Wilshire

August 31, 2022

Mr. David Miller
Chair of the Investment Committee
California Public Employees' Retirement System
400 P Street
Sacramento, CA 95814

Re: Consultant Trust Level and Program Reviews

Wilshire's 2022 review of CalPERS' investment programs continues with a broader, more holistic approach with an emphasis on how the various programs combine to influence Total Fund results. The review process included virtual on-sites with both video conference and teleconference discussions with senior team members across the following programs and functional areas:

- Trust Level Portfolio Management
- Global Equity
- Global Fixed Income
- Opportunistic Strategies
- Private Debt
- Real Assets – general oversight

These formal discussions have been supplemented with regular conference calls with the Managing Investment Directors (MIDs) and key investment personnel throughout the year to discuss team structure, portfolio construction, positioning, and performance. This opinion letter starts with an organizational review that is consistent across each program, followed by a summary and review of the individual programs, and concludes with an appendix of the scores for each program consistent with past annual reviews.

Organization

In evaluating the quality of an asset management 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. Stability is particularly crucial during periods of heightened market volatility like those seen in 2022. Past Wilshire reviews have highlighted our concerns over Staff stability, as a successful investment program requires a true long term investment horizon that comes from a consistent and enduring investment philosophy. The organization recognizes this importance given Investment Belief #2 – A long time investment horizon is a responsibility and an advantage. Driving strong portfolio returns requires consistency, deep resources, a thorough understanding of the opportunity set, and accountability.

This year's overall Organization score (see appendix) has increased given the hiring of a new Chief Investment Officer (CIO). The conclusion of the search for a permanent CIO removes a distraction for the broader organization, and Wilshire's evaluation reflects the new situation. Importantly, the process of implementing the strategic portfolio approved by the Board will be set on firmer footing. In addition, an interim Chief Operating Investment Officer (COIO) has been appointed to focus on operational considerations and administration. The impact from potential changes in the structure of the investment teams still contributes to a level of uncertainty, though Wilshire expects to continue increasing the broader organization score over time as it demonstrates improved stability.

The new Chief Investment Officer has laid out a series of initiatives designed to move INVO in a productive direction. These initiatives are anchored by four pillars – portfolio, processes, people, and performance. Within each pillar are important strategic initiatives with designated senior investment professional leads accountable for their execution. These initiatives include items such as active risk innovation, investment data & technology, culture, and governance which are critical for building a resilient investment program. The interim COIO will be focused on a number of these initiatives with fresh insight and perspective. The Board should expect to see adjustments to the reporting structure to support the CIO's vision for INVO. Wilshire will discuss these changes with the team and highlight them for the Board as necessary.

Our conversations with the new CIO underlined a vision to shape INVO culturally and strategically to improve Total Fund performance by improving accountability. The vision dovetails well with key Investment Beliefs such as #4 – long-term value creation requires effective management of three forms of capital: financial, physical, and human; and #10 - strong processes and teamwork and deep resources are needed to achieve CalPERS goals and objectives.

To deliver on that vision, governance within INVO is being restructured through the following committees:

- Operations & Administration
- Total Fund Management
- Investment Underwriting

These committees are made up of the most senior investment professionals, across multiple market segments, providing diversity of experience and insight. Operations & Administration will focus on organizational priorities, policy, technology, talent, Board preparation, and communications. The newly appointed interim Chief Operating Investment Officer will be a key contributor on this committee. Total Fund Management will direct strategic portfolio design, leverage and liquidity monitoring, and absolute and active risk management. Active risk management, in particular, is a strategic priority and the CIO has indicated a desire to explore additional active strategies through a risk budgeting lens. An expansion of active risk would represent a shift in investment direction and the specific details underpinning the pursuit of these return sources will be critical to its success. Wilshire will need to evaluate the specific active strategies before opining on their relative merits. Finally, the Investment Underwriting Committee is responsible for evaluating the investment pipeline, approval of larger investment commitments, overseeing proxy voting, and managing 'investment and innovation' working groups. This ensures an additional level of oversight for more impactful investments, with multiple eyes evaluating the opportunities. Wilshire discussed these functions with the CIO and reviewed sample agendas. Wilshire is comfortable that the governance aligns with critical functions necessary to design and build a strong investment program. As the Board consultant, we will continue to monitor their functions and modifications as the committees evolve, staying attuned to flux in reporting lines and responsibilities which could impact Staff stability.

Wilshire's score also considers the positive impacts from allowing both the DCIO and MID-Fixed Income to resume focusing on their established roles. Both professionals acted capably in the interim positions, though interim positions are not empowered to make strategic investment shifts. Additionally, in early FY22, the interim MID of Global Equity was made permanent. This opened an ID role in Corporate Governance, which is close to being filled as of this writing. Together, this underlines a trend toward stability in the senior team.

Over the last year, the Board Governance & Sustainability Team (BGST) was formed, consisting of nine Staff, combining two previously distinct functions under the interim leadership of the MID who reports to the CEO, and has a dotted reporting line to the Interim CIO. BGST is responsible for a wide range of priorities including: the board self-evaluation process; financial markets advocacy; human capital management, including the responsible contractor policy; and stakeholder engagement. With its focus on ensuring access to high quality sustainability data, the Team is responsible for delivering the third installment of the Sustainable Investment Research Initiative, leveraging off three resources from the Research and Strategy Group. Significant resources are being invested in CalPERS' regulatory advocacy program, including multiple presentations to Congressional hearings on sustainability topics and formal consultation responses to the SEC to improve sustainability disclosures standards across the market.

The Team also leads Diversity, Equity and Inclusion work in INVO, led by an IM with two direct reports. This includes the emerging manager program, which will be refreshed during 2022. There is close interaction between the Team and Global Equity as well as the asset class sustainability leads from Private Equity, Real Assets and Global Fixed Income. There is regular collaboration between the Team and both legislative affairs and stakeholder relations, as well as ICOR that leads the divestment mandates, across state, Board and management-led exclusions.

A senior role for a Deputy CIO – Private Markets remains in recruitment. This is a critical position for the organization given the increase in private asset exposure contemplated by the new asset allocation. The number of opportunities in private markets continues to grow even as the number of public companies has declined materially over the past ten years. Some of the fastest growing companies are choosing to stay private longer, which means investors need to take a broad view of the opportunity set to optimize returns. Enhancing the resources available to scour the private opportunity set will be a significant determinant of INVO's success in this area. There are a few positions across the individual programs that will require backfilling through recruitment or promotion, and it is critical to ensure that sufficient resources are in place to execute on the Board's strategic investment decisions.

The CIO is evaluating how the organization recruits and market perception of the job opportunities available for the right candidates. Ensuring that CalPERS continues to have the tools necessary to recruit and retain qualified, diverse candidates should be a strong focus. As a governmental entity, CalPERS faces some unique organizational risks that for-profit enterprises have greater flexibility in managing, such as the inability to provide employees direct and indirect ownership opportunities. These long-term forms of incentives are common within private sector investment organizations and can serve as significant retention tools. The absence of such compensation structures can expose the organization to the increased risk of losing intellectual capital at the INVO Senior Staff level to asset managers and other financial institutions.

We do note that the organization has made strides to adjust pay scales to be more competitive in the marketplace, as well as aligning incentive compensation with Total Fund performance objectives. This includes a Long-Term Incentive Plan designed around exceeding the overall Fund's return target, which helps align Staff incentives with those of the plan stakeholders. In Q2 of 2022, the Board's compensation consultant recommended modifying the incentive plan targets for the next fiscal year. A Board working group is also scheduled for the next fiscal year to further delve into the incentive compensation structure.

CalPERS continues to compete for talent in a tight labor market environment and any changes to the compensation structure should be undertaken with a clear understanding of the risks they might introduce. These risks could be personnel related, such as increased turnover or recruiting challenges, or portfolio related, impacting how much active risk is incorporated across investment programs. Active return targets (alpha) should be set based on the strategies pursued within the portfolio and, importantly, the desired active risk tolerance of the Board. Set too low, the portfolio is likely to exhibit a limited active risk profile and potentially miss out on active return opportunities. Set too high, the objectives risk driving excessive risk taking or a belief that the objective is unobtainable. Balancing these competing forces is critical to enhancing Total Fund returns through active management.

Personnel turnover is not uncommon (nor always undesirable), and ensuring continuity is of paramount importance through recruitment of a strong bench. As an example, with the retirement of the MID in Board Governance and Sustainability, the new interim MID position was filled internally through promotion. The interim MID has significant experience in both regulatory and industry matters, and a history of working collaboratively with various stakeholders. This is an example of the bench available within INVO, and one that should be carefully tended as the organization moves forward.

In summary, we will continue to monitor the stability of the investment organization and believe there remains substantial room for improvement in the overall evaluation score. The strategic initiatives illustrate a roadmap for INVO to successfully move the portfolio forward in key areas:

- Team stability and resources – People Strategy and Investment Data & Technology
- Improving absolute returns – Portfolio Optimization, Sustainable Investment Strategy, Private Assets

- Improving relative returns – Active Risk Innovation
- Consistent investment in private assets – Innovation Platform and Private Debt Implementation

As for any investment management organization, we would like to see evidence of continued senior member stability and will monitor the progress of strategic initiatives. We are cautiously optimistic that the onboarding of the new CIO and the strategic initiatives laid out at the Board offsite represent a positive direction for the Investment Office.

Trust Fund Portfolio Management (TFPM)

The role of TFPM within INVO has undergone several evolutions over the last few years, however over the last 12 month there was stability in the core functions of the group which are listed below:

- Allocation Management
- Investment Treasury and Trading
- Research (Economics)
- Strategy
- Portfolio Design

It is worth noting that Staff resources within TFPM have moderately decreased since last year and 7 positions are currently open. One common theme that stood out in conversations with Staff was the challenge the team faces in retention and recruitment. Given the turnover and challenges in filling positions, the information resources score was slightly decreased. Specific comments on the staffing within the TFPM program are broken out below:

1. Allocation Management – while Staff resources are similar to last year, it should be noted that the two current open positions were also open last year
2. Investment Treasury and Trading – trading resources have increased moderately however that includes 4 open positions versus 1 open position last year
3. Research – Staffing is slightly lower and there is an open position whereas last year there were no open positions
4. Strategy Group – Staffing levels have decreased relative to last year
5. Portfolio Design – This team was introduced last year and currently stands at 2 members

The **Research (Economics)** group supports PERF by driving thought leadership and assisting with support on various projects for other programs within the broader INVO team. Within the last year, the team continued work to formalize the support process for any ad hoc work related to new initiatives across the various programs. In addition, they continue to assist in generating scenario analysis and stress testing that is used by the strategy team in work related to the ALM process. Macro research is also provided by the chief economist supported by regional specialists and there is a desire to expand that team to ensure sufficient macro coverage across all capital markets. Research related to ESG continues to be a priority and adding additional resources is currently being evaluated. Given the number of open positions and turnover across the team we have downgraded the information resources score. This team has impacts beyond TFPM and is integral to work done throughout the PERF and across the Affiliate Investment Programs (AIP).

Portfolio Strategy serves as a complement to research and their work can generally be separated into the following components:

1. Strategic Asset Allocation – evaluation of the current SAA and its efficacy in current market environment
2. Research and Strategy – using various model and signals to evaluate probability of drawdown for the PERF
3. Asset Class Support – research related to the asset class programs such as the review of the Global Equity segment two benchmark data provider

Wilshire views the role of this team positively and sees this as an area of future improvement of the overall score for TFPM, particularly as active risk comes more into focus and this team can assist with active risk innovation.

The Allocation Management team handles much of the day-to-day work of both the PERF and the Affiliate funds. During FY22, the team was an integral part of the ALM process, including leverage and liquidity implementation. The Affiliate Investment Program includes the California Employers' Retiree Benefit Trust, the Public Employees' Long-Term Care Fund, and the Judges' Retirement System II Fund. AIP responsibilities also include the supervision of two Supplemental Income Plans within a defined contribution platform. A common theme we have observed with regard to the work done for the affiliates is trying to ensure (to the extent possible given different portfolios) some degree of process consistency in managing the affiliate funds as well as the PERF. This relates not only to portfolio construction but also to policy changes. This year, AIP has been focused on moving the LTC program from a unitized to de-unitized structure with separate accounts. This is a large project and one where additional legal and administrative resources would be useful.

Investment Treasury and Trading focused on several initiatives in addition to their core function that are designed to reduce operational risk by centralizing trading for both Global Fixed Income and Global Equity. The team has supported the implementation of the new SAA, as well as working on initiative related to:

- Balance sheet management
- Supporting the new Total Fund leverage implementation
- Mortgage funding collateral management

Similar to what has been mentioned related to other areas within TFPM, the resources within this team are lean and filling the four open spots should be a priority. These staffing challenges are also a reason we have decreased our resources scoring within the Implementation factor.

Portfolio Design was introduced as a carve out under TFPM last year, with the intention of complementing the portfolio construction process by helping to guide how the approved asset

Wilshire

segments come together. Additional structural reorganization has resulted in several other areas that will also fold in under portfolio design going forward and those are listed below

1. PERF Allocation Management
2. Market Risk Management
3. Liquidity and Counterparty Risk Management

INVO has focused a significant amount of time on improving the management of liquidity for the Total Fund. A centralized liquidity dashboard provides INVO with a holistic view on liquidity sources and uses over different time horizons. This allows CalPERS to optimize liquidity management on an ongoing basis. Taking advantage of the most efficient and least costly sources of liquidity will be critical for implementing and maintaining strategies adopted during the ALM process.

A large part of the focus of resources of Portfolio Design but also the broader TFPM team have been spent working on implementation of the new SAA (resulting from the recent ALM). Implementing a portfolio as large as PERF is not a simple task and requires thoughtful planning and anticipation of complications that could arise during the process. Wilshire has viewed the implementation up to this point favorably, and in light of resource limitations, there does seem to be a culture of "all hands-on deck" to ensure that regardless of resources the implementation continues to be handled efficiently.

Utilizing Wilshire's standard manager research scoring framework, Wilshire's qualitative assessment of the Program places it in the 4th decile which is a slight downgrade from last year (3rd decile). As described above, the primary drivers for this decrease are related to resource issues that impacted our scoring in multiple areas including Implementation and Information Gathering. Forecasting and Portfolio Construction are still very strong and our Team and Attribution scores remain high.

Global Equity

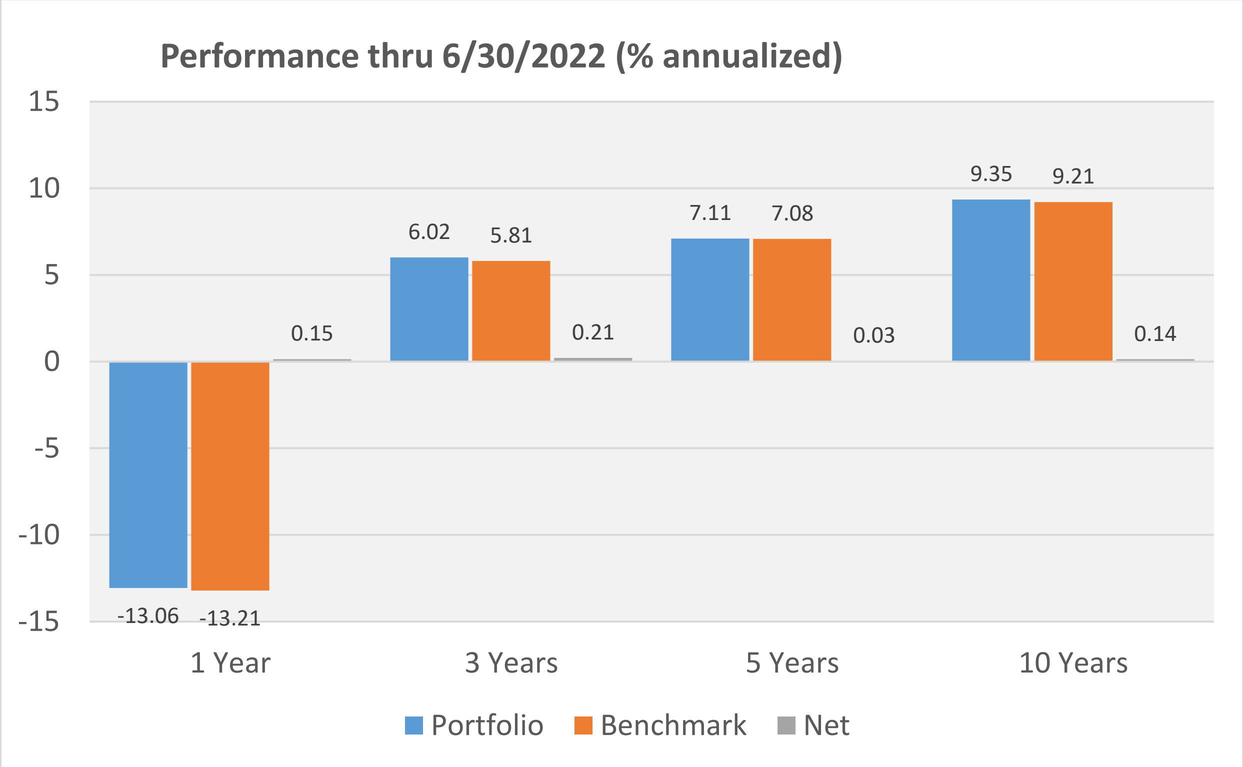
The Global Equity (GE) Program's mandate is to efficiently deliver low-cost global equity beta to the PERF, which provides the Fund strategic exposure to global growth and the equity risk premium. The program as whole performed as expected over the last 12 months and Wilshire sees a high degree of consistency between our review last year and this year, with the major improvement coming from the hiring of a permanent MID which is viewed favorably.

Equity returns (-13.1% absolute return) for the latest fiscal year reflected a significant mean reversion over the last 12 months, primarily driven by the first half sell-off in 2022 where most assets were not immune to correction after such a strong run post covid. Similar to last year the GE portfolio team was able to add additional (15 basis points this year vs 31 bps last year) alpha via some of the actively managed, and alternative beta strategies in the portfolio. Staff manages the portfolio within a narrow risk budget (i.e., tracking error) however in recent years there has been some discussion of expanding active risk within the portfolio.

Of the $195.1 billion within GE, $186.8 billion is now invested in index-oriented accounts which equates to 95.7% of the portfolio. This is essentially on par with the allocation to index oriented accounts that were reviewed last year.

The GE team currently stands at 16 FTE with 4 open positions. This represents a decrease in size by two people, however the role of ID in charge of Corporate Governance is under an active search and there is optimism about filling that position soon. Given the heavy tilt towards index orientation, Wilshire feels that the team is adequately staffed to manage the portfolio going forward. Wilshire would want to re-evaluate this view if there is a desire to drive higher levels of return through active portfolio management in the future. A material increase in the active risk budget would likely require additional resources.

As can be seen in the chart below, the GE portfolio exceeded its benchmark by 0.15% in the 2021-2022 fiscal year and by an annualized 0.21% over the last three years. Those recent periods have also led to longer term outperformance over 5 and 10 years.



In addition, the portfolio has also contributed very strong absolute returns over the ten-year period (9.35% annualized). Factoring in the global pandemic and the selloff experienced in 2022, this return remains remarkably robust, and consistent with the long-term goals of the portfolio. Given the consistency of the portfolio and continued outperformance Wilshire has not changed the forecasting score, which remains high.

The overall makeup of the GE portfolio continues to be predominately index-oriented as shown below.

As of June 2022

Managed	Index Oriented	Active				Total
		Traditional	Alt Beta	Activist	Emerging Managers	
Internally	95.7%	0.0%	0.7%	0.0%	0.0%	96.4%
Externally	0.0%	3.4%	0.0%	0.0%	0.2%	3.6%
Total	95.7%	3.4%	0.7%	0.0%	0.2%	100.0%

The following table highlights the minimal change in percent allocated to internal vs external strategies which was driven by active strategy outperformance. The number of internal vs external accounts was unchanged.

June 2022 vs. June 2021

Managed	Index Oriented	Active				Total
		Traditional	Alt Beta	Activist	Emerging Managers	
Internally	-0.2%	0.0%	0.1%	0.0%	0.0%	-0.1%
Externally	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
Total	-0.2%	0.1%	0.1%	0.0%	0.0%	0.0%

From a portfolio construction standpoint, the major accomplishments of the last year are centered around work related to the ALM selection and implementation:

- Collaborated with Total Fund Portfolio Management (TFPM) to complete the Asset Liability Management (ALM) process which ultimately resulted in the adoption of a new Strategic Asset Allocation
- Worked with the ALM implementation committee to assist in planning for the implementation of the new strategic portfolio
- Worked with Board consultant to identify a new data provider for the factor weighted segment benchmark which will result in material cost savings

Implementation of the Total Fund governance & sustainability strategic plan is on-going, and progress continues to be made. Our portfolio construction score remains high for this year’s review.

From an attribution standpoint, the passive nature of the GE portfolio does not require a significant amount of decomposition given the low level of tracking error. However, the team did focus on improving technology via a platform optimization initiative that reduced platform complexity, and improved platform robustness. If there is a desire to increase active risk within the program, a review of attribution tools that the team has access to would be recommended. Our score for attribution remains unchanged.

The GE performance in the table below decomposes the overall segment into the subcomponents (Cap Weighted, and Factor Weighted). The recent excess performance of the Cap Weighed segment was positive for the 1-year period which was a result of positive contributions from the primary sleeves within it (Index Oriented, Active, Alternative Beta). It is also worth noting that the Factor Weighted segment materially outperformed Cap Weighted during the broad equity market sell off, which is precisely the rationale for incorporating that strategy into the portfolio.

	Asset Value ($Billion)	Quarter	1-Year	3-Year	5-Year	10-Year	VaR ($Billion)	5-Year Ratios Sharpe	5-Year Ratios Info
PUBLIC EQUITY*	**$ 195.1**	**-13.5%**	**-13.1%**	**6.0%**	**7.1%**	**9.4%**	**$ 38.2**	**0.4**	**0.1**
Public Equity Policy Benchmark		-13.7%	-13.2%	5.8%	7.1%	9.2%		**0.4**	**0.0**
Public Equity - Cap Weighted*	**$ 130.5**	**-15.5%**	**-15.8%**	**6.8%**	**7.4%**	**9.5%**	**$ 28.1**	**0.4**	**0.2**
CalPERS Custom FTSE Global Benchmark		-15.7%	-16.0%	6.5%	7.3%	9.3%		**0.4**	**0.0**
Public Equity - Factor Weighted	**$ 64.7**	**-9.5%**	**-6.9%**	**3.6%**	**-.-%**	**-.-%**	**$ 10.1**	**N/A**	**N/A**
CalPERS Custom FTSE Factor Weighted Benchmark		-9.4%	-6.8%	3.6%	-.-%	-.-%		**N/A**	**N/A**

GE Program – Corporate Governance

The GE program includes a fully integrated Corporate Governance (CG) team that oversees proxy voting, corporate engagement, partnerships, and research on best practices. Relative to assets under management, the CG team is lean and the new head of the Team is expected to be appointed in 2022. The CG team is focused on 3 priorities: (1) seeking alignment with portfolio companies on executive compensation; (2) improving corporate board diversity and accountability; and (3) improving climate disclosures and environmental risk management.

Given the lean team structure, the implementation model is focused on collaborations and partnerships. For example, through its leadership in collaboration with the Climate Action (CA) 100+, the Team voted against 95 directors at 26 CA100+ companies for their inadequate response and filed/co-filed 2 shareowner proposals (1 withdrawn and 1 achieved 27% support) during 2022. Over 70% of CA100+ companies have now set a net zero by 2050 target or ambition

The Global Equity team has access to meaningful information resources through external ESG quantitative and qualitative data from MSCI, Sustainalytics and Bloomberg for each portfolio and their underlying investments. A data review is underway of some smaller data vendors to help fill any gaps in the Team's coverage of specific sustainability topics.

Consistent with CalPERS' approved program of divestments, Global Equity excludes some markets and industries including Tobacco, Iran, Sudan, Firearms and Thermal coal.

GE Program Total Scoring

Utilizing Wilshire's standard manager research scoring framework, Wilshire's qualitative assessment of the Program places it in the 3rd decile. While this is the same score as last year, it reflects a minor increase in the quality of the team score with the hiring of the new MID, as well as minor increase in the information gathering score as Wilshire felt that communication between

GE and TFPM was improved. Overall, the score continues to reflect a very strong team that is engaged, with new leadership in place. The communication channels seem to be strong and reflective of a collaborative culture.

Global Fixed Income

The CalPERS Global Fixed Income (GFI) Program is designed to diversify equity risk for the total fund and provide current income and liquidity. The Program is actively managed with 96% of the $117.6 billion in assets managed internally by staff, and the remaining 4% outsourced to external managers. The review process included discussions with senior staff members of each fixed income segment within the GFI Program. Review topics included Program investment process, personnel and resource management, as well as investment and risk management procedures.

Team

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. With the new CIO, the MID of Global Fixed Income will relinquish the interim Deputy CIO role and refocus on fixed income program management. The size of the internal GFI team represents, in Wilshire's view, a risk factor to ensuring continuity of the demonstrated investment success of the portfolio. With a few departures, including the IM overseeing sovereign debt, there is one Investment Director, and 3 Investment Manager positions open. Staff's participation in 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.

It is clear that the MID – Global Fixed Income understands this dynamic and is actively looking to strengthen the team with requests for additional positions. However, a historically tight labor market and lengthy job posting and recruitment process continue to challenge efforts to bring on talented investment professionals. The risk is mitigated by the experience level of the senior fixed income staff (AIM's and above) which provides some level of assurance that the successful implementation of the global fixed income program will continue. This dynamic was highlighted over this past fiscal year during a historically challenging market for fixed income, which is discussed in more detail below.

Portfolio

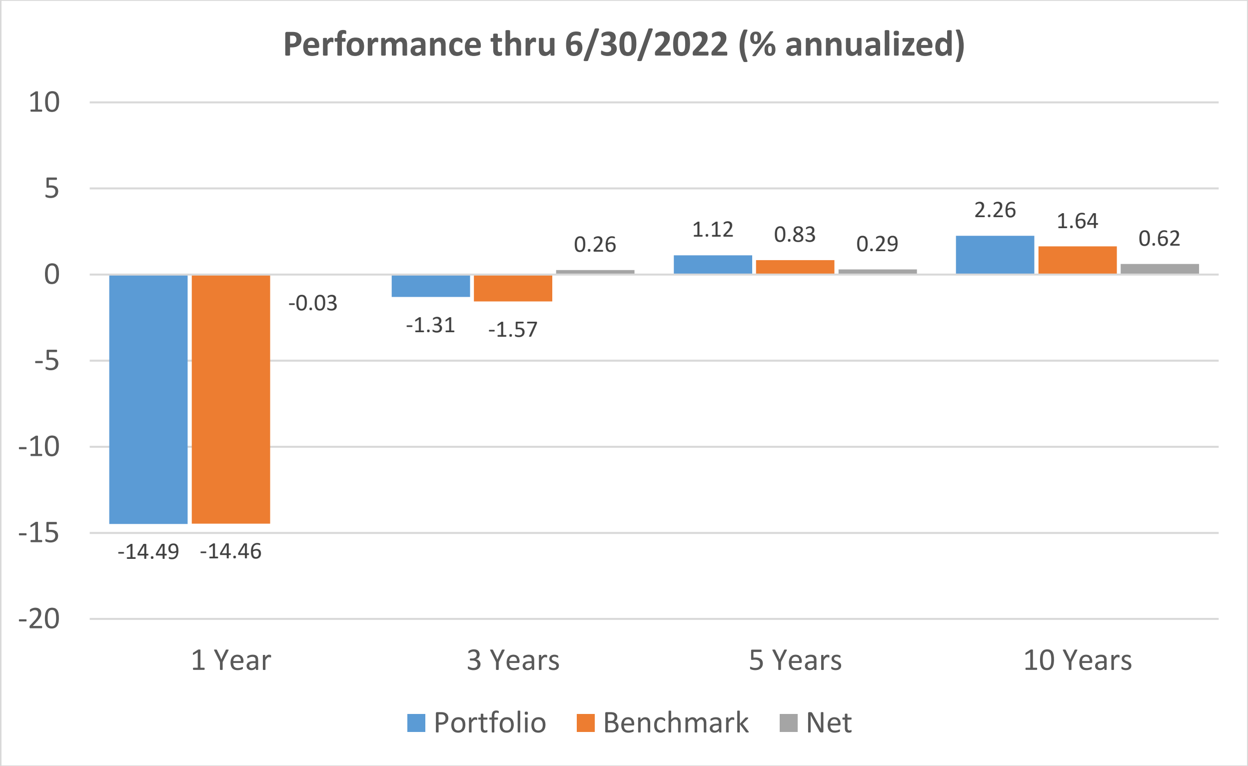
With the new asset allocation, GFI has been expanded into five component segments (from 3): 1) Treasuries, 2) Mortgage, 3) Investment Grade Corporates, 4) Sovereign Emerging Market Debt, and 5) High Yield. The roles and characteristics of each segment are sufficiently distinct that separating them during the asset allocation optimization process allowed for more efficient portfolio construction. Additionally, a tactical Total Fund Fixed Income mandate is available to take advantage of market dislocations when available.

Treasuries offer very high levels of liquidity and have offered solid protection against equity drawdowns but experience direct sensitivity to interest rate changes. Mortgages are similarly very liquid and together with Treasuries can offer a funding source for the leverage that is now incorporated into the asset allocation targets. Investment grade corporate bonds balance interest rate sensitivity with higher quality credit risk for additional income. Sovereign EMD, as a new dedicated asset class, offer enhanced yields as well as diversification across difference economies globally. High yield bonds behave more like equities in bear markets but offer a significant pickup in yield versus other instruments and some diversification in more typical markets. This granularity allows for a higher level of flexibility in the asset allocation process to help achieve CalPERS' investment objectives.

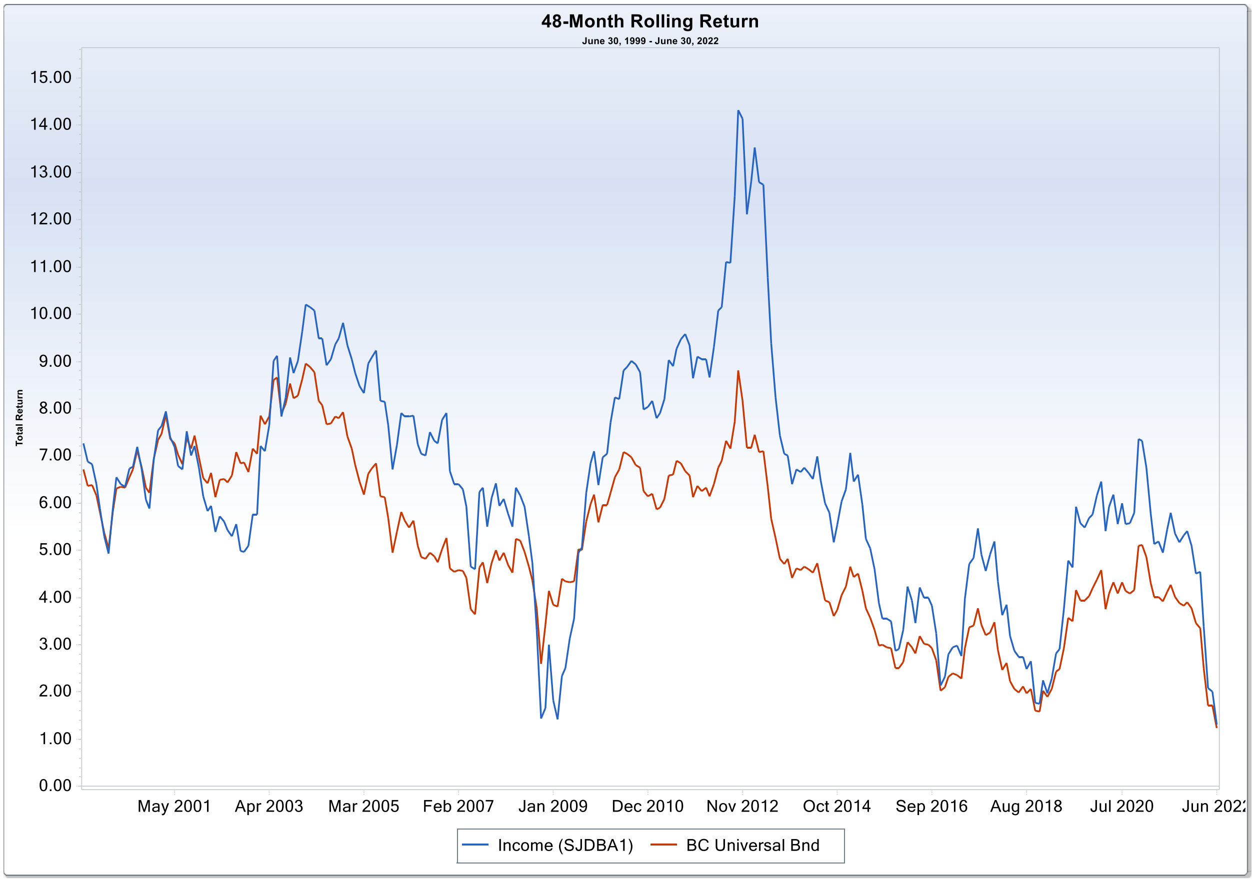
The team has, to date, successfully managed the portfolio towards the new asset allocation targets. This encompassed significant planning and execution across INVO, particularly as it relates to Treasuries/Mortgages and their use as a source of Total Fund Leverage.

Performance

The chart below shows the Program's historical performance relative to its benchmark. FY22 performance has meaningfully degraded longer term absolute performance, though relative returns remain positive over all periods greater than 1 year. Global Fixed Income was buffeted by a historically difficult period for interest rate markets in both fiscal years 2021 and 2022. The Program's longer duration exposure (vs. core fixed income) continued to be a meaningful headwind for absolute performance with the 10-year Treasury rate hitting a trough of 0.52% in August 2020, almost tripling to 1.45% in June 2021, and doubling again to 2.98% by the end of FY22.

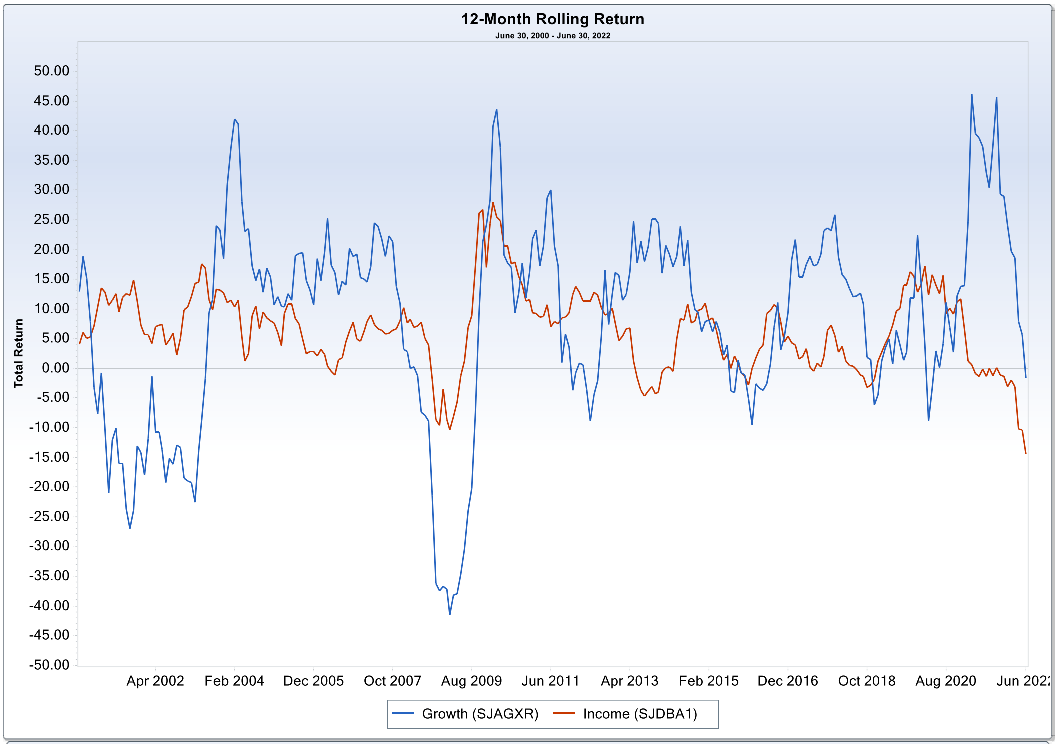


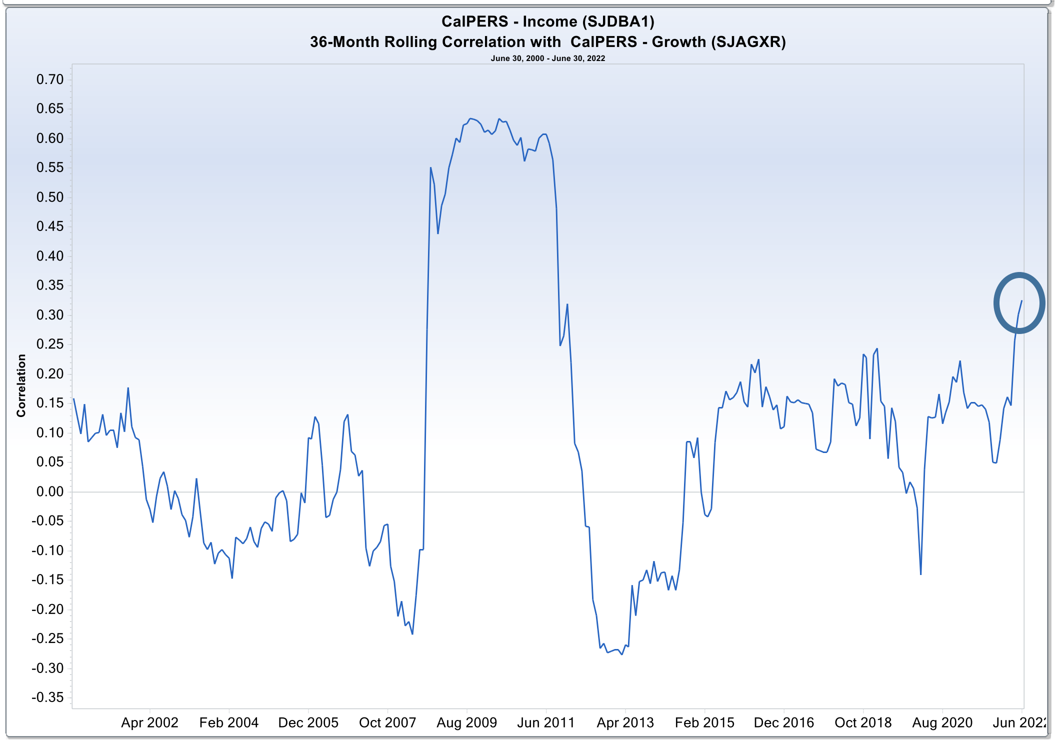
It is worth noting for strategic context that the longer duration Income portfolio has historically tended to outperform a core duration benchmark (Barclays Universal) over longer term 4 year rolling time periods.



The 12-month rolling returns and 3-year rolling correlation with Global Equity are shown in the following charts. Together, these demonstrate the strategic role the GFI portfolio plays in diversifying equity returns over different market cycles throughout the past 20+ years. The Board will note that the most recent correlations are at their highest levels since the Global Financial Crisis and its aftermath. This highlights a risk Wilshire discussed with the Board previously, specifically an increase in correlation between growth and income assets to the downside. As yields approached a lower bound, the potential return pattern risks becoming asymmetric in shape with diminished upside potential and lower diversification impact. As inflation accelerated and expectations for Federal Reserve rate increases climbed, both public equity and fixed income were negatively impacted at the same time.

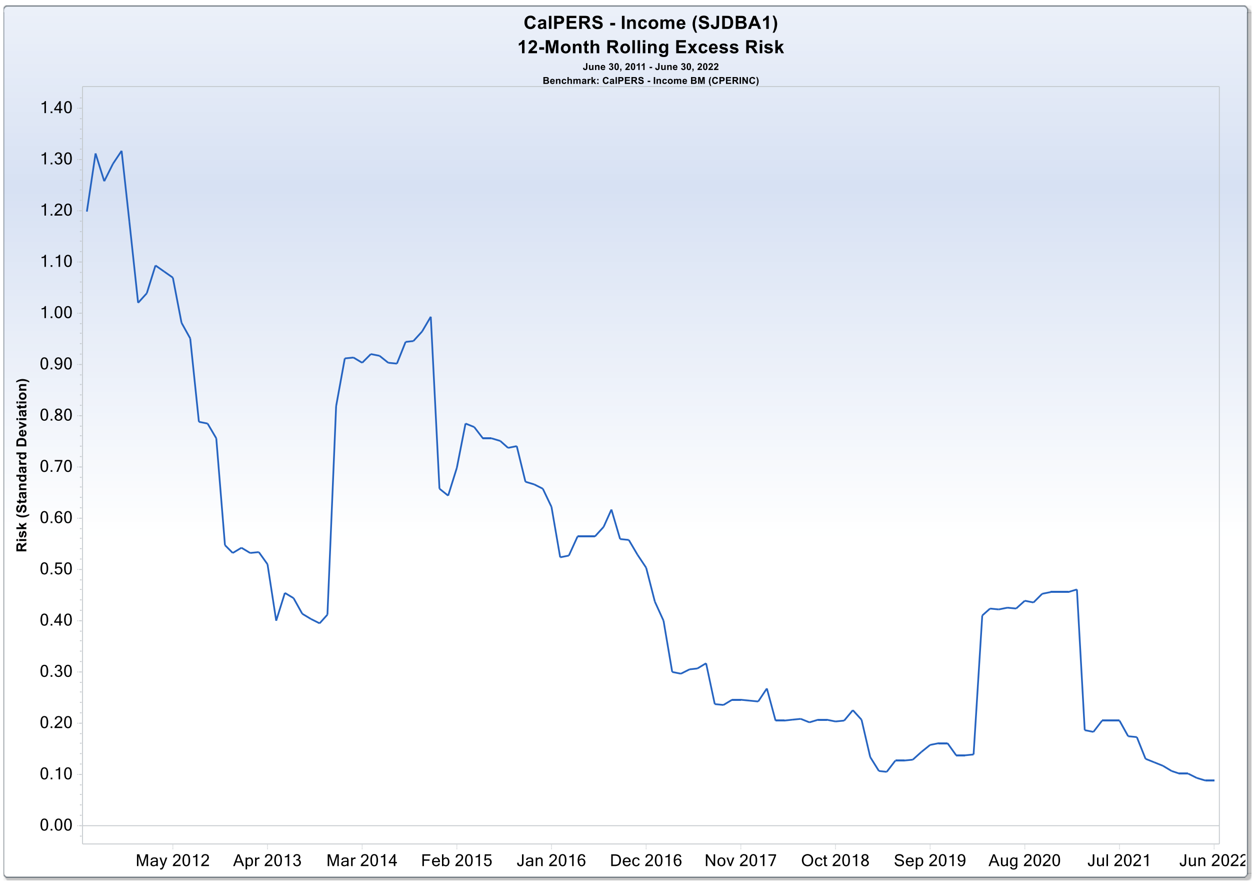
Wilshire





From an active return perspective, the CalPERS GFI program managed to match the benchmark during the most recent one-year period. Over longer-term periods, the Global Fixed Income portfolio has been a consistent source of value-add for the portfolio. The underlying active strategies in the fixed income portfolio (Structured Securities, Credit, Sovereign) almost meet (1 year) or exceed (3+ years) benchmark performance. This has been a consistent theme and one reason for the continuation of internal active management within fixed income.

The GFI portfolio has consistently demonstrated a level of forecasting success as evidenced by the positive relative returns for the portfolio as a whole, which continues to rank very positively in Wilshire's evaluation. The portfolio construction approach is very well aligned with Investment Beliefs #1 – Liabilities, #2 – Long-Term Horizon, and #7 – Risk vs. Reward. For example, given the current environment, the team believes the potential for spread widening overwhelms the yield advantage and are taking a more cautious approach in both investment grade and high yield markets. The high portfolio construction score is in recognition that active risk positioning has been dynamic but has not resulted in wholesale increases in tracking error for the GFI portfolio as a whole. This is a sign of a well-defined risk budgeting process.



The investment approach of the total GFI program remains consistent with its key strategic objective of providing income, stability, and equity risk diversification within the Total Fund. At the same time, GFI has outperformed its benchmark consistently through both sub-sector relative value decisions and tactical positioning. GFI portfolios have taken advantage of alpha generating opportunities in different markets, while maintaining relatively prudent risk positioning over time. The team has continued to improve portfolio implementation with increased use of portfolio trades, improved counter party relationships, and remaining active in the new issue market.

Utilizing our standard manager research scoring framework, Wilshire's qualitative assessment of the Program places it in the 3rd decile. It reflects the increase in the broader organization score, a reduction in information gathering resources and continuing strong portfolio construction and implementation scores. Overall, the score continues to reflect the strong team in place and clear success at managing the portfolio as charged.

Opportunistic Strategies

The purpose of the Opportunistic Strategies Program (OS) is to invest in strategies that may not fit into one specific asset class / type but possess characteristics that present relative value opportunities to enhance Total Fund performance. During the past few years, the Program has been focused on taking advantage of opportunities in private debt strategies. During the recent asset allocation study, the Board approved a 5% dedicated allocation to private debt. Therefore, the private debt investments within the OS Program will be part of the Private Debt Program starting July 1, 2022. Under the newly approved Total Fund Policy, The Private Debt Program sub-strategy targets are defined as follows:

Strategy	Range
Direct Lending	20-100%
Specialty Lending	5-40%
Liquidity Financing	0-25%
Real Estate Financing	5-40%
Private Structured Products	0-25%

The OS team has made meaningful strides during the past year in ramping up CalPERS' allocation to private debt. Since 2020, more than $20 billion has been committed across four of the five sub-strategies noted above. The team's ability and hard work to evaluate opportunities across multiple sub-strategies in a short amount of time is truly impressive. The Program's MID has a deep understanding of the opportunities in the space and has led the team with a vision to establish a strong basis for building up the private debt portfolio. The dedication and thoughtful approach the team has demonstrated in achieving this progress continue to warrant strong Information Gathering and Forecasting scores.

While meaningful progress has been made in terms of investment commitments, the portfolio is still in the relatively early stages of implementation and deployment. As the committed capital gets deployed in the next few years, the team expects new commitments to slow, while increasing its focus on portfolio management. The team also has been able to secure co-investment opportunities alongside several fund commitments, which will require resources dedicated to underwriting the individual investment opportunities. As noted in our previous reviews, the size of the team is very small considering the program's wide investment scope and its related portfolio management responsibilities. The team is also challenged with attracting and retaining talent in a competitive private credit market in terms of compensation. Therefore, we believe enhancing the team resources with additional headcount, as well as drawing from resources of other INVO personnel is critical for the success of the program going forward.

In terms of portfolio construction approach, the structure of the Private Debt Program is expected to be largely focused on corporate direct lending. Strategies such as real estate financing and specialty lending will be a smaller portion of the overall portfolio but will be important from a diversification perspective. Based on the commitments that have been made thus far and the overall objective of the portfolio, this approach is deemed reasonable, particularly in light of the CalPERS portfolio size.

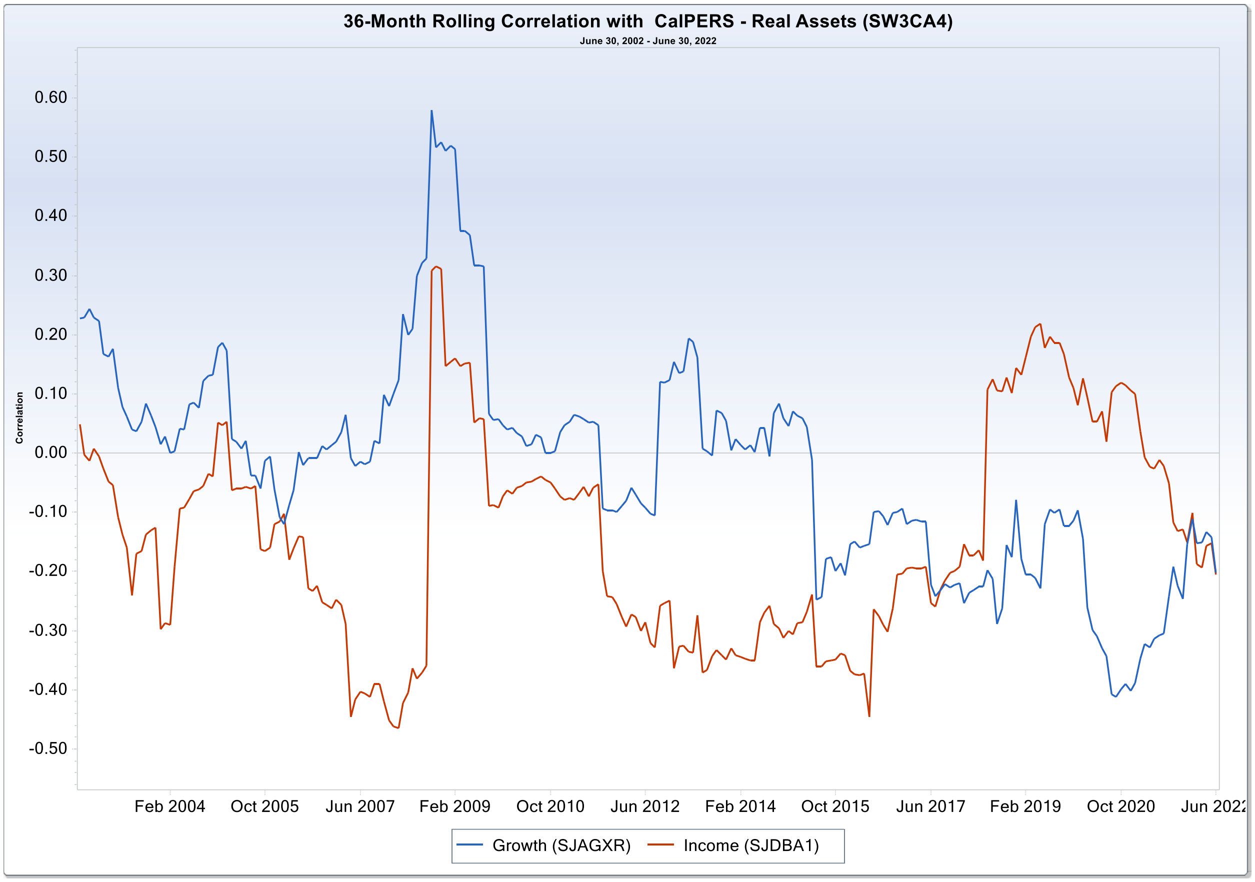
With respect to Implementation and Attribution, the portfolio is still in its early implementation stage and there is no meaningful realization of the private debt investments to measure its performance. It is important to keep in mind that private markets investments are underwritten based on a potential IRR (internal rate of return) basis, while CalPERS performance is reported on a time-weighted return basis. This makes short-term performance evaluation challenging. We do note that the team has been resourceful and cost conscious in utilizing the PAIRS portfolio management platform, to make it more relevant for a private debt portfolio. As commitments are invested and realizations of deals occur over the next several years, it will be important to not only evaluate the performance but also efficacy of the implementation pace by the managers in the program.

Wilshire's qualitative assessment of the OS Program is a 3rd decile, same as that from last year. The team is led by talented staff, with the ability to deeply understand the value drivers in the private debt sector. The team has worked tremendously hard and demonstrated its ability to identify opportunities across multiple sectors, establishing a strong basis for the growth of the private debt portfolio. Additional resources, on both the personnel and technological fronts will be critical to sustain and support the success of these investments going forward.

Real Assets

Wilshire acts in a general oversight role with the Real Assets portfolio in order to provide the Board with a holistic view of the entire portfolio. This is meant to supplement the work that is provided by the dedicated real assets consultant, who will provide an in-depth evaluation under separate cover. Wilshire's work in Real Assets involves regular discussions with the MID to understand high-level investment initiatives, portfolio construction, performance attribution, and how risk is being managed in the portfolio.

The strategic role of the Real Assets Program is to provide stable cash flows, serve to provide long-term inflation protection and act as a diversifier for equity risk. The 5-year correlation between the returns of the Real Assets Program and global equities has been low, measured at -0.24. It is important to note that asset class correlations are unstable and that in times of crisis they tend to increase. The following chart plots the rolling 3-year correlation of the Real Assets program relative to both the Growth and Income portfolios. Broadly, each has exhibited low levels of correlation outside of the late 2008, early 2009 period. More recently, the correlation with equity returns has remained low while that to Income drifted more negative. This was additive to the portfolio's absolute returns in FY22, as a negative correlation to declining markets indicates beneficial diversification.



Performance of the Real Asset portfolio was the best performing asset class on an absolute basis for the last fiscal year with a return of 24.1%, though it did underperform relative to the Real Asset policy benchmark. This relative performance was driven by the Infrastructure portfolio. Infrastructure and Forestland both represent "out-of-benchmark" positions because the benchmark index is a core real estate index. As Infrastructure exposure grows, Wilshire recommends evaluating appropriate benchmarks to incorporate in policy, perhaps around the mid-cycle ALM process.

As with any private asset class, shorter term returns do not fully capture the performance of a program. As the table shows, the longer term 5 and 10-year absolute returns trail only Private Equity in absolute returns across the portfolio. It has moderately underperformed the policy benchmark given the legacy impact of Forestland and a challenging environment for some real estate sub-sectors, particularly retail. This is an active portfolio management discussion for the team, along with an evaluation of the office portfolio. The Real Assets team incorporates an appraisal policy, which utilizes independent 3rd party appraisals as the basis for determining fair market value. In addition, per industry norms, performance is reported on a one quarter lag.

	Asset Value ($Billion)	Quarter	1-Year	3-Year	5-Year	10-Year
REAL ASSETS	**$ 69.6**	**5.2%**	**24.1%**	**10.0%**	**8.3%**	**9.2%**
Real Assets Policy Benchmark		7.2%	27.1%	10.2%	8.8%	9.5%
Real Estate	**$ 57.2**	**5.3%**	**26.5%**	**10.8%**	**8.5%**	**9.6%**
CalPERS Custom Real Estate Benchmark		7.2%	27.1%	10.2%	8.8%	9.9%
Infrastructure	**$ 11.6**	**5.3%**	**14.7%**	**7.2%**	**10.5%**	**11.3%**
CalPERS Custom Infrastructure Benchmark		7.2%	27.1%	10.2%	8.7%	7.0%
Forestland	**$ 0.8**	**1.1%**	**3.3%**	**1.5%**	**-1.0%**	**-0.5%**
CalPERS Custom Forestland Benchmark		7.2%	27.1%	10.2%	8.1%	7.6%

As discussed in previous reviews, the Real Assets program has focused on higher quality, stable income producing assets to a larger degree than seen prior to the credit crisis, which should provide greater diversification during risk-off market environments. This was particularly evident in the FY22 returns. Going forward, there is room for value-add or opportunistic strategies to grow, while maintaining a core orientation, with the goal of increasing program returns while remaining cognizant of increased risks from these types of opportunities. Wilshire continues to believe that Real Assets is appropriately structured to meet its strategic objectives, including protection against unanticipated inflation, and improve the expected risk-adjusted returns of the Total Fund.

Appendix - Evaluation Scores for all Programs

CalPERS Global Equity		Tier	Letter
Total Qualitative Score		3rd	B

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

CalPERS Global Fixed Income	**Tier**	**Letter**
Total Qualitative Score	**3rd**	**B**

	Weight	**Tier**	**Letter**
Organization	**20%**	**5th**	**C**
FIRM	***50%***	**6th**	**C**
Quality and Stability of Senior Management			
Quality of Organization			
Ownership/Incentives			
TEAM	***50%***	**4th**	**B**
Stability of Investment Professionals			
Quality of Team			
Commitment to Improvement			
Information Gathering	**20%**	**2nd**	**A**
Information Resources			
Depth of Information			
Breadth of Information			
Forecasting	**20%**	**2nd**	**A**
Clear & Intuitive Forecasting Approach			
Repeatable Process			
Strength, Clarity, and Intuitiveness of Valuation Methodology			
Forecasting Success			
Unique Forecasting Approach			
Portfolio Construction	**20%**	**2nd**	**A**
Risk Budgeting/Control			
Defined Buy/Sell Discipline			
Consistency of Portfolio Characteristics			
Implementation	**10%**	**2nd**	**A**
Resources			
Liquidity			
Compliance/Trading/Monitoring			
Attribution	**10%**	**2nd**	**A**
Depth of Attribution			
Integration of Attribution			

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

CalPERS Trust Level Portfolio Management	Weight	Tier	Letter
Total Qualitative Score		4th	B
Organization	**20%**	**5th**	**C**
FIRM	***50%***	**6th**	**C**
Quality and Stability of Senior Management			
Quality of Organization			
Ownership/Incentives			
TEAM	***50%***	**4th**	**B**
Stability of Investment Professionals			
Quality of Team			
Commitment to Improvement			
Information Gathering	**20%**	**4th**	**B**
Information Resources			
Depth of Information			
Breadth of Information			
Forecasting	**20%**	**4th**	**B**
Clear & Intuitive Forecasting Approach			
Repeatable Process			
Strength, Clarity, and Intuitiveness of Valuation Methodology			
Forecasting Success			
Unique Forecasting Approach			
Portfolio Construction	**20%**	**2nd**	**A**
Risk Budgeting/Control			
Defined Buy/Sell Discipline			
Consistency of Portfolio Characteristics			
Implementation	**10%**	**3rd**	**B**
Resources			
Liquidity			
Compliance/Trading/Monitoring			
Attribution	**10%**	**3rd**	**B**
Depth of Attribution			
Integration of Attribution			

