Understanding the Impact of Negative Cash Flow

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Your Goal

- What is your goal?
  - Generate a return equal to or greater than your actuarial assumed rate of return
- How do you accomplish it?
  - A portfolio of assets with an expected return equal to or greater than your goal
- What can go wrong?
  - Sequencing of returns can lead to substantially different outcomes even if your goal is achieved
- How to address?
  - More diversified portfolio, limit volatility
  - In today's low expected return environment, may need to think outside the box
- Focus on wealth accumulation to meet cash flow needs

Negative Cash Flow

- **Negative cash flow** is when benefit payments exceed employee and employer contributions received

Employee Contributions

+ Employer Contributions

- Benefit Payments

= Net Cash Flow

PSERS' Net Shortfall in Cash Flows as a Percentage of Net Assets by Year (in 000's)

Fiscal Year-End June 30	Member Contributions	Employer Contributions	Benefit Payments (1)	Net Shortfall	Beginning Fund NAV	Shortfall as of % of Beginning NAV
2000	$ 552,502	$ 390,504	$ 2,227,903	$(1,284,897)	$ 48,911,432	2.63%
2001	$ 579,850	$ 158,193	$ 2,123,526	$(1,385,483)	$ 53,361,722	2.60%
2002	$ 662,561	$ 539	$ 2,731,417	$(2,068,317)	$ 48,096,955	4.30%
2003	$ 752,110	$ 20,831	$ 2,916,251	$(2,143,310)	$ 43,473,249	4.93%
2004	$ 783,691	$ 321,091	$ 3,283,506	$(2,178,724)	$ 42,316,379	5.15%
2005	$ 788,310	$ 431,556	$ 3,666,930	$(2,447,064)	$ 48,339,649	5.06%
2006	$ 827,647	$ 456,878	$ 3,885,450	$(2,600,925)	$ 51,936,397	5.01%
2007	$ 855,322	$ 659,545	$ 4,068,625	$(2,553,758)	$ 57,235,667	4.46%
2008	$ 879,598	$ 753,532	$ 4,682,210	$(3,049,080)	$ 67,340,997	4.53%
2009	$ 911,118	$ 503,227	$ 4,667,613	$(3,253,268)	$ 62,473,426	5.21%
2010	$ 952,047	$ 527,212	$ 4,985,957	$(3,506,698)	$ 42,995,480	8.16%
2011	$ 1,042,707	$ 646,560	$ 5,308,762	$(3,619,495)	$ 45,598,475	7.94%
2012	$ 952,887	$1,004,585	$ 5,682,746	$(3,725,274)	$ 51,199,994	7.28%
2013	$ 991,087	$1,446,402	$ 6,044,246	$(3,606,757)	$ 48,533,796	7.43%
2014	$ 966,926	$1,992,084	$ 6,053,505	$(3,094,495)	$ 49,015,561	6.31%
15 Year Totals	**$12,498,363**	**$9,312,739**	**$62,328,647**	**$(40,517,545)**		

(1) Includes benefits, refunds, and net transfers to SERS

CASE STUDY OF TWO PORTFOLIOS WITH SIMILAR RETURNS

Excerpts from a presentation made to PSERS' Board of Trustees June 12, 2014

Effect of Negative Cash Flow

S&P 500 Index

Year	Return
2008	(37.00%)
2009	26.45%
2010	15.06%
2011	2.11%
2012	15.99%
2013	32.38%
Average Return	9.17%
Time-Weighted Return	6.23%

Risk Parity*

Year	Return
2008	(17.90%)
2009	9.70%
2010	19.10%
2011	13.20%
2012	9.80%
2013	7.10%
Average Return	6.83%
Time-Weighted Return	6.12%

* Allocation of 22% S&P 500 Index, 62% Ibbotson Intermediate-Term Treasury Index, and 16% GSCI Commodity Index, with a notional exposure of 185% and a targeted risk level of 10%

Source: BlackRock

What is Risk Parity?

- Approach to investment portfolio management that allocates to assets based on risk, not capital
  - Example:
    - A 60% equity/40% bond portfolio essentially gets 90% of its risk from equities since equities are generally 3 to 4 times more volatile than bonds
- Risk parity allocates assets to get the highest Sharpe Ratio
  - To achieve a return target, that portfolio is either leveraged or deleveraged

Examples of 3 Different Portfolios

- Each portfolio starts with $100 at January 1, 2008
- Cash flow varies for each portfolio
  - Portfolio 1: No net cash flow
  - Portfolio 2: Positive net cash flow of $7/year
  - Portfolio 3: Negative net cash flow of $7/year
    - All cash flows assumed to happen on last day of year
- What is the wealth accumulation after 6 years for each portfolio?

Portfolio 1: No Net Cash Flow

S&P 500 Index

Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(37.00%)	(37)	-	63
2009	63	26.45%	17	-	80
2010	80	15.06%	12	-	92
2011	92	2.11%	2	-	94
2012	94	15.99%	15	-	109
2013	109	32.38%	35	-	144

Risk Parity

Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(17.90%)	(18)	-	82
2009	82	9.70%	8	-	90
2010	90	19.10%	17	-	107
2011	107	13.20%	14	-	121
2012	121	9.80%	12	-	133
2013	133	7.10%	9	-	143

- The S&P 500 Index ended with $1 more wealth at the end of the 6-year period vs. the Risk Parity portfolio (note, the risk parity portfolio was run with a risk level of 10% vs. the S&P 500 with a risk level of approximately 18%).
- A zero volatility return to match the S&P 500 Index ending NAV would be 6.23%

Portfolio 2: Positive Net Cash Flow

S&P 500 Index

Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(37.00%)	(37)	7	70
2009	70	26.45%	19	7	96
2010	96	15.06%	14	7	117
2011	117	2.11%	2	7	126
2012	126	15.99%	20	7	154
2013	154	32.38%	50	7	210

Risk Parity

Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(17.90%)	(18)	7	89
2009	89	9.70%	9	7	105
2010	105	19.10%	20	7	132
2011	132	13.20%	17	7	156
2012	156	9.80%	15	7	178
2013	178	7.10%	13	7	198

- The S&P 500 ended with $12 more wealth at the end of the 6-year period vs. the Risk Parity portfolio (note, the risk parity portfolio was run with a risk level of 10% vs. the S&P 500 with a risk level of approximately 18%).
- A zero volatility return to match the S&P 500 Index ending NAV would be 8.00%

Portfolio 3: Negative Net Cash Flow

S&P 500 Index

Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(37.00%)	(37)	(7)	56
2009	56	26.45%	15	(7)	64
2010	64	15.06%	10	(7)	66
2011	66	2.11%	1	(7)	61
2012	61	15.99%	10	(7)	64
2013	64	32.38%	21	(7)	77

Risk Parity

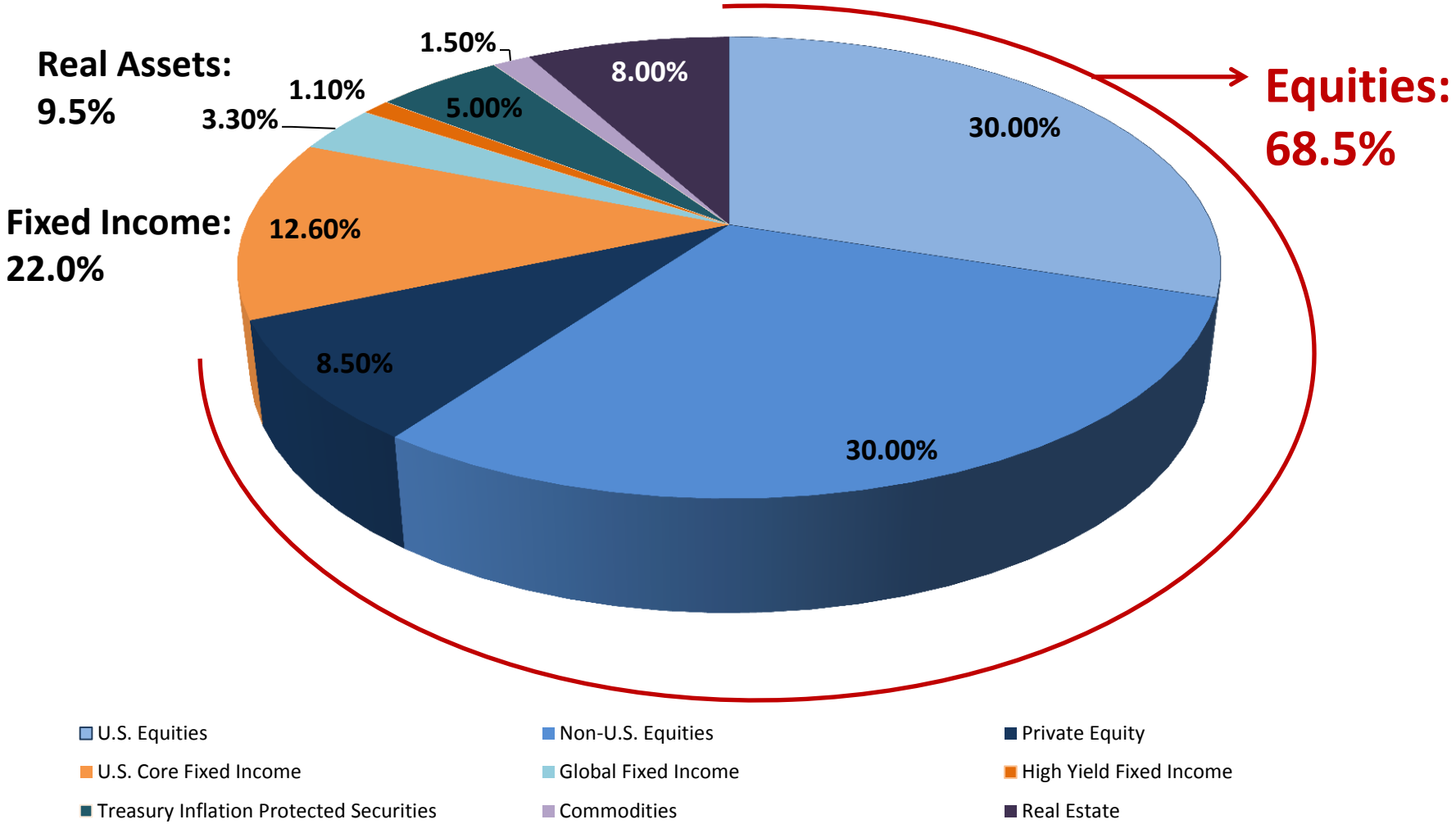
Year	Beginning NAV	Annual Return	Earnings	Cash Flow	Ending NAV
2008	100	(17.90%)	(18)	(7)	75
2009	75	9.70%	7	(7)	75
2010	75	19.10%	14	(7)	83
2011	83	13.20%	11	(7)	87
2012	87	9.80%	8	(7)	88
2013	88	7.10%	6	(7)	87

- The Risk Parity Portfolio ended with $10 more wealth at the end of the 6-year period vs. the Risk Parity portfolio (note, the risk parity portfolio was run with a risk level of 10% vs. the S&P 500 with a risk level of approximately 18%).
- A zero volatility return to match the S&P 500 Index ending NAV would be 3.50%

What Did PSERS Do?

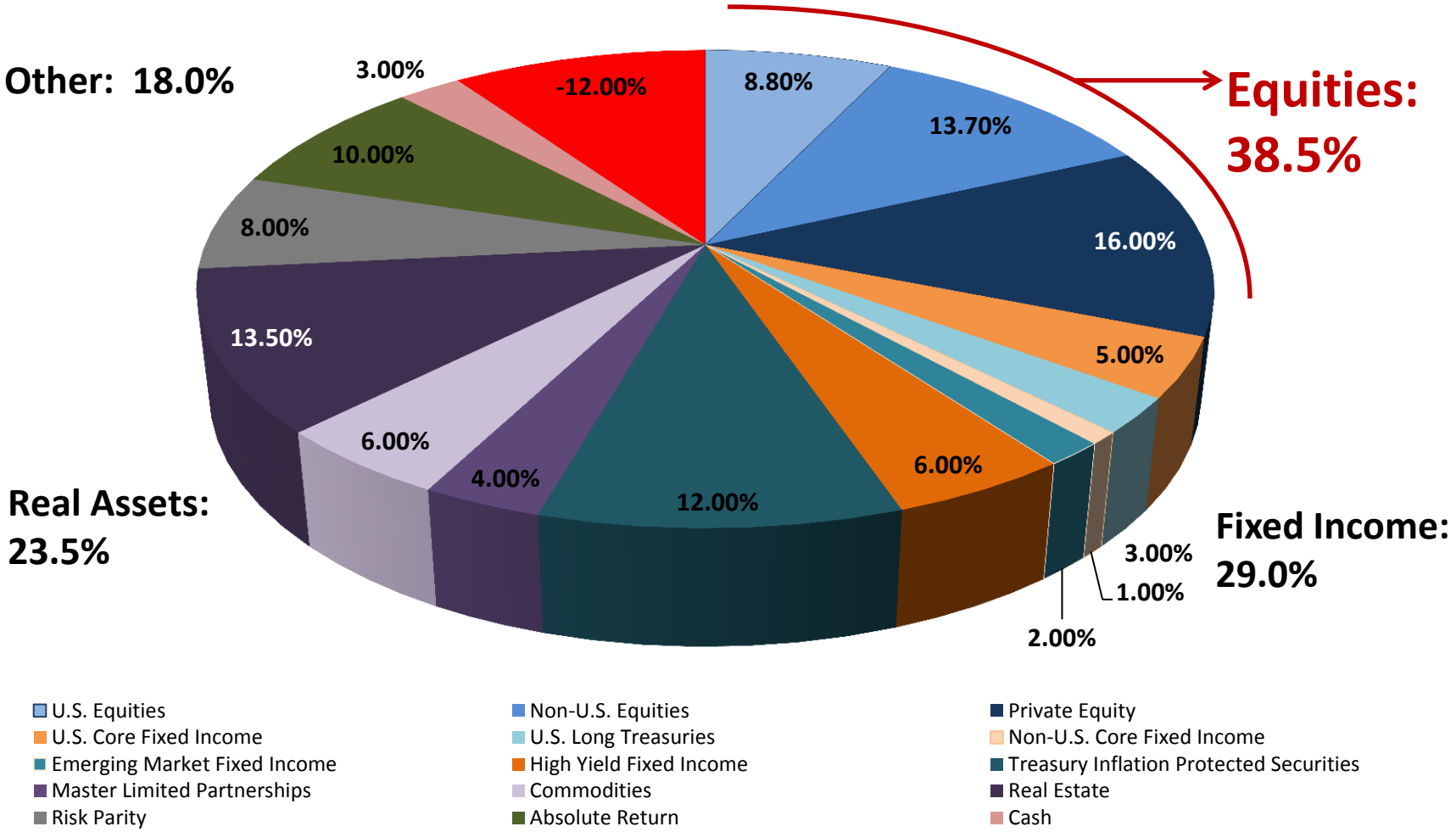
- Increased the diversification of the portfolio
  - Aimed for a higher Sharpe Ratio portfolio
    - More efficient use of risk
  - Used modest leverage to achieve long-term return target
    - Explicit vs. implicit
- Added cash allocation
  - Used as a buffer to prevent forced sales during short-term dislocations in the market
- Focused on illiquid assets
  - Tightly manage the amount of illiquidity risk we are willing to incur

PSERS' 2007 Asset Allocation



PSERS' asset allocation in 2007 was similar to a 60/40 allocation

PSERS' Current Asset Allocation



PSERS has a well-diversified asset allocation that provides protection from economic downturns. PSERS takes much less equity risk today than it did in 2007.

Conclusions

- Volatility and sequencing of returns does matter when faced with negative cash flows
- Goal should be wealth accumulation
  - Caution should be used when reaching for returns in an undiversified manner