Wilshire

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August 24, 2017

Mr. Henry Jones
Chairman of the Investment Committee
California Public Employees' Retirement System
400 P Street, Suite 3492
Sacramento, CA 95814

Re: Internal Fixed Income Annual Review

Dear Mr. Jones:

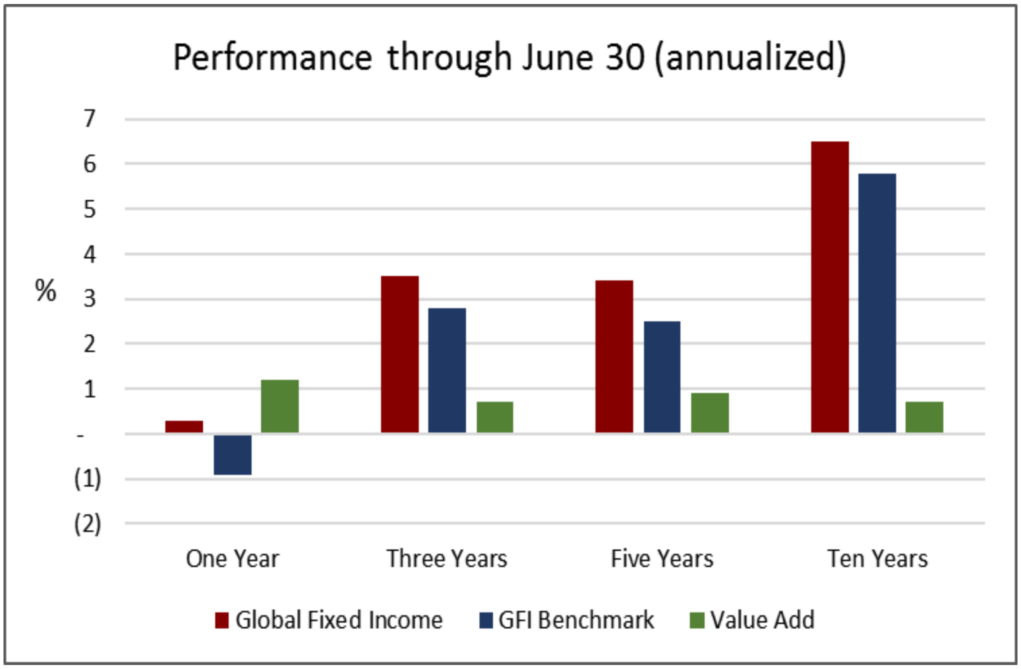
Wilshire conducted an on-site review of the internal fixed income team's personnel, investment process, and resources. The CalPERS Global Fixed Income (GFI) Programs are designed to diversify equity risk for the total fund and provide current income and liquidity. The Programs are actively managed with 93% of the $62.9 billion in assets managed internally by staff and the remaining 7% outsourced to external managers.

The review process included discussions with senior staff members of each fixed income segment within the GFI Programs. Review topics included Program investment process, personnel and resource management, as well as investment process and risk management processes.

<u>Summary</u>

We believe the Global Fixed Income program is managed in an effective and risk-conscious manner, leveraging the deep expertise of the senior management team. The investment approach is consistent with its key strategic objective of providing income, stability, and diversifying equity risk within the Total Fund. At the same time, the program has added alpha consistently through both sub-sector relative value decisions and tactical positioning. Drawing upon extensive macroeconomic and market analysis, along with judicious awareness of the current extended credit cycle, the GFI portfolios have taken advantage of alpha generating opportunities across different markets, while maintaining relatively prudent risk positioning. Exhibit One shows the Program's historical performance relative to its benchmark, and Exhibit Two shows the stability of the GFI return profile in comparison to that of the Global Equity Program over time.

Exhibit One



The CalPERS GFI program has generated positive value-add across all periods, and has added 120 bps over the benchmark for the most recent one-year period. As noted in previous discussions, the Program will face the challenge of managing duration risk in a rising rate environment. This risk will be increasingly germane in the coming years should higher interest rates result from continued economic growth and an acceleration in inflation. The 12-month rolling returns shown in Exhibit Two, as well as the 3-year rolling correlations with the Global Equity Program shown in Exhibit Three, demonstrate the stability the GFI portfolio has provided in diversifying equity returns over different market cycles throughout the past 20 years.

Exhibit Two

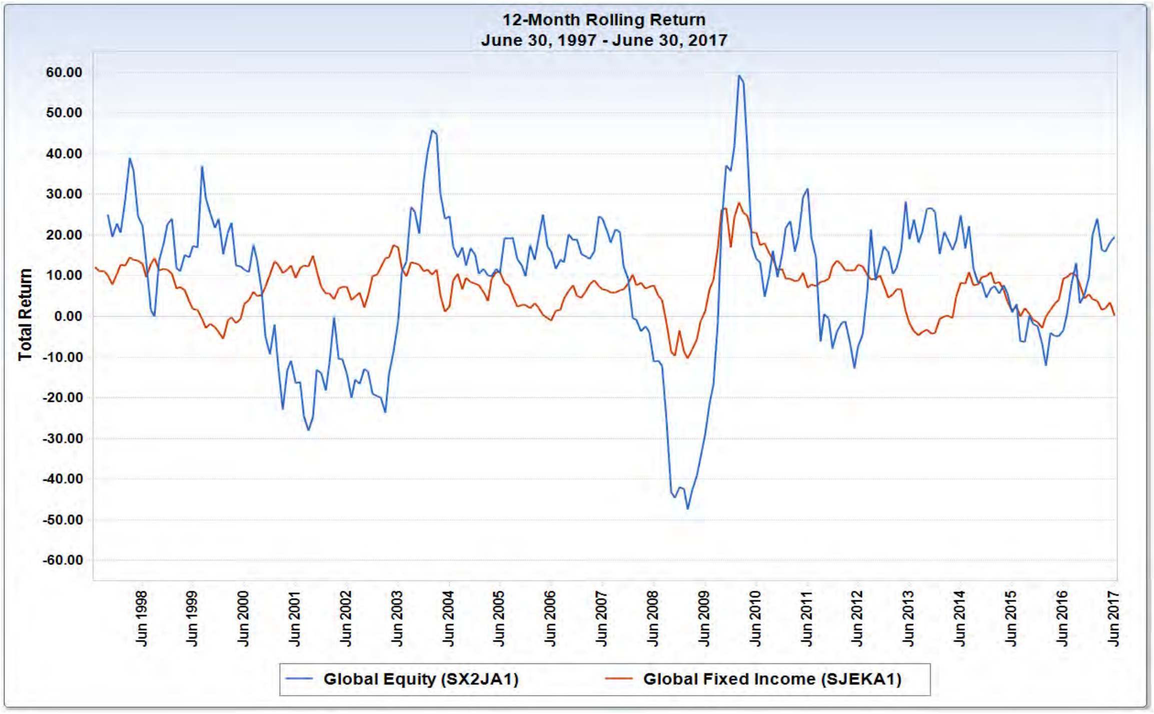
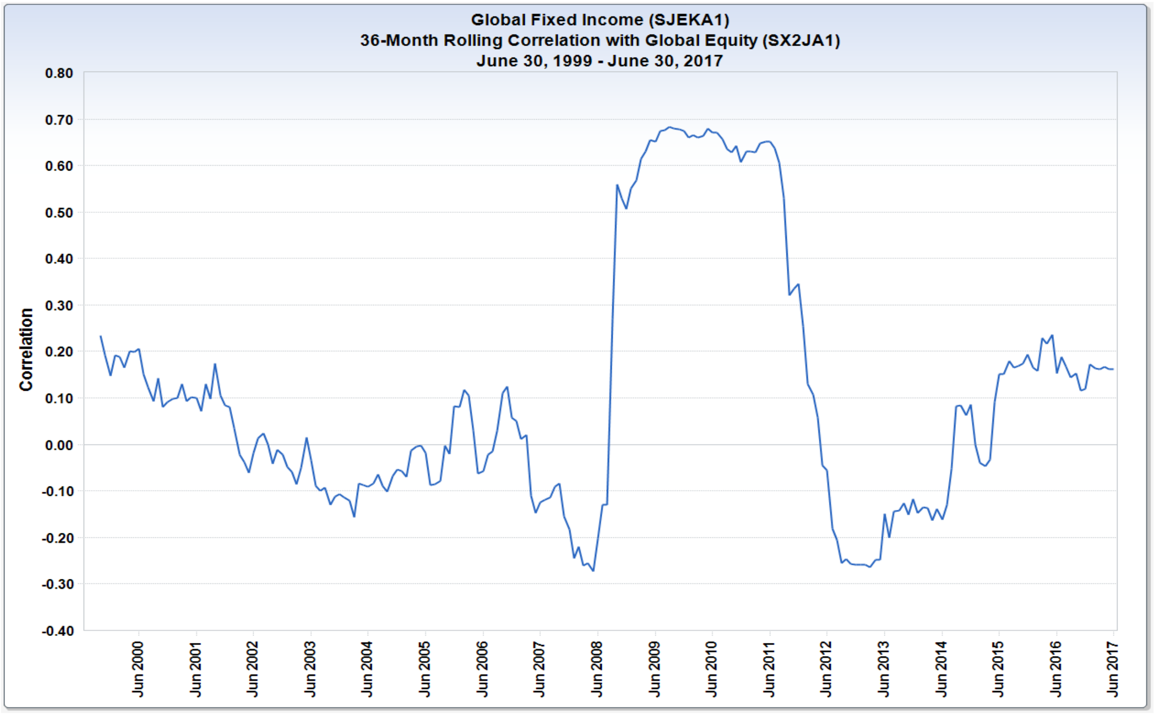


Exhibit Three



The remainder of this report provides Wilshire's thoughts, scoring, and rationale on the Global Fixed Income Program.

Scoring

Wilshire continues to rate the GFI Program highly, ranking the overall Program in the second decile relative to other asset managers. The Programs' ability to gather, process and implement portfolio strategies are significant positives, as is the high quality and experience of the senior management team. Lack of equity ownership and competitive compensation remain a detractor to the overall score, as do recruiting challenges and the concomitant time it takes to fill open positions.

Manager's Score		Tier
Total Qualitative Score		**2nd**
	Wt.	**Tier**
Organization	**20%**	**4th**
FIRM	***50%***	**6th**
Quality and Stability of Senior Management		
Quality of Organization		
Ownership/Incentives		
TEAM	***50%***	**3rd**
Stability of Investment Professionals		
Quality of Team		
Commitment to Improvement		
Information Gathering	**20%**	**1st**
Information Resources		
Depth of Information		
Breadth of Information		
Forecasting	**20%**	**1st**
Clear & Intuitive Forecasting Approach		
Repeatable Process		
Strength, Clarity, and Intuitiveness of Valuation Methodology		
Forecasting Success-Atlas		
Unique Forecasting Approach		
Portfolio Construction	**20%**	**1st**
Risk Budgeting/Control		
Defined Buy/Sell Discipline		
Consistency of Portfolio Characteristics		
Implementation	**10%**	**2nd**
Resources		
Liquidity		
Compliance/Trading/Monitoring		
Attribution	**10%**	**3rd**
Depth of Attribution		
Integration of Attribution		

Discussion

Organization - Firm
In evaluating the quality of a manager's organization, Wilshire assesses factors contributing to the stability of the organization and the alignment of incentives between the team and the organization's long-term objectives. As noted in previous reviews, one of the challenges CalPERS continues to face is the level of compensation required to consistently attract a wide pool of top-tier talent. Combined with the lack of ownership opportunity in the organization, the compensation hurdle is a source of ongoing risk for CalPERS. The retention of intellectual talent is currently achieved with a challenging work environment and the mission-driven culture of the organization. However, there remains a number of vacant positions and as the employment market tightens, recruiting talent will become even more challenging. Staff is clearly cognizant of this issue and has structured the team with layers of expertise for coverage of critical investment functions.

Organization - Team
The team structure remains largely consistent, with the MID-Fixed Income having overall responsibility for all portfolios' sector weights and duration positioning. The sub-sectors IDs determine the positioning of the respective strategies within their respective guidelines, while the MID ultimately adjusts aggregate exposures. The sub-sectors are divided based on the systematic nature of fixed income risk, such as credit (corporate), structured products (mortgage-backed, asset-backed, etc.), and global governments ex-U.S / FX and inflation. Staff in charge of the strategies are highly knowledgeable and manage their respective sectors of the portfolio against appropriate benchmarks. There are also a number of external managers who provide direct investment management and act as strategic partners to provide research and insight, supplementing the work performed by Staff.

A primary risk the team faces is the MID succession plan. This change in leadership has been anticipated well in advance and continues to be thoughtfully considered. The presence of senior staff members with deep investment expertise, as well as management skills developed within the CalPERS culture is a strong plus in maintaining stability through the transition. The impact on mid-level staff and a potential increase in turnover as with any significant organizational changes will be the main challenges if and when the change takes place. Turnover in the mid to junior level staff is exacerbated by a relatively structured career path and promotion system. A mitigating factor is the availability of internal opportunities within other INVO groups for those looking to make a transition within the CalPERS organization. The creation of the AIM position has also been a very positive development in the effort to retain senior talent. Recruiting efforts have been focused on attracting a more diverse pool of candidates to fill open positions, particularly at the senior level, which Wilshire views positively and believes further broadens the pool of top tier talent for consideration.

The creation of the Opportunistic Strategies Program is another change that has taken place within the division. Overall, Wilshire views this as a positive step in expanding the opportunity set for the fixed income space, as the coordination between the two programs is expected to result in positive synergies at the Total Fund level with the potential to capture additional alpha.

Total Fund level initiatives continue to be an area of cross-division cooperation and commitment. Senior GFI staff members continue to dedicate a meaningful amount of time contributing to various sub-committees designed to increase the knowledge base necessary for implementing the strategic plan, as well as to find ways to improve Total Fund performance. Staff's participation in these cross-functional initiatives provides important insights and is a reflection of their dedication to the success of the plan. This additional demand on the staff's time reinforces the need for efficient resource management, particularly with respect to recruiting and retaining talent for the organization.

Information Gathering

Staff leverages a network of managers and financial institutions, as well as the internal economic research team to gather the necessary information relevant to the GFI portfolios. The sector specialists covering the sub-sectors - sovereign bonds, structured securities, corporate bonds, and commodities – leverage the research and quantitative analyses generated both internally and externally to formulate investment strategies. These strategies are shared in weekly meetings, along with the macro outlook impacting the overall financial markets. Given the secular appreciation of the equity market and concerns over valuation levels in the market, the GFI portfolio has been opportunistic in finding alpha opportunities within the low yield, low volatility environment.

On environmental, social and governance (ESG) related initiatives, the GFI team continues to make progress in integrating relevant indicators to better identify and manage ESG related risks in internal credit portfolios. Staff holds quarterly ESG reviews of the portfolio and is exploring additional measures to manage these risks. For example, staff studied utilization of social indicators such as corruption, transparency and inequality for sovereign portfolios, which led them to reduce exposure to certain countries. Drawing on research conducted by Barclays, the team continues to see a link between governance and performance. Staff is also continuing its work to measure the carbon footprint of the internal credit portfolio relative to the benchmark, as well as monitoring the green bond space for opportunities. By year end, the team plans to update the

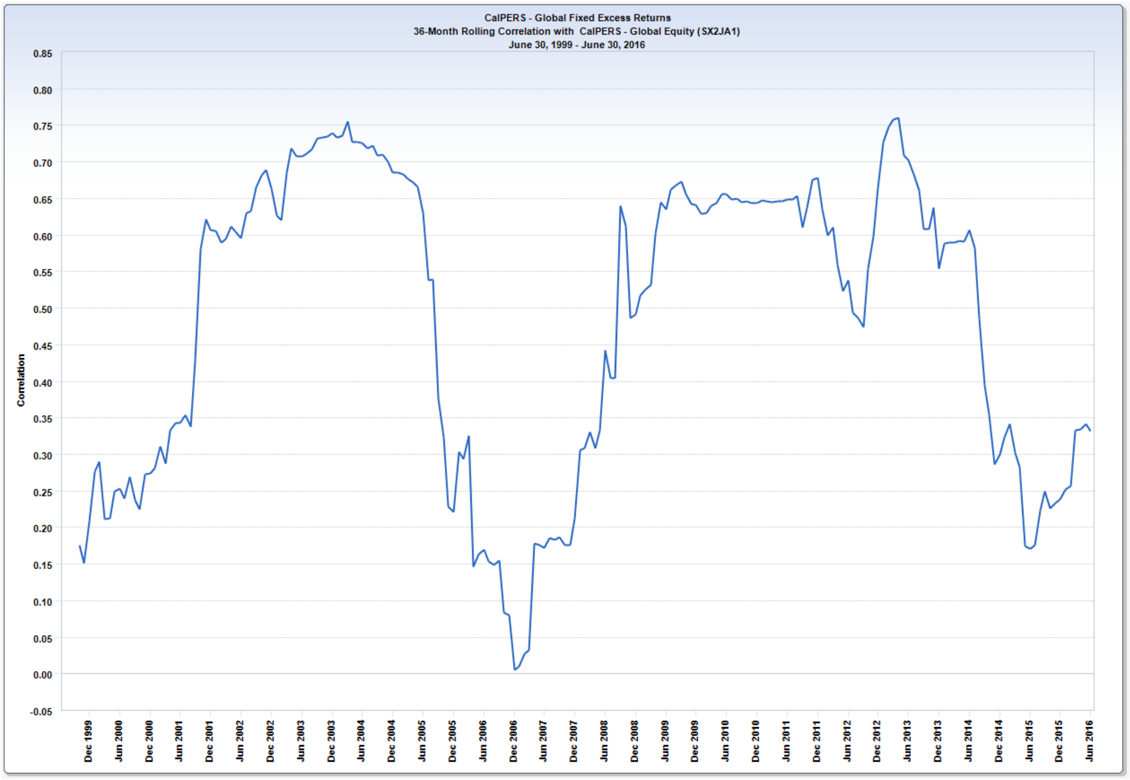
GFI manager investment guidelines to incorporate ESG factors into the investment process.

<u>Forecasting</u>
The key themes developed through the qualitative and quantitative analyses conducted within each segment are shared in weekly strategy and research meetings. The recent hiring of an IM with deep experience in quantitative analysis is expected to contribute to a more systematic approach in managing risks and finding relative value opportunities.

Over the past year, duration has been managed relatively conservatively, as opportunities for value-add have been driven more by credit spread and sector relative value decisions. Currently, the portfolio has a higher quality bias and directional exposure has been decreased with respect to both interest rate and credit spread active risks. Mortgage-backed structured products have been maintained close to benchmark exposure, given the market dynamics driven by QE (quantitative easing) programs. As the interest rate environment changes going forward, the liquid nature of these securities will allow them to be utilized as an additional duration management tool, while providing some yield pickup compared to Treasuries.

<u>Portfolio Construction</u>
The GFI portfolio is constructed to reflect the relative value opportunities across the underlying sub-sectors. The respective sub-sector IDs manage the relative value and tactical positioning within the guidelines but the MID-Fixed Income ultimately has the responsibility of managing the total interest rate and credit spread exposure to the desired profile. The MID-Fixed Income is able to vary the duration of the portfolio by -50%/+10% versus the benchmark per policy in order to protect against the rising interest rate risk of the portfolio. Each sub-sector ID monitors the risks relative to the respective index, within the guidelines of the Fixed Income Policy with respect to the credit spread, interest rate and portfolio concentration risks.

The allocation to interest rate risk and credit risk contribute to the diversification provided by the GFI portfolio versus global equity market performance. As spread products such as corporate bonds (investment grade and high yield alike) are driven by the credit worthiness of the issuer, the return drivers of these segments are more highly correlated to the equity markets in comparison to government issued bonds and, to a lesser extent, structured products. The outperformance of the GFI portfolio in the past year has been driven by relative overweight and underweights of spread products, and tactically managing the interest rate risk in the portfolio. These portfolio decisions are managed with a consistent approach to avoid biases, and takes into account liquidity and market capacity considerations.



With respect to liquidity management, staff has reduced reliance on third party for cash management, with the goal of consolidating the management of all short term investment funds in the future. This is expected to increase the efficiency of the portfolio, as well as add value through streamlining the management process across asset classes. Overall, the portfolio construction approach is very well aligned with Investment Beliefs #1 – Liabilities, #2 – Long-Term Horizon, and #7 – Risk vs. Reward.

Implementation and Attribution

The GFI Programs utilize third-party portfolio management and trading platforms, and are evaluating additional platforms to improve efficiency across different fixed income instruments. Staff continues to look for ways to enhance internal capabilities for return and risk attribution, and are well aware of the re-investment requirement for improving system capabilities and supplementing them when necessary with outside input and expertise. The enhancement of internal systems continues to be a focus for certain team members and ensures that new capabilities keep pace with the additional workload being undertaken by the internal team, a process which Wilshire fully supports. Currently the trading process is handled by two teams, one for corporate bonds and another for currencies and Treasuries. Wilshire recognizes that synergistic opportunities can be harvested when the execution teams have the expertise and market knowledge of the instruments being traded. Wilshire is also supportive of the continue evaluation of further cross asset class coordination possibilities.

Operational and compliance risk is also present in the internal fixed income portfolio, as it would be for any external manager. CalPERS has both enterprise and investment compliance teams, and a risk management group which are collectively tasked with monitoring portfolios across asset classes. Given the size and complexity of the CalPERS portfolio, ensuring that the risk management group remains adequately staffed is important.

Conclusion

In brief, we believe that Staff has demonstrated the ability to both effectively and efficiently manage CalPERS' fixed income portfolios. The investment philosophy has been applied consistently, is appropriate to CalPERS' needs, and sufficient investment risk controls are present to mitigate many of the risks of managing fixed income portfolios. **Utilizing our standard manager research scoring framework, Wilshire's score on this strategy is 2nd decile, which continues to reflect the strong team and clear success at managing the portfolio as charged.** The main challenges from a scoring perspective overall are largely due to organizational-level issues such as a lack of long-term retention incentives rather than issues specific to the portfolio management process.

Should you require anything further or have any questions, please do not hesitate to contact us.

Best regards,

Thomas Toth
Managing Director

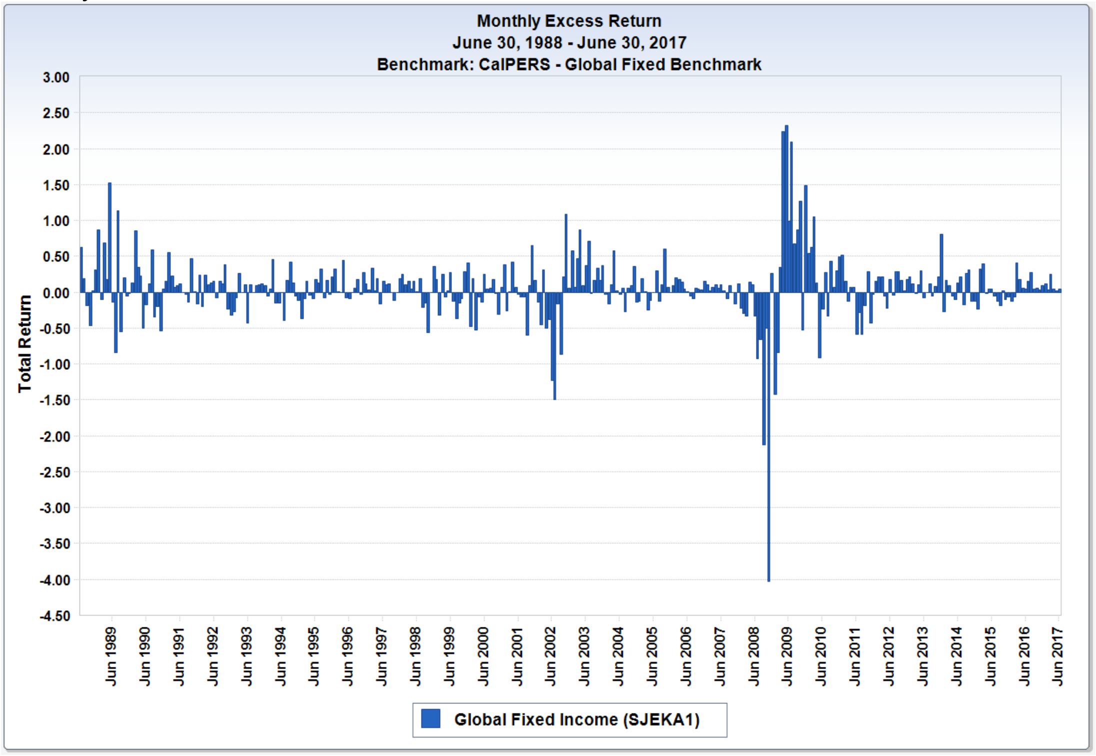
Rose Dean
Managing Director

Performance Appendix

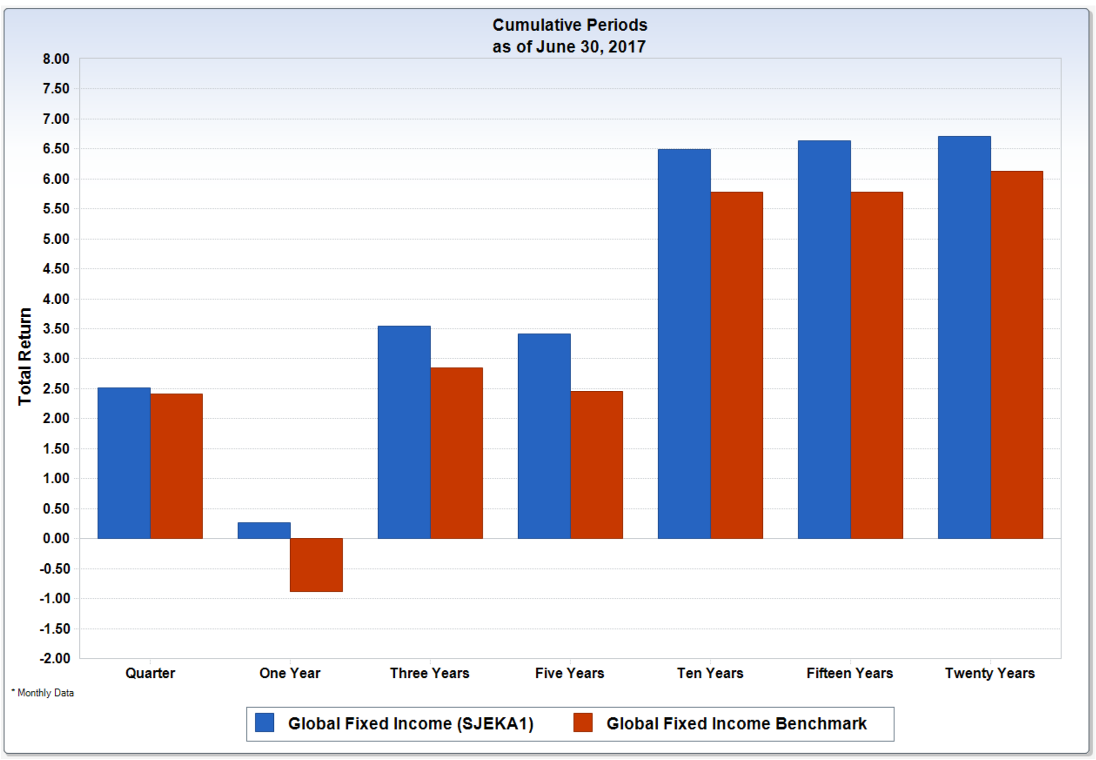
	Market Value	Qtr	1-Year	3-Year	5-Year	10-Year	Date
INCOME	**62.9**	**2.5%**	**0.3%**	**3.5%**	**3.4%**	**6.5%**	**6/88**
Income Policy Benchmark		2.4%	-0.9%	2.8%	2.5%	5.8%	
Value Added		0.1%	1.2%	0.7%	0.9%	0.7%	
U.S. Income	**56.4**	**2.3%**	**0.3%**	**4.3%**	**3.9%**	**6.8%**	**12/95**
Mortgage Bonds	10.4	1.1%	1.0%	3.6%	3.6%	5.3%	12/82
Long Duration Mortgages	2.8	1.6%	0.8%	4.0%	3.3%	6.7%	6/05
Corporate Bonds	11.4	4.1%	5.2%	5.1%	6.4%	8.0%	3/02
U.S. Government	27.4	2.0%	-4.0%	4.0%	2.0%	6.0%	1/00
Sovereign Bonds	1.7	2.5%	-0.1%	4.1%	3.7%	-.-%	7/09
Long Duration Corporates	3.2	4.2%	-0.8%	2.4%	5.9%	8.7%	9/05
Internal High Yield Bonds	0.7	2.1%	15.8%	9.8%	9.7%	10.7%	9/99
External High Yield	1.1	1.0%	12.3%	4.6%	7.5%	5.0%	3/02
Other							
Non-U.S. Income	**6.5**	**4.4%**	**0.1%**	**-2.6%**	**-0.9%**	**3.8%**	**3/89**
Custom Benchmark		4.1%	-1.1%	-3.4%	-1.6%	2.8%	
Value Added		0.3%	1.2%	0.8%	0.7%	1.0%	
Internal Active Short Term	1.8	0.3%	0.8%	0.5%	0.4%	-.-%	3/11
Custom Benchmark		0.2%	0.7%	0.3%	0.2%	-.-%	
Value Added		0.1%	0.1%	0.2%	0.2%	-.-%	
CalPERS ESEC Cash Collateral	2.6	0.2%	0.6%	0.5%	0.3%	-.-%	6/10
Custom Benchmark		0.2%	0.6%	0.3%	0.2%	-.-%	
Value Added		0.0%	0.0%	0.2%	0.1%	-.-%	

	Market Value	Qtr	1-Year	3-Year	5-Year	10-Year	Inception Date
INFLATION	**25.3**	**-0.7%**	**-2.7%**	**-6.0%**	**-2.1%**	**-.-%**	**9/07**
Inflation Policy Benchmark		-0.6%	-1.8%	-6.7%	-2.7%	-.-%	
Value Added		-0.1%	-0.9%	0.7%	0.6%	-.-%	
Internal Commodities	**4.5**	**-5.4%**	**-9.2%**	**-24.7%**	**-13.9%**	**-.-%**	**9/07**
GSCI Total Return Index		-5.5%	-9.0%	-24.8%	-13.7%	-.-%	
Value Added		0.1%	-0.2%	0.1%	-0.2%	-.-%	
Core Inflation Linked Bonds	**17.0**	**1.3%**	**0.5%**	**-0.2%**	**1.1%**	**-.-%**	**3/08**
Custom Benchmark		1.2%	0.5%	-0.5%	0.8%	-.-%	
Value Added		0.1%	0.0%	0.3%	0.3%	-.-%	
Tactical Commodities	**1.9**	**-6.4%**	**-18.6%**	**-25.6%**	**-.-%**	**-.-%**	**1/13**
GSCI Total Return Index		-5.5%	-9.0%	-24.8%	-.-%	-.-%	
Value Added		-0.9%	-9.6%	-0.8%	-.-%	-.-%	
Tactical TIPS	**1.9**	**-0.4%**	**-0.8%**	**0.5%**	**-.-%**	**-.-%**	**1/13**
CalPERS TIPS		-0.4%	-0.6%	0.6%	-.-%	-.-%	
Value Added		0.0%	-0.2%	-0.1%	-.-%	-.-%	

Monthly Excess Returns



Cumulative Returns



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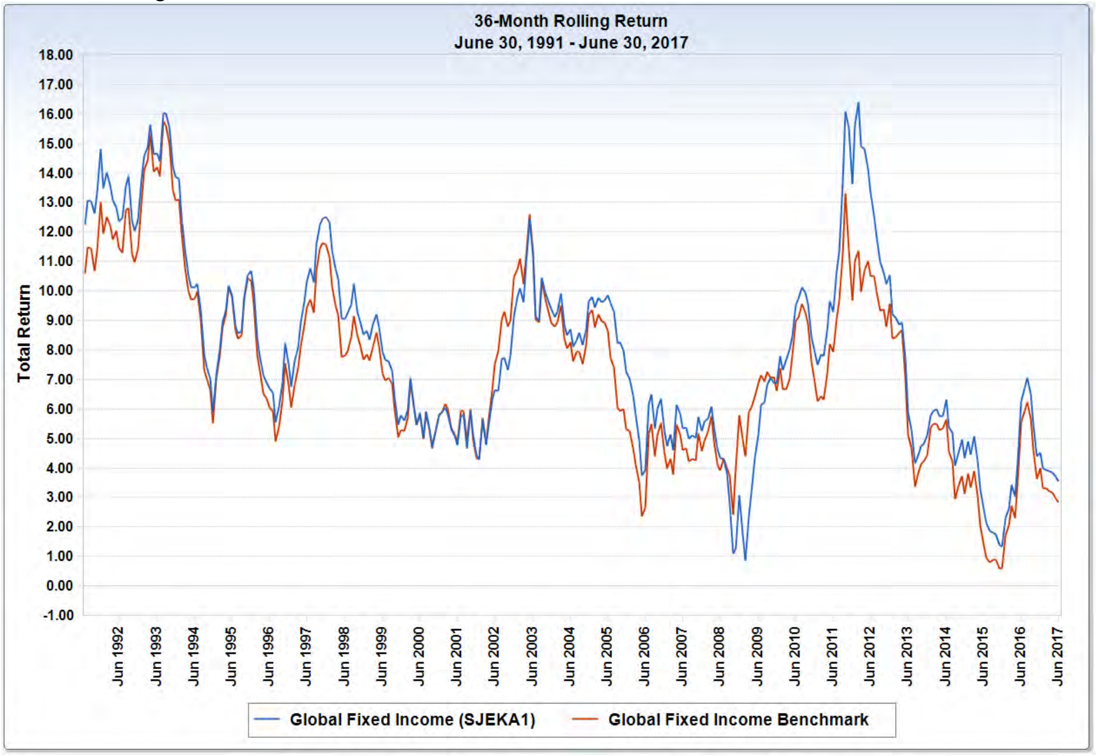
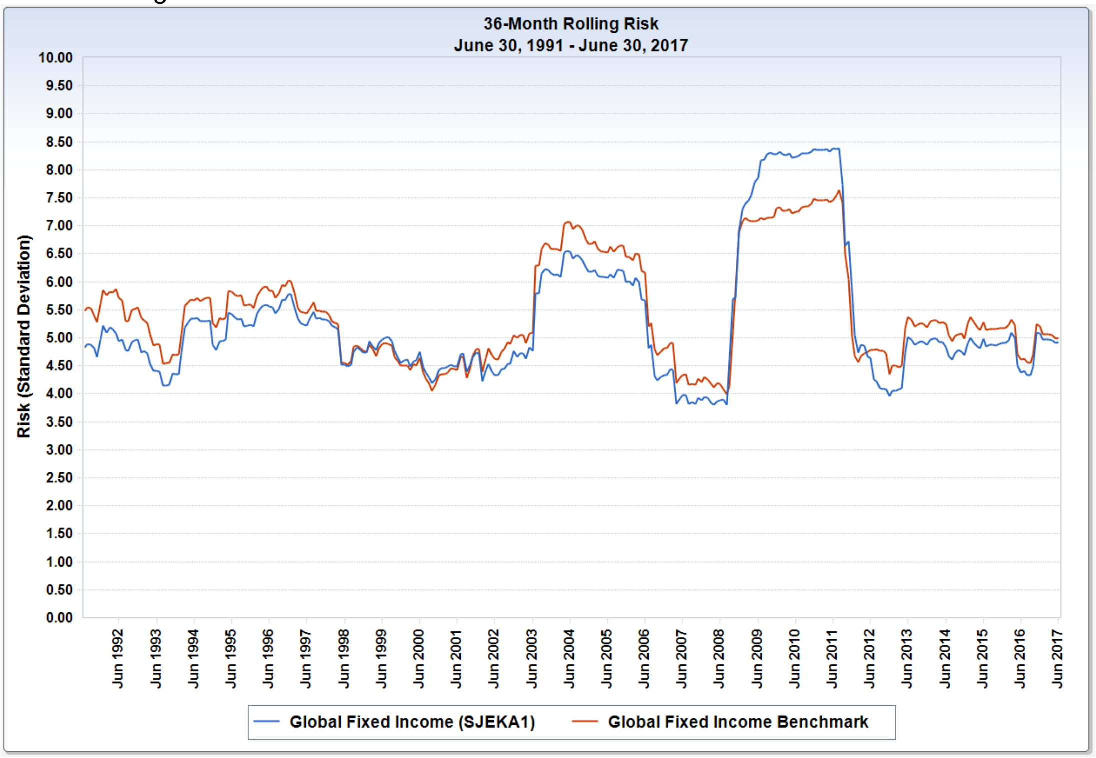
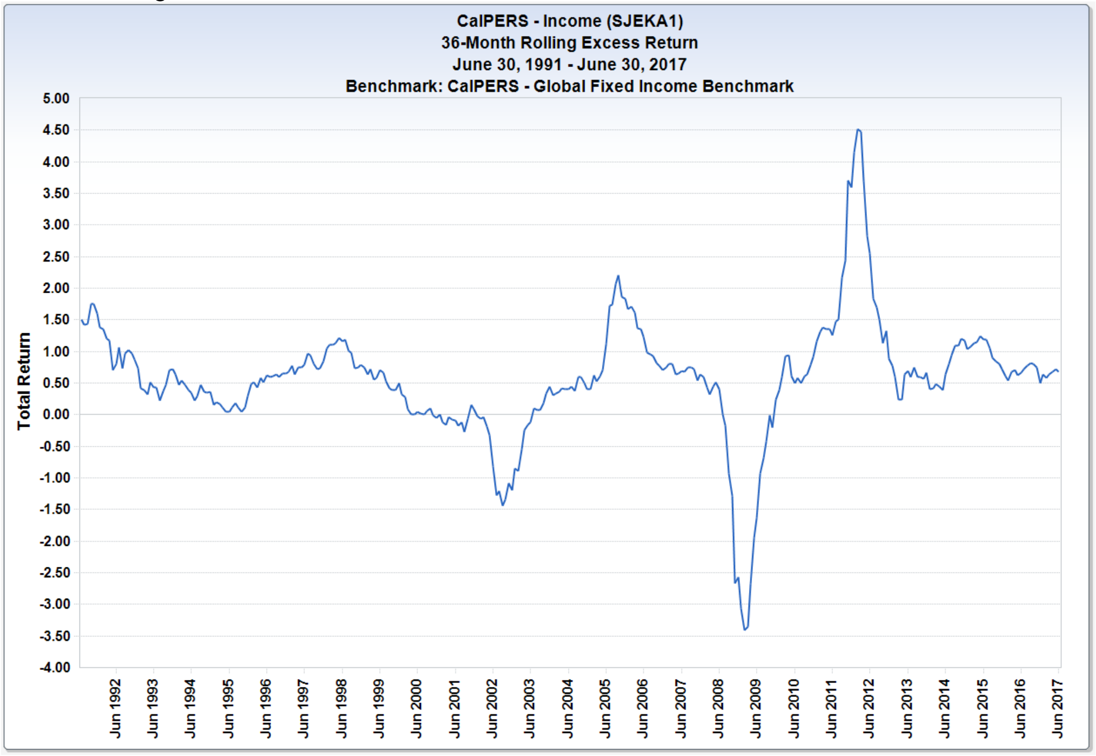
3 Year Rolling Returns



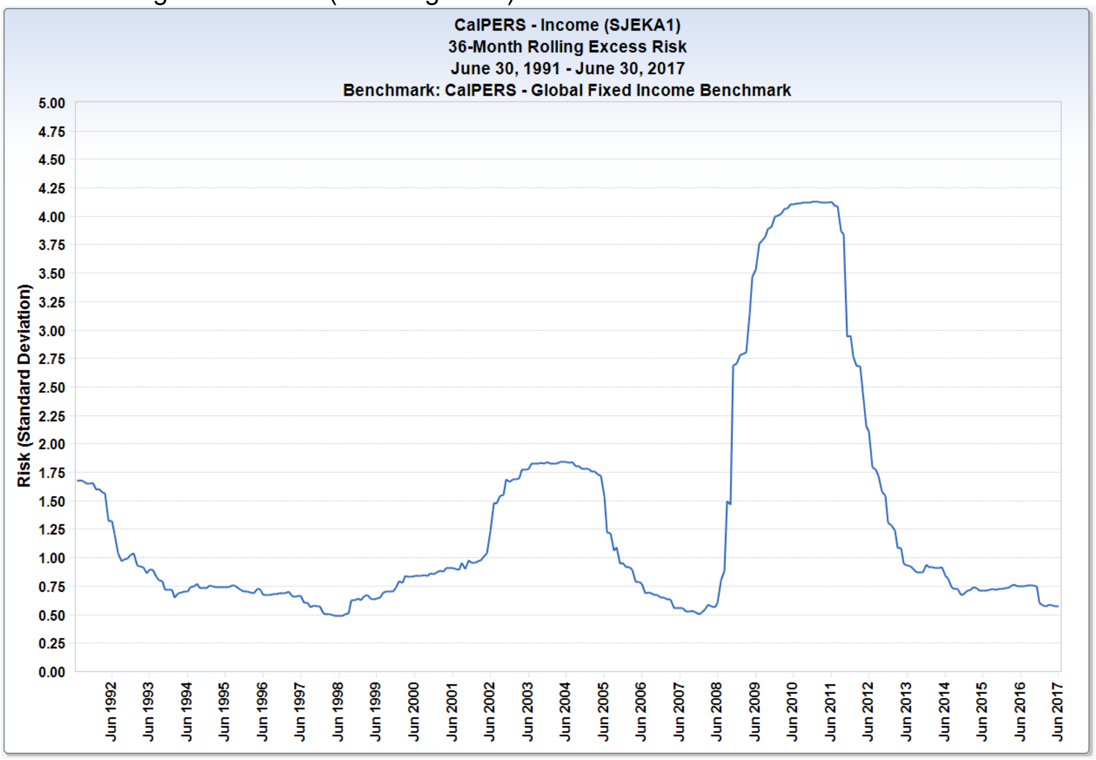
3 Year Rolling Risk



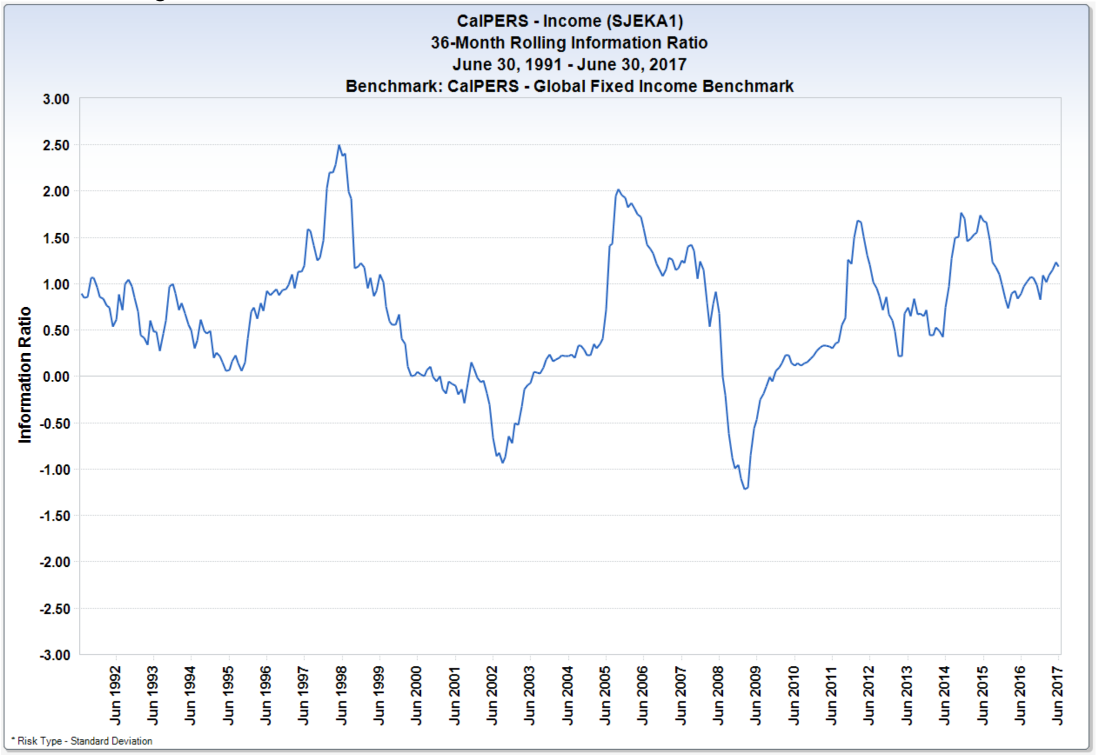
3 Year Rolling Excess Returns



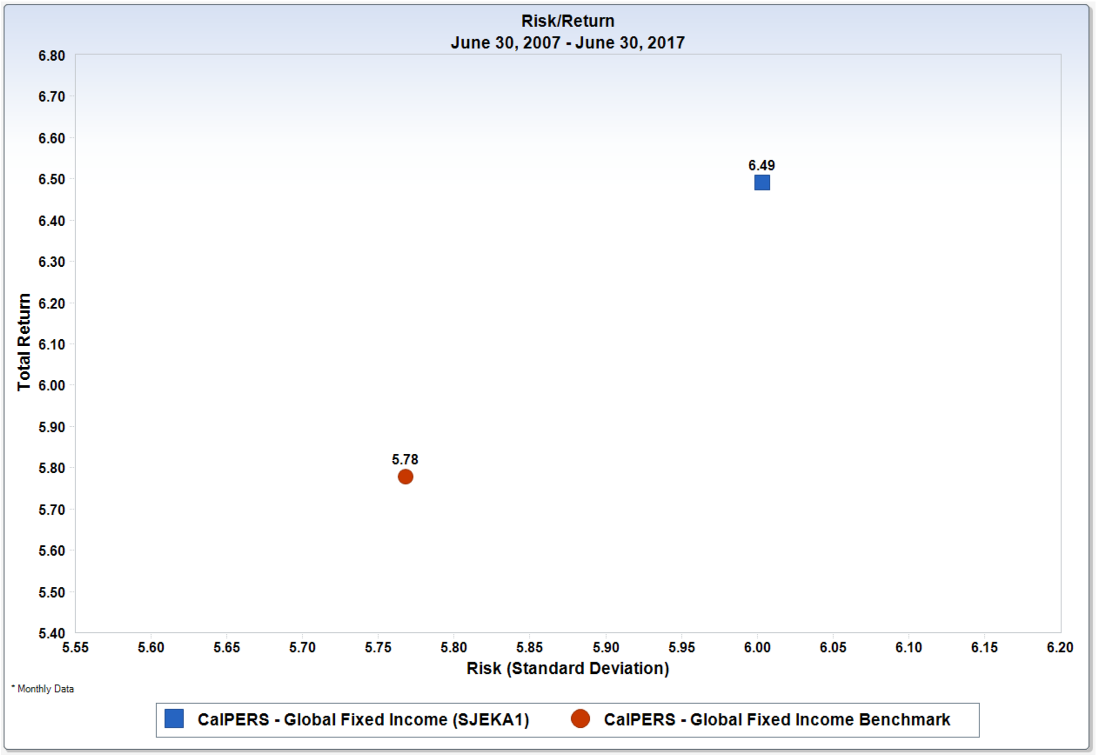
3 Year Rolling Excess Risk (Tracking Error)



3 Year Rolling Information Ratio



Risk vs. Return - Last 10 Years



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Risk vs. Return – Last Five Years