter, Precious Metals was the best performing sector over the quarter with a return of 5.3%. This took the one-year return to over 20%. All other commodity sectors posted negative returns over the same period.
- Agriculture (-6.1%) was the worst performing sector in Q3 2019. Within the Agriculture sector, Softs fell by 8.6% whilst Grains fell by 6.5%.

Hedge Fund Markets Overview

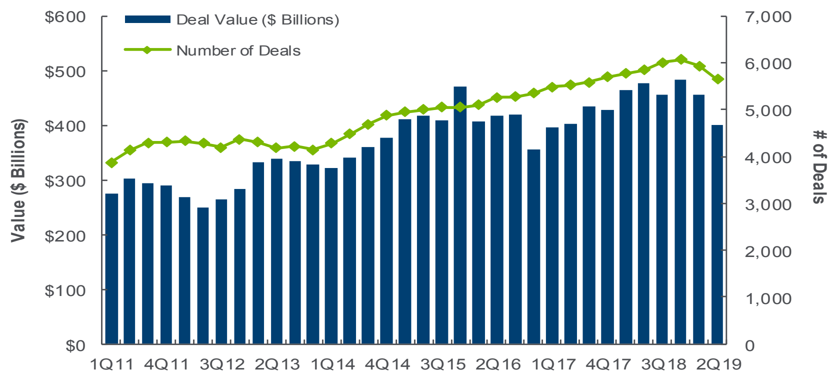


Note: Latest 5 months of HFR data are estimated by HFR and may change in the future.
Source: HFR

- Hedge fund performance was mixed across all strategies in the third quarter.
- Over the quarter, Global Macro hedge fund strategies were the best performers with a return of 1.5%. Most of the outperformance occurred over August when market risks were elevated. Conversely, Emerging Markets and Distressed-Restructuring were the worst performers, returning -2.0% and -1.6% respectively.
- The HFRI Fund-Weighted Composite Index and the HFRI Fund of Funds Composite Index produced returns of -0.4% and -0.9%, respectively.

Private Equity Market Overview – Q2 2019

LTM Global Private Equity-Backed Buyout Deal Volume

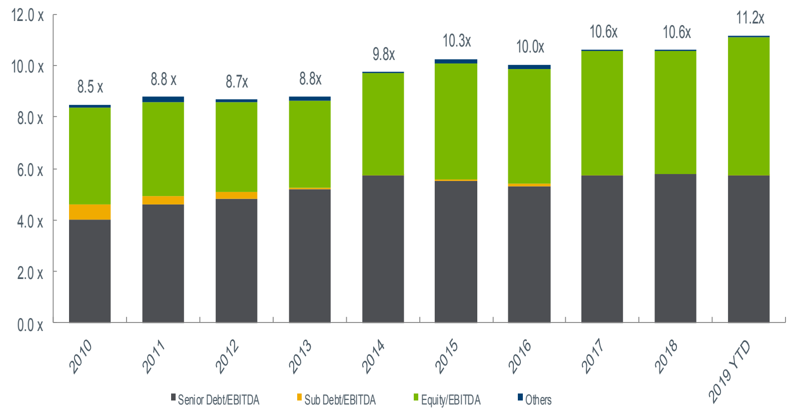


Source: Preqin

- **Fundraising:** In Q2 2019, $178.1 billion was raised by 366 funds, which was an increase of 25.8% on a capital basis and an increase of 0.3% by number of funds over the prior quarter. Dry powder stood at nearly $2.0 trillion at the end of the quarter, a modest increase compared to the previous quarter.[1]
- **Buyout:** Global private equity-backed buyout deals totaled $77.7 billion in Q2 2019, which was up 6.8% on a number of deals basis and down 27.0% on a capital basis from Q1 2019.[1] Through the end of Q2 2019, the average purchase price multiple for all U.S. LBOs was 11.2x EBITDA, an increase of 0.6x over year-end 2018 and up from the five-year average (10.2x).[2] Large cap purchase price multiples stood at 11.0x, up compared to the full-year 2018 level of 10.6x.[2] The weighted average purchase price multiple across all European transaction sizes averaged 11.1x EBITDA for Q2 2019, up from the 10.9x multiple seen at the end of Q1 2019. Purchase prices for transactions of €1.0 billion remained at 11.3x at the end of Q2 2019, a drop from the 11.7x seen at year-end 2018. Transactions between €500.0 million and €1.0 billion were down 0.3x from the end of 2018, and stood at 11.0x at the end of the quarter.[2] Globally, exit value totaled $104.7 billion from 453 deals during the second quarter, significantly higher than the $40.8 billion in exits from 460 deals during Q1 2019.[1]
- **Venture:** During the second quarter, 1,409 venture-backed transactions totaling $28.7 billion were completed in the U.S., which was an increase on a capital and deal basis over the prior quarter's total of $26.1 billion across 1,362 deals. This was 41.4% higher than the five-year quarterly average of $20.3 billion.[3] Total U.S. venture-backed exit activity totaled approximately $138.3 billion across 198 completed transactions in Q2 2019, up slightly on a capital basis from the $50.1 billion across 185 exits in Q1 2019.[4]
- **Mezzanine:** Four funds closed on $1.2 billion during the second quarter. This was an increase from the prior quarter's total of $1.0 billion raised by three funds, but represented a decrease of 76.7% from the five-year quarterly average of $5.1 billion. Estimated dry powder was $51.5 billion at the end of Q2 2019, down from the $58.8 billion seen at the end of Q1 2019.[1]

Private Equity Market Overview – Q2 2019

U.S. LBO Purchase Price Multiples – All Transactions Sizes



Source: S&P

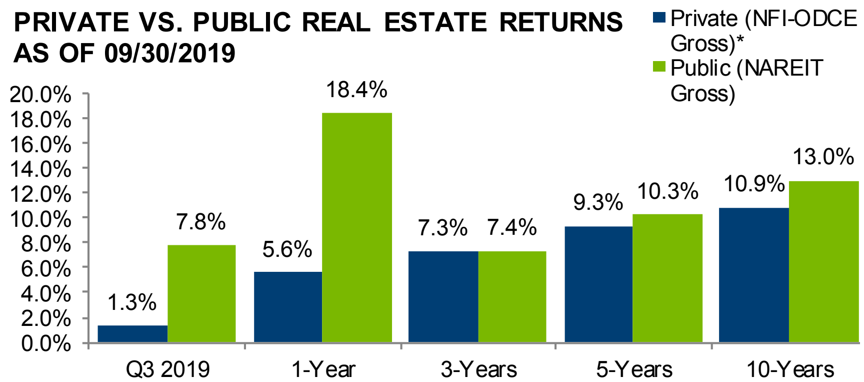
- **Distressed Debt:** The LTM U.S. high-yield default rate was 1.9% as of July 2019, which was down from year-end 2018's LTM rate of 2.4%.[5] During the quarter, $15.3 billion was raised by 15 funds, higher than both the $5.0 billion raised by 14 funds in Q1 2019 and the five-year quarterly average of $11.0 billion.[1] Dry powder was estimated at $119.4 billion at the end of Q2 2019, which was up slightly from the $118.0 billion seen at the end of Q1 2019. This remained above the five-year annual average level of $103.3 billion.[1]
- **Secondaries:** Four funds raised $1.5 billion during the quarter, down from the $2.2 billion raised by nine funds in Q1 2019 and the $9.0 billion raised by ten funds in Q4 2018.[1] At the end of Q2 2019, there were an estimated 58 secondary and direct secondary funds in market targeting roughly $74.6 billion.[1] The average discount rate for all private equity sectors finished the quarter at 9.2%, lower than the 9.5% discount at the end of Q1 2019.[6]
- **Infrastructure:** $23.1 billion of capital was raised by 29 funds in Q2 2019 compared to $18.3 billion of capital raised by 21 partnerships in Q1 2019. At the end of the quarter, dry powder stood at an estimated $217.0 billion, up significantly from Q1 2019's total of $175.0 billion. Infrastructure managers completed 582 deals with an estimated aggregate deal value of $155.0 billion in Q2 2019 compared to 552 deals totaling $63.0 billion a quarter ago.[1]
- **Natural Resources:** During Q2 2019, two funds closed on $0.4 billion compared to five funds totaling $1.5 billion in Q1 2019. Energy and utilities industry managers completed approximately 80 deals totaling an estimated $12.4 billion through Q2 2019, which represents 36.1% of the full year capital deployment in 2018.[1]

Sources: [1] Preqin [2] Standard & Poor's [3] PwC/CB Insights MoneyTree Report [4] PitchBook/NVCA Venture Monitor [5] Fitch Ratings [6] Thomson Reuters [7] UBS

Notes: FY=Fiscal year ended 12/31; YTD=Year to date; LTM=Last 12 months (aka trailing 12 months); PPM=Purchase Price Multiples: Total Purchase Price ÷ EBITDA.

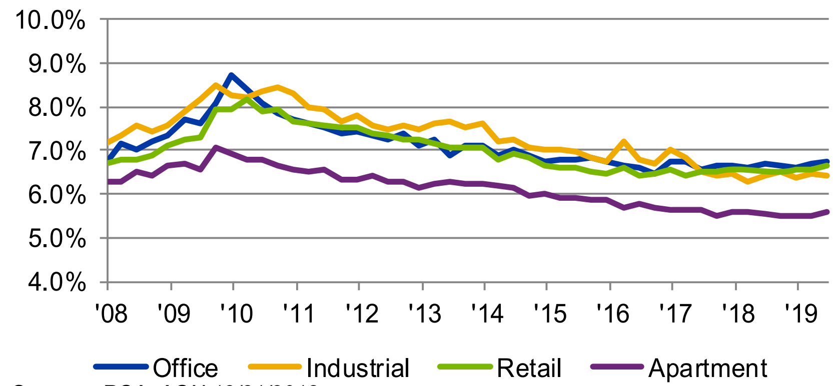
U.S. Commercial Real Estate Markets

PRIVATE VS. PUBLIC REAL ESTATE RETURNS AS OF 09/30/2019



**Third quarter returns are preliminary*
Sources: NCREIF, FactSet

CAP RATES BY SECTOR



Sources: RCA, AON 12/31/2018

- U.S. Core Real Estate returned 1.3%* over the third quarter, equating to a 5.6% total gross return year-over-year, including a 4.2% income return. Debt mark-to-market was a drag on the quarterly return as a result of declining interest rates. Going forward, income and income growth are expected to be the larger drivers of return, given the current point of the real estate cycle.
- Global property markets, as measured by the FTSE EPRA/NAREIT Developed Real Estate Index, returned 4.9% (USD) in aggregate during the third quarter. The sector benefitted from increasingly accommodative monetary policy. REIT market performance was driven by North America (7.6% USD) and Europe (3.3% USD). The U.S. REIT markets (FTSE NAREIT Equity REITs Index) gained 7.8% in the third quarter. Central bank easing proved to be supportive of REIT pricing.
- According to RCA through August 2019, the U.S. property market has experienced price growth of 6.7% year-over-year across major sectors. The industrial sector pricing appreciated 12.5% year-over-year, leading all sectors. Furthermore, transaction volume was up 10% over the same period.
- Return expectations have normalized, with go forward expectations in line with historical norms. The market benefited from two rate cuts during the Quarter, from the Federal Reserve, and declining interest rates have led to a rally across various asset classes. According to Preqin, there remains a record amount of dry powder ($334 billion) in closed-end vehicles seeking real estate exposure, which should continue to lend support to valuations and liquidity in the commercial real estate market.

*Indicates preliminary NFI-ODCE data gross of fees

Notes

1. Preqin
2. Standard & Poors
3. PitchBook/National Venture Capital Association Venture Monitor
4. First Trust Advisors
5. Evercore

Notes:
FY: Fiscal year ended 12/31
YTD: Year to date
YE: Year end
LTM: Last twelve months (aka trailing twelve months or TTM)
PPM: Purchase Price Multiples: Total Purchase Price / EBITDA
/bbl: Price per barrel
MMBtu: Price per million British thermal units

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ATTN: AHIC Compliance Officer

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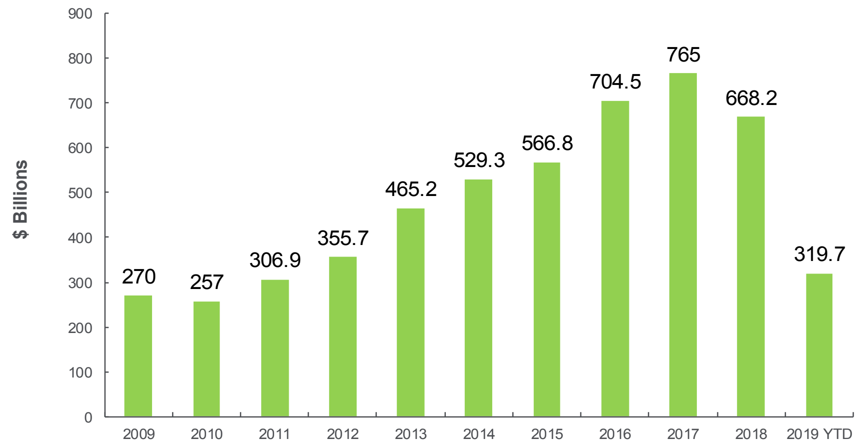
Appendix A:

Global Private Equity Market Overview
2Q 2019

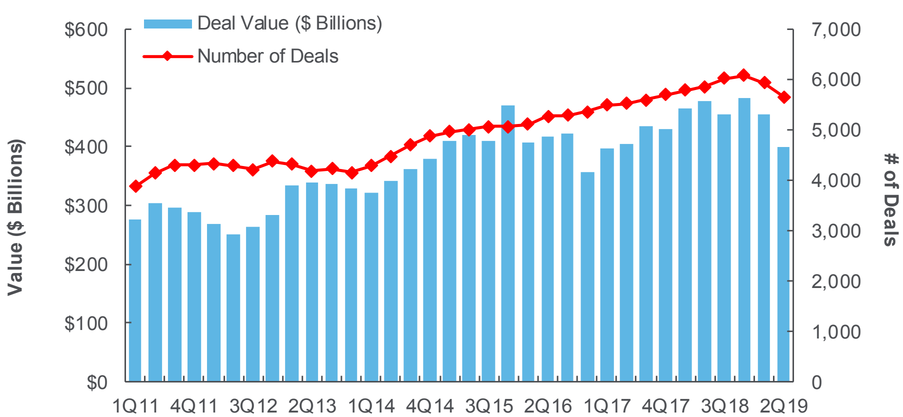
Private Equity Overview

Total Funds Raised



Source: Preqin

LTM Global Private Equity-Backed Buyout Deal Volume



Source: Preqin

Fundraising

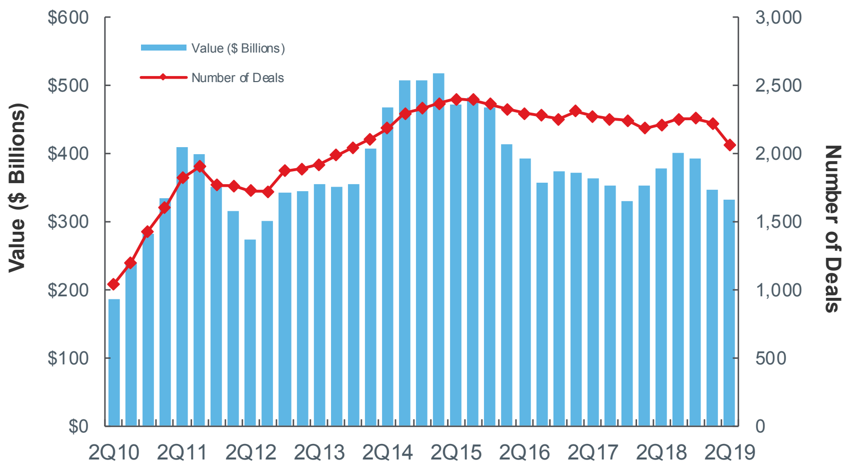
- In 2Q 2019, $178.1 billion was raised by 366 funds, which was an increase of 25.8% on a capital basis and an increase of 0.3% by number of funds from the prior quarter.[1]
  - 2Q 2019 fundraising was 13.3% higher on a capital basis than 2Q 2018.
  - Relative to the five-year quarterly average, the number of funds raised decreased by 32.7% while the total capital raised increased by 8.2%, strengthening the observation that larger amounts of capital are being raised by fewer funds.
  - The majority of 2Q 2019 capital was raised by funds with target geographies in North America, comprising 59.7% of the quarterly total. Capital targeted for Europe made up 25.5% of the total funds raised during the quarter, while the remainder was attributable to managers targeting Asia and other parts of the world.
- Dry powder stood at nearly $2.0 trillion at the end of the quarter, a modest increase compared to the previous quarter.[1]

Activity

- In 2Q 2019, 1,305 deals were completed for an aggregate deal value of $77.7 billion as compared to 1,264 transactions totaling $106.4 billion in 1Q 2019.[1]
  - This was 26.6% lower than the five-year quarterly average deal volume of $105.8 billion.
- European LBO transaction volume totaled €7.4 billion in 2Q 2019, representing roughly 29.7% of 2018's total LBO loan volume.[3]
- At the end of 2Q 2019, the average purchase price multiple for all U.S. LBOs was 11.2x EBITDA, up compared to the year-end 2018 (10.6x) and up from the five-year average (10.2x). Large corporate purchase price multiples stood at 11.0x through 2Q 2019, up from with the 10.6x observed at year-end 2018.[3]
  - For all U.S. LBOs, this quarter was 1.1x and 2.0x turns (multiple of EBITDA) above the five and ten-year average levels, respectively.
- European multiples for transactions greater than €1.0 billion averaged 11.3x in the second quarter, equal to that witnessed in the first quarter. Transactions greater than €500.0 million saw a slight increase of 0.1x in purchase multiples and ended the quarter at 11.0x. [3]
- Debt remained broadly available in the U.S.
  - U.S. average leverage levels in 2Q 2019 were 5.7x compared to the five and ten-year averages of 5.7x and 5.2x, respectively.[3]
  - The amount of debt issued supporting new transactions increased compared to year-end 2018 from 68.2% to 72.2%, which is also higher than the 61.7% average level over the prior five years.[3]
- In Europe, average senior debt/EBITDA through 2Q 2019 was 5.6x, up from the 4.7x observed year-end 2018. This was also up over the five-year average of 5.1x and ten-year average level of 4.5x.

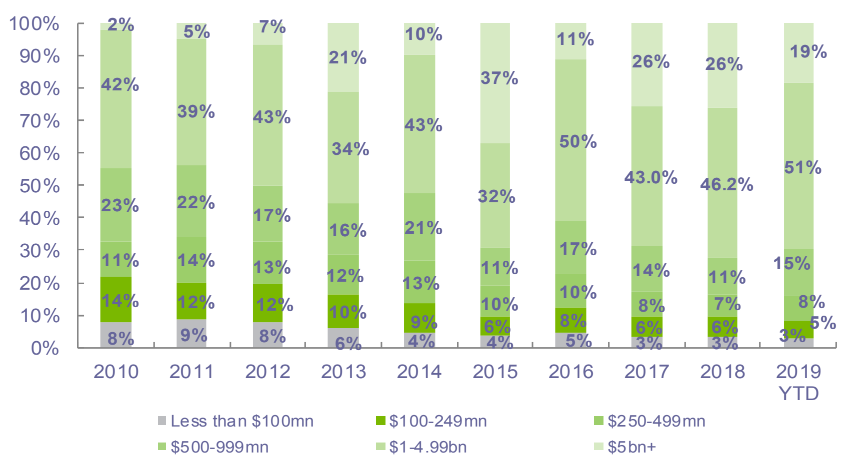
Buyouts / Corporate Finance

LTM PE Exit Volume and Value



Source: Preqin

M&A Deal Value by Deal Size



Source: Preqin

Fundraising

- $103.8 billion was closed on by 89 buyout and growth funds in 2Q 2019, compared to $64.4 billion raised by 111 funds in 2Q 2018.[1]
  - This was higher than the five-year quarterly average of $83.1 billion.
  - Advent Global Private Equity IX was the largest fund raised, closing on $17.5 billion.[1]
- Buyout and growth equity dry powder was estimated at $948.2 billion, which surpassed the $930.5 billion observed at the end of 1Q 2019. This was substantially higher than the five-year average level of $675.5 billion.[1]
  - Aside from mega funds, which increased 5.1% quarter-over-quarter, buyout dry powder decreased across all fund size categories in 2Q 2019. Middle-market fund dry powder exhibited the largest decrease during the quarter (2.1%), and is now estimated at $123.8 billion. Large and small market buyout dry powder finished the quarter down 1.3% and 0.4%, respectively, from 1Q 2019.[1]
  - An estimated 58.8% of buyout dry powder was targeted for North America, while European dry powder comprised 26.4% of the total.[1]

Activity

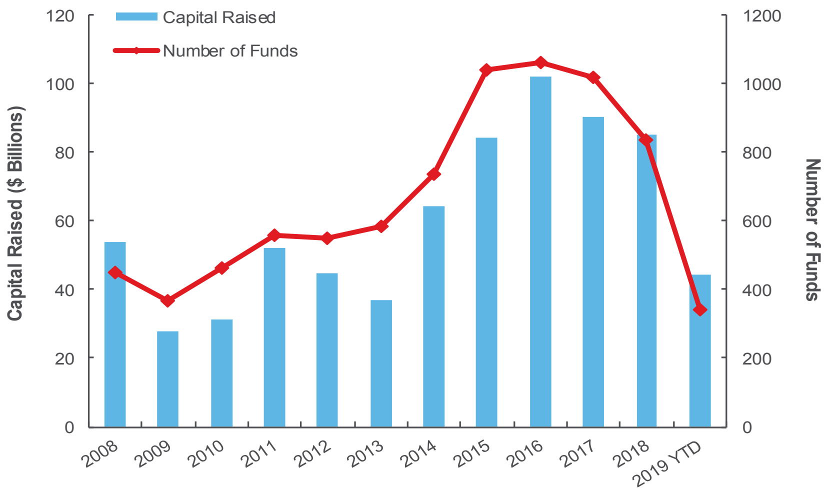
- Global private equity-backed buyout deals totaled $77.7 billion in 2Q 2019, which was a decrease of 27.0% and 26.6% from 1Q 2019 and the five-year quarterly average, respectively.[1]
  - 1,350 deals were completed during 2Q 2019, which was up 6.8% from 1Q 2019 and down 1.1% compared to the five-year quarterly average.
  - In 2Q 2019, deals valued at $1-4.99 billion accounted for an estimated 60.1% of total deal value during the quarter compared to 46.2% in 2018 and 43.0% in 2017.[1]
- Entry multiples for all transaction sizes in 2Q 2019 stood at 11.3x EBITDA, up from 2018's level (10.6x).[3]
  - Large corporate purchase price multiples stood at 10.8x during the quarter, up from the 10.6x observed at year-end 2018.[3]
  - The weighted average purchase price multiple across all European transaction sizes averaged 11.1x EBITDA in 2Q 2019, down from the 11.3x seen at year-end 2018. Purchase prices for transactions of €1.0 billion or more remained at 11.3x during the quarter.
  - Transactions greater that €500.0 million were up 0.1x from 1Q 2019, and stood at 11.0x.[3]
  - The portion of average purchase prices financed by equity for all deals was 42.2% in 2Q 2019, up from 40.1% in 2018. This remained above the five and ten-year average levels of 39.9% and 39.8%, respectively.[3]
- Globally, exit value totaled $104.7 billion from 453 deals in 2Q 2019 compared to $40.8 billion for 460 deals in 1Q 2019 and $119.4 billion across 610 deals in Q2 2018.[1]

Opportunity

- Operationally focused managers targeting the middle and large markets with expertise in multiple sectors

Venture Capital

Venture Capital Fundraising



Source: Preqin

U.S. Venture Capital Investments by Quarter ($B)

Source: PwC/CB Insights Report

Fundraising

- $22.1 billion of capital closed in 2Q 2019,up from the prior quarter total of $20.1 billion but down from the Q2 2018 total of $26.7 billion.[1]
  - 154 funds closed during the quarter, down 5.5% and 33.4% from the prior quarter and five year quarterly average, respectively.[1]
  - Andreessen Horowitz LSV Fund I was the largest fund raised during the quarter, closing on $2.2 billion.[16]
- The average fund size raised during the quarter was approximately $153.0 million, which was less than both the prior quarter of $154.0 million but higher than the five year quarterly average of $117.9 million.[1]
- Dry powder was estimated at $255.0 billion at the end of 2Q 2019, which was up from 1Q 2019's total of $239.9 billion. This was 54.7% higher than the five year average. An estimated 45.7% of dry powder was targeted for North America, followed by approximately 37.7% earmarked for Asia.[1]

Activity

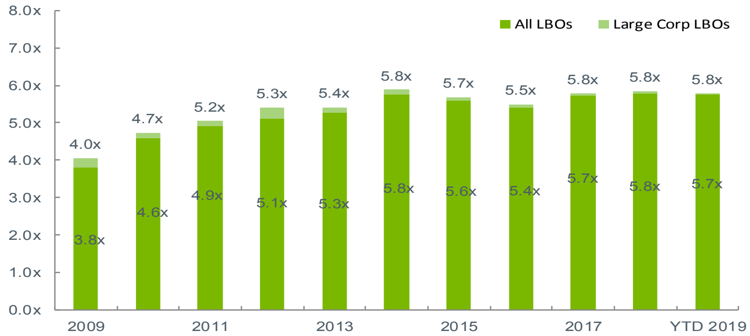
- During the second quarter, 1,409 venture-backed transactions totaling $28.7 billion were completed in the U.S., which was an increase on a capital and deal basis over the prior quarter's total of $26.1 billion across 1,362 deals. This was 41.4% higher than the five-year quarterly average of $20.3 billion. This was the second strongest quarter on a capital investment basis since Q2 2017 and marks the eighth consecutive quarter of $20.0 billion or more invested into venture-backed companies.[7]
  - The number of unicorns in the U.S., or companies with valuations of $1.0 billion or more, increased by 19 in 2Q 2019.[7]
- Median pre-money valuations increased across all deal stages except Series D during Q2. Seed, Series A, and Series B increased by 22.5%, 24.0%, and 16.5%, respectively, to valuations of $9.8 million, $24.8 million, and $75.0 million, respectively. Series C pre-money valuations increased by 21.9% quarter-over-quarter, ending at $195.0 million. Series D+ deal valuations, however, were down significantly by 39.6% quarter-over-quarter and are currently valued at $305.0 million.[9]
- Total U.S. venture backed exit activity totaled $138.3 billion across 198 completed transactions in 2Q 2019, up significantly on a capital basis from $50.1 billion in 1Q 2019.[8]
  - There were 34 venture-backed initial public offerings during the quarter, which was significantly higher than the 14 completed in 1Q 2019.[8]
  - The number of M&A transactions totaled 163 deals in 2Q 2019, barely up from 162 deals in Q1 2019.[7]

Opportunity

- Early stage continues to be attractive, although we are monitoring valuation increases
- Smaller end of growth equity
- Technology sector

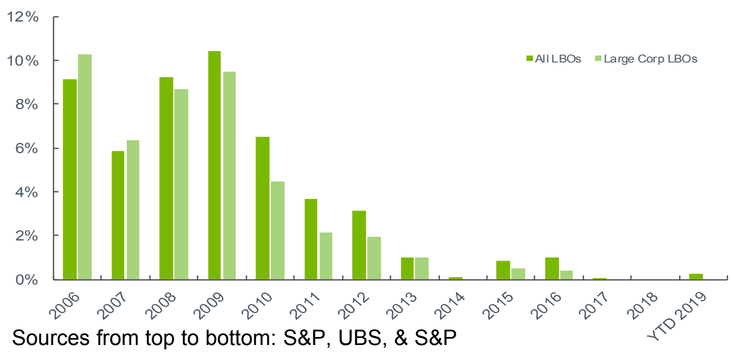
Leveraged Loans & Mezzanine

Average Leverage by Deal Size



Debt Issuance ($ Billions)

Mezzanine % of Purchase Price Multiple



Sources from top to bottom: S&P, UBS, & S&P

Leveraged Loans

Fundraising

- New CLO issuance totaled $63.7 billion through 2Q 2019, up $34.6 billion from 1Q 2019.[2]
- High-yield debt issuance totaled $71.7 billion in 2Q 2019, up from $60.5 billion issued in 1Q 2019.[2]
- Leveraged loan mutual fund net flows ended 2Q 2019 with a net outflow of $17.6 billion, compared to a net outflow of $10.1 billion through 1Q 2019.[2]

Activity

- Leverage for all LBO transactions ended the quarter at 5.7x, down slightly from 2018's level of 5.8x. Leverage continues to be comprised almost entirely of senior debt. The average leverage level for large cap LBOs was 5.8x during the quarter, up 0.1x from 1Q 2019.[3]
- YTD institutional new leveraged loan issuances totaled $146.9 billion through 2Q 2019, down significantly from the $270.4 billion issued during the same period in 2018.[2]
- 72.2% of new leveraged loans were used to support M&A and growth activity in 2Q 2019, down from 80.4% in 1Q 2019. This was above the prior five-year average of 61.7%.[3]
- European leveraged loan issuance decreased by 20.6% quarter-over-quarter to €12.0 billion, which was 35.4% of 2018's total sponsored loan volume.[3]
- High yield YTWs for BB, B, and CCC indices ended the quarter at 4.36%, 5.99%, and 10.14%, respecitvely.[2]

Opportunity

- Funds with the ability to source deals directly and the capacity to scale for large transactions
- Funds with an extensive track record and experience through prior credit cycles

Mezzanine

Fundraising

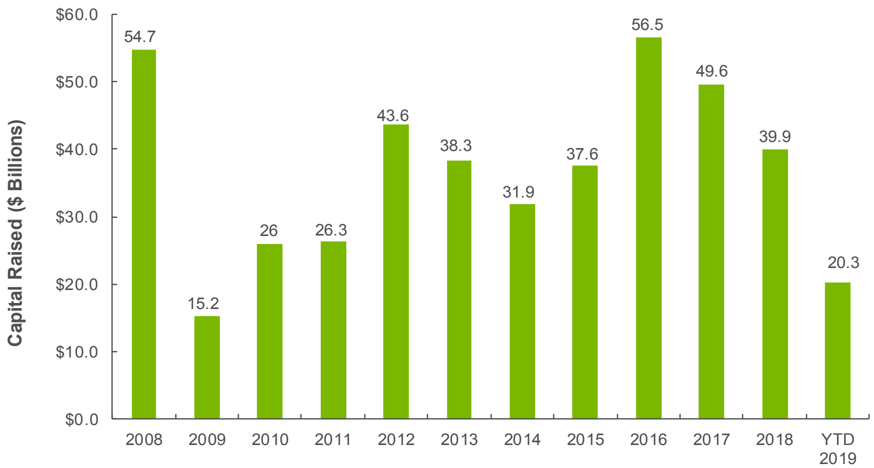
- Four funds closed on $1.2 billion during the second quarter. This was a significant decrease from the $12.4 billion raised by 10 funds in Q2 2018 and represented a decrease of 76.7% from the five-year quarterly average of $5.1 billion.[1]
- Estimated dry powder was $51.5 billion at the end of 2Q 2019, down from the $58.8 billion seen at the end of 1Q 2019.[1]
- Fundraising activity picked up with an estimated 73 funds in market targeting $29.0 billion of commitments, compared to 67 funds in market at the end of 2018 targeting $25.0 billion of commitments. HPS Mezzanine Partners 2019 is the largest fund in market, targeting commitments of $8.0 billion.[1]

Opportunity

- Funds with the capacity to scale for large sponsored deals

Distressed Private Markets

Distressed Debt, Turnaround, & Special Situations Fundraising



Source: Preqin

High-Yield Bond Volume vs Default Rates

Source: UBS & Fitch Ratings

Fundraising

- During the quarter, $15.3 billion was raised by 15 funds compared to $5.0 billion raised by 14 funds in 1Q 2019.[1]
  - 2Q 2019 fundraising was 39.6% higher than the five-year quarterly average of $11.0 billion.
  - GSO Energy Select Opportunities Fund II was the largest partnership raised during the quarter, closing on $4.5 billion.
- Dry powder was estimated at $119.4 billion at the end of 2Q 2019, up slightly from the $118.0 billion seen at the end of 1Q 2019. This was up compared to year-end 2018 ($117.5 billion). This remained above the five-year average level of $103.3 billion.[1]
- Roughly 118 funds were in the market at the end of 2Q 2019, seeking $59.7 billion in capital commitments.[1]
  - Distressed debt managers were targeting the most capital, seeking an aggregate $29.5 billion.
  - Fortress Credit Opportunities Fund V was the largest fund in market with a target fund size of $5.0 billion.

Activity

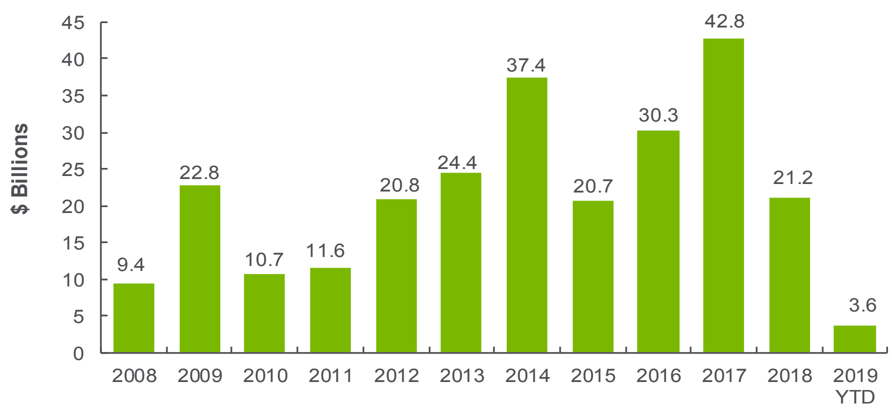
- The LTM U.S. high-yield default rate was 1.9% as of July 2019, which was down from year-end 2018's LTM rate of 2.4%.[6]
- While spreads remained in line with the prior period, a declining LIBOR rate saw yields tighten during the quarter. Credit markets are bracing for a volatile period moving forward, which may result in opportunities for lenders.[4]
- High purchase prices and continued elevated levels of leverage may result in an increase in distressed opportunities looking out over the next two to three years, or sooner if there is a stall in the economy.

Opportunity

- Funds capable of performing operational turnarounds
- Funds with the flexibility to invest globally

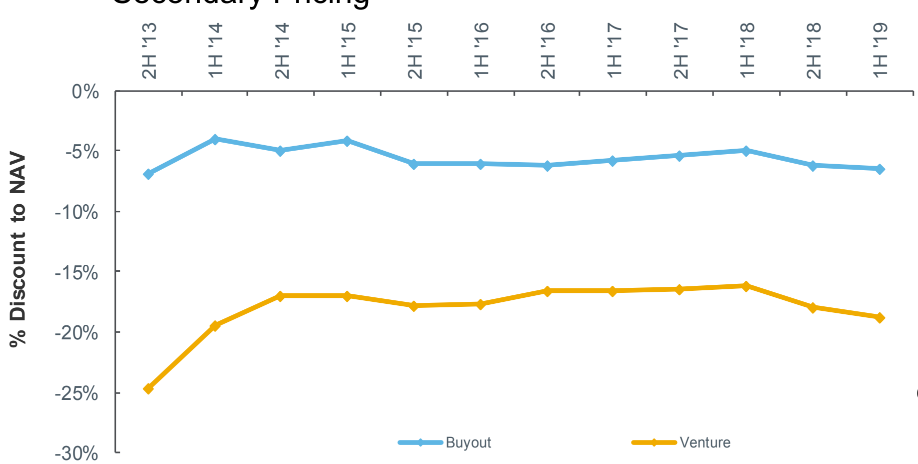
Secondaries

Secondary Fundraising



Source: Preqin

Secondary Pricing



Source: UBS

Fundraising

- Four funds raised $1.5 billion during the quarter, down from the $2.2 billion raised by nine funds in Q1 2019 and the $9.0 billion raised by ten funds in Q4 2018.[1]
  - 2Q 2019's aggregate capital raised represents 6.4% of 2018's full year total.
  - Adams Street Global Secondary Fund VI was the largest fund raised during the quarter, closing on $1.05 billion.[1]
- Approximately 73% of secondaries funds in market are raising capital to target North America, up 54% from 1H 2018. An estimated 84% of secondaries funds are targeting private equity investments.[1]
- At the end of 2Q 2019, there were an estimated 58 secondary and direct secondary funds in market, targeting approximately $74.6 billion. Ardian Secondaries Fund VIII and Lexington Capital Partners IX were the largest funds in the market targeting $12.0 billion each.[1]
  - Two funds, Ardian Secondaries Fund VIII and Lexington Capital Partners IX ($12.0 billion target), represent 32.2% of all capital being raised.[1]

Activity

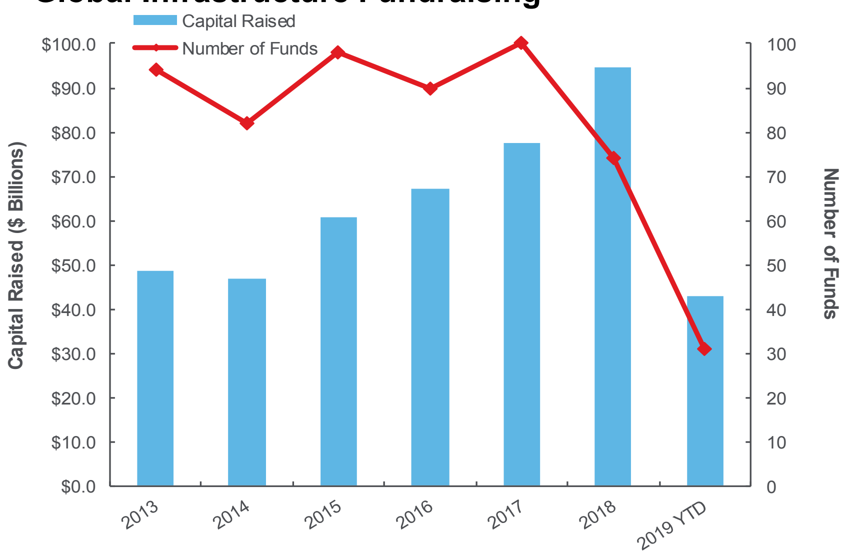
- Buyers have increasingly turned to leverage in their transactions in order to support attractive pricing and transaction execution. The spreads between committed capital and drawn capital by secondary purchasers has increased over the last quarter (and year).[2]
- The average discount rate for all private equity sectors finished Q2 2019 at 9.2%, down from 9.5% at the end of Q1 2019. The average buyout pricing discount ended at 6.4%, while venture ended at a discount of 18.8%.[2] The average buyout pricing discount for Q2 was down from Q1 2019's 6.8% discount, while the venture discount was up from 18.5%.
- Pricing, while having become slightly less favorable for buyers over the last quarter, is expected to remain attractive for sellers given the continued high levels of dry powder and competition for secondary transactions. Pricing increased marginally in Q2 due to reduced public market volatility and a slight decline in secondary fundraising.[2]
- For buyout pricing, tail-end vintages were being traded at larger discounts, while top performing funds continued to obtain premiums for their assets. While there is support and interest in pre-2010 vintage funds, there is significant volume and competition for younger vintages where premiums are often being commanded.[2]

Opportunity

- Funds that are able to execute complex and structured transactions at scale
- Funds that are able to leverage their long-standing relationships and networks in the secondaries marketplace
- Niche strategies

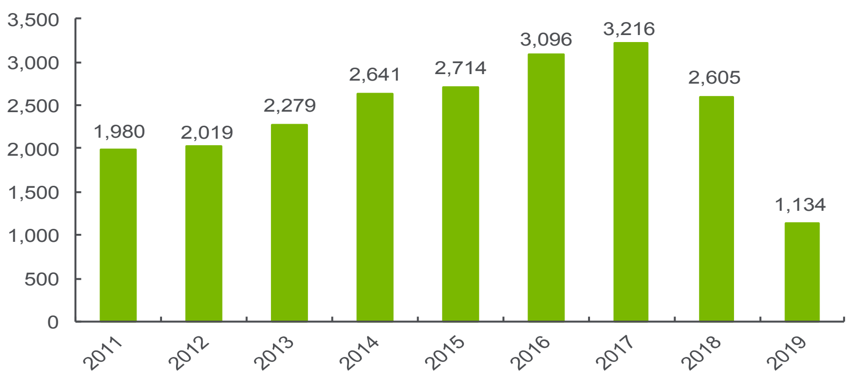
Infrastructure

Global Infrastructure Fundraising



Source: Preqin

Number of Deals Completed



Source: Preqin

Fundraising

- $23.1 billion of capital was raised by 29 funds in 2Q 2019 compared to $18.3 billion of capital raised by 21 partnerships in 1Q 2019, as capital continues to be concentrated around a smaller set of infrastructure managers.[1]
  - About 87.4% of the capital raised is targeting investment in North America or Europe.[1]
- As of the end of 1Q 2019, there were an estimated 173 funds in the market seeking roughly $162.0 billion, compared to 210 funds targeting $190.0 billion in 1Q 2019.[1]
  - The majority of infrastructure funds in market are targeting capital commitments of $1.0 billion or more.[1]
  - Global Infrastructure Partners IV and Brookfield Infrastructure Fund IV were the largest funds in the market as of the end of 2Q 2019, targeting $20.0 billion each. Both are focused on making investments within the U.S.[1]
- At the end of the quarter, dry powder stood at an estimated $217.0 billion, up from Q1 2019 of $185.0 billion.[1] Current dry powder levels for infrastructure are at five year highs.[1]
- Concerns surrounding the relative availability and pricing of assets remain. Fundraising continues to be very competitive given the number of funds and aggregate target level of funds in market. Investor appetite for the asset class persists despite the record levels of dry powder and increased investment activity from strategic and corporate buyers as well as institutional investors.

Activity

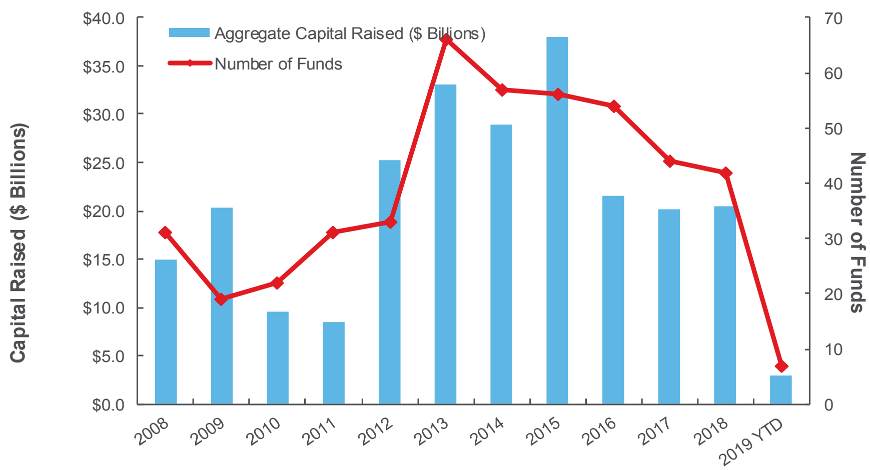
- Infrastructure managers completed 582 deals with an estimated aggregate deal value of $155.0 billion in 2Q 2019 compared to 552 deals totaling $63.0 billion a quarter ago.[1] The average deal value during the quarter was $266.3 million, up compared to the five-year average of $135.0 million.
  - North America accounted for 33.5% of the deals in 2Q 2019, while 36.6% and 12.2% of deals were transacted in Europe and Asia, respectively.[1]
  - Renewable energy was the dominant industry during the quarter with 52.9% of transactions, followed by the utilities and conventional energy sectors, which accounted for 14.4% and 13.9%, respectively, of the quarter's deals. Transport accounted for 9.6% of transactions.[1]

Opportunity

- Greenfield infrastructure is less competitive and offers a premium for managers willing to take on construction risk

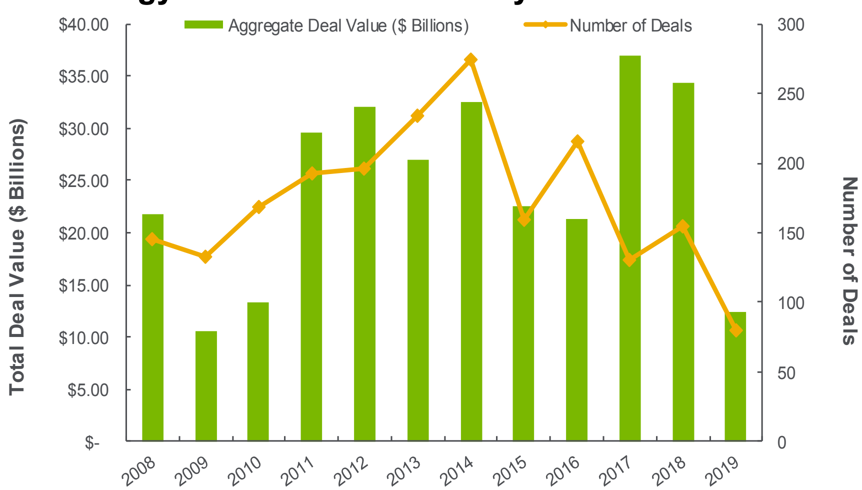
Natural Resources

Natural Resources Fundraising



Source: Preqin

Energy & Utilities Deal Activity



Source: Preqin

Fundraising

- During 2Q 2019, two funds closed on $0.4 billion compared to five funds totaling $1.5 billion in 1Q 2019.[1]
- At the end of 2Q 2019, there were roughly 97 funds in the market targeting an estimated $36.6 billion in capital, compared to 94 funds seeking an estimated $36.1 billion in 1Q 2019.[1]
  - NGP Natural Resources XII was seeking the most capital with a target fund size of $5.3 billion.
- Dry powder was estimated at $49.7 billion at the end of 2Q 2019, which was down 7.8% from 1Q 2019's level, and remains below the record level of $72.1 billion observed in 4Q 2015.[1]

Activity

- Energy and utilities industry managers completed 80 deals totaling a reported $12.4 billion in 2Q 2019, representing 51.6% and 36.1% of 2018's total deal activity and total deal value, respectively.[1]
- Crude oil prices decreased during the quarter.
  - WTI crude oil prices decreased 6.0% during the quarter to $54.66/bbl.[11]
  - Brent crude oil prices ended the quarter at $64.22/bbl, down 2.9% from Q1 2019.[11]
- Natural gas prices (Henry Hub) decreased by a significant 18.6% during the second quarter, ending at $2.40 per MMBtu.[11]
- A total of 958 crude oil and natural gas rotary rigs were in operation in the U.S. at the end of 2Q 2019, down 5.4% from the prior quarter. Crude oil rigs represented 81.8% of the total rigs in operation, while gas rigs represented 18.0% of the total rigs in operation.[15]
- The price of iron ore (Tianjin Port) ended the second quarter at $108.94 per dry metric ton, up by 26.0% quarter-over-quarter.[12]

Opportunity

- Acquire and exploit existing oil and gas strategies preferred over early stage exploration in core U.S. and Canadian basins
- Select midstream opportunities

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Appendix B:

Real Estate Market Update

2Q 2019

United States Real Estate Market Update (2Q19)

General

- The S&P 500 produced a gross total return of 4.3% during the quarter. The MSCI US REIT index produced a return of 1.3%. Consumer Sentiment remained flat at 98.2, but rose subsequent to quarter-end.

- Macro indicators for U.S. real estate continue to be positive; GDP grew at an annualized rate of 2.3% in the second quarter and headline CPI rose by 1.8% YoY, below the Fed's 2% target. As of quarter-end, the economy has now experienced 105 consecutive months of job growth. The Federal Reserve has paused its tightening of monetary policy, and cut the effective federal funds rate, which was 2.13% at quarter-end.

Commercial Real Estate

- Private real estate market carrying values remained flat over the quarter. Transaction cap rates (5.3%) compressed 5 bps during the quarter, while current valuation cap rates expanded across property sectors, apartments (+6 bps), industrial (+11 bps), office (+18 bps), and retail (+16 bps) .

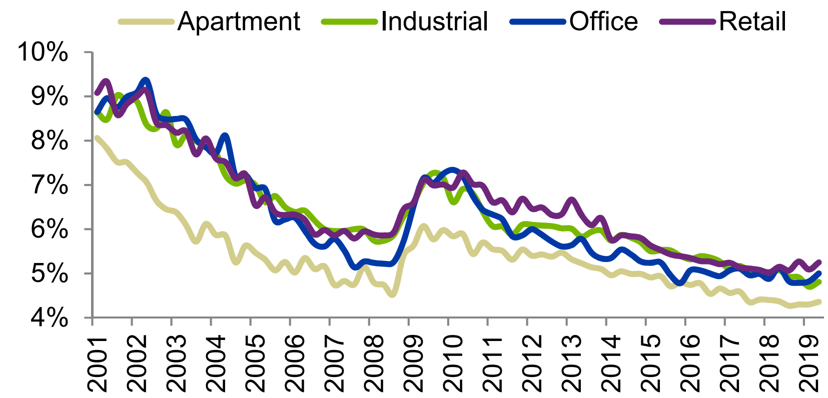
- NOI growth by sector continued to deviate during the quarter, with the industrial and apartments sector continuing to outpace the other traditional property types. While the industrial sector has faced increasing supply, it continues to benefit from outsized demand tailwinds (e-commerce and economic growth). On the other hand, retail experienced negative 40 bps of NOI growth during the quarter.

- In the second quarter of 2019, $23 bn of aggregate capital was raised by real estate funds. In 2018, private equity real estate funds raised $236 bn which is an increase of 9% YoY. However, transaction volume declined during the 1st quarter by 18% year over year to $28 bn.

- 10-year treasury bond yields dropped 40 bps to 2.0% during the quarter, and, subsequent to quarter-end, have dropped further to 1.7%. A combination of expansionary fiscal policy and tightening monetary policy have led to increasing short-term interest rates and an inversion of the yield curve.

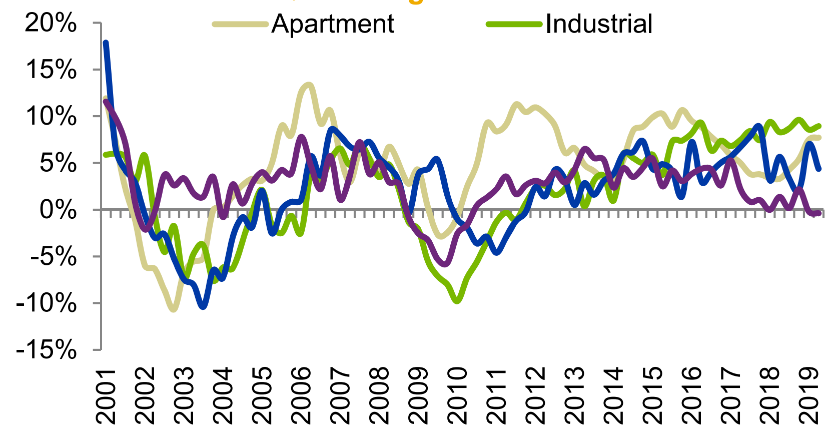
Sources: Bureau of Economic Analysis, U.S. Census Bureau, Federal Reserve Board, NCREIF, Cushman and Wakefield, Real Capital Analytics, Bloomberg LP., Preqin, University of Michigan, Green Street

Current Value Cap Rates by Property Type



Source: NCREIF

4 Qtr Rolling NOI Growth



Source: NCREIF

United States Property Matrix (2Q19)

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INDUSTRIAL

- In 2Q19, industrial properties were the highest returning sector at 3.4% and outperformed the NPI by 191 bps.
- Transaction volumes reached $19.1 billion in the second quarter of the year, a 4.0% year-over-year decrease. Individual asset sales were up 13.6% year-over-year, while portfolio sales drove the decline in year-over-year volume (-31.5%).
- The industrial sector continued to experience steady NOI growth of 8.9% over the past year, increasing from the prior periods TTM growth of 8.6% in 1Q19. Market rent growth is expected to decelerate compared to the recent phenomenal pace, but still remains strong.
- Vacancy declined 40 bps to 3.1%, close to all-time historic lows. E-commerce continues to drive demand.
- Industrial cap rates compressed approximately 12 bps from a year ago, to 4.8%. Industrial fundamentals still top all property sectors.

MULTIFAMILY

- The apartment sector delivered a 1.4% return during the quarter, underperforming the NPI by 9 bps.
- Transaction volume in the second quarter of 2019 reached $45.6 billion, an increase of 25.3% year-over-year. This volume continues to make multifamily the most actively traded sector for the eighth straight quarter.
- Cap rates increased to 4.4%, expanding 9 bps year-over-year. Robust job growth and improving wages have supported healthy operating fundamentals.
- Steady demand for the sector continues to keep occupancy above 94.3%, over a 1.0% increase from a year ago. Delayed deliveries from construction labor bottlenecks have created a gap between permitting activity and starts volume.

OFFICE

- The office sector returned 1.7% in 2Q19, 15 bps above the NPI return over the period.
- Transaction volumes increased by 36.4% year-over-year in Q2. Annual sales volumes equaled $39.5 billion for the quarter. Single asset transactions accounted for 77% of volume.
- Occupancy growth within the office sector has improved, increasing 1.0% year-over-year. Office continues to be the highest vacancy property type at close to 9.8%.
- NOI growth of 4.4% in the last year is a positive as the sector continues to benefit from positive job growth. Sun Belt and tech-oriented West Coast office fundamentals are healthiest.
- Office cap rates compressed slightly from a year ago to approximately 4.8% in the second quarter. Office-using job growth is positive, though decelerating as expected.

RETAIL

- As of 2Q19, the retail sector delivered a quarterly return of -0.1%, performing 162 bps below the NPI.
- Transaction volumes totaled $16.9 billion in the second quarter, down 22.7% year-over-year.
- Cap rates have expanded approximately 25 bps within the sector over the last year. Strong fundamental headwinds continue to effect the retail landscape.
- NOI growth has been negative for five consecutive quarters. NOI has declined 40 bps over the past year. Retail is expected to continue to suffer from the shift towards e-commerce.
- Retail vacancy rates declined 74 bps over the past year to 6.8%. Many big box stores have closed as the need for retail space shrinks, translating to a negative outlook for rent growth.

Sources: Real Capital Analytics, Green Street, US Census Bureau, NCREIF

Global Real Estate Market Update (2Q19)

- Global investment activity during the second quarter of 2019 continues to slow, and YoY transaction activity has decreased.

- Geopolitical uncertainty and its potential impacts on the global real estate markets has remained a principal concern for investors. However, global commercial real estate is still positioned to steadily perform in 2019. Despite compressing yields, broad decreases in risk-free rates has increased the value of real estate yields. Capital values and rents are expected to increase during the year. However, full-year global investment volumes are expected to decline by 5-10%, especially in the office and retail sectors.

Global Total Commercial Real Estate Volume - 2018 - 2019

$ US Billions	Q2 2019	Q2 2018	% Change Q2 19 - Q2 18	H1 2019	H1 2018	% Change H1 19 - H1 18
Americas	120	114	5%	214	221	-3%
EMEA	67	79	-15%	126	158	-20%
Asia Pacific	257	211	22%	433	428	1%
Total	444	404	10%	773	807	-4%

Source: Real Capital Analytics, Inc., Q2' 19

- In the second quarter, investment volumes in the Americas to decline YoY, led by the U.S., Brazil, and Mexico.

- Asia-Pacific cross-border investment activity slightly decreased in the second quarter. Despite this, Asia-Pacific has shown the best first-half of the year performance on record. This growth was driven by robust activity in China and Singapore.

- In EMEA, the decline in investment volume is largely attributable to uncertainty over Brexit in the UK and ongoing structural changes in the retail sector.

- In the office sector, leasing activity continued to increase through the second quarter of 2019. The U.S office market continued to perform well, driven by demand from the technology and co-working industries. Europe's net absorption outperformed the 10 year average, led by performance in Madrid. In Asia Pacific's office market gross leasing volumes witnessed a 30% year-over year decline due to limited availability of space, economic uncertainty and trade tensions. Globally, aggregate rental growth for prime office locations is expected to stay positive in 2019 and office vacancy is expected to continue to fall.

- In the retail sector, the U.S. net absorption declined by 45% YoY in the second quarter. Strengthening labor markets and wage growth in Europe has positively impacted consumer spending, and retailers continue to focus on rightsizing their store portfolios. Asia Pacific retailers are focusing their efforts on providing unique products and targeting niche consumer segments. Australia is experiencing challenging retailer market pressures and rising incentives leading to modest rental growth.

- The multifamily market in the U.S. has continued to see growth in demand and declines in vacancy rates. There has been an increase in construction activity which is likely to lead to some near-term supply headwinds. Investment activity in European multifamily markets was lower due to rent control regulation leading to investor caution.

- The global industrial market continued to perform well during the quarter, with vacancy rates in the U.S. and Asia Pacific at all-time lows, as demand continues to be robust. U.S. rental rates are excepted to increase, driven by robust leasing momentum. Demand has been strong in the European logistics market as well, however, a slight deceleration in the rate of growth suggests the sector may be entering a stage of stabilization.

Sources: Jones Lang LaSalle Research, Real Capital Analytics, Inc.

Global Outlook - GDP (Real) Growth % pa, 2019-2021

	2019	2020	2021
Global	**3.2**	**3.2**	**3.0**
Asia Pacific	**4.5**	**4.5**	**4.6**
Australia	1.9	2.5	2.6
China	6.2	6.0	5.8
India	6.6	6.7	7.0
Japan	1.0	0.3	0.9
North America	**2.2**	**1.8**	**1.8**
US	2.3	1.8	1.8
MENA*	**2.6**	**2.9**	**3.1**
European Union	**1.4**	**1.4**	**1.5**
France	1.3	1.3	1.4
Germany	0.6	0.9	1.2
UK	1.2	1.2	1.5

*Middle East North Africa

Source: Bloomberg

Note: 2021 projections are not yet available for certain regions

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Capital Markets Outlook & Risk Metrics

As of September 30, 2019

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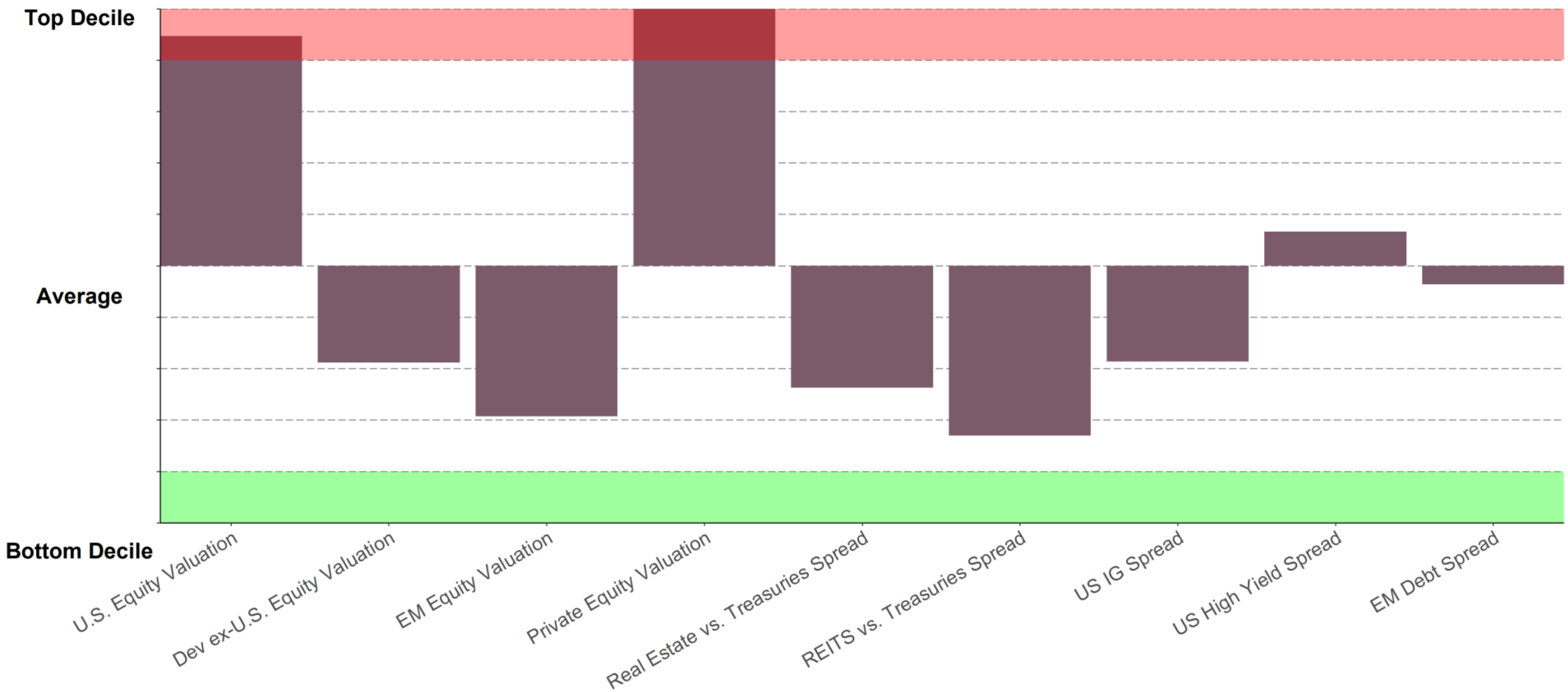
Capital Markets Outlook

Takeaways

- From a market performance perspective, September was a relatively normal "risk-on" month as most Global Equity markets produced positive returns whereas most sovereign-oriented Fixed Income markets produced negative returns. On a year-to-date basis, however, most indices across Global Equity and Global Fixed Income markets have produced unusually high returns.
- Recent interest rate movements are historically consistent with oncoming recessions. However, economic data remains extremely mixed and shifting political rhetoric regarding global trade has added to short-term uncertainty. In the face of all this, Global Equity markets have continued to deliver positive returns.
- While there continues to be significant discussion regarding interest rates (e.g., yield curve inversions, central bank policy, etc.), the complexity of the current environment has increased what is always an immense challenge for forecasting.
- US Equity markets remain expensive whereas Non-US Equity markets remain reasonably valued relative to their history.
- Implied equity market volatility[1] remained lower than its historical average (≈19) throughout the entire month of September, although this metric did steadily rise from mid-month (≈13) to the end of the month (≈17).
- The Market Sentiment Indicator[2] stayed at neutral at month end.
- Market uncertainty, as measured by Systemic Risk, decreased during September. With that said, recent economic data suggests that the global economy is in a slowing, but not yet recessionary, phase. The potential for negative surprises exists as global economies navigate their respective "late-cycle" dynamics and geopolitical events continue to unfold, as evidenced by recent market movements.
- *New Addition: We incorporated a measure of Fixed Income Volatility to the Dashboard.*

[1] As measured by VIX Index.
[2] See Appendix for the rationale for selection and calculation methodology used for the risk metrics.

Risk Overview/Dashboard (1)
(As of September 30, 2019)[1]

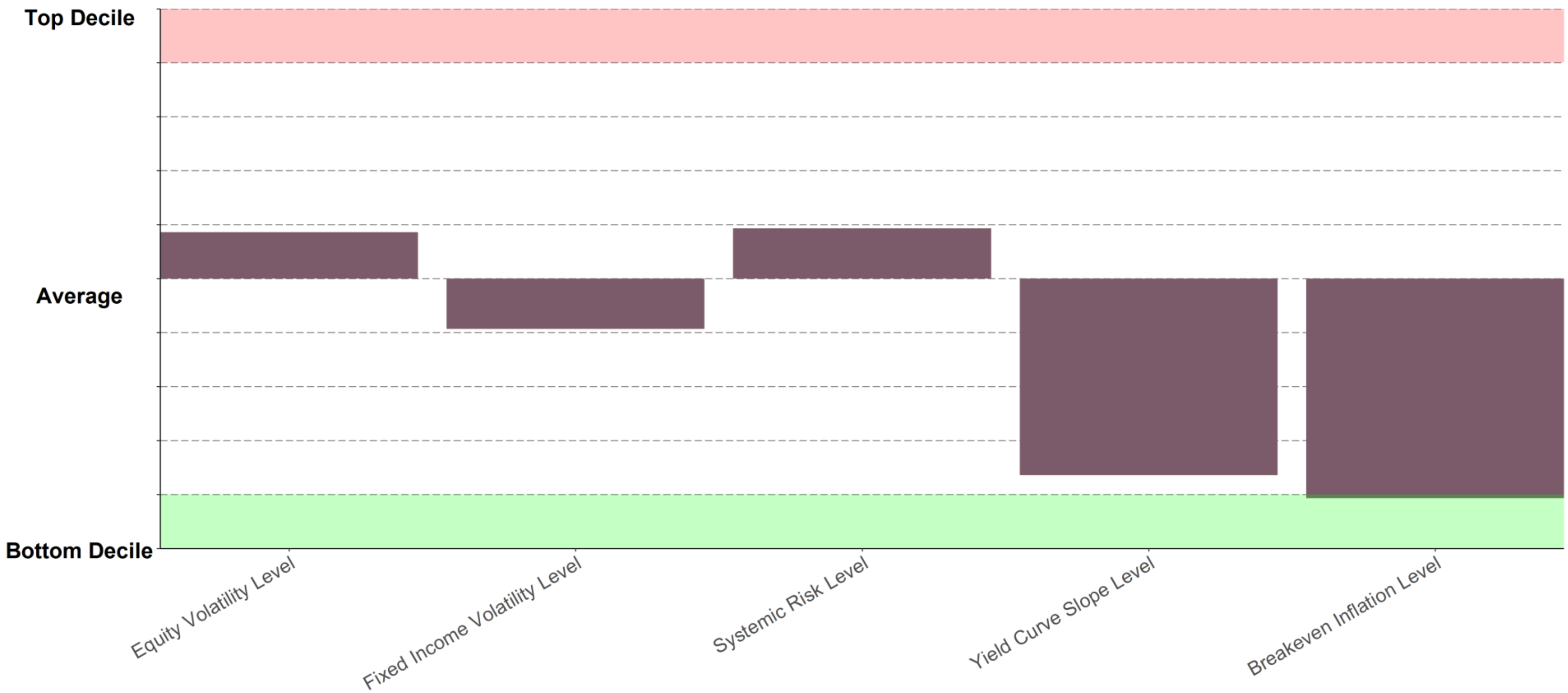


- Dashboard (1) summarizes the current state of the different valuation metrics per asset class relative to their own history.

[1] With the exception of Private Equity Valuation that are available annually and data is as of December 31, 2018.

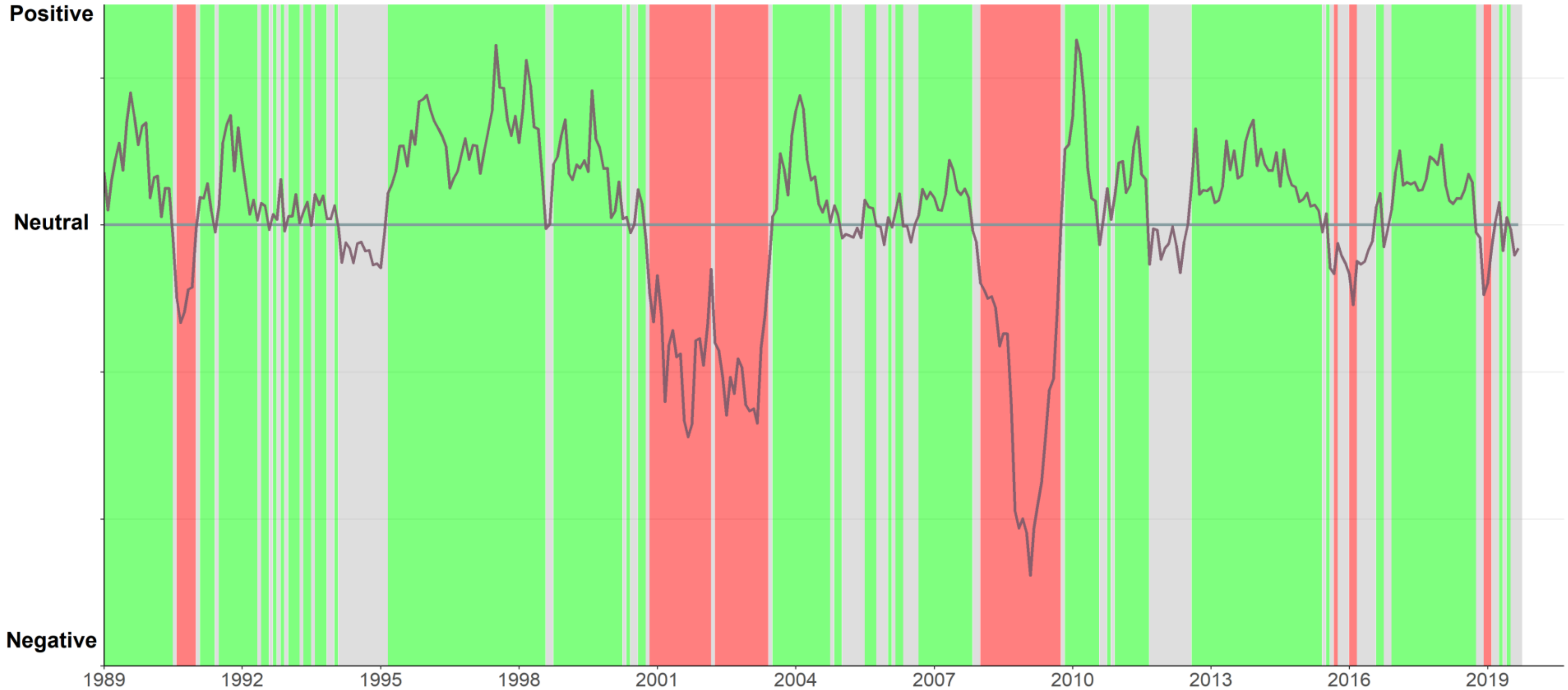
Risk Overview/Dashboard (2)

(As of September 30, 2019)

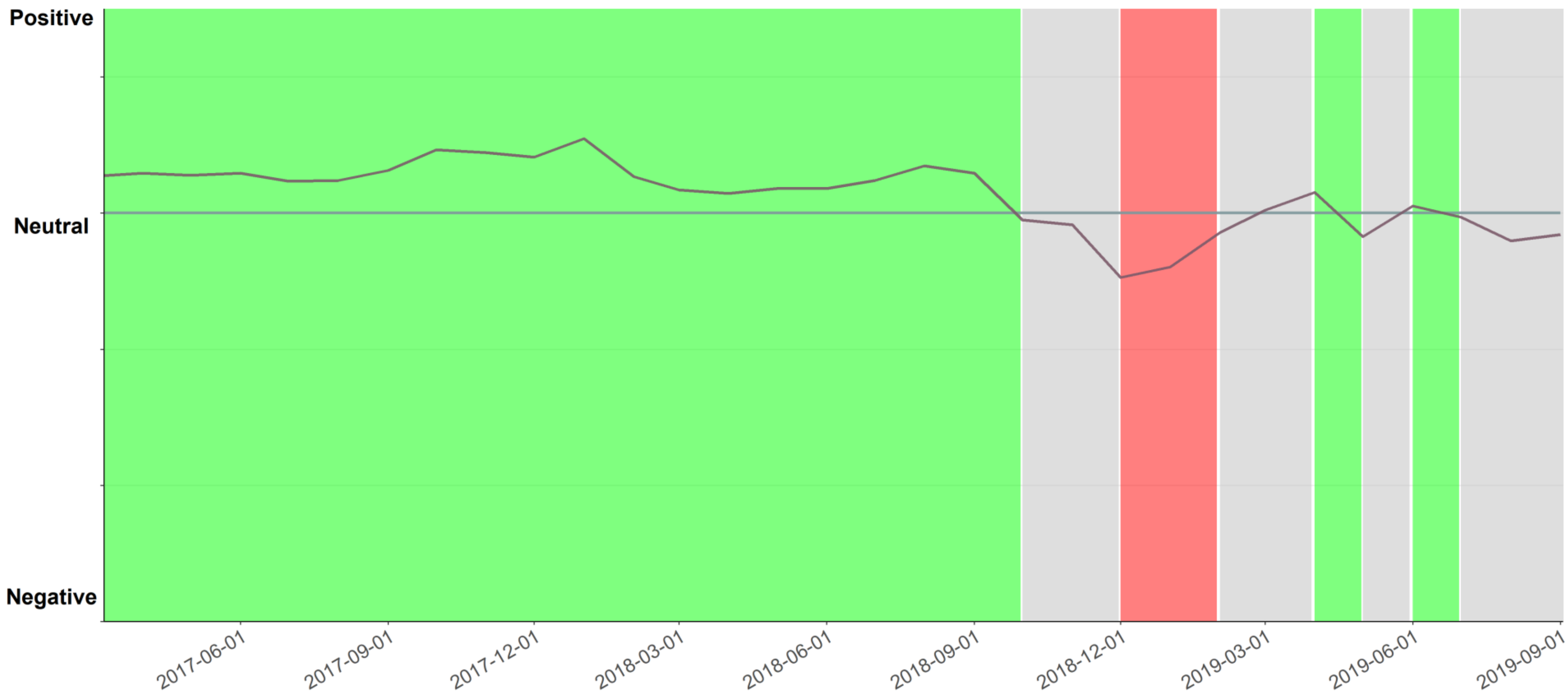


- Dashboard (2) shows how the current level of each indicator compares to its respective history.

Market Sentiment Indicator (All History)
(As of September 30, 2019)



Market Sentiment Indicator (Last Three Years)
(As of September 30, 2019)

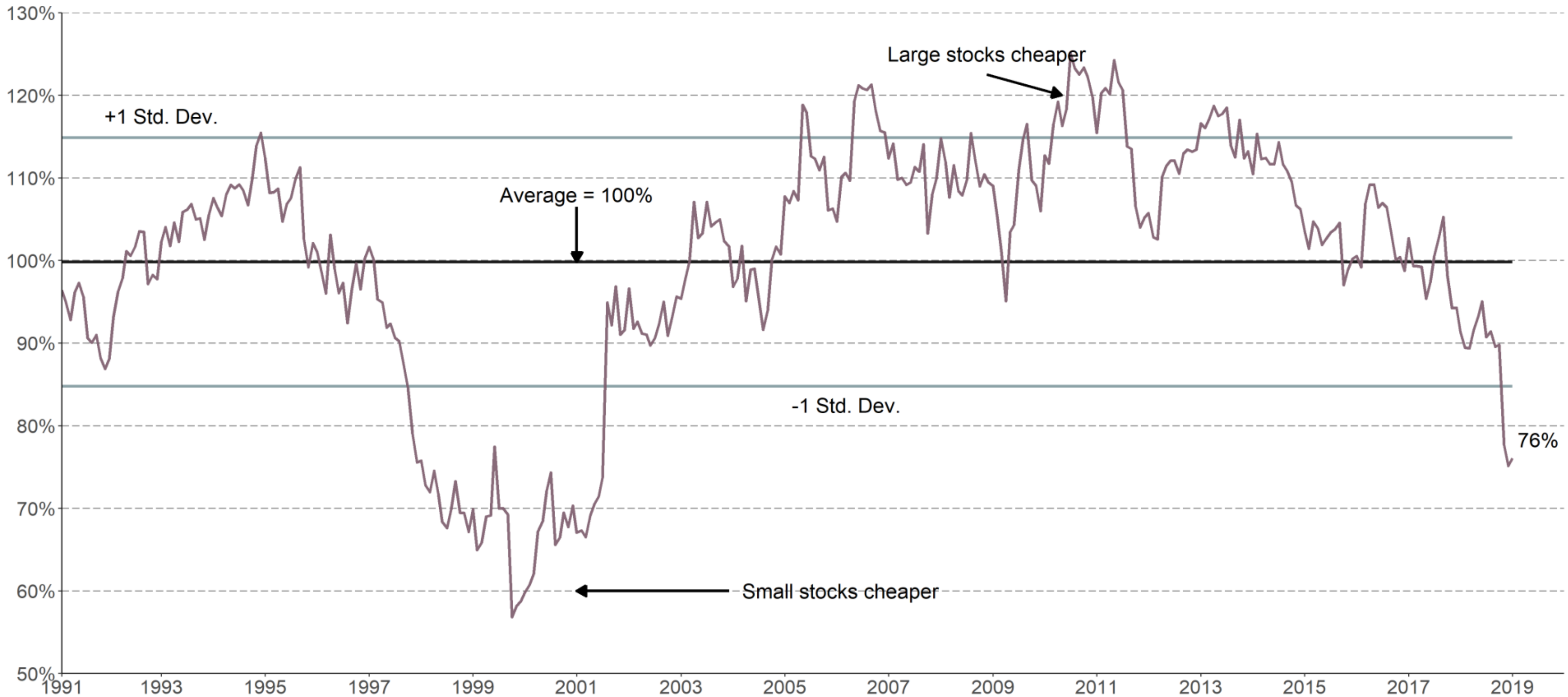


US Equity Cyclically Adjusted P/E[1]
(As of September 30, 2019)

- This chart details one valuation metric for US Equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] US Equity Cyclically Adjusted P/E on S&P 500 Index – Source: Robert Shiller and Yale University.

Small Cap P/E vs. Large Cap P/E[1]
(As of September 30, 2019)



- This chart compares the relative attractiveness of Small Cap US Equities vs. Large Cap US Equities on a valuation basis. A higher (lower) figure indicates that Large Cap (Small Cap) is more attractive.

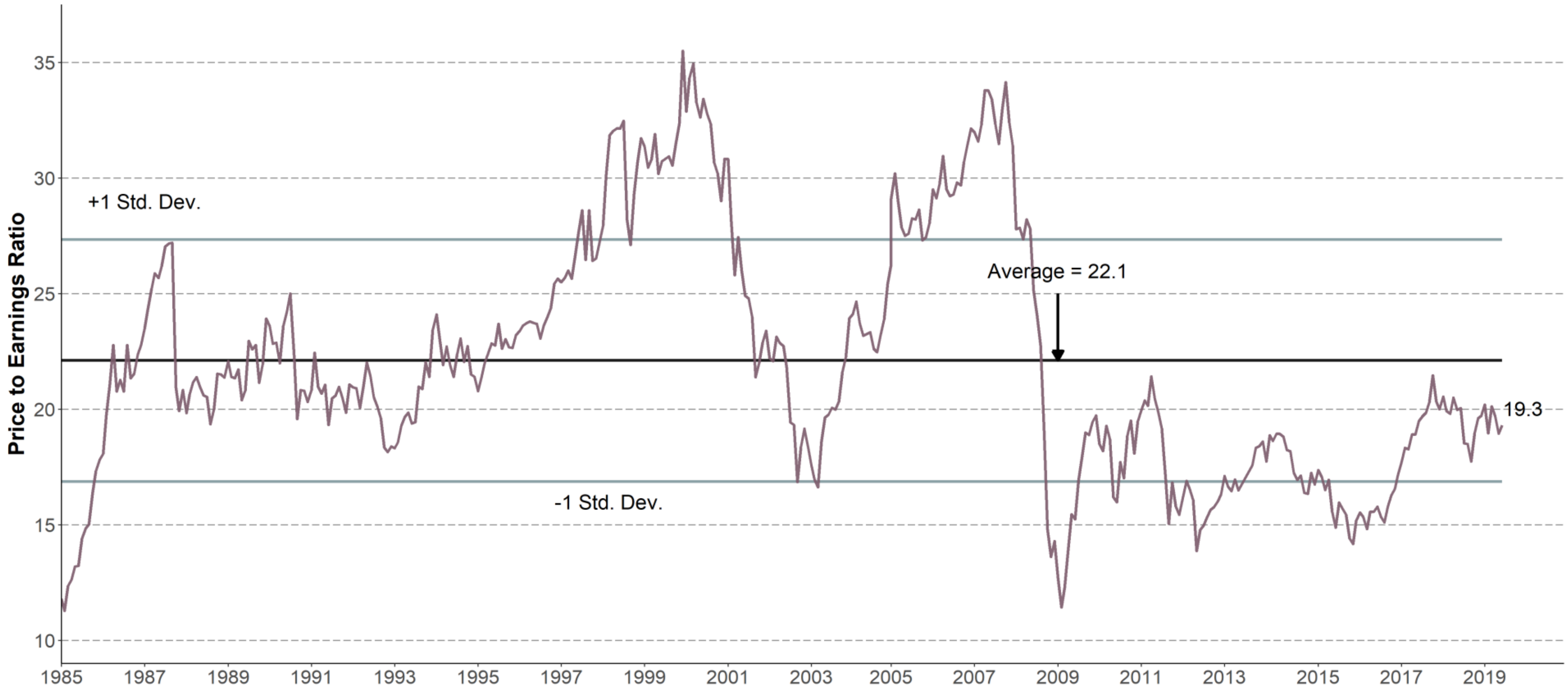
[1] Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month "as reported" earnings.

Growth P/E vs. Value P/E[1]
(As of September 30, 2019)

- This chart compares the relative attractiveness of US Growth Equities vs. US Value Equities on a valuation basis. A higher (lower) figure indicates that Value (Growth) is more attractive.

[1] Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month "as reported" earnings.

Developed International Equity Cyclically Adjusted P/E[1]
(As of September 30, 2019)



- This chart details one valuation metric for Developed International Equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

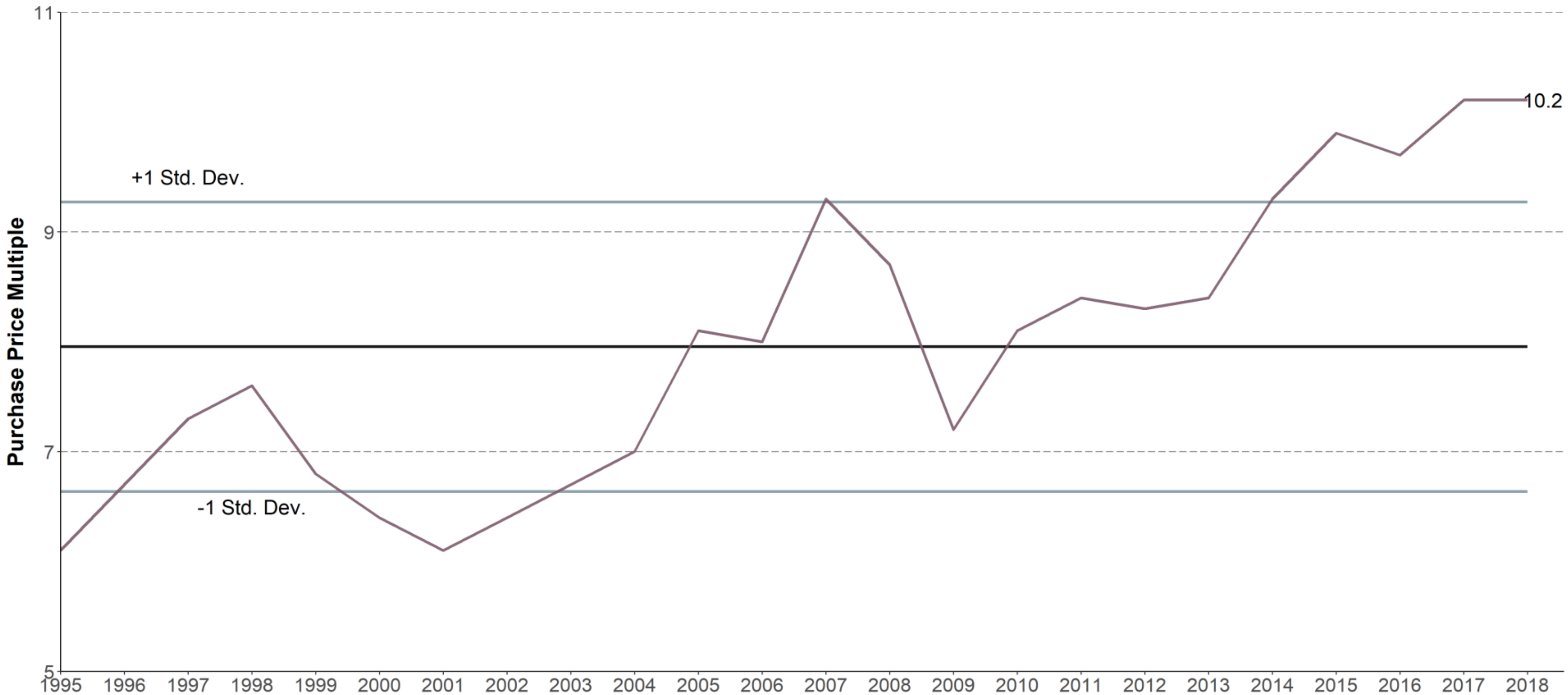
[1] Developed International Equity (MSCI EAFE ex Japan Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.

Emerging Market Equity Cyclically Adjusted P/E[1]
(As of September 30, 2019)

- This chart details one valuation metric for Emerging Markets Equities. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] Emerging Market Equity (MSCI Emerging Markets Index) Cyclically Adjusted P/E – Source: MSCI and Bloomberg. Earnings figures represent the average of monthly "as reported" earnings over the previous ten years.

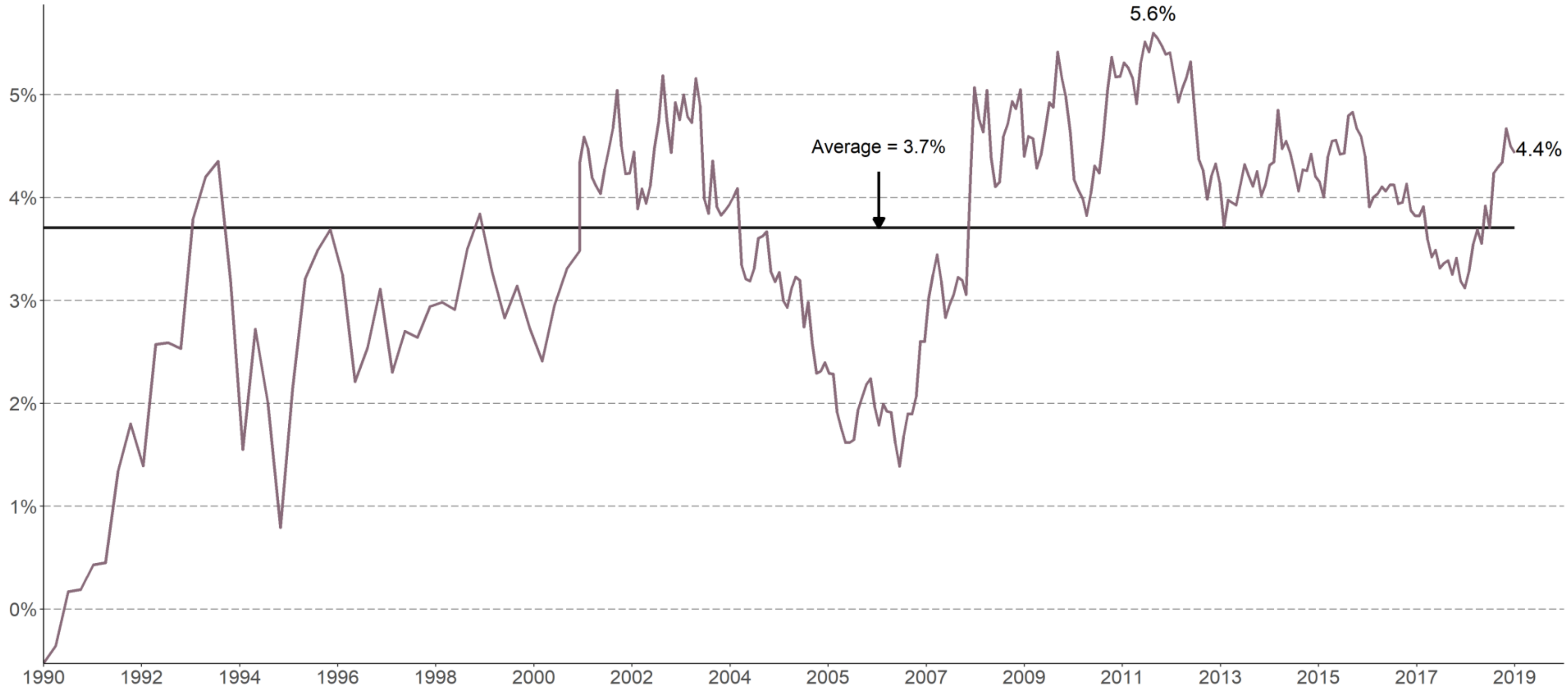
Private Equity Multiples[1]
(As of December 31, 2018)[2]



- This chart details one valuation metric for the Private Equity market. A higher (lower) figure indicates more expensive (cheaper) valuation relative to history.

[1] Private Equity Multiples – Source: S&P LCD Average EBITDA Multiples Paid in All LBOs.
[2] Only annual figures available.

Core Real Estate Spread vs. Ten-Year Treasury[1]
(As of September 30, 2019)



- This chart details one valuation metric for the Private Core Real Estate market. A higher (lower) figure indicates cheaper (more expensive) valuation.

[1] Core Real Estate Spread vs. Ten-Year Treasury – Source: Real Capital Analytics, US Treasury, Bloomberg, and Meketa Investment Group. Core Real Estate is proxied by weighted sector transaction based indices from Real Capital Analytics and Meketa Investment Group.

REITs Dividend Yield Spread vs. Ten-Year Treasury[1]
(As of September 30, 2019)

- This chart details one valuation metric for the Public REITs market. A higher (lower) figure indicates cheaper (more expensive) valuation.

[1] REITs Dividend Yield Spread vs. Ten-Year Treasury – Source: NAREIT, US Treasury. REITs are proxied by the yield for the NAREIT Equity index.

Credit Spreads[1]
(As of September 30, 2019)

- This chart details one valuation metric for the US Credit markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

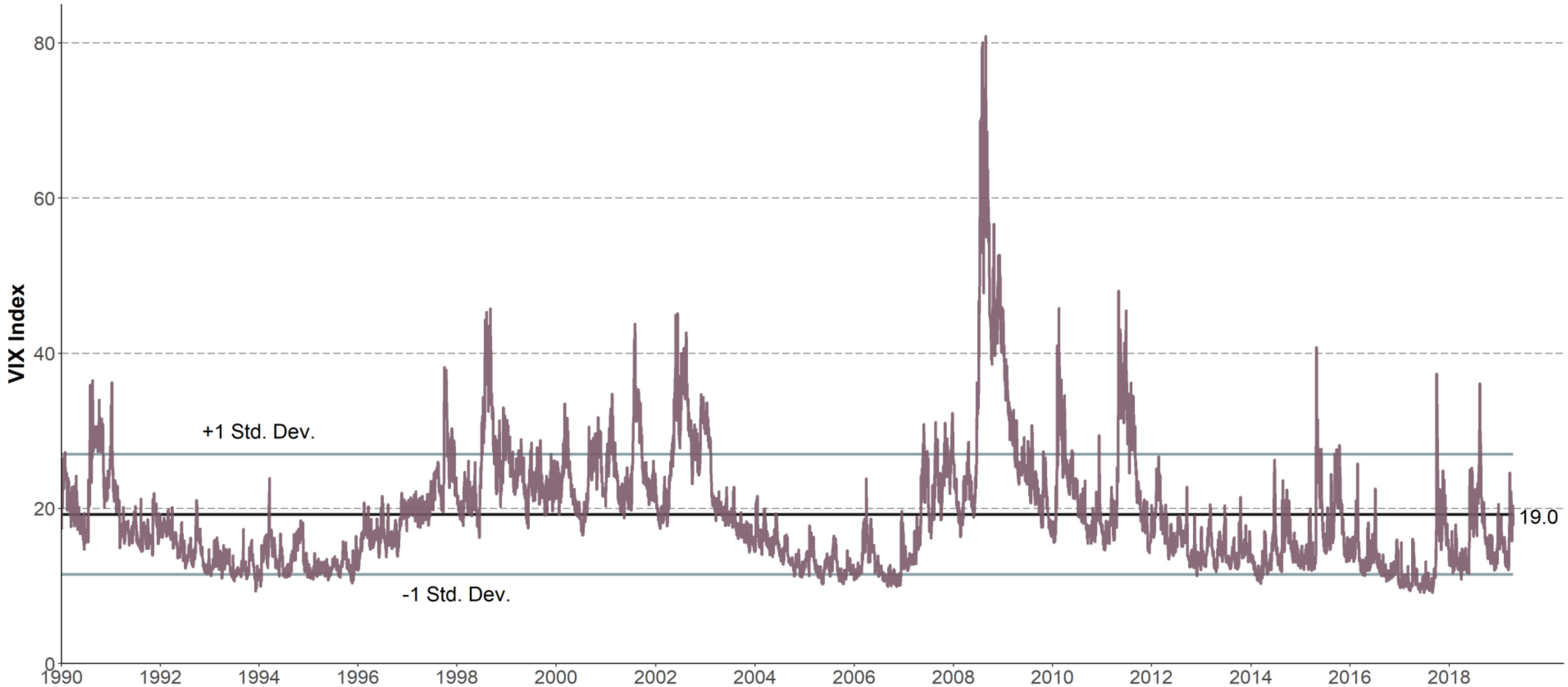
[1] Credit Spreads – Source: Barclays Capital. High Yield is proxied by the Barclays High Yield index and Investment Grade Corporates are proxied by the Barclays US Corporate Investment Grade index.

Emerging Market Debt Spreads[1]
(As of September 30, 2019)

- This chart details one valuation metric for the EM Debt markets. A higher (lower) figure indicates cheaper (more expensive) valuation relative to history.

[1] EM Spreads – Source: Bloomberg. Option Adjusted Spread (OAS) for the Bloomberg Barclays EM USD Aggregate Index.

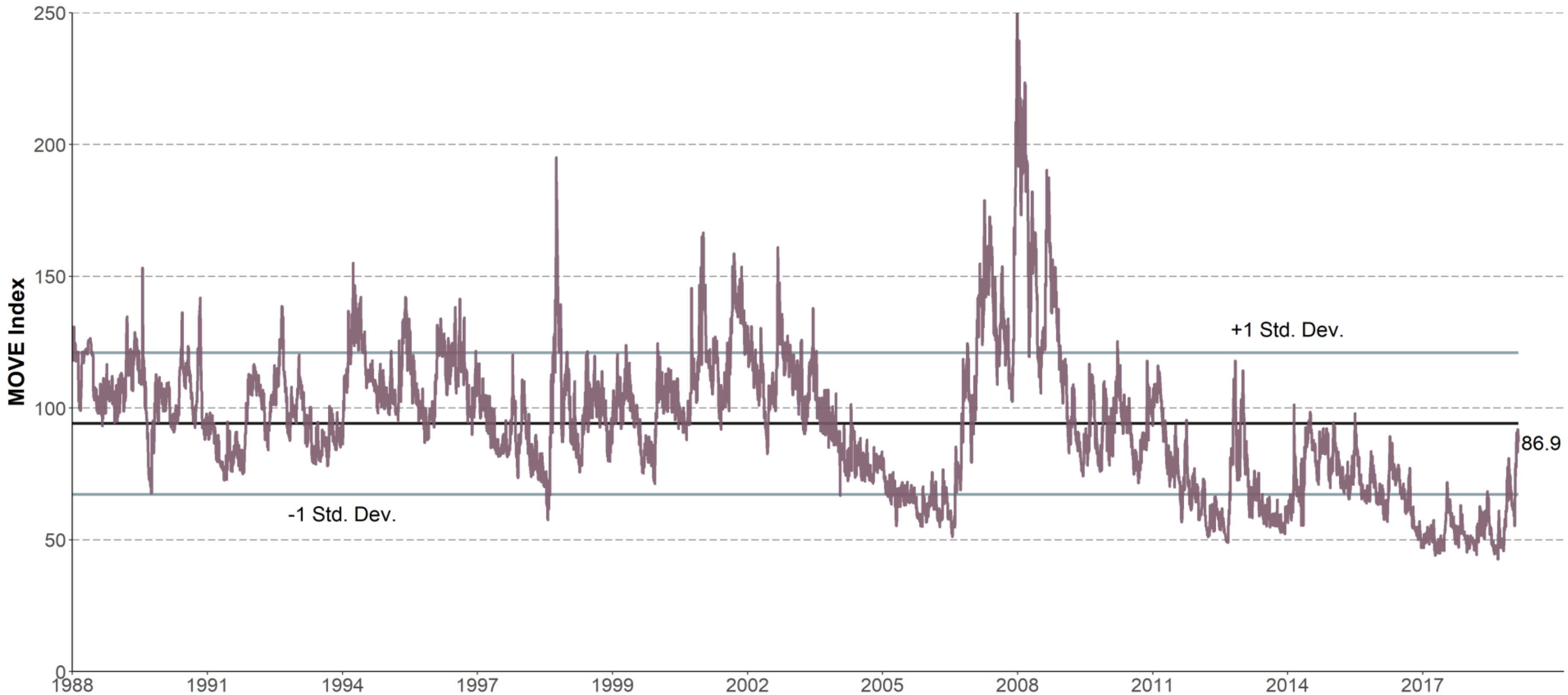
Equity Volatility [1]
(As of September 30, 2019)



- This chart details historical implied equity market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

[1] Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.

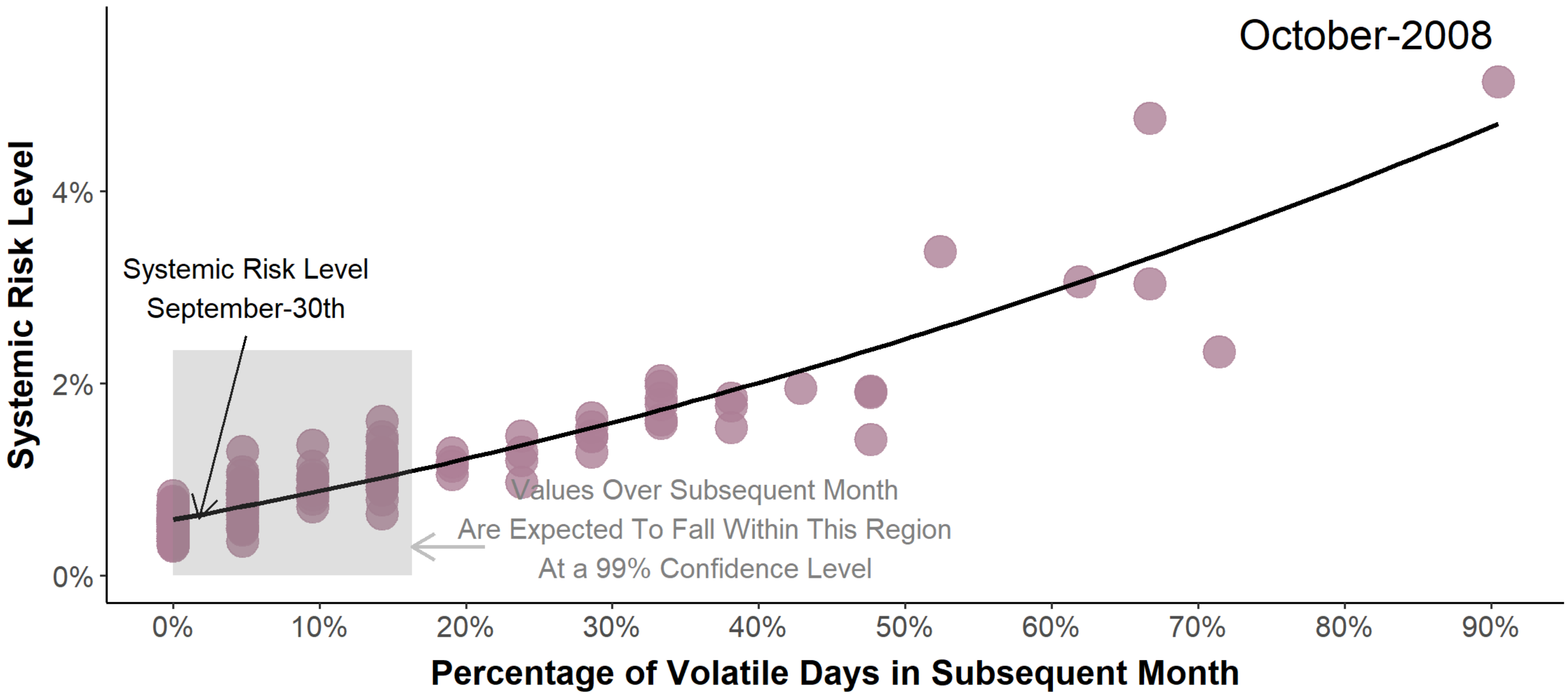
Fixed Income Volatility [1]
(As of September 30, 2019)



- This chart details historical implied fixed income market volatility. This metric tends to increase during times of stress/fear and while declining during more benign periods.

[1] Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Fixed Income Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.

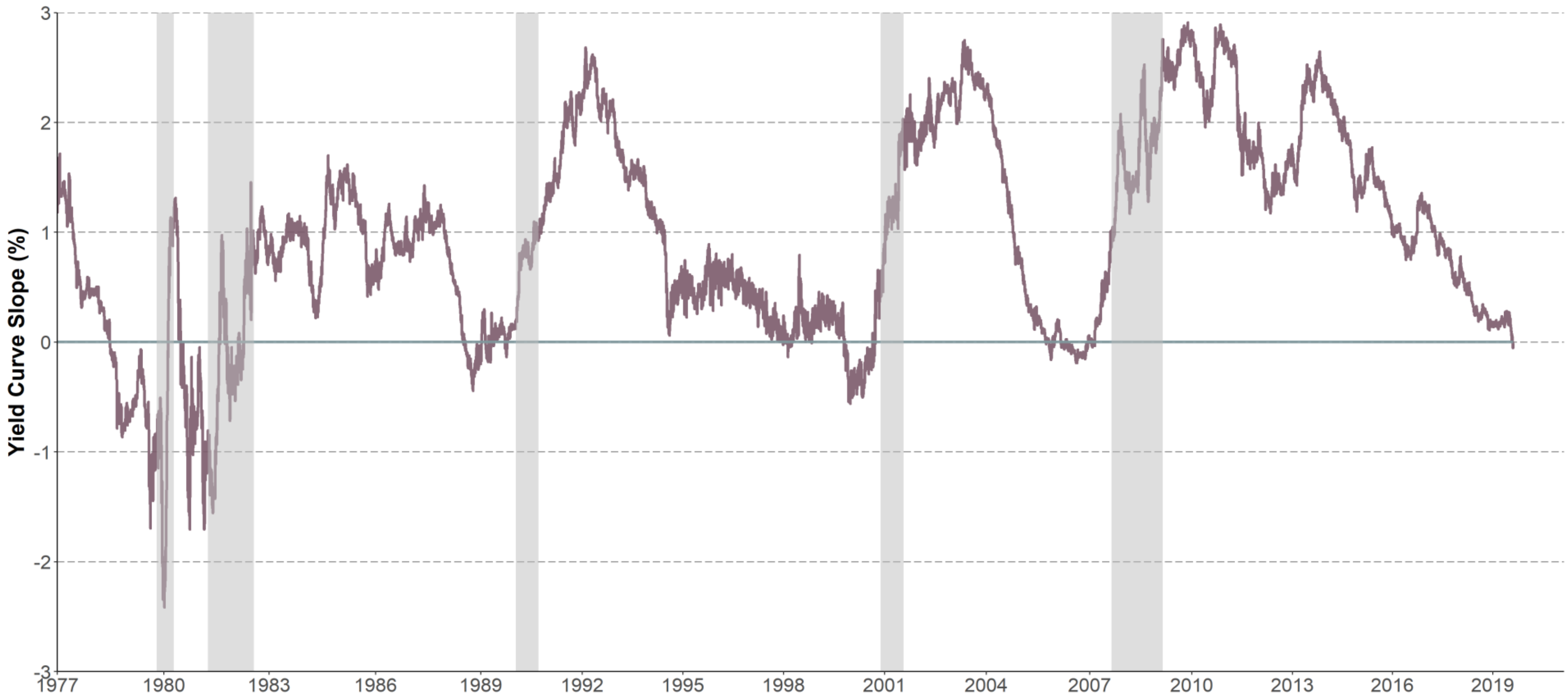
Systemic Risk and Volatile Market Days[1]
(As of September 30, 2019)



- Systemic Risk is a measure of 'System-wide' risk, which indicates herding type behavior. This measure declined materially during September.

[1] Source: Meketa Investment Group, as of September 30, 2019. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.

Yield Curve Slope (Ten Minus Two)[1]
(As of September 30, 2019)



- This chart details the historical difference in yields between ten-year and two-year US Treasury bonds/notes. A higher (lower) figure indicates a steeper (flatter) yield curve slope.

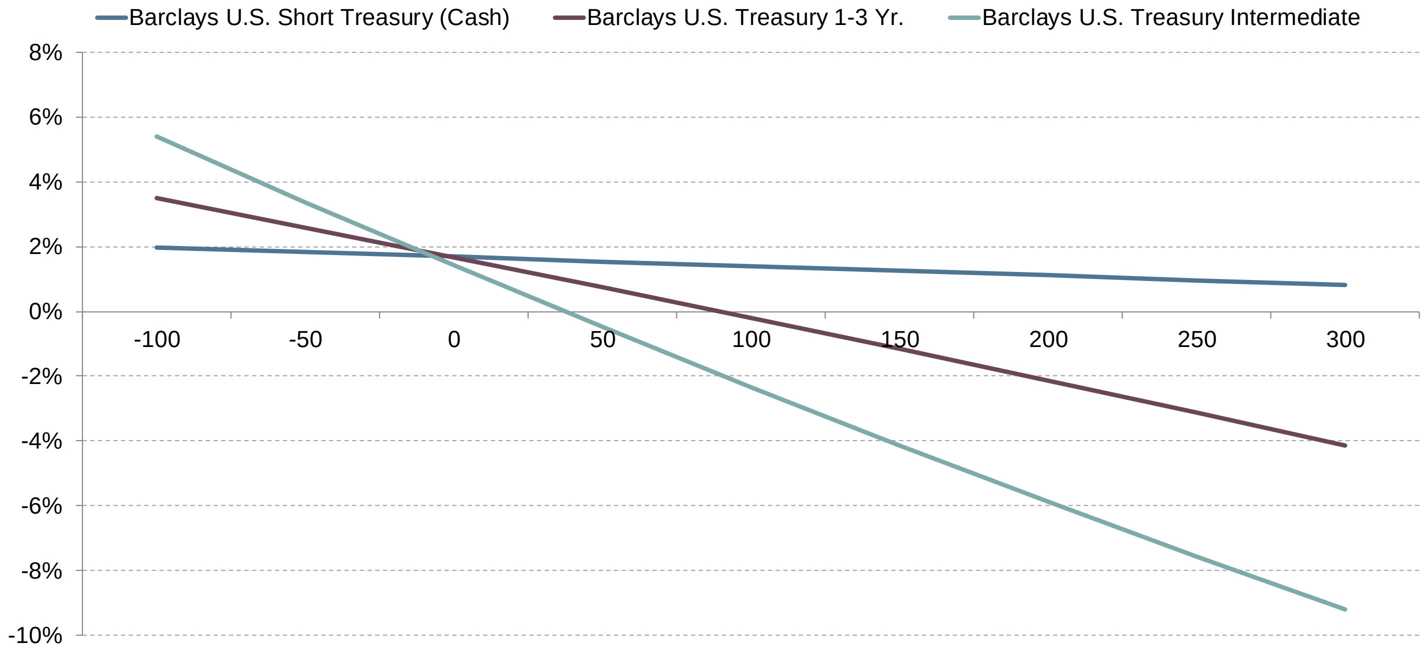
[1] Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.

Ten-Year Breakeven Inflation[1]
(As of September 30, 2019)

- This chart details the difference between nominal and inflation-adjusted US Treasury bonds. A higher (lower) figure indicates higher (lower) inflation expectations.

[1] Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Data is as of June 30, 2019 for TIPS and Treasuries. Inflation is measured by the Consumer Price Index (CPI-U NSA).

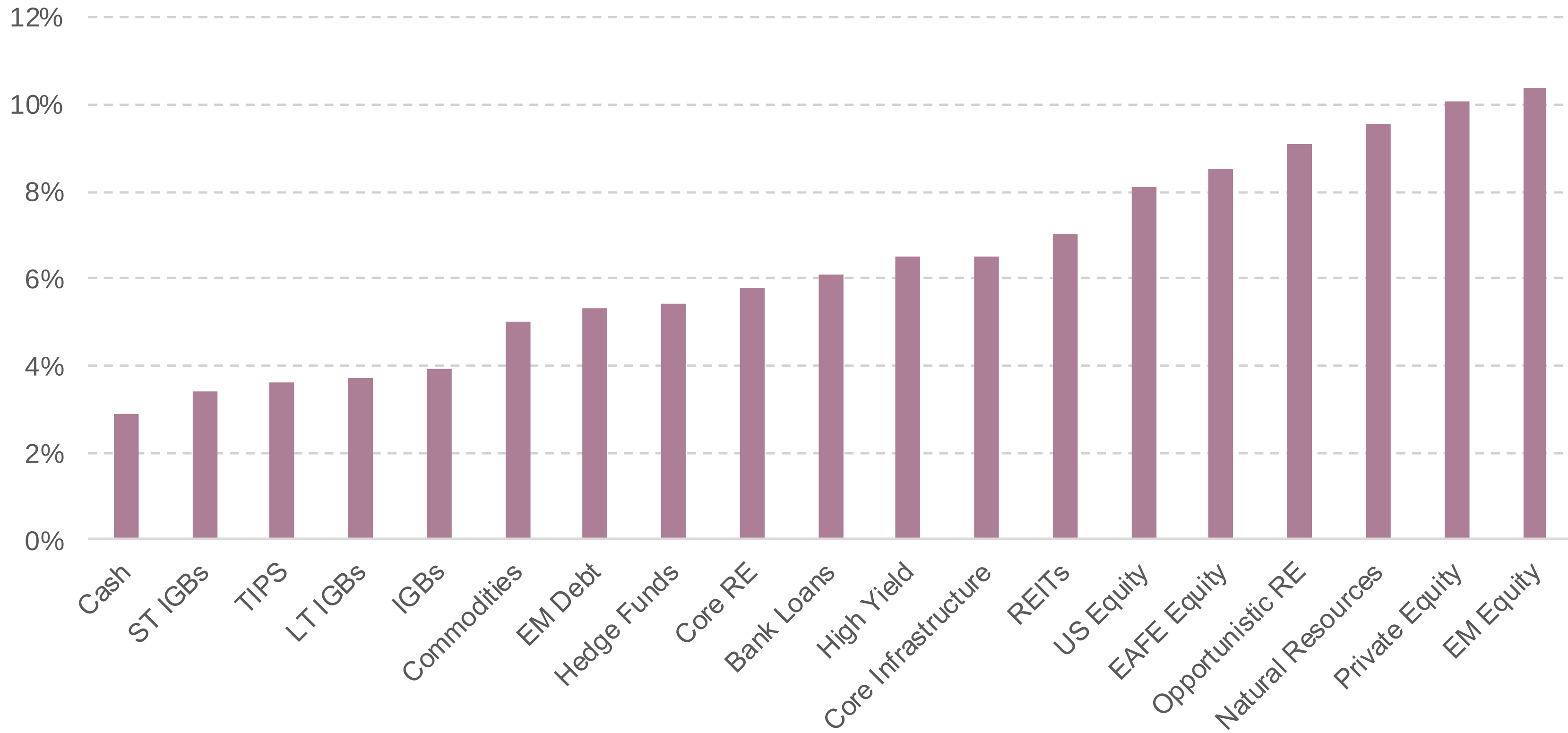
Total Return Given Changes in Interest Rates (bps)[1]
(As of September 30, 2019)



	Total Return for Given Changes in Interest Rates (bps)									Statistics	
	-100	-50	0	50	100	150	200	250	300	Duration	YTW
Barclays US Short Treasury (Cash)	2.0%	1.8%	1.7%	1.5%	1.4%	1.3%	1.1%	1.0%	0.8%	0.29	1.69%
Barclays US Treasury 1-3 Yr.	3.5%	2.6%	1.7%	0.8%	-0.2%	-1.2%	-2.1%	-3.1%	-4.1%	1.84	1.68%
Barclays US Treasury Intermediate	5.4%	3.4%	1.4%	-0.5%	-2.3%	-4.1%	-5.9%	-7.6%	-9.2%	3.87	1.42%
Barclays US Treasury Long	22.5%	11.7%	2.0%	-6.7%	-14.3%	-20.8%	-26.3%	-30.7%	-34.0%	18.4	1.98%

[1] Data represents the expected total return from a given change in interest rates (shown in basis points) over a 12-month period assuming a parallel shift in rates. Data is as of September 30, 2019 via Barclays, Bloomberg, and Meketa Investment Group.

Long-Term Outlook – 20-Year Annualized Expected Returns[1]



- This chart details Meketa's long-term forward-looking expectations for total returns across asset classes.

[1] Source: Meketa Investment Group's 2019 Annual Asset Study.

Appendix

Data Sources and Explanations[1]

- US Equity Cyclically Adjusted P/E on S&P 500 Index – Source: Robert Shiller and Yale University.
- Small Cap P/E (Russell 2000 Index) vs. Large Cap P/E (Russell 1000 Index) - Source: Russell Investments. Earnings figures represent 12-month "as reported" earnings.
- Growth P/E (Russell 3000 Growth Index) vs. Value (Russell 3000 Value Index) P/E - Source: Bloomberg, MSCI, and Meketa Investment Group. Earnings figures represent 12-month "as reported" earnings.
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[1] All Data as of September 30, 2019 unless otherwise noted.

Appendix

Data Sources and Explanations[1]

- EM Debt Spreads – Source: Bloomberg, and Meketa Investment Group. Option Adjusted Spread (OAS) for the Bloomberg Barclays EM USD Aggregate Index.
- Equity Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by VIX Index, a Measure of implied option volatility for US equity markets.
- Fixed Income Volatility – Source: Bloomberg, and Meketa Investment Group. Equity Volatility proxied by MOVE Index, a Measure of implied option volatility for US Treasury markets.
- Systemic Risk and Volatile Market Days – Source: Meketa Investment Group. Volatile days are defined as the top 10 percent of realized turbulence, which is a multivariate distance between asset returns.
  - Systemic Risk, which measures risk across markets, is important because the more contagion of risk that exists between assets, the more likely it is that markets will experience volatile periods.
- Yield Curve Slope (Ten Minus Two) – Source: Bloomberg, and Meketa Investment Group. Yield curve slope is calculated as the difference between the 10-Year US Treasury Yield and 2-Year US Treasury Yield.
- Ten-Year Breakeven Inflation – Source: US Treasury and Federal Reserve. Inflation is measured by the Consumer Price Index (CPI-U NSA).

[1] All Data as of September 30, 2019 unless otherwise noted.

Meketa Market Sentiment Indicator

Explanation, Construction and Q&A

Meketa has created the MIG Market Sentiment Indicator (MIG-MSI) to complement our valuation-focused Risk Metrics. This measure of sentiment is meant to capture significant and persistent shifts in long-lived market trends of economic growth risk, either towards a risk-seeking trend or a risk-aversion trend.

This appendix explores:

- What is the Meketa Market Sentiment Indicator?
- How do I read the indicator graph?
- How is the Meketa Market Sentiment Indicator constructed?
- What do changes in the indicator mean?

Meketa has created a market sentiment indicator for monthly publication (the MIG-MSI – see below) to complement Meketa's Risk Metrics.

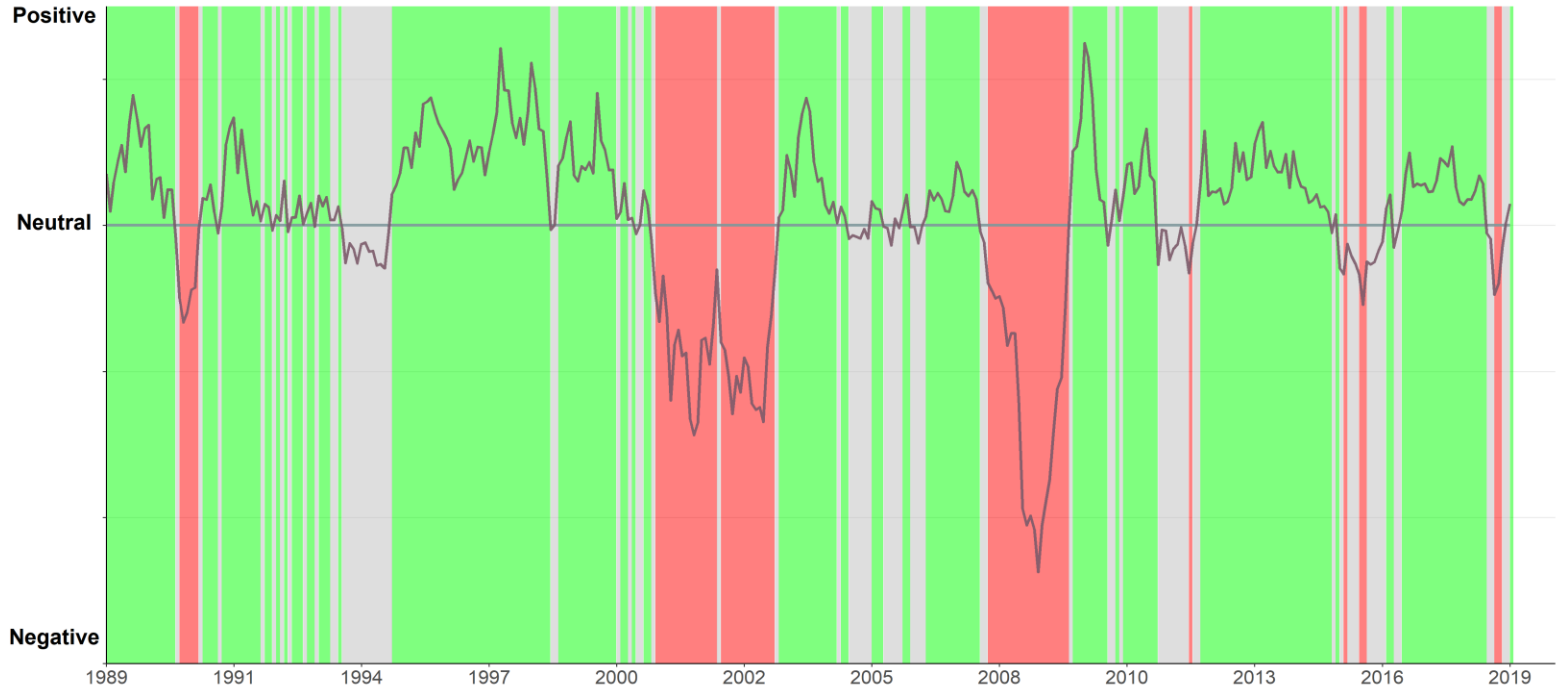
- Meketa's Risk Metrics, which rely significantly on standard market measures of relative valuation, often provide valid early signals of increasing long-term risk levels in the global investment markets. However, as is the case with numerous valuation measures, the Risk Metrics may convey such risk concerns long before a market corrections take place. The MIG-MSI helps to address this early-warning bias by measuring whether the markets are beginning to acknowledge key Risk Metrics trends, and / or indicating non-valuation based concerns. Once the MIG-MSI indicates that the market sentiment has shifted, it is our belief that investors should consider significant action, particularly if confirmed by the Risk Metrics. Importantly, Meketa believes the Risk Metrics and MIG-MSI should always be used in conjunction with one another and never in isolation. The questions and answers below highlight and discuss the basic underpinnings of the Meketa MIG-MSI:

What is the Meketa Market Sentiment Indicator (MIG-MSI)?

- The MIG-MSI is a measure meant to gauge the market's sentiment regarding economic growth risk. Growth risk cuts across most financial assets, and is the largest risk exposure that most portfolios bear. The MIG-MSI takes into account the momentum (trend over time, positive or negative) of the economic growth risk exposure of publicly traded stocks and bonds, as a signal of the future direction of growth risk returns; either positive (risk seeking market sentiment), or negative (risk averse market sentiment).

How do I read the Meketa Market Sentiment Indicator graph?

- Simply put, the MIG-MSI is a color-coded indicator that signals the market's sentiment regarding economic growth risk. It is read left to right chronologically. A green indicator on the MIG-MSI indicates that the market's sentiment towards growth risk is positive. A gray indicator indicates that the market's sentiment towards growth risk is neutral or inconclusive. A red indicator indicates that the market's sentiment towards growth risk is negative. The black line on the graph is the level of the MIG-MSI. The degree of the signal above or below the neutral reading is an indication the signal's current strength.
- Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.



How is the Meketa Market Sentiment Indicator (MIG-MSI) Constructed?

- The MIG-MSI is constructed from two sub-elements representing investor sentiment in stocks and bonds:
  - Stock return momentum: Return momentum for the S&P 500 Equity Index (trailing 12-months)
  - Bond yield spread momentum: Momentum of bond yield spreads (excess of the measured bond yield over the identical duration US Treasury bond yield) for corporate bonds (trailing 12-months) for both investment grade bonds (75% weight) and high yield bonds (25% weight).
  - Both measures are converted to Z-scores and then combined to get an "apples to apples" comparison without the need of re-scaling.
- The black line reading on the graph is calculated as the average of the stock return momentum measure and the bonds spread momentum measure.[1] The color reading on the graph is determined as follows:
  - If both stock return momentum and bond spread momentum are positive = GREEN (positive)
  - If one of the momentum indicators is positive, and the other negative = GRAY (inconclusive)
  - If both stock return momentum and bond spread momentum are negative = RED (negative)

[1] Momentum as we are defining it is the use of the past behavior of a series as a predictor of its future behavior.
" Time Series Momentum" Moskowitz, Ooi, Pedersen, August 2010. *http://pages.stern.nyu.edu/~lpederse/papers/TimeSeriesMomentum.pdf*

What does the Meketa Market Sentiment Indicator (MIG-MSI) mean? Why might it be useful?

- There is strong evidence that time series momentum is significant and persistent. In particular, across an extensive array of asset classes, the sign of the trailing 12-month return (positive or negative) is indicative of future returns (positive or negative) over the next 12-month period. The MIG-MSI is constructed to measure this momentum in stocks and corporate bond spreads. A reading of green or red is agreement of both the equity and bond measures, indicating that it is likely that this trend (positive or negative) will continue over the next 12 months. When the measures disagree, the indicator turns gray. A gray reading does not necessarily mean a new trend is occurring, as the indicator may move back to green, or into the red from there. The level of the reading (black line) and the number of months at the red or green reading, gives the user additional information on which to form an opinion, and potentially take action.

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Minnesota State Board of Investments

Private Markets Performance Report
June 30, 2019

Aon Hewitt
Retirement and Investment

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Table of Contents

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Section 1:
Private Markets Overview

Portfolio Overview

Inception to 6/30/2019

	Distressed/ Opportunistic Portfolio	Private Credit Portfolio	Private Equity Portfolio	Real Assets Portfolio	Real Estate Portfolio	Total Private Markets Portfolio
Number of Investments	28	23	136	41	26	**254**
Commitments	$2,864,714,067	$2,275,553,799	$14,941,089,214	$4,566,879,857	$2,774,500,000	**$27,422,736,937**
Unfunded Commitments	812,658,095	819,887,406	6,543,363,615	967,602,283	1,346,754,106	**10,490,265,505**
Total Paid-In	1,970,371,684	1,624,201,282	9,151,482,240	3,741,344,851	1,543,523,689	**18,030,923,746**
Total Distributions	1,823,771,018	1,535,772,550	8,715,856,266	3,250,986,429	1,212,370,512	**16,538,756,775**
Net Asset Value	1,123,899,368	600,600,253	5,621,288,944	2,067,086,242	834,422,455	**10,247,297,262**
Total Value[1]	2,947,670,386	2,136,372,803	14,337,145,210	5,318,072,671	2,046,792,967	**26,786,054,037**
DPI[2]	0.93x	0.95x	0.95x	0.87x	0.79x	**0.92x**
TVPI[3]	1.50x	1.32x	1.57x	1.42x	1.33x	**1.49x**
IRR Since Inception	10.8%	9.7%	12.3%	14.4%	7.8%	**11.9%**
Benchmark	US CPI + 550 bps	US CPI + 550 bps	US CPI + 1000 bps	US CPI + 500 bps	US CPI + 500 bps	
Benchmark PME[4] IRR	6.7%	6.9%	12.1%	7.1%	6.9%	

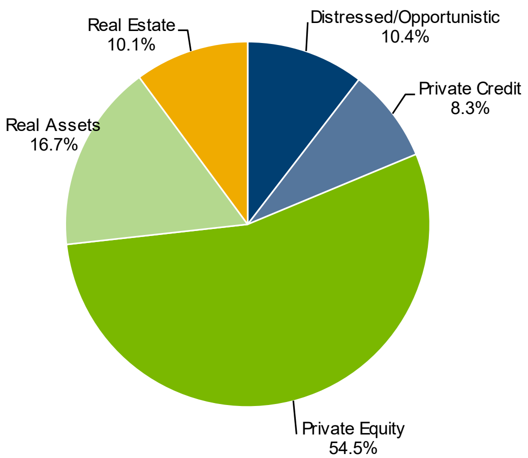
See section 7 for notes.

Asset Allocation

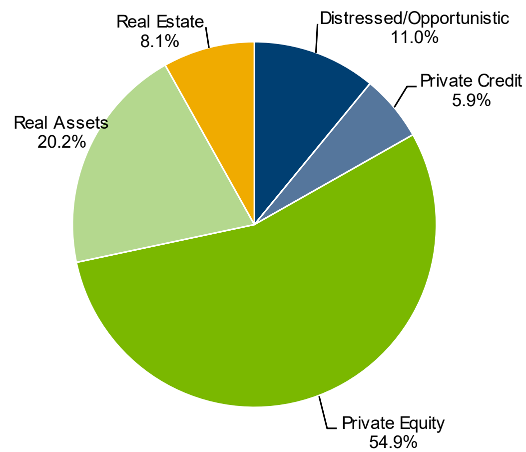
As of 6/30/2019

Portfolio	Number of Investments	Commitments Amount	Commitments % of Commitments	Net Asset Value Amount	Net Asset Value % of Total NAV	Potential Market Exposure[5] Amount	Potential Market Exposure[5] % of Total Potential Market Exposure
Distressed/Opportunistic	28	$2,864,714,067	10.4%	$1,123,899,368	11.0%	$1,936,557,463	9.3%
Private Credit	23	2,275,553,799	8.3%	600,600,253	5.9%	1,420,487,659	6.8%
Private Equity	136	14,941,089,214	54.5%	5,621,288,944	54.9%	12,164,652,558	58.7%
Real Assets	41	4,566,879,857	16.7%	2,067,086,242	20.2%	3,034,688,525	14.6%
Real Estate	26	2,774,500,000	10.1%	834,422,455	8.1%	2,181,176,562	10.5%
Total Private Markets	**254**	**$27,422,736,937**	**100.0%**	**$10,247,297,262**	**100.0%**	**$20,737,562,767**	**100.0%**

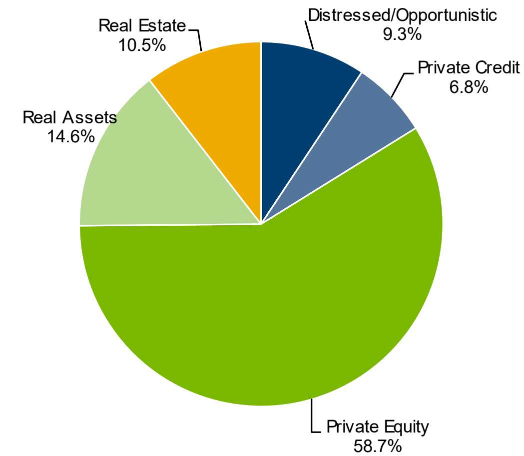
Portfolio Diversification by Commitment



Portfolio Diversification by Net Asset Value



Portfolio Diversification by Potential Market Exposure



See section 7 for notes.

Performance by Fund Status

Inception to 6/30/2019

Status	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Active	$2,853,737,500	$806,515,852	$1,959,958,124	$1,814,955,306	$1,120,660,383	$2,935,615,689	0.93x	1.50x	10.9%
Heritage	10,976,567	6,142,243	10,413,560	8,815,713	3,238,985	12,054,697	0.85x	1.16x	5.8%
Total Distressed/Opportunistic Portfolio	**2,864,714,067**	**812,658,095**	**1,970,371,684**	**1,823,771,018**	**1,123,899,368**	**2,947,670,386**	**0.93x**	**1.50x**	**10.8%**
Active	2,109,701,215	819,377,418	1,475,629,648	1,329,470,563	593,987,198	1,923,457,762	0.90x	1.30x	9.7%
Heritage	165,852,584	509,988	148,571,634	206,301,986	6,613,055	212,915,041	1.39x	1.43x	10.3%
Total Private Credit Portfolio	**2,275,553,799**	**819,887,406**	**1,624,201,282**	**1,535,772,550**	**600,600,253**	**2,136,372,803**	**0.95x**	**1.32x**	**9.7%**
Active	14,260,194,512	6,531,826,262	8,478,467,640	7,715,429,080	5,556,201,588	13,271,630,668	0.91x	1.57x	13.5%
Heritage	680,894,702	11,537,352	673,014,600	1,000,427,186	65,087,356	1,065,514,542	1.49x	1.58x	7.8%
Total Private Equity Portfolio	**14,941,089,214**	**6,543,363,615**	**9,151,482,240**	**8,715,856,266**	**5,621,288,944**	**14,337,145,210**	**0.95x**	**1.57x**	**12.3%**
Active	4,566,879,857	967,602,283	3,741,344,851	3,250,986,429	2,067,086,242	5,318,072,671	0.87x	1.42x	14.4%
Heritage	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Real Assets Portfolio	**4,566,879,857**	**967,602,283**	**3,741,344,851**	**3,250,986,429**	**2,067,086,242**	**5,318,072,671**	**0.87x**	**1.42x**	**14.4%**
Active	2,449,500,000	1,258,030,693	1,302,016,623	937,305,116	817,028,346	1,754,333,461	0.72x	1.35x	8.2%
Heritage	325,000,000	88,723,414	241,507,066	275,065,396	17,394,109	292,459,506	1.14x	1.21x	6.2%
Total Real Estate Portfolio	**2,774,500,000**	**1,346,754,106**	**1,543,523,689**	**1,212,370,512**	**834,422,455**	**2,046,792,967**	**0.79x**	**1.33x**	**7.8%**
Total Private Markets Portfolio	**$27,422,736,937**	**$10,490,265,505**	**$18,030,923,746**	**$16,538,756,775**	**$10,247,297,262**	**$26,786,054,037**	**0.92x**	**1.49x**	**11.9%**

See section 7 for notes.

Section 2:
Distressed/Opportunistic Portfolio

Performance by Strategy, Distressed/Opportunistic Portfolio

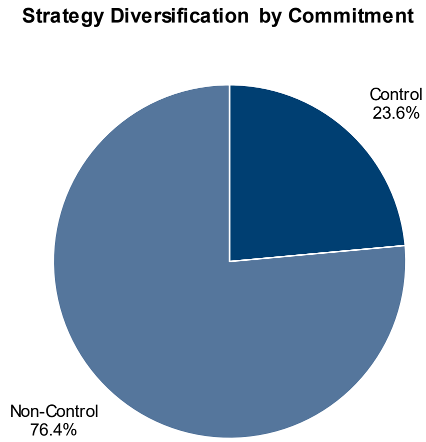
Inception to 6/30/2019

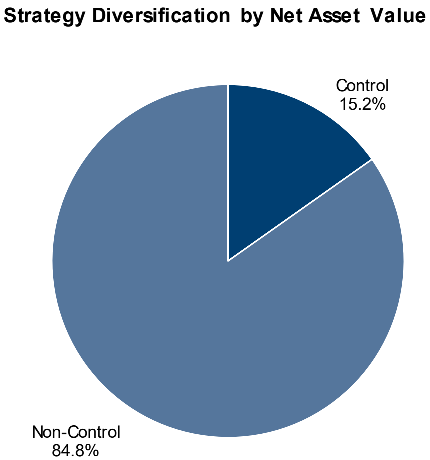
Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Wayzata Opportunities Fund II, L.P.	Active	2007	$150,000,000	$30,000,000	$57,450,000	$208,482,839	$2,351,905	$210,834,744	3.63x	3.67x	16.4%
Wayzata Opportunities Fund III, L.P.	Active	2012	150,000,000	15,000,000	68,415,000	37,605,787	28,846,621	66,452,408	0.55x	0.97x	-0.9%
Oaktree Special Situations Fund, L.P.	Active	2014	100,000,000	28,293,967	84,287,744	14,037,147	80,117,197	94,154,344	0.17x	1.12x	7.4%
MHR Institutional Partners IV, L.P.	Active	2015	75,000,000	42,475,035	35,809,392	3,343,007	31,484,264	34,827,271	0.09x	0.97x	-1.3%
Carlyle Strategic Partners IV, L.P.	Active	2016	100,000,000	77,060,244	42,630,089	19,732,224	28,414,595	48,146,820	0.46x	1.13x	14.7%
Oaktree Special Situations Fund II, L.P.	Active	2018	100,000,000	100,000,000	-11,926	0	0	0	0.00x	0.00x	N/A
Total Control			**675,000,000**	**292,829,246**	**288,580,299**	**283,201,004**	**171,214,582**	**454,415,586**	**0.98x**	**1.57x**	**13.7%**
CVI Global Value Fund I, L.P.	Active	2007	200,000,000	10,000,000	190,000,000	311,161,915	9,060,293	320,222,208	1.64x	1.69x	9.5%
The Varde Fund IX, L.P.	Active	2008	100,000,000	0	100,000,000	215,289,913	886,042	216,175,955	2.15x	2.16x	15.0%
CarVal Credit Value Fund I	Active	2010	100,000,000	5,000,000	95,000,000	207,569,569	5,876,550	213,446,120	2.18x	2.25x	18.8%
Merced Partners III, L.P.	Active	2010	100,000,000	0	100,000,000	122,497,107	13,400,883	135,897,990	1.22x	1.36x	6.3%
Varde Fund X, L.P.	Active	2010	150,000,000	0	150,000,000	240,096,045	46,699,690	286,795,735	1.60x	1.91x	11.7%
CVI Credit Value Fund II, L.P.	Active	2012	150,000,000	7,500,000	142,500,000	180,629,576	24,419,433	205,049,009	1.27x	1.44x	8.7%
Merced Partners IV, L.P.	Active	2013	125,000,000	0	124,968,390	79,977,033	76,575,197	156,552,230	0.64x	1.25x	5.9%
Varde Fund XI, LP	Active	2013	200,000,000	0	200,000,000	94,006,474	200,984,288	294,990,762	0.47x	1.47x	7.9%
PIMCO BRAVO Fund II, L.P.	Heritage	2014	5,243,670	3,794,070	4,680,663	3,226,244	2,777,404	6,003,647	0.69x	1.28x	6.2%
PIMCO BRAVO Fund Onshore Feeder I	Heritage	2014	3,958,027	2,348,173	3,958,027	3,978,735	111,761	4,090,497	1.01x	1.03x	3.2%
Avenue Energy Opportunities Fund, L.P.	Active	2015	100,000,000	0	100,977,328	10,934,495	119,602,800	130,537,295	0.11x	1.29x	7.5%
BlackRock Tempus Fund	Heritage	2015	1,774,870	0	1,774,870	1,610,734	349,820	1,960,553	0.91x	1.10x	6.2%
CVI Credit Value Fund A III	Active	2015	150,000,000	7,500,000	142,500,000	58,053,370	122,383,571	180,436,941	0.41x	1.27x	9.6%
Oaktree Opportunities Fund X, L.P.	Active	2015	50,000,000	8,500,000	46,500,021	11,119,660	47,283,408	58,403,068	0.24x	1.26x	13.7%
Oaktree Opportunities Fund Xb, L.P.	Active	2015	100,000,000	87,500,000	12,500,000	0	12,382,250	12,382,250	0.00x	0.99x	-1.3%
Avenue Energy Opportunities Fund II, L.P.	Active	2017	100,000,000	0	100,000,000	417,420	99,992,700	100,410,120	0.00x	1.00x	0.4%
CVI Credit Value Fund IV	Active	2017	150,000,000	75,000,000	75,203,333	60	78,376,950	78,377,010	0.00x	1.04x	5.9%
Merced Partners V, L.P.	Active	2017	53,737,500	0	53,915,358	0	53,419,159	53,419,159	0.00x	0.99x	-0.5%
TSSP Adjacent Opportunities GenPar, L.P.	Active	2018	100,000,000	99,929,682	70,318	0	70,318	70,318	0.00x	1.00x	0.0%
TSSP Adjacent Opportunities Partners (B)	Active	2018	50,000,000	26,489,064	23,510,936	0	24,300,129	24,300,129	0.00x	1.03x	6.1%
TSSP Opportunities Partners IV (A), L.P.	Active	2018	50,000,000	43,767,860	6,232,140	1,665	6,232,140	6,233,805	0.00x	1.00x	0.1%
Varde Fund XIII, L.P.	Active	2018	150,000,000	142,500,000	7,500,000	0	7,500,000	7,500,000	0.00x	1.00x	0.0%
Total Non-Control			**2,189,714,067**	**519,828,849**	**1,681,791,385**	**1,540,570,014**	**952,684,786**	**2,493,254,800**	**0.92x**	**1.48x**	**10.3%**
Total Distressed/Opportunistic Portfolio			**$2,864,714,067**	**$812,658,095**	**$1,970,371,684**	**$1,823,771,018**	**$1,123,899,368**	**$2,947,670,386**	**0.93x**	**1.50x**	**10.8%**

See section 7 for notes.

Diversification by Strategy, Distressed/Opportunistic Portfolio

Inception to 6/30/2019



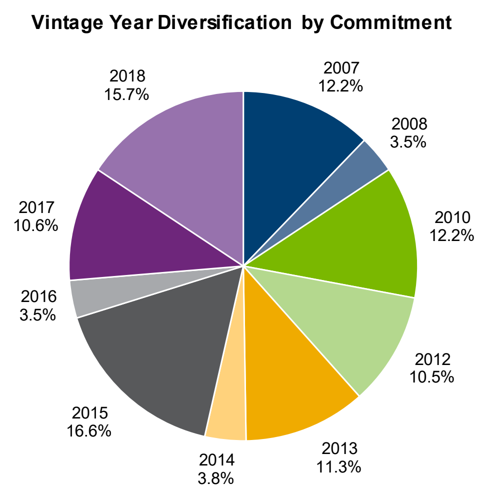


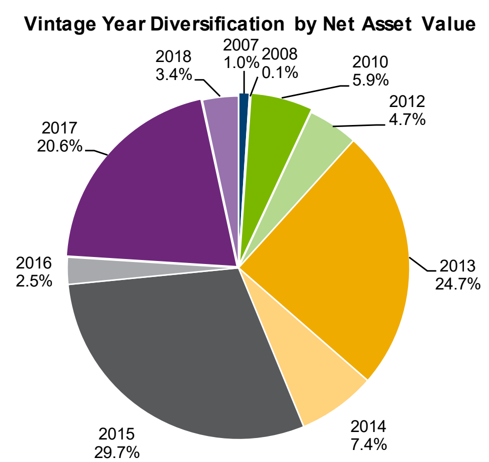
See section 7 for notes.

Performance by Vintage Year, Distressed/Opportunistic Portfolio

Inception to 6/30/2019

Vintage Year	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
2007	2	$350,000,000	$40,000,000	$247,450,000	$519,644,754	$11,412,198	$531,056,951	2.10x	2.15x	12.2%
2008	1	100,000,000	0	100,000,000	215,289,913	886,042	216,175,955	2.15x	2.16x	15.0%
2010	3	350,000,000	5,000,000	345,000,000	570,162,721	65,977,123	636,139,844	1.65x	1.84x	12.3%
2012	2	300,000,000	22,500,000	210,915,000	218,235,363	53,266,054	271,501,417	1.03x	1.29x	6.6%
2013	2	325,000,000	0	324,968,390	173,983,507	277,559,485	451,542,992	0.54x	1.39x	7.3%
2014	3	109,201,697	34,436,210	92,926,434	21,242,126	83,006,362	104,248,488	0.23x	1.12x	7.1%
2015	6	476,774,870	145,975,035	340,061,611	85,061,266	333,486,112	418,547,378	0.25x	1.23x	8.1%
2016	1	100,000,000	77,060,244	42,630,089	19,732,224	28,414,595	48,146,820	0.46x	1.13x	14.7%
2017	3	303,737,500	75,000,000	229,118,691	417,480	231,788,809	232,206,289	0.00x	1.01x	1.2%
2018	5	450,000,000	412,686,606	37,301,468	1,665	38,102,587	38,104,252	0.00x	1.02x	4.6%
Total Dist./Opp. Portfolio	**28**	**$2,864,714,067**	**$812,658,095**	**$1,970,371,684**	**$1,823,771,018**	**$1,123,899,368**	**$2,947,670,386**	**0.93x**	**1.50x**	**10.8%**





See section 7 for notes.

Evolution of IRR, Distressed/Opportunistic Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Wayzata Opportunities Fund II, L.P.	Active	2007	16.1%	16.8%	16.0%	15.4%	16.9%	17.0%	16.3%	16.3%	16.5%	16.4%	16.4%
Wayzata Opportunities Fund III, L.P.	Active	2012	N/A	N/A	N/A	NM	-19.5%	-11.3%	-16.3%	0.2%	-0.1%	-1.5%	-0.9%
Oaktree Special Situations Fund, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	4.2%	23.6%	23.7%	9.5%	7.4%
MHR Institutional Partners IV, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	33.8%	-10.5%	-5.8%	-0.9%	-1.3%
Carlyle Strategic Partners IV, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5%	18.7%	8.6%	14.7%
Oaktree Special Situations Fund II, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	N/A
Total Control			**16.1%**	**16.8%**	**16.0%**	**15.4%**	**16.6%**	**16.5%**	**15.1%**	**15.0%**	**14.9%**	**14.0%**	**13.7%**
CVI Global Value Fund I, L.P.	Active	2007	0.8%	5.6%	6.1%	8.1%	9.3%	10.0%	9.8%	9.7%	9.6%	9.6%	9.5%
The Varde Fund IX, L.P.	Active	2008	17.4%	18.0%	11.6%	12.8%	14.1%	14.4%	14.4%	14.9%	14.9%	15.0%	15.0%
CarVal Credit Value Fund I	Active	2010	N/A	0.0%	1.0%	18.7%	21.1%	21.2%	19.7%	19.3%	19.0%	18.8%	18.8%
Merced Partners III, L.P.	Active	2010	N/A	91.9%	-0.5%	8.7%	9.3%	8.4%	7.4%	6.8%	6.5%	6.4%	6.3%
Varde Fund X, L.P.	Active	2010	N/A	5.2%	2.0%	8.4%	12.1%	12.1%	11.2%	12.0%	12.1%	11.8%	11.7%
CVI Credit Value Fund II, L.P.	Active	2012	N/A	N/A	N/A	N/A	20.8%	12.5%	7.9%	8.2%	9.4%	8.9%	8.7%
Merced Partners IV, L.P.	Active	2013	N/A	N/A	N/A	N/A	-8.9%	-2.9%	0.1%	6.1%	7.2%	6.3%	5.9%
Varde Fund XI, LP	Active	2013	N/A	N/A	N/A	N/A	3.5%	8.0%	8.0%	8.0%	8.0%	8.2%	7.9%
PIMCO BRAVO Fund II, L.P.	Heritage	2014	N/A	N/A	N/A	N/A	N/A	N/A	6.5%	7.9%	7.3%	5.9%	6.2%
PIMCO BRAVO Fund Onshore Feeder I	Heritage	2014	N/A	N/A	N/A	N/A	N/A	N/A	2.2%	3.0%	1.5%	3.6%	3.2%
Avenue Energy Opportunities Fund, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-29.4%	17.5%	11.1%	7.5%	7.5%
BlackRock Tempus Fund	Heritage	2015	N/A	N/A	N/A	N/A	N/A	N/A	24.0%	16.4%	11.1%	6.4%	6.2%
CVI Credit Value Fund A III	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	3.9%	15.6%	15.0%	9.5%	9.6%
Oaktree Opportunities Fund X, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-12.2%	39.7%	24.8%	16.6%	13.7%
Oaktree Opportunities Fund Xb, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-12.9%	-1.3%
Avenue Energy Opportunities Fund II, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2%	-3.5%	0.4%
CVI Credit Value Fund IV	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.6%	5.9%
Merced Partners V, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.8%	-0.5%	-0.5%
TSSP Adjacent Opportunities GenPar, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
TSSP Adjacent Opportunities Partners (B)	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.1%	6.1%
TSSP Opportunities Partners IV (A), L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.1%
Varde Fund XIII, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
Total Non-Control			**5.1%**	**10.0%**	**6.8%**	**10.1%**	**12.0%**	**12.2%**	**10.8%**	**11.3%**	**11.2%**	**10.5%**	**10.3%**
Total Distressed/Opportunistic Portfolio			**8.3%**	**11.9%**	**9.2%**	**11.3%**	**13.0%**	**13.0%**	**11.6%**	**12.0%**	**11.8%**	**11.1%**	**10.8%**

See section 7 for notes.

Performance by Manager, Distressed/Opportunistic Portfolio

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Avenue Capital	2	$200,000,000	$0	$200,977,328	$11,351,915	$219,595,500	$230,947,415	0.06x	1.15x	6.0%
BlackRock Alternative Advisors	1	1,774,870	0	1,774,870	1,610,734	349,820	1,960,553	0.91x	1.10x	6.2%
Carlyle Group	1	100,000,000	77,060,244	42,630,089	19,732,224	28,414,595	48,146,820	0.46x	1.13x	14.7%
CarVal Investors	5	750,000,000	105,000,000	645,203,333	757,414,490	240,116,797	997,531,287	1.17x	1.55x	11.1%
Merced Capital	3	278,737,500	0	278,883,748	202,474,140	143,395,239	345,869,379	0.73x	1.24x	5.6%
MHR Fund Management	1	75,000,000	42,475,035	35,809,392	3,343,007	31,484,264	34,827,271	0.09x	0.97x	-1.3%
Oaktree Capital Management	4	350,000,000	224,293,967	143,275,839	25,156,807	139,782,855	164,939,662	0.18x	1.15x	9.5%
PIMCO	2	9,201,697	6,142,243	8,638,690	7,204,979	2,889,165	10,094,144	0.83x	1.17x	5.7%
TSSP (TPG)	3	200,000,000	170,186,606	29,813,394	1,665	30,602,587	30,604,252	0.00x	1.03x	5.2%
Varde Partners Inc.	4	600,000,000	142,500,000	457,500,000	549,392,432	256,070,020	805,462,452	1.20x	1.76x	11.6%
Wayzata Investment Partners LLC	2	300,000,000	45,000,000	125,865,000	246,088,626	31,198,526	277,287,151	1.96x	2.20x	14.6%
Total Distressed/Opportunistic Portfolio	**28**	**$2,864,714,067**	**$812,658,095**	**$1,970,371,684**	**$1,823,771,018**	**$1,123,899,368**	**$2,947,670,386**	**0.93x**	**1.50x**	**10.8%**

See section 7 for notes.

Section 3:
Private Credit Portfolio

Performance by Strategy, Private Credit Portfolio

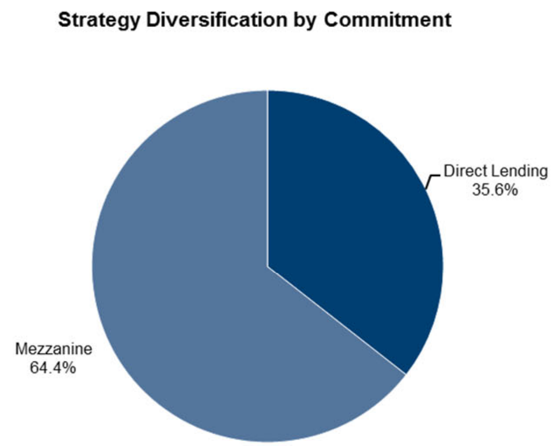
Inception to 6/30/2019

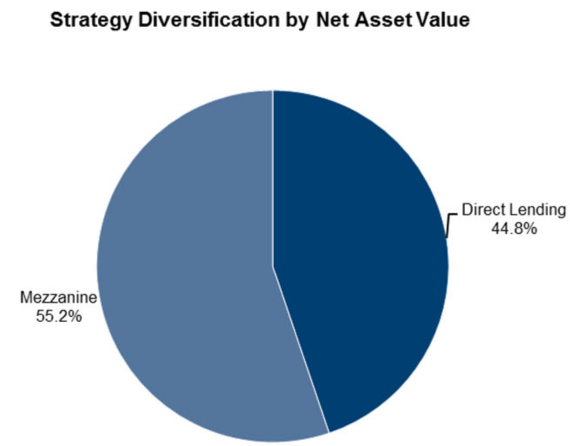
Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
KKR Lending Partners II, L.P.	Active	2015	$75,000,000	$8,802,924	$85,873,107	$75,728,529	$25,985,857	$101,714,386	0.88x	1.18x	9.6%
TCW Direct Lending LLC	Active	2015	100,000,000	25,329,409	83,599,652	55,775,315	41,618,975	97,394,290	0.67x	1.17x	7.6%
LBC Credit Partners IV, L.P.	Active	2016	84,123,090	15,135,796	84,888,047	24,853,912	69,418,193	94,272,105	0.29x	1.11x	10.6%
KKR Lending Partners III, L.P.	Active	2017	200,000,000	133,302,062	72,547,481	13,335,209	69,661,994	82,997,203	0.18x	1.14x	16.2%
BlackRock Middle Market Senior Fund	Active	2018	250,000,000	221,317,557	28,682,443	0	28,229,576	28,229,576	0.00x	0.98x	-1.9%
TCW Direct Lending VII	Active	2018	100,000,000	66,506,505	36,456,148	2,090,382	34,169,619	36,260,000	0.06x	0.99x	-0.7%
Total Direct Lending			**809,123,090**	**470,394,253**	**392,046,877**	**171,783,346**	**269,084,214**	**440,867,560**	**0.44x**	**1.12x**	**9.3%**
Gold Hill Venture Lending	Heritage	2004	40,000,000	0	40,000,000	65,077,862	360,588	65,438,450	1.63x	1.64x	10.7%
Prudential Capital Partners II, L.P.	Active	2004	100,000,000	10,658,689	97,354,846	136,363,957	6,053,800	142,417,758	1.40x	1.46x	8.9%
Summit Subordinated Debt Fund III	Active	2004	45,000,000	2,250,000	44,088,494	60,443,093	3,728,682	64,171,775	1.37x	1.46x	8.9%
Merit Mezzanine Fund IV, L.P.	Active	2005	75,000,000	4,821,429	70,178,571	135,917,682	1,912,671	137,830,352	1.94x	1.96x	11.5%
GS Mezzanine Partners 2006	Active	2006	100,000,000	9,858,563	113,445,143	134,654,263	923,532	135,577,795	1.19x	1.20x	5.0%
IP III Mezzanine Partners, L.P.	Heritage	2006	100,000,000	509,988	82,719,050	96,478,980	583,958	97,062,938	1.17x	1.17x	6.8%
GS Mezzanine Partners V	Active	2007	150,000,000	37,906,336	147,691,560	178,674,923	1,819,620	180,494,543	1.21x	1.22x	9.0%
Gold Hill 2008	Heritage	2008	25,852,584	0	25,852,584	44,745,145	5,668,508	50,413,653	1.73x	1.95x	14.8%
Prudential Capital Partners III	Active	2008	100,000,000	14,896,373	100,567,556	169,754,106	3,700,203	173,454,309	1.69x	1.72x	14.1%
Summit Subordinated Debt Fund IV	Active	2008	50,000,000	17,609,569	55,837,807	72,207,729	4,498,506	76,706,235	1.29x	1.37x	10.4%
Merit Mezzanine Fund V, L.P.	Active	2009	75,000,000	4,334,694	70,665,306	59,544,918	43,316,055	102,860,973	0.84x	1.46x	9.3%
Audax Mezzanine Fund III, L.P.	Active	2010	100,000,000	12,412,811	96,267,884	106,333,207	16,920,264	123,253,471	1.10x	1.28x	9.1%
Prudential Capital Partners IV	Active	2012	100,000,000	2,494,372	107,116,335	75,216,604	60,803,277	136,019,880	0.70x	1.27x	9.4%
Audax Mezzanine Fund IV-A, L.P.	Active	2015	100,000,000	60,915,173	42,270,178	14,790,221	31,501,527	46,291,748	0.35x	1.10x	9.0%
Merit Mezzanine Fund VI	Active	2016	55,578,125	2,959,367	52,545,141	2,425,373	60,693,585	63,118,959	0.05x	1.20x	13.3%
Prudential Capital Partners V, L.P.	Active	2016	150,000,000	67,865,788	85,553,949	11,361,141	89,031,263	100,392,404	0.13x	1.17x	15.4%
Energy Capital Credit Solutions II-A	Active	2018	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Total Mezzanine			**1,466,430,709**	**349,493,153**	**1,232,154,405**	**1,363,989,203**	**331,516,039**	**1,695,505,242**	**1.11x**	**1.38x**	**9.8%**
Total Private Credit Portfolio			**$2,275,553,799**	**$819,887,406**	**$1,624,201,282**	**$1,535,772,550**	**$600,600,253**	**$2,136,372,803**	**0.95x**	**1.32x**	**9.7%**

See section 7 for notes.

Diversification by Strategy, Private Credit Portfolio

Inception to 6/30/2019





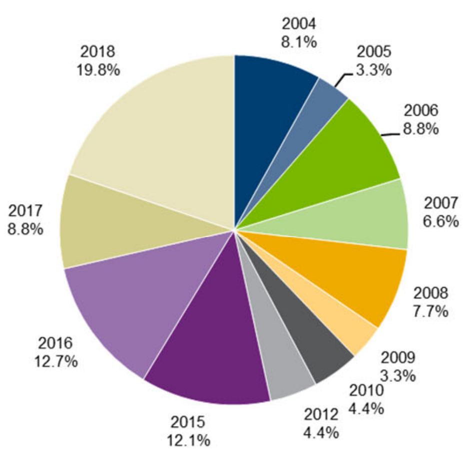
See section 7 for notes.

Performance by Vintage Year, Private Credit Portfolio

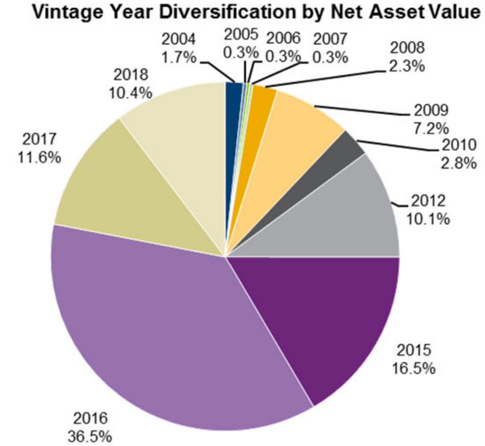
Inception to 6/30/2019

Vintage Year	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
2004	3	$185,000,000	$12,908,689	$181,443,339	$261,884,912	$10,143,071	$272,027,983	1.44x	1.50x	9.4%
2005	1	75,000,000	4,821,429	70,178,571	135,917,682	1,912,671	137,830,352	1.94x	1.96x	11.5%
2006	2	200,000,000	10,368,551	196,164,193	231,133,243	1,507,490	232,640,733	1.18x	1.19x	5.6%
2007	1	150,000,000	37,906,336	147,691,560	178,674,923	1,819,620	180,494,543	1.21x	1.22x	9.0%
2008	3	175,852,584	32,505,942	182,257,947	286,706,980	13,867,216	300,574,196	1.57x	1.65x	13.4%
2009	1	75,000,000	4,334,694	70,665,306	59,544,918	43,316,055	102,860,973	0.84x	1.46x	9.3%
2010	1	100,000,000	12,412,811	96,267,884	106,333,207	16,920,264	123,253,471	1.10x	1.28x	9.1%
2012	1	100,000,000	2,494,372	107,116,335	75,216,604	60,803,277	136,019,880	0.70x	1.27x	9.4%
2015	3	275,000,000	95,047,506	211,742,937	146,294,065	99,106,360	245,400,424	0.69x	1.16x	8.6%
2016	3	289,701,215	85,960,952	222,987,137	38,640,426	219,143,041	257,783,467	0.17x	1.16x	13.1%
2017	1	200,000,000	133,302,062	72,547,481	13,335,209	69,661,994	82,997,203	0.18x	1.14x	16.2%
2018	3	450,000,000	387,824,062	65,138,591	2,090,382	62,399,195	64,489,576	0.03x	0.99x	-1.5%
Total Private Credit Portfolio	**23**	**$2,275,553,799**	**$819,887,406**	**$1,624,201,282**	**$1,535,772,550**	**$600,600,253**	**$2,136,372,803**	**0.95x**	**1.32x**	**9.7%**

Vintage Year Diversification by Commitment



Vintage Year Diversification by Net Asset Value



See section 7 for notes.

Evolution of IRR, Private Credit Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of										
			12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
KKR Lending Partners II, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	7.4%	15.6%	12.3%	10.1%	9.6%
TCW Direct Lending LLC	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-4.4%	4.1%	6.7%	7.5%	7.6%
LBC Credit Partners IV, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0%	15.7%	12.0%	10.6%
KKR Lending Partners III, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	22.0%	18.6%	16.2%
BlackRock Middle Market Senior Fund	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-2.3%	-1.9%
TCW Direct Lending VII	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.7%
Total Direct Lending			**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**2.6%**	**9.9%**	**10.5%**	**9.9%**	**9.3%**
Gold Hill Venture Lending	Heritage	2004	5.5%	6.8%	7.5%	8.5%	9.6%	10.7%	10.7%	10.7%	10.7%	10.7%	10.7%
Prudential Capital Partners II, L.P.	Active	2004	8.8%	8.7%	9.8%	9.0%	9.1%	8.7%	9.1%	8.9%	9.0%	8.9%	8.9%
Summit Subordinated Debt Fund III	Active	2004	8.9%	8.6%	8.7%	8.8%	8.8%	8.9%	8.5%	9.1%	9.5%	9.0%	8.9%
Merit Mezzanine Fund IV, L.P.	Active	2005	4.4%	5.0%	8.3%	7.8%	8.2%	8.7%	8.6%	10.1%	10.7%	11.5%	11.5%
GS Mezzanine Partners 2006	Active	2006	-7.7%	4.3%	1.1%	2.4%	3.7%	4.6%	4.8%	4.9%	5.0%	5.0%	5.0%
IP III Mezzanine Partners, L.P.	Heritage	2006	-24.4%	-9.9%	-3.6%	1.0%	4.7%	7.0%	6.8%	7.3%	6.9%	6.8%	6.8%
GS Mezzanine Partners V	Active	2007	6.3%	7.2%	7.3%	9.4%	9.6%	9.8%	9.6%	9.3%	9.0%	9.0%	9.0%
Gold Hill 2008	Heritage	2008	3.8%	8.8%	14.5%	14.6%	13.9%	13.6%	13.4%	12.2%	14.5%	14.5%	14.8%
Prudential Capital Partners III	Active	2008	-2.7%	5.6%	11.8%	12.9%	12.8%	13.6%	14.2%	13.5%	13.6%	13.7%	14.1%
Summit Subordinated Debt Fund IV	Active	2008	-3.5%	6.7%	-2.3%	7.9%	7.9%	8.5%	9.1%	9.7%	10.2%	10.5%	10.4%
Merit Mezzanine Fund V, L.P.	Active	2009	N/A	-6.0%	-15.6%	-4.8%	1.0%	8.3%	8.2%	9.7%	9.7%	9.5%	9.3%
Audax Mezzanine Fund III, L.P.	Active	2010	N/A	N/A	-3.0%	4.9%	7.8%	8.0%	8.5%	9.5%	9.8%	9.0%	9.1%
Prudential Capital Partners IV	Active	2012	N/A	N/A	N/A	8.8%	24.6%	11.3%	13.2%	12.3%	10.4%	9.7%	9.4%
Audax Mezzanine Fund IV-A, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-19.7%	9.0%	8.5%	9.0%
Merit Mezzanine Fund VI	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.2%	18.5%	14.5%	13.3%
Prudential Capital Partners V, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	17.3%	20.7%	15.4%
Energy Capital Credit Solutions II-A	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Mezzanine			**3.1%**	**5.8%**	**6.7%**	**7.5%**	**8.2%**	**8.9%**	**9.1%**	**9.4%**	**9.7%**	**9.8%**	**9.8%**
Total Private Credit Portfolio			**3.1%**	**5.8%**	**6.7%**	**7.5%**	**8.2%**	**8.9%**	**9.1%**	**9.4%**	**9.7%**	**9.8%**	**9.7%**

See section 7 for notes.

Performance by Manager, Private Credit Portfolio

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Audax Group	2	$200,000,000	$73,327,984	$138,538,063	$121,123,428	$48,421,791	$169,545,219	0.87x	1.22x	9.1%
BlackRock Alternative Advisors	1	250,000,000	221,317,557	28,682,443	0	28,229,576	28,229,576	0.00x	0.98x	-1.9%
Energy Capital Partners	1	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Gold Hill Capital	2	65,852,584	0	65,852,584	109,823,007	6,029,096	115,852,103	1.67x	1.76x	11.9%
Goldman Sachs Private Equity Group	2	250,000,000	47,764,899	261,136,703	313,329,186	2,743,152	316,072,338	1.20x	1.21x	6.7%
Kohlberg Kravis Roberts	2	275,000,000	142,104,986	158,420,588	89,063,738	95,647,851	184,711,589	0.56x	1.17x	11.3%
LBC Capital	1	84,123,090	15,135,796	84,888,047	24,853,912	69,418,193	94,272,105	0.29x	1.11x	10.6%
Merit Capital Partners	3	205,578,125	12,115,490	193,389,018	197,887,973	105,922,311	303,810,284	1.02x	1.57x	10.9%
Portfolio Advisors	1	100,000,000	509,988	82,719,050	96,478,980	583,958	97,062,938	1.17x	1.17x	6.8%
Prudential Capital Partners	4	450,000,000	95,915,224	390,592,686	392,695,809	159,588,542	552,284,351	1.01x	1.41x	11.0%
Summit Partners	2	95,000,000	19,859,569	99,926,301	132,650,822	8,227,188	140,878,009	1.33x	1.41x	9.5%
TCW Group	2	200,000,000	91,835,914	120,055,799	57,865,696	75,788,594	133,654,291	0.48x	1.11x	7.1%
Total Private Credit Portfolio	**23**	**$2,275,553,799**	**$819,887,406**	**$1,624,201,282**	**$1,535,772,550**	**$600,600,253**	**$2,136,372,803**	**0.95x**	**1.32x**	**9.7%**

See section 7 for notes.

Section 4:
Private Equity Portfolio

Performance by Strategy, Private Equity Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Warburg, Pincus Equity Partners, L.P.	Active	1998	$100,000,000	$0	$100,000,000	$163,542,253	$386,522	$163,928,774	1.64x	1.64x	10.0%
Vestar Capital Partners IV	Active	1999	55,000,000	57,313	55,652,024	102,273,825	747,071	103,020,896	1.84x	1.85x	14.7%
Windjammer Mezzanine & Equity Fund II	Active	2000	66,708,861	10,139,363	55,215,684	84,876,800	66,484	84,943,284	1.54x	1.54x	8.9%
KKR Millennium Fund	Active	2001	200,000,000	0	205,167,570	424,946,028	178,659	425,124,687	2.07x	2.07x	16.4%
Blackstone Capital Partners IV	Active	2002	70,000,000	1,862,355	84,429,831	198,697,669	3,076,227	201,773,897	2.35x	2.39x	37.0%
Elevation Partners	Heritage	2004	75,000,000	799,634	73,237,580	113,492,106	144,367	113,636,473	1.55x	1.55x	11.8%
Silver Lake Partners II, L.P.	Active	2004	100,000,000	11,771,953	90,200,747	171,246,452	912,328	172,158,780	1.90x	1.91x	11.0%
GS Capital Partners V	Active	2005	100,000,000	1,041,099	74,319,006	191,435,136	1,092,872	192,528,008	2.58x	2.59x	18.3%
Vestar Capital Partners V	Active	2005	75,000,000	63,188	76,456,520	90,693,238	9,520,459	100,213,698	1.19x	1.31x	3.9%
Blackstone Capital Partners V	Active	2006	140,000,000	7,027,560	152,169,559	237,565,752	6,102,292	243,668,044	1.56x	1.60x	8.0%
Court Square Capital Partners II	Active	2006	175,000,000	16,176,139	170,186,067	293,299,965	18,395,992	311,695,957	1.72x	1.83x	12.9%
Golder Thoma Cressey Rauner IX	Active	2006	75,000,000	3,585,067	71,414,933	128,764,150	165,020	128,929,170	1.80x	1.81x	13.8%
KKR 2006 Fund	Active	2006	200,000,000	3,360,223	218,952,911	315,358,398	61,498,848	376,857,246	1.44x	1.72x	9.0%
Windjammer Senior Equity Fund III	Active	2006	75,000,000	13,380,380	62,684,411	154,618,016	401,894	155,019,909	2.47x	2.47x	19.6%
GS Capital Partners VI	Active	2007	100,000,000	2,801,717	109,807,690	130,385,768	13,296,247	143,682,015	1.19x	1.31x	7.3%
Hellman & Friedman Capital Partners VI	Active	2007	175,000,000	5,084,864	171,037,755	309,138,681	11,149,880	320,288,561	1.81x	1.87x	13.0%
Silver Lake Partners III, L.P.	Active	2007	100,000,000	10,559,311	91,865,976	174,273,455	19,915,095	194,188,550	1.90x	2.11x	17.9%
Advent International GPE VI-A, L.P.	Active	2008	50,000,000	0	52,993,313	99,117,913	9,704,411	108,822,324	1.87x	2.05x	17.0%
Banc Fund VIII	Active	2008	98,250,000	0	98,250,000	142,853,973	69,662,533	212,516,506	1.45x	2.16x	13.5%
Blackstone Capital Partners VI, L.P.	Active	2008	100,000,000	13,199,714	103,491,189	78,454,884	88,138,191	166,593,075	0.76x	1.61x	13.2%
CVC European Equity Partners V, L.P.	Active	2008	133,692,530	1,624,336	153,756,444	260,306,257	26,938,137	287,244,394	1.69x	1.87x	16.4%
Welsh, Carson, Anderson & Stowe XI, L.P.	Active	2008	100,000,000	0	100,000,000	129,502,945	35,364,295	164,867,240	1.30x	1.65x	12.4%
Hellman & Friedman Capital Partners VII, L.P.	Active	2009	50,000,000	2,343,044	49,759,311	62,974,408	67,642,880	130,617,288	1.27x	2.62x	24.6%
GTCR Fund X, L.P.	Active	2010	100,000,000	6,751,396	103,907,821	188,348,914	20,799,688	209,148,602	1.81x	2.01x	21.5%
Vestar Capital Partners VI, L.P.	Active	2011	100,000,000	1,821,992	106,195,246	118,359,663	68,301,014	186,660,677	1.11x	1.76x	26.7%
Advent International GPE VII, L.P.	Active	2012	90,000,000	5,400,000	84,690,641	76,034,048	75,004,405	151,038,453	0.90x	1.78x	16.2%
Court Square Capital Partners III, L.P.	Active	2012	175,000,000	13,624,629	180,618,546	91,142,790	173,531,817	264,674,607	0.50x	1.47x	18.2%
Green Equity Investors VI, L.P.	Active	2012	200,000,000	14,332,365	215,919,566	143,815,738	213,155,198	356,970,936	0.67x	1.65x	15.6%
Silver Lake Partners IV, L.P.	Active	2012	100,000,000	7,057,636	108,966,844	60,600,091	137,886,690	198,486,781	0.56x	1.82x	26.5%
Trailhead Fund	Active	2012	20,000,000	3,935,813	16,070,803	6,406,955	34,369,639	40,776,594	0.40x	2.54x	19.5%
Windjammer Senior Equity IV	Active	2012	100,000,000	18,397,478	89,524,405	19,278,060	116,213,120	135,491,180	0.22x	1.51x	12.1%
APAX VIII - USD	Active	2013	200,000,000	14,644,515	222,011,295	211,796,833	130,148,428	341,945,261	0.95x	1.54x	14.0%
GTCR Fund XI, L.P.	Active	2013	110,000,000	13,716,556	97,445,726	66,755,383	92,206,797	158,962,180	0.69x	1.63x	22.5%

See section 7 for notes.

Performance by Strategy, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
IK Fund VII	Active	2013	179,630,786	8,118,138	177,717,768	104,167,821	183,148,220	287,316,040	0.59x	1.62x	13.8%
Nordic Capital Fund VIII	Active	2013	173,775,736	62,536,883	190,003,473	114,939,555	157,264,890	272,204,445	0.60x	1.43x	13.6%
Permira V, L.P.	Active	2013	177,323,259	25,351,322	171,146,581	83,631,687	208,221,956	291,853,644	0.49x	1.71x	15.5%
Banc Fund IX, L.P.	Active	2014	107,205,932	0	107,205,932	17,673,634	113,653,190	131,326,823	0.16x	1.22x	7.4%
CVC Capital Partners VI, L.P.	Active	2014	247,087,422	51,553,009	255,492,099	76,191,255	260,188,310	336,379,565	0.30x	1.32x	12.6%
Glouston Private Equity Opportunities IV	Heritage	2014	5,337,098	1,090,000	4,376,198	3,457,751	1,300,762	4,758,514	0.79x	1.09x	3.7%
HarbourVest Dover Street VII	Active	2014	2,198,112	132,416	2,072,893	1,584,581	314,508	1,899,089	0.76x	0.92x	-4.3%
HarbourVest HIPEP V - Cayman Partnership	Active	2014	3,507,649	181,968	3,344,847	3,589,077	721,576	4,310,653	1.07x	1.29x	13.0%
HarbourVest Partners VIII - Buyout Fund	Active	2014	4,506,711	234,000	4,298,488	4,240,871	1,595,542	5,836,413	0.99x	1.36x	14.1%
HIPEP VI - Cayman Partnership Fund, L.P.	Active	2014	4,199,801	238,833	3,999,555	2,446,132	3,799,442	6,245,574	0.61x	1.56x	15.9%
North Sky Capital LBO Fund III, LP	Heritage	2014	1,070,259	350,000	720,259	708,259	300,141	1,008,400	0.98x	1.40x	14.0%
Paine Schw artz Food Chain Fund IV	Active	2014	75,000,000	20,858,445	55,214,709	14,823,737	54,802,423	69,626,160	0.27x	1.26x	10.2%
Public Pension Capital Fund I, L.P.	Active	2014	100,000,000	30,350,177	79,633,866	44,315,075	75,135,151	119,450,226	0.56x	1.50x	22.0%
Welsh Carson Anderson & Stow e XII, L.P.	Active	2014	150,000,000	24,173,871	125,826,129	53,574,205	135,669,422	189,243,627	0.43x	1.50x	23.2%
Blackstone Capital Partners VII	Active	2015	130,000,000	64,800,687	75,491,797	7,693,243	81,023,331	88,716,574	0.10x	1.18x	14.2%
Brookfield Capital Partners IV, L.P.	Active	2015	100,000,000	27,499,345	90,760,734	110,229,853	89,588,356	199,818,209	1.21x	2.20x	59.4%
Dyal Capital Partners III	Active	2015	175,000,000	112,982,304	154,683,944	95,399,724	101,280,011	196,679,735	0.62x	1.27x	26.4%
Madison Dearborn Capital Partners VII	Active	2015	100,000,000	38,393,836	67,396,018	5,817,652	71,741,418	77,559,070	0.09x	1.15x	9.2%
Thomas H. Lee Equity Fund VII, LP	Active	2015	100,000,000	12,265,936	96,075,814	30,607,993	102,863,280	133,471,273	0.32x	1.39x	23.5%
TPG Partners VII	Active	2015	100,000,000	16,597,098	90,994,420	17,515,734	97,638,555	115,154,289	0.19x	1.27x	15.5%
Advent International GPE VIII, L.P.	Active	2016	100,000,000	15,900,000	84,100,000	0	97,562,728	97,562,728	0.00x	1.16x	11.1%
Apax IX USD L.P.	Active	2016	150,000,000	81,077,199	72,867,205	3,944,404	94,704,841	98,649,245	0.05x	1.35x	21.0%
IK Fund VIII	Active	2016	160,988,362	49,017,414	125,184,424	2,213,957	146,370,930	148,584,887	0.02x	1.19x	12.6%
KKR Americas Fund XII	Active	2016	150,000,000	89,511,167	61,091,605	988,851	63,225,469	64,214,320	0.02x	1.05x	5.9%
Permira VI, L.P.	Active	2016	128,284,930	44,489,612	92,507,453	0	104,315,059	104,315,059	0.00x	1.13x	10.8%
Thoma Bravo Fund XII, L.P.	Active	2016	75,000,000	5,207,940	72,161,313	2,298,018	85,800,882	88,098,900	0.03x	1.22x	12.4%
West Street Capital Partners VII, L.P.	Active	2016	150,000,000	110,258,025	51,153,586	12,491,195	41,100,369	53,591,564	0.24x	1.05x	3.4%
Asia Alternatives Capital Partners V	Active	2017	99,000,000	84,720,148	14,564,710	289,056	10,156,916	10,445,972	0.02x	0.72x	-37.1%
Carlyle Partners VII, L.P.	Active	2017	150,000,000	127,904,392	22,095,608	0	18,634,883	18,634,883	0.00x	0.84x	-20.5%
KKR Asia Fund III, L.P.	Active	2017	100,000,000	65,504,002	36,559,631	0	38,622,892	38,622,892	0.00x	1.06x	9.0%
Lexington Co-Investment Partners IV	Active	2017	200,000,000	75,389,099	131,326,240	6,715,339	137,748,821	144,464,160	0.05x	1.10x	11.6%
Nordic Capital IX Beta, L.P.	Active	2017	175,132,566	143,155,586	27,277,658	0	33,899,055	33,899,055	0.00x	1.24x	46.7%
Oak Hill Capital Partners IV Onshore LP	Active	2017	150,000,000	69,551,869	102,244,567	28,267,962	93,266,820	121,534,782	0.28x	1.19x	31.1%
Silver Lake Partners V, L.P.	Active	2017	135,000,000	66,780,621	54,186,798	0	57,066,935	57,066,935	0.00x	1.05x	7.6%
Vestar Capital Partners VII, L.P.	Active	2017	150,000,000	123,437,337	26,562,663	0	23,431,483	23,431,483	0.00x	0.88x	-17.8%
Wellspring Capital Partners VI, L.P.	Active	2017	125,000,000	89,559,183	35,440,817	0	33,011,491	33,011,491	0.00x	0.93x	-21.2%

See section 7 for notes.

Performance by Strategy, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Windjammer Senior Equity Fund V, L.P.	Active	2017	100,000,000	97,281,028	2,718,972	0	505,479	505,479	0.00x	0.19x	-90.6%
Banc Fund X, L.P.	Active	2018	67,890,909	45,060,364	22,830,545	0	21,858,535	21,858,535	0.00x	0.96x	-8.8%
Bridgepoint Europe VI, L.P.	Active	2018	183,630,000	160,625,579	9,854,501	0	7,883,738	7,883,738	0.00x	0.80x	-20.2%
Brookfield Capital Partners V, L.P.	Active	2018	250,000,000	250,000,000	0	0	-1,017,621	-1,017,621	N/A	N/A	NM
Court Square Capital Partners IV, L.P.	Active	2018	150,000,000	150,000,000	0	0	0	0	N/A	N/A	N/A
Dyal Capital Partners IV	Active	2018	250,000,000	241,250,918	12,408,973	3,803,147	9,291,800	13,094,947	0.31x	1.06x	5.7%
Goldner Hawn Fund VII	Active	2018	75,000,000	75,000,000	0	0	0	0	N/A	N/A	N/A
GS China-US Cooperation Fund	Active	2018	99,800,000	89,820,000	10,154,445	0	8,603,918	8,603,918	0.00x	0.85x	-15.4%
Hellman & Friedman Investors IX, L.P.	Active	2018	175,000,000	172,258,308	0	0	-313,512	-313,512	N/A	N/A	NM
KKR Europe V	Active	2018	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Oak Hill Capital Partners V	Active	2018	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Paine Schwartz Food Chain Fund V, L.P.	Active	2018	126,340,000	126,340,000	0	0	-1,403,561	-1,403,561	N/A	N/A	NM
Thoma Bravo Fund XIII, L.P.	Active	2018	150,000,000	96,413,138	53,586,862	0	53,256,553	53,256,553	0.00x	0.99x	-1.0%
Thomas H. Lee Equity Fund VIII, L.P.	Active	2018	150,000,000	146,091,906	3,908,094	0	1,705,856	1,705,856	0.00x	0.44x	-56.6%
TPG Partners VIII	Active	2018	150,000,000	150,000,000	0	0	0	0	N/A	N/A	N/A
Welsh, Carson, Anderson & Stowe XIII, L.P.	Active	2018	250,000,000	248,166,175	1,833,825	0	494,427	494,427	0.00x	0.27x	-73.4%
Advent International GPE IX, L.P.	Active	2019	115,000,000	115,000,000	0	0	0	0	N/A	N/A	N/A
Arsenal Capital Partners V	Active	2019	75,000,000	75,000,000	0	0	0	0	N/A	N/A	N/A
BlackRock Long Term Capital, SCSP	Active	2019	250,000,000	250,000,000	0	0	0	0	N/A	N/A	N/A
Blackstone Capital Partners VIII	Active	2019	150,000,000	150,000,000	0	0	0	0	N/A	N/A	N/A
Permira VII, L.P. 1	Active	2019	142,350,048	142,162,500	0	0	0	0	N/A	N/A	N/A
Wind Point Partners IX	Active	2019	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Total Buyout			**10,952,910,971**	**5,024,201,418**	**6,529,475,432**	**5,893,976,315**	**4,426,153,168**	**10,320,129,482**	**0.90x**	**1.58x**	**13.9%**
DSV Partners IV	Heritage	1985	10,000,000	0	10,000,000	39,196,082	30,883	39,226,965	3.92x	3.92x	10.6%
Thoma Cressey Equity Partners VII	Heritage	2000	50,000,000	0	50,000,000	107,057,940	468,920	107,526,859	2.14x	2.15x	23.6%
William Blair Capital Partners VII	Heritage	2000	50,000,000	1,650,000	48,150,000	69,201,191	1,075,428	70,276,618	1.44x	1.46x	8.6%
Warburg Pincus Private Equity VIII	Active	2002	100,000,000	0	100,373,266	228,271,451	1,392,922	229,664,373	2.27x	2.29x	14.8%
Chicago Growth Partners I, L.P.	Heritage	2005	50,000,000	300,000	52,441,998	54,532,745	1,873,424	56,406,169	1.04x	1.08x	1.7%
Warburg Pincus Private Equity IX, L.P.	Active	2005	100,000,000	0	100,000,000	168,124,301	6,021,559	174,145,860	1.68x	1.74x	9.8%
Thoma Cressey Equity Partners VIII	Heritage	2006	70,000,000	770,000	69,577,712	202,471,763	457,758	202,929,521	2.91x	2.92x	18.3%
Warburg Pincus Private Equity X, L.P.	Active	2007	150,000,000	0	150,000,000	180,343,550	56,970,774	237,314,324	1.20x	1.58x	8.1%
Chicago Growth Partners II	Heritage	2008	60,000,000	1,652,374	58,347,626	121,871,703	3,441,868	125,313,571	2.09x	2.15x	19.8%
Summit Partners Growth Equity VIII, L.P.	Active	2011	100,000,000	23,853,356	115,015,327	157,829,723	68,829,457	226,659,180	1.37x	1.97x	25.0%

See section 7 for notes.

Performance by Strategy, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Warburg Pincus Private Equity XI, L.P.	Active	2012	200,000,000	0	200,299,952	145,134,148	179,449,542	324,583,689	0.72x	1.62x	13.9%
Summit Partners Growth Equity IX, L.P.	Active	2015	100,000,000	33,123,626	76,850,000	9,973,626	78,408,823	88,382,449	0.13x	1.15x	17.2%
Warburg Pincus Private Equity XII, L.P.	Active	2015	131,000,000	28,623,500	102,376,500	5,740,813	114,023,133	119,763,946	0.06x	1.17x	9.7%
Warburg Pincus China, L.P.	Active	2016	45,000,000	8,820,000	38,115,000	3,899,250	40,697,959	44,597,209	0.10x	1.17x	13.8%
Warburg Pincus Financial Sector	Active	2017	90,000,000	52,830,000	41,620,808	4,590,000	34,594,762	39,184,762	0.11x	0.94x	-11.0%
Warburg Pincus Global Growth, L.P.	Active	2018	250,000,000	247,000,000	2,897,089	0	2,195,811	2,195,811	0.00x	0.76x	-24.4%
Summit Partners Growth Equity X-A, L.P.	Active	2019	150,000,000	150,000,000	0	0	0	0	N/A	N/A	N/A
Warburg Pincus China-SEA II	Active	2019	50,000,000	48,250,000	1,750,000	0	1,750,000	1,750,000	0.00x	1.00x	0.0%
Total Growth			**1,756,000,000**	**596,872,856**	**1,217,815,279**	**1,498,238,286**	**591,683,022**	**2,089,921,308**	**1.23x**	**1.72x**	**12.7%**
CS Strategic Partners III VC	Active	2004	25,000,000	1,067,943	24,998,952	31,145,688	2,981,276	34,126,964	1.25x	1.37x	6.1%
Strategic Partners III-B, L.P.	Active	2004	100,000,000	14,934,308	79,488,031	114,448,044	4,261,237	118,709,282	1.44x	1.49x	6.4%
Lexington Capital Partners VI	Active	2006	100,000,000	1,634,703	98,374,022	136,577,361	9,113,811	145,691,172	1.39x	1.48x	8.0%
CS Strategic Partners IV VC	Active	2008	40,500,000	2,439,627	41,058,721	53,616,011	9,747,180	63,363,191	1.31x	1.54x	9.4%
Strategic Partners IV-B	Active	2008	100,000,000	17,798,494	99,017,142	143,932,425	9,746,794	153,679,218	1.45x	1.55x	12.2%
Lexington Capital Partners VII, L.P.	Active	2009	200,000,000	38,059,995	172,466,709	220,490,869	51,325,173	271,816,042	1.28x	1.58x	14.6%
Strategic Partners Fund V, L.P.	Active	2011	100,000,000	38,034,796	84,043,533	115,882,823	19,909,727	135,792,550	1.38x	1.62x	19.2%
Adams Street Global Secondary Fund 5, L.P.	Active	2012	100,000,000	23,470,250	76,529,750	38,701,321	53,902,821	92,604,142	0.51x	1.21x	6.1%
Lexington Capital Partners VIII, L.P.	Active	2014	150,000,000	37,620,383	127,263,490	54,736,720	110,116,433	164,853,153	0.43x	1.30x	18.7%
Strategic Partners Fund VI	Active	2014	150,000,000	60,956,184	94,961,080	90,242,956	54,003,596	144,246,552	0.95x	1.52x	18.2%
GS Vintage VII	Active	2016	100,000,000	42,963,816	68,395,888	11,282,171	69,623,518	80,905,690	0.16x	1.18x	18.0%
Lexington Middle Market Investors IV	Active	2016	100,000,000	88,976,559	11,023,441	1,458,011	10,622,751	12,080,762	0.13x	1.10x	N/A
Strategic Partners VII, L.P.	Active	2016	150,000,000	68,418,182	94,176,314	16,118,810	114,291,115	130,409,925	0.17x	1.38x	28.9%
Adams Street Global Secondary Fund 6, L.P.	Active	2017	100,000,000	88,800,000	11,200,000	1,214,007	11,543,494	12,757,501	0.11x	1.14x	25.5%
Lexington Capital Partners IX, L.P.	Active	2018	150,000,000	150,000,000	0	0	4,498,002	4,498,002	N/A	N/A	N/A
Strategic Partners VIII	Active	2018	150,000,000	142,048,757	7,951,243	0	7,951,243	7,951,243	0.00x	1.00x	0.0%
Whitehorse Liquidity Partners III	Active	2019	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Total PE Secondaries			**1,915,500,000**	**917,223,996**	**1,090,948,315**	**1,029,847,218**	**543,638,171**	**1,573,485,389**	**0.94x**	**1.44x**	**11.2%**

See section 7 for notes.

Performance by Strategy, Private Equity Portfolio (cont'd)

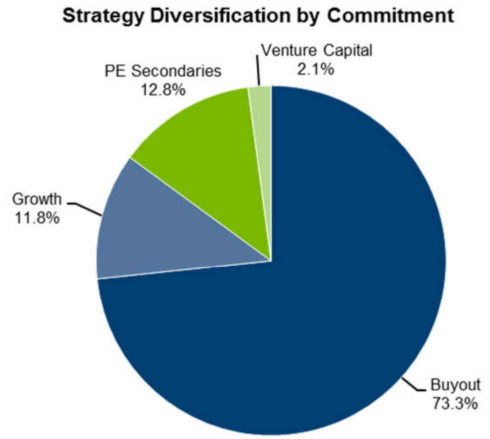
Inception to 6/30/2019

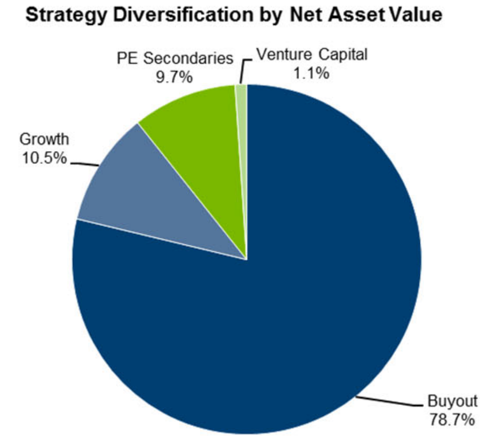
Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Crescendo IV	Heritage	2000	101,500,000	0	103,101,226	55,121,736	2,145,317	57,267,053	0.53x	0.56x	-4.8%
Thomas McNerney & Partners	Heritage	2002	30,000,000	0	30,000,000	15,087,143	6,987,335	22,074,478	0.50x	0.74x	-4.3%
Affinity Ventures IV	Heritage	2004	4,000,000	0	4,000,000	1,541,970	576,089	2,118,059	0.39x	0.53x	-11.7%
Split Rock Partners	Heritage	2005	50,000,000	2,109,094	47,890,906	56,816,177	6,074,471	62,890,648	1.19x	1.31x	3.4%
RWI Ventures I	Heritage	2006	7,603,265	0	7,603,265	6,122,274	453,038	6,575,312	0.81x	0.86x	-4.1%
Thomas McNerney & Partners II	Heritage	2006	50,000,000	1,875,000	48,125,000	103,648,037	7,979,476	111,627,513	2.15x	2.32x	16.7%
Affinity Ventures V, L.P.	Heritage	2008	5,000,000	0	5,000,000	1,706,245	2,263,538	3,969,783	0.34x	0.79x	-4.1%
Split Rock Partners II	Heritage	2008	60,000,000	835,000	59,165,000	47,174,545	29,133,475	76,308,020	0.80x	1.29x	5.5%
HarbourVest Partners VIII - Venture Fund	Active	2014	7,190,898	140,000	7,079,986	5,356,802	3,820,778	9,177,580	0.76x	1.30x	9.2%
North Sky Capital Venture Fund III, LP	Heritage	2014	1,384,080	106,250	1,277,830	1,219,519	381,065	1,600,584	0.95x	1.25x	10.5%
Total Venture Capital			**316,678,243**	**5,065,344**	**313,243,213**	**293,794,448**	**59,814,583**	**353,609,031**	**0.94x**	**1.13x**	**1.5%**
Total Private Equity Portfolio			**$14,941,089,214**	**$6,543,363,615**	**$9,151,482,240**	**$8,715,856,266**	**$5,621,288,944**	**$14,337,145,210**	**0.95x**	**1.57x**	**12.3%**

See section 7 for notes.

Diversification by Strategy, Private Equity Portfolio

Inception to 6/30/2019





See section 7 for notes.

Performance by Vintage Year, Private Equity Portfolio

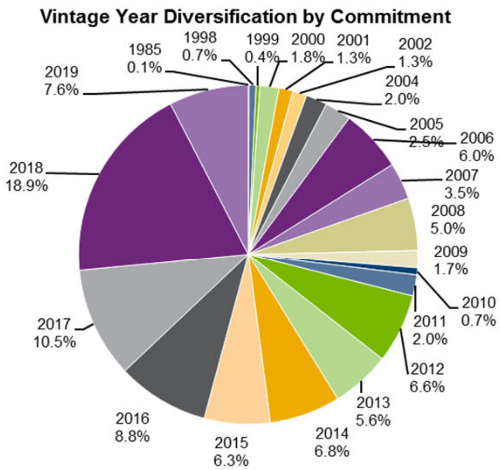
Inception to 6/30/2019

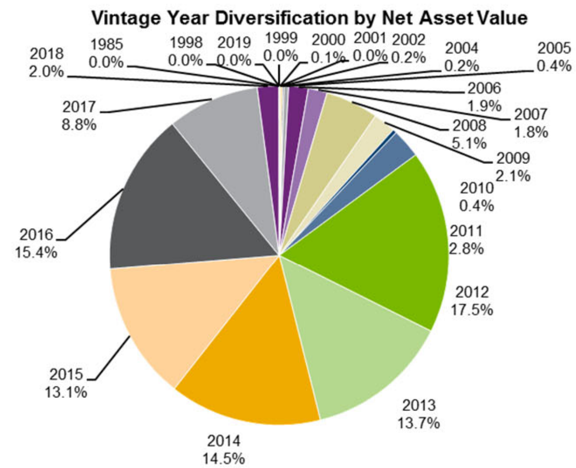
Vintage Year	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
1985	1	$10,000,000	$0	$10,000,000	$39,196,082	$30,883	$39,226,965	3.92x	3.92x	10.6%
1998	1	100,000,000	0	100,000,000	163,542,253	386,522	163,928,774	1.64x	1.64x	10.0%
1999	1	55,000,000	57,313	55,652,024	102,273,825	747,071	103,020,896	1.84x	1.85x	14.7%
2000	4	268,208,861	11,789,363	256,466,910	316,257,666	3,756,149	320,013,815	1.23x	1.25x	3.5%
2001	1	200,000,000	0	205,167,570	424,946,028	178,659	425,124,687	2.07x	2.07x	16.4%
2002	3	200,000,000	1,862,355	214,803,097	442,056,263	11,456,485	453,512,748	2.06x	2.11x	17.7%
2004	5	304,000,000	28,573,838	271,925,309	431,874,261	8,875,297	440,749,558	1.59x	1.62x	9.1%
2005	5	375,000,000	3,513,381	351,108,430	561,601,597	24,582,785	586,184,382	1.60x	1.67x	9.1%
2006	9	892,603,265	47,809,073	899,087,879	1,578,425,716	104,568,129	1,682,993,845	1.76x	1.87x	11.8%
2007	4	525,000,000	18,445,892	522,711,421	794,141,455	101,331,996	895,473,451	1.52x	1.71x	11.5%
2008	10	747,442,530	37,549,545	771,079,435	1,078,536,901	284,140,423	1,362,677,324	1.40x	1.77x	13.6%
2009	2	250,000,000	40,403,039	222,226,020	283,465,277	118,968,053	402,433,330	1.28x	1.81x	17.4%
2010	1	100,000,000	6,751,396	103,907,821	188,348,914	20,799,688	209,148,602	1.81x	2.01x	21.5%
2011	3	300,000,000	63,710,145	305,254,107	392,072,209	157,040,198	549,112,407	1.28x	1.80x	23.5%
2012	8	985,000,000	86,218,170	972,620,508	581,113,151	983,513,232	1,564,626,383	0.60x	1.61x	15.6%
2013	5	840,729,782	124,367,415	858,324,843	581,291,279	770,990,291	1,352,281,570	0.68x	1.58x	14.9%
2014	15	1,008,687,962	227,985,536	872,767,361	374,160,573	815,802,338	1,189,962,911	0.43x	1.36x	15.0%
2015	8	936,000,000	334,286,332	754,629,227	282,978,638	736,566,906	1,019,545,544	0.37x	1.35x	24.4%
2016	11	1,309,273,292	604,639,914	770,776,229	54,694,667	868,315,621	923,010,288	0.07x	1.20x	14.7%
2017	12	1,574,132,566	1,084,913,265	505,798,472	41,076,364	492,483,031	533,559,395	0.08x	1.05x	8.9%
2018	18	2,827,660,909	2,690,075,144	125,425,577	3,803,147	115,005,187	118,808,334	0.03x	0.95x	-14.1%
2019	9	1,132,350,048	1,130,412,500	1,750,000	0	1,750,000	1,750,000	0.00x	1.00x	0.0%
Total Private Equity Portfolio	**136**	**$14,941,089,214**	**$6,543,363,615**	**$9,151,482,240**	**$8,715,856,266**	**$5,621,288,944**	**$14,337,145,210**	**0.95x**	**1.57x**	**12.3%**

See section 7 for notes.

Diversification by Vintage Year, Private Equity Portfolio

Inception to 6/30/2019





See section 7 for notes.

Evolution of IRR, Private Equity Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Warburg, Pincus Equity Partners, L.P.	Active	1998	9.1%	9.9%	9.9%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Vestar Capital Partners IV	Active	1999	15.2%	15.8%	15.0%	14.7%	14.8%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
Windjammer Mezzanine & Equity Fund II	Active	2000	8.4%	8.0%	8.0%	8.3%	8.8%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%
KKR Millennium Fund	Active	2001	17.9%	18.5%	16.6%	16.2%	16.6%	16.6%	16.6%	16.3%	16.4%	16.4%	16.4%
Blackstone Capital Partners IV	Active	2002	41.3%	40.6%	39.1%	38.3%	38.0%	37.5%	37.2%	37.1%	37.1%	37.0%	37.0%
Elevation Partners	Heritage	2004	-2.3%	6.9%	10.5%	8.4%	10.9%	11.5%	11.9%	11.8%	11.8%	11.8%	11.8%
Silver Lake Partners II, L.P.	Active	2004	6.9%	10.7%	9.7%	9.9%	9.9%	10.8%	11.5%	11.3%	11.0%	11.0%	11.0%
GS Capital Partners V	Active	2005	20.5%	17.6%	16.7%	16.7%	17.4%	17.9%	18.3%	18.3%	18.3%	18.3%	18.3%
Vestar Capital Partners V	Active	2005	7.4%	5.7%	2.4%	0.6%	3.4%	2.7%	3.0%	4.2%	4.3%	4.0%	3.9%
Blackstone Capital Partners V	Active	2006	-12.0%	-1.0%	0.5%	2.5%	6.9%	8.0%	8.1%	8.0%	8.1%	8.0%	8.0%
Court Square Capital Partners II	Active	2006	-6.6%	11.3%	11.0%	9.5%	10.6%	11.4%	13.6%	13.0%	13.1%	13.0%	12.9%
Golder Thoma Cressey Rauner IX	Active	2006	-23.9%	-11.2%	4.0%	10.8%	13.0%	13.6%	14.0%	13.6%	13.6%	13.8%	13.8%
KKR 2006 Fund	Active	2006	-3.0%	3.9%	4.0%	6.6%	8.0%	8.4%	8.6%	8.5%	8.5%	8.5%	9.0%
Windjammer Senior Equity Fund III	Active	2006	9.8%	17.8%	18.6%	16.1%	16.5%	17.4%	18.3%	19.0%	19.6%	19.5%	19.6%
GS Capital Partners VI	Active	2007	-12.5%	-5.6%	-3.3%	2.0%	5.3%	6.0%	6.4%	6.5%	7.3%	7.3%	7.3%
Hellman & Friedman Capital Partners VI	Active	2007	-0.2%	7.0%	5.3%	7.0%	10.5%	12.5%	13.0%	13.0%	13.2%	13.0%	13.0%
Silver Lake Partners III, L.P.	Active	2007	-1.1%	12.0%	19.6%	15.6%	17.2%	19.2%	17.8%	18.0%	18.8%	18.9%	17.9%
Advent International GPE VI-A, L.P.	Active	2008	3.3%	8.0%	7.8%	15.8%	21.0%	19.2%	18.7%	17.9%	17.4%	17.1%	17.0%
Banc Fund VIII	Active	2008	1.0%	4.0%	1.1%	7.7%	16.8%	14.1%	13.6%	16.5%	15.4%	13.5%	13.5%
Blackstone Capital Partners VI, L.P.	Active	2008	N/A	N/A	-52.3%	8.6%	10.9%	14.4%	11.8%	11.0%	13.2%	13.3%	13.2%
CVC European Equity Partners V, L.P.	Active	2008	1.1%	8.5%	8.0%	10.4%	11.6%	10.5%	11.4%	14.1%	15.7%	16.5%	16.4%
Welsh, Carson, Anderson & Stowe XI, L.P.	Active	2008	-94.2%	-19.7%	5.6%	10.4%	15.1%	14.2%	14.2%	13.2%	13.0%	12.8%	12.4%
Hellman & Friedman Capital Partners VII, L.P.	Active	2009	N/A	N/A	-13.8%	-8.4%	6.8%	10.5%	16.6%	17.0%	24.6%	24.8%	24.6%
GTCR Fund X, L.P.	Active	2010	N/A	N/A	-10.4%	7.5%	13.4%	19.4%	21.6%	23.0%	22.9%	21.5%	21.5%
Vestar Capital Partners VI, L.P.	Active	2011	N/A	N/A	N/A	0.0%	-42.8%	21.2%	29.3%	35.4%	35.2%	29.0%	26.7%
Advent International GPE VII, L.P.	Active	2012	N/A	N/A	N/A	-6.8%	38.5%	23.2%	12.0%	15.7%	19.3%	16.4%	16.2%
Court Square Capital Partners III, L.P.	Active	2012	N/A	N/A	N/A	-6.1%	-0.6%	1.6%	6.1%	12.3%	13.8%	17.6%	18.2%
Green Equity Investors VI, L.P.	Active	2012	N/A	N/A	N/A	1.8%	2.8%	8.5%	12.3%	13.0%	15.4%	16.0%	15.6%
Silver Lake Partners IV, L.P.	Active	2012	N/A	N/A	N/A	N/A	-19.5%	69.7%	38.1%	28.8%	26.5%	25.5%	26.5%

See section 7 for notes.

Evolution of IRR, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of										
			12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Trailhead Fund	Active	2012	N/A	N/A	N/A	-14.7%	-16.4%	2.1%	9.6%	12.9%	17.7%	21.2%	19.5%
Windjammer Senior Equity IV	Active	2012	N/A	N/A	N/A	NM	-23.7%	-6.0%	-8.2%	-3.2%	8.6%	10.9%	12.1%
APAX VIII - USD	Active	2013	N/A	N/A	N/A	N/A	-5.4%	7.8%	18.1%	12.5%	13.9%	13.6%	14.0%
GTCR Fund XI, L.P.	Active	2013	N/A	N/A	N/A	N/A	N/A	-3.2%	5.2%	14.8%	19.4%	22.9%	22.5%
IK Fund VII	Active	2013	N/A	N/A	N/A	N/A	-8.6%	-11.2%	2.7%	3.3%	10.3%	13.6%	13.8%
Nordic Capital Fund VIII	Active	2013	N/A	N/A	N/A	N/A	-10.2%	-20.0%	-9.2%	4.7%	18.5%	13.4%	13.6%
Permira V, L.P.	Active	2013	N/A	N/A	N/A	N/A	NM	-16.0%	-7.2%	3.4%	13.5%	15.5%	15.5%
Banc Fund IX, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	2.8%	9.3%	24.8%	16.6%	6.9%	7.4%
CVC Capital Partners VI, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	-35.8%	-22.8%	5.6%	14.3%	14.4%	12.6%
Glouston Private Equity Opportunities IV	Heritage	2014	N/A	N/A	N/A	N/A	N/A	N/A	6.8%	4.3%	3.1%	4.0%	3.7%
HarbourVest Dover Street VII	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	0.9%	-6.6%	-4.4%	-3.5%	-4.3%
HarbourVest HIPEP V - Cayman Partnership	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	18.4%	13.3%	13.7%	14.8%	13.0%
HarbourVest Partners VIII - Buyout Fund	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	15.7%	14.6%	15.2%	14.4%	14.1%
HIPEP VI - Cayman Partnership Fund, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	21.9%	14.6%	17.6%	16.5%	15.9%
North Sky Capital LBO Fund III, LP	Heritage	2014	N/A	N/A	N/A	N/A	N/A	N/A	13.8%	15.3%	15.3%	16.7%	14.0%
Paine Schw artz Food Chain Fund IV	Active	2014	N/A	N/A	N/A	N/A	N/A	NM	-50.4%	-17.7%	8.1%	10.6%	10.2%
Public Pension Capital Fund I, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	NM	-37.2%	-17.7%	20.5%	22.8%	22.0%
Welsh Carson Anderson & Stow e XII, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	-7.3%	10.6%	17.6%	25.2%	23.2%
Blackstone Capital Partners VII	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-79.7%	7.4%	20.5%	14.2%
Brookfield Capital Partners IV, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-2.7%	22.2%	90.7%	65.0%	59.4%
Dyal Capital Partners III	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.5%	26.5%	29.9%	26.4%
Madison Dearborn Capital Partners VII	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-22.2%	5.1%	9.2%	9.2%
Thomas H. Lee Equity Fund VII, LP	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	NM	15.0%	39.2%	28.6%	23.5%
TPG Partners VII	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	NM	-7.5%	18.8%	15.8%	15.5%
Advent International GPE VIII, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-53.7%	12.8%	9.0%	11.1%
Apax IX USD L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	16.7%	16.0%	21.0%
IK Fund VIII	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-15.3%	16.5%	8.7%	12.6%
KKR Americas Fund XII	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-57.5%	-1.1%	5.9%
Permira VI, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	18.5%	10.3%	10.8%
Thoma Bravo Fund XII, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-5.5%	9.6%	7.7%	12.4%
West Street Capital Partners VII, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-9.8%	-14.8%	5.7%	3.4%
Asia Alternatives Capital Partners V	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-19.2%	-47.9%	-37.1%
Carlyle Partners VII, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-77.7%	-20.5%
KKR Asia Fund III, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	16.2%	9.0%
Lexington Co-Investment Partners IV	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.6%	14.7%	11.6%
Nordic Capital IX Beta, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	46.7%

See section 7 for notes.

Evolution of IRR, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Oak Hill Capital Partners IV Onshore LP	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	50.6%	50.3%	31.1%
Silver Lake Partners V, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-8.0%	7.6%
Vestar Capital Partners VII, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-47.7%	-17.8%
Wellspring Capital Partners VI, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-28.4%	-21.2%
Windjammer Senior Equity Fund V, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-90.6%
Banc Fund X, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-23.4%	-8.8%
Bridgepoint Europe VI, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-20.2%
Brookfield Capital Partners V, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	NM
Court Square Capital Partners IV, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dyal Capital Partners IV	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.5%	5.7%
Goldner Hawn Fund VII	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GS China-US Cooperation Fund	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-15.4%
Hellman & Friedman Investors IX, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM
KKR Europe V	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oak Hill Capital Partners V	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paine Schwartz Food Chain Fund V, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	NM
Thoma Bravo Fund XIII, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-1.0%
Thomas H. Lee Equity Fund VIII, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-56.6%
TPG Partners VIII	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welsh, Carson, Anderson & Stowe XIII, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-73.4%
Advent International GPE IX, L.P.	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenal Capital Partners V	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BlackRock Long Term Capital, SCSP	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Blackstone Capital Partners VIII	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Permira VII, L.P. 1	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wind Point Partners IX	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Buyout			**9.2%**	**11.5%**	**10.8%**	**11.0%**	**12.2%**	**12.6%**	**12.7%**	**12.9%**	**13.9%**	**14.0%**	**13.9%**
DSV Partners IV	Heritage	1985	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%	10.6%
Thoma Cressey Equity Partners VII	Heritage	2000	23.4%	22.7%	23.1%	23.4%	23.4%	23.7%	23.7%	23.6%	23.6%	23.6%	23.6%
William Blair Capital Partners VII	Heritage	2000	9.2%	9.7%	9.4%	9.0%	8.0%	7.9%	8.2%	8.3%	8.6%	8.6%	8.6%
Warburg Pincus Private Equity VIII	Active	2002	14.7%	16.5%	16.4%	15.8%	16.4%	15.4%	14.7%	14.9%	14.9%	14.7%	14.8%
Chicago Growth Partners I, L.P.	Heritage	2005	6.4%	7.7%	7.0%	5.6%	3.0%	4.1%	2.6%	2.5%	2.2%	1.7%	1.7%
Warburg Pincus Private Equity IX, L.P.	Active	2005	4.2%	7.9%	9.0%	10.1%	11.0%	10.2%	10.1%	10.1%	9.9%	9.8%	9.8%
Thoma Cressey Equity Partners VIII	Heritage	2006	5.6%	10.7%	15.2%	16.1%	15.7%	17.2%	18.2%	18.3%	18.3%	18.3%	18.3%
Warburg Pincus Private Equity X, L.P.	Active	2007	-14.5%	1.7%	3.0%	5.6%	8.9%	8.2%	7.7%	7.7%	8.2%	8.0%	8.1%
Chicago Growth Partners II	Heritage	2008	-4.9%	8.0%	13.8%	17.7%	19.9%	17.2%	18.4%	19.1%	19.9%	19.8%	19.8%

See section 7 for notes.

Evolution of IRR, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of										
			12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Summit Partners Growth Equity VIII, L.P.	Active	2011	N/A	N/A	N/A	-8.1%	0.3%	11.4%	17.5%	18.8%	23.1%	26.0%	25.0%
Warburg Pincus Private Equity XI, L.P.	Active	2012	N/A	N/A	N/A	N/A	12.4%	20.8%	15.9%	12.7%	13.9%	14.1%	13.9%
Summit Partners Growth Equity IX, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	70.3%	29.7%	17.2%
Warburg Pincus Private Equity XII, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-13.8%	-22.5%	6.1%	11.7%	9.7%
Warburg Pincus China, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-3.3%	13.7%	22.2%	13.8%
Warburg Pincus Financial Sector	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-23.6%	-11.0%
Warburg Pincus Global Growth, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-24.4%
Summit Partners Growth Equity X-A, L.P.	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Warburg Pincus China-SEA II	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
Total Growth			**10.3%**	**11.6%**	**12.0%**	**12.1%**	**12.5%**	**12.4%**	**12.4%**	**12.4%**	**12.7%**	**12.7%**	**12.7%**
CS Strategic Partners III VC	Active	2004	7.0%	6.3%	5.8%	6.5%	6.6%	6.7%	6.4%	6.4%	6.4%	6.1%	8.0%
Strategic Partners III-B, L.P.	Active	2004	1.6%	5.3%	6.6%	6.9%	7.0%	7.3%	6.7%	6.6%	6.7%	6.4%	9.4%
Lexington Capital Partners VI	Active	2006	-1.4%	4.5%	6.3%	7.3%	8.7%	8.7%	8.1%	7.8%	8.0%	8.0%	8.0%
CS Strategic Partners IV VC	Active	2008	1.3%	11.2%	13.1%	10.8%	9.5%	10.7%	10.7%	9.8%	9.3%	9.8%	9.4%
Strategic Partners IV-B	Active	2008	9.1%	14.8%	16.1%	14.6%	14.3%	14.0%	13.1%	12.7%	12.6%	12.5%	12.2%
Lexington Capital Partners VII, L.P.	Active	2009	-89.8%	40.8%	31.1%	25.6%	21.6%	20.1%	17.6%	16.1%	15.4%	15.1%	14.6%
Strategic Partners Fund V, L.P.	Active	2011	N/A	N/A	64.1%	88.8%	45.1%	34.2%	25.0%	21.5%	20.4%	19.7%	19.2%
Adams Street Global Secondary Fund 5, L.P.	Active	2012	N/A	N/A	N/A	5.6%	11.5%	4.4%	-4.1%	3.3%	6.2%	6.3%	6.1%
Lexington Capital Partners VIII, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	74.4%	34.1%	27.8%	23.9%	18.7%
Strategic Partners Fund VI	Active	2014	N/A	N/A	N/A	N/A	N/A	123.8%	57.4%	28.7%	22.0%	19.7%	18.2%
GS Vintage VII	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42.5%	29.7%	18.0%
Lexington Middle Market Investors IV	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	N/A	N/A
Strategic Partners VII, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	84.2%	110.7%	45.0%	28.9%
Adams Street Global Secondary Fund 6, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21.9%	25.5%
Lexington Capital Partners IX, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Strategic Partners VIII	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
Whitehorse Liquidity Partners III	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total PE Secondaries			**2.1%**	**7.4%**	**10.0%**	**11.1%**	**11.6%**	**12.3%**	**11.5%**	**11.2%**	**11.4%**	**11.6%**	**11.2%**

See section 7 for notes.

Evolution of IRR, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Crescendo IV	Heritage	2000	-10.1%	-9.6%	-9.2%	-8.4%	-6.9%	-7.5%	-6.9%	-6.1%	-5.6%	-5.1%	-4.8%
Thomas McNerney & Partners	Heritage	2002	-1.0%	0.1%	-4.7%	-6.0%	-2.1%	-7.8%	-10.0%	-10.2%	-8.6%	-7.7%	-4.3%
Affinity Ventures IV	Heritage	2004	-18.2%	-7.7%	0.1%	-2.7%	-7.2%	-0.7%	-2.2%	-7.5%	-13.4%	-12.1%	-11.7%
Split Rock Partners	Heritage	2005	-7.5%	-10.1%	-8.5%	-7.2%	-5.4%	-4.1%	-2.6%	1.4%	3.5%	3.4%	3.4%
RWI Ventures I	Heritage	2006	-15.1%	-16.2%	-5.2%	-4.4%	-4.5%	-4.6%	-4.5%	-4.4%	-4.3%	-4.1%	-4.1%
Thomas McNerney & Partners II	Heritage	2006	-14.2%	-5.5%	-2.5%	0.4%	2.9%	13.8%	16.8%	17.1%	16.6%	16.4%	16.7%
Affinity Ventures V, L.P.	Heritage	2008	-11.8%	-1.9%	5.0%	-0.6%	-1.8%	-4.1%	-2.9%	-2.1%	-4.5%	-4.3%	-4.1%
Split Rock Partners II	Heritage	2008	-38.0%	-23.5%	-16.0%	-10.5%	-7.3%	-0.8%	2.0%	2.7%	8.4%	5.9%	5.5%
HarbourVest Partners VIII - Venture Fund	Active	2014	N/A	N/A	N/A	N/A	N/A	N/A	11.2%	5.6%	6.9%	9.0%	9.2%
North Sky Capital Venture Fund III, LP	Heritage	2014	N/A	N/A	N/A	N/A	N/A	N/A	10.6%	4.9%	8.8%	10.4%	10.5%
Total Venture Capital			**-9.4%**	**-8.5%**	**-7.8%**	**-6.7%**	**-4.7%**	**-1.7%**	**-0.7%**	**0.3%**	**1.4%**	**1.2%**	**1.5%**
Total Private Equity Portfolio			**7.0%**	**9.2%**	**9.3%**	**9.7%**	**10.7%**	**11.1%**	**11.2%**	**11.4%**	**12.2%**	**12.3%**	**12.3%**

See section 7 for notes.

Performance by Manager, Private Equity Portfolio

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Adams Street Partners	2	$200,000,000	$112,270,250	$87,729,750	$39,915,328	$65,446,315	$105,361,643	0.45x	1.20x	6.6%
Advent International	4	355,000,000	136,300,000	221,783,954	175,151,961	182,271,544	357,423,505	0.79x	1.61x	16.1%
Affinity Ventures	2	9,000,000	0	9,000,000	3,248,215	2,839,628	6,087,842	0.36x	0.68x	-6.8%
Apax Partners	2	350,000,000	95,721,715	294,878,500	215,741,237	224,853,269	440,594,506	0.73x	1.49x	14.8%
Arsenal Capital Partners	1	75,000,000	75,000,000	0	0	0	0	N/A	N/A	N/A
Asia Alternatives	1	99,000,000	84,720,148	14,564,710	289,056	10,156,916	10,445,972	0.02x	0.72x	-37.1%
Banc Funds Company	3	273,346,841	45,060,364	228,286,477	160,527,606	205,174,258	365,701,864	0.70x	1.60x	12.0%
BlackRock Alternative Advisors	1	250,000,000	250,000,000	0	0	0	0	N/A	N/A	N/A
Blackstone Group	11	1,340,000,000	579,081,037	875,219,718	1,003,036,607	388,503,754	1,391,540,361	1.15x	1.59x	13.9%
Bridgepoint Capital Limited	1	183,630,000	160,625,579	9,854,501	0	7,883,738	7,883,738	0.00x	0.80x	-20.2%
Brookfield Asset Management	2	350,000,000	277,499,345	90,760,734	110,229,853	88,570,735	198,800,588	1.21x	2.19x	59.1%
Cardinal Partners	1	10,000,000	0	10,000,000	39,196,082	30,883	39,226,965	3.92x	3.92x	10.6%
Carlyle Group	1	150,000,000	127,904,392	22,095,608	0	18,634,883	18,634,883	0.00x	0.84x	-20.5%
Chicago Grow th Partners	2	110,000,000	1,952,374	110,789,624	176,404,448	5,315,292	181,719,740	1.59x	1.64x	10.9%
Court Square Capital Partners	3	500,000,000	179,800,768	350,804,613	384,442,755	191,927,810	576,370,565	1.10x	1.64x	13.9%
Credit Suisse Strategic Partners	2	65,500,000	3,507,569	66,057,673	84,761,700	12,728,456	97,490,155	1.28x	1.48x	8.0%
Crescendo Ventures	1	101,500,000	0	103,101,226	55,121,736	2,145,317	57,267,053	0.53x	0.56x	-4.8%
CVC Capital Partners	2	380,779,952	53,177,345	409,248,543	336,497,512	287,126,448	623,623,960	0.82x	1.52x	15.2%
Elevation Partners	1	75,000,000	799,634	73,237,580	113,492,106	144,367	113,636,473	1.55x	1.55x	11.8%
Goldman Sachs Private Equity Group	5	549,800,000	246,884,657	313,830,615	345,594,270	133,716,925	479,311,195	1.10x	1.53x	14.2%
Goldner Haw n Johnson & Morrison	2	95,000,000	78,935,813	16,070,803	6,406,955	34,369,639	40,776,594	0.40x	2.54x	19.5%
GTCR Golder Rauner	3	285,000,000	24,053,019	272,768,480	383,868,447	113,171,505	497,039,952	1.41x	1.82x	17.8%
HarbourVest Partners, LLC	5	21,603,171	927,217	20,795,769	17,217,463	10,251,845	27,469,308	0.83x	1.32x	11.2%
Hellman & Friedman	3	400,000,000	179,686,216	220,797,066	372,113,089	78,479,248	450,592,338	1.69x	2.04x	14.6%
IK Limited	2	340,619,149	57,135,551	302,902,193	106,381,777	329,519,150	435,900,927	0.35x	1.44x	13.6%
Kohlberg Kravis Roberts	5	750,000,000	258,375,392	521,771,717	741,293,277	163,525,867	904,819,144	1.42x	1.73x	12.7%
Leonard Green & Partners	1	200,000,000	14,332,365	215,919,566	143,815,738	213,155,198	356,970,936	0.67x	1.65x	15.6%
Lexington Partners Inc.	6	900,000,000	391,680,739	540,453,902	419,978,300	323,424,991	743,403,291	0.78x	1.38x	11.8%
Madison Dearborn Partners	1	100,000,000	38,393,836	67,396,018	5,817,652	71,741,418	77,559,070	0.09x	1.15x	9.2%
Neuberger Berman Group	2	425,000,000	354,233,222	167,092,917	99,202,870	110,571,811	209,774,681	0.59x	1.26x	25.1%
Nordic Capital	2	348,908,302	205,692,470	217,281,131	114,939,555	191,163,946	306,103,500	0.53x	1.41x	14.4%
North Sky Capital	2	2,454,339	456,250	1,998,089	1,927,777	681,206	2,608,984	0.96x	1.31x	11.9%
Oak Hill Capital Management, LLC	2	250,000,000	169,551,869	102,244,567	28,267,962	93,266,820	121,534,782	0.28x	1.19x	31.1%
Paine & Partners	2	201,340,000	147,198,445	55,214,709	14,823,737	53,398,862	68,222,599	0.27x	1.24x	9.3%

See section 7 for notes.

Performance by Manager, Private Equity Portfolio (cont'd)

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Permal Capital Management	1	5,337,098	1,090,000	4,376,198	3,457,751	1,300,762	4,758,514	0.79x	1.09x	3.7%
Permira	3	447,958,236	212,003,435	263,654,033	83,631,687	312,537,015	396,168,702	0.32x	1.50x	15.0%
PPC Enterprises LLC	1	100,000,000	30,350,177	79,633,866	44,315,075	75,135,151	119,450,226	0.56x	1.50x	22.0%
RWI Ventures	1	7,603,265	0	7,603,265	6,122,274	453,038	6,575,312	0.81x	0.86x	-4.1%
Silver Lake Partners	4	435,000,000	96,169,521	345,220,365	406,119,998	215,781,048	621,901,046	1.18x	1.80x	14.6%
Split Rock Partners	2	110,000,000	2,944,094	107,055,906	103,990,722	35,207,946	139,198,668	0.97x	1.30x	4.2%
Summit Partners	3	350,000,000	206,976,982	191,865,327	167,803,349	147,238,279	315,041,629	0.87x	1.64x	24.3%
Texas Pacific Group	2	250,000,000	166,597,098	90,994,420	17,515,734	97,638,555	115,154,289	0.19x	1.27x	15.5%
Thoma Bravo	2	225,000,000	101,621,078	125,748,175	2,298,018	139,057,434	141,355,452	0.02x	1.12x	11.2%
Thoma Cressey Bravo	2	120,000,000	770,000	119,577,712	309,529,703	926,678	310,456,381	2.59x	2.60x	20.3%
Thomas H. Lee Partners	2	250,000,000	158,357,842	99,983,908	30,607,993	104,569,135	135,177,128	0.31x	1.35x	22.1%
Thomas, McNerney & Partners	2	80,000,000	1,875,000	78,125,000	118,735,180	14,966,811	133,701,991	1.52x	1.71x	8.9%
Vestar Capital Partners	4	380,000,000	125,379,830	264,866,452	311,326,726	102,000,027	413,326,753	1.18x	1.56x	11.3%
Warburg Pincus LLC	10	1,216,000,000	385,523,500	837,432,616	899,645,765	437,482,984	1,337,128,749	1.07x	1.60x	11.1%
Wellspring Capital Management	1	125,000,000	89,559,183	35,440,817	0	33,011,491	33,011,491	0.00x	0.93x	-21.2%
Welsh, Carson, Anderson & Stowe	3	500,000,000	272,340,046	227,659,954	183,077,150	171,528,143	354,605,294	0.80x	1.56x	15.0%
Whitehorse Capital	1	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
William Blair Capital Partners	1	50,000,000	1,650,000	48,150,000	69,201,191	1,075,428	70,276,618	1.44x	1.46x	8.6%
Wind Point Partners	1	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Windjammer Capital Investors	4	341,708,861	139,198,249	210,143,472	258,772,876	117,186,977	375,959,852	1.23x	1.79x	13.1%
Total Private Equity Portfolio	**136**	**$14,941,089,214**	**$6,543,363,615**	**$9,151,482,240**	**$8,715,856,266**	**$5,621,288,944**	**$14,337,145,210**	**0.95x**	**1.57x**	**12.3%**

See section 7 for notes.

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Section 5:
Real Assets Portfolio

Performance by Strategy, Real Assets Portfolio

Inception to 6/30/2019

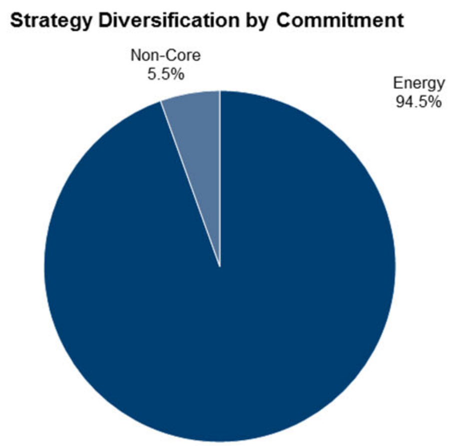
Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Merit Energy Partners B	Active	1996	$24,000,000	$0	$24,000,000	$188,273,079	$3,140,663	$191,413,742	7.84x	7.98x	24.3%
Merit Energy Partners C	Active	1998	25,000,000	0	25,000,000	243,510,009	2,362,191	245,872,200	9.74x	9.83x	30.0%
Merit Energy Partners C II	Active	1998	25,000,000	0	25,000,000	269,483,707	3,792,678	273,276,385	10.78x	10.93x	31.9%
Merit Energy Partners D	Active	2001	63,500,000	0	53,039,103	221,749,944	8,245,195	229,995,139	4.18x	4.34x	21.3%
Merit Energy Partners D-II, L.P.	Active	2001	24,500,000	0	17,899,200	110,519,518	4,995,645	115,515,163	6.17x	6.45x	25.7%
First Reserve Fund X	Active	2004	100,000,000	0	100,000,000	182,429,002	348,231	182,777,233	1.82x	1.83x	31.1%
Merit Energy Partners E	Active	2004	50,000,000	0	18,230,644	42,627,155	987,263	43,614,418	2.34x	2.39x	14.2%
Merit Energy Partners E-II, L.P.	Active	2004	50,000,000	0	21,752,553	38,678,781	1,984,209	40,662,990	1.78x	1.87x	8.8%
First Reserve Fund XI	Active	2006	150,000,000	0	150,292,121	97,802,016	7,348,721	105,150,737	0.65x	0.70x	-7.3%
Merit Energy Partners F-II, L.P.	Active	2006	100,000,000	0	59,522,861	29,256,493	10,370,141	39,626,634	0.49x	0.67x	-6.8%
EIG Energy Fund XIV, LP	Active	2007	100,000,000	2,761,129	113,177,137	94,745,253	10,736,680	105,481,933	0.84x	0.93x	-2.4%
EnCap Energy Capital Fund VII	Active	2007	100,000,000	0	105,357,255	134,445,165	7,240,831	141,685,996	1.28x	1.34x	14.8%
Natural Gas Partners IX, L.P.	Active	2007	150,000,000	750,911	173,775,602	244,762,733	3,594,649	248,357,381	1.41x	1.43x	12.1%
NGP Midstream & Resources L.P.	Active	2007	100,000,000	17,857	103,527,211	176,410,295	15,002,556	191,412,851	1.70x	1.85x	13.9%
Sheridan Production Partners I, L.P.	Active	2007	100,000,000	0	116,552,260	82,750,000	34,083,992	116,833,992	0.71x	1.00x	0.1%
First Reserve Fund XII, L.P.	Active	2008	150,000,000	0	165,617,044	81,001,567	29,295,626	110,297,193	0.49x	0.67x	-9.0%
EIG Energy Fund XV, LP	Active	2010	150,000,000	-1,863,983	158,557,720	117,356,327	70,235,877	187,592,204	0.74x	1.18x	4.5%
EnCap Energy Capital VIII, L.P.	Active	2010	100,000,000	4,802,299	99,003,512	53,818,149	32,694,422	86,512,571	0.54x	0.87x	-3.9%
Energy Capital Partners II, LP	Active	2010	100,000,000	29,749,110	85,551,360	111,999,239	12,328,320	124,327,559	1.31x	1.45x	10.4%
Sheridan Production Partners II, L.P.	Active	2010	100,000,000	-3,500,000	103,500,000	7,000,000	8,392,003	15,392,003	0.07x	0.15x	-33.6%
Energy & Minerals Group II, L.P.	Active	2011	100,000,000	1,265,780	104,644,059	98,854,931	97,417,497	196,272,428	0.94x	1.88x	15.1%
Merit Energy Partners H, L.P.	Active	2011	100,000,000	0	100,000,000	29,668,582	69,773,960	99,442,542	0.30x	0.99x	-0.1%
EnCap Energy Capital Fund IX	Active	2012	100,000,000	6,307,627	110,823,005	82,206,325	67,917,410	150,123,736	0.74x	1.35x	13.0%
NGP Natural Resources X, L.P.	Active	2012	150,000,000	5,951,029	144,048,971	105,475,349	58,192,419	163,667,768	0.73x	1.14x	3.8%
EIG Energy Fund XVI, LP	Active	2013	200,000,000	48,746,567	175,065,404	71,917,670	139,646,091	211,563,761	0.41x	1.21x	7.6%
Energy Capital Partners III, LP	Active	2013	200,000,000	30,132,086	201,330,531	68,434,490	180,407,231	248,841,721	0.34x	1.24x	9.9%
First Reserve Fund XIII, L.P.	Active	2014	200,000,000	55,124,670	168,086,747	63,482,040	134,418,428	197,900,468	0.38x	1.18x	11.2%
NGP Natural Resources XI, L.P.	Active	2014	150,000,000	20,159,854	136,035,482	29,131,205	143,751,819	172,883,024	0.21x	1.27x	12.1%
Sheridan Production Partners III-B, L.P.	Active	2014	100,000,000	65,650,000	34,353,005	17,300,000	31,835,999	49,135,999	0.50x	1.43x	16.2%
The Energy & Minerals Group Fund III, LP	Active	2014	200,000,000	9,428,480	192,607,030	18,442,920	152,403,918	170,846,838	0.10x	0.89x	-2.9%
EnCap Energy Capital Fund X, L.P.	Active	2015	100,000,000	22,090,249	85,798,877	17,941,118	86,533,531	104,474,649	0.21x	1.22x	11.1%
EnerVest Energy Institutional Fund XIV-A, L.P.	Active	2015	100,000,000	13,739,749	94,353,949	39,331,232	85,949,255	125,280,487	0.42x	1.33x	11.5%
Merit Energy Partners I, L.P.	Active	2015	169,721,518	0	169,721,518	35,839,059	212,409,071	248,248,130	0.21x	1.46x	16.4%

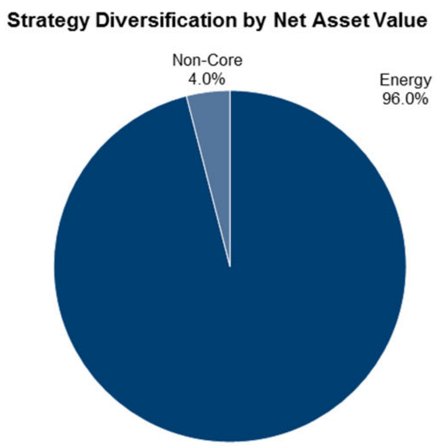
See section 7 for notes.

Performance by Strategy, Real Assets Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
The Energy & Minerals Group Fund IV, LP	Active	2016	150,000,000	38,187,834	132,518,254	35,874,026	167,568,920	203,442,946	0.27x	1.54x	20.6%
Energy Capital Partners IV, LP	Active	2017	105,808,339	68,738,145	39,699,839	2,378,600	46,858,875	49,237,475	0.06x	1.24x	22.8%
NGP Natural Resources XII, L.P.	Active	2017	149,500,000	105,980,905	43,178,620	0	42,646,581	42,646,581	0.00x	0.99x	-1.1%
Merit Energy Partners K, L.P.	Active	2019	150,000,000	150,000,000	0	0	0	0	N/A	N/A	N/A
The Energy & Minerals Group Fund V	Active	2019	112,500,000	112,500,000	0	0	0	0	N/A	N/A	N/A
The Energy & Minerals Group Fund V Accordion	Active	2019	17,500,000	17,500,000	0	0	0	0	N/A	N/A	N/A
Total Energy			**4,317,029,857**	**804,220,298**	**3,651,620,874**	**3,244,895,979**	**1,984,910,897**	**5,229,806,876**	**0.89x**	**1.43x**	**14.5%**
BlackRock Global Renewable Power Fund II	Active	2017	100,000,000	32,421,892	70,834,071	6,090,450	64,884,791	70,975,241	0.09x	1.00x	0.2%
KKR Global Infrastructure Investors III, L.P.	Active	2018	149,850,000	130,960,094	18,889,906	0	17,290,554	17,290,554	0.00x	0.92x	-13.3%
Total Infrastructure			**249,850,000**	**163,381,986**	**89,723,977**	**6,090,450**	**82,175,345**	**88,265,795**	**0.07x**	**0.98x**	**-1.5%**
Total Real Assets Portfolio			**$4,566,879,857**	**$967,602,283**	**$3,741,344,851**	**$3,250,986,429**	**$2,067,086,242**	**$5,318,072,671**	**0.87x**	**1.42x**	**14.4%**





See section 7 for notes.

Performance by Vintage Year, Real Assets Portfolio

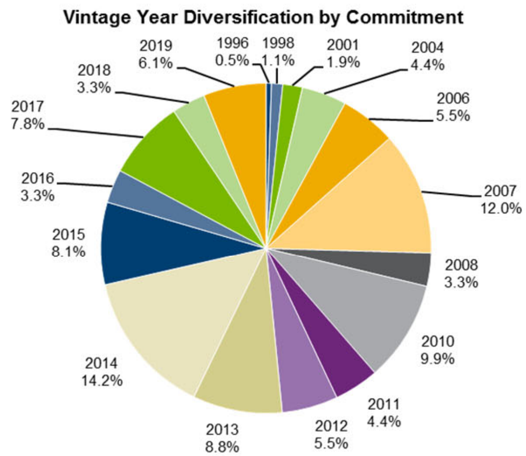
Inception to 6/30/2019

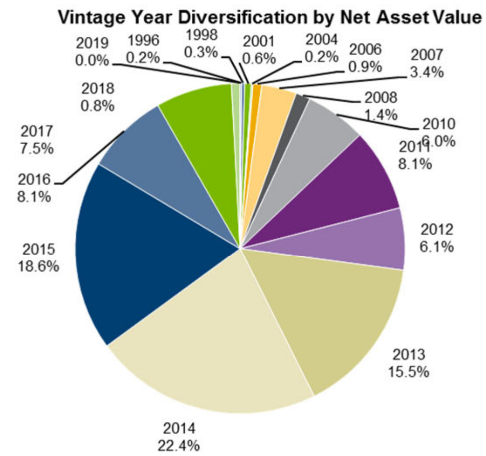
Vintage Year	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
1996	1	$24,000,000	$0	$24,000,000	$188,273,079	$3,140,663	$191,413,742	7.84x	7.98x	24.3%
1998	2	50,000,000	0	50,000,000	512,993,716	6,154,869	519,148,585	10.26x	10.38x	31.0%
2001	2	88,000,000	0	70,938,303	332,269,462	13,240,840	345,510,302	4.68x	4.87x	22.7%
2004	3	200,000,000	0	139,983,197	263,734,938	3,319,703	267,054,641	1.88x	1.91x	19.9%
2006	2	250,000,000	0	209,814,982	127,058,509	17,718,862	144,777,371	0.61x	0.69x	-7.1%
2007	5	550,000,000	3,529,897	612,389,465	733,113,445	70,658,708	803,772,153	1.20x	1.31x	8.3%
2008	1	150,000,000	0	165,617,044	81,001,567	29,295,626	110,297,193	0.49x	0.67x	-9.0%
2010	4	450,000,000	29,187,425	446,612,592	290,173,715	123,650,622	413,824,337	0.65x	0.93x	-2.0%
2011	2	200,000,000	1,265,780	204,644,059	128,523,513	167,191,457	295,714,970	0.63x	1.45x	8.4%
2012	2	250,000,000	12,258,656	254,871,976	187,681,674	126,109,829	313,791,504	0.74x	1.23x	7.1%
2013	2	400,000,000	78,878,653	376,395,935	140,352,160	320,053,322	460,405,482	0.37x	1.22x	8.8%
2014	4	650,000,000	150,363,004	531,082,264	128,356,165	462,410,164	590,766,329	0.24x	1.11x	4.1%
2015	3	369,721,518	35,829,998	349,874,344	93,111,409	384,891,857	478,003,266	0.27x	1.37x	14.0%
2016	1	150,000,000	38,187,834	132,518,254	35,874,026	167,568,920	203,442,946	0.27x	1.54x	20.6%
2017	3	355,308,339	207,140,942	153,712,530	8,469,050	154,390,247	162,859,297	0.06x	1.06x	5.0%
2018	1	149,850,000	130,960,094	18,889,906	0	17,290,554	17,290,554	0.00x	0.92x	-13.3%
2019	3	280,000,000	280,000,000	0	0	0	0	N/A	N/A	N/A
Total Real Assets Portfolio	**41**	**$4,566,879,857**	**$967,602,283**	**$3,741,344,851**	**$3,250,986,429**	**$2,067,086,242**	**$5,318,072,671**	**0.87x**	**1.42x**	**14.4%**

See section 7 for notes.

Diversification by Vintage Year, Real Assets Portfolio

Inception to 6/30/2019





See section 7 for notes.

Evolution of IRR, Real Assets Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of										
			12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Merit Energy Partners B	Active	1996	25.2%	24.9%	24.9%	24.8%	24.6%	24.5%	24.4%	24.3%	24.3%	24.3%	24.3%
Merit Energy Partners C	Active	1998	31.7%	30.5%	30.3%	30.5%	30.4%	30.2%	30.1%	30.0%	30.1%	30.0%	30.0%
Merit Energy Partners C II	Active	1998	34.1%	32.7%	32.3%	32.5%	32.4%	32.1%	31.9%	31.9%	31.9%	31.9%	31.9%
Merit Energy Partners D	Active	2001	24.5%	22.5%	22.1%	22.3%	22.7%	22.0%	21.5%	21.4%	21.4%	21.4%	21.3%
Merit Energy Partners D-II, L.P.	Active	2001	30.0%	27.6%	27.0%	27.0%	27.2%	26.4%	26.0%	25.8%	25.8%	25.7%	25.7%
First Reserve Fund X	Active	2004	41.2%	38.3%	33.3%	31.6%	31.3%	31.1%	31.1%	31.1%	31.1%	31.1%	31.1%
Merit Energy Partners E	Active	2004	17.2%	16.8%	17.4%	17.2%	17.5%	16.3%	15.3%	15.0%	14.9%	14.2%	14.2%
Merit Energy Partners E-II, L.P.	Active	2004	17.9%	18.0%	17.8%	15.6%	16.0%	13.3%	10.8%	10.5%	10.1%	8.9%	8.8%
First Reserve Fund XI	Active	2006	3.5%	2.3%	3.5%	3.7%	2.9%	-2.8%	-8.5%	-8.2%	-8.4%	-8.2%	-7.3%
Merit Energy Partners F-II, L.P.	Active	2006	-6.3%	8.3%	7.8%	2.1%	3.1%	2.4%	-1.7%	-2.3%	-3.7%	-7.3%	-6.8%
EIG Energy Fund XIV, LP	Active	2007	12.8%	16.9%	14.1%	11.2%	8.7%	6.7%	-1.4%	-3.5%	-2.9%	-2.3%	-2.4%
EnCap Energy Capital Fund VII	Active	2007	-3.9%	18.1%	23.7%	20.6%	18.8%	18.3%	15.9%	15.6%	14.7%	14.8%	14.8%
Natural Gas Partners IX, L.P.	Active	2007	-9.8%	14.4%	19.4%	11.1%	16.8%	15.3%	12.3%	12.0%	11.9%	12.1%	12.1%
NGP Midstream & Resources L.P.	Active	2007	7.9%	17.3%	24.0%	21.0%	26.0%	23.5%	17.0%	16.6%	14.8%	13.8%	13.9%
Sheridan Production Partners I, L.P.	Active	2007	26.1%	20.3%	17.2%	13.6%	13.1%	8.4%	5.7%	6.5%	5.7%	-0.7%	0.1%
First Reserve Fund XII, L.P.	Active	2008	-27.5%	-12.5%	0.8%	3.2%	4.9%	-0.7%	-8.1%	-8.8%	-8.4%	-8.9%	-9.0%
EIG Energy Fund XV, LP	Active	2010	N/A	-16.0%	32.0%	20.2%	15.6%	9.8%	2.9%	5.3%	5.0%	4.4%	4.5%
EnCap Energy Capital VIII, L.P.	Active	2010	N/A	7.6%	13.3%	20.6%	14.4%	7.7%	-12.6%	-2.9%	-3.0%	-4.4%	-3.9%
Energy Capital Partners II, LP	Active	2010	N/A	21.9%	30.6%	15.3%	21.3%	21.5%	13.0%	13.9%	13.5%	10.8%	10.4%
Sheridan Production Partners II, L.P.	Active	2010	N/A	0.0%	-28.5%	-16.2%	-30.0%	-30.4%	-37.4%	-6.4%	-14.2%	-39.7%	-33.6%
Energy & Minerals Group II, L.P.	Active	2011	N/A	N/A	-44.8%	-16.4%	40.9%	30.0%	18.7%	18.4%	17.3%	15.5%	15.1%
Merit Energy Partners H, L.P.	Active	2011	N/A	N/A	0.2%	-3.9%	2.5%	-7.4%	-10.1%	-5.0%	-2.0%	-1.0%	-0.1%
EnCap Energy Capital Fund IX	Active	2012	N/A	N/A	N/A	N/A	-3.1%	-8.0%	6.0%	22.2%	16.8%	13.2%	13.0%
NGP Natural Resources X, L.P.	Active	2012	N/A	N/A	N/A	12.2%	14.1%	8.3%	-0.7%	5.2%	6.1%	3.5%	3.8%
EIG Energy Fund XVI, LP	Active	2013	N/A	N/A	N/A	N/A	-24.8%	-76.0%	-26.5%	4.9%	8.0%	8.0%	7.6%
Energy Capital Partners III, LP	Active	2013	N/A	N/A	N/A	N/A	N/A	-39.9%	-8.0%	11.5%	13.5%	9.4%	9.9%
First Reserve Fund XIII, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	-12.4%	-42.6%	13.6%	12.0%	11.7%	11.2%
NGP Natural Resources XI, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	NM	-19.1%	23.3%	27.1%	14.8%	12.1%
Sheridan Production Partners III-B, L.P.	Active	2014	N/A	N/A	N/A	N/A	N/A	-89.0%	-97.0%	53.1%	30.9%	17.7%	16.2%
The Energy & Minerals Group Fund III, LP	Active	2014	N/A	N/A	N/A	N/A	N/A	-0.8%	-17.6%	-7.6%	-3.3%	-4.2%	-2.9%
EnCap Energy Capital Fund X, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-45.0%	34.6%	15.9%	13.7%	11.1%
EnerVest Energy Institutional Fund XIV-A, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	-24.9%	-5.1%	3.3%	11.0%	11.5%
Merit Energy Partners I, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	0.0%	-4.2%	50.9%	27.4%	16.1%	16.4%

See section 7 for notes.

Evolution of IRR, Real Assets Portfolio (cont'd)

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of										
			12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
The Energy & Minerals Group Fund IV, LP	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	26.4%	21.1%	20.0%	20.6%
Energy Capital Partners IV, LP	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	13.2%	22.8%
NGP Natural Resources XII, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-2.4%	-1.1%
Merit Energy Partners K, L.P.	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The Energy & Minerals Group Fund V	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The Energy & Minerals Group Fund V Accordion	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Energy			**26.2%**	**24.7%**	**24.0%**	**22.6%**	**22.2%**	**20.0%**	**16.4%**	**16.9%**	**16.1%**	**14.6%**	**14.5%**
BlackRock Global Renewable Power Fund II	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-6.9%	-0.2%	0.2%
KKR Global Infrastructure Investors III, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-11.3%	-13.3%
Total Real Assets			**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**-6.9%**	**-2.0%**	**-1.5%**
Total Real Assets Portfolio			**26.2%**	**24.7%**	**24.0%**	**22.6%**	**22.2%**	**20.0%**	**16.4%**	**16.9%**	**16.1%**	**14.6%**	**14.4%**

See section 7 for notes.

Performance by Manager, Real Assets Portfolio

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
BlackRock Alternative Advisors	1	$100,000,000	$32,421,892	$70,834,071	$6,090,450	$64,884,791	$70,975,241	0.09x	1.00x	0.2%
EIG Global Energy Partners	3	450,000,000	49,643,713	446,800,261	284,019,250	220,618,648	504,637,898	0.64x	1.13x	3.7%
EnCap Investments	4	400,000,000	33,200,175	400,982,649	288,410,757	194,386,194	482,796,951	0.72x	1.20x	8.2%
Energy Capital Partners	3	405,808,339	128,619,341	326,581,730	182,812,329	239,594,426	422,406,755	0.56x	1.29x	10.6%
EnerVest Management Partners	1	100,000,000	13,739,749	94,353,949	39,331,232	85,949,255	125,280,487	0.42x	1.33x	11.5%
First Reserve Corp.	4	600,000,000	55,124,670	583,995,912	424,714,625	171,411,006	596,125,631	0.73x	1.02x	0.8%
Kohlberg Kravis Roberts	1	149,850,000	130,960,094	18,889,906	0	17,290,554	17,290,554	0.00x	0.92x	-13.3%
Merit Energy Partners	11	781,721,518	150,000,000	514,165,879	1,209,606,327	318,061,016	1,527,667,343	2.35x	2.97x	24.2%
Natural Gas Partners	5	699,500,000	132,860,556	600,565,886	555,779,582	263,188,023	818,967,605	0.93x	1.36x	10.8%
Sheridan Production Partners	3	300,000,000	62,150,000	254,405,265	107,050,000	74,311,994	181,361,994	0.42x	0.71x	-8.9%
The Energy & Minerals Group	5	580,000,000	178,882,094	429,769,343	153,171,877	417,390,335	570,562,212	0.36x	1.33x	8.3%
Total Real Assets Portfolio	**41**	**$4,566,879,857**	**$967,602,283**	**$3,741,344,851**	**$3,250,986,429**	**$2,067,086,242**	**$5,318,072,671**	**0.87x**	**1.42x**	**14.4%**

See section 7 for notes.

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Section 6:
Real Estate Portfolio

Performance by Strategy, Real Estate Portfolio

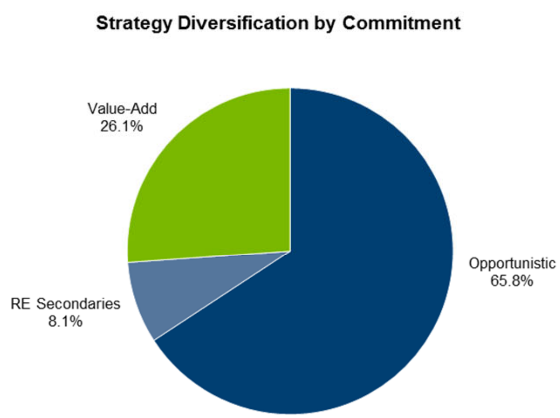
Inception to 6/30/2019

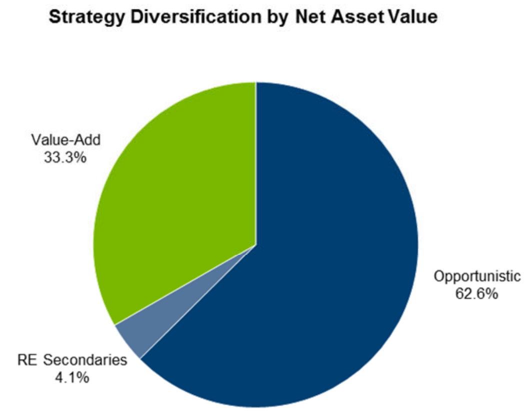
Investment	Investment Status	Vintage Year	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Colony Investors III, L.P.	Heritage	1997	$100,000,000	$0	$99,660,860	$173,622,105	$2,996,500	$176,618,605	1.74x	1.77x	14.5%
Silverpeak Legacy Pension Partners II, L.P.	Heritage	2005	75,000,000	9,134,547	71,430,523	89,267,013	1,616,723	90,883,735	1.25x	1.27x	4.2%
Blackstone Real Estate Partners V	Active	2006	100,000,000	4,174,052	104,213,007	198,817,559	7,740,330	206,557,889	1.91x	1.98x	10.8%
Blackstone Real Estate Partners VI	Active	2007	100,000,000	4,907,906	109,477,567	209,759,596	9,036,720	218,796,316	1.92x	2.00x	13.1%
Silverpeak Legacy Pension Partners III, L.P.	Heritage	2008	150,000,000	79,588,867	70,415,683	12,176,279	12,780,887	24,957,165	0.17x	0.35x	-11.4%
Blackstone Real Estate Partners VII, L.P.	Active	2011	100,000,000	13,995,597	107,645,658	127,633,007	59,516,202	187,149,208	1.19x	1.74x	16.5%
Blackstone Real Estate Partners VIII, L.P.	Active	2015	150,000,000	50,756,838	137,178,382	46,179,092	126,892,520	173,071,612	0.34x	1.26x	13.9%
AG Asia Realty Fund III, L.P.	Active	2016	50,000,000	6,196,250	47,587,261	17,000,000	43,297,351	60,297,351	0.36x	1.27x	15.7%
AG Realty Fund IX	Active	2016	100,000,000	18,650,000	85,141,582	13,500,000	94,383,445	107,883,445	0.16x	1.27x	11.7%
Rockpoint Real Estate Fund V, L.P.	Active	2016	100,000,000	26,125,220	87,501,883	18,087,068	84,880,438	102,967,506	0.21x	1.18x	11.4%
Angelo Gordon Europe Realty Fund II	Active	2017	75,000,000	37,500,000	37,144,581	28,384	38,998,500	39,026,884	0.00x	1.05x	5.9%
Blackstone Real Estate Partners Asia II	Active	2017	75,000,000	59,293,436	16,633,853	20,015	15,769,312	15,789,327	0.00x	0.95x	-11.1%
Carlyle Realty Partners VIII, L.P.	Active	2017	150,000,000	135,175,253	14,847,362	13,748	12,085,479	12,099,227	0.00x	0.81x	-23.7%
AG Asia Realty Fund IV, L.P.	Active	2018	100,000,000	87,500,000	12,500,000	0	12,500,000	12,500,000	0.00x	1.00x	0.0%
Blackstone Real Estate Partners IX, L.P.	Active	2018	300,000,000	300,000,000	0	0	0	0	N/A	N/A	N/A
Rockpoint Real Estate Fund VI, L.P.	Active	2019	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Total Opportunistic			**1,825,000,000**	**932,997,965**	**1,001,378,202**	**906,103,866**	**522,494,405**	**1,428,598,270**	**0.90x**	**1.43x**	**10.2%**
Strategic Partners III RE, L.P.	Active	2005	25,000,000	9,006	25,988,048	14,666,337	646,314	15,312,651	0.56x	0.59x	-6.5%
Strategic Partners IV RE, L.P.	Active	2008	50,000,000	1,119,776	51,437,038	46,958,338	4,623,963	51,582,300	0.91x	1.00x	0.1%
Landmark Real Estate Partners VIII, L.P.	Active	2017	149,500,000	109,966,051	39,820,779	17,034,494	29,173,061	46,207,555	0.43x	1.16x	22.2%
Total RE Secondaries			**224,500,000**	**111,094,833**	**117,245,865**	**78,659,168**	**34,443,338**	**113,102,506**	**0.67x**	**0.96x**	**-0.7%**
TA Fund VIII	Active	2006	100,000,000	0	100,000,000	99,064,669	256,967	99,321,636	0.99x	0.99x	-0.1%
TA Realty Associates Fund X	Active	2012	100,000,000	0	100,000,000	109,656,048	47,050,666	156,706,713	1.10x	1.57x	12.4%
Realty Associates Fund XI	Active	2015	100,000,000	0	100,000,000	12,019,309	104,683,941	116,703,250	0.12x	1.17x	8.1%
Rockwood Capital Real Estate Partners Fund X, L.P.	Active	2016	100,000,000	27,838,939	73,869,859	5,136,364	73,726,546	78,862,910	0.07x	1.07x	5.0%
Lubert-Adler Real Estate Fund VII-B, L.P.	Active	2017	75,000,000	36,072,369	39,779,763	1,731,088	41,440,409	43,171,498	0.04x	1.09x	7.1%
AG Realty Fund X, L.P.	Active	2018	150,000,000	138,750,000	11,250,000	0	11,250,000	11,250,000	0.00x	1.00x	0.0%
Realty Associates Fund XII	Active	2018	100,000,000	100,000,000	0	0	-923,817	-923,817	N/A	N/A	NM
Total Value-Add			**725,000,000**	**302,661,308**	**424,899,622**	**227,607,478**	**277,484,712**	**505,092,190**	**0.54x**	**1.19x**	**4.3%**
Total Real Estate Portfolio			**$2,774,500,000**	**$1,346,754,106**	**$1,543,523,689**	**$1,212,370,512**	**$834,422,455**	**$2,046,792,967**	**0.79x**	**1.33x**	**7.8%**

See section 7 for notes.

Diversification by Strategy, Real Estate Portfolio (cont'd)

Inception to 6/30/2019





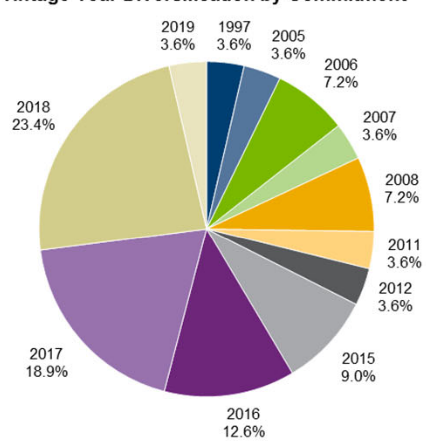
See section 7 for notes.

Performance by Vintage Year, Real Estate Portfolio

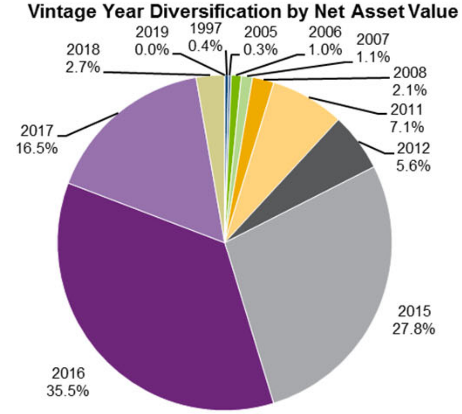
Inception to 6/30/2019

Vintage Year	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
1997	1	$100,000,000	$0	$99,660,860	$173,622,105	$2,996,500	$176,618,605	1.74x	1.77x	14.5%
2005	2	100,000,000	9,143,553	97,418,570	103,933,349	2,263,037	106,196,386	1.07x	1.09x	1.4%
2006	2	200,000,000	4,174,052	204,213,007	297,882,228	7,997,297	305,879,525	1.46x	1.50x	5.6%
2007	1	100,000,000	4,907,906	109,477,567	209,759,596	9,036,720	218,796,316	1.92x	2.00x	13.1%
2008	2	200,000,000	80,708,643	121,852,721	59,134,617	17,404,849	76,539,466	0.49x	0.63x	-6.4%
2011	1	100,000,000	13,995,597	107,645,658	127,633,007	59,516,202	187,149,208	1.19x	1.74x	16.5%
2012	1	100,000,000	0	100,000,000	109,656,048	47,050,666	156,706,713	1.10x	1.57x	12.4%
2015	2	250,000,000	50,756,838	237,178,382	58,198,401	231,576,461	289,774,862	0.25x	1.22x	11.4%
2016	4	350,000,000	78,810,409	294,100,585	53,723,432	296,287,779	350,011,211	0.18x	1.19x	10.9%
2017	5	524,500,000	378,007,109	148,226,338	18,827,729	137,466,762	156,294,491	0.13x	1.05x	6.4%
2018	4	650,000,000	626,250,000	23,750,000	0	22,826,183	22,826,183	0.00x	0.96x	-5.4%
2019	1	100,000,000	100,000,000	0	0	0	0	N/A	N/A	N/A
Total Real Estate Portfolio	**26**	**$2,774,500,000**	**$1,346,754,106**	**$1,543,523,689**	**$1,212,370,512**	**$834,422,455**	**$2,046,792,967**	**0.79x**	**1.33x**	**7.8%**

Vintage Year Diversification by Commitment



Vintage Year Diversification by Net Asset Value



See section 7 for notes.

Evolution of IRR, Real Estate Portfolio

Inception to 6/30/2019

Investment	Investment Status	Vintage Year	IRR as of 12/31/2009	12/31/2010	12/31/2011	12/31/2012	12/31/2013	12/31/2014	12/31/2015	12/31/2016	12/31/2017	12/31/2018	6/30/2019
Colony Investors III, L.P.	Heritage	1997	14.7%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.6%	14.5%	14.5%	14.5%
Silverpeak Legacy Pension Partners II, L.P.	Heritage	2005	-8.1%	-2.5%	-1.3%	-0.6%	1.0%	2.5%	4.5%	4.5%	4.4%	4.2%	4.2%
Blackstone Real Estate Partners V	Active	2006	-6.5%	7.0%	8.4%	9.1%	9.9%	11.0%	11.1%	11.0%	11.0%	10.8%	10.8%
Blackstone Real Estate Partners VI	Active	2007	-34.8%	6.1%	8.6%	9.1%	13.7%	14.1%	12.8%	13.0%	13.2%	13.1%	13.1%
Silverpeak Legacy Pension Partners III, L.P.	Heritage	2008	-42.3%	-30.3%	-22.2%	-19.6%	-16.2%	-15.0%	-13.2%	-12.9%	-12.5%	-11.7%	-11.4%
Blackstone Real Estate Partners VII, L.P.	Active	2011	N/A	N/A	-2.4%	26.5%	28.0%	26.6%	22.7%	18.6%	18.4%	16.8%	16.5%
Blackstone Real Estate Partners VIII, L.P.	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	6.2%	18.4%	17.3%	16.1%	13.9%
AG Asia Realty Fund III, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.1%	26.1%	19.1%	15.7%
AG Realty Fund IX	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.9%	14.3%	13.2%	11.7%
Rockpoint Real Estate Fund V, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.1%	11.3%	12.6%	11.4%
Angelo Gordon Europe Realty Fund II	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.8%	5.9%
Blackstone Real Estate Partners Asia II	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-23.8%	-11.1%
Carlyle Realty Partners VIII, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM	-56.1%	-23.7%
AG Asia Realty Fund IV, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
Blackstone Real Estate Partners IX, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockpoint Real Estate Fund VI, L.P.	Active	2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Opportunistic			**-0.7%**	**7.2%**	**7.6%**	**7.9%**	**9.5%**	**10.3%**	**10.3%**	**10.3%**	**10.5%**	**10.3%**	**10.2%**
Strategic Partners III RE, L.P.	Active	2005	-39.1%	-24.7%	-16.4%	-14.1%	-10.9%	-8.6%	-7.5%	-7.2%	-6.6%	-6.5%	-6.5%
Strategic Partners IV RE, L.P.	Active	2008	-31.3%	-16.0%	-9.2%	-5.8%	-3.1%	-0.8%	-0.7%	-0.5%	-0.2%	0.2%	0.1%
Landmark Real Estate Partners VIII, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	41.1%	37.1%	22.2%
Total RE Secondaries			**-34.1%**	**-19.1%**	**-11.8%**	**-8.7%**	**-5.7%**	**-3.5%**	**-3.0%**	**-2.8%**	**-0.8%**	**-0.7%**	**-0.7%**
TA Fund VIII	Active	2006	-17.0%	-11.6%	-7.9%	-6.4%	-4.8%	-2.7%	-0.9%	-0.6%	-0.2%	-0.1%	-0.1%
TA Realty Associates Fund X	Active	2012	N/A	N/A	N/A	NM	9.0%	12.7%	13.8%	12.3%	12.6%	12.4%	12.4%
Realty Associates Fund XI	Active	2015	N/A	N/A	N/A	N/A	N/A	N/A	NM	-1.2%	5.8%	8.5%	8.1%
Rockwood Capital Real Estate Partners Fund X, L.P.	Active	2016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-4.2%	-0.7%	5.0%	5.0%
Lubert-Adler Real Estate Fund VII-B, L.P.	Active	2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-6.5%	8.2%	7.1%
AG Realty Fund X, L.P.	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0%
Realty Associates Fund XII	Active	2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NM
Total Value-Add			**-17.0%**	**-11.6%**	**-7.9%**	**-6.4%**	**-4.0%**	**-0.5%**	**2.0%**	**2.6%**	**3.3%**	**4.2%**	**4.3%**
Total Real Estate Portfolio			**-10.1%**	**0.9%**	**2.7%**	**3.5%**	**5.7%**	**7.0%**	**7.4%**	**7.5%**	**7.9%**	**7.9%**	**7.8%**

See section 7 for notes.

Performance by Manager, Real Estate Portfolio

Inception to 6/30/2019

Investment	Number of Investments	Commitments	Unfunded Commitments	Total Paid-In	Total Distributions	Net Asset Value	Total Value[1]	DPI[2]	TVPI[3]	IRR
Angelo, Gordon & Co.	5	$475,000,000	$288,596,250	$193,623,424	$30,528,384	$200,429,296	$230,957,680	0.16x	1.19x	12.1%
Blackstone Real Estate Advisors	8	900,000,000	434,256,611	552,573,553	644,033,944	224,225,360	868,259,303	1.17x	1.57x	10.0%
Carlyle Group	1	150,000,000	135,175,253	14,847,362	13,748	12,085,479	12,099,227	0.00x	0.81x	-23.7%
Colony Realty Partners	1	100,000,000	0	99,660,860	173,622,105	2,996,500	176,618,605	1.74x	1.77x	14.5%
Landmark Partners Real Estate	1	149,500,000	109,966,051	39,820,779	17,034,494	29,173,061	46,207,555	0.43x	1.16x	22.2%
Lubert-Adler	1	75,000,000	36,072,369	39,779,763	1,731,088	41,440,409	43,171,498	0.04x	1.09x	7.1%
Rockpoint Group	2	200,000,000	126,125,220	87,501,883	18,087,068	84,880,438	102,967,506	0.21x	1.18x	11.4%
Rockw ood Capital	1	100,000,000	27,838,939	73,869,859	5,136,364	73,726,546	78,862,910	0.07x	1.07x	5.0%
Silverpeak Real Estate Partners	2	225,000,000	88,723,414	141,846,206	101,443,291	14,397,609	115,840,901	0.72x	0.82x	-3.2%
TA Associates Realty	4	400,000,000	100,000,000	300,000,000	220,740,026	151,067,757	371,807,783	0.74x	1.24x	4.2%
Total Real Estate Portfolio	**26**	**$2,774,500,000**	**$1,346,754,106**	**$1,543,523,689**	**$1,212,370,512**	**$834,422,455**	**$2,046,792,967**	**0.79x**	**1.33x**	**7.8%**

See section 7 for notes.

Section 7:
Notes

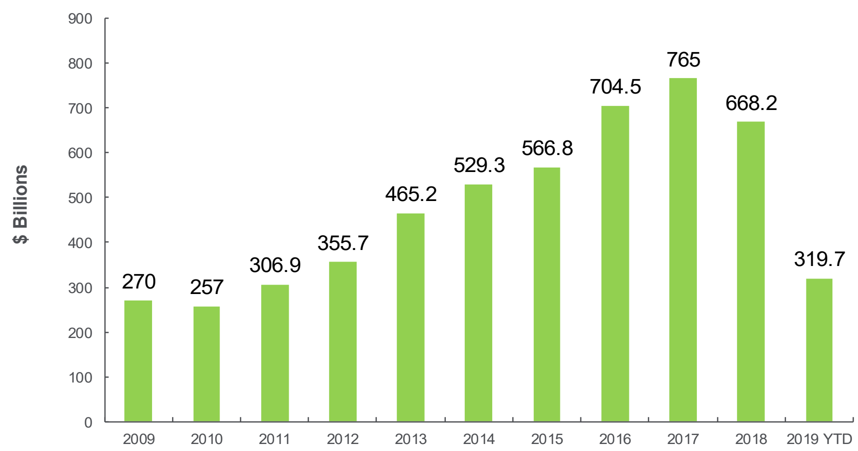
Notes

1. Total Value = Total Distributions + Net Asset Value
2. DPI = Total Distributions/Total Paid-In
3. TVPI = Total Value/Total Paid-In
4. The Public Market Equivalent (PME) return is measured against US CPI using the Long-Nickels/Index Comparison Method (ICM) methodology. This methodology calculates the hypothetical return that could have been achieved by purchasing/selling shares in the index on the same dates and in the same amounts as the cash flows to/from the private market portfolio.
5. Potential Market Exposure = Net Asset Value + Unfunded Commitments

Appendix A:
Private Equity Market Overview

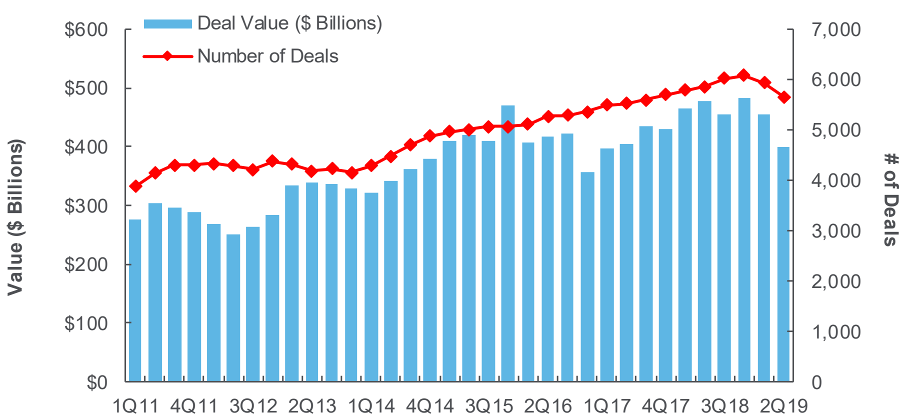
Private Equity Overview

Total Funds Raised



Source: Preqin

LTM Global Private Equity-Backed Buyout Deal Volume



Source: Preqin

Fundraising

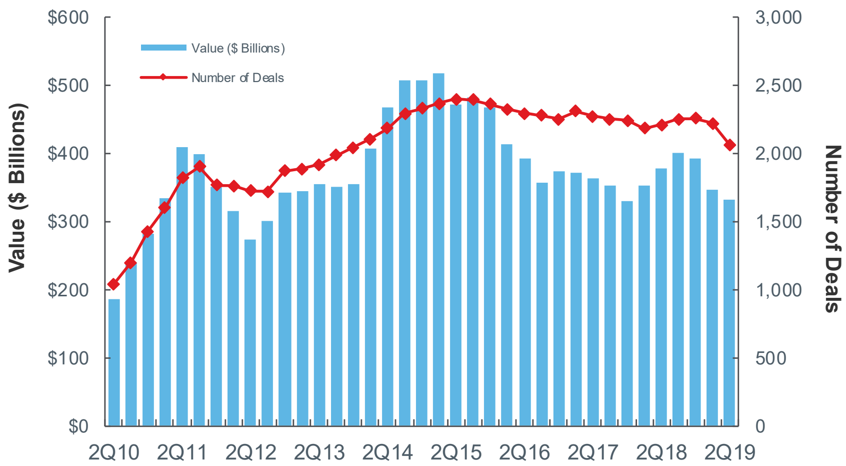
- In 2Q 2019, $178.1 billion was raised by 366 funds, which was an increase of 25.8% on a capital basis and an increase of 0.3% by number of funds from the prior quarter.[1]
  - 2Q 2019 fundraising was 13.3% higher on a capital basis than 2Q 2018.
  - Relative to the five-year quarterly average, the number of funds raised decreased by 32.7% while the total capital raised increased by 8.2%, strengthening the observation that larger amounts of capital are being raised by fewer funds.
  - The majority of 2Q 2019 capital was raised by funds with target geographies in North America, comprising 59.7% of the quarterly total. Capital targeted for Europe made up 25.5% of the total funds raised during the quarter, while the remainder was attributable to managers targeting Asia and other parts of the world.
- Dry powder stood at nearly $2.0 trillion at the end of the quarter, a modest increase compared to the previous quarter.[1]

Activity

- In 2Q 2019, 1,305 deals were completed for an aggregate deal value of $77.7 billion as compared to 1,264 transactions totaling $106.4 billion in 1Q 2019.[1]
  - This was 26.6% lower than the five-year quarterly average deal volume of $105.8 billion.
- European LBO transaction volume totaled €7.4 billion in 2Q 2019, representing roughly 29.7% of 2018's total LBO loan volume.[3]
- At the end of 2Q 2019, the average purchase price multiple for all U.S. LBOs was 11.2x EBITDA, up compared to the year-end 2018 (10.6x) and up from the five-year average (10.2x). Large corporate purchase price multiples stood at 11.0x through 2Q 2019, up from with the 10.6x observed at year-end 2018.[3]
  - For all U.S. LBOs, this quarter was 1.1x and 2.0x turns (multiple of EBITDA) above the five and ten-year average levels, respectively.
- European multiples for transactions greater than €1.0 billion averaged 11.3x in the second quarter, equal to that witnessed in the first quarter. Transactions greater than €500.0 million saw a slight increase of 0.1x in purchase multiples and ended the quarter at 11.0x.[3]
- Debt remained broadly available in the U.S.
  - U.S. average leverage levels in 2Q 2019 were 5.7x compared to the five and ten-year averages of 5.7x and 5.2x, respectively.[3]
  - The amount of debt issued supporting new transactions increased compared to year-end 2018 from 68.2% to 72.2%, which is also higher than the 61.7% average level over the prior five years.[3]
- In Europe, average senior debt/EBITDA through 2Q 2019 was 5.6x, up from the 4.7x observed year-end 2018. This was also up over the five-year average of 5.1x and ten-year average level of 4.5x.

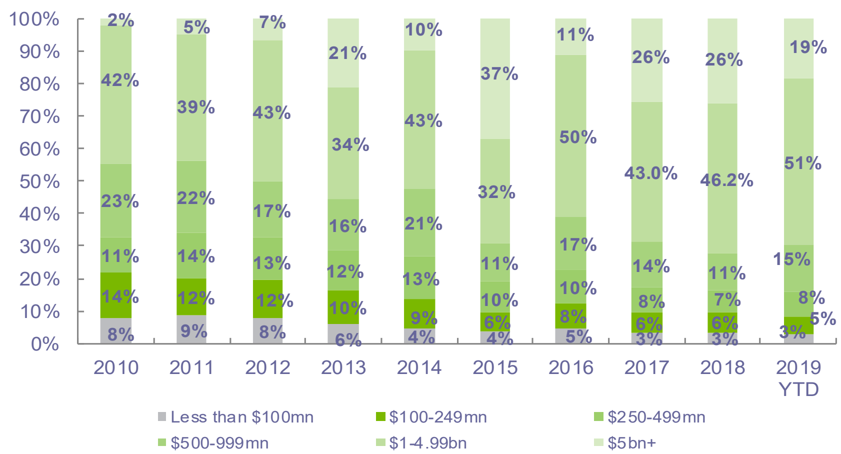
Buyouts / Corporate Finance

LTM PE Exit Volume and Value



Source: Preqin

M&A Deal Value by Deal Size



Source: Preqin

Fundraising

- $103.8 billion was closed on by 89 buyout and growth funds in 2Q 2019, compared to $64.4 billion raised by 111 funds in 2Q 2018.[1]
  - This was higher than the five-year quarterly average of $83.1 billion.
  - Advent Global Private Equity IX was the largest fund raised, closing on $17.5 billion.[1]
- Buyout and growth equity dry powder was estimated at $948.2 billion, which surpassed the $930.5 billion observed at the end of 1Q 2019. This was substantially higher than the five-year average level of $675.5 billion.[1]
  - Aside from mega funds, which increased 5.1% quarter-over-quarter, buyout dry powder decreased across all fund size categories in 2Q 2019. Middle-market fund dry powder exhibited the largest decrease during the quarter (2.1%), and is now estimated at $123.8 billion. Large and small market buyout dry powder finished the quarter down 1.3% and 0.4%, respectively, from 1Q 2019.[1]
  - An estimated 58.8% of buyout dry powder was targeted for North America, while European dry powder comprised 26.4% of the total.[1]

Activity

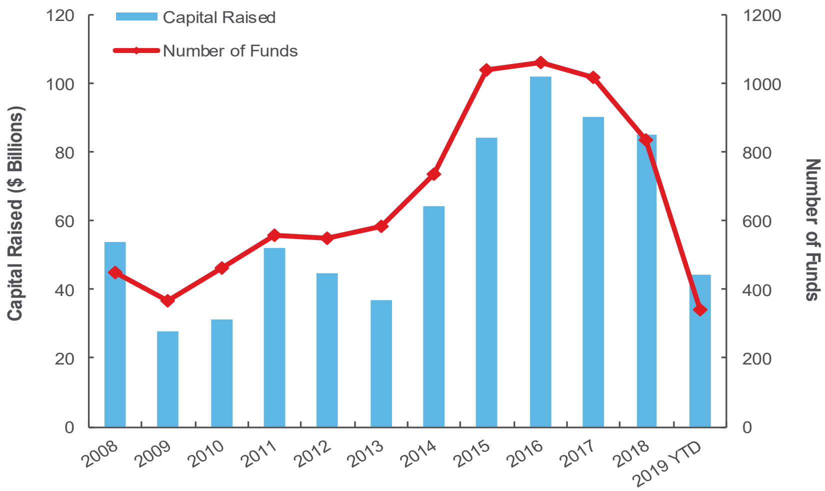
- Global private equity-backed buyout deals totaled $77.7 billion in 2Q 2019, which was a decrease of 27.0% and 26.6% from 1Q 2019 and the five-year quarterly average, respectively.[1]
  - 1,350 deals were completed during 2Q 2019, which was up 6.8% from 1Q 2019 and down 1.1% compared to the five-year quarterly average.
  - In 2Q 2019, deals valued at $1-4.99 billion accounted for an estimated 60.1% of total deal value during the quarter compared to 46.2% in 2018 and 43.0% in 2017.[1]
- Entry multiples for all transaction sizes in 2Q 2019 stood at 11.3x EBITDA, up from 2018's level (10.6x).[3]
  - Large corporate purchase price multiples stood at 10.8x during the quarter, up from the 10.6x observed at year-end 2018.[3]
  - The weighted average purchase price multiple across all European transaction sizes averaged 11.1x EBITDA in 2Q 2019, down from the 11.3x seen at year-end 2018. Purchase prices for transactions of €1.0 billion or more remained at 11.3x during the quarter.
  - Transactions greater that €500.0 million were up 0.1x from 1Q 2019, and stood at 11.0x.[3]
  - The portion of average purchase prices financed by equity for all deals was 42.2% in 2Q 2019, up from 40.1% in 2018. This remained above the five and ten-year average levels of 39.9% and 39.8%, respectively.[3]
- Globally, exit value totaled $104.7 billion from 453 deals in 2Q 2019 compared to $40.8 billion for 460 deals in 1Q 2019 and $119.4 billion across 610 deals in Q2 2018.[1]

Opportunity

- Operationally focused managers targeting the middle and large markets with expertise in multiple sectors

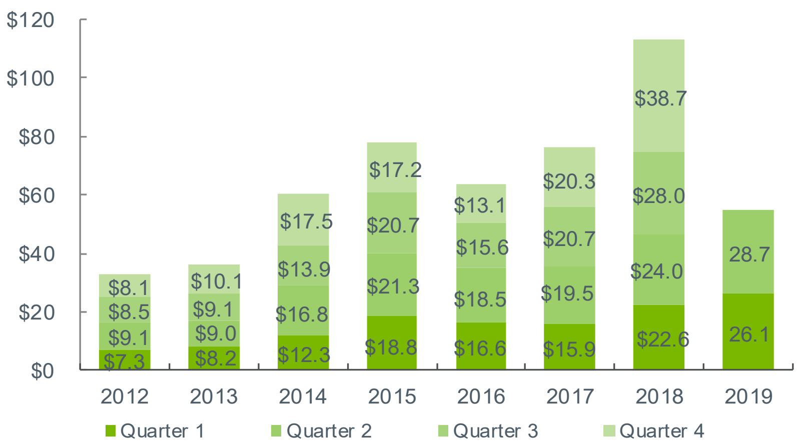
Venture Capital

Venture Capital Fundraising



Source: Preqin

U.S. Venture Capital Investments by Quarter ($B)



Source: PwC/CB Insights Report

Fundraising

- $22.1 billion of capital closed in 2Q 2019,up from the prior quarter total of $20.1 billion but down from the Q2 2018 total of $26.7 billion.[1]
  - 154 funds closed during the quarter, down 5.5% and 33.4% from the prior quarter and five year quarterly average, respectively.[1]
  - Andreessen Horowitz LSV Fund I was the largest fund raised during the quarter, closing on $2.2 billion.[16]
- The average fund size raised during the quarter was approximately $153.0 million, which was less than both the prior quarter of $154.0 million but higher than the five year quarterly average of $117.9 million.[1]
- Dry powder was estimated at $255.0 billion at the end of 2Q 2019, which was up from 1Q 2019's total of $239.9 billion. This was 54.7% higher than the five year average. An estimated 45.7% of dry powder was targeted for North America, followed by approximately 37.7% earmarked for Asia.[1]

Activity

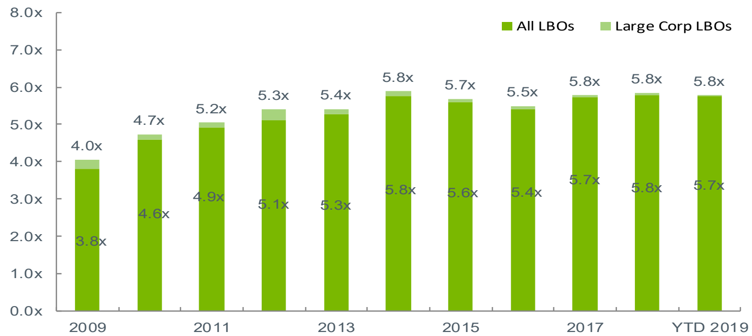
- During the second quarter, 1,409 venture-backed transactions totaling $28.7 billion were completed in the U.S., which was an increase on a capital and deal basis over the prior quarter's total of $26.1 billion across 1,362 deals. This was 41.4% higher than the five-year quarterly average of $20.3 billion. This was the second strongest quarter on a capital investment basis since Q2 2017 and marks the eighth consecutive quarter of $20.0 billion or more invested into venture-backed companies.[7]
  - The number of unicorns in the U.S., or companies with valuations of $1.0 billion or more, increased by 19 in 2Q 2019.[7]
- Median pre-money valuations increased across all deal stages except Series D during Q2. Seed, Series A, and Series B increased by 22.5%, 24.0%, and 16.5%, respectively, to valuations of $9.8 million, $24.8 million, and $75.0 million, respectively. Series C pre-money valuations increased by 21.9% quarter-over-quarter, ending at $195.0 million. Series D+ deal valuations, however, were down significantly by 39.6% quarter-over-quarter and are currently valued at $305.0 million.[9]
- Total U.S. venture backed exit activity totaled $138.3 billion across 198 completed transactions in 2Q 2019, up significantly on a capital basis from $50.1 billion in 1Q 2019.[8]
  - There were 34 venture-backed initial public offerings during the quarter, which was significantly higher than the 14 completed in 1Q 2019.[8]
  - The number of M&A transactions totaled 163 deals in 2Q 2019, barely up from 162 deals in Q1 2019.[7]

Opportunity

- Early stage continues to be attractive, although we are monitoring valuation increases
- Smaller end of growth equity
- Technology sector

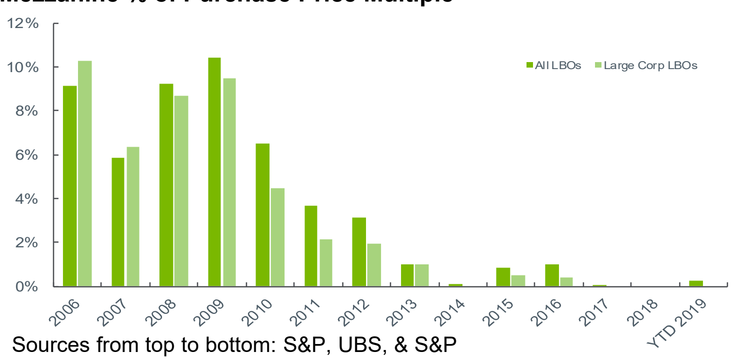
Leveraged Loans & Mezzanine

Average Leverage by Deal Size



Debt Issuance ($ Billions)

Mezzanine % of Purchase Price Multiple



Sources from top to bottom: S&P, UBS, & S&P

Leveraged Loans

Fundraising

- New CLO issuance totaled $63.7 billion through 2Q 2019, up $34.6 billion from 1Q 2019.[2]
- High-yield debt issuance totaled $71.7 billion in 2Q 2019, up from $60.5 billion issued in 1Q 2019.[2]
- Leveraged loan mutual fund net flows ended 2Q 2019 with a net outflow of $17.6 billion, compared to a net outflow of $10.1 billion through 1Q 2019.[2]

Activity

- Leverage for all LBO transactions ended the quarter at 5.7x, down slightly from 2018's level of 5.8x. Leverage continues to be comprised almost entirely of senior debt. The average leverage level for large cap LBOs was 5.8x during the quarter, up 0.1x from 1Q 2019.[3]
- YTD institutional new leveraged loan issuances totaled $146.9 billion through 2Q 2019, down significantly from the $270.4 billion issued during the same period in 2018.[2]
- 72.2% of new leveraged loans were used to support M&A and growth activity in 2Q 2019, down from 80.4% in 1Q 2019. This was above the prior five-year average of 61.7%.[3]
- European leveraged loan issuance decreased by 20.6% quarter-over-quarter to €12.0 billion, which was 35.4% of 2018's total sponsored loan volume.[3]
- High yield YTWs for BB, B, and CCC indices ended the quarter at 4.36%, 5.99%, and 10.14%, respecitvely.[2]

Opportunity

- Funds with the ability to source deals directly and the capacity to scale for large transactions
- Funds with an extensive track record and experience through prior credit cycles

Mezzanine

Fundraising

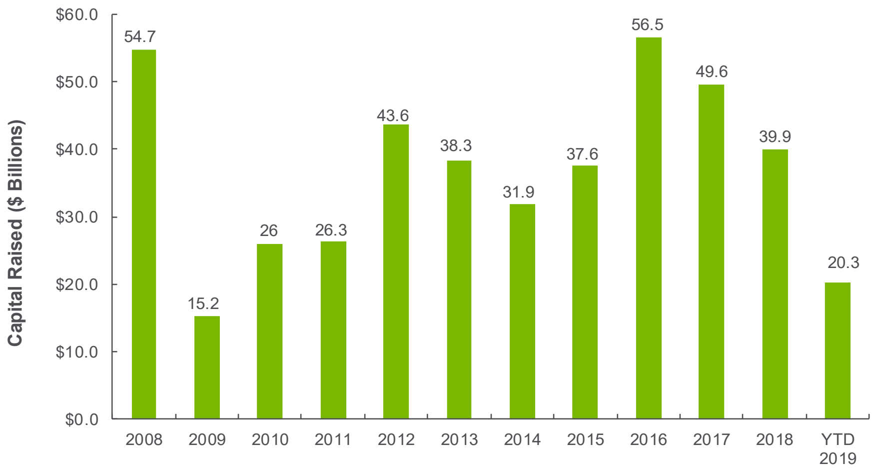
- Four funds closed on $1.2 billion during the second quarter. This was a significant decrease from the $12.4 billion raised by 10 funds in Q2 2018 and represented a decrease of 76.7% from the five-year quarterly average of $5.1 billion.[1]
- Estimated dry powder was $51.5 billion at the end of 2Q 2019, down from the $58.8 billion seen at the end of 1Q 2019.[1]
- Fundraising activity picked up with an estimated 73 funds in market targeting $29.0 billion of commitments, compared to 67 funds in market at the end of 2018 targeting $25.0 billion of commitments. HPS Mezzanine Partners 2019 is the largest fund in market, targeting commitments of $8.0 billion.[1]

Opportunity

- Funds with the capacity to scale for large sponsored deals

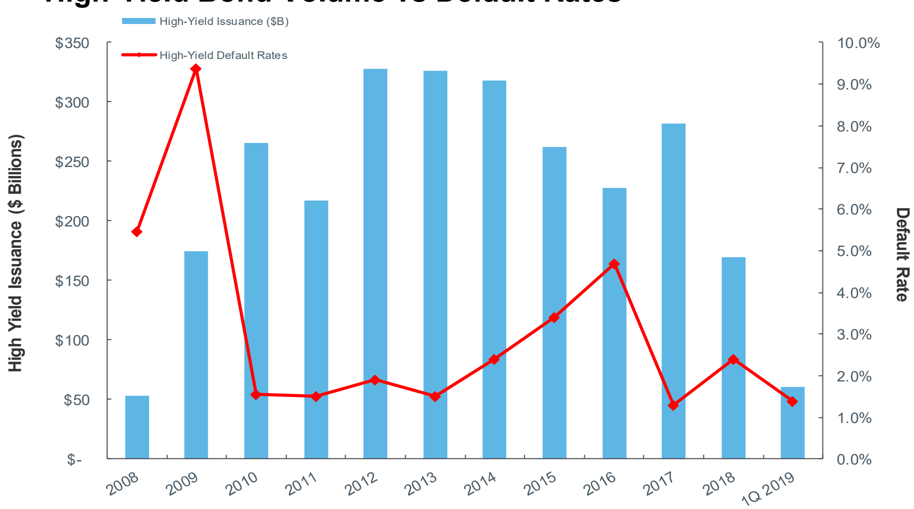
Distressed Private Markets

Distressed Debt, Turnaround, & Special Situations Fundraising



Source: Preqin

High-Yield Bond Volume vs Default Rates



Source: UBS & Fitch Ratings

Fundraising

- During the quarter, $15.3 billion was raised by 15 funds compared to $5.0 billion raised by 14 funds in 1Q 2019.[1]
  - 2Q 2019 fundraising was 39.6% higher than the five-year quarterly average of $11.0 billion.
  - GSO Energy Select Opportunities Fund II was the largest partnership raised during the quarter, closing on $4.5 billion.
- Dry powder was estimated at $119.4 billion at the end of 2Q 2019, up slightly from the $118.0 billion seen at the end of 1Q 2019. This was up compared to year-end 2018 ($117.5 billion). This remained above the five-year average level of $103.3 billion.[1]
- Roughly 118 funds were in the market at the end of 2Q 2019, seeking $59.7 billion in capital commitments.[1]
  - Distressed debt managers were targeting the most capital, seeking an aggregate $29.5 billion.
  - Fortress Credit Opportunities Fund V was the largest fund in market with a target fund size of $5.0 billion.

Activity

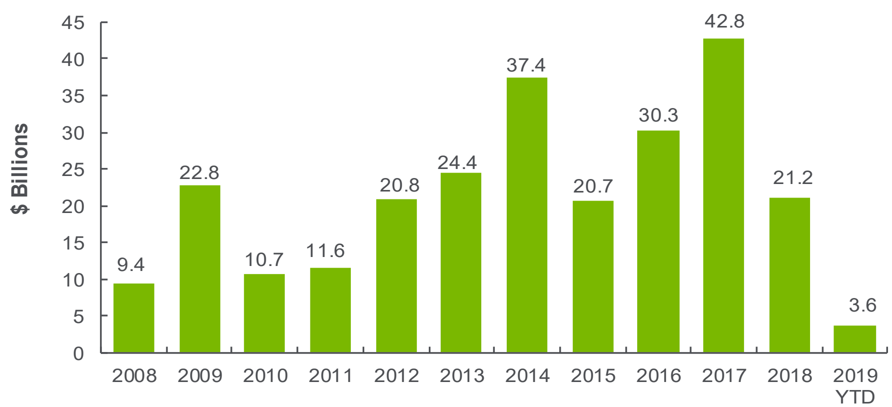
- The LTM U.S. high-yield default rate was 1.9% as of July 2019, which was down from year-end 2018's LTM rate of 2.4%.[6]
- While spreads remained in line with the prior period, a declining LIBOR rate saw yields tighten during the quarter. Credit markets are bracing for a volatile period moving forward, which may result in opportunities for lenders.[4]
- High purchase prices and continued elevated levels of leverage may result in an increase in distressed opportunities looking out over the next two to three years, or sooner if there is a stall in the economy.

Opportunity

- Funds capable of performing operational turnarounds
- Funds with the flexibility to invest globally

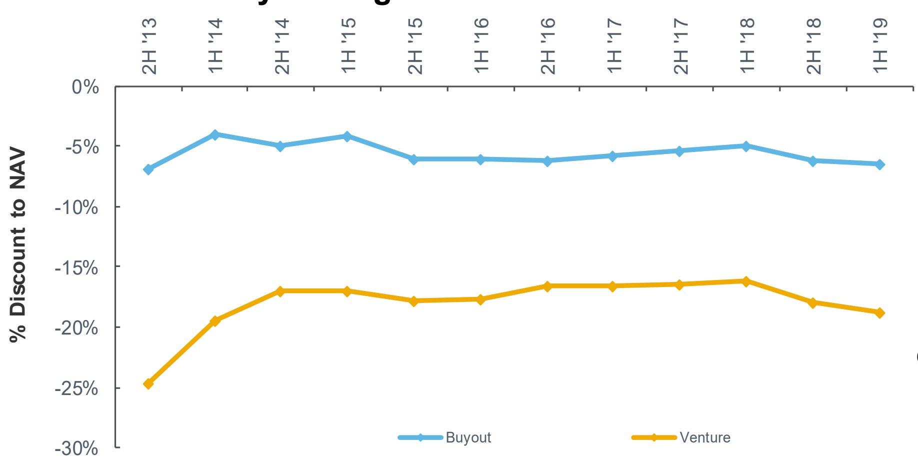
Secondaries

Secondary Fundraising



Source: Preqin

Secondary Pricing



Source: UBS

Fundraising

- Four funds raised $1.5 billion during the quarter, down from the $2.2 billion raised by nine funds in Q1 2019 and the $9.0 billion raised by ten funds in Q4 2018.[1]
  - 2Q 2019's aggregate capital raised represents 6.4% of 2018's full year total.
  - Adams Street Global Secondary Fund VI was the largest fund raised during the quarter, closing on $1.05 billion.[1]
- Approximately 73% of secondaries funds in market are raising capital to target North America, up 54% from 1H 2018. An estimated 84% of secondaries funds are targeting private equity investments.[1]
- At the end of 2Q 2019, there were an estimated 58 secondary and direct secondary funds in market, targeting approximately $74.6 billion. Ardian Secondaries Fund VIII and Lexington Capital Partners IX were the largest funds in the market targeting $12.0 billion each.[1]
  - Two funds, Ardian Secondaries Fund VIII and Lexington Capital Partners IX ($12.0 billion target), represent 32.2% of all capital being raised.[1]

Activity

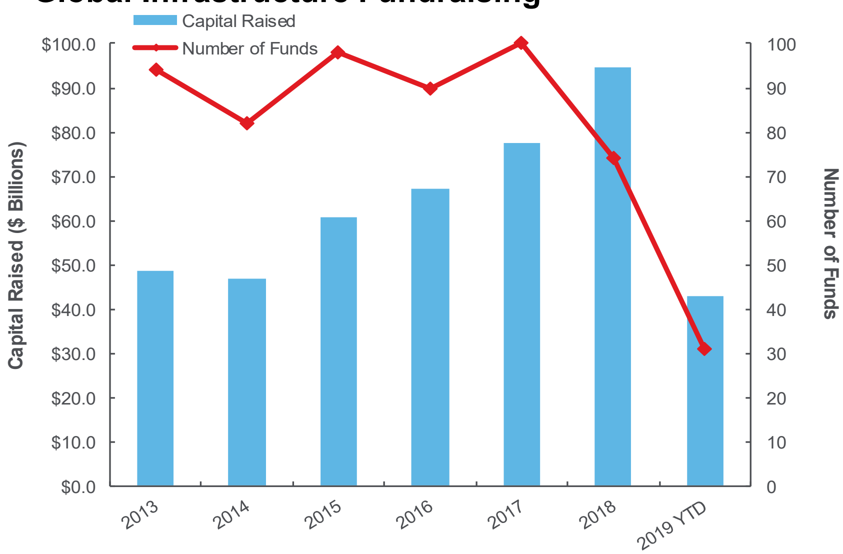
- Buyers have increasingly turned to leverage in their transactions in order to support attractive pricing and transaction execution. The spreads between committed capital and drawn capital by secondary purchasers has increased over the last quarter (and year).[2]
- The average discount rate for all private equity sectors finished Q2 2019 at 9.2%, down from 9.5% at the end of Q1 2019. The average buyout pricing discount ended at 6.4%, while venture ended at a discount of 18.8%.[2] The average buyout pricing discount for Q2 was down from Q1 2019's 6.8% discount, while the venture discount was up from 18.5%.
- Pricing, while having become slightly less favorable for buyers over the last quarter, is expected to remain attractive for sellers given the continued high levels of dry powder and competition for secondary transactions. Pricing increased marginally in Q2 due to reduced public market volatility and a slight decline in secondary fundraising.[2]
- For buyout pricing, tail-end vintages were being traded at larger discounts, while top performing funds continued to obtain premiums for their assets. While there is support and interest in pre-2010 vintage funds, there is significant volume and competition for younger vintages where premiums are often being commanded.[2]

Opportunity

- Funds that are able to execute complex and structured transactions at scale
- Funds that are able to leverage their long-standing relationships and networks in the secondaries marketplace
- Niche strategies

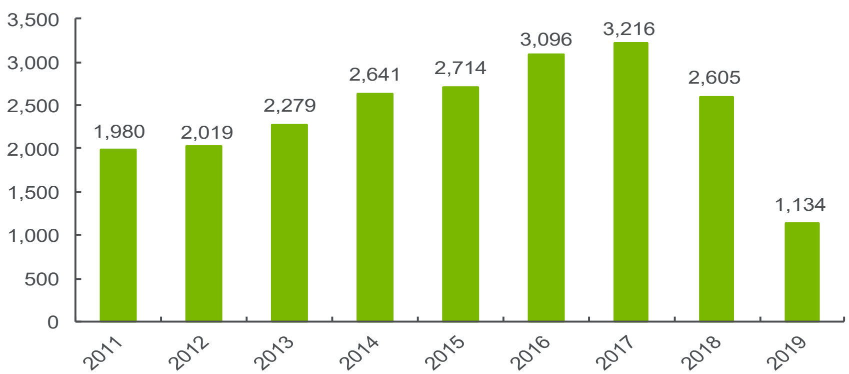
Infrastructure

Global Infrastructure Fundraising



Source: Preqin

Number of Deals Completed



Source: Preqin

Fundraising

- $23.1 billion of capital was raised by 29 funds in 2Q 2019 compared to $18.3 billion of capital raised by 21 partnerships in 1Q 2019, as capital continues to be concentrated around a smaller set of infrastructure managers.[1]
  - About 87.4% of the capital raised is targeting investment in North America or Europe.[1]
- As of the end of 1Q 2019, there were an estimated 173 funds in the market seeking roughly $162.0 billion, compared to 210 funds targeting $190.0 billion in 1Q 2019.[1]
  - The majority of infrastructure funds in market are targeting capital commitments of $1.0 billion or more.[1]
  - Global Infrastructure Partners IV and Brookfield Infrastructure Fund IV were the largest funds in the market as of the end of 2Q 2019, targeting $20.0 billion each. Both are focused on making investments within the U.S.[1]
- At the end of the quarter, dry powder stood at an estimated $217.0 billion, up from Q1 2019 of $185.0 billion.[1] Current dry powder levels for infrastructure are at five year highs.[1]
- Concerns surrounding the relative availability and pricing of assets remain. Fundraising continues to be very competitive given the number of funds and aggregate target level of funds in market. Investor appetite for the asset class persists despite the record levels of dry powder and increased investment activity from strategic and corporate buyers as well as institutional investors.

Activity

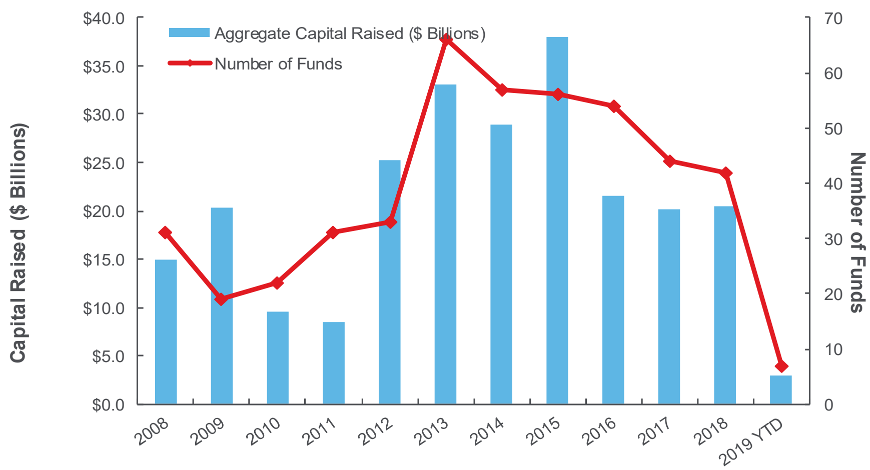
- Infrastructure managers completed 582 deals with an estimated aggregate deal value of $155.0 billion in 2Q 2019 compared to 552 deals totaling $63.0 billion a quarter ago.[1] The average deal value during the quarter was $266.3 million, up compared to the five-year average of $135.0 million.
  - North America accounted for 33.5% of the deals in 2Q 2019, while 36.6% and 12.2% of deals were transacted in Europe and Asia, respectively.[1]
  - Renewable energy was the dominant industry during the quarter with 52.9% of transactions, followed by the utilities and conventional energy sectors, which accounted for 14.4% and 13.9%, respectively, of the quarter's deals. Transport accounted for 9.6% of transactions.[1]

Opportunity

- Greenfield infrastructure is less competitive and offers a premium for managers willing to take on construction risk

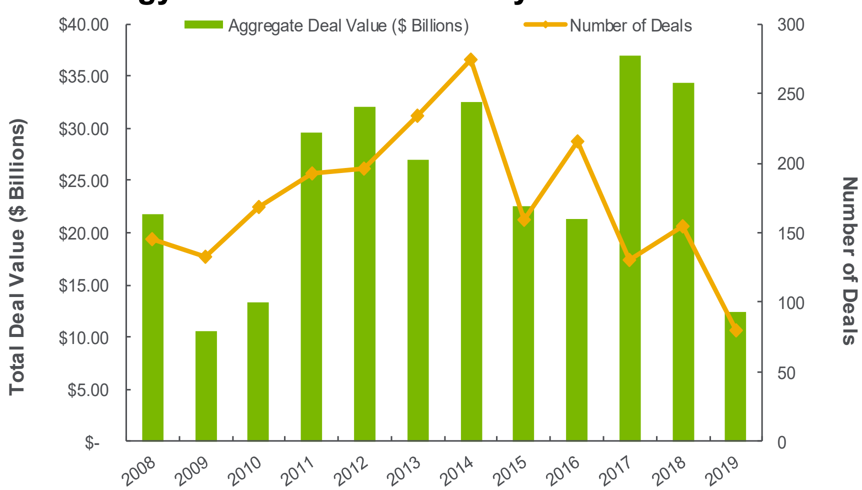
Natural Resources

Natural Resources Fundraising



Source: Preqin

Energy & Utilities Deal Activity



Source: Preqin

Fundraising

- During 2Q 2019, two funds closed on $0.4 billion compared to five funds totaling $1.5 billion in 1Q 2019.[1]
- At the end of 2Q 2019, there were roughly 97 funds in the market targeting an estimated $36.6 billion in capital, compared to 94 funds seeking an estimated $36.1 billion in 1Q 2019.[1]
  - NGP Natural Resources XII was seeking the most capital with a target fund size of $5.3 billion.
- Dry powder was estimated at $49.7 billion at the end of 2Q 2019, which was down 7.8% from 1Q 2019's level, and remains below the record level of $72.1 billion observed in 4Q 2015.[1]

Activity

- Energy and utilities industry managers completed 80 deals totaling a reported $12.4 billion in 2Q 2019, representing 51.6% and 36.1% of 2018's total deal activity and total deal value, respectively.[1]
- Crude oil prices decreased during the quarter.
  - WTI crude oil prices decreased 6.0% during the quarter to $54.66/bbl.[11]
  - Brent crude oil prices ended the quarter at $64.22/bbl, down 2.9% from Q1 2019.[11]
- Natural gas prices (Henry Hub) decreased by a significant 18.6% during the second quarter, ending at $2.40 per MMBtu.[11]
- A total of 958 crude oil and natural gas rotary rigs were in operation in the U.S. at the end of 2Q 2019, down 5.4% from the prior quarter. Crude oil rigs represented 81.8% of the total rigs in operation, while gas rigs represented 18.0% of the total rigs in operation.[15]
- The price of iron ore (Tianjin Port) ended the second quarter at $108.94 per dry metric ton, up by 26.0% quarter-over-quarter.[12]

Opportunity

- Acquire and exploit existing oil and gas strategies preferred over early stage exploration in core U.S. and Canadian basins
- Select midstream opportunities

Notes

1. Preqin
2. UBS
3. Standard & Poor's
4. Aon Hewitt Investment Consulting
5. Moody's
6. Fitch Ratings
7. PriceWaterhouseCoopers/National Venture Capital Association MoneyTree Report
8. PitchBook/National Venture Capital Association Venture Monitor
9. Cooley Venture Financing Report
10. Federal Reserve
11. U.S. Energy Information Administration
12. Bloomberg
13. Setter Capital Volume Report: Secondary Market FY 2018
14. KPMG and CB Insights
15. Baker Hughes
16. Dow Jones Venture Capital Report

Notes:

FY: Fiscal year ended 12/31

YTD: Year to date

YE: Year end

LTM: Last twelve months (aka trailing twelve months or TTM)

PPM: Purchase Price Multiples: Total Purchase Price / EBITDA

/bbl: Price per barrel

MMBtu: Price per million British thermal units

Appendix B:
Real Estate Market Overview

United States Real Estate Market Update (2Q19)

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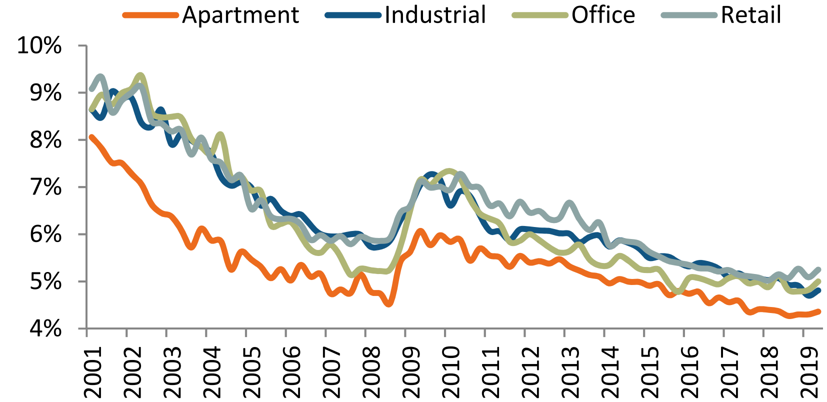
General

- The S&P 500 produced a gross total return of 4.3% during the quarter. The MSCI US REIT index produced a return of 1.3%. Consumer Sentiment remained flat at 98.2, but rose subsequent to quarter-end.
- Macro indicators for U.S. real estate continue to be positive; GDP grew at an annualized rate of 2.3% in the second quarter and headline CPI rose by 1.8% YoY, below the Fed's 2% target. As of quarter-end, the economy has now experienced 105 consecutive months of job growth. The Federal Reserve has paused its tightening of monetary policy, and cut the effective federal funds rate, which was 2.13% at quarter-end.

Commercial Real Estate

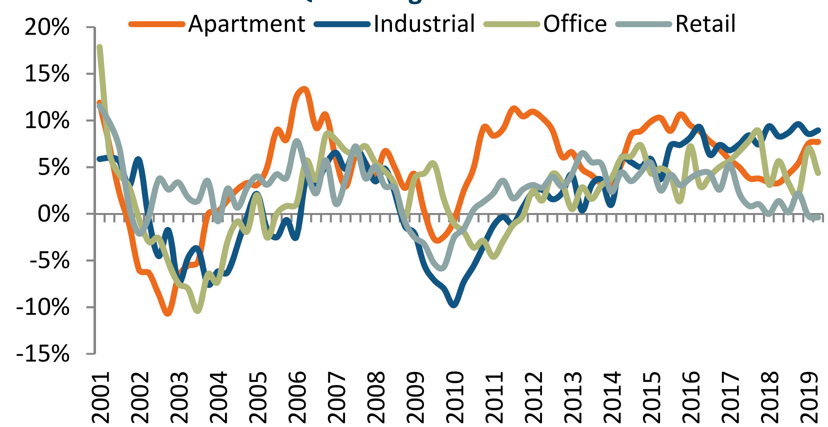
- Private real estate market carrying values remained flat over the quarter. Transaction cap rates (5.3%) compressed 5 bps during the quarter, while current valuation cap rates expanded across property sectors, apartments (+6 bps), industrial (+11 bps), office (+18 bps), and retail (+16 bps) .
- NOI growth by sector continued to deviate during the quarter, with the industrial and apartments sector continuing to outpace the other traditional property types. While the industrial sector has faced increasing supply, it continues to benefit from outsized demand tailwinds (e-commerce and economic growth). On the other hand, retail experienced negative 40 bps of NOI growth during the quarter.
- In the second quarter of 2019, $23 bn of aggregate capital was raised by real estate funds. In 2018, private equity real estate funds raised $236 bn which is an increase of 9% YoY. However, transaction volume declined during the 1st quarter by 18% year over year to $28 bn.
- 10-year treasury bond yields dropped 40 bps to 2.0% during the quarter, and, subsequent to quarter-end, have dropped further to 1.7%. A combination of expansionary fiscal policy and tightening monetary policy have led to increasing short-term interest rates and an inversion of the yield curve.

Current Value Cap Rates by Property Type



Source: NCREIF

4 Qtr Rolling NOI Growth



Source: NCREIF

Sources: Bureau of Economic Analysis, U.S. Census Bureau, Federal Reserve Board, NCREIF, Cushman and Wakefield, Real Capital Analytics, Bloomberg LP., Preqin, University of Michigan, Green Street

United States Property Matrix (2Q19)

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INDUSTRIAL

- In 2Q19, industrial properties were the highest returning sector at 3.4% and outperformed the NPI by 191 bps.
- Transaction volumes reached $19.1 billion in the second quarter of the year, a 4.0% year-over-year decrease. Individual asset sales were up 13.6% year-over-year, while portfolio sales drove the decline in year-over-year volume (-31.5%).
- The industrial sector continued to experience steady NOI growth of 8.9% over the past year, increasing from the prior periods TTM growth of 8.6% in 1Q19. Market rent growth is expected to decelerate compared to the recent phenomenal pace, but still remains strong.
- Vacancy declined 40 bps to 3.1%, close to all-time historic lows. E-commerce continues to drive demand.
- Industrial cap rates compressed approximately 12 bps from a year ago, to 4.8%. Industrial fundamentals still top all property sectors.

MULTIFAMILY

- The apartment sector delivered a 1.4% return during the quarter, underperforming the NPI by 9 bps.
- Transaction volume in the second quarter of 2019 reached $45.6 billion, an increase of 25.3% year-over-year. This volume continues to make multifamily the most actively traded sector for the eighth straight quarter.
- Cap rates increased to 4.4%, expanding 9 bps year-over-year. Robust job growth and improving wages have supported healthy operating fundamentals.
- Steady demand for the sector continues to keep occupancy above 94.3%, over a 1.0% increase from a year ago. Delayed deliveries from construction labor bottlenecks have created a gap between permitting activity and starts volume.

OFFICE

- The office sector returned 1.7% in 2Q19, 15 bps above the NPI return over the period.
- Transaction volumes increased by 36.4% year-over-year in Q2. Annual sales volumes equaled $39.5 billion for the quarter. Single asset transactions accounted for 77% of volume.
- Occupancy growth within the office sector has improved, increasing 1.0% year-over-year. Office continues to be the highest vacancy property type at close to 9.8%.
- NOI growth of 4.4% in the last year is a positive as the sector continues to benefit from positive job growth. Sun Belt and tech-oriented West Coast office fundamentals are healthiest.
- Office cap rates compressed slightly from a year ago to approximately 4.8% in the second quarter. Office-using job growth is positive, though decelerating as expected.

RETAIL

- As of 2Q19, the retail sector delivered a quarterly return of -0.1%, performing 162 bps below the NPI.
- Transaction volumes totaled $16.9 billion in the second quarter, down 22.7% year-over-year.
- Cap rates have expanded approximately 25 bps within the sector over the last year. Strong fundamental headwinds continue to effect the retail landscape.
- NOI growth has been negative for five consecutive quarters. NOI has declined 40 bps over the past year. Retail is expected to continue to suffer from the shift towards e-commerce.
- Retail vacancy rates declined 74 bps over the past year to 6.8%. Many big box stores have closed as the need for retail space shrinks, translating to a negative outlook for rent growth.

Sources: Real Capital Analytics, Green Street, US Census Bureau, NCREIF

Global Real Estate Market Update (2Q19)

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- Global investment activity during the second quarter of 2019 continues to slow, and YoY transaction activity has decreased.

- Geopolitical uncertainty and its potential impacts on the global real estate markets has remained a principal concern for investors. However, global commercial real estate is still positioned to steadily perform in 2019. Despite compressing yields, broad decreases in risk-free rates has increased the value of real estate yields. Capital values and rents are expected to increase during the year. However, full-year global investment volumes are expected to decline by 5-10%, especially in the office and retail sectors.

Global Total Commercial Real Estate Volume - 2018 - 2019

$ US Billions	Q2 2019	Q2 2018	% Change Q2 19 - Q2 18	H1 2019	H1 2018	% Change H1 19 - H1 18
Americas	120	114	5%	214	221	-3%
EMEA	67	79	-15%	126	158	-20%
Asia Pacific	257	211	22%	433	428	1%
Total	444	404	10%	773	807	-4%

Source: Real Capital Analytics, Inc., Q2' 19

- In the second quarter, investment volumes in the Americas to decline YoY, led by the U.S., Brazil, and Mexico.

- Asia-Pacific cross-border investment activity slightly decreased in the second quarter. Despite this, Asia-Pacific has shown the best first-half of the year performance on record. This growth was driven by robust activity in China and Singapore.

- In EMEA, the decline in investment volume is largely attributable to uncertainty over Brexit in the UK and ongoing structural changes in the retail sector.

- In the office sector, leasing activity continued to increase through the second quarter of 2019. The U.S office market continued to perform well, driven by demand from the technology and co-working industries. Europe's net absorption outperformed the 10 year average, led by performance in Madrid. In Asia Pacific's office market gross leasing volumes witnessed a 30% year-over year decline due to limited availability of space, economic uncertainty and trade tensions. Globally, aggregate rental growth for prime office locations is expected to stay positive in 2019 and office vacancy is expected to continue to fall.

- In the retail sector, the U.S. net absorption declined by 45% YoY in the second quarter. Strengthening labor markets and wage growth in Europe has positively impacted consumer spending, and retailers continue to focus on rightsizing their store portfolios. Asia Pacific retailers are focusing their efforts on providing unique products and targeting niche consumer segments. Australia is experiencing challenging retailer market pressures and rising incentives leading to modest rental growth.

- The multifamily market in the U.S. has continued to see growth in demand and declines in vacancy rates. There has been an increase in construction activity which is likely to lead to some near-term supply headwinds. Investment activity in European multifamily markets was lower due to rent control regulation leading to investor caution.

- The global industrial market continued to perform well during the quarter, with vacancy rates in the U.S. and Asia Pacific at all-time lows, as demand continues to be robust. U.S. rental rates are excepted to increase, driven by robust leasing momentum. Demand has been strong in the European logistics market as well, however, a slight deceleration in the rate of growth suggests the sector may be entering a stage of stabilization.

Global Outlook - GDP (Real) Growth % pa, 2019-2021

	2019	2020	2021
Global	**3.2**	**3.2**	**3.0**
Asia Pacific	**4.5**	**4.5**	**4.6**
Australia	1.9	2.5	2.6
China	6.2	6.0	5.8
India	6.6	6.7	7.0
Japan	1.0	0.3	0.9
North America	**2.2**	**1.8**	**1.8**
US	2.3	1.8	1.8
MENA*	**2.6**	**2.9**	**3.1**
European Union	**1.4**	**1.4**	**1.5**
France	1.3	1.3	1.4
Germany	0.6	0.9	1.2
UK	1.2	1.2	1.5

*Middle East North Africa

Source: Bloomberg

Note: 2021 projections are not yet available for certain regions

Sources: Jones Lang LaSalle Research, Real Capital Analytics, Inc.

Appendix C: Glossary

Glossary of Terms

- **Private Equity:** Private equity is broadly defined as investments in privately-negotiated securities that typically do not trade in a capital market. Investments are typically illiquid and long-term in nature, thereby introducing greater risk into a portfolio, which is generally rewarded by higher returns than traditional asset classes.

Fund Classifications by Strategy

- **Buyout/Corporate Finance:** A fund investment strategy involving the acquisition of a product or business from either a public or private company, utilizing debt and equity.
  - Buyout Fund Classifications by Fund Size:
    - Small < $500 million
    - Medium $500 million - $ 1 billion
    - Large $1 billion - $5 billion
    - Mega > $5 billion
  - Buyout Fund Classifications by Portfolio Company Enterprise Value:
    - Small < $100 million
    - Medium $100 million - $1 billion
    - Large $1 billion - $3 billion
    - Mega > $3 billion
- **Co-Investment:** The syndication of a private equity financing round or an investment by a general partner alongside a private equity fund in a financing round.

Glossary of Terms (cont'd)

Fund Classifications by Strategy (cont'd)

- **Direct Lending:** Private direct lending involves a limited number of investors that structure terms of a transaction directly with a middle-market or small corporate borrower. Private loans offer either a fixed or variable coupon payment due either monthly or quarterly, typically with a "LIBOR-plus" floating rate structure (LIBOR refers to the London Interbank offer rate, a commonly used risk-free rate). The term of the loan tends to be in the 24-60 month range. There is generally a limited public market for these loans and they are usually refinanced prior to maturity or held to maturity by one or a relatively small number of investors. Senior secured private debt securities are arranged in the form of term loans and revolving credit facilities. The loan is typically backed by collateral such as property, plant, equipment, inventory, receivables, or trade claims.
- **Distressed Debt:** A fund investment strategy involving investment in equity or debt of companies that are unable to service existing debt, often including companies in, or preparing to enter, bankruptcy.
- **Fund of Funds:** A fund set up to distribute investments among a selection of private equity fund managers, who in turn invest the capital directly. Funds of funds are specialist private equity investors and have existing relationships with direct private equity managers. They may be able to provide investors with a route to investing in particular funds that would otherwise be closed to them or provide a broadly-diversified private equity portfolio through the investment of a small amount of capital.
- **Growth:** Growth equity investments exhibit similar characteristics to venture capital and buyout investments. Deals are often venture capital-like (structured equity) and ownership can be minority or control. Companies exhibit high revenue growth and may or may not be profitable.
- **Infrastructure:** A fund investment strategy involving investment in equity and debt securities in transportation, communication, sewage, water and electric systems. These systems tend to be high-cost investments however they are needed for a country to be efficient and productive.
- **Mezzanine:** A fund investment strategy involving subordinated debt (the level of financing senior to equity and below senior debt).

Glossary of Terms (cont'd)

Fund Classifications by Strategy (cont'd)

- **Secondaries:** A fund investment strategy where the buyer purchases pre-existing limited partnership interests, typically at a discount to Net Asset Value.
- **Venture Capital:**
  - Seed – An entrepreneur has a new idea or product, but no established organization or structure. Investors tend to provide a few hundred thousand dollars and perhaps some office space to an entrepreneur who needs to develop a business plan.
  - Early Stage – The organization has been formed and has employees, and products are in the developmental stage. Early stage investors back companies when they have a completed business plan, at least part of a management team in place, and perhaps a working prototype.
  - Late Stage – An established infrastructure is in place, and the company has a viable product that is market-ready and generating revenues. Late stage investors typically provide financing for expansion of a company that is producing, shipping and increasing its sales volume.

Glossary of Terms (cont'd)

- **Capital Contribution:** The amount of capital drawn down by the general partner. Also known as the paid-in capital.
- **Carried Interest:** The performance fee a general partner receives once the limited partners have received their return of capital and preferred return.
- **Catch-Up:** The provision that dictates how distributions from a fund will be allocated between the limited partners and the general partner once the limited partners have received their preferred return. The catch-up rate determines how quickly the general partner earns its carried interest.
- **Commitment:** A limited partner's obligation to provide a certain amount of capital to a fund.
- **Distribution:** The value of the cash and stock disbursed to the partners of a fund.
- **DPI:** "Distributions to Paid-In Capital". The ratio of cumulative distributions to cumulative paid-in. Used to measure to what extent the value of an investor's position is realized relative to the cash paid-in.
- **Final Closing:** The final date at which new investors can subscribe to a closed-end fund.
- **First Closing:** The date at which a general partner receives and executes the initial subscription documents for a closed-end fund and can begin drawing capital from investors.
- **Hurdle**: The return that the limited partners of a fund must earn before the general partner is entitled to receive carried interest. Also known as the Preferred Return.
- **IRR:** "Internal Rate of Return". The discount rate that equates the net present value of an investment's cash inflows with its cash outflows. The IRR is determined by both the timing and magnitude of a fund's cash flows and thus is known as a dollar-weighted return. This is a more appropriate performance metric for closed-end funds than a time-weighted return because the general partner determines the timing and magnitude of cash flows.
- **J-Curve:** The curve that results from plotting the since inception returns or cumulative net cash flows of a fund over time.
- **Net Asset Value:** The carrying value of the remaining investments. Also known as the Market Value or Fair Market Value.

Glossary of Terms (cont'd)

- **Pooled IRR:** A method of calculating an aggregate IRR for multiple investments by totaling cash flows and net asset values to create a portfolio-level stream of cash flows and valuations. Pooled IRRs are commonly used to measure the aggregate performance of all investments of a given vintage year, strategy or manager within a given portfolio.
- **RVPI:** "Residual Value to Paid-In Capital". The ratio of net asset value to cumulative paid-in. Used to measure to what extent the value of an investor's position is unrealized relative to the cash paid-in.
- **Time-Weighted Return:** A method of measuring the performance of a portfolio over a particular period of time. Effectively, it is the return of one dollar invested in the portfolio at the beginning of the measurement period. This methodology is commonly used to measure manager performance of open-end funds, as the manager does not determine the timing or magnitude of cash flows into or out of the fund.
- **TVPI:** "Total Value to Paid-In Capital". The sum of DPI and RVPI. Used to measure the total realized and unrealized value of an investor's position relative to the cash paid-in. Also known as the Multiple on Invested Capital.
- **Unfunded Commitment:** The portion of a limited partner's commitment that remains to be called by the general partner. This is generally calculated as the commitment minus contributions plus recallable returns of capital.
- **Vintage Year:** For closed-end funds, generally the year in which the first drawdown of capital occurs. Evaluating a fund's performance against other funds of the same vintage year enables the comparison of funds that are investing during the same economic conditions. The vintage year is sometimes alternately determined by the year of the first close, final close or start of the investment period.

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