MEKETA
INVESTMENT GROUP

Plymouth County Retirement Association

March 29, 2022

Meeting Materials

Agenda

1. Estimated Retirement Association Performance As of February 28, 2022

2. Performance Update As of January 31, 2022

3. Current Issues

   - Peer Universe Review

   - Meketa White Paper: Insurance-Linked Securities

4. Appendices

   - Recent Meketa Investment Group Memorandums:

     – Market Update: Russian Invasion of Ukraine March 3, 2022

     – Market Update: Russian Invasion of Ukraine February 25, 2022

   - Disclaimer, Glossary, and Notes

Estimated Retirement Association Performance
As of February 28, 2022

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Estimated Aggregate Performance[1]

	February[2] (%)	QTD (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
Total Retirement Association	-0.9	-4.0	-4.0	9.2	11.3	9.1	8.2

Benchmark Returns

	February (%)	QTD (%)	YTD (%)	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
Russell 3000	-2.5	-8.3	-8.3	12.3	17.6	14.7	14.2
MSCI EAFE	-1.8	-6.5	-6.5	2.8	7.8	7.2	6.1
MSCI Emerging Markets	-3.0	-4.8	-4.8	-10.7	6.0	7.0	3.4
Barclays Aggregate	-1.1	-3.3	-3.3	-2.6	3.3	2.7	2.5
Barclays TIPS	0.9	-1.2	-1.2	6.0	7.5	4.8	2.7
Barclays High Yield	-1.0	-3.7	-3.7	0.6	5.3	4.9	5.9
JPM EMBI Global Diversified (Hard Currency)	-6.6	-9.2	-9.2	-7.5	0.8	1.9	3.9
S&P Global Natural Resources	4.7	8.7	8.7	24.4	13.0	10.8	4.2

Estimated Total Assets

	Estimate
Total Retirement Association	1,349,566,780

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[1] The February performance estimates are calculated using index returns as of February 28, 2022 for each asset class. No performance estimate was included for private equity, real estate, infrastructure, and private natural resources asset classes.

[2] As of February 2022

Performance Update
As of January 31, 2022

Allocation vs. Target	Current Balance	Current Allocation	Policy	Policy Range	Within IPS Range?
Domestic Equity	$303,813,376	22%	26%	21% - 36%	Yes
International Developed Market Equity	$43,506,839	3%	6%	1% - 16%	Yes
International Emerging Market Equity	$122,253,476	9%	10%	5% - 20%	Yes
Global Equity	$150,801,595	11%	10%	5% - 20%	Yes
Core Bonds	$147,379,994	11%	9%	4% - 14%	Yes
Value-Added Fixed Income	$102,421,390	8%	6%	2% - 12%	Yes
Private Equity	$170,275,849	13%	13%	4% - 18%	Yes
Real Estate	$136,943,600	10%	10%	5% - 15%	Yes
Real Assets	$83,316,507	6%	6%	2% - 10%	Yes
Hedge Fund of Funds	$88,312,432	6%	4%	2% - 8%	Yes
Cash	$12,765,608	1%	0%	0% - 3%	Yes
Total	**$1,361,790,666**	**100%**	**100%**		

	Current Balance	Current Allocation	Policy	Policy Range	Within IPS Range?
Total Equity	$862,395,797	63%	69%	60% - 80%	Yes
Total Fixed Income	$249,801,385	18%	15%	5% - 25%	Yes
Total Real Assets and Real Estate	$236,827,877	17%	16%	13% - 19%	Yes
Cash	$12,765,608	1%	0%	0% - 3%	Yes

Asset Allocation History
5 Years Ending January 31, 2022

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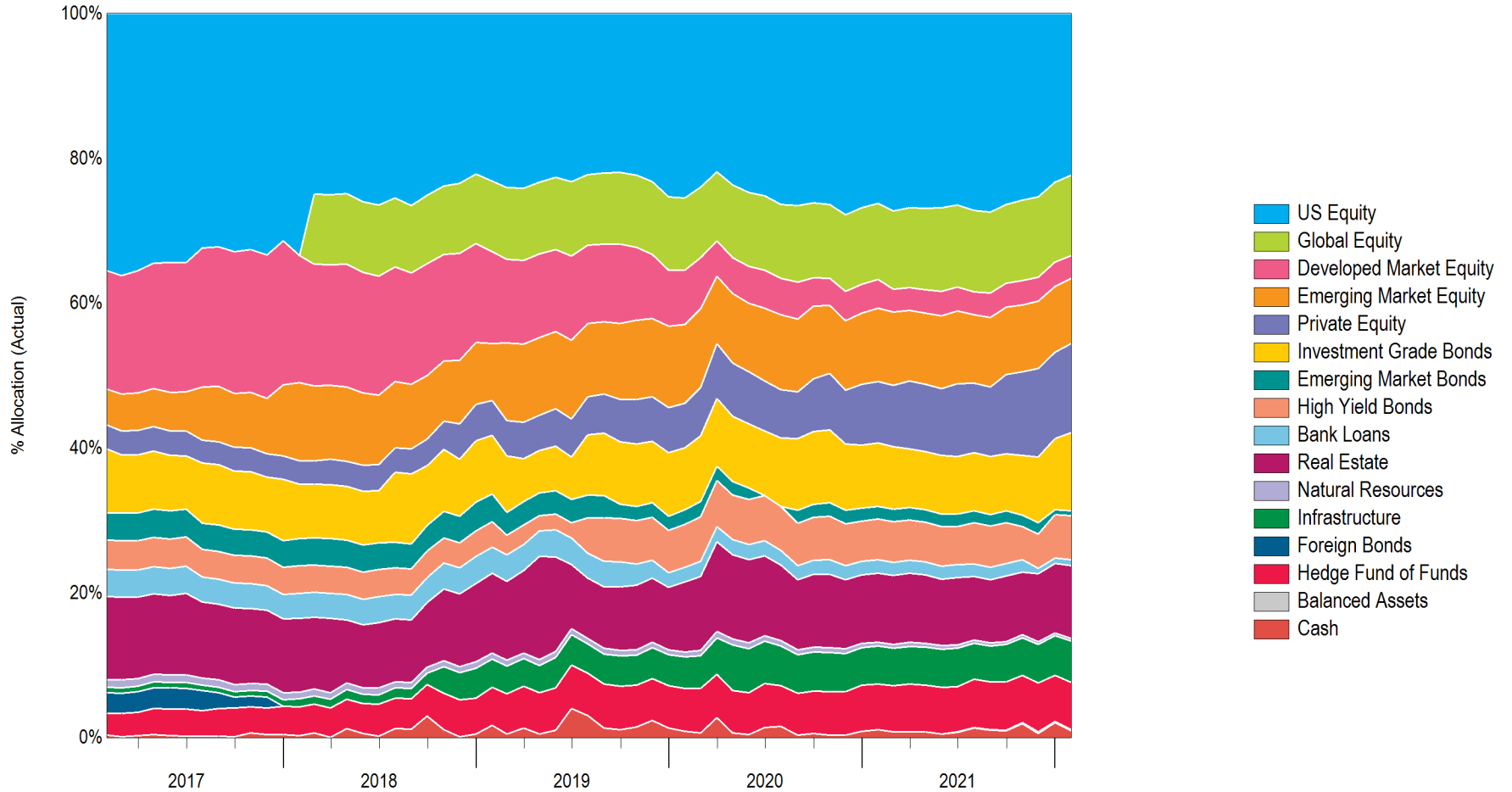
Asset Class Net Performance Summary									
	Market Value ($)	% of Portfolio	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Total Retirement Association	1,361,790,666	100.0	-3.1	12.3	12.3	9.7	8.5	8.1	**Nov-89**
Policy Benchmark (Net) (1)			-2.8	13.2	12.7	10.4	9.1	--	*Nov-89*
Actual Allocation (Net)			-2.7	11.7	11.4	9.2	--	--	*Nov-89*
Domestic Equity Assets	303,813,376	22.3	-7.5	11.4	19.3	15.2	--	15.5	**Jan-16**
Russell 3000			-5.9	18.8	19.9	16.1	15.0	15.7	*Jan-16*
International Developed Market Equity Assets	43,506,839	3.2	-8.4	1.4	4.5	4.7	--	4.7	**Jan-16**
MSCI EAFE			-4.8	7.0	9.3	7.8	6.9	7.1	*Jan-16*
International Emerging Market Equity Assets	122,253,476	9.0	-4.3	-5.2	8.8	8.5	--	9.1	**Jan-16**
MSCI Emerging Markets			-1.9	-7.2	7.2	8.3	4.2	9.6	*Jan-16*
Global Equity Assets	150,801,595	11.1	-3.4	14.1	13.2	--	--	8.2	**Feb-18**
MSCI ACWI			-4.9	13.2	15.4	12.6	10.7	9.2	*Feb-18*
Core Fixed Income	147,379,994	10.8	-1.3	-0.9	4.1	3.2	--	3.3	**Jan-16**
75% Bbg Aggregate/25% Bbg US TIPs 1-10 year			-1.9	-1.3	4.3	3.3	2.5	3.3	*Jan-16*
Value Added Fixed Income	102,421,390	7.5	-1.6	2.0	4.8	4.7	--	5.9	**Jan-16**
Custom Benchmark (2)			-1.8	-0.7	4.5	4.3	--	5.7	*Jan-16*
Hedge Funds	88,312,432	6.5	-1.9	2.7	7.1	5.0	5.0	4.6	**Feb-10**
Custom Benchmark			-1.3	4.9	7.4	5.3	4.3	3.7	*Feb-10*
Real Estate (3)	136,943,600	10.1	0.3	27.5	13.9	10.5	--	9.3	**Jan-16**
Custom Benchmark			0.0	22.2	9.2	8.0	--	7.7	*Jan-16*
Private Equity (4)	170,275,849	12.5	0.0	46.0	22.5	16.6	--	12.7	**Jan-16**
Preqin Private Equity FoF 1Q Lagged			0.0	42.7	22.2	19.0	15.3	16.6	*Jan-16*
Real Assets (5)	83,316,507	6.1	-0.1	19.9	9.0	5.6	--	3.0	**Jan-16**
CPI + 3%			1.1	10.5	6.8	6.0	5.2	5.9	*Jan-16*
Cash and Cash Equivalent	12,765,608	0.9							

(1) The custom benchmark is comprised of 26% Russell 3000/ 6% MSCI EAFE/ 10% MSCI Emerging Markets/ 13% Cambridge Associates FOF 1Q Lag/ 10% MSCI ACWI/ 4% Hedge Funds Custom Benchmark/ 9% (75/25 Barclays Aggregate and Barclays Tips 1-10yr)/ 6% Value Added FI Custom Benchmark/ 10% (80/20 NCREIF ODCE and Wilshire REIT)/ 6% CPI+3%

(2) The custom benchmark is comprised of 25% BBgBarc US High Yield/ 25% Credit Suisse Leveraged Loans/ 25% JP Morgan EMBI Global diversified/ 25% BBgBarc Multiverse TR

(3) The market value and performance is one quarter lagged.

(4) The market value and performance is one quarter lagged.

(5) The market value and performance is one quarter lagged.

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Trailing Net Performance										
	Market Value ($)	% of Portfolio	% of Sector	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Total Retirement Association	1,361,790,666	100.0	--	-3.1	12.3	12.3	9.7	8.5	8.1	Nov-89
Policy Benchmark (Net)				-2.8	13.2	12.7	10.4	9.1	--	Nov-89
Actual Allocation (Net)				-2.7	11.7	11.4	9.2	--	--	Nov-89
Domestic Equity Assets	303,813,376	22.3	22.3	-7.5	11.4	19.3	15.2	--	15.5	Jan-16
Russell 3000				-5.9	18.8	19.9	16.1	15.0	15.7	Jan-16
Rhumbline Russell 1000 Value	67,797,710	5.0	22.3	-2.3	23.3	13.8	10.4	--	10.8	Apr-13
Russell 1000 Value				-2.3	23.4	13.8	10.5	12.3	10.9	Apr-13
Rhumbline Russell 1000 Growth	66,534,151	4.9	21.9	-8.6	17.5	26.4	22.2	17.9	17.6	Jul-09
Russell 1000 Growth				-8.6	17.5	26.4	22.3	18.0	17.7	Jul-09
Fisher Midcap Value	66,979,327	4.9	22.0	-8.2	20.9	22.1	16.2	13.7	10.0	Apr-07
Russell MidCap Value				-4.3	23.1	14.1	9.9	12.4	8.0	Apr-07
Russell MidCap				-7.4	13.9	16.1	12.8	13.4	9.2	Apr-07
Mellon Small Cap Growth	51,516,929	3.8	17.0	-14.4	-18.9	20.0	18.4	15.9	15.8	Aug-09
Russell 2000 Growth				-13.4	-15.0	11.4	10.9	11.7	12.9	Aug-09
LMCG Small Cap Value	50,985,259	3.7	16.8	-3.7	25.3	13.9	8.3	10.8	9.3	Mar-11
Russell 2000 Value				-5.8	14.8	11.7	7.9	10.6	9.2	Mar-11

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Plymouth County Retirement Association

Summary | As of January 31, 2022

	Market Value ($)	% of Portfolio	% of Sector	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
International Developed Market Equity Assets	**43,506,839**	**3.2**	**3.2**	**-8.4**	**1.4**	**4.5**	**4.7**	**--**	**4.7**	**Jan-16**
MSCI EAFE				*-4.8*	*7.0*	*9.3*	*7.8*	*6.9*	*7.1*	*Jan-16*
Aristotle International Equity	23,281,019	1.7	53.5	-7.1	--	--	--	--	7.6	Mar-21
MSCI EAFE				*-4.8*	*7.0*	*9.3*	*7.8*	*6.9*	*4.7*	*Mar-21*
Walter Scott International Equity	20,225,820	1.5	46.5	-9.7	--	--	--	--	3.6	Mar-21
MSCI EAFE				*-4.8*	*7.0*	*9.3*	*7.8*	*6.9*	*4.7*	*Mar-21*
International Emerging Market Equity Assets	**122,253,476**	**9.0**	**9.0**	**-4.3**	**-5.2**	**8.8**	**8.5**	**--**	**9.1**	**Jan-16**
MSCI Emerging Markets				*-1.9*	*-7.2*	*7.2*	*8.3*	*4.2*	*9.6*	*Jan-16*
ABS Emerging Markets	65,613,878	4.8	53.7	-4.4	-1.9	11.7	--	--	13.6	Dec-18
MSCI Emerging Markets				*-1.9*	*-7.2*	*7.2*	*8.3*	*4.2*	*8.7*	*Dec-18*
Driehaus Emerging Markets Growth	56,639,598	4.2	46.3	-4.0	-8.5	--	--	--	11.9	Mar-19
MSCI Emerging Markets				*-1.9*	*-7.2*	*7.2*	*8.3*	*4.2*	*7.3*	*Mar-19*
Global Equity Assets	**150,801,595**	**11.1**	**11.1**	**-3.4**	**14.1**	**13.2**	**--**	**--**	**8.2**	**Feb-18**
MSCI ACWI				*-4.9*	*13.2*	*15.4*	*12.6*	*10.7*	*9.2*	*Feb-18*
First Eagle Global Value Fund	25,421,903	1.9	16.9	-0.5	13.4	10.4	--	--	6.2	Feb-18
MSCI ACWI Value NR USD				*-1.2*	*19.1*	*9.8*	*8.1*	*8.1*	*4.9*	*Feb-18*
Kopernik Global All Cap Fund	36,736,100	2.7	24.4	-2.0	16.8	17.3	--	--	10.7	Feb-18
MSCI ACWI Value NR USD				*-1.2*	*19.1*	*9.8*	*8.1*	*8.1*	*4.9*	*Feb-18*
Lee Munder Global Multi-Cap Strategy	45,374,410	3.3	30.1	-4.3	16.7	13.2	--	--	8.9	Mar-18
MSCI ACWI				*-4.9*	*13.2*	*15.4*	*12.6*	*10.7*	*10.6*	*Mar-18*
Wellington Durable Enterprises, L.P.	43,269,182	3.2	28.7	-5.2	9.9	11.9	--	--	9.8	Mar-18
MSCI ACWI				*-4.9*	*13.2*	*15.4*	*12.6*	*10.7*	*10.6*	*Mar-18*

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	Market Value ($)	% of Portfolio	% of Sector	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Core Fixed Income	**147,379,994**	**10.8**	**10.8**	**-1.3**	**-0.9**	**4.1**	**3.2**	**--**	**3.3**	**Jan-16**
75% Bbg Aggregate/25% Bbg US TIPs 1-10 year				*-1.9*	*-1.3*	*4.3*	*3.3*	*2.5*	*3.3*	*Jan-16*
Lord Abbett Short Duration Credit Trust II	61,743,502	4.5	41.9	-0.7	0.0	--	--	--	2.0	Aug-19
Bloomberg US Credit 1-3 Yr TR				*-0.7*	*-1.0*	*2.3*	*2.1*	*1.9*	*1.7*	*Aug-19*
Lord Abbett Core Fixed Income Trust II	55,205,990	4.1	37.5	-1.8	--	--	--	--	-1.7	Dec-21
Bloomberg US Aggregate TR				*-2.2*	*-3.0*	*3.7*	*3.1*	*2.6*	*-2.4*	*Dec-21*
Rhumbline TIPS Trust	30,430,503	2.2	20.6	-2.0	3.5	--	--	--	3.6	Sep-20
Bloomberg US TIPS TR				*-2.0*	*3.5*	*7.2*	*4.7*	*2.6*	*3.6*	*Sep-20*
Value Added Fixed Income	**102,421,390**	**7.5**	**7.5**	**-1.6**	**2.0**	**4.8**	**4.7**	**--**	**5.9**	**Jan-16**
Custom Benchmark				*-1.8*	*-0.7*	*4.5*	*4.3*	*--*	*5.7*	*Jan-16*
Eaton Vance High Yield	12,516,721	0.9	12.2	-2.6	2.3	5.8	4.9	5.9	6.6	Apr-06
ICE BofA US High Yield TR				*-2.7*	*2.1*	*6.0*	*5.2*	*6.1*	*6.9*	*Apr-06*
First Eagle Bank Loan Select Fund	10,906,703	0.8	10.6	0.4	4.9	4.7	4.2	5.2	5.2	Sep-10
Credit Suisse Leveraged Loans				*0.4*	*4.5*	*4.8*	*4.3*	*4.7*	*4.8*	*Sep-10*
Manulife Strategic Fixed Income	54,560,749	4.0	53.3	-2.1	-0.6	--	--	--	3.6	Jul-19
Bloomberg Multiverse TR				*-2.0*	*-5.6*	*2.4*	*2.8*	*1.6*	*1.3*	*Jul-19*
Mesirow High Yield	15,648,786	1.1	15.3	-0.8	7.8	--	--	--	9.7	Aug-19
Bloomberg US Corporate High Yield TR				*-2.7*	*2.1*	*6.3*	*5.4*	*6.2*	*5.2*	*Aug-19*
Eaton Vance EMD Opportunities Fund	8,788,431	0.6	8.6	-1.4	0.7	--	--	--	6.0	Aug-20
JP Morgan EMBI Global Diversified				*-2.8*	*-3.5*	*3.4*	*3.8*	*4.8*	*-0.3*	*Aug-20*

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	Market Value ($)	% of Portfolio	% of Sector	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Hedge Funds	**88,312,432**	**6.5**	**6.5**	**-1.9**	**2.7**	**7.1**	**5.0**	**5.0**	**4.6**	**Feb-10**
Custom Benchmark				*-1.3*	*4.9*	*7.4*	*5.3*	*4.3*	*3.7*	*Feb-10*
ABS Offshore SPC - Global Segregated Portfolio	36,646,857	2.7	41.5	-3.4	1.7	8.1	6.4	5.8	5.7	Aug-10
HFRI Fund of Funds Composite Index				*-2.7*	*4.0*	*6.6*	*4.9*	*4.1*	*3.7*	*Aug-10*
Entrust Special Opportunities Fund III, Ltd.	18,517,002	1.4	21.0	0.0	-4.1	4.2	3.8	--	6.4	Oct-16
HFRI Fund of Funds Composite Index (QTR)				*0.0*	*5.8*	*8.2*	*5.5*	*4.5*	*5.3*	*Oct-16*
Old Farm Partners Master Fund, L.P.	11,220,997	0.8	12.7	-3.4	4.8	9.0	--	--	7.1	Oct-18
HFRI Fund of Funds Composite Index				*-2.7*	*4.0*	*6.6*	*4.9*	*4.1*	*5.1*	*Oct-18*
EnTrustPermal Special Opportunities Evergreen Fund, Ltd.	21,927,577	1.6	24.8	0.0	9.2	9.9	--	--	10.1	Jan-19
HFRI Fund of Funds Composite Index (QTR)				*0.0*	*5.8*	*8.2*	*5.5*	*4.5*	*7.9*	*Jan-19*
Real Estate	**136,943,600**	**10.1**	**10.1**	**0.3**	**27.5**	**13.9**	**10.5**	**--**	**9.3**	**Jan-16**
Custom Benchmark				*0.0*	*22.2*	*9.2*	*8.0*	*--*	*7.7*	*Jan-16*
Core Real Estate	**84,972,224**	**6.2**	**62.0**	**0.4**	**25.8**	**12.1**	**10.2**	**--**	**9.7**	**Jan-16**
NCREIF-ODCE				*0.0*	*22.2*	*9.2*	*8.7*	*10.4*	*8.6*	*Jan-16*
TA Realty Core Property Fund, L.P.	50,986,726	3.7	60.0	0.0	29.5	15.3	--	--	13.7	Apr-18
NCREIF ODCE				*0.0*	*22.2*	*9.2*	*8.7*	*10.5*	*8.8*	*Apr-18*
JPMorgan Strategic Property	33,985,499	2.5	40.0	1.1	20.6	--	--	--	8.2	Apr-19
NCREIF-ODCE				*0.0*	*22.2*	*9.2*	*8.7*	*10.4*	*9.2*	*Apr-19*
Non-Core Real Estate	**51,971,376**	**3.8**	**38.0**	**0.0**	**30.2**	**16.9**	**9.6**	**--**	**6.4**	**Jan-16**

Entrust Special Opportunities Fund III and EntrustPermal Special Opportunities Evergreen Fund: Data is based on September 30, 2021 fair market value, adjusted for subsequent cash flows.
Note: The data for Real Estate is based on September 30, 2021 fair market value, adjusted for subsequent cash flows.
Note: The data for JPMorgan Strategic Property is as of January 31, 2022.

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	Market Value ($)	% of Portfolio	% of Sector	1 Mo (%)	1 Yr (%)	3 Yrs (%)	5 Yrs (%)	10 Yrs (%)	Inception (%)	Inception Date
Private Equity	170,275,849	12.5	12.5	0.0	46.0	22.5	16.6	--	12.7	Jan-16
Preqin Private Equity FoF 1Q Lagged				0.0	42.7	22.2	19.0	15.3	16.6	*Jan-16*
Private Equity	155,701,066	11.4	91.4	0.0	44.7	23.7	16.1	--	12.2	Jan-16
Venture Capital	14,574,783	1.1	8.6	0.0	62.2	15.1	15.7	--	13.1	Jan-16
Real Assets	83,316,507	6.1	6.1	-0.1	19.9	9.0	5.6	--	3.0	Jan-16
CPI + 3%				1.1	10.5	6.8	6.0	5.2	5.9	*Jan-16*
IFM Global Infrastructure	43,696,692	3.2	52.4	-0.2	17.4	12.0	--	--	11.7	Oct-18
CPI + 3%				1.0	9.7	6.0	5.2	4.4	5.5	*Oct-18*
Cash and Cash Equivalent	12,765,608	0.9	0.9							
Cash	12,765,608	0.9	100.0							

Note: The data for Real Estate, Private Equity, and Real Assets is based on September 30, 2021 fair market value, adjusted for subsequent cash flows.
Note: The data for IFM Global Infrastructure is as of January 31, 2022.

Prepared by Meketa Investment Group

Attribution Effects
1 Year Ending January 31, 2022

Legend:
- Allocation Effect
- Selection Effect
- Interaction Effects
- Total Effect
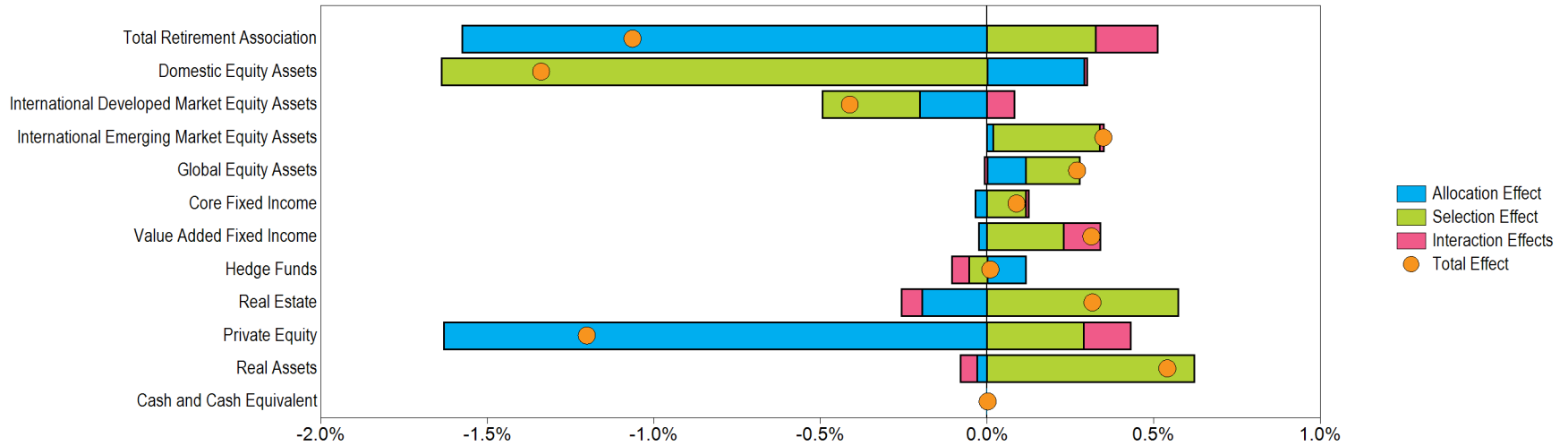
Attribution Summary 1 Year Ending January 31, 2022	Wtd. Actual Return	Wtd. Index Return	Excess Return	Selection Effect	Allocation Effect	Interaction Effects	Total Effects
Domestic Equity Assets	11.4%	18.0%	-6.5%	-1.6%	0.3%	0.0%	-1.3%
International Developed Market Equity Assets	1.4%	6.3%	-4.8%	-0.3%	-0.2%	0.1%	-0.4%
International Emerging Market Equity Assets	-5.2%	-7.9%	2.7%	0.3%	0.0%	0.0%	0.3%
Global Equity Assets	14.1%	12.4%	1.7%	0.2%	0.1%	0.0%	0.3%
Core Fixed Income	-0.9%	-2.0%	1.2%	0.1%	0.0%	0.0%	0.1%
Value Added Fixed Income	2.0%	-1.4%	3.5%	0.2%	0.0%	0.1%	0.3%
Hedge Funds	2.7%	4.2%	-1.5%	-0.1%	0.1%	-0.1%	0.0%
Real Estate	27.5%	21.3%	6.2%	0.6%	-0.2%	-0.1%	0.3%
Private Equity	46.0%	42.7%	3.3%	0.3%	-1.6%	0.1%	-1.2%
Real Assets	19.9%	9.7%	10.2%	0.6%	0.0%	0.0%	0.5%
Cash and Cash Equivalent	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**12.3%**	**13.3%**	**-1.1%**	**0.3%**	**-1.6%**	**0.2%**	**-1.1%**

Annual Investment Expense Analysis As Of January 31, 2022				
Name	**Fee Schedule**	**Market Value**	**Estimated Fee Value**	**Estimated Fee**
Domestic Equity Assets		**$303,813,376**		
Rhumbline Russell 1000 Value	0.05% of First 25.0 Mil, 0.04% of Next 25.0 Mil, 0.03% Thereafter	$67,797,710	$27,839	0.04%
Rhumbline Russell 1000 Growth	0.05% of First 25.0 Mil, 0.04% of Next 25.0 Mil, 0.03% Thereafter	$66,534,151	$27,460	0.04%
Fisher Midcap Value	0.65% of Assets	$66,979,327	$435,366	0.65%
Mellon Small Cap Growth	0.45% of Assets	$51,516,929	$231,826	0.45%
LMCG Small Cap Value	0.90% of Assets	$50,985,259	$458,867	0.90%
International Developed Market Equity Assets		**$43,506,839**		
Aristotle International Equity	0.49% of Assets	$23,281,019	$114,077	0.49%
Walter Scott International Equity	0.75% of Assets	$20,225,820	$151,694	0.75%
International Emerging Market Equity Assets		**$122,253,476**		
ABS Emerging Markets	Performance-based 0.35 and 0.10	$65,613,878	$229,649	0.35%
Driehaus Emerging Markets Growth	0.55% of Assets	$56,639,598	$311,518	0.55%
Global Equity Assets		**$150,801,595**		
First Eagle Global Value Fund	0.75% of Assets	$25,421,903	$190,664	0.75%
Kopernik Global All Cap Fund	0.80% of First 50.0 Mil, 0.75% of Next 150.0 Mil, 0.70% of Next 250.0 Mil, 0.65% of Next 350.0 Mil	$36,736,100	$293,889	0.80%
Lee Munder Global Multi-Cap Strategy	0.45% of Assets	$45,374,410	$204,185	0.45%
Wellington Durable Enterprises, L.P.	0.60% of Assets	$43,269,182	$259,615	0.60%

Name	Fee Schedule	Market Value	Estimated Fee Value	Estimated Fee
Core Fixed Income		**$147,379,994**		
Lord Abbett Short Duration Credit Trust II	0.17% of Assets	$61,743,502	$104,964	0.17%
Lord Abbett Core Fixed Income Trust II		$55,205,990		
Rhumbline TIPS Trust	0.04% of First 5.0 Mil, 0.03% Thereafter	$30,430,503	$9,629	0.03%
Value Added Fixed Income		**$102,421,390**		
Eaton Vance High Yield	0.42% of Assets	$12,516,721	$52,570	0.42%
First Eagle Bank Loan Select Fund	0.40% of Assets	$10,906,703	$43,627	0.40%
Manulife Strategic Fixed Income	0.35% of Assets	$54,560,749	$190,963	0.35%
Mesirow High Yield	0.40% of Assets	$15,648,786	$62,595	0.40%
Eaton Vance EMD Opportunities Fund	0.30% of Assets	$8,788,431	$26,365	0.30%

Eaton Vance EMD Opportunities Fund: Stated fee of 0.30% with other operating expenses capped at 0.15%.

Note: The value is based on September 30, 2021 FMV.

Private Equity	Commitment	Total Contributions	Total Distributions	Value
Ascend Ventures II, L.P.	2,500,000	2,327,488	925,962	52,310
Ascent Venture Partners IV, L.P.	2,500,000	2,502,219	417,638	7,998
Ascent Venture Partners V, L.P.	5,000,000	5,004,731	3,182,862	5,267,269
Audax Mezzanine Fund IV, L.P.	10,000,000	8,125,631	4,833,065	4,654,566
Charles River Partnership XI, L.P.	1,839,000	1,820,323	2,532,884	9,492
Charlesbank Technology Opportunities Fund, L.P.	12,000,000	4,396,183	1,066,732	7,059,452
Constitution Ironsides Co-Investment Fund VI	13,000,000	0	0	0
DN Partners II, L.P.	5,000,000	2,375,841	23,571	1,851,617
Euro Choice V, L.P.	6,089,875	5,919,759	3,998,789	5,105,995
FS Equity Partners VIII, L.P.	12,000,000	6,198,691	0	7,930,578
Globespan Capital Partners V, L.P.	5,000,000	4,852,500	8,895,488	4,802,375
HarbourVest Partners Co-Investment Fund V, L.P.	12,000,000	9,300,000	0	15,511,306
HarbourVest Partners Co-Investment Fund VI	13,000,000	0	0	0
Ironsides Direct Investment Fund V, L.P.	12,000,000	10,383,258	924,048	18,211,807
Kohlberg Investors IX	10,000,000	2,162,530	171,120	2,830,025
Landmark Equity Partners XIV, L.P.	6,000,000	5,837,967	7,032,082	863,768
Leeds Equity Partners IV, L.P.	5,000,000	5,093,100	9,709,704	13,621
Leeds Equity Partners V, L.P.	2,500,000	3,533,481	5,478,607	417,949
Lexington Capital Partners VII, L.P.	10,000,000	8,922,153	12,509,853	2,089,160
LLR Equity Partners V, L.P.	12,000,000	11,040,000	2,358,333	13,214,209
Mesirow Financial Capital Partners IX, L.P.	4,000,000	3,840,731	2,021,056	80,253
Ridgemont Equity Partners III, L.P.	12,000,000	7,869,248	654,545	11,149,883
Ridgemont Equity Partners IV	13,000,000	0	0	0
Rimco Production Company, Inc	2,000,000	2,000,000	7,651,066	1
Searchlight Capital III, L.P.	12,000,000	5,419,101	1,009,703	6,928,410
Siguler Guff Distressed Opportunities Fund III, L.P.	6,000,000	5,820,000	8,590,845	1,059,038
Summit Partners Growth Equity Fund IX, L.P.	10,000,000	11,590,999	7,966,353	20,402,091
Summit Partners Growth Equity Fund XI	13,000,000	0	0	0
Summit Venture V	10,000,000	1,994,519	0	1,994,519
TRG Growth Partnership II, L.P.	7,500,000	7,366,152	7,603,067	1,426,529

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Note: The value is based on September 30, 2021 FMV.

Private Equity	Commitment	Total Contributions	Total Distributions	Value
Trilantic Capital Partners VI (North America), L.P.	12,000,000	6,251,944	34,205	7,071,958
Waud Capital Partners V, L.P.	10,000,000	7,581,718	0	8,849,688
Wellspring Capital Partners VI, L.P.	12,000,000	9,296,983	0	13,490,917
Total Plymouth County - PE	**280,928,875**	**168,827,251**	**99,591,579**	**162,346,784**

Real Assets	Commitment	Total Contributions	Total Distributions	Value
Basalt Infrastructure Partners II	10,000,000	9,416,866	488,876	10,821,748
BlackRock Global Renewable Power Infrastructure Fund III, L.P.	10,000,000	1,115,709	14,116	973,550
BTG Pactual Global Timberland Resources Fund, LLC	5,043,536	5,043,536	1,869,240	1,447,752
Global Infrastructure Partners III, L.P.	10,000,000	9,194,124	2,288,135	9,249,219
Global Infrastructure Partners IV, L.P.	10,000,000	2,215,584	0	1,731,930
IFM Global Infrastructure (U.S.), L.P.	35,000,000	35,000,000	3,191,514	43,696,692
ISQ Global Infrastructure Fund III (USTE), L.P.	10,000,000	0	0	0
JPMorgan Global Maritime Investment	10,000,000	10,034,375	1,809,932	8,771,924
Domain Timbervest Partners III, L.P.	5,000,000	5,000,000	2,896,126	4,157,623
Total Plymouth County - RA	**105,043,536**	**77,020,194**	**12,557,939**	**80,850,438**

Real Estate	Commitment	Total Contributions	Total Distributions	Value
1921 Realty, Inc.	5,000,000	5,378,194	0	562,673
AEW Partners IX, L.P.	10,000,000	1,114,735	0	1,001,751
AEW Partners Real Estate Fund VIII, L.P.	25,000,000	21,549,970	15,959,869	14,172,535
Berkshire Value Fund V, L.P.	9,000,000	1,957,870	979,534	2,022,600
Carlyle Realty Partners VIII, L.P.	18,000,000	10,196,683	6,085,324	8,234,661
DSF Capital Partners IV, L.P.	5,000,000	5,000,000	7,406,550	0
DSF Multi-Family Real Estate Fund III, L.P.	15,000,000	15,079,717	4,086,879	17,962,957
JPMorgan Strategic Property	27,000,000	27,000,000	625,647	33,985,499
PCCP Equity IX, L.P.	10,000,000	0	0	0
Real Estate International Partnership Fund I, L.P.	15,000,000	12,675,476	11,147,161	1,204,971
Rockpoint Real Estate Fund VI, L.P.	9,000,000	2,614,931	90,341	3,292,935
TA Realty Core Property Fund, L.P.	35,000,000	35,289,972	2,422,205	50,986,726
TerraCap Partners V, L.P.	5,000,000	3,468,100	37,177	3,490,403
Total Plymouth County - RE	**188,000,000**	**141,325,649**	**48,840,687**	**136,917,710**

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Cash Flow Summary Month Ending January 31, 2022	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
1921 Realty, Inc	$562,673	$0	$0	$0	$562,673
ABS Emerging Markets	$68,663,388	$0	$0	$0	$65,613,878
ABS Offshore SPC - Global Segregated Portfolio	$37,942,317	$0	$0	$0	$36,646,857
AEW Partners Real Estate Fund IX, L.P.	$2,891,020	$0	$0	$0	$2,891,020
AEW Partners Real Estate VIII	$8,804,981	$0	$0	$0	$8,804,981
Aristotle International Equity	$25,066,871	$0	$0	$0	$23,281,019
Ascend Ventures II	$52,310	$0	$0	$0	$52,310
Ascent Ventures IV	$7,998	$0	$0	$0	$7,998
Ascent Ventures V	$4,395,569	$0	$0	$0	$4,395,569
Audax Mezzanine Debt IV	$4,542,166	$242,808	-$945,553	-$702,744	$3,839,421
Basalt Infrastructure Partners II	$10,821,748	$0	$0	$0	$10,821,748
Berkshire Value Fund V	$2,342,293	$0	$0	$0	$2,342,293
BlackRock Global Renewable Power Infrastructure Fund III, L.P.	$1,538,953	$341,337	$0	$341,337	$1,880,290
BTG Pactual Global Timberland Resources	$1,447,752	$0	$0	$0	$1,447,752
Carlyle Realty Partners VIII	$6,917,427	$0	$0	$0	$6,917,427
Cash	$29,246,527	$0	-$16,480,919	-$16,480,919	$12,765,608
Charles River Partnership XI	$9,492	$0	$0	$0	$9,492
Charlesbank Technology Opportunities Fund	$7,829,929	$0	$0	$0	$7,829,929
DN Partners II, LP	$1,851,617	$0	$0	$0	$1,851,617
Driehaus Emerging Markets Growth	$58,993,894	$0	$0	$0	$56,639,598
DSF Multi-Family Real Estate Fund III	$17,642,039	$0	-$326,178	-$326,178	$17,315,861
Eaton Vance EMD Opportunities Fund	$8,911,545	$0	$0	$0	$8,788,431

	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
Eaton Vance High Yield	$12,847,326	$0	$0	$0	$12,516,721
Entrust Special Opportunities Fund III, Ltd.	$18,517,002	$0	$0	$0	$18,517,002
EnTrustPermal Special Opportunities Evergreen Fund, Ltd.	$21,927,577	$0	$0	$0	$21,927,577
Euro Choice V Programme	$4,574,127	$0	$0	$0	$4,574,127
First Eagle Bank Loan Select Fund	$10,865,798	$0	$0	$0	$10,906,703
First Eagle Global Value Fund	$25,561,076	$0	$0	$0	$25,421,903
Fisher Midcap Value	$72,958,849	$0	$0	$0	$66,979,327
FS Equity Partners VIII, L.P.	$7,606,254	$0	$0	$0	$7,606,254
Global Infrastructure Partners III	$9,155,729	$642,314	-$425	$641,889	$9,797,618
Global Infrastructure Partners IV, L.P.	$1,797,169	$465,711	$0	$465,711	$2,262,880
Globespan Capital V	$4,802,375	$0	$0	$0	$4,802,375
HarbourVest Partners Co-Investment V	$14,888,274	$0	$0	$0	$14,888,274
IFM Global Infrastructure	$43,799,912	$0	$0	$0	$43,696,692
Ironsides Co-Investment Fund VI, L.P.	$11,261,173	$0	$0	$0	$11,261,173
Ironsides Direct Investment Fund V, L.P.	$18,211,807	$0	$0	$0	$18,211,807
ISQ Global Infrastructure Fund III (USTE), L.P.	$785,481	$0	$0	$0	$785,481
JP Morgan Global Maritime Investment	$8,771,924	$0	$0	$0	$8,771,924
JPMorgan Strategic Property	$33,662,943	$0	-$77,239	-$77,239	$33,985,499
Kohlberg Investors IX	$5,316,531	$0	$0	$0	$5,316,531
Kopernik Global All Cap Fund	$37,504,072	$0	$0	$0	$36,736,100
Landmark Equity Partners XIV	$672,791	$0	$0	$0	$672,791
Lee Munder Global Multi-Cap Strategy	$47,411,539	$0	$0	$0	$45,374,410
Leeds Equity Partners IV	$13,621	$0	$0	$0	$13,621
Leeds Equity Partners V	$417,949	$0	$0	$0	$417,949
Lexington Capital Partners VII	$1,799,856	$1,709	-$77,139	-$75,430	$1,724,426

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	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
LLR Equity Partners V, L.P.	$12,506,785	$0	$0	$0	$12,506,785
LMCG Small Cap Value	$52,899,338	$0	$0	$0	$50,985,259
Lord Abbett Core Fixed Income Trust II	$56,215,855	$0	$0	$0	$55,205,990
Lord Abbett Short Duration Credit Trust II	$62,146,678	$0	$0	$0	$61,743,502
Manulife Strategic Fixed Income	$55,733,231	$0	-$37,185	-$37,185	$54,560,749
Mellon Small Cap Growth	$60,193,918	$0	$0	$0	$51,516,929
Mesirow Financial Capital Partners IX, LP	$80,253	$0	$0	$0	$80,253
Mesirow Financial International Real Estate Fund I	$981,636	$0	$0	$0	$981,636
Mesirow High Yield	$15,772,983	$0	$0	$0	$15,648,786
Old Farm Partners Master Fund, L.P.	$11,617,242	$0	$0	$0	$11,220,997
PCCP Equity IX, L.P.	$0	$957,118	$0	$957,118	$957,118
Rhumbline Russell 1000 Growth	$72,771,143	$0	$0	$0	$66,534,151
Rhumbline Russell 1000 Value	$69,408,163	$0	$0	$0	$67,797,710
Rhumbline TIPS Trust	$20,904,338	$10,000,000	$0	$10,000,000	$30,430,503
Ridgemont Equity Partners III, L.P.	$9,662,064	$0	$0	$0	$9,662,064
RIMCO Royalty Partners, LP	$1	$0	$0	$0	$1
Rockpoint Real Estate Fund VI, L.P.	$6,183,160	$0	$0	$0	$6,183,160
Searchlight Capital III, L.P.	$8,350,676	$387,164	$0	$387,164	$8,737,840
Siguler Guff Distressed Opportunities Fund III, LP	$579,431	$0	$0	$0	$579,431
Summit Partners Growth Equity Fund IX	$15,936,379	$0	-$126,688	-$126,688	$15,809,691
Summit Partners Venture Capital Fund V	$2,554,079	$0	$0	$0	$2,554,079
TA Realty Core Property Fund, L.P.	$50,986,726	$0	$0	$0	$50,986,726
TerraCap Partners V, L.P	$5,015,207	$0	$0	$0	$5,015,207
Timbervest Partners III, LP	$3,852,123	$0	$0	$0	$3,852,123
TRG Growth Partnership II	$1,157,483	$0	$0	$0	$1,157,483

	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
Trilantic Capital Partners VI, L.P.	$9,431,307	$0	$0	$0	$9,431,307
Walter Scott International Equity	$22,436,418	$0	-$41,632	-$41,632	$20,225,820
Waud Capital Partners V	$8,849,688	$0	$0	$0	$8,849,688
Wellington Durable Enterprises, L.P.	$45,650,511	$0	$0	$0	$43,269,182
Wellspring Capital Partners VI	$13,431,564	$0	$0	$0	$13,431,564
Total	**$1,410,922,042**	**$13,038,161**	**-$18,112,958**	**-$5,074,797**	**$1,361,790,666**

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Cash Flow Summary From October 01, 2021 through January 31, 2022	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
1921 Realty, Inc	$561,585	$0	$0	$0	$562,673
ABS Emerging Markets	$68,577,165	$0	$0	$0	$65,613,878
ABS Offshore SPC - Global Segregated Portfolio	$37,919,117	$0	$0	$0	$36,646,857
AEW Partners Real Estate Fund IX, L.P.	$1,031,205	$1,893,004	-$3,735	$1,889,269	$2,891,020
AEW Partners Real Estate VIII	$10,856,950	$2,439,619	-$7,807,173	-$5,367,554	$8,804,981
Aristotle International Equity	$23,881,714	$0	$0	$0	$23,281,019
Ascend Ventures II	$52,310	$0	$0	$0	$52,310
Ascent Ventures IV	$8,478	$0	$0	$0	$7,998
Ascent Ventures V	$4,986,732	$0	-$871,700	-$871,700	$4,395,569
Audax Mezzanine Debt IV	$4,502,795	$263,809	-$1,078,953	-$815,145	$3,839,421
Basalt Infrastructure Partners II	$10,530,422	$0	$0	$0	$10,821,748
Berkshire Value Fund V	$2,128,919	$354,348	-$34,655	$319,693	$2,342,293
BlackRock Global Renewable Power Infrastructure Fund III, L.P.	$996,930	$906,740	$0	$906,740	$1,880,290
BTG Pactual Global Timberland Resources	$1,486,026	$0	$0	$0	$1,447,752
Carlyle Realty Partners VIII	$7,084,666	$1,593,315	-$2,910,549	-$1,317,234	$6,917,427
Cash	$12,921,128	$35,462,474	-$35,617,450	-$154,975	$12,765,608
Charles River Partnership XI	$12,822	$0	$0	$0	$9,492
Charlesbank Technology Opportunities Fund	$6,216,583	$775,480	-$5,003	$770,477	$7,829,929
DN Partners II, LP	$1,851,631	$0	$0	$0	$1,851,617
Driehaus Emerging Markets Growth	$59,437,458	$0	$0	$0	$56,639,598
DSF Multi-Family Real Estate Fund III	$16,452,610	$0	-$647,096	-$647,096	$17,315,861
Eaton Vance EMD Opportunities Fund	$22,299,105	$0	-$13,000,000	-$13,000,000	$8,788,431
Eaton Vance High Yield	$24,734,552	$0	-$12,000,000	-$12,000,000	$12,516,721

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	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
Entrust Special Opportunities Fund III, Ltd.	$20,910,528	$0	$0	$0	$18,517,002
EnTrustPermal Special Opportunities Evergreen Fund, Ltd.	$20,704,048	$1,223,529	$0	$1,223,529	$21,927,577
Euro Choice V Programme	$4,871,650	$0	-$531,868	-$531,868	$4,574,127
First Eagle Bank Loan Select Fund	$23,720,659	$0	-$13,000,000	-$13,000,000	$10,906,703
First Eagle Global Value Fund	$24,682,559	$0	$0	$0	$25,421,903
Fisher Midcap Value	$71,200,032	$0	-$6,000,000	-$6,000,000	$66,979,327
FS Equity Partners VIII, L.P.	$6,838,118	$0	-$324,324	-$324,324	$7,606,254
Global Infrastructure Partners III	$9,017,798	$690,177	-$141,778	$548,399	$9,797,618
Global Infrastructure Partners IV, L.P.	$1,764,261	$530,950	$0	$530,950	$2,262,880
Globespan Capital V	$4,522,339	$0	$0	$0	$4,802,375
HarbourVest Partners Co-Investment V	$15,669,509	$0	-$623,032	-$623,032	$14,888,274
IFM Global Infrastructure	$42,729,584	$0	-$478,098	-$478,098	$43,696,692
IR&M Core Bonds	$56,151,385	$0	-$56,076,248	-$56,076,248	--
Ironsides Co-Investment Fund VI, L.P.	$0	$11,261,173	$0	$11,261,173	$11,261,173
Ironsides Direct Investment Fund V, L.P.	$19,041,321	$0	$0	$0	$18,211,807
ISQ Global Infrastructure Fund III (USTE), L.P.	--	$785,481	$0	$785,481	$785,481
JP Morgan Global Maritime Investment	$6,630,191	$0	$0	$0	$8,771,924
JPMorgan Strategic Property	$31,205,873	$0	-$149,980	-$149,980	$33,985,499
Kohlberg Investors IX	$2,345,695	$2,609,494	-$122,988	$2,486,506	$5,316,531
Kopernik Global All Cap Fund	$37,557,368	$0	$0	$0	$36,736,100
Landmark Equity Partners XIV	$795,003	$0	-$190,977	-$190,977	$672,791
Lee Munder Global Multi-Cap Strategy	$44,187,796	$0	$0	$0	$45,374,410
Leeds Equity Partners IV	$13,189	$0	$0	$0	$13,621
Leeds Equity Partners V	$0	$0	$0	$0	$417,949
Lexington Capital Partners VII	$1,926,464	$1,709	-$366,443	-$364,734	$1,724,426
LLR Equity Partners V, LP.	$12,108,880	-$511,462	-$195,962	-$707,424	$12,506,785

	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
LMCG Small Cap Value	$78,210,339	$0	-$30,000,000	-$30,000,000	$50,985,259
Lord Abbett Core Fixed Income Trust II	--	$56,198,732	$0	$56,198,732	$55,205,990
Lord Abbett Short Duration Credit Trust II	$42,258,267	$20,000,000	$0	$20,000,000	$61,743,502
Manulife Strategic Fixed Income	$35,643,350	$20,000,000	-$68,769	$19,931,231	$54,560,749
Mellon Small Cap Growth	$74,904,714	$0	-$15,000,000	-$15,000,000	$51,516,929
Mesirow Financial Capital Partners IX, LP	$74,400	$0	$0	$0	$80,253
Mesirow Financial International Real Estate Fund I	$1,228,923	$1,665	-$225,000	-$223,335	$981,636
Mesirow High Yield	$17,658,038	$0	-$2,000,000	-$2,000,000	$15,648,786
Old Farm Partners Master Fund, L.P.	$11,613,154	$0	$0	$0	$11,220,997
PCCP Equity IX, L.P.	--	$957,118	$0	$957,118	$957,118
Rhumbline Russell 1000 Growth	$70,114,267	$0	-$5,003,000	-$5,003,000	$66,534,151
Rhumbline Russell 1000 Value	$69,323,971	$0	-$5,000,267	-$5,000,267	$67,797,710
Rhumbline TIPS Trust	$10,555,175	$19,999,700	$0	$19,999,700	$30,430,503
Ridgemont Equity Partners III, L.P.	$9,929,332	$2,344,751	-$3,832,570	-$1,487,819	$9,662,064
RIMCO Royalty Partners, LP	$1	$0	$0	$0	$1
Rockpoint Real Estate Fund VI, L.P.	$3,101,521	$2,890,225	$0	$2,890,225	$6,183,160
Searchlight Capital III, L.P.	$5,982,977	$1,890,166	-$80,736	$1,809,430	$8,737,840
Siguler Guff Distressed Opportunities Fund III, LP	$1,060,074	$0	-$481,655	-$481,655	$579,431
Summit Partners Growth Equity Fund IX	$18,646,415	$368,900	-$4,961,300	-$4,592,400	$15,809,691
Summit Partners Venture Capital Fund V	$1,994,519	$583,274	$0	$583,274	$2,554,079
TA Realty Core Property Fund, L.P.	$47,524,726	$83,168	-$558,416	-$475,247	$50,986,726
TerraCap Partners V, L.P	$3,475,109	$1,524,804	$0	$1,524,804	$5,015,207
Timbervest Partners III, LP	$4,176,075	$0	-$305,500	-$305,500	$3,852,123

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	Beginning Market Value	Contributions	Withdrawals	Net Cash Flow	Ending Market Value
TRG Growth Partnership II	$1,252,180	$0	-$269,047	-$269,047	$1,157,483
Trilantic Capital Partners VI, L.P.	$6,829,773	$2,753,882	-$394,533	$2,359,349	$9,431,307
Walter Scott International Equity	$21,497,874	$0	-$83,557	-$83,557	$20,225,820
Waud Capital Partners V	$8,623,026	$0	$0	$0	$8,849,688
Wellington Durable Enterprises, L.P.	$43,645,775	$0	$0	$0	$43,269,182
Wellspring Capital Partners VI	$12,330,056	$5,080,651	-$5,140,004	-$59,353	$13,431,564
Total	**$1,378,779,184**	**$194,956,876**	**-$225,582,364**	**-$30,625,487**	**$1,361,790,666**

Current Issues

2021 Peer Universe Review

Background

- In addition to analyzing the Association's structure and performance relative to its stated goals and risk tolerance, it can be instructive to evaluate the investment structure and performance relative to other similar Funds.

- Meketa Investment Group has access to peer universe asset allocation and performance information from a third-party data analytics provider, Investment Metrics.

  - In some cases, we are able to dissect this information by size and plan sponsor sub-categories (i.e. public pension funds, Taft-Hartley pension funds, health funds, endowments & foundations, etc.).

- For asset allocation structure analysis, we have taken a look at how the Fund compares to a universe of Public DB plans.

- For performance analysis, the Investment Metrics survey provides us with a universe consisting of 566 public plans. These funds range in size from $0.5M to $100B.

- These universes are one way to evaluate the Association relative to the broad public fund peer universe.

  - Please note that there are some limitations to the data available, and throughout this document numbers may not sum due to rounding.

- In this document we will examine the Association's asset allocation vs Peers & PRIT and how those allocation choices impacted overall performance.

- We will also examine how the Associations portfolio would have performed, relative to Peers & PRIT, during various historical market conditions.

- Finally, we provide a more robust overview of the Public DB peer universe.

2021 Asset Class Allocation Review vs Peer Median & PRIT

	PCRA Allocation (%)	Peer Med. Allocation (%)	PRIT Allocation (%)	PCRA Allocation (Peer/PRIT)
US Equity	25	32	24	- / +
International Equity	4	8	13	- / -
Emerging Markets Equity	10	5	5	+ / +
Global Equity	11	-	-	+ / +
Core Fixed Income	10	15	16	- / -
Value-Added Fixed Income	8	8	7	NM / +
Hedge Funds / Portfolio Completion	7	5	8	+ / -
Private Equity	10	11	15	- / -
Real Estate	10	8	8	+ / +
Timber/Real Assets	6	6	3	NM / +
Overlay / Cash	2	2	1	NM / +

2021 Performance Review vs PRIT

	System Allocation (%)	PRIT Allocation (%)	PCRA Allocation Effect Vs PRIT	Index Performance[1] (%)	PCRA Performance (%)	PRIT Performance (%)	Manager Effect Vs Index / PRIT
Total Aggregate Performance[2]				16.5[3]	16.9	20.6	
US Equity	25	24	+	25.7	21.3	28.0	- / -
International Equity	4	13	+	11.3	9.1	11.2	- / -
Emerging Markets Equity	10	5	-	-2.5	2.4	2.2	+ / +
Global Equity	11	-	+	18.5	16.1	NA	- / NA
Core Fixed Income	10	16	+	0.2	0.3	0.2	+ / +
Value-Added Fixed Income	8	7	-	5.5	4.2	11.5	- / -
Hedge Funds / Port. Comp.	7	8	+	6.0	5.9	8.8	NM / -
Real Estate	10	8	+	21.1	27.3	28.1	+ / -
Private Equity	10	15	-	40.0	46.0	66.2	+ / -
Timber/Real Assets	6	3	-	5.0	19.7	11.6	+ / +
Overlay / Cash	2	1	+	0.0	N/A	6.2	N/A

- The System underperformed PRIT in 2021, returning 16.9% gross of fees vs. 20.6% gross of fees for PRIT.

- The underperformance can be principally attributed to PRIT's historic year in private equity. PRIT's PE holdings returned over 66% in 2021 mainly due to 100%+ returns from investments made in the early 2010s. PE contributed 9.9% (out of 20.6%) to PRIT's total return while PCRA's PE portfolio contributed 4.6% (out of 16.9%).

- Overall, the allocation positioning and manager performance had concentrated areas of strength (e.g., portfolio completion, real assets) and weakness (e.g., private equity).

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[1] Indexes used in descending order: Russell 3000, MSCI EAFE, MSCI EM, 75% BBgBarc US Aggregate/ 25% BBgBarc US TIPS, BBgBarc US High Yield, Prequin PE Index, NCREIF ODCE, NECREIF, NCREIF Timberland, HFRX Equal Weighted Index and Barclays 3 Month T-Bill. Allocation percentages are annual averages which may not sum to 100.

[2] Categories as follows: Core fixed income: TIPS + Investment Grade Bonds; Value added bonds: High yield bonds + emerging market bonds; Timber/Real assets: Infrastructure

[3] Performance may not sum due to rounding and allocation averaging.

Historical Negative Scenario Analysis[1]
(*Cumulative* Return)

Scenario	PCRA Current Policy (%)	2022 -All Public DB (%)	PCRA 2021 Avg Allocation (%)	PRIT (%)
COVID-19 Market Shock (Feb 2020-Mar 2020)	-21.7	-18.5	-20.5	-15.7
Taper Tantrum (May - Aug 2013)	0.7	0.0	0.3	0.2
Global Financial Crisis (Oct 2007 - Mar 2009)	-32.6	-28.8	-31.7	-27.0
Popping of the TMT Bubble (Apr 2000 - Sep 2002)	-19.1	-15.4	-16.8	-12.6
LTCM (Jul - Aug 1998)	-11.5	-9.4	-11.3	-7.7
Asian Financial Crisis (Aug 97 - Jan 98)	1.0	3.1	1.2	4.2
Rate spike (1994 Calendar Year)	2.5	2.3	1.8	4.1
Early 1990s Recession (Jun - Oct 1990)	-8.5	-5.6	-8.8	-5.5
Crash of 1987 (Sep - Nov 1987)	-14.3	-12.7	-14.2	-9.9
Strong dollar (Jan 1981 - Sep 1982)	1.3	2.8	1.7	4.0
Volcker Recession (Jan - Mar 1980)	-4.6	-4.1	-4.5	-3.7
Stagflation (Jan 1973 - Sep 1974)	-25.6	-20.4	-24.6	-21.5

- PCRA's Current Policy and 2021 Average allocation would have underperformed, relative to PRIT, during periods of sizeable equity market declines, due to its more aggressive positioning.

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[1] See the Appendix for our scenario inputs. In periods where the ideal benchmark was not yet available we used the next closest benchmark(s) as a proxy.

Historical Positive Scenario Analysis[1]
(Cumulative Return)

Scenario	Current Policy (%)	2022 - All Public DB (%)	2021 Avg Allocation (%)	PRIT (%)
Global Financial Crisis Recovery (Mar 2009 - Nov 2009)	39.0	34.9	39.2	29.9
Best of Great Moderation (Apr 2003 - Feb 2004)	36.3	29.3	34.9	29.1
Peak of the TMT Bubble (Oct 1998 - Mar 2000)	54.6	43.4	47.1	45.2
Plummeting Dollar (Jan 1986 - Aug 1987)	55.6	50.7	53.6	48.7
Volcker Recovery (Aug 1982 - Apr 1983)	36.2	33.8	36.0	29.5
Bretton Wood Recovery (Oct 1974 - Jun 1975)	32.7	29.9	32.2	26.8

- Conversely, during periods with strongly positive markets, PCRA's Current Policy is positioned to capturing the most upside.

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[1] See the Appendix for our scenario inputs. In periods where the ideal benchmark was not yet available we used the next closest benchmark(s) as a proxy.

Public DB Constituent & Performance Analysis

Public DB Universe Characteristics[1]

Client Type	# of Funds	Smallest ($)	Largest ($)	Median Fund Size ($)	Average Fund Size ($)	Total Assets
All Publics[2]	566	460K	100B	76M	1.6B	914.3B
Public - Federal & State Govt.	59	5M	70B	800M	9.3B	545.8B
Public - Local Govt.	507	460K	100B	62M	727M	368.5B
All Publics:						
Between $250M & $1B	83	250M	990M	450M	524M	43.5B
Between $250M & $10B	141	250M	10.0B	830M	1.7B	237.6B
Between $500M & $5B	87	510M	4.6B	1.1B	1.6B	135.8B
Over $10B	17	20B	100B	30B	38.2B	650B

PCRA Performance Vs Peers

Client Type	1 YR (%)	3 YR (%)	5 YR (%)	10 YR (%)
PCRA	16.4	15.6	10.8	9.3
All Publics	13.7	15.3	11.1	9.6
Public - Federal & State Govt.	14.2	14.4	10.7	9.6
Public - Local Govt.	13.6	15.4	11.1	9.6
All Publics:				
Between $250M & $1B	13.0	15.0	10.9	9.7
Between $250M & $10B	13.7	14.8	10.8	9.6
Between $500M & $5B	13.9	15.0	10.9	9.6
Over $10B	16.7	14.8	11.5	10.1

[1] All Peer data is as of December 31, 2021 unless otherwise noted

[2] Peer set used in PCRA Performance Reporting

PCRA Asset Allocation Vs Relevant Peer Universes[1]

Client Type	Total Equity (%)	Total Fixed Income (%)	Total PE (%)	US Equity (%)	EM Equity (%)	Dev EM Equity (%)
PCRA	64	17	12	23	9	3
All Publics[2]	58.3	25.0	11.7	29.8	4.4	7.0
Public - Federal & State	53.2	23.0	13.0	26.1	5.8	3.6
Public - Local Govt.	59.3	25.4	11.3	30.7	4.1	7.7
All Publics						
Between $250M & $1B	60.9	24.7	8.9	30.0	3.4	6.1
Between $250M & $10B	57.1	22.9	10.8	25.4	4.6	5.3
Between $500M & $5B	57.0	22.1	11.4	24.4	5.2	5.2
Over $10B	40.5	20.2	17.0	18.0	5.2	6.2

- While asset allocation data is not largely reported among peer universe constituents, there are a few observations that stand out.

- Relative to similar sized public peers, PCRA:

    – Leans more aggressive, with a higher allocation to Total Equity.

    – Is also underweight Domestic Equity, with a modest overweight in International Equity.

    – Has meaningfully less exposure to Fixed Income.

[1] All data as of 12/31/21

[2] Note – not all funds report complete asset allocation data

Appendix

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Broader Peer Universe Performance: Public & Private
(Funds Under $1B)

Client Type	Average Return 1 Yr (%)	Average Return 5 Yr (%)	Average Return 10 Yr (%)
Corporate - closely held	8.9	9.7	8.6
Corporate - publicly traded	6.6	9.8	8.8
Educational Institution	8.0	8.1	6.6
Financial Intermediary / Wirehouse	6.9	9.7	7.7
Healthcare / Medical Research Org.	8.8	9.7	8.5
Multi-employer / Taft Hartley	13.2	10.2	9.3
Not For Profit / Charity Org.	11.1	10.3	9.3
Public - Federal and State Govt.	12.5	10.3	9.4
Public - Local Govt.	13.5	11.1	9.6
Religious Establishment / Church	12.7	10.8	9.8
Funds Under $1B Total	11.2	10.4	9.2

Funds Over $1B

Client Type	Average Return 1 Yr (%)	Average Return 5 Yr (%)	Average Return 10 Yr (%)
Corporate - closely held	9.5	9.6	8.4
Corporate - publicly traded	8.2	10.7	9.5
Financial Intermediary / Wirehouse	3.0	5.5	4.6
Healthcare / Medical Research Org.	11.4	10.5	8.8
Multi-employer / Taft Hartley	14.8	10.7	9.6
Not For Profit / Charity Org.	12.8	11.8	10.2
Public - Federal and State Govt.	16.1	11.1	9.8
Public - Local Govt.	14.5	10.8	9.5
Funds Over $1B Total	12.1	10.7	9.4

Meketa White Paper:
Insurance-Linked Securities

MEKETA
INVESTMENT GROUP

Insurance-linked Securities

Insurance-linked securities ("ILS") is an asset class that generally derives its return and risk from property damage insurance contracts related to natural catastrophes (e.g., earthquakes, hurricanes, etc.). In this class, investors provide insurance-related, at-risk capital in exchange for pre-defined premium payments. Investors assume the role of an insurer, as the underlying risk sources are insurance policies and/or derivatives that are analogous to insurance policies. The archetype of ILS is natural catastrophe property reinsurance where investors effectively assume insurance policies from the original insurers of global property damage that stem from natural perils.

ILS generally provides a moderate level of return whose risk sources are completely unrelated to the traditional capital markets. This type of investment provides a unique source of uncorrelated and economically intuitive returns that are typically absent from most investment portfolios. Moreover, ILS has the potential to provide societal benefits by lowering the cost of insurance for end policyholders and diluting the risk of ruin for the most susceptible companies and regions. For institutional investors that are willing to accept the complexity, modest returns, and relatively small market size, we believe that ILS, and in particular natural catastrophe property insurance/reinsurance, can benefit a total portfolio when included as an illiquid diversifying strategy.

CONTRIBUTORS
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Key takeaways

→ Insurance is one of the world's oldest commercial activities, and ILS/reinsurance offers institutional investors the ability to participate in this endeavor via the capital markets.

→ Reinsurance is best described as insurance for insurance companies. ILS represents a broader category that is generally dominated by reinsurance but also includes other related segments (e.g., direct/original insurance, insurance for reinsurance companies, etc.).

→ The underlying risks of this asset class primarily stem from insurance policies related to natural catastrophes (e.g., earthquake, hurricane, etc.).

→ Although ILS/reinsurance is an illiquid asset class, investors can generally fully redeem their investments within one year (unresolved insurance claims may extend this window).

- → Compared to other illiquid asset classes (Private Equity, Real Estate, Infrastructure, etc.), ILS offers greater diversification benefits but typically a lower expected return.
- → The asset class is unique, complex, and smaller than most traditional markets, but its returns/risks are generated from truly independent sources.
- → Similar to other insurance markets, investments in ILS/reinsurance exhibit truncated upside scenarios and the potential for severe drawdowns.
- → With mid-to-high single-digit returns and de minimis correlation to traditional markets, ILS/reinsurance can potentially benefit numerous types of investment portfolios as a diversifying strategy.

Introduction

Insurance is predicated on the concept of risk transfer. In a particular transaction, one party (the insurer) receives a known, upfront payment in exchange for assuming a defined but unknown risk that another party (the insured) is unable or unwilling to bear. Properly functioning insurance markets allow for a given set of risks to be more evenly distributed across a larger community. Due to risk aversion, purchasing insurance is perfectly rational despite it being a negative expected return exercise (i.e., a cost). This is most easily exemplified by the fact that insurance lowers the risk of ruin for a given entity. Furthermore, a lower risk of ruin allows for increased economic activity as entities are no longer required (either by law or self-determination) to hold a cash reserve to potentially cover a certain set of risks. Without getting too deep into utility theory (i.e., explanations for how individuals subjectively value outcomes), both policyholders and insurance companies mutually benefit from insurance transactions. This is possible because policyholders are able to reduce risks and have a narrower distribution of outcomes and insurance companies are able to receive a payment for this service – both of which are attractive events for the respective entities.

Reinsurance is the most common form/segment of ILS. At its most basic level, reinsurance is insurance for insurance companies. Like many investment strategies that are utilized by institutional investors today (e.g., middle market direct lending), reinsurance began as a relatively common transaction among corporate entities that has since expanded to the capital markets. For reinsurance, this has resulted in the growth of the "alternative capital" reinsurance market. Whether for regulatory or portfolio/risk management reasons, insurance companies of all sizes utilize the reinsurance marketplace (the combination of traditional and alternative capital) to modify and transform the risk on their books.

Although ILS is a relatively young asset class (e.g., mid-1990s) for institutional investors, it has continually evolved since its inception. Originally, the terms "ILS" and "reinsurance" were used interchangeably and they have both tended to refer to natural catastrophe property reinsurance. Due to the evolution of the asset class,

and the insurance industry more broadly, this is no longer necessarily the case. While the utilization of ILS has been sparse among US institutional investors, it has been widely adopted by institutional investors outside the US. This delayed adoption by US institutions has been seen in a wide variety of other asset classes over time (e.g., Infrastructure). Although the focus of this paper is on natural catastrophe property reinsurance, we will also review other areas that the ILS market has expanded into more recently.

History

Insurance is one of the world's oldest industries. There are examples of insurance-like behavior dating back to the Babylonians where maritime loans could be forgiven in the event of the loss of the ship.[1] Similar agreements occurred from this time up through the Middle Ages. As it relates to formal documentation, historians have traced some of the oldest insurance contracts to roughly the 1300-1345 A.D. timeframe, and the oldest law dealing with insurance is believed to be found in a Barcelona ordinance from 1435.[2] Moreover, it is believed that the earliest reinsurance agreement stems from a 1370 transaction where the risk of a sea voyage from Italy to Belgium was transferred from one insurer to another via contract.[3]

Reinsurance eventually became a mainstream business in the mid-1800s when Cologne Re (1848)[4], Swiss Re (1863)[5], and Munich Re (1880)[6] were founded as dedicated reinsurance companies. This industry expanded throughout the 1800s and 1900s, and both insurance and reinsurance companies were tested in the early-1900s as major catastrophes shook the world (e.g., 1904 Baltimore fire, 1906 San Francisco earthquake, 1912 Titanic sinking, World War I, etc.). As a result of these events, there was a divergence among insurers as several were unable to pay claims, and ultimately folded, whereas others began to build their reputation as reliable firms. While there were numerous events that affected insurance companies during the 20th century, the next major crossroads for the industry occurred in the early-1990s with Hurricane Andrew (1992) and the Northridge Earthquake in California (1994). These two events highlighted the need for a larger reinsurance marketplace, as it became evident that the demand for reinsurance exceeded the available supply.

As a response to the need for additional reinsurance supply, the capital markets began to provide alternative risk capital that allowed insurance and reinsurance companies to transfer portions of their risk to other entities in exchange for a premium payment. Catastrophe bonds ("cat bonds"), first issued in 1997, was one of the first methods of transferring risk from insurers/reinsurers to the institutional capital markets.[7] This marketplace has since grown to include other forms of risk transfer such as private collateralized reinsurance, industry loss warrants, and reinsurance sidecars and quota shares, among others (see Appendix). These other forms are analogous to the evolution of private equity (e.g., private collateralized

[1] Peter L. Bernstein, Against the Gods (New York: John Wiley & Sons, Inc., 1996).

[2] Society of Actuaries. Reinsurance News (February 2009 – Issue 65).

[3] Society of Actuaries. Reinsurance News (February 2009 – Issue 65).

[4] "History of Gen Re." Retrieved from www.genre.com.

[5] "Our history." Retrieved from www.swisre.com

[6] "Facts and figures." Retrieved from www.munichre.com.

[7] "Catastrophe bonds: A primer and retrospective." The Federal Reserve Bank of Chicago. Chicago Fed Letter 2018 Number 405.

reinsurance), co-investments (e.g., sidecars and quota shares), and equity index futures (e.g., industry loss warrants) if compared to public equity (e.g., cat bonds). All of these instruments are potentially used by ILS asset managers, a market segment that began in the late-1990s and expanded considerably after the Global Financial Crisis. For most ILS asset managers, private collateralized reinsurance makes up the majority of their portfolios.

Insurance is a heavily regulated industry across the globe. In order to abide by various rules and regulations, reinsurance companies (and related asset managers) have naturally gravitated towards certain reinsurance "capitals" of the world such as Bermuda, London, Zurich, and Singapore. All of these areas tended to be early-adopters of functioning insurance/reinsurance markets and thus centers for expertise. Moreover, this geographical positioning has been reinforced by the fact that market participants naturally want to be close to one another as transactions are still largely private in nature.

Strategic mechanics

The following diagram details the basic lifecycle path of how risks are transferred from the original entity/individual to the insurance/reinsurance market. Of note, the risk is divisible across various facets (e.g., region, peril, deductible/attachment level, etc.) at each point and may be transferred in part or in whole.

A homeowner of business seeks insurance for a given risk (e.g., hurricane)

A primary insurer underwrites/sells a direct insurance policy to the end policyholder

The primary insurer transfers part or all of the risk to a reinsurance company, ILS fund, or cat bond

In certain incidents, a reinsurer can further transfer part or all of the risk via retrocession (insurance for reinsurance)
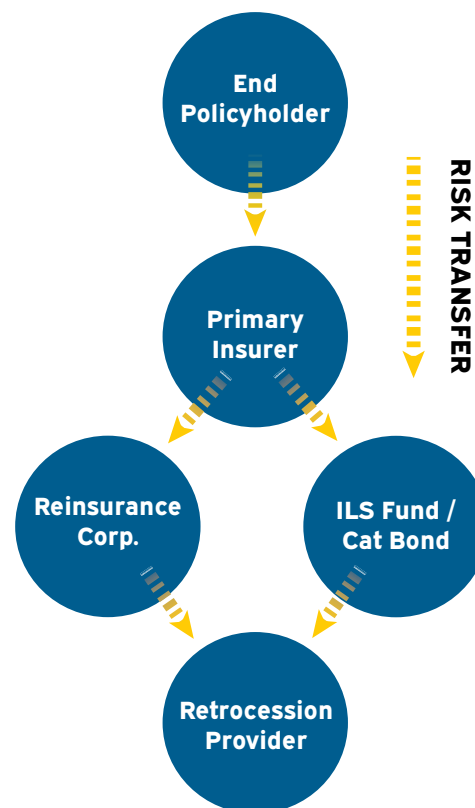
As highlighted above, reinsurance companies/ILS funds can purchase their own insurance (i.e., transfer the risk) via the retrocession market, which is served by other reinsurance companies and ILS funds.

As mentioned previously, insurance is a heavily regulated industry. It is for this reason that a unique mechanism must be used to transform insurance policies into investment securities. This is not too dissimilar from traditional financial securitization where special purpose vehicles ("SPVs") are used to create new investment securities that consist of other assets. The following diagram provides a basic illustration of how this process works for ILS.

In the simplified example above, a cedant transfers the risk of an insurance contract (or more specifically, a collection of contracts) by utilizing a "transformer" mechanism via an SPV in order to transfer the terms and conditions of the policies into an investable security. The SPV, which is typically registered as a reinsurer, is nothing more than an intermediate vehicle that allows the cedant to enter into a risk transfer contract that is collateralized by a corresponding collateral trust. Proceeds from the insurance premium (from the cedant) and the equity injection (from the ILS fund) are held in a collateral trust account and invested in money market-like instruments. The exposures are valued at regular periods based on realized claims, potential claims, and returns on the collateral. Upon expiration of the underlying contracts, the remaining value in the SPV/collateral trust is distributed to the ILS investor. In a best-case scenario, this value includes all of the original equity and insurance premiums, as well as a modest return from the money market-like exposure. In a worst-case scenario, all of the capital in the collateral trust account must be transferred back to the cedant to help pay for claims.

The schematic above represents a simplified version of how insurance exposure is transformed into an investable security, and it is important to note that all ILS transactions use similar methodologies, although they may be more complex in certain circumstances (e.g., partnership transactions may involve multiple SPVs, etc.). This applies to both catastrophe bonds as well as private collateralized reinsurance. To further complicate matters, the holdings of a given fund may be stated as various structures/entities (e.g., SPVs, ISDA swaps, etc.) that obscure the true exposures to an extent. This is due to regulations on what type of entity can actually trade these securities. In particular, certain investments, such as catastrophe bonds, can

be traded by a variety of entities (i.e., open market investments), whereas private collateralized reinsurance can only be transacted/traded by registered reinsurance companies. These registered insurance companies are effectively the SPV entity highlighted above. The registered reinsurance company is typically set-up by the ILS fund manager, and it is important for investors to understand how the costs of this entity are or are not amortized (i.e., does the asset manager pay for these costs from their management fee or are they borne by the fund as an operating expense?). Furthermore, these various constructs have evolved and will likely continue to evolve over time. The complexity that can be embedded in these constructs/vehicles is a reason why operational due diligence is a crucial endeavor when investing in ILS strategies. There can potentially be layers upon layers of SPVs and other entities, and it is important to understand the setup and management of these operationally complex structures. Moreover, it is important to understand how leverage may or may not be embedded into the fund structures.

Market size

The reinsurance market has grown considerably in recent years. As of Q3 2019, it is estimated that the reinsurance marketplace had approximately $625 billion of capital with over $90 billion originating from alternative capital sources. Traditional capital originates from dedicated reinsurance companies (e.g., Munich Re), whereas alternative capital comes from ILS-related investment strategies/funds. Prior to the Global Financial Crisis, the majority of the alternative capital stemmed from catastrophe bonds, but that has since declined to roughly one-third of the alternative capital amount (currently there is approximately $30 billion in outstanding catastrophe bonds). The limited size of the alternative capital market acts as a headwind for large investors to utilize ILS strategies. In addition to potentially impacting pricing, the majority of ILS funds are capacity constrained and will not allow large (e.g., greater than $1 billion) allocations. The largest managers in the segment currently manage approximately $5 to $10 billion and have closed their funds and/or have explored returning capital at points in recent history. This capacity issue, combined with the fact that ILS is a relatively complex private markets asset class, implies that investing in ILS requires careful consideration of an investor's individual portfolio and corresponding resources. ILS funds are also expanding into the direct insurance market (for similar perils), which allows ILS funds to access a materially larger market size (over $5 trillion).[8]

[8] Nephila Capital Ltd.
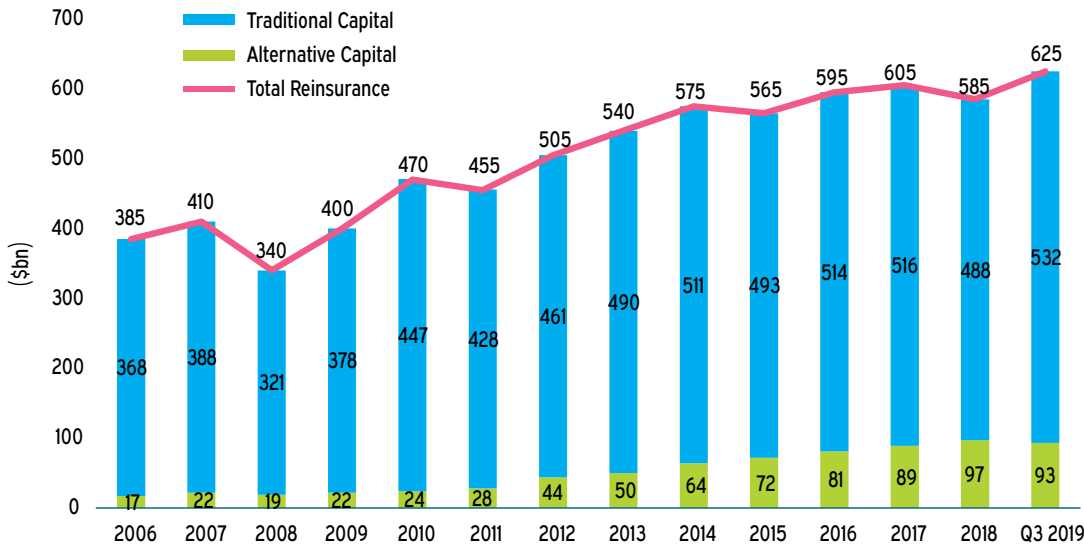
Contract/market pricing

Reinsurance has a similar payoff structure as fixed income asset classes (e.g., high yield bonds): the best-case scenario is an investor keeps 100% of the yield/premium income and the worst-case scenario is an investor loses both the yield/premium and the principal/collateral value. Considering this asymmetric payoff, investors need to pay close attention to the yields/premiums that are available in the ILS market. This is no different from a high yield bond investor seeking a reasonable credit spread in order to compensate them for the risk of default. The graphic below details regional Rate-On-Line[9] indices from Guy Carpenter (a global insurance company) that depicts how premium levels have changed over time.

[9] Rate-On-Line ("ROL") is the premium of a contract divided by the contract limit (e.g., a premium of $2 million to cover up to $10 million in damage would be a 20% ROL).
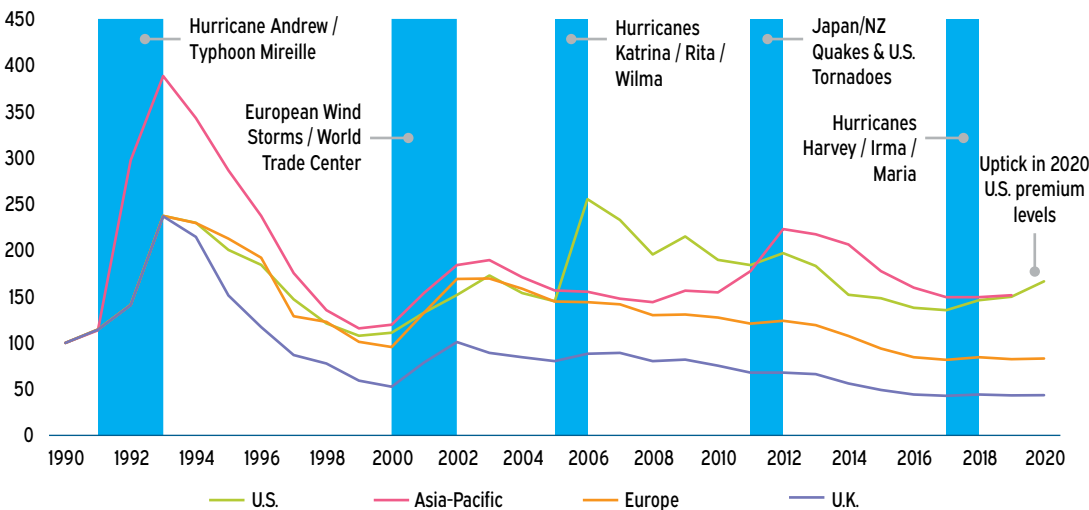
CHART 2
Global Reinsurance Premium Levels[10]

[10] 'Source: Bloomberg, Artemis

As illustrated in the previous chart, premium levels tend to increase after major events occur (highlighted in blue). One major exception was after the 2017 timeframe that saw several major hurricanes. This lack of a premium increase in 2018/2019 has been attributed to several causes:

1. The events of 2017 occurred after several years of relatively light natural catastrophes. As such, insurers/reinsurers were generally in sound financial condition and willing to take on risk.

2. As shown previously, the supply of risk capital had increased since 2012 and thus, reinsurers were naturally willing to accept lower premium levels.

3. This timeframe also occurred during the latter part of an extended equity bull market. The investment portfolios of insurance/reinsurance companies had thus appreciated significantly and further increased their risk appetite and willingness to accept lower premiums.

The explanations above all point to two things: 1) supply/demand for reinsurance and 2) risk appetite among insurers/reinsurers. Monitoring both of these elements (e.g., both have shifted in favor of higher premiums in 2020) are crucial to understanding market pricing.

Historical performance

One of the challenges with examining reinsurance as an asset class is the relatively small amount of representative historical performance data. This is not too dissimilar from other asset classes that have more recently transitioned from traditional commerce transactions to the capital markets (e.g., middle market direct lending). Generally speaking, most practitioners examine two sources of historical data: 1) catastrophe bonds and 2) multi-manager composites.

As it relates to catastrophe bond indices, there are several providers that produce these, each of which tends to be a major reinsurance broker or market participant. For the purposes of this paper, we examined a commonly used cat bond index from Swiss Re, a dedicated reinsurance company who also produces market data. As it relates to multi-manager composites, the most commonly referenced index is from EurekaHedge, which consists of roughly 32 ILS managers. It is important to note that neither of these data sources are perfect representations of what investors would have historically experienced or what they should expect to experience going forward.

As it relates to catastrophe bonds, this is merely a subset of the ILS market and, as publicly traded assets, catastrophe bonds can be subject to public market influences (e.g., yield compression). Catastrophe bonds are structured by securitizing underlying insurance policies into an investable form (identical to the SPV/transformer mechanism highlighted earlier) that are then traded among institutional investors,

typically subject to Rule 144a (i.e., there are various restrictions on who, how, and when they can be sold/resold). From the standpoint of an investor, cat bonds looks similar to a corporate bond with a principal/par value, regular coupon payments (e.g., quarterly), and a maturity (anywhere from one-to-five years but most commonly three).

The tables and graphics below provide basic performance analysis since inception for catastrophe bonds.[11]

	1-year	3-year	5-year	7-year	10-year	Since 2/2002
Catastrophe Bonds[12]	5.6	2.5	3.9	4.6	5.8	6.9
Global Equity[13]	2.1	6.1	6.5	7.8	9.2	6.7
Investment Grade Bonds[14]	8.7	5.3	4.3	4.0	3.8	4.7

TABLE 1
Trailing Period Performance — as of 6/30/2020

	1-year	3-year	5-year	7-year	10-year	Since 2/2002
Catastrophe Bonds	2.9	4.7	3.7	3.3	3.4	3.0
Global Equity	21.6	16.3	14.5	13.2	14.0	15.6
Investment Grade Bonds	3.7	3.3	3.1	3.0	2.9	3.4

TABLE 2
Trailing Period Volatility — as of 6/30/2020

	Catastrophe Bonds	Global Equity
Global Equity	0.20	
Investment Grade Bonds	0.15	-0.01

TABLE 3
Historical Monthly Correlations — as of 6/30/2020

[11] We have opted not to provide performance analysis for the EurekaHedge ILS Advisors Index. The diverse strategy types and opaque underlying risk/insurance sources requires numerous caveats that materially detract from the analytical value. With respect to multi-manager indices such as that from EurekaHedge, several issues stem from risk level and insurance-type heterogeneity. In other words, ILS managers/funds vary with respect to their risk targets (typically stated as a 99% Value-at-Risk expectation), underlying source of risk (e.g., property, life, cyber-risk, etc.), and overall objective (e.g., long-short absolute return vs. long-only). This level of characteristic variation, unfortunately, potentially results in a misrepresentation of the asset class.

[12] Swiss Re Global Catastrophe Bond Index

[13] Global Equity = MSCI ACWI Index

[14] IG Bonds = Bloomberg Barclays Aggregate Index
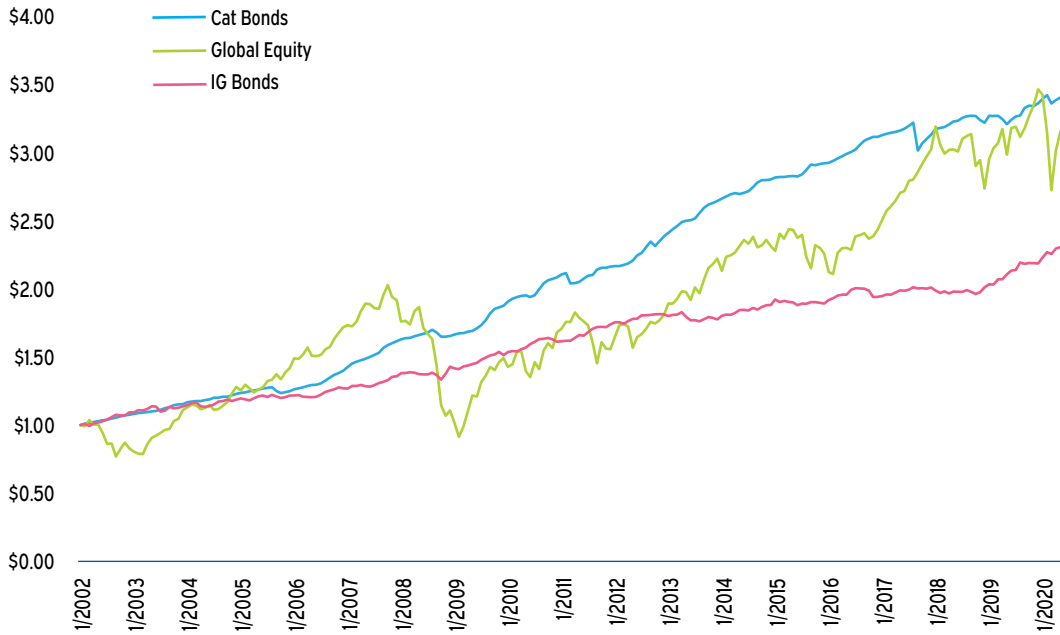
CHART 3
**Growth of $1 — as of
6/30/2020**

Cat Bonds
Global Equity
IG Bonds

$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00

1/2002 1/2003 1/2004 1/2005 1/2006 1/2007 1/2008 1/2009 1/2010 1/2011 1/2012 1/2013 1/2014 1/2015 1/2016 1/2017 1/2018 1/2019 1/2020
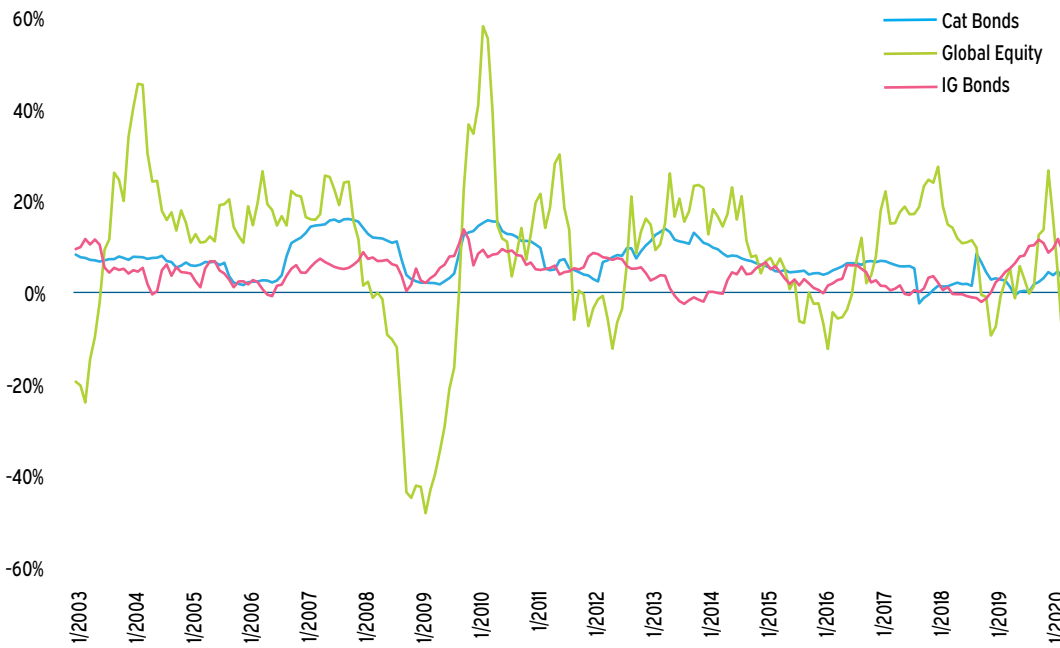
CHART 4
Rolling 1-Year Returns

Cat Bonds
Global Equity
IG Bonds

60%
40%
20%
0%
-20%
-40%
-60%

1/2003 1/2004 1/2005 1/2006 1/2007 1/2008 1/2009 1/2010 1/2011 1/2012 1/2013 1/2014 1/2015 1/2016 1/2017 1/2018 1/2019 1/2020

CHART 5
Rolling 1-Year Correlations
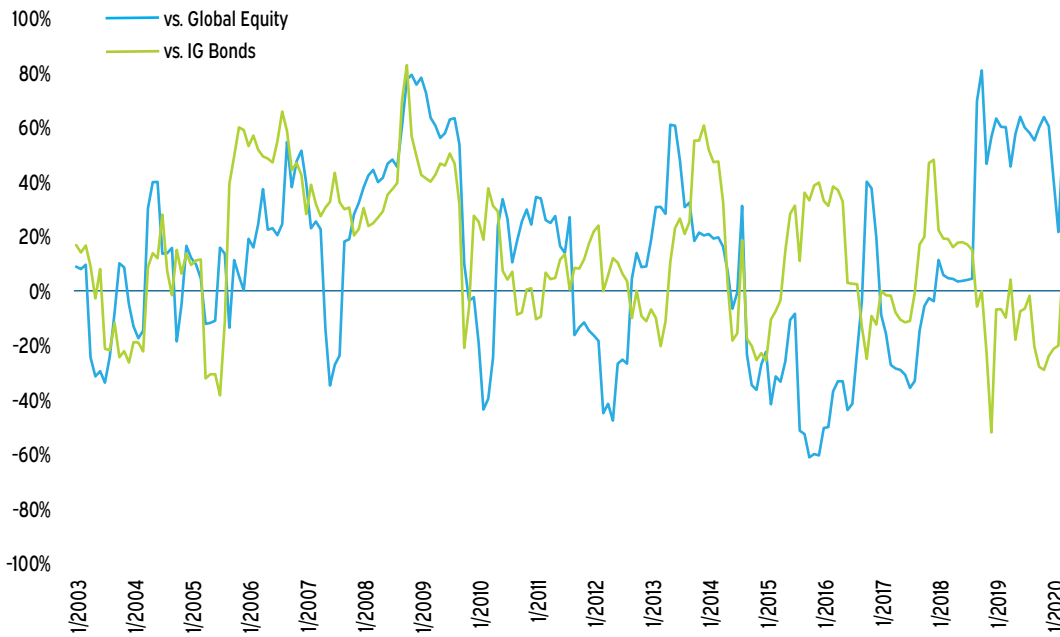
As detailed in the rolling 1-year correlation graphic above, the linear relationship between cat bonds and global equity can vary immensely when examined over short time periods. This is exactly what one would expect when examining two relatively uncorrelated assets. It is important to note that having a high correlation during a certain period does not necessarily mean that if one asset experiences a material negative return that the other asset also will. A high correlation simply means that both assets are likely to produce below average returns at the same time. This fact is commonly lost when examining correlation data.

To further highlight this point, below is a table that describes four material drawdowns for cat bonds and global equity, respectively. As shown in this table, when equity markets drawdown, cat bonds have tended to produce positive to marginally negative returns. Similarly, during natural catastrophe periods, when cat bonds have experienced negative drawdowns, global equity has tended to be unrelated (in 2008, however, there were both hurricane events as well as the Global Financial Crisis). In summary, the table below further demonstrates the relatively independent behavior of these two assets even during times of material stress.

Event/Backdrop	Dates	Cat Bonds	Global Equity
Equity Drawdowns			
Global Financial Crisis	Nov 07' — Feb 09'	5.4%	-54.9%
European Debt Crisis	May 11' — Sept 11'	4.8%	-20.5%
Geopolitical Turmoil & Rising Rates	Oct 18' — Dec 18'	-1.6%	-12.8%
COVID-19	Jan 19' — Mar 20'	-0.1%	-21.4%
Natural Disaster Drawdowns			
2005 Hurricanes (Katrina/Rita/Wilma)	Sep 05' – Oct 05'	-3.4%	0.2%
2008 Hurricanes (Gustav/Ike)	Sep 08' – Oct 08'*	-3.1%	-29.8%*
Japan Earthquake/Tsunami	Mar 11'	-3.6%	-0.1%
2017 Hurricanes (Harvey/Irma /Maria)	Sep 17'	-6.3%	1.9%

TABLE 4
Example Market Drawdowns

*This period coincides with the Global Financial Crisis

As illustrated in the tables and graphics above, catastrophe bonds have experienced strong performance since the inception of the Swiss Re Global Catastrophe Bond Index. In particular, this index has produced returns in-line or above investment grade bonds with a similar level of volatility. Catastrophe bonds have also managed to perform in-line with global equity over this timeframe. While this data makes catastrophe bonds (as a proxy for the broader ILS asset class) seem highly attractive, it comes with several significant caveats:

→ This period has multiple biases against global equity. The January 2002 to June 2020 timeframe includes the end of the tech bubble crash, the Global Financial Crisis, and the COVID-19 pandemic. In other words, this period had three historically challenging events in the beginning, middle, and end for global equity.

→ Catastrophe bonds are sometimes used as fixed income replacements and/ or within fixed income portfolios (e.g., PIMCO has traded catastrophe bonds in traditional fixed income strategies since their inception). Due to this, catastrophe bonds have been, at least in part, influenced by dynamics in the fixed income markets.

→ It is important to note that the size of the catastrophe bond market changed throughout this timeframe but has never been near the scale of other yield-oriented asset classes such as investment grade or high yield corporate bonds.[15] The market has increased from several hundred million in the late 1990s to $30 billion in 2020.[16]

[15] As of 6/30/20, the US investment grade and high yield corporate bond markets were approximately $6.6 trillion and $1.4 trillion, respectively (as represented by Bloomberg Barclays indices).

[16] Source: Aon Securities (excludes most non-catastrophe related risks)

From Meketa's perspective, a key element of the historical performance analysis of catastrophe bonds is the correlation data. Over the last 18+ years, and despite being a publicly traded asset, catastrophe bonds have demonstrated little relationship with the world's most prevalent asset classes (i.e., global equity and investment grade bonds). This is aligned with economic intuition (i.e., that natural catastrophes tend to

be uncorrelated with the broader economic cycle), and Meketa would expect these correlations to be close to zero on a forward-looking basis, especially as investors implement ILS in private fund structures rather than as a publicly traded subset. While most private markets strategies provide illusory correlation benefits, private ILS strategies have realized gains/losses at very short intervals (i.e., monthly valuations and annual realizations/renewals) and, thus, their observed correlation behavior is a better representation of economic reality.

Implementation

As detailed under the *Risk and Utility Theory* section in the Appendix, the key to any insurance strategy is properly evaluating the probabilities and magnitudes of scenarios and pricing policies accordingly. For ILS/reinsurance managers, this comes down to deal flow/access, actuarial/modeling experience and expertise, negotiating power[17], and portfolio/risk management. Reinsurance can generally be accessed via three methods: 1) cat bond mandates, 2) hedge funds, and 3) private reinsurance funds.[18] From Meketa's standpoint, private reinsurance funds represent the most attractive offerings. As it relates to cat bonds, there are a few primary drawbacks: 1) there is no information edge or negotiating ability as they are public securities, 2) the market size is variable and can be of insufficient size (currently around $30 billion in aggregate), and 3) dedicated offerings are relatively scarce. For hedge funds, they commonly utilize reinsurance in an opportunistic fashion or as part of a larger insurance book that contains other forms of risk (e.g., life settlements). When used in an opportunistic fashion, the funds typically lack one or more of the ideal attributes listed above. When used as a part of a large insurance book, there are other risks that may increase the strategy's correlation to the traditional capital markets or that may increase the risk an institutional investor already bears (e.g., longevity risk as it relates to life settlements).

Private reinsurance/ILS funds, and more specifically, natural catastrophe property reinsurance/ILS–focused funds, offer investors the best avenue for achieving success in the reinsurance/ILS space. When it comes to evaluating these funds, it is best to focus on the four key attributes highlighted above: 1) deal flow/access, 2) actuarial/modeling experience and expertise, 3) negotiating power, and 4) portfolio/risk management. It should be expected that fees are similar to other private markets strategies (e.g., 1-2% management with the potential for a performance fee of 10-20%). The reinsurance marketplace is continually evolving, and event risks outside of natural catastrophe risks (e.g., cyber security) are growing as potential areas of investment. It is important to remember that one of the most attractive elements of natural catastrophe reinsurance is its uncorrelated behavior to traditional investments, and thus, investors need to examine each new event risk category and its potential relationship to the capital markets prior to investing.

[17] With private reinsurance, there is typically a back-and-forth negotiating process on a given deal where better pricing can potentially be achieved.

[18] Large-scale, sophisticated investors could also set-up separate accounts/entities that can act as a reinsurance company, but this is beyond the scope of this paper.

TABLE 5
Tradeoffs of Investment Options

	Cat Bonds	Hedge Funds	Private/Dedicated Reinsurance/ILS Funds
Pros	→ Relatively liquid (more frequent commitments and withdrawals). → Lowest cost option.	→ Potentially more opportunistic exposure to ILS. → Typically diverse insurance-related risks.	→ Dedicated expertise. → Strongest industry relationships and operational infrastructure. → Best-in-class portfolio and risk management tools and approaches. → Customizable risk levels (i.e., multiple funds at each manager).
Cons	→ Higher correlation to traditional asset classes. → Transaction costs and access can be limit implementations. → Generally minimal actuarial and insurance expertise among managers. → Highly variable underlying market size. → Potentially the most capacity constrained. → Minimal ability for portfolio managers to customize the underlying exposures.	→ Variable levels of transparency. → Moderate actuarial and insurance expertise among managers. → Underlying policy-types (e.g., pandemic, cyber security, life insurance, etc.) may increase correlation risks already borne by the investor. → Potentially non-ILS exposures within the funds. → Poorer access to deal flow and relationships. → Liquidity can vary immensely.	→ Strategic exposure to the segment — may be forced to put money to work at unattractive prices. → Partial liquidity is generally only at the major renewal periods.

Additionally, due to the complex structures, legal entities, and operations of reinsurance markets and funds, in-depth operational due diligence is an absolute must prior to investing in reinsurance funds. Reinsurance is a private markets strategy and should be treated in a similar fashion as other private markets investments when it comes to due diligence.

Expected return/risk and strategic allocation

Reinsurance has a large amount of variability with respect to expected returns and risks. While these metrics vary at the instrument level, the most relevant divergences for an investor occur at the strategy or implementation level. In particular, managers commonly offer a suite of strategies that meet different risk/return objectives. A close analogy would be that of credit: investments can range from relatively safe and low returning investment grade credit bonds, to distressed debt investments that have significant levels of risk with commensurate expected returns. A nice feature of reinsurance, unlike credit, is that expected correlations with traditional capital markets should not be impacted by the different risk levels/implementations. This allows us to keep a constant correlation assumption while varying the expected return and risk levels based on the implementation.

For the purposes of this paper, we will provide a framework to use when developing expected returns and risk assumptions and analyzing reinsurance within the context of a total portfolio allocation. We will keep this relatively simple, as this could be an entire paper in and of itself. Moreover, we will focus on private reinsurance/ILS funds as that is Meketa's recommended implementation.

For expected returns, there are four metrics to examine: 1) current publicly traded catastrophe bond yields, 2) historical returns of catastrophe bonds and/or reinsurance strategies, 3) current market pricings/premiums and historical loss rates, 4) manager expectations. These metrics typically range from the low single digits (e.g., 3% cat bond yield) to the mid-teens (e.g., 15% target returns for the riskiest private reinsurance strategies). In general, however, most of these metrics will point to an expected long-term return in the 4-8% range (in excess of cash)[19] for commonly used private reinsurance funds.

For expected risks, it is very important to use as forward-looking metrics as possible. Since reinsurance exhibits truncated upside potential and a significant left tail, historical data may not be the most indicative of the level of risk. For example, specific catastrophe bonds have exhibited de minimis drawdowns and volatility levels by pure chance simply because the underlying events/triggers did not occur (e.g., they were high severity but low probability events). This does not mean that there was no risk embedded in those securities, however. Luckily, private reinsurance funds are typically constructed based on a 99% value-at-risk ("VaR") level (i.e., a 1 in 100 event loss). Managers use very similar, if not identical, tools to estimate these levels.[20] While a normal distribution does not perfectly align with the return outcomes of reinsurance/ILS, we can use a z-score methodology to back into an expected volatility level for simplification and framing purposes. For example, if we assume a given fund has an expected return of 6% and a commonly referenced 99% VaR level of -25%[21], we can estimate an expected volatility of 13.3%.[22]

$$6\% - 2.33 \times 13.3\% = -25\%$$

An interesting observation is that this return/risk ratio is very similar to other asset classes with expected volatilities close to this level (e.g., high yield debt, equity option put-writing, etc.). Once again, due to the truncated upside potential and significant left tail exposure, traditional mean-variance optimization, and corresponding volatility metrics, are not the most optimal methods/metrics for examining ILS strategies. With that said, using a z-score methodology for backing into an expected volatility is useful for obtaining a high-level grasp of the relative "riskiness" of ILS strategies. The takeaway from the example above is that the example ILS fund is fairly risky and expectations should be managed in a similar fashion as those of high yield bonds, for example. Additionally, the distribution of ILS fund returns can vary based on a given fund's design. The probability and severity of the underlying risks can vary significantly, and this adds another challenge to incorporating ILS into a portfolio optimization and/or expected return/risk exercise.

[19] In order to approach the higher end of this range, a considerable amount of additional downside risk is typically taken on in the strategy.

[20] While the tools are similar, managers will modify certain inputs and parameters based on their viewpoints and research. This is similar to how public equity managers use systems such as BARRA and Axioma, among others.

[21] In this instance, we are removing the dollar value in the VaR metric. These levels often range from -20% to -50% for ILS funds of different risk levels.

[22] 99% (or 1% depending on frame of reference) VaR is 2.33 standard deviations away from the mean.

The decision to include reinsurance in a total portfolio should only come after one gains a solid understanding of its intricacies and as part of a comprehensive asset allocation optimization exercise. Due to the relative stability of its correlation to other asset classes, however, one can use a very simple framework[23] to determine if adding reinsurance to a portfolio would improve its Sharpe Ratio. In particular, if the following is true, adding reinsurance can prove beneficial:

$$S_i > S_p \times \rho_{i,p}$$

Where:
S_i = Sharpe Ratio of reinsurance
S_p = Sharpe Ratio of the existing portfolio
$\rho_{i,p}$ = correlation between reinsurance and the existing portfolio

Considering that a fundamental underpinning of reinsurance is its lack of correlation to traditional investment strategies, it could have nearly any positive Sharpe Ratio and its inclusion would improve a portfolio's Sharpe Ratio. While very few institutional investors seek to solely maximize the Sharpe Ratio of their portfolio, the fact that reinsurance/ILS exhibits an expected return in between traditional stocks and bonds while also exhibiting near zero correlation to both implies that its inclusion can be beneficial from a risk/return standpoint while maintaining a similar expected return of the total portfolio. As discussed earlier, the decision to include reinsurance in a total portfolio should only come as part of a comprehensive asset allocation exercise.

Summary and recommendation

Insurance is one of the world's oldest and most consistently profitable industries. With insurance-like transactions occurring for hundreds (if not thousands) of years, insurance has history and economic intuition supporting its continued existence. Insurance represents a crucial part of the global economic system that can improve economic growth by spreading risk and minimizing the risk of ruin. This service, however, is not free, but both insurance sellers and buyers can be considered rationale economic actors, reinforcing insurance as a foundation of a developed society.

Insurance-linked securities (i.e., reinsurance) is a unique asset class that generally derives its return and risk from property damage insurance contracts related to natural catastrophes. Most commonly described as insurance for insurance companies, reinsurance/ILS generally provides a moderate level of return whose risk sources are completely unrelated to the traditional capital markets. As a private market, reinsurance has various intricacies that must be fully understood, but it represents an illiquid diversifying strategy that can enhance the risk-return tradeoff of most any portfolio.

[23] This uses mean-variance analysis preferences. In practice, investors should utilize multi-parameter optimization approaches that are customized to their situation.

Meketa believes that insurance-linked securities represents an attractive asset class to generate a moderate level of return with tremendous diversification benefits. As a moderately illiquid class, however, investors need to consider its inclusion within their broader liquidity budget. Additionally, due to the annual variation in policy premium levels and the potential for severe left tail events (which will need to be recouped), investors should only invest in reinsurance/ILS if they are willing to stick with the strategy for periods of at least 5-10 years.

Moreover, the asset class's relevance for investors can vary. Investors that are too large may run into sizing issues, unlikely to allocate enough to the class for it to be meaningful, whereas small institutions that are inexperienced with private markets classes may not have the resources to properly manage and oversee the strategy. For institutional investors that are willing to accept the complexity, modest returns, and relatively small market size, we believe that an allocation of 2%-7% to reinsurance may be worthwhile.. When combined with other diversifying strategies (relative to equity-like investments), reinsurance can help create a more efficient portfolio.

Appendix

Contract basics

This section provides basic information on two key elements of standard private reinsurance contracts: 1) issuance and 2) risk type.

Similar to home or automobile insurance, reinsurance is an insurance policy that is in effect for a specified amount of time (typically one year) and must be renewed. One of the unique features of reinsurance is the renewal periods, which are detailed in the table below:

	January	Majority of global transactions are renewed.
	February	
	March	
	April	Most Japan transactions are renewed.
	May	
Hurricane Season	June	Most US wind and Australia/New Zealand transactions are renewed.
	July	
	August	
	September	
	October	
	November	
	December	

As detailed above, there are three major annual renewal periods: January 1st, April 1st, and June/July 1st. With a standardized renewal cycle (both traditional reinsurers and ILS funds participate at the same time), reinsurance is able to create a more efficient marketplace for sellers and buyers to transact. With that said, once reinsurance contracts are bought/sold (i.e., risk is transferred from a cedant to a reinsurer), the contracts are effectively illiquid. While there may be mechanisms to reduce certain exposures (e.g., retro, ILWs, etc.), most reinsurance will be held until expiration, at which point, the same contract is commonly renewed the following year. This liquidity characteristic is the primary reason why ILS funds generally have quarterly (at best) liquidity. ILS funds commonly obtain liquidity by waiting for renewal periods, holding cash, or buying/selling catastrophe bonds or quota shares. Additionally, due to the unique renewal cycle, ILS funds must re-create regional exposures at the major renewal dates.[24]

[24] This also poses a challenge for new funds entering the market – they cannot get exposure to all regions/perils at inception. Due to this, most new funds will use quota share engagements to obtain a diversified portfolio on day one.

Another important element of the issuance process is how the transactions actually occur. It is not an exaggeration to state that reinsurance is a relationship business. Reinsurance will typically flow through a broker of some kind, but ILS funds may also be able to source transactions directly from cedants, via quasi-marketplaces (e.g., Lloyd's Syndicate), or via other partnership mechanisms, including direct insurance programs[25]. A vital element for successful ILS funds is deal flow, which manifests itself via relationships, reputation, and operational infrastructure (e.g., direct insurance programs).

A second important element of reinsurance contracts is the risk type.[26] At a high-level, this can be separated into proportional vs. non-proportional risks. For proportional risks (e.g., quota shares), risk is shared on a proportional basis where premiums and losses are distributed pro rata. For non-proportional reinsurance, risk is shared based on a specified threshold (i.e., once claims reach a level, the reinsurer bears 100% of the exposure up to a limit). A close analogy for non-proportional reinsurance is that of tail risk protection (with a limit).

Non-proportional risk is generally broken up into two groups: aggregate and occurrence. The basic difference is that aggregate contracts cover multiple events that occur within a window whereas occurrence contracts only cover one event/risk (with an agreed upon definition)[27]. It is important to note that as a private market, there is a high degree of customization that can occur. The graphic below pictorially describes these variants. The "attachment level" can be thought of as a deductible and the "exhaustion level" can be thought of as an upper threshold amount. The maximum loss for a given reinsurance contract is the difference between those two amounts and is called the notional limit.

Occurrence Example — Event 1

Exhaustion Level (e.g., $500mn)

Attachment Level (e.g., $300mn)

Aggregate Example — Event 1, Event 2, Event 3, Event 4
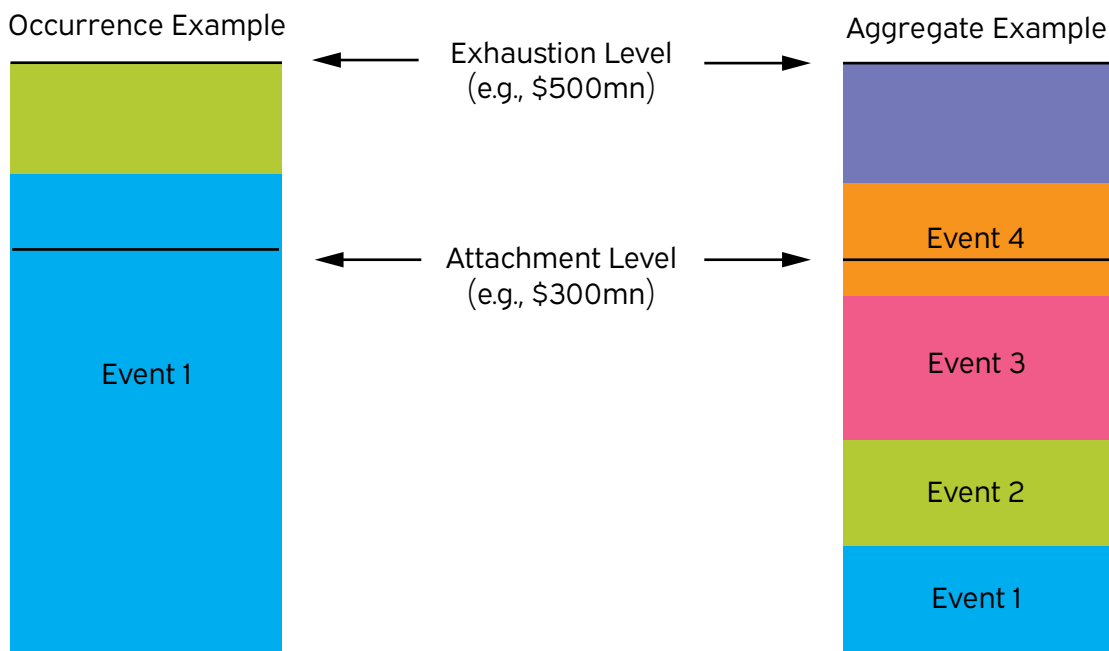
Additionally, if contracts hit their limits or otherwise expire (e.g., a single event exceeds the attachment level but does not hit the exhaustion level), there is a mechanism for cedants to renew/continue their coverage. This is referred to as the "reinstatement clauses" in the contracts and can be significantly customized.

Geographic/peril exposures

Despite the fact that certain security types are held within publicly traded assets (i.e., cat bonds), reinsurance is a private market. As a private market, obtaining accurate and up-to-date market-level data is challenging. This issue is exacerbated even further by the fact that contracts are relatively short in maturity, the insurance industry is continually changing, and reinsurance is technically "derived" from another private market: direct insurance. Given all of these caveats, it is still useful to explore data that is indicative, even if not precise, of the aggregate market.

There are degrees of granularity that can be explored, but for the purposes of this paper, we will focus on the highest levels: geographies and perils. While not exactly analogous to market capitalization, one can examine "economic losses" and "insured losses" to gauge the potential size of various insurance/reinsurance markets. Economic losses represent the total amount of damage incurred in a given area for a given peril, and insured losses represents the subset of that which was covered by insurance (and potentially by reinsurance). These figures will differ from what is actually transacted in the reinsurance market, but nonetheless, they provide indications of the aggregate natural catastrophe insurance market. The graphic below provides estimated economic and insured loss data for the last decade (2010-2019) across major regions and perils.
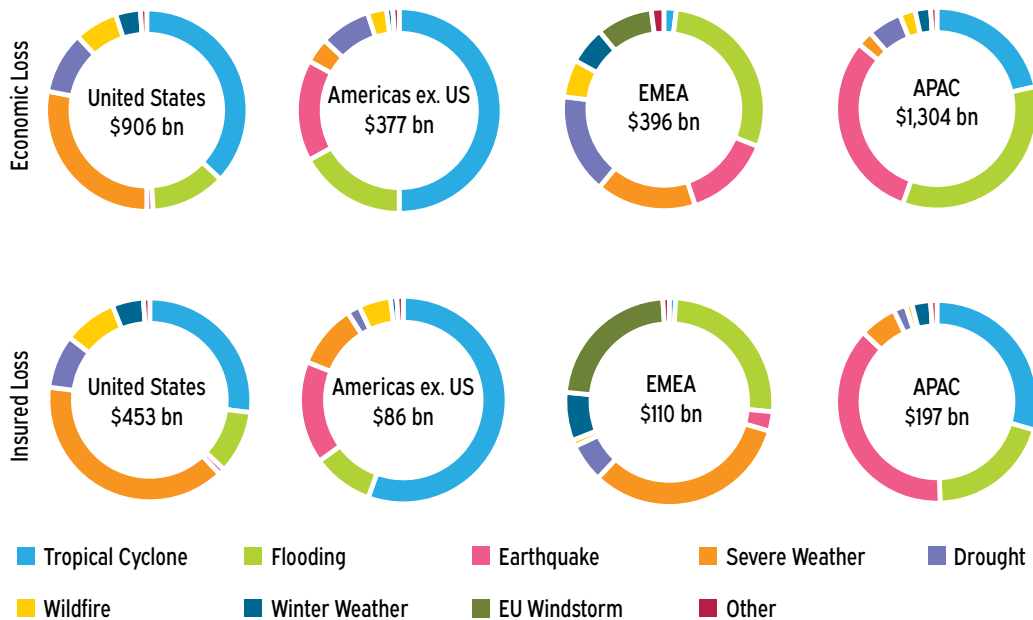
CHART 6
Economic and Insured Losses (2010—2019)

Source: Aon plc

There is a variety of general takeaways from the graphic above:

→ The types of perils that impacted the different regions are aligned with what one would expect given their geographies.

→ Tropical Cyclone (i.e., Hurricanes and Typhoons), Severe Weather, and Flooding were the dominant events across the globe.

→ While insured losses generally resembled the economic losses on a peril percentage basis, there were slight variances in certain regions (e.g., minimal earthquake insured losses compared to economic losses in EMEA).

→ The US is better insured than the rest of the world. Roughly half of the economic damage was insured over this time period.

→ The APAC (Asia-Pacific) region had the largest economic losses but was significantly underinsured ($197bn in insured losses vs. $1.3tn in economic losses) compared to the US. This equates to only a 15% insurance penetration rate.

→ For both the Americas (ex. US) and EMEA (Europe, Africa, and the Middle East), only about 25% of the economic losses were insured.

→ The economic losses in the EMEA (Europe, Africa, and the Middle East) region were fairly diverse (as expected given the geographic diversity of the region).

Additionally, in regions where insurance penetration is low (e.g., developing Asia, Africa, etc.), there can be a significant drag on economic growth, as these costs are then shared across governments and individual entities (i.e., households and companies). This provides further support for insurance/reinsurance as a societal benefit and an important element of economic growth.

We can also examine how many natural disaster events occurred over time in the various regions. This measure partially normalizes the regions for property values and other variations. The graphic below details the number of natural disaster events that meet all of the following qualifications:

→ Economic loss = $50+ million (inflation-adjusted)

→ Insured loss = $25+ million (inflation-adjusted)

→ Fatalities = 10+

→ Injured = 50+

→ Structures damages/filed claims = 2,000+

As detailed in the graphic above, the number of events that have occurred across the globe has been somewhat stable in aggregate, but regions have experienced material variation. For example, the United States experienced a material increase in the 2016-2019 timeframe compared to earlier in the 21st century. This metric can be compared/contrasted with the number of billion dollar economic losses (inflation-adjusted) across the globe as shown below.
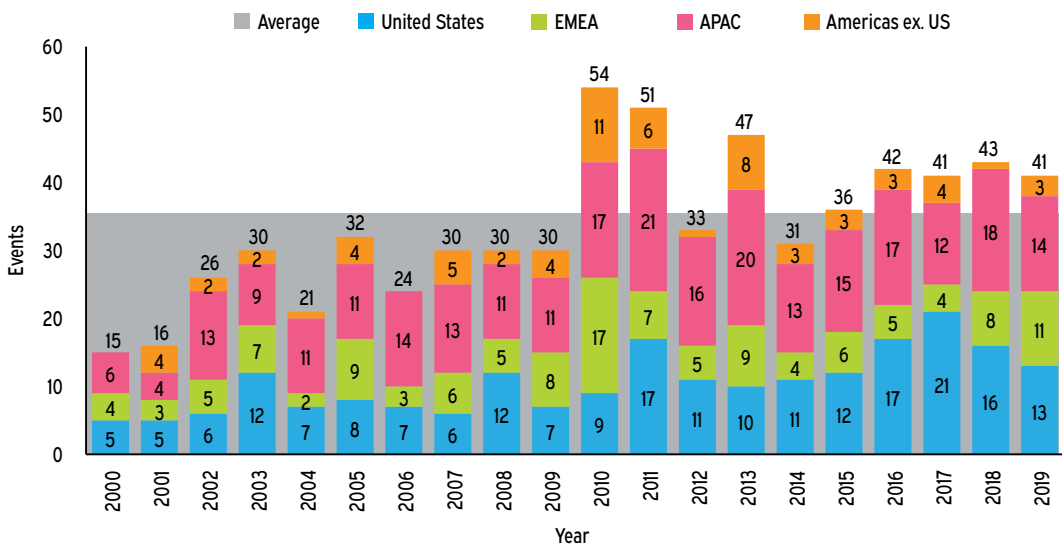
When examining the *Global Billion Dollar Economic Loss Events* graphic, there is an obvious trend that large-scale economic losses have been increasing over the last twenty years. Reconciling this takeaway with the fact that the total number of global natural disaster events has remained relatively stable over this same time period leads to three major takeaways (i.e., hypotheses):

1. The magnitude of events have increased.

2. Infrastructure development and/or migration to more susceptible areas (e.g., coasts) has increased.

3. Real property values have increased.

The takeaways above are widely accepted by the insurance/reinsurance industry and are key elements to their decision-making processes. While the purpose of this paper is not to dive into climate change as a topic, this is a significant point of interest for the insurance/reinsurance industry. The widely accepted industry view is that climate change is occurring and vendors are adapting their models and policy pricing accordingly.

Security types/market segments

An ILS portfolio can consist of a variety of security types. These often range from publicly traded catastrophe bonds to privately negotiated sidecar structures. We define the most common security types (i.e., implementations) below:

→ **Publicly traded reinsurance companies** Several of the world's largest reinsurance companies (e.g., Swiss Re, Munich Re, etc.) are publicly traded corporations. As such, certain ILS funds may include their common stock (or debt) as holdings within a portfolio. While their revenue, operations, and profits are derived from the reinsurance industry as a whole, there is a large equity market beta component in their returns (i.e., commonality with traditional equity portfolios) that negates most perceived benefits. Meketa does not believe that these securities should be utilized within a client's ILS portfolio as they increase its correlation to traditional markets by definition.

→ **Catastrophe bonds** ("cat bonds") These securities are publicly traded debt instruments that are typically created by insurance/reinsurance companies to cover certain risks. In-line with the SPV structure shown previously, the collateral and premiums are held at a separate entity and invested in money market–like investments. The cat bond investor receives a coupon payment (typically a floating rate) and will receive the principal back when the bonds expire. If there are claims, the collateral account will decline and the principal value will decrease. The bonds are commonly three years in maturity.

→ **Sidecars** These legal structures allow insurers/reinsurers to separate specific exposures into a separate entity. This separate entity can be used to aggregate risk capital from different entities or simply isolate certain exposures (e.g., impaired policies).

→ **Quota share** An agreement in which risk is shared across multiple entities. This is a form of proportional reinsurance where the parties share premiums, losses, and costs of a specific reinsurance portfolio. Quota shares are commonly used in funds that want to gain quick access to an existing portfolio or hard-to-access exposures.

→ **Industry loss warrants ("ILWs")** These are derivative contracts that provide payoffs based on losses across the entire insurance industry, although they are customized to specific regions and perils. The contracts contains specific parameters (i.e., triggers) that are then measured by widely accepted third-party entities. Like all reinsurance, these can be highly customized and can include payoffs during and/or after events have occurred.

→ **Private collateralized reinsurance** This is the most common security type and what most practitioners refer to when discussing the asset class. These privately negotiated contracts utilize the SPV structure that was previously discussed, and while similar to cat bonds in structure, they are typically only one year in maturity.

→ **Retrocessional reinsurance ("retro")** This is simply reinsurance for reinsurance companies. Retro represents an additional transfer of risk from the second cedant to a third reinsurer.

Example resinsurance contract metrics and outcomes for California earthquake

Notional limit = $10 million

→ One-year maturity for single event earthquake damages within a specified region in CA

Attachment = $30 million | Exhaustion = $40mn

→ Event loss less than $30mn = nothing paid
→ Event loss greater than $40mn = $10mn paid
→ Event loss $30mn-$40mn = pro rata $0-$10mn paid

Expected Return Calculation

→ Premium paid   = $2.8mn
→ Collateral posted = $10mn - $2.8mn   = $7.2mn
→ Expected loss (based on models)   = $1.0mn
→ Expected profit = $2.8mn - $1.0mn   = $1.8mn
→ Cash return on collateral + premium = $10mn * 1%   = $0.1mn
→ **Expected return = ($1.8mn + 0.1mn) / $7.2mn   = 26.4%**

Risk utility thought experiment

The below describes a basic thought experiment for this concept:

→ Suppose one has been offered to participate in a game where the payoff is based on the flipping of a fair coin. If it is heads, the player wins $100, and if it is tails, the player wins $0.

→ Since there is a 50% chance of landing on either side, the expected value (i.e., the statistical average payoff if one were to conduct this experiment over and over again) is $50 (50%*$0 + 50%*$100 = $50).

→ Now, suppose the same individual was offered the choice between: 1) a guaranteed payoff or 2) the chance to play the game. At what value would someone be indifferent between the two? That depends on their risk preferences.
   → A risk averse individual would be willing to accept a guaranteed payment less than $50 rather than potentially receiving nothing by playing the game.
   → A risk neutral individual would be indifferent between a guaranteed payment of $50 compared to playing the game.
   → A risk seeking individual would require a payment more than $50 in order to not play the game.

→ This same game can be reversed with the following parameters. If it is heads, the player loses $100, and if it is tails, the player loses $0.

→ In this game, the expected value is -$50 (50%*$0 + 50%*-$100 = -$50).

→ Similar to the prior game, is there a value at which individuals would be indifferent between paying versus playing the game? This also depends on their risk preferences.
   → A risk averse individual would be willing to pay more than $50 (i.e., accept a known loss more than $50) rather than potentially losing $100.
   → A risk neutral individual would be indifferent between a guaranteed loss of $50 and playing the game.
   → A risk seeking individual would only pay less than $50; otherwise they would play the game.

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Appendices

MEKETA

Recent Meketa Investment Group Memorandums

MEKETA

INVESTMENT GROUP

MEMORANDUM

TO: Meketa Clients
FROM: Meketa Investment Group
DATE: March 3, 2022
RE: Market Update: Russian Invasion of Ukraine

Given the rapidly evolving situation between Russia and Ukraine and its impact on capital markets, we wanted to follow-up on our memo from last week with an update. In this piece we will discuss the increase in coordinated sanctions against Russia and their response, the current state of the capital markets within Russia and elsewhere, the call for divestment from Russian investments, and potential risks going forward. We recognize that this is a rapidly evolving situation with many potential outcomes, and we will continue to monitor the situation as it unfolds.

Escalating sanctions

In our memo from last week, we noted that the sanctions that had been enacted were similar to past sanctions: in this case, targeting key Russian officials and their families, companies, and banking transactions. Since then, the scope of sanctions and the countries participating has grown dramatically, and Russia has responded with its own set of sanctions and efforts to protect their economy. Given Russia's apparent intent to continue its aggressive path, sanctions against the country will likely continue to evolve.

Foreign exchange reserves locked down, and banks being excluded from SWIFT[1]

Few anticipated the sweeping scope of the joint sanction announcement by the Council of Europe states, the United Kingdom, Canada, and the US at the end of February. And while a number of restrictions were announced, the two most likely to upset the functioning of Russian financial markets directly are the seizing of Russia's foreign exchange reserves by several central banks and the exclusion of select Russian banks from the SWIFT network. However, at this time, major oil and energy banks are not under sanction, which allows EU countries to continue to trade respective energy commodities with Russia.

First, with the restriction on Russia's foreign reserves invoked, the Russian central bank has faced significant challenges supporting the currency as investors shed exposure and Russian citizens look to exchange rubles for more stable foreign currencies.

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[1] The SWIFT messaging system is a global electronic platform that provides for safe and secure transmission of transactions for its members. Most notably, this includes payment messaging and instructions.

Based on recent estimates Russia's foreign exchange reserves are meaningful at roughly $630 billion. The composition of those reserves is proving problematic as over half of the assets are dominated in major foreign currencies that have largely been seized through the sanction. Faced with this reality, the Russian central bank has been unable to support the currency over the last week as the ruble depreciated by over 25% against the dollar during that period to trade at an all-time low of roughly 1 penny per dollar.

The other major sanction, namely a handful of banks being excluded from SWIFT, is likely the most material sanction that will heavily impact Russia's financial markets and the functioning of the Russian economy. For Russia, the exclusion of some of their largest domestic banks from the platform will greatly curtail the government's ability to execute transactions such as trades related to energy and agricultural commerce. The repercussions of this could be notable spikes in related commodity prices as Russia is effectively removed from markets. Not waiting for the sanction to be finalized,[2] anecdotal reports suggest some clearing houses and currency desks are actively stepping back from ruble-denominated transitions. Overall, as this continues to develop and potentially expands to include additional banking entities, volatility in assets with notable Russian exposure is likely to continue.

Russia's response

Given the above sanctions, particularly the restricted access to central bank reserves, Russia has tried to support its financial markets and currency through other means.

This includes the Central Bank of Russia (CBR) hiking policy rates from 9.5% to 20% in an effort to defend the value of the ruble. Restrictions were also placed on capital outflows from the country, the servicing of foreign loans, and the paying of corporate debt. Russian export companies have further been ordered to sell 80% of their foreign exchange reserves to repatriate capital to the banking system.

The CBR has also taken the aggressive step of closing the Moscow stock exchange (MICEX) with no short-term prospect of reopening. That said, some equity-related assets are trading, including Russian-focused ETFs, which are largely composed of American Depository Receipts (ADRs) and Global Depository Receipts (GDRs). While ultimate values for underlying holdings may be limited, some of these vehicles are down well over 50% year-to-date.

Russia's Sovereign Wealth Fund has also been used to support domestic markets, including being ordered to purchase $8.9 billion of locally-listed shares.

Further, to prevent an asset fire-sale, foreign investors have been forbidden from selling their Russian assets. As such, major energy companies like Shell, BP, and TotalEnergies, as well as financial institutions such as France's Society General or manufacturers such as Germany's BASF, could suffer from significant stranded assets and balance sheet write-downs.

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[2] While the details of the SWIFT-related sanctions are yet to be disclosed, it is believed that energy and grain related transactions will be allowed. This would permit Russia to continue to provide the EU with approximately 30% to 40% of its natural gas requirements and may provide Russia with some cashflow through the sale of oil and gas.

Lastly, on March 1, the CBR also confirmed a ban on coupon payments, suggesting Russia may soon default on local currency debt. Hard currency debt is still lightly trading at this time, although with steep markdowns, with questions remaining about the future of coupon payments.

Financial markets

As the table below highlights, global financial markets have seen significant volatility and sharp repricing since the onset of Russian military actions on February 23.

Broadly, risk assets have declined as market participants account for the evolving sanctions and the potential impact on specific sectors and industries as well as the potential impact to global economic fundamentals. Perceived safe-haven assets, however, have generally benefited from the flight-to-quality flows with global sovereign debt yields declining across most major economies.

Market Returns

Market	Change from 2/23/22 – 3/2/22 (%)
S&P 500	3.8
10-year US Treasury Yield	2.0 to 1.9 (yield change)
VIX	-0.9 (31.0 to 30.7)
MSCI EAFE	-3.3
MSCI Emerging Markets	-3.2
iShares MSCI Russia ETF	-63.5
10-year Russian Bond Yield*	9.8 to 12.2 (yield change)
USD/Ruble	27.6
Russian CDS	944.4
WTI Crude Oil	20.1
Gold	0.7

*Trading for 10-year Russian Bonds has been suspended. Change in yield is from 2/18/22 – 2/28/22.

However, as the table also details, Russian markets are feeling the impact most acutely at the moment. The Russian ruble (as previously highlighted) has weakened against the dollar to an all-time low, Russian bond yields spiked for some longer-dated maturities as S&P and Moody's downgraded the country to below investment grade, and the Russian central bank has raised its key policy rate by over 1,000 basis points to 20% in an effort to stem bank-run pressures. As we also noted previously, Russian equity markets remain closed. In fixed income and credit markets, volumes and liquidity are reportedly weak to non-existent, making price discovery exceedingly challenging, if not impossible.

Financial sanctions may become economic risks

Market participants generally agree that the announced sanctions (thus far) are notably impacting the functioning of Russian financial markets and the broader Russian economy and will likely continue to do so for as long as they are in place.

While the US and its allies are using these pressures to try to deter Russia from further aggressions, they could come at the cost of commodity prices potentially remaining elevated and/or spiking higher. This could drive global inflation pressures even further beyond the multi-decade highs currently being experienced.

In response to the additional inflation pressures, global central banks could raise policy rates even more aggressively than anticipated, and potentially adversely impact global economic growth and thereby exacerbate stagflationary risks.

In the US, recent commentary from Federal Open Market Committee (FOMC) members (including Chair Powell himself) imply that the Committee's strategy is to err on the side of potentially slowing the pace of reducing accommodation and hopefully support financial markets through this time of disruption.

Increased discussions of divestment from Russian assets

Given the recent events, many institutional investors are reviewing their direct and indirect exposures to Russian assets with some being directed to divest from these investments. Several prominent pension funds in the US and Europe have announced they will pursue this path of divestment. At the investment manager level, we are seeing that many are taking a wait and see approach given the market conditions and thin trading volumes. Given that Russian markets are not trading, many equity managers and fixed income managers with hard currency Russian bond exposure are resorting to estimating the value of their holdings with a range of write-downs from 40% to 75%. Further, major index providers are reviewing the inclusion of Russian securities in their indices, with MSCI and Russell recently deciding they will be removing locally-listed Russian equities from their respective index families in the near future.

Logistically though, exiting these holdings in the current market environment is virtually impossible. The Russian stock exchange remains closed and selling other assets might require accepting a huge discount if buyers can even be located or their sale is allowed. Once equity markets reopen and reprice the recent events, losses could escalate.

Conclusion

The current situation is rapidly developing. At least for now, US markets are largely functioning without support being needed from the Fed. Russian markets are a dramatically different story though with significant declines and some markets not even operating. Fortunately, many institutional investors have very small direct investments in these markets, but the second order effects are still evolving. Key risks include an escalation of the conflict as well as prolonged above-trend inflation due to sanctions with an increased risk for stagflation if growth slows. We recognize that this is a very rapidly changing situation and that the range of potential outcomes is broad. We will continue to diligently monitor it and provide updates as needed. Please do not hesitate to reach out to your client team with any questions you may have.

## Disclaimer

MEKETA
INVESTMENT GROUP

MEMORANDUM

TO: Meketa Clients
FROM: Meketa Investment Group
DATE: February 25, 2022
RE: Market Update: Russian Invasion of Ukraine

Despite being well telegraphed by intelligence officials and related resources over the last few weeks, the announcement of Russia's invasion of Ukraine prompted a meaningful response across global financial markets.

Global equities and credit spreads sold off to year-to-date lows and highs, respectively, while commodity prices were mixed but generally rose due to spikes in energy markets hitting multi-year highs. Risk mitigating strategies, including hedge funds targeting volatility and defensive fixed income mandates, saw flight-to-quality demand drive positive performance, and the US dollar appreciated against most major currencies, due to the country's standing as a perceived safe-haven currency. Reportedly, markets have continued to function properly on elevated volumes, with buyers and sellers finding decent two-way flows and reasonable bid/ask spreads.

In the US, equity futures were lower by roughly 5% in overnight trading on Wednesday but ended Thursday higher by 1.5%. Across Europe, equity markets also declined by similar amounts early in respective sessions and managed a decent recovery (but not full) into the session close. In emerging market equities, including Chinese equities, it was a similar story of an aggressive price response followed by a modest recovery.

Equity Market Performance[1]

MSCI Emerging Markets Equity Performance[1]

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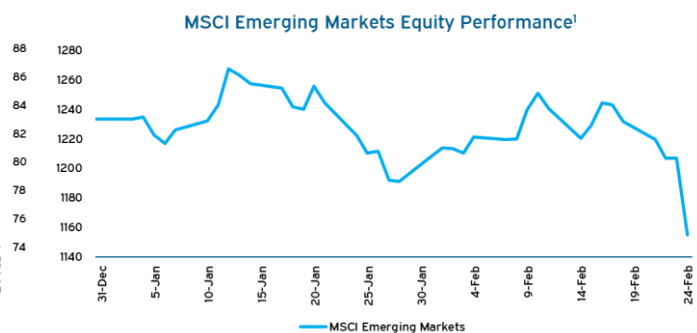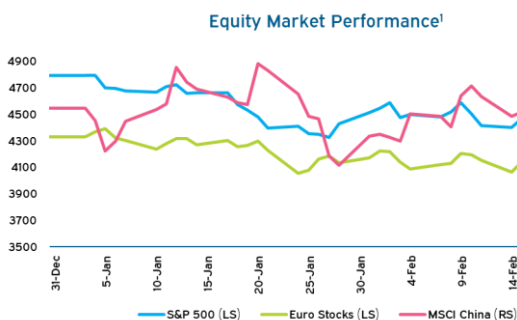
[1] Data provided by Bloomberg for all referenced charts as of February 24, 2022.

BOSTON CHICAGO LONDON MIAMI NEW YORK PORTLAND SAN DIEGO

Russian markets, however, failed to experience the same late day buying interest on Thursday, as the imposed sanctions are expected to meaningfully impact the Russian economy. Ultimately, Russian equities ended lower by over 30% and are now down by over 40% year-to-date, and 10-year Russian sovereign debt yields have spiked to over 12%, or a roughly 10% spread to the US Treasury equivalent as of February 24, 2022.

MSCI Russia

10-Year Russian Treasury
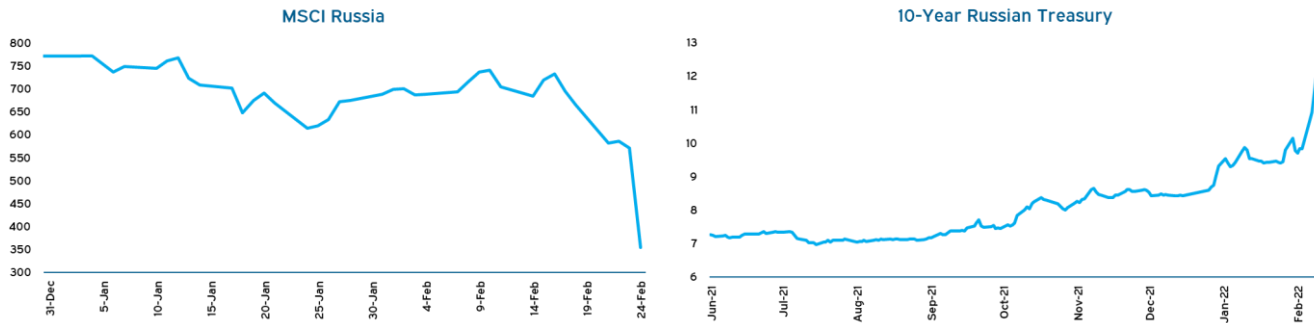
Sanctions are expected to meaningfully impact the Russian economy

The US and its allies are in the process of aggressively applying multilateral sanctions on the Russian government, and market participants suggest the measures could meaningfully impact the Russian economy going forward. At this point, sanctions targeting a wide range of Russian leaders, their families, companies, and banking transactions are expected to be similar to prior sanctions. It is noteworthy to highlight, however, that sanctions related to the SWIFT payment system and focused sanctions for the purpose of disrupting oil and gas markets, more broadly, have thus far been avoided in an effort to mitigate the impact on consumers and already elevated global inflation risks. Further clarity on the terms of the sanctions is expected over the coming days.

What are we focused on over the near-term?

First, and most saliently, developments directly related to the Russian invasion of Ukraine are of immediate concern. In this context, we anticipate that overall volatility is likely to remain elevated, and particularly so as market participants continue to process Russia's overarching intentions both with Ukraine and across the broader eastern European region.

We consider that the relatively benign response in asset prices seen thus far is modestly supportive of the notion that the probability of further advancement by Russia into other European countries is low for now, but that could change over time. President Putin's broader ambitions for the expansion of Russian interests – and his ability to execute on those ambitions – remain uncertain at this point, so the full impact of his actions have likely yet to be priced in.

Second, monetary policy expectations across the major central banks will continue to drive price action over the near-term. A number of central banks are currently in the process of tightening policy rates, and others are anticipated to begin tightening policy rates soon, including the US. With the recent sanctions less focused on targeting Russian energy markets and related payment systems, oil and energy prices have thus far avoided spiking to levels that could prompt a more aggressive policy response to mitigate inflation related risks. Still, we acknowledge that this could change abruptly and significantly tighten financial conditions even further.

Lastly, with uncertainty related to the above points, we remain focused on the continued risks to economic growth and of building stagflationary pressures. Should the situation in Ukraine push energy prices and the broader commodity complex to materially higher levels, the disruption in markets, higher policy rates, and the subsequent tightening of financial conditions could drive recession back to the forefront of our concerns. For additional thoughts on this, please see our recently published piece detailing this risk.

We will continue to monitor the situation as it evolves and communicate key developments. For now, we do not recommend any immediate changes to your portfolio because of recent events. If that position changes, we will reach out to you promptly. In the meantime, do not hesitate to contact your consultant with any questions.

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Credit Risk: Refers to the risk that the issuer of a fixed income security may default (i.e., the issuer will be unable to make timely principal and/or interest payments on the security.)

Duration: Measure of the sensitivity of the price of a bond to a change in its yield to maturity. Duration summarizes, in a single number, the characteristics that cause bond prices to change in response to a change in interest rates. For example, the price of a bond with a duration of three years will rise by approximately 3% for each 1% decrease in its yield to maturity. Conversely, the price will decrease 3% for each 1% increase in the bond's yield. Price changes for two different bonds can be compared using duration. A bond with a duration of six years will exhibit twice the percentage price change of a bond with a three-year duration. The actual calculation of a bond's duration is somewhat complicated, but the idea behind the calculation is straightforward. The first step is to measure the time interval until receipt for each cash flow (coupon and principal payments) from a bond. The second step is to compute a weighted average of these time intervals. Each time interval is measured by the present value of that cash flow. This weighted average is the duration of the bond measured in years.

Information Ratio: This statistic is a measure of the consistency of a portfolio's performance relative to a benchmark. It is calculated by subtracting the benchmark return from the portfolio return (excess return), and dividing the resulting excess return by the standard deviation (volatility) of this excess return. A positive information ratio indicates outperformance versus the benchmark, and the higher the information ratio, the more consistent the outperformance.

Jensen's Alpha: A measure of the average return of a portfolio or investment in excess of what is predicted by its beta or "market" risk. Portfolio Return- [Risk Free Rate+Beta*(market return-Risk Free Rate)].

Market Capitalization: For a firm, market capitalization is the total market value of outstanding common stock. For a portfolio, market capitalization is the sum of the capitalization of each company weighted by the ratio of holdings in that company to total portfolio holdings; thus it is a weighted-average capitalization. Meketa Investment Group considers the largest 65% of the broad domestic equity market as large capitalization, the next 25% of the market as medium capitalization, and the smallest 10% of stocks as small capitalization.

Market Weighted: Stocks in many indices are weighted based on the total market capitalization of the issue. Thus, the individual returns of higher market-capitalization issues will more heavily influence an index's return than the returns of the smaller market-capitalization issues in the index.

Maturity: The date on which a loan, bond, mortgage, or other debt/security becomes due and is to be paid off.

Prepayment Risk: The risk that prepayments will increase (homeowners will prepay all or part of their mortgage) when mortgage interest rates decline; hence, investors' monies will be returned to them in a lower interest rate environment. Also, the risk that prepayments will slow down when mortgage interest rates rise; hence, investors will not have as much money as previously anticipated in a higher interest rate environment. A prepayment is any payment in excess of the scheduled mortgage payment.

Price-Book Value (P/B) Ratio: The current market price of a stock divided by its book value per share. Meketa Investment Group calculates P/B as the current price divided by Compustat's quarterly common equity. Common equity includes common stock, capital surplus, retained earnings, and treasury stock adjusted for both common and nonredeemable preferred stock. Similar to high P/E stocks, stocks with high P/B's tend to be riskier investments.

Price-Earnings (P/E) Ratio: A stock's market price divided by its current or estimated future earnings. Lower P/E ratios often characterize stocks in low growth or mature industries, stocks in groups that have fallen out of favor, or stocks of established blue chip companies with long records of stable earnings and regular dividends. Sometimes a company that has good fundamentals may be viewed unfavorably by the market if it is an industry that is temporarily out of favor. Or a business may have experienced financial problems causing investors to be skeptical about is future. Either of these situations would result in lower relative P/E ratios. Some stocks exhibit above-average sales and earnings growth or expectations for above average growth. Consequently, investors are willing to pay more for these companies' earnings, which results in elevated P/E ratios. In other words, investors will pay more for shares of companies whose profits, in their opinion, are expected to increase faster than average. Because future events are in no way assured, high P/E stocks tend to be riskier and more volatile investments. Meketa Investment Group calculates P/E as the current price divided by the I/B/E/S consensus of twelve-month forecast earnings per share.

Quality Rating: The rank assigned a security by such rating services as Fitch, Moody's, and Standard & Poor's. The rating may be determined by such factors as (1) the likelihood of fulfillment of dividend, income, and principal payment of obligations; (2) the nature and provisions of the issue; and (3) the security's relative position in the event of liquidation of the company. Bonds assigned the top four grades (AAA, AA, A, BBB) are considered investment grade because they are eligible bank investments as determined by the controller of the currency.

Sharpe Ratio: A commonly used measure of risk-adjusted return. It is calculated by subtracting the risk-free return (usually three-month Treasury bill) from the portfolio return and dividing the resulting excess return by the portfolio's total risk level (standard deviation). The result is a measure of return per unit of total risk taken. The higher the Sharpe ratio, the better the fund's historical risk adjusted performance.

SI: Since Inception

STIF Account: Short-term investment fund at a custodian bank that invests in cash-equivalent instruments. It is generally used to safely invest the excess cash held by portfolio managers.

Standard Deviation: A measure of the total risk of an asset or a portfolio. Standard deviation measures the dispersion of a set of numbers around a central point (e.g., the average return). If the standard deviation is small, the distribution is concentrated within a narrow range of values. For a normal distribution, about two thirds of the observations will fall within one standard deviation of the mean, and 95% of the observations will fall within two standard deviations of the mean.

Style: The description of the type of approach and strategy utilized by an investment manager to manage funds. For example, the style for equities is determined by portfolio characteristics such as price-to-book value, price-to-earnings ratio, and dividend yield. Equity styles include growth, value, and core.

Tracking Error: A divergence between the price behavior of a position or a portfolio and the price behavior of a benchmark, as defined by the difference in standard deviation.

Yield to Maturity: The yield, or return, provided by a bond to its maturity date; determined by a mathematical process, usually requiring the use of a "basis book." For example, a 5% bond pays $5 a year interest on each $100 par value. To figure its current yield, divide $5 by $95—the market price of the bond—and you get 5.26%. Assume that the same bond is due to mature in five years. On the maturity date, the issuer is pledged to pay $100 for the bond that can be bought now for $95. In other words, the bond is selling at a discount of 5% below par value. To figure yield to maturity, a simple and approximate method is to divide 5% by the five years to maturity, which equals 1% pro rata yearly. Add that 1% to the 5.26% current yield, and the yield to maturity is roughly 6.26%.

$$\frac{5\% \text{ (discount)}}{5 \text{ (yrs. to maturity)}} = \begin{matrix} 1\% \text{ pro rata, plus} \\ 5.26\% \text{ (current yield)} \end{matrix} = 6.26\% \text{ (yield to maturity)}$$

Yield to Worst: The lowest potential yield that can be received on a bond without the issuer actually defaulting. The yield to worst is calculated by making worst-case scenario assumptions on the issue by calculating the returns that would be received if provisions, including prepayment, call, or sinking fund, are used by the issuer.

NCREIF Property Index (NPI): Measures unleveraged investment performance of a very large pool of individual commercial real estate properties acquired in the private market by tax-exempt institutional investors for investment purposes only. The NPI index is capitalization-weighted for a quarterly time series composite total rate of return.

NCREIF Fund Index - Open End Diversified Core Equity (NFI-ODCE): Measures the investment performance of 28 open-end commingled funds pursuing a core investment strategy that reflects funds' leverage and cash positions. The NFI-ODCE index is equal-weighted and is reported gross and net of fees for a quarterly time series composite total rate of return.

Sources: Investment Terminology, International Foundation of Employee Benefit Plans, 1999.
The Handbook of Fixed Income Securities, Fabozzi, Frank J., 1991

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

Returns for periods greater than one year are annualized throughout this report.

Values shown are in millions of dollars, unless noted otherwise.