Verus

PERSPECTIVES THAT DRIVE ENTERPRISE SUCCESS

MARCH 23, 2017

Joint Board Educational Presentation

Fresno County Employees’ Retirement Association’s Investment Program

Table of Contents

Verus

VERUSINVESTMENTS.COM

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I. Introduction & overview

Firm overview

ESTABLISHED

Founded in 1986
87 employees across three offices
68 investment professionals

EXPERIENCED

Established reputation for research
20 years average consultant experience

VESTED

100% employee-owned; impartial business philosophy and structure

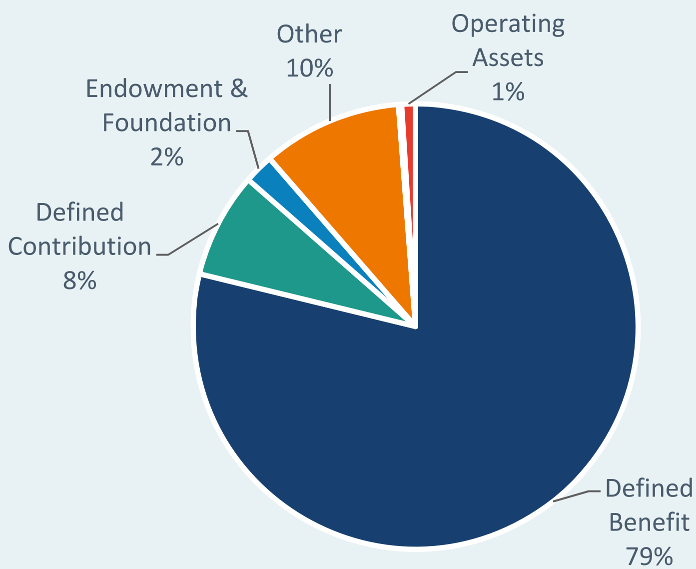
INDUSTRY LEADING

Global thought leadership on risk allocation, risk management and capital markets

BOUTIQUE CULTURE

Personalized and well-resourced

CLIENT ASSETS



$333 billion in assets under advisement*

145 client relationships

**Includes Verus' total assets under advisement, net of divestment of Strategic Partnership business; preliminary as of 1/19/17; pie chart depicts client breakdown by assets.*

Top-rated expertise

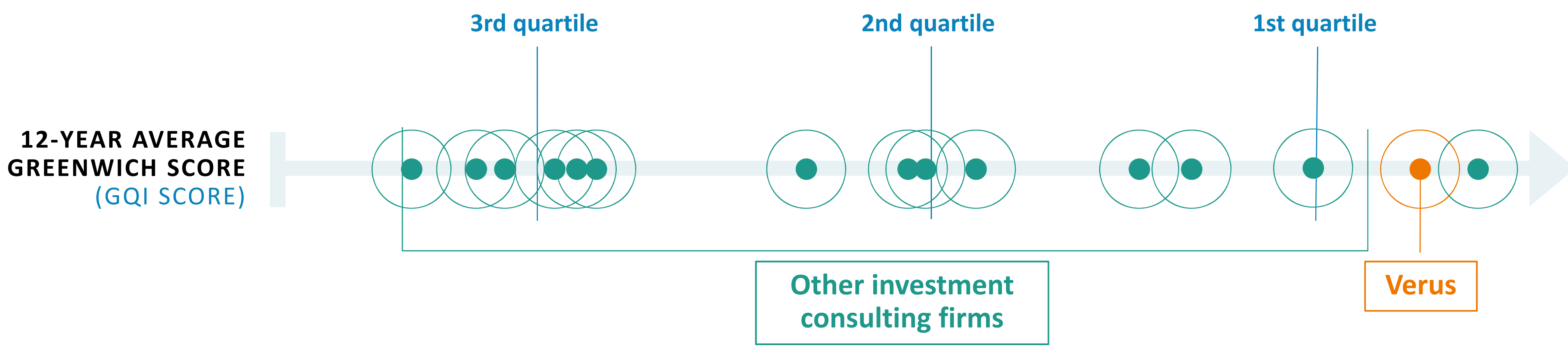
Clients consistently rated our service in the upper quartiles

(Greenwich associates annual consultant survey)

—Ranked within the top 5 largest investment consultants

—Greenwich survey participant for 12 years

—Upper quartiles in 12 of the last 12 years



Verus was known as "Wurts & Associates" at the time of the survey. This data reflects the results as shown by Greenwich Associates, in which Verus is compared to the top 17 consultants by number of client citations. Bounds of quartiles may not be representative.

Roles & responsibilities

BOARD/STAFF

- Set objectives & risk tolerance of investments
- Approve investment policy, including broad asset allocation
- Establish sub-allocations in-line with IPS
- Manager selection
- Monitor results
- Administer all paperwork & transfers

- Non-investment related responsibilities

INVESTMENT CONSULTANT

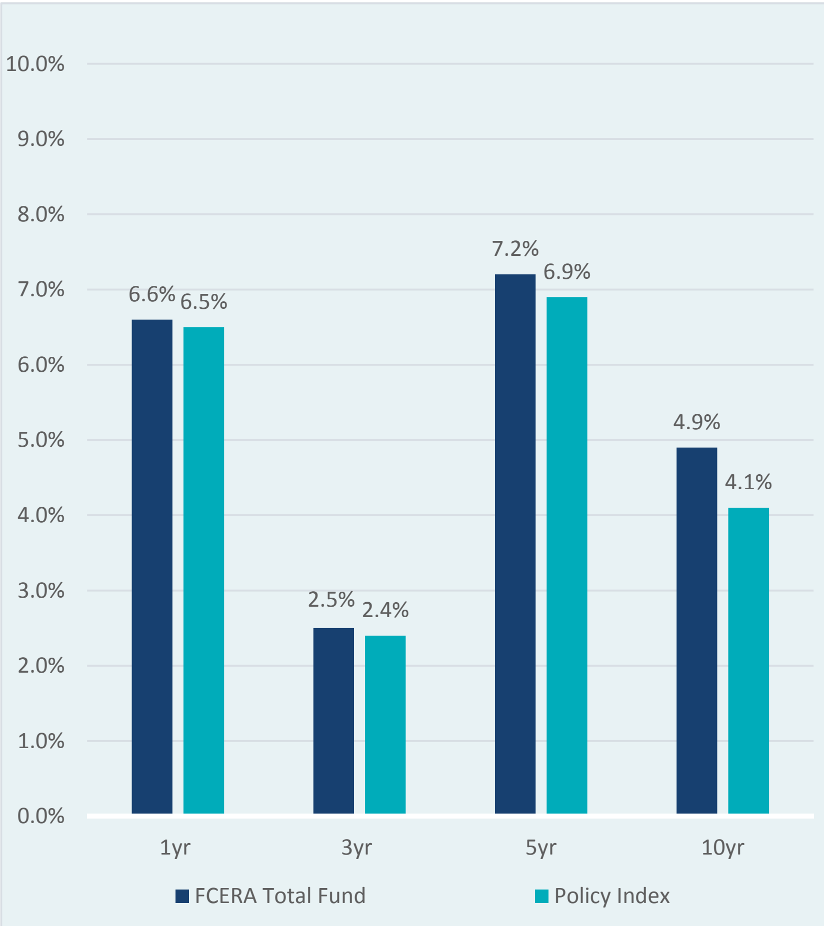
- Propose Investment Policies
- Conduct asset allocation studies & advise on sub-allocation targets
- Assist with manager due diligence & selection
- Monitor results & prepare performance reports

INVESTMENT MANAGER

- Security selection
- Compliance

History of relationship

ANNUALIZED PERFORMANCE



Source: InvestorForce, as of 12/31/16. Returns are net of fees.

— Verus has been proudly serving the Fresno County Employees' Retirement Association since 2002.

— In 2013, a risk diversified investment approach was implemented.

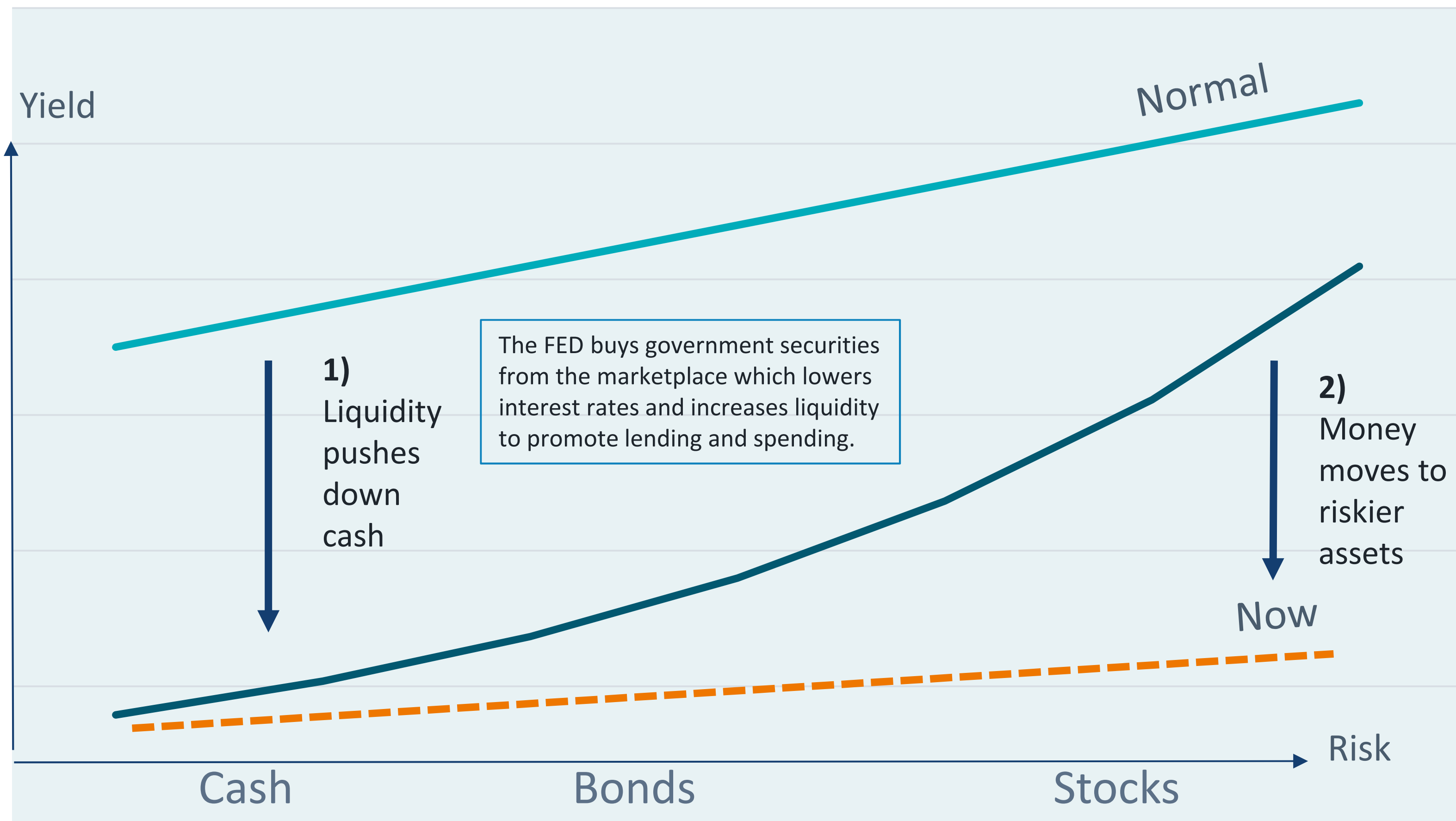
- Beta diversification lowered the portfolio's exposure to equity risk, reducing the impact of a large drawdown

— The FCERA Total Fund has met or exceeded the actuarial assumed rate of return in 9 out of the last 17 fiscal and calendar years.

II. The low return environment

Liquidity and low interest rates

THE CAPITAL MARKETS LINE IS ARTIFICIALLY LOW



Liquidity has forced investors into risky investments, lowering go-forward expected returns.

Source: Verus, Bridgewater

Historical policy return

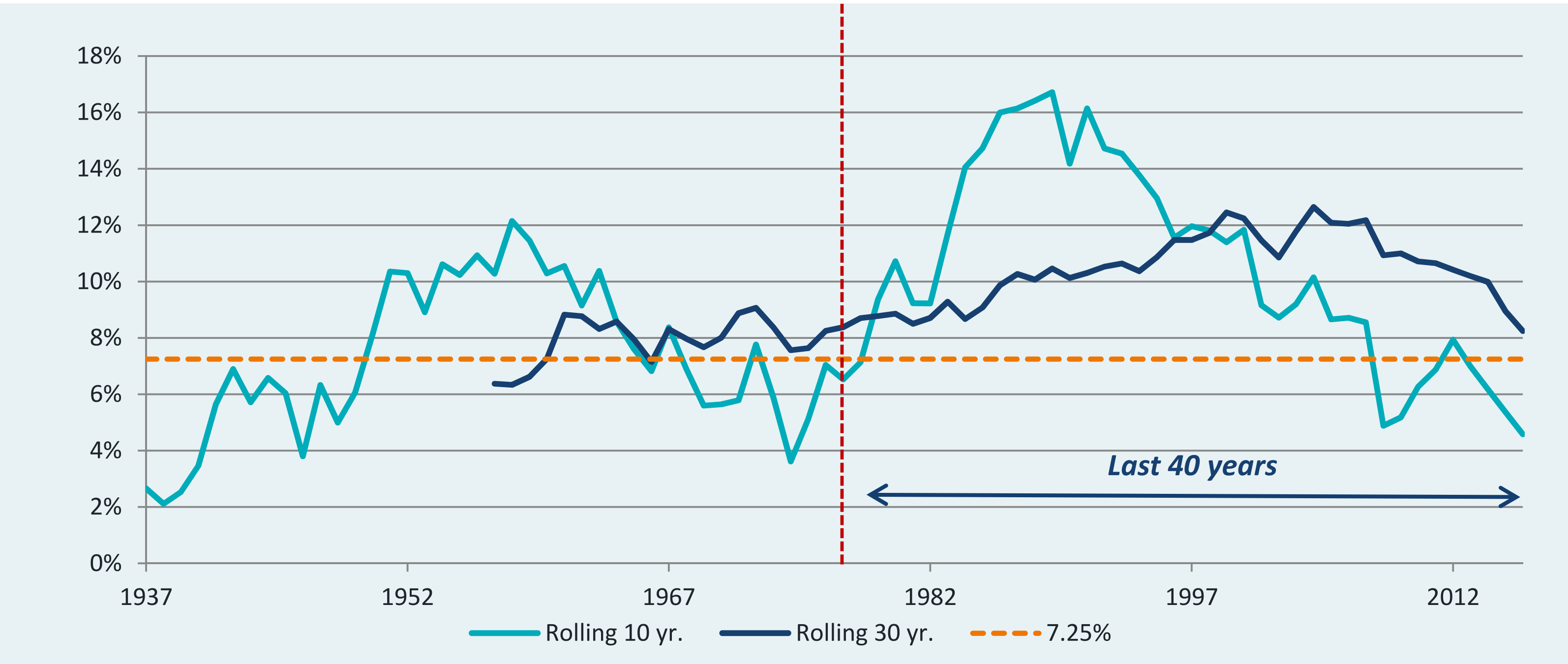
Estimating the FCERA policy index return going back to 1928

— **Since 1928:**

- The policy outperforms the required return 86% of the time on a rolling 20 year basis and 60% of the time on a rolling 10 year basis.

— **The last 40 years:**

- The policy outperforms the required return 93% of the time on a rolling 20 year basis and 75% on a rolling 10 year basis.

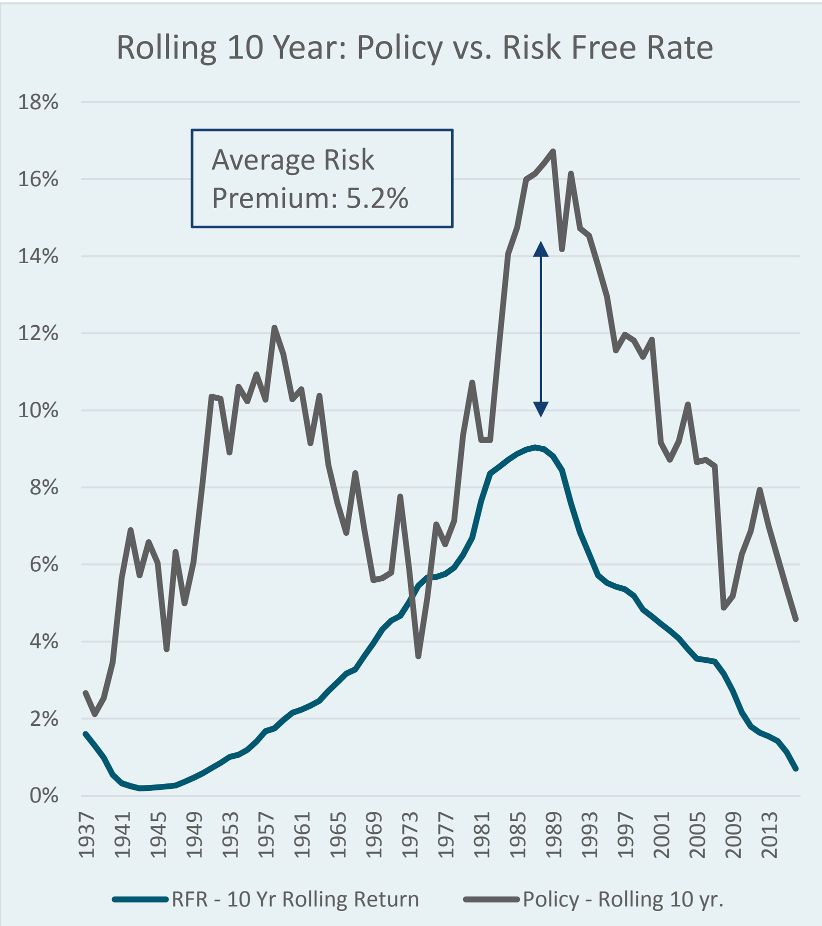


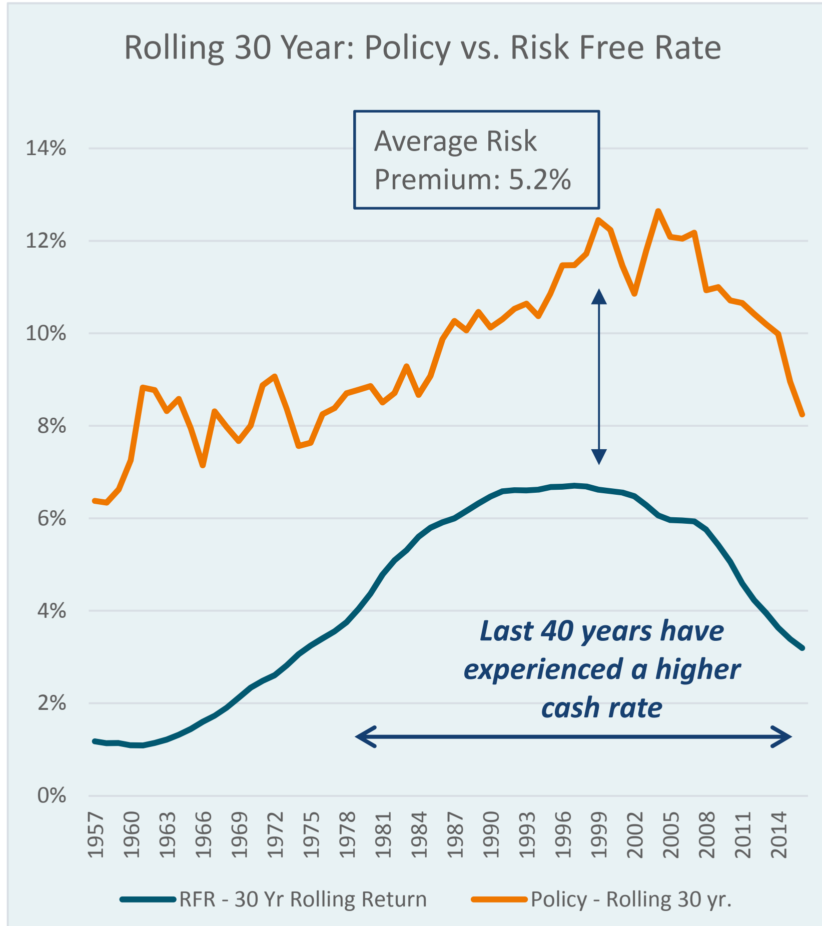
History shows that it is common for the portfolio to materially outperform or underperform for prolonged periods of time.

Current strategic allocation approximated using indices. Prior to 1970, 55% LC Equity, 45% 10 Yr. Treasuries. Subsequent to 1970 includes international equity and commodities. Subsequent to 1973 includes real estate. Subsequent to 1979 includes private equity. Subsequent to 1991 includes private credit. Subsequent to 1997 includes hedge funds.

Historical policy return & risk free rate

There is a relatively strong correlation between the risk free rate and the policy return.





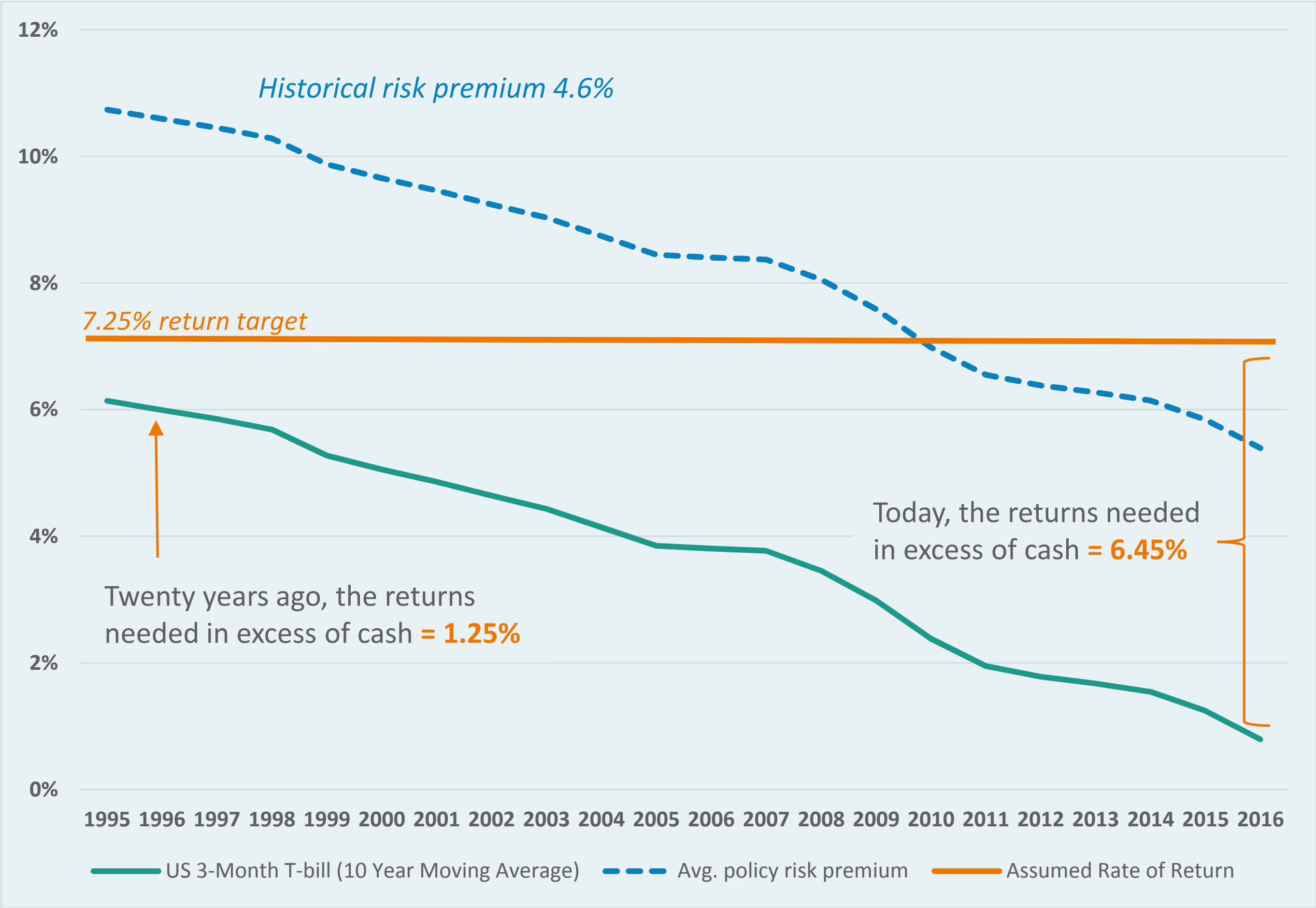
Given today's risk free rate, a 7.25% return would necessitate an above average risk premium.

A 60/40 portfolio had an average risk premium of 4.6% for both time periods.

Risk Free Rate represents 3 Month Treasury Bills. See prior page for notes regarding the estimated policy return.

Risk free rate and expected returns

WHAT THE MARKET CAN PROVIDE



Very low interest rates make the 'math' in achieving the assumed return challenging

This analysis assumes that the Pension's assumed return was not materially higher than 7.25% in the past. Data as of 12/31/16. Avg. policy risk premium calculated using a domestic 60/40 S&P 500/Cash portfolio. 10 year trailing T-bill =0.8% on 12/31/16.

Asset allocation forecast

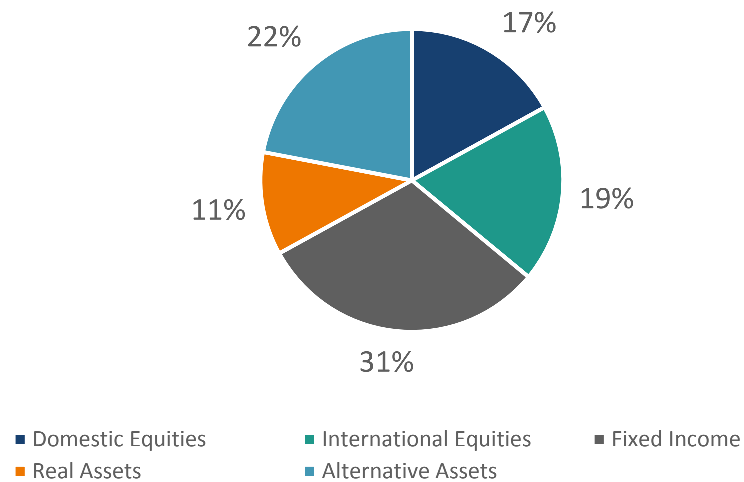
— In January of each year, Verus prepares forward looking 10 year return assumptions for each asset class (see appendix)

- At a high level, the method utilized is a “building block” approach, analyzing the return drivers of each asset class (i.e. inflation, earnings growth, starting yields, etc.)
- We are constantly refining the process by which we make “educated guesses” about the future; this can lead to changes in the output

— Using the 2017 assumptions, the 10 year annualized return forecast for the portfolio is **6.3%** and the 1 year arithmetic mean return is 6.9%

— Changes in the forecasted risk/return profile of the policy were driven by reductions in the forecasted returns of US Large Cap Equites, Emerging Market Equities, and High Yield Corporate Credit along with increases in forecasted risk among Equities, Fixed Income, and Hedge Funds.

	2017 Assumptions	**2016 Assumptions**
Modeling Results	FCERA Policy	FCERA Policy
Expected 10yr Return	6.3%	6.9%
Expected 10yr Deviation	11.8%	10.7%
Sharpe Ratio	0.4	0.5
1st Percentile 1 Year	-24.4	-25.1
Arithmetic 1yr Return	6.9%	7.5%



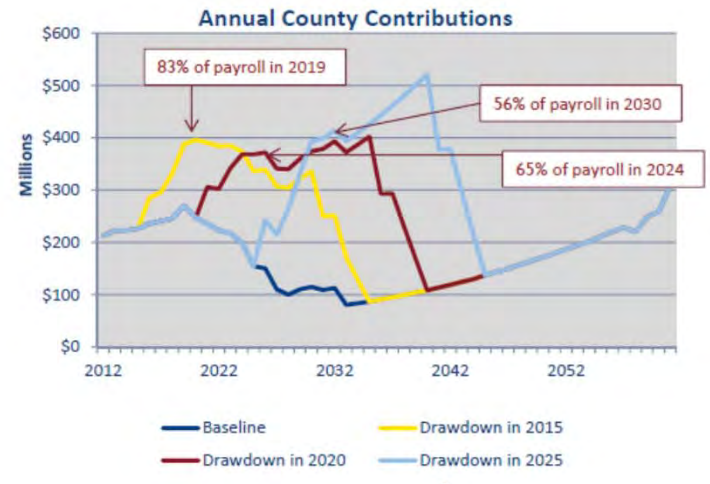
III. Current investment strategy

Mitigating drawdowns

- The 2013 A/L Study analyzed the effects of drawdowns on the Pension portfolio.
- FCERA experienced a 28.7% drawdown for the 12 months ended February 2009.
- This drawdown had a significant impact on the Plan's trailing 10 year return relative to the 7.25% assumed return.

SOLVENCY & DRAWDOWNS

- Assuming the County can meet all future recommended contributions, the Plan can still achieve fully funded status, albeit 10-20 years later.
- After all, any funded ratio can be repaired through higher capital contributions.
- Contributions are projected to reach as high as 83% of payroll in 2019 if the Plan experiences another 28% drawdown near or before 2015.
- The subsequent drawdowns all result in contributions as a percentage of payroll that are greater than the current level.



The risk-diversified portfolio

The key tenets of the risk-diversified approach:

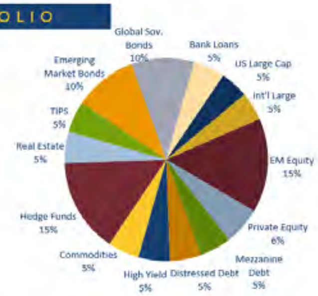
- Reduces the absolute level of expected volatility.
- Diversified the sources of return (beta) to be more dependent on contractual cash flows, and less dependent on capital appreciation.
- Effectively reduces equity risk.
- Delivers beta diversification, making the portfolio less susceptible to large drawdowns.

IMPROVING THE PORTFOLIO CONSTRUCTION PROCESS

1. Understand the sources of risk.
2. "**Win by not losing**" – Mitigate large drawdowns.
3. Supplement MVO with other methods of forecasting portfolios:
   - Risk Decomposition
   - Economic Diversification
   - Stress-testing & Scenario Analysis
4. The alternative: **A Risk-Diversified Portfolio**

THE RISK-DIVERSIFIED PORTFOLIO

	Risk-Diversified Portfolio	CMA's (10 Yr)*
Large Cap US Equity	4.5	6.3
Total Domestic Equity	*4.5*	
International Large	4.5	8.0
Emerging Markets	15	9.6
Total Int'l Equity	*19.5*	
Total Equity	*24*	
High Yield Fixed Income	5	4.9
Bank Loans	5	4.1
Global Bonds - Sovereign	10	2.2
Mezzanine Debt	5	5.9
Distressed Debt	5	5.9
Emerging Markets Debt - Local	10	5.7
TIPS	5	2.2
Total Fixed Income	*45*	
Commodities	5	4.3
Real Estate	5	5.6
Total Real Assets	*10*	
Hedge Funds	15	5.4
Private Equity/VC	6	9.9
Total Non-Public Investments	*21*	
Total Allocation	**100**	



Risk-Diversified Portfolio	
*Forecast 10 Year Return**	6.4%
Standard Deviation	8.8%
Sharpe Ratio	0.43

*Represents the ten year annualized return of the median one year geometric portfolio returns from a lognormal-distributed Monte Carlo analysis.

DIVERSIFICATION OF RISK FACTORS

Because of the need to earn a reasonable return we still need a significant exposure to the equity risk factor. Still, the direct exposure to equities is meaningfully reduced.

Contributions a key consideration

Managing downside risk to contributions was a key factor in pursuing a more risk diversified portfolio

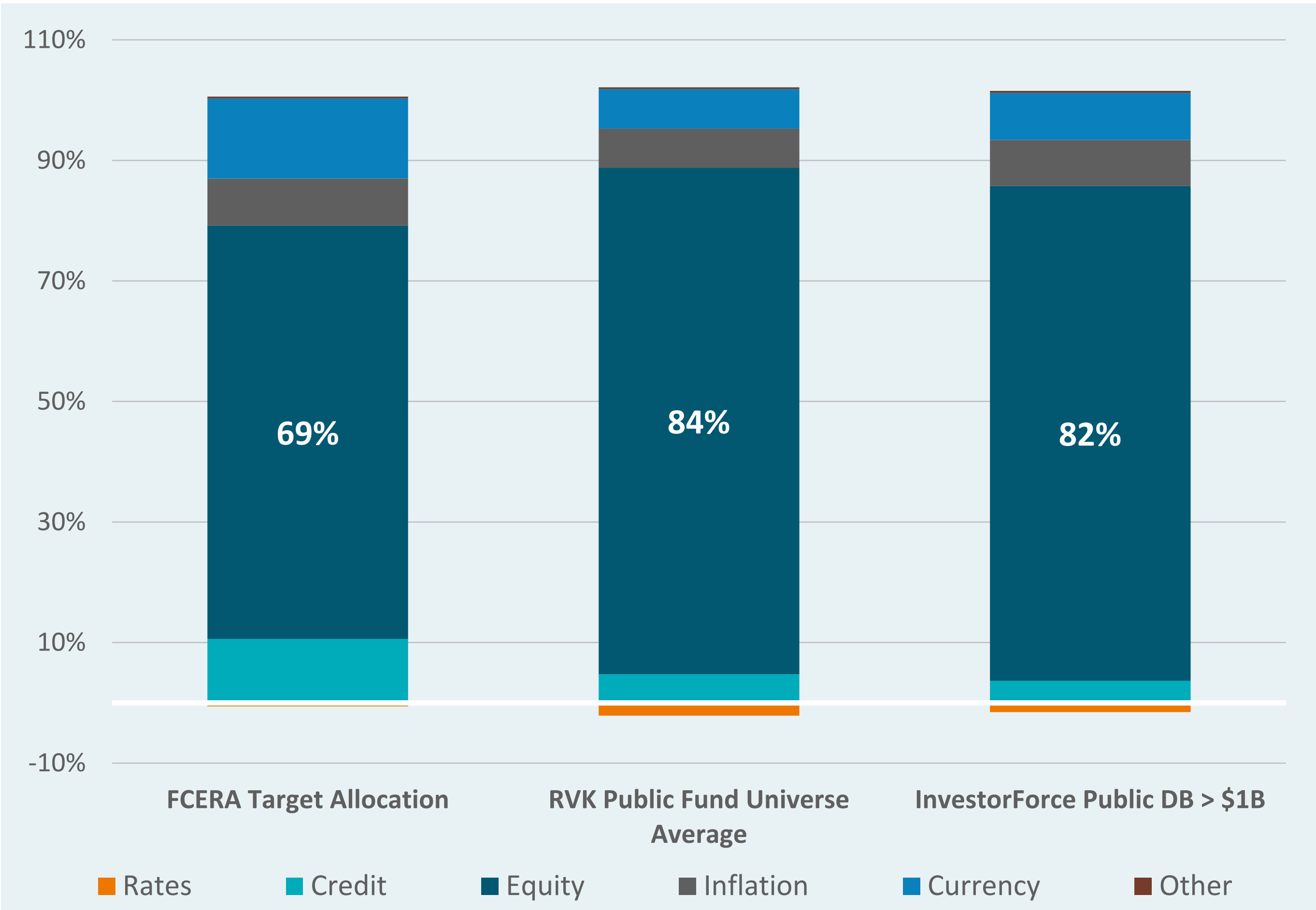
5 Year Forecast		FCERA Current Portfolio	Current + Tail Risk Hedge	Difference ($)	Difference (%)	Risk-Diversified Mix	Difference ($)	Difference (%)	Risk-Diversified + Tail Risk Hedge	Difference ($)	Difference (%)
Annual County Contributions	Median	$243	$245	$2	1%	$244	$1	0%	$246	$3	1%
	Best Case	$0	$0	$0	0%	$0	$0	0%	$0	$0	0%
	Worst Case	$477	$422	($55)	**-12%**	$420	($57)	**-12%**	$380	($98)	**-20%**
Actuarial Funded Status	Median	79%	79%		0%	79%		0%	79%		0%
	Best Case	139%	138%	n/a	-1%	128%	n/a	-11%	126%	n/a	-13%
	Worst Case	35%	45%		**10%**	46%		**11%**	54%		**18%**

10 Year Forecast		FCERA Current Portfolio	Current + Tail Risk Hedge	Difference ($)	Difference (%)	Risk-Diversified Mix	Difference ($)	Difference (%)	Risk-Diversified + Tail Risk Hedge	Difference ($)	Difference (%)
Annual County Contributions	Median	$248	$250	$2	1%	$248	($0)	0%	$252	$4	2%
	Best Case	$0	$0	$0	0%	$0	$0	0%	$0	$0	0%
	Worst Case	$636	$614	($22)	**-3%**	$581	($55)	**-9%**	$558	($78)	**-12%**
Actuarial Funded Status	Median	88%	88%		0%	89%		0%	88%		0%
	Best Case	226%	222%	n/a	-4%	173%	n/a	-53%	168%	n/a	-59%
	Worst Case	43%	46%		**2%**	49%		**5%**	51%		**8%**
Present Value of Future County Contributions	Median	$1,874	$1,879	$5	0%	$1,879	$5	0%	$1,889	$15	1%
	Best Case	$754	$755	$1	0%	$819	$66	9%	$816	$62	8%
	Worst Case	$2,998	$2,783	($214)	**-7%**	$2,784	($214)	**-7%**	$2,709	($288)	**-10%**

"Worst Case" contribution rates were projected to be 12% better under the Risk-Diversified Portfolio that was implemented

Diversification of risk factors

RISK CONTRIBUTION BY RISK FACTOR



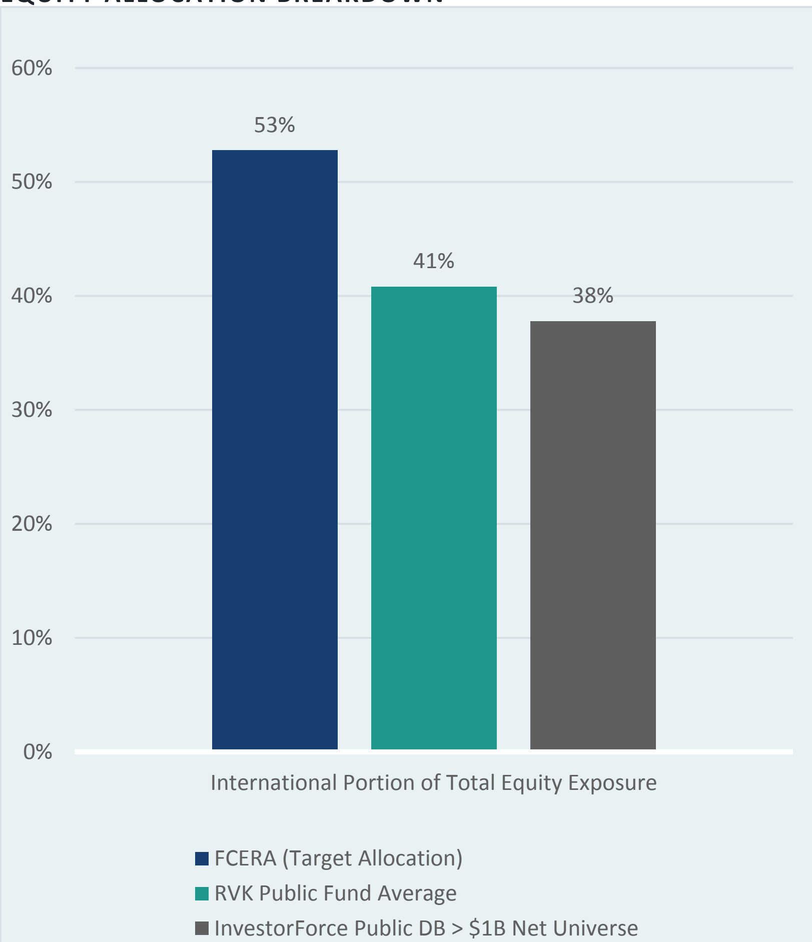
FCERA's portfolio was designed to mitigate the concentration of equity risk that is prevalent in most portfolios

Source: BarraOne

International equity allocation

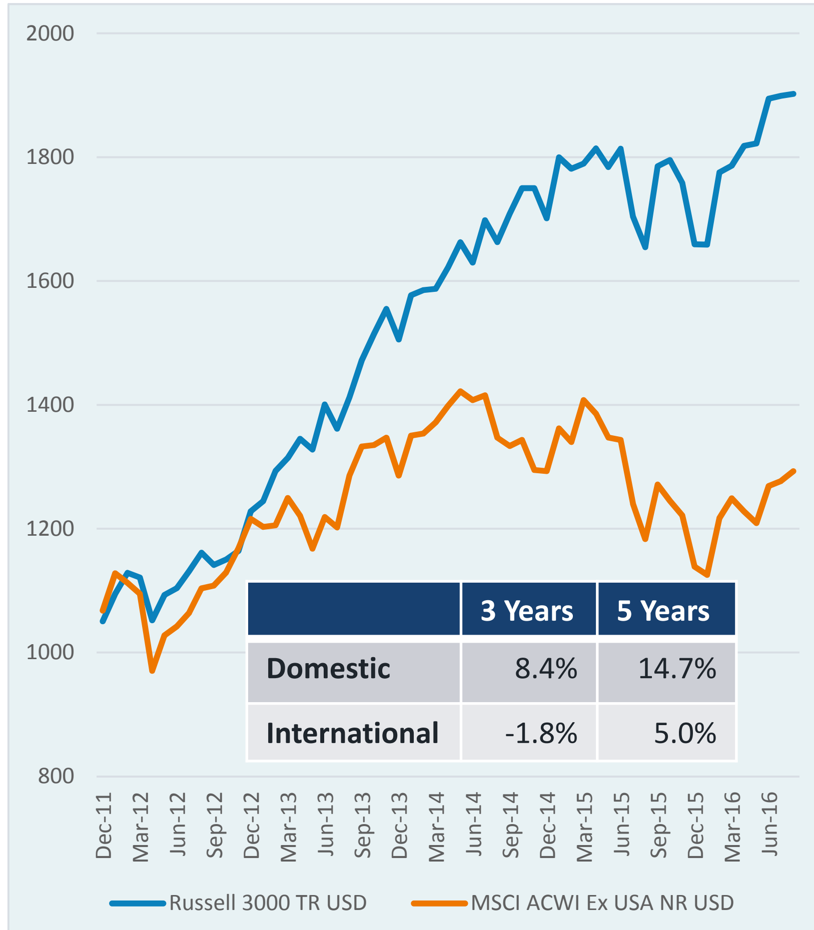
International: a recent headwind to performance relative to peers

EQUITY ALLOCATION BREAKDOWN



Source: RVK, InvestorForce, as of 12/31/2016.

CUMULATIVE PERFORMANCE



	3 Years	5 Years
Domestic	8.4%	14.7%
International	-1.8%	5.0%

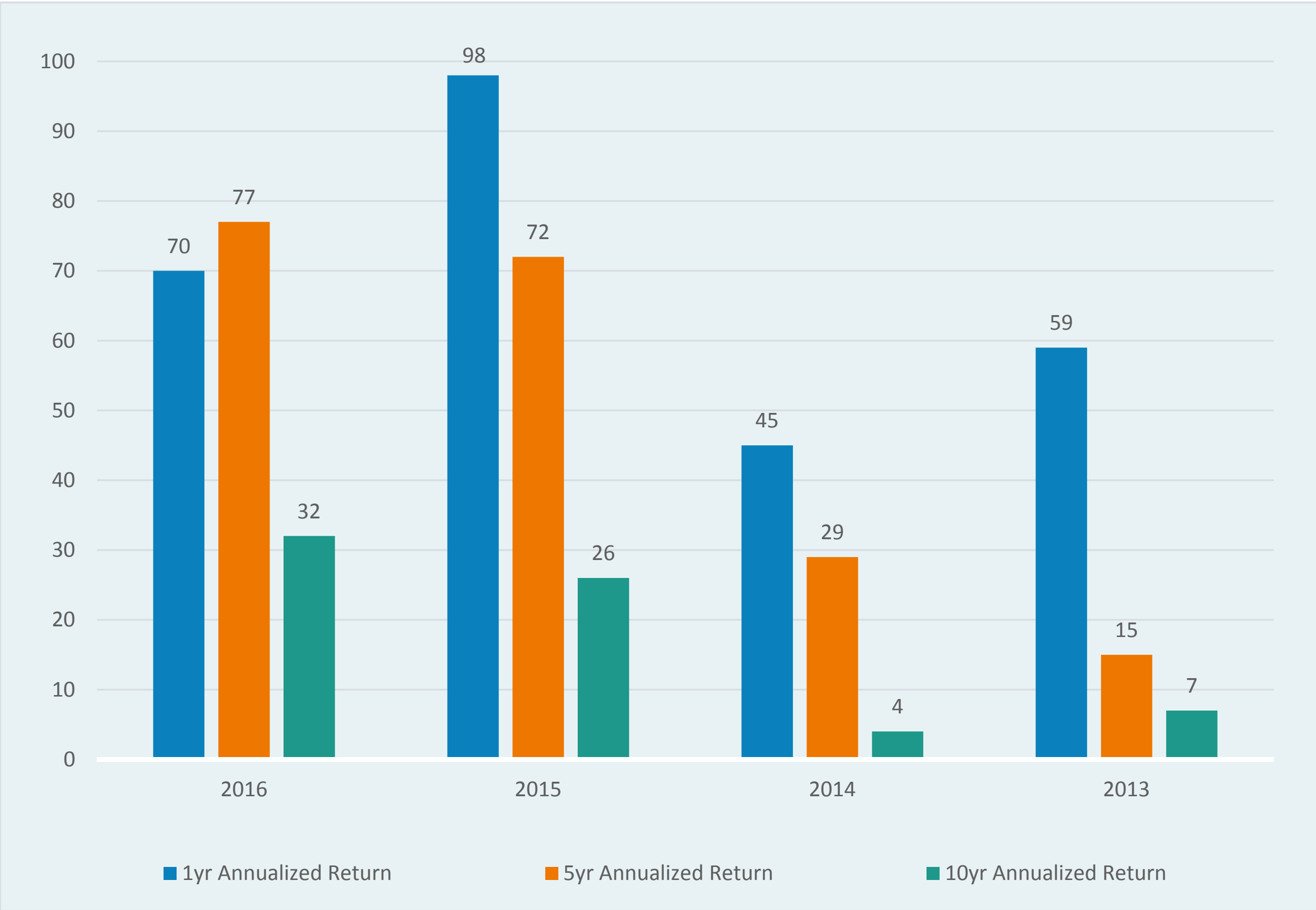
Source: MPI, as of 12/31/2016.
Russell 3000 and MSCI ACWI ex USA used as proxies for Domestic and International respectively

The performance disparity between International and Domestic equity has been as wide as it has even been

Markets typically correct these disparities…

Peer comparisons

RVK PUBLIC FUND UNIVERSE RANKINGS



Source: Verus, RVK.

Note: Returns represent total plan returns. A ranking of 1 indicates top percentile performance, 99 worst percentile performance.

Implementing a risk diversified approach lowered the portfolio's exposure to equity risk.

The recent equity bull market has been a headwind for FCERA relative to peers.

Summary

— FCERA's portfolio strategy is designed to take less risk than the average pension.

- The current market environment provides little incentive to take risk
- A recognition that significant drawdowns and the resulting spike in contributions could put significant strain on the Plan Sponsor.
- The portfolio is more diversified by sources of risk

— Low interest rates also make this a challenging environment for meeting the actuarial return.

— Verus believes the portfolio is well positioned for a highly uncertain capital markets environment.

IV. Slides for Q&A

FCERA fiscal year performance

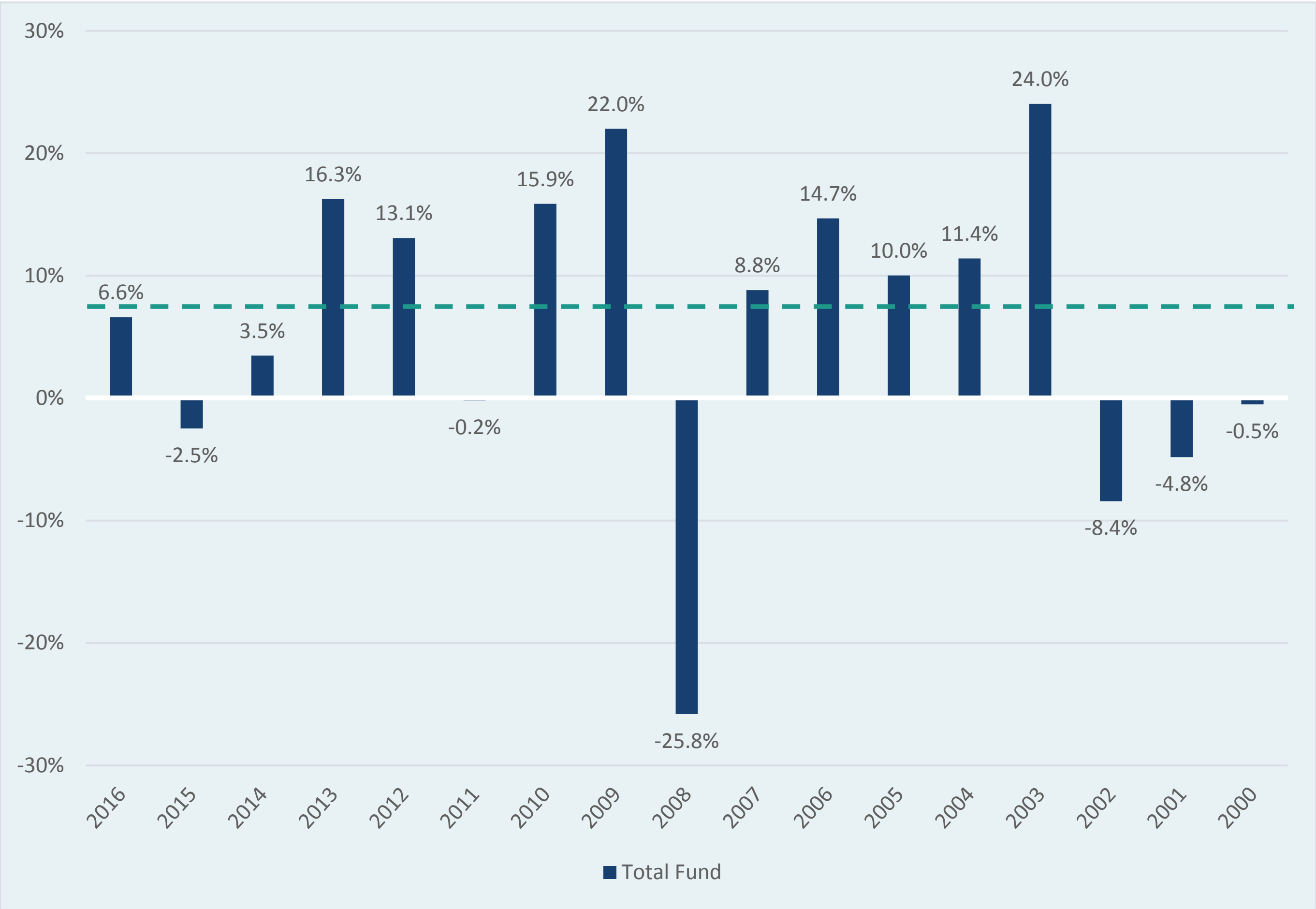
PERFORMANCE COMPARISON BY FISCAL YEAR

The FCERA Total Fund has met or exceeded the actuarial assumed rate of return 9 out of the last 17 fiscal years.

Note: FCERA's actuarial assumed rate of return is 7.25%

FCERA calendar year performance

PERFORMANCE COMPARISON BY CALENDAR YEAR

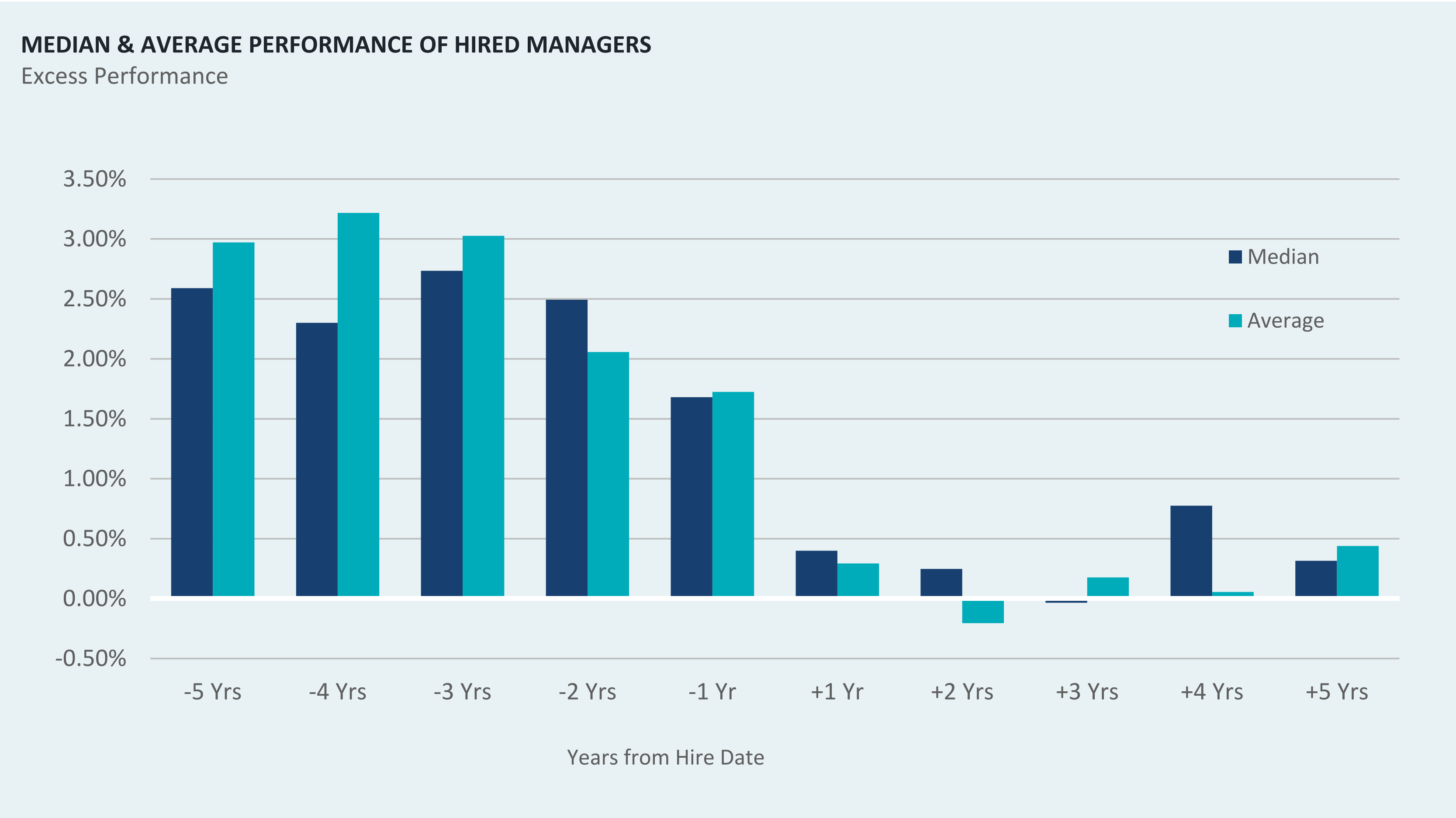


The FCERA Total Fund has met or exceeded the actuarial assumed rate of return 9 out of the last 17 calendar years.

Note: FCERA's actuarial assumed rate of return is 7.25%

Hired managers and pre-hire returns

Excess performance before and after hire

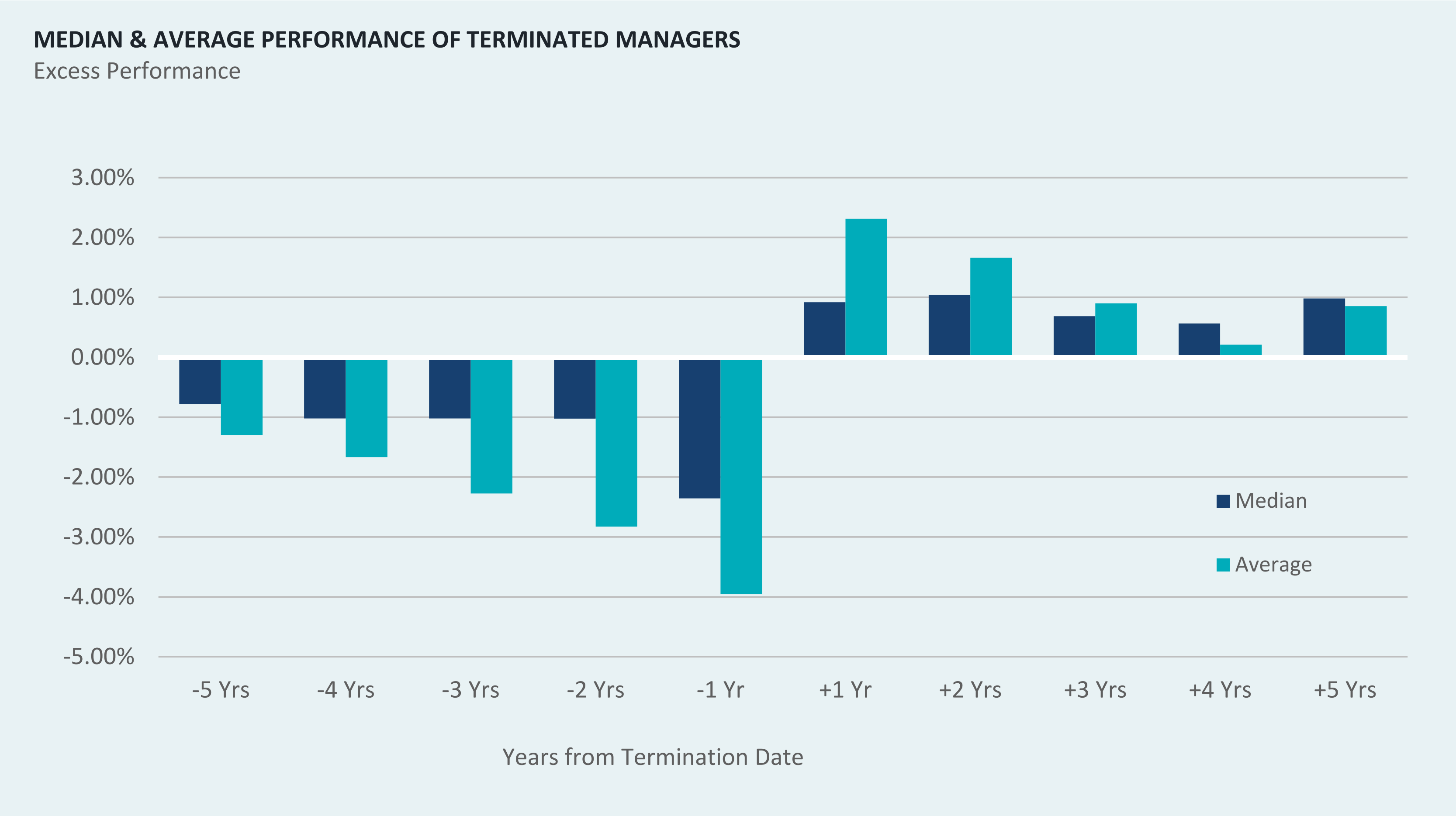


Managers observed 1.5% to 3% of excess returns before hire.

After being hired, excess returns were generally less than 0.5%.

Terminated managers and post-termination results

Excess performance before and after termination

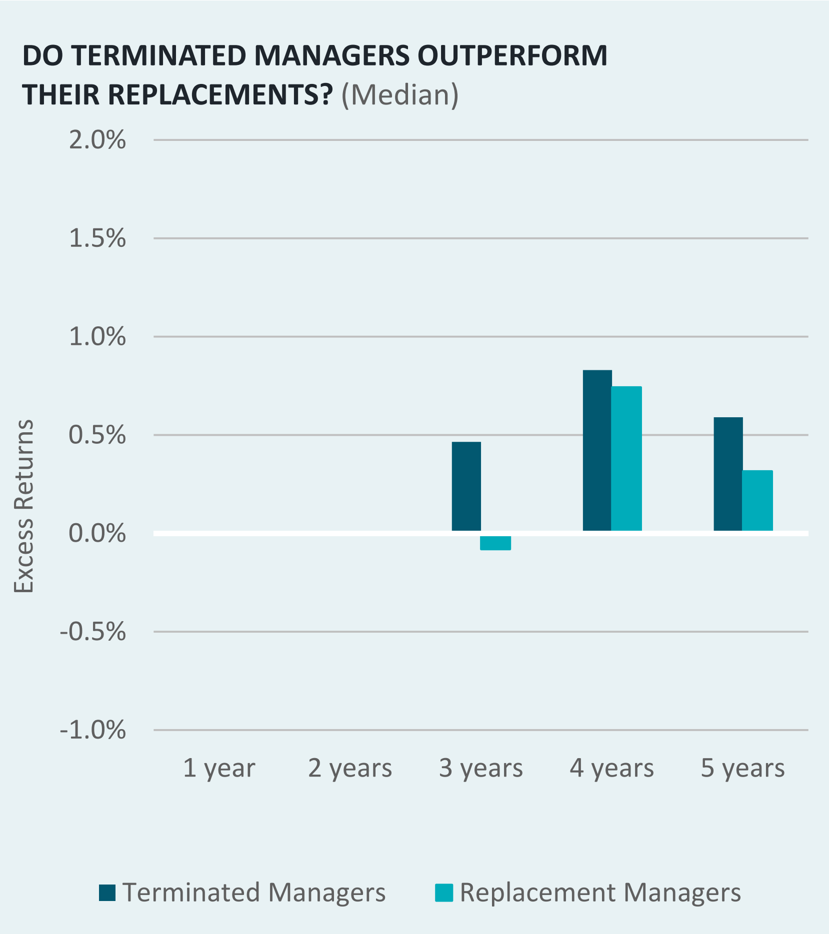


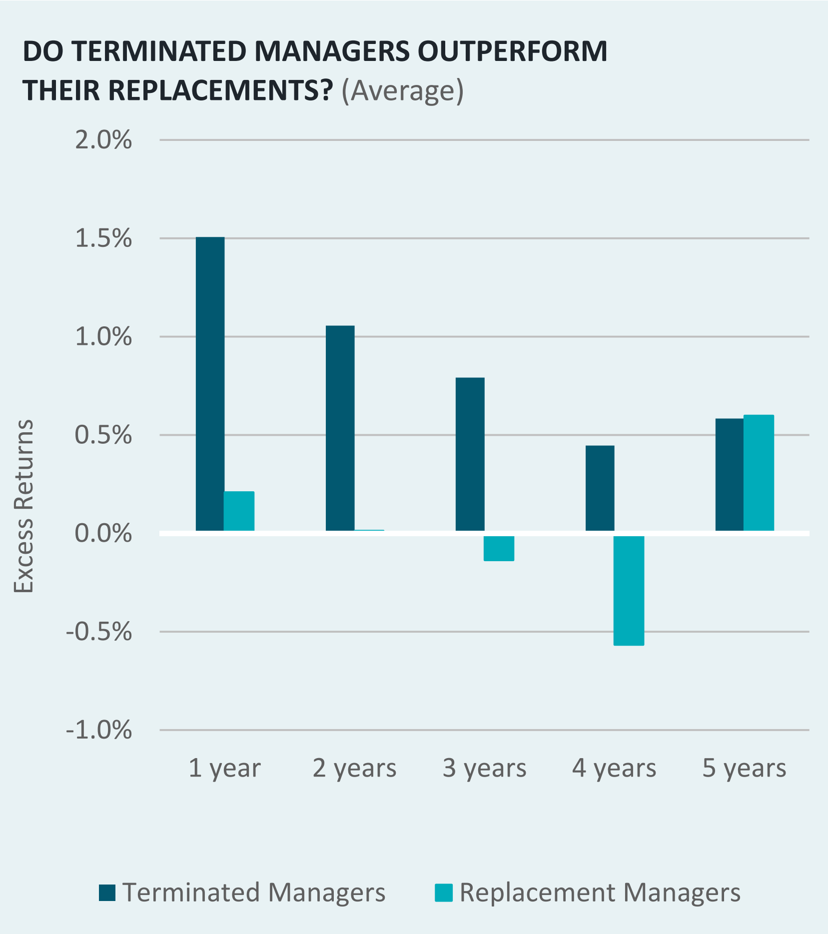
The average and median terminated managers have negative excess returns leading up to termination.

After termination, the average and median outperform.

Terminated managers vs. replacements

Analysis of the median and average





Expecting high excess returns from a newly hired manager, can lead to disappointment.

Expect periods of underperformance.

Be mindful of hiring and firing managers based solely on performance to avoid selling low and buying high.

Source: Verus, Goyal, Amit and Wahal, Sunil. "The Selection and Termination of Investment Management Firms by Plan Sponsors." Journal of Finance, Vol LXIII, No. 4, August 2008

Representative clients

PUBLIC

- Contra Costa County Employees' Retirement Association
- Fresno County Employees' Retirement Association
- Imperial County Employees' Retirement System
- Indiana Public Retirement System
- Kern County Employees' Retirement Association
- Los Angeles Metropolitan Transportation Authority
- Oklahoma Public Employees' Retirement System
- Pasadena Fire and Police Retirement System
- San Luis Obispo County Pension Trust
- Stanislaus County Employees' Retirement Association
- Tulare County Employees' Retirement Association
- West Virginia Investment Management Board
- Wisconsin State Investment Board

MULTI-EMPLOYER

- 112/73 Retirement Trust Fund NECA-IBEW
- Alaska Teamsters-Employer Pension Trust
- Arizona Bricklayers' Pension Trust Fund
- Golden Valley Electric Association
- Gunite Workers Pension Trust Fund
- IBEW #100 Pension Trust Fund
- IBEW #1710 Pension Trust Fund
- Inlandboatmen's Union
- Inland Empire Electrical Workers Health & Welfare Trust
- Juan de la Cruz Farm Workers Pension Plan
- Laborers Pension Trust Fund for N. California
- Marine Carpenters
- NECA Puget Sound Chapter
- Northern California Pipe Trades
- Northwest Ironworkers
- Oregon Retail Employees Pension Trust
- Oregon and Southwest Washington Painters Pension Trust
- Painters & Allied Trades Paint Makers Pension Fund
- Plasterers Local No. 82 Pension Trust
- Puget Sound Electrical Workers
- San Diego County Cement Masons
- San Diego County Teamsters Trust Fund
- San Diego Theatrical
- Signatory Employers – Idaho Laborers Pension Plan
- Solano and Napa Counties Electrical Workers Benefit Funds
- Sound Retirement Trust
- Southern CA Cement Masons Trust Funds
- Southern California Floor Covering Pension and Health & Welfare Fund
- Teamsters Local 631 Security Fund
- U.A. Local #290 (Portland Plumbers)
- U.A. Local No 343 Trust Funds
- Utah Laborers
- Western Glaziers
- Western States OPEIU H&W Trust and 401k Plan

CORPORATE

- Allergan, Inc.
- Apria Healthcare 401K Savings Plan
- Avista Corporation
- Barrick Gold Corporation
- Boise Cascade
- Carnival Corporation
- Carollo Engineers
- Cox Enterprises
- Eastside Retirement Association
- Forever Living Products
- Hanford Site
- Harnish Group
- Jack in the Box, Inc.
- Karsten Manufacturing
- Kinross Gold Corporation
- LaCrosse Footwear
- Moss-Adams LLP
- Mutual of Enumclaw Insurance Company
- The Seattle Times
- Southwest Airlines Pilots' Association

NOT-FOR-PROFIT

- Allergan Foundation
- American University of Cairo
- Archdiocese of Seattle
- Barry Foundation
- Blood Centers of the Pacific Pension Plan
- Blood Systems Inc.
- Campanile Foundation
- Catholic Community Foundation of San Diego
- Community Foundation of N. Central WA
- Community Foundation for Monterey County
- Community Foundation of Southern Arizona
- Diocese of San Bernardino
- Foundation for CSU Monterey Bay
- Gonzaga University
- Group Health Foundation
- Hamilton Family Trusts
- Idaho Community Foundation
- Leichtag Foundation
- Puget Sound Energy Foundation
- The Salvation Army – Western Division
- Sisters of St. Dominic
- Sisters of the Holy Family
- University of Colorado Health
- University of Missouri
- UCSD Foundation
- Virginia Mason Medical Center
- Whitworth University

It is not known whether the listed clients approve of Verus or the advisory services provided. The client list includes all Verus' clients as of March 1, 2017 who have provided permission to use their name.

Research oversight and guidance

INVESTMENT COMMITTEE

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President

Ian Toner, CFA
Chief Investment Officer

Anne Westreich, CFA
Managing Director

Margaret Jadallah
Managing Director

Ed Hoffman, CFA, FRM
Managing Director

ALTERNATIVE INVESTMENTS COMMITTEE

Kraig McCoy, CFA*
Chief Financial Officer

Ian Toner, CFA
Chief Investment Officer

John Meier, CFA
Managing Director

Brent Nelson
Managing Director

CHIEF INVESTMENT OFFICER

Ian Toner, CFA

GUIDANCE, OVERSIGHT AND APPROVAL OF STRATEGIC ADVICE & PORTFOLIO TOOLS

- ASSET ALLOCATION PROCESS & MODELS
- CAPITAL MARKET ASSUMPTIONS
- INVESTMENT LANDSCAPE
- REAL ASSETS OUTLOOK
- PRIVATE EQUITY OUTLOOK
- HEDGE FUND ENVIRONMENT
- ACTIVE MANAGEMENT ENVIRONMENT
- FOCUS LIST & RECOMMENDED PRODUCTS

OWNERSHIP OF TACTICAL TILTS & PORTFOLIO MANAGEMENT

- MONTHLY STRATEGY MEETING
- TACTICAL TILTS
- OPPORTUNITIES
- OCIO PORTFOLIO STRATEGY
- EDITORIAL & COMMENTARY
- SPECIAL PROJECTS

**Committee Chair*

Comprehensive market coverage

RISK

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  Chief Risk Officer
- **Ruth Danner, CIPM**
  Director
- **Danny Sullivan, CAIA**
  Associate Director
- **Zoey Yan, FRM**
  Senior Risk Analyst
- **Vance Creekpaum, ASA**
  Actuarial Analyst

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  Chief Investment Officer
- **Matt Brady, CFA**
  Portfolio Manager
- **Thomas Garrett, CFA, CAIA**
  Sr. Associate Dir.
- **Andrew Akers**
  Strategic Research Analyst

EQUITY

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  Sr. Associate Dir.
- **Annika Williams**
  Sr. Manager Research Analyst
- **Marianne Feeley, CFA**
  Managing Director
- **Noah Schmidt**
  Sr. Manager Research Analyst
- **Riley Dinnison**
  Consulting Assoc.

FIXED INCOME

- **Philip Schmitt, CIMA**
  Sr. Associate Dir.
- **Ping Zhu, CFA, FRM, CAIA**
  Sr. Associate Dir.
- **Maggie McRae, CFA**
  Associate Director
- **Matt Brady, CFA**
  Portfolio Manager
- **Kevin Tjernberg**
  Sr. Consulting Assoc.

REAL ASSETS

- **John Wasnock**
  Associate Director
- **Noah Schmidt**
  Sr. Manager Research Analyst
- **Eric Crowder**
  Consulting Associate
- **Joseph Abdou, CFA**
  Consulting Assoc.
- **Andrew Kogan, CFA**
  Consulting Assoc.

HEDGE FUNDS

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  Managing Director
- **Trevor Parmelee, CFA**
  Sr. Manager Research Analyst
- **Glenn Cagan, CFA**
  Consulting Assoc.

PRIVATE ASSETS

- **Ping Zhu, CFA, FRM, CAIA**
  Sr. Associate Dir.
- **Derek Kong**
  Associate Director
- **Faraz Shooshani**
  Managing Director
- **Steve Hempler**
  Managing Director
- **John Nicolini, CFA**
  Managing Director
- **Herbert Nishii**
  Sr. Consulting Assoc.
- **Nick Pursley**
  Consulting Associate

- Research and analytics
- Portfolio management
- Consulting team
- Risk allocation and asset management

Our guiding principles

— Enterprise objectives and risk tolerance should guide all decisions

— Asset allocation and risk exposures drive portfolio results

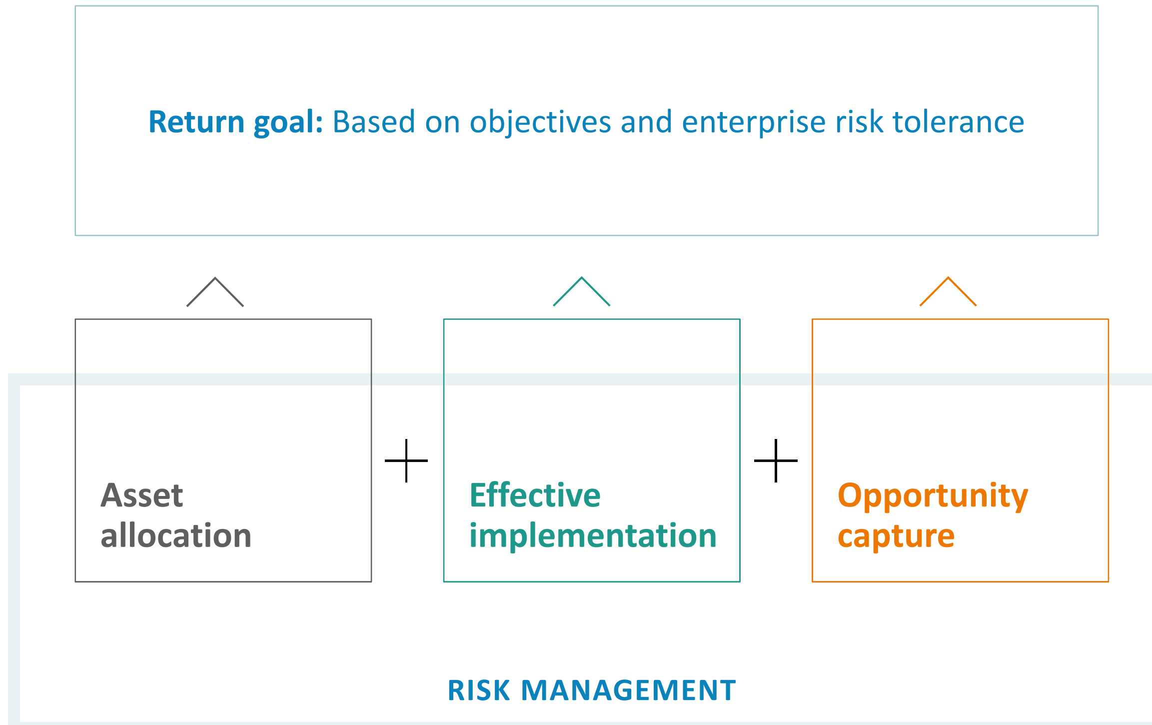
— Economic factors and valuation drive long-term asset class returns

— Risk and diversification must be viewed through multiple lenses

— Fees and costs must be minimized…and justified

Achieving your return goal one step at a time

- Develop a thoughtful **strategic asset allocation** based on your enterprise objectives and risk tolerance
- Effective and efficient implementation, combining **best-in-class investment managers**, low-cost passive exposures, and appropriate operations
- Identify and **capture attractive** valuation-based **market opportunities**
- Apply **risk management best practices** across the portfolio to **maximize risk-adjusted return**



Asset allocation designed to meet your enterprise objectives

Asset allocation and risk exposures drive portfolio results

Enterprise risk tolerance assessment → **Enterprise return objectives** → **Multifaceted risk analytics** → **Strategic asset allocation**

Monte-Carlo stochastic modeling | Risk factor modeling | Scenario analysis stress testing

Design tools

STRENGTH AND DEPTH OF CAPITAL MARKETS RESEARCH

Team members have significant hands-on money management experience.

Our asset allocation approach is informed by their unique perspectives and depth of resources.

Economic sensitivity

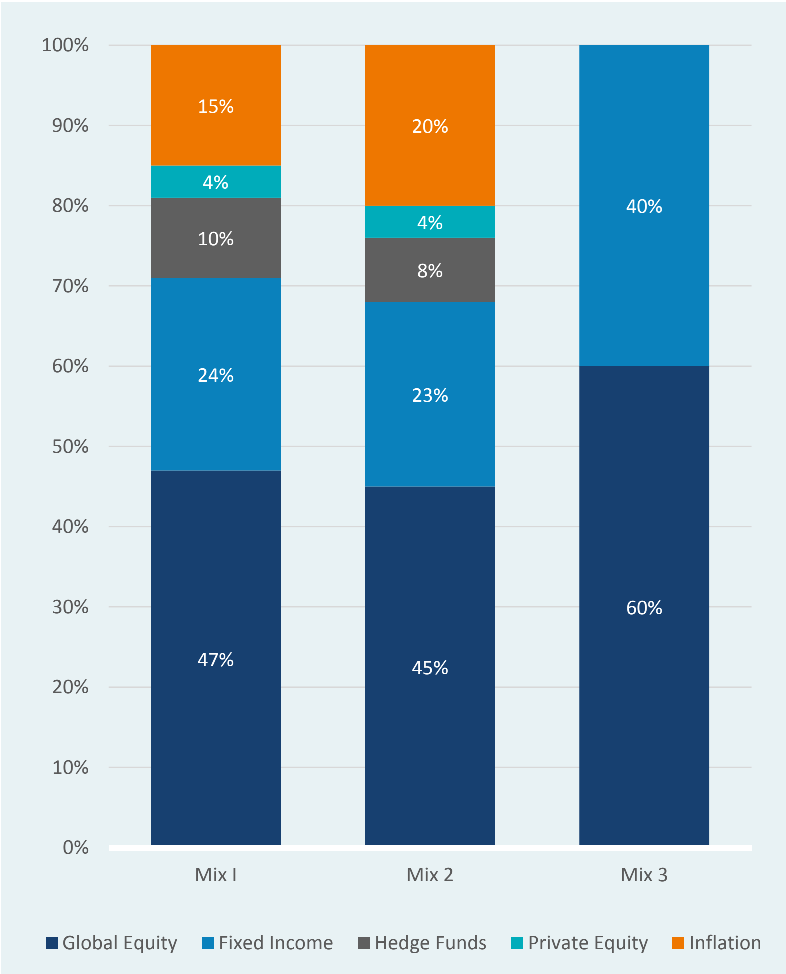
GROWTH

INFLATION

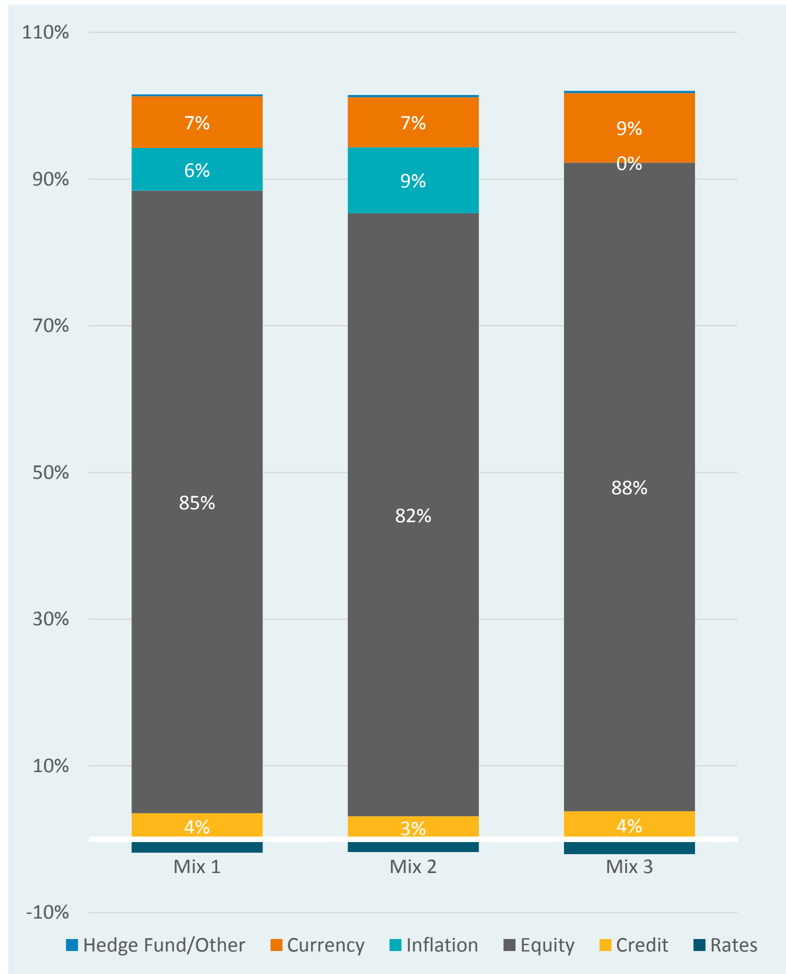
Rising growth Falling inflation	Equities, corporate bonds, emerging market debt, infrastructure, mortgages, government bonds, real estate, commodities	Commodities, infrastructure, real estate, equities, corporate bonds, emerging market debt	Rising growth Rising inflation
Falling growth Falling inflation	Government bonds, corporate bonds, emerging market debt, inflation linked bonds	Inflation linked bonds, commodities, infrastructure, real estate	Falling growth Rising inflation

Asset allocation ≠ risk allocation

ASSET ALLOCATION MIXES



RISK CONTRIBUTION BY RISK FACTOR



Traditional asset allocation methodologies do not take into account that different asset classes contain the same risk factors

The roles of asset classes

Think outside the optimizer…

- Why do we invest in various asset classes?
- What is it we practically expect them to contribute to the portfolio over time?
- What will determine whether or not they serve the desired role?

	RETURN ROLES				DIVERSIFICATION & VOLATILITY ROLES			HOW MACRO OUTLOOK/GDP AFFECTS ROLE	
	Benefit from GDP Growth	Earn Risk Premium	Produce Stable Income	Hedge Against Inflation	Low Absolute Volatility	Low Corr. To Other Assets	Reduce Portfolio Volatility	Elements of Return for Asset Class	Sensitivity of Role to GDP
Public Equities	High	Med-High	Low	Medium	None	Low	Low	PEs, Dividends, Earnings Growth	High
Private Equities	High	High	None	None	Low	Medium	Medium	PEs (exits), Financing, Opportunity Set	Med-High
Fixed (Treasury)	None	None	High	Low	High	Medium	High	Direct Link to Yields	Medium
Fixed (Credit)	Medium	Low	High	Low	Med-High	Medium	Med-High	Direct Link to Yields, Credit Spreads	Med-High
Hedge Funds (Perceived role)	None	Low	None	None	High	High	High	Pes, Credit Spreads, Fat Tails	Medium
Real Estate	Med-High	Medium	Med-High	High	Medium	Med-High	Medium	Unemployment, Vacancies, Cap Rates	High

MAGNITUDE				
High	Med-High	Medium	Low	None

Alternative approaches to implementation

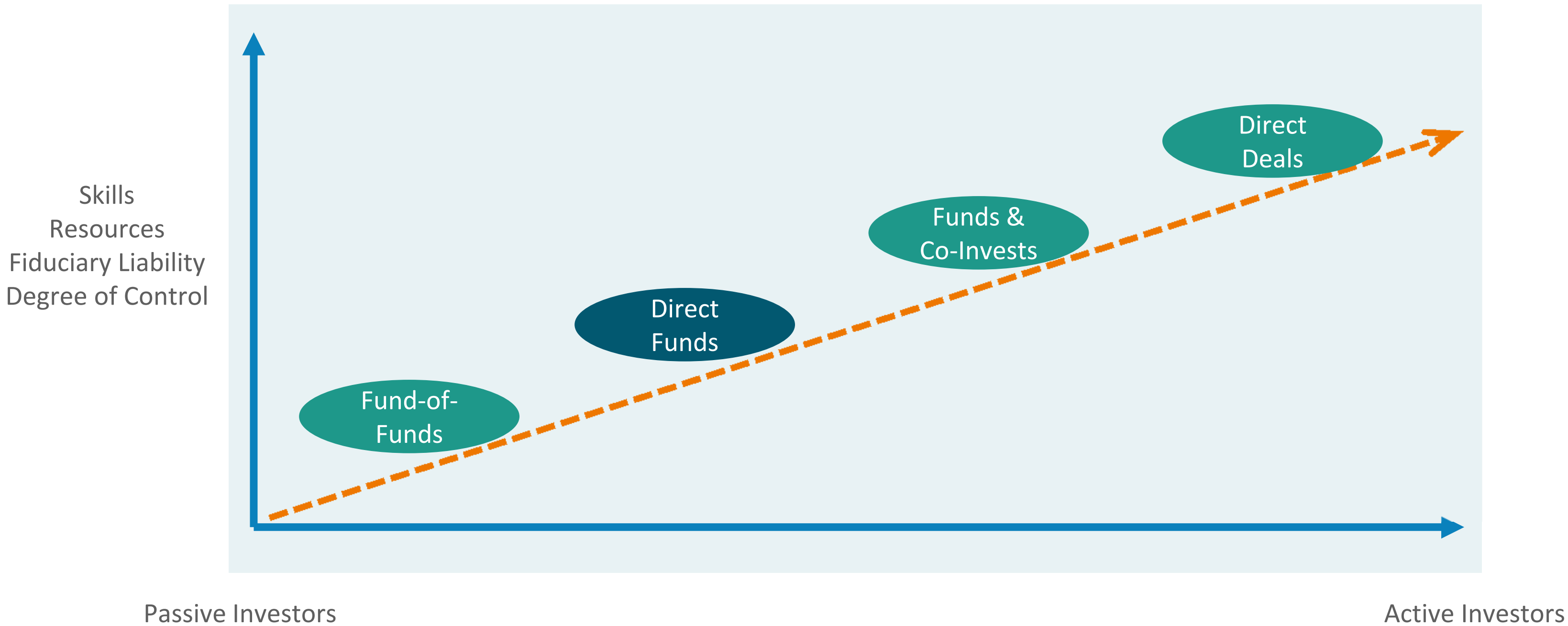
Implementation approach driven by each investor's:

— Investment objectives

— Internal skills and resources

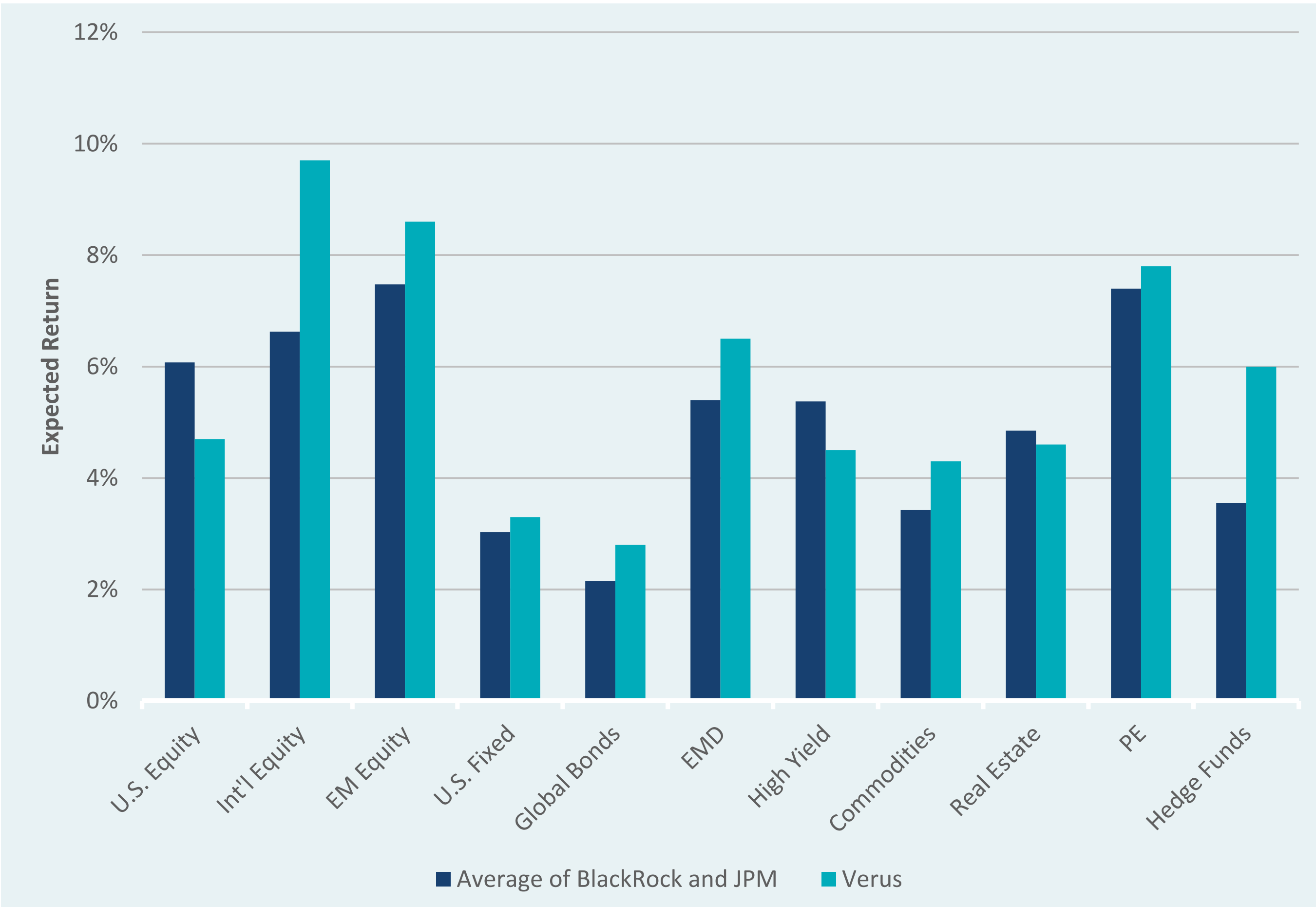
— Tolerance for control, risks, cost

ACTIVE-PASSIVE INVESTOR SPECTRUM



Comparing return assumptions

2017 CAPITAL MARKET ASSUMPTIONS



- We compared our 2017 capital market assumptions to those produced by two of the largest institutions in the world, BlackRock and JP Morgan.
- 50% of the time, our forecast was more optimistic than either firm.
- When comparing to the average of the two firms, our assumptions were more optimistic in 8 of 11 asset classes.

Data compiled by Verus.

10 year return & risk assumptions

Asset Class	Index Proxy	Ten Year Return Forecast Geometric	Ten Year Return Forecast Arithmetic	Standard Deviation Forecast	Sharpe Ratio (g) Forecast	Sharpe Ratio (a) Forecast	Ten Year Historical Sharpe Ratio (g)	Ten Year Historical Sharpe Ratio (a)
Equities								
US Large	S&P 500	4.7%	5.9%	15.8%	0.16	0.24	0.39	0.45
US Small	Russell 2000	4.8%	7.0%	21.8%	0.12	0.22	0.30	0.39
International Developed	MSCI EAFE	9.7%	11.3%	18.9%	0.40	0.48	-0.02	0.07
International Small	MSCI EAFE Small Cap	8.1%	10.5%	23.3%	0.26	0.36	0.09	0.19
Emerging Markets	MSCI EM	8.6%	11.8%	27.2%	0.24	0.35	0.04	0.16
Global Equity	MSCI ACWI	7.0%	8.4%	17.9%	0.27	0.35	0.15	0.23
Private Equity	Cambridge Private Equity	7.8%	10.8%	26.2%	0.22	0.33	0.88	0.89
Fixed Income								
Cash	30 Day T-Bills	2.2%	2.2%	1.2%	-	-	-	-
US TIPS	Barclays US TIPS 5 - 10	2.6%	2.7%	5.7%	0.08	0.10	0.57	0.59
US Treasury	Barclays Treasury 7 - 10 year	2.4%	2.7%	6.9%	0.04	0.08	0.70	0.72
Global Sovereign ex US	Barclays Global Treasury ex US	2.8%	3.3%	10.0%	0.07	0.12	0.23	0.27
Core Fixed Income	Barclays US Aggregate Bond	3.3%	3.5%	6.5%	0.17	0.20	1.07	1.06
Core Plus Fixed Income	Barclays US Corporate IG	3.9%	4.2%	8.5%	0.20	0.24	0.75	0.76
Short-Term Gov't/Credit	Barclays US Gov't/Credit 1 - 3 year	2.6%	2.7%	3.7%	0.13	0.14	1.45	1.44
Short-Term Credit	Barclays Credit 1 - 3 year	2.8%	2.9%	3.5%	0.17	0.20	1.08	1.07
Long-Term Credit	Barclays Long US Corporate	3.7%	4.2%	9.6%	0.17	0.21	0.56	0.59
High Yield Corp. Credit	Barclays High Yield	4.5%	5.2%	11.8%	0.20	0.26	0.60	0.63
Bank Loans	S&P/LSTA	4.5%	5.1%	10.8%	0.22	0.27	0.45	0.48
Global Credit	Barclays Global Credit	2.0%	2.3%	7.8%	-0.03	0.01	0.50	0.53
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	5.8%	6.6%	13.0%	0.28	0.34	0.66	0.69
Emerging Markets Debt (Local)	JPM GBI EM Global Diversified	6.5%	7.2%	13.4%	0.35	0.41	0.22	0.28
Private Credit	High Yield + 200 bps	6.5%	7.2%	11.8%	0.37	0.43	-	-
Other								
Commodities	Bloomberg Commodity	4.3%	5.5%	16.1%	0.13	0.21	-0.37	-0.35
Hedge Funds	HFRI Fund of Funds	6.0%	6.8%	13.2%	0.29	0.35	0.08	0.10
Hedge Funds (Fund of Funds)	HFRI Fund of Funds	5.0%	5.8%	13.2%	0.22	0.28	-	-
Core Real Estate	NCREIF Property	4.6%	5.1%	9.9%	0.25	0.29	1.03	1.03
Value-Add Real Estate	NCREIF Property + 200bps	6.6%	8.1%	17.9%	0.25	0.33	-	-
Opportunistic Real Estate	NCREIF Property + 400bps	8.6%	11.5%	26.0%	0.25	0.46	-	-
REITs	Wilshire REIT	4.6%	6.4%	19.7%	0.1	0.21	0.15	0.28
Risk Parity		7.2%	7.7%	10.0%	0.50	0.55	-	-
Inflation		2.1%	-	1.4%*	-	-	-	-

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

**Historical volatility of inflation. This is not a forecast.*

Modeling assumptions

		10 Year Return & Risk Forecasts	
Asset Class	Modeling Assumptions	Geometric Return	Standard Deviation
Domestic Equities	14% US Large	4.7%	15.8%
	3% US Small	4.8%	21.8%
International Equities	9% International Developed	9.7%	18.9%
	3% International Small	8.1%	23.3%
	7% Emerging Markets	8.6%	27.2%
Fixed Income	5% Core Plus Fixed Income	3.9%	8.5%
	5% High Yield Corp. Credit	4.5%	11.8%
	5% Bank Loans	4.5%	10.8%
	7% Global Sovereign ex US	2.8%	10.0%
	5% Emerging Markets Debt (Local)	6.5%	13.4%
	4% US TIPS	2.6%	5.7%
Real Assets	3% Commodities	4.3%	16.1%
	8% Core Real Estate	4.6%	9.9%
Alternative Investments	4% Hedge Funds	6.0%	13.2%
	4% Hedge Fund of Funds	5.0%	13.2%
	6% Private Equity	7.8%	26.2%
	8% Private Credit	6.5%	11.8%

Utilizes Verus' 2017 capital market assumptions.