CalPERS Trust Level Review
Risk Management Summary

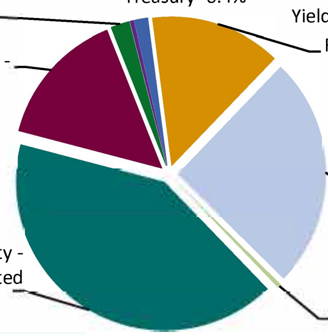
As of June 30, 2022

Investment Belief 9: *Risk to CalPERS is multi-faceted and not fully captured through measures such as volatility or tracking error. CalPERS shall develop a broad set of investment and actuarial risk measures and clear processes for managing risk. The path of returns matters, because highly volatile returns can have unexpected impacts on contribution rates and funding status.*

Total Fund Forecasted Volatility Trends (%)

	Policy Limit	Current 6/30/2022	Last Qtr 4/4/2022	Last Year 7/1/2021
Total	n/a	12.9	10.8	10.7
Benchmark	n/a	11.7	10.3	10.4
Tracking Error (TE)				
Actionable	< 1.00	0.10	0.17	0.13
Total Fund	n/a	1.63	1.55	1.16
Allocation	n/a	0.00	0.02	0.00

Portfolio Volatility Contribution (%)



Comments:

- Total Fund Forecasted Volatility is 12.9%, which is higher than was reported over the last 12 months . This change is primarily resulted from the use of a new risk model that is calibrated with long horizon historical data.
- Rapid shifts in volatility regime can occur and would not be predicted by this model. The best interpretation of this estimate is as an indicator of the plan's volatility given the current market environment.
- The pie chart above gives a visual representation of portfolio volatility contribution by asset classes (in percent). Growth sensitive assets, such as public and private equities, high yield bonds and real assets dominate, so PERF returns will be driven by performance of those assets.

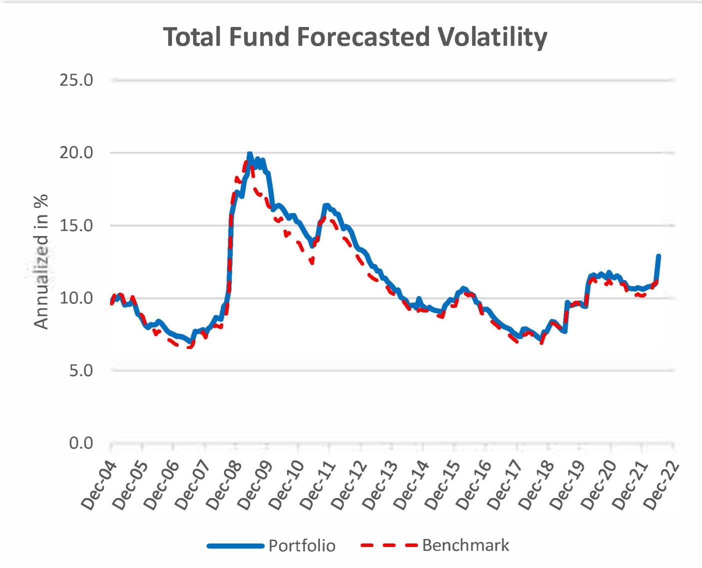
Asset Class		Market Value ($millions)	Total Forecasted Volatility (%)	% Contribution to Total Volatility	Tracking Error (%)
Public Equity	**$**	**195,151**	**16.8**	**56.5**	**0.1**
Cap Weighted[1]	$	130,486	18.5	41.5	0.2
Factor Weighted	$	64,665	13.7	15.0	0.1
Income	**$**	**117,565**	**7.5**	**3.1**	**0.2**
Long Spread	$	66,412	6.8	2.1	0.3
Long Treasury[1]	$	31,402	11.8	-0.4	0.1
Total Fund Income	$	6,773	11.6	0.0	1.0
High Yield	$	12,977	7.7	1.5	0.4
Total Fund	**$**	**18,823**	**4.2**	**0.7**	**4.2**
Opportunistic	$	6,361	7.4	0.4	7.4
LLER	$	11,618	2.9	0.3	2.9
Other	$	844	3.7	0.1	3.7
Financing & Liquidity	**$**	**(14,411)**	**N/A**	**0.0**	**N/A**
Trust Level Financing[2]	$	(24,517)	N/A	0.0	N/A
Liquidity[2]	$	10,106	0.0	0.0	0.1
TOTAL PERF Actionable					**0.10**
Private Equity	**$**	**52,848**	**27.9**	**25.3**	**11.4**
Real Assets	**$**	**69,645**	**13.3**	**14.4**	**3.8**
TOTAL PERF	**$**	**439,620**	**12.9**	**100.0**	**1.63**

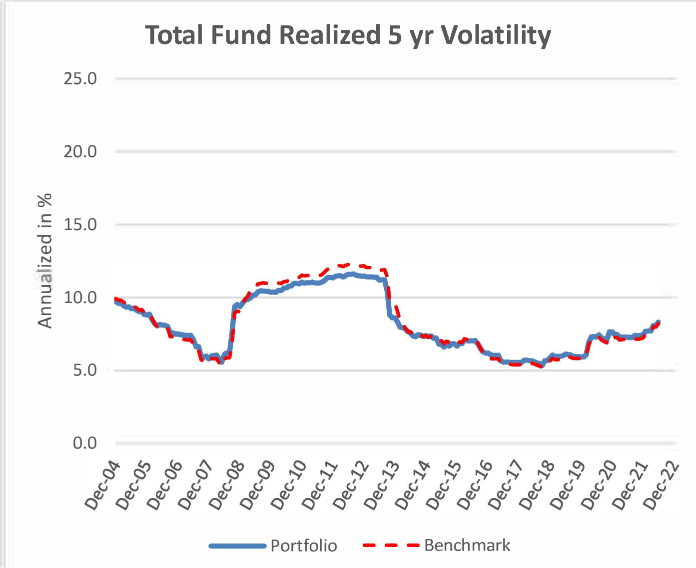
Source: Aladdin, SSB, CalPERS

[1] Market value of Public Equity Cap Weighted and Income Treasury segments includes notional exposure obtained via trust level Synthetic Cap Weighted and Synthetic Treasury portfolios respectively.

[2]Liquidity reflects net asset value of the Liquidity segment. Trust Level Financing reflects derivatives financing and repo borrowing in trust level Synthetic Cap Weighted and Synthetic Treasury portfolios.

RISK MANAGEMENT TIME SERIES

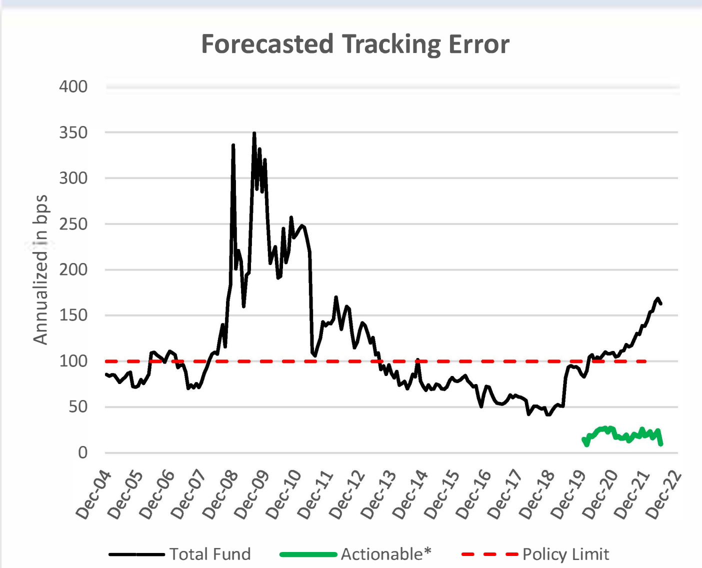


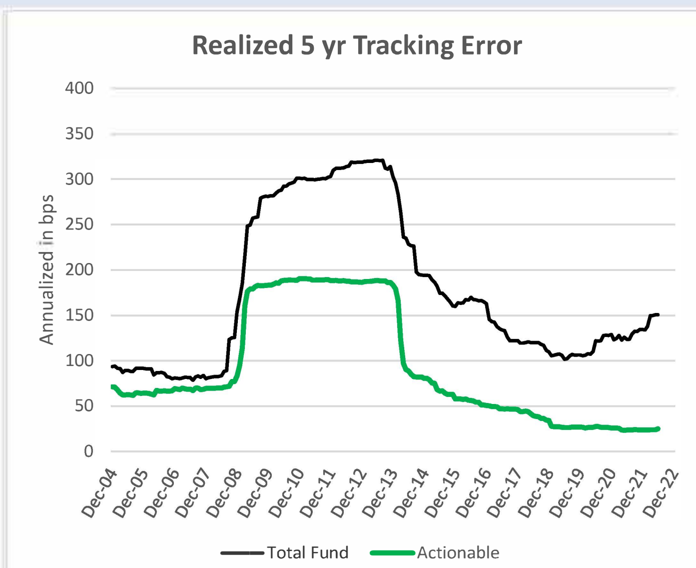


Comments:

Forecasted volatility and tracking error are model-based estimates that reflect the point in time portfolio positions and historical returns of market factors. These charts correspond to the point in time "volatility" and "tracking error" figures reported for PERF on the first page of this report and in the Quarterly Update on Performance and Risk.

In contrast, 5 yr Realized volatility and tracking error are based on the realized portfolio returns and do not provide information about current positioning. Divergence between Forecasted and subsequently Realized metrics should be expected due to a number of reasons, including a downward bias for Realized volatility resulting from smoothed valuations in private assets.





Comments:

Changes in Forecasted Tracking Error over time reflect evolving market conditions, changes in active portfolio positions, and changes in the underlying risk model.

Actionable Tracking Error metric captures controllable and measurable active exposures. This measure includes all public market strategies and asset allocation management, and excludes contributions from private assets relative to their respective benchmarks.

** Limited historical data availability; Sources: SSB, CalPERS*
Risk model changes: Barra's BIM301L prior to Jul 2019, BIM301XL Jul 2019-Apr 2021, MAC.XL Apr 2021-Jun 2022, Blackrock's Aladdin from Jun 2022

STRESS TESTING

Historical scenarios highlight the sensitivity of the portfolio to past economic regimes or specific events. The scenarios can be used as a "what if" gauge of current portfolio positioning to understand the potential impact if a similar event or regime were to repeat.

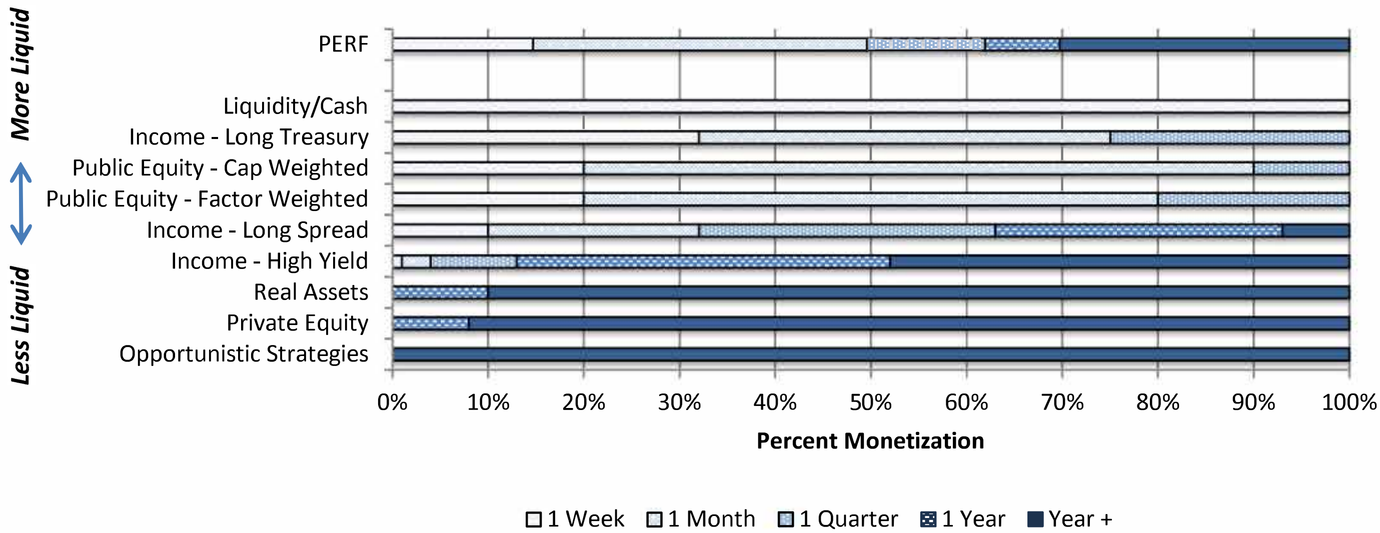
Scenario	Portfolio Return	Policy Benchmark Return	Excess Return
2003 Mortgage Spreads Widening (Jul 2003 - Aug 2003)	-2.9%	-2.5%	-0.4%
2015 Chinese Market Crash (Jun 2015 - Aug 2015)	-4.8%	-4.4%	-0.4%
2011 US Downgrade (Jul 2011 - Sep 2011)	-6.6%	-6.2%	-0.4%
2013 Fed Tapering (May 2013 - Jun 2013)	-7.4%	-7.4%	0.0%
2007 Credit Spreads Widening (Jul 2007 - Jul 2008)	-9.9%	-7.7%	-2.2%
2008 Market Crash (Sep 2008 - Nov 2008)	-22.0%	-19.9%	-2.2%

Source: Aladdin, CalPERS

LIQUIDITY

Total Fund Liquidity

As of 6/30/22

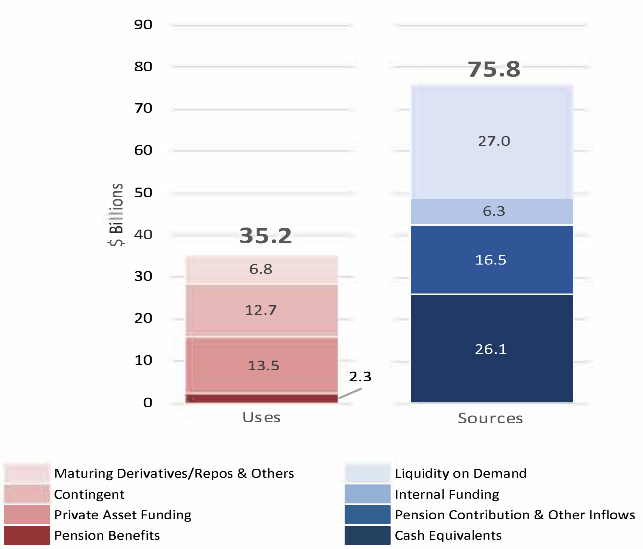


Transactional liquidity is estimated for each asset class/strategy based on the current market environment while also accounting for legal structures or other factors that may impact liquidity. *Source: SSB, CalPERS*

Stress (Current Regime)[1]

Tier 1 30 Day Liquidity Coverage Ratio =

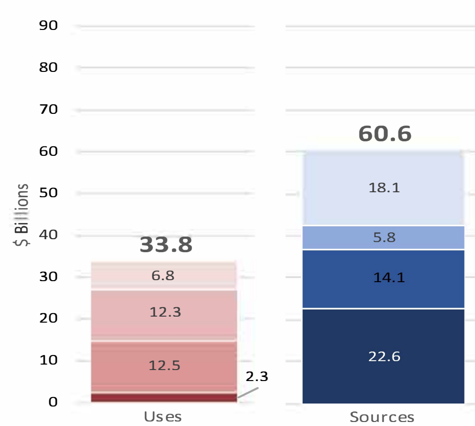
2.2x



Historical Worst[2]

Tier 1 30 Day Liquidity Coverage Ratio =

1.8x



[1] **Stress (Current Regime)** - Regime-dependent scenario to capture a "worst contemplated" outcome across liquidity uses and sources given current market conditions.
[2] **Historical Worst** - Historical experience for the 30 day period: 9/27/08-10/27/08 (the worst 30 day equity drawdown in the past 20 years) applied to current portfolio.

Liquidity Coverage is computed from estimates of future cash inflows and outflows. In this table, the 1-month forward period is shown with Liquidity Coverage ratios for a stress scenario and for a historical worst experience. The Liquidity Coverage ratios could be interpreted as how many times available sources could cover projected cash needs over a 1-month forward period. A ratio of less than one implies the Fund could be forced to sell assets to meet liquidity needs in the given scenario.

Source: Aladdin, SSB, CalPERS

LEVERAGE

Total Fund Leverage

As of 6/30/22

Leverage changes a portfolio's risk profile through both impact on liquidity and amplification of returns volatility. As a metric, leverage has the benefit of being relatively straightforward to calculate, making it a good backstop to more nuanced but complex perspectives on risk that could suffer from model errors or flawed assumptions. However, since the leverage metric implicitly treats all assets as equally risky, and because it does not capture the interrelationships between assets (diversification), leverage should always be viewed in conjunction with other perspectives. For example, a low leverage portfolio could easily be more risky than a better-diversified moderate leverage portfolio.

PERF Leverage Breakdown:
Total portfolio leverage as defined in the Total Fund Investment Policy.

Company Embedded Leverage:
Some Fund assets embed leverage by their nature (i.e., private and public companies). In this case, leverage is not a portfolio management decision, but does contribute to the assets' inherent riskiness.

Unfunded Commitments:
Represent potential draws on Fund liquidity, but are contingent in nature.

PERF Leverage Breakdown[1]	Asset Value ($ M)	Share of PERF NAV (%)
Total Fund Financing		
Financing (Derivatives and Repos)	24,517	
Liquidity	(10,106)	
TOTAL	**14,411**	3.3%
Program Level Financing		
Real Assets (Borrowing including Subscription Financing, Net of Cash)	28,987	
Private Equity (Subscription Financing & Other Liabilities)	3,437	
Opportunistic (Subscription Financing & Other Liabilities)	1,905	
Public Equity	19	
Income	(959)	
Total Fund Income	394	
Other	1,841	
TOTAL	**35,623**	8.1%
PERF LEVERAGE	**50,034**	11.4%
Leverage in Strategic Asset Allocation		2.4%
POLICY LEVERAGE		**8.9%**

Embedded Leverage in Asset Classes

	Embedded Leverage[2]
Public Equity	1.60
Private Equity	2.22
Real Estate	1.26

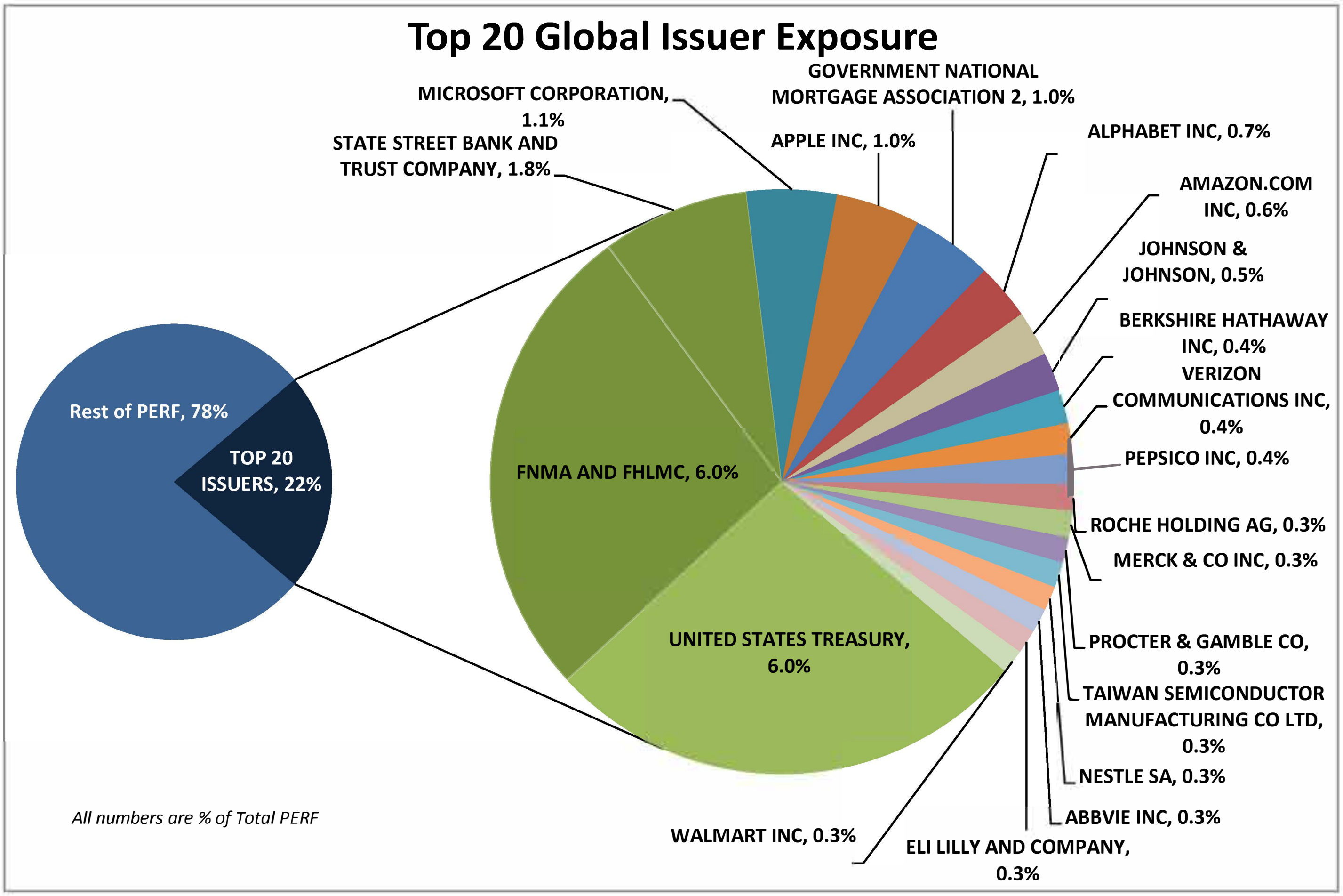
Unfunded Commitments

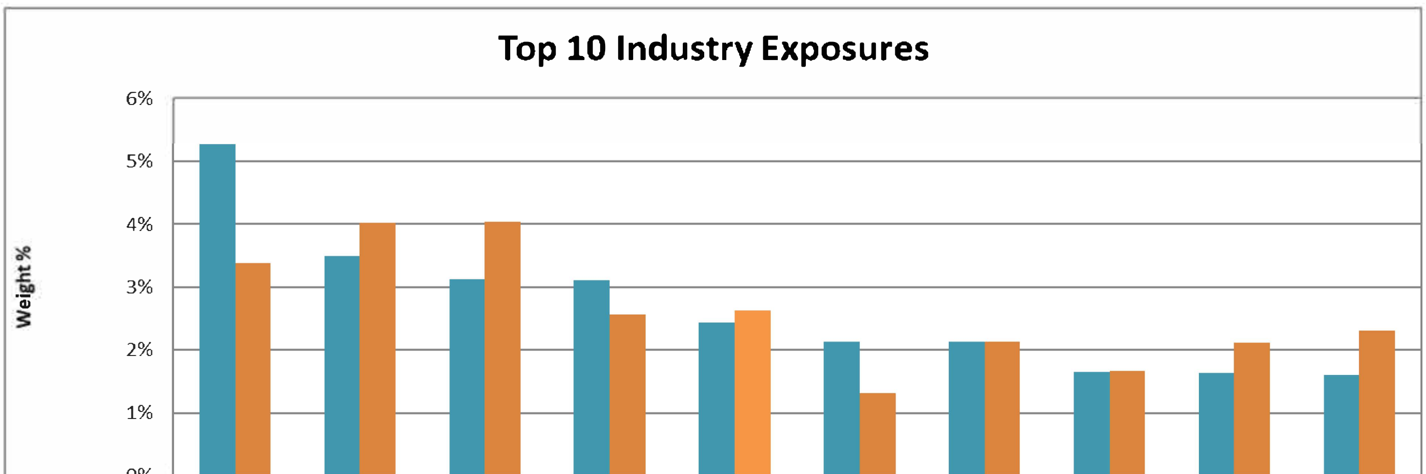
	Market Value ($ B)	Unfunded Commitments ($ B)	% of PERF
Opportunistic (Private Debt)	6.4	10.7	2.4%
Private Equity	52.8	30.2	6.9%
Real Assets	69.6	10.3	2.3%

1. FX Forwards used for hedging are not counted as leverage. Options are included based on delta adjusted notional value. Cash includes assets meeting Liquidity program guidelines. All debt is considered recourse unless explicitly noted. Subscription Financing recourse is limited to unfunded commitments. Other fund level liabilities do not represent recourse. Real Assets debt is currently non-recourse.
2. Embedded leverage shown represents Enterprise Value to Equity Ratio. Embedded leverage for Public Equity and Private Equity is estimated based on industry research.

Source: Aladdin, SSB, Factset, CalPERS

CONCENTRATION REPORT

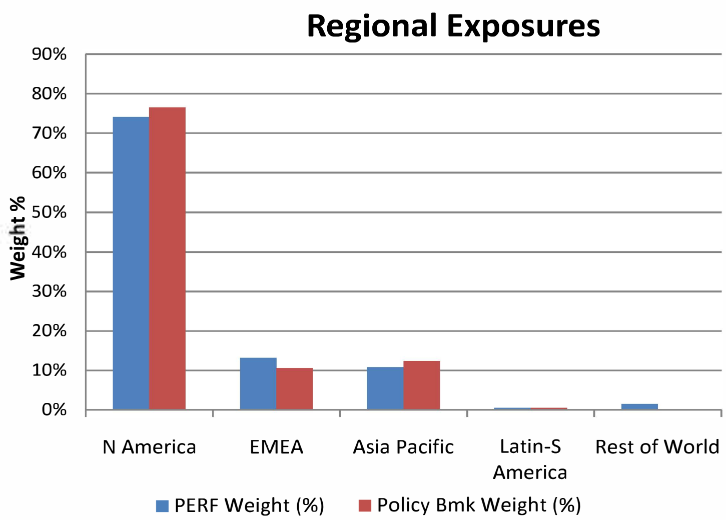




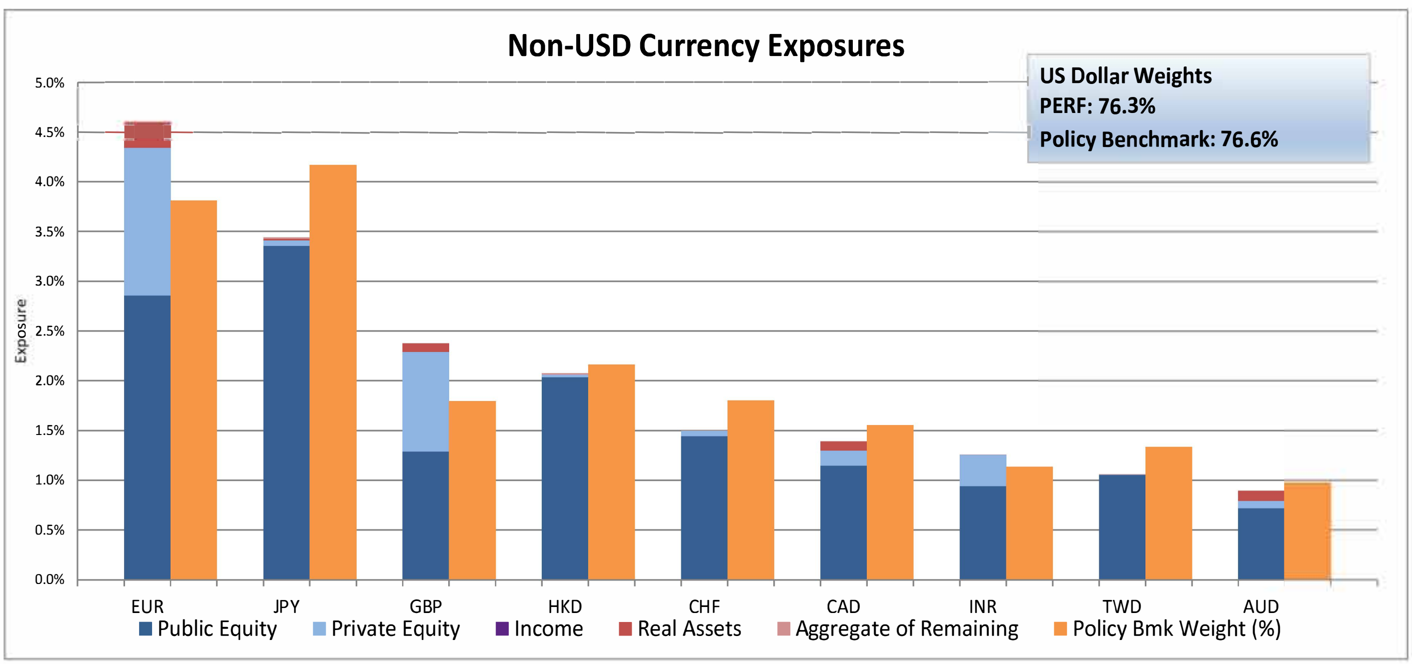
	Software	Pharmaceuticals	Banks	IT Services	Oil, Gas & Consumable Fuels	Health Care Providers & Services	Insurance	Capital Markets	Technology Hardware, Storage & Peripherals	Semiconductors & Semiconductor Equipment
Weight (%)	5.3%	3.5%	3.1%	3.1%	2.4%	2.1%	2.1%	1.7%	1.6%	1.6%
Bmk Weight (%)	3.4%	4.0%	4.0%	2.6%	2.6%	1.3%	2.1%	1.7%	2.1%	2.3%

Industry Exposure figures are % of PERF and they represent exposures in Public Equity, Spread (Corporates), High Yield and Private Equity Segments.
Source: Aladdin, CalPERS

CONCENTRATION REPORT



Country	PERF Weight (%)	Policy Bmk Weight (%)	Active Weight (%)
United States	71.9%	74.3%	-2.4%
Japan	3.4%	4.2%	-0.8%
United Kingdom	3.2%	2.1%	1.1%
China*	2.7%	3.0%	-0.2%
Canada	1.8%	1.9%	-0.1%
Switzerland	1.6%	1.9%	-0.3%
France	1.5%	1.2%	0.3%
India	1.2%	1.1%	0.1%
Germany	1.2%	1.0%	0.2%
Australia	1.1%	1.0%	0.1%



*Includes Hong Kong

Source: Aladdin, CalPERS

COUNTERPARTY RISK

Total Fund Counterparty Risk

As of 7/1/22

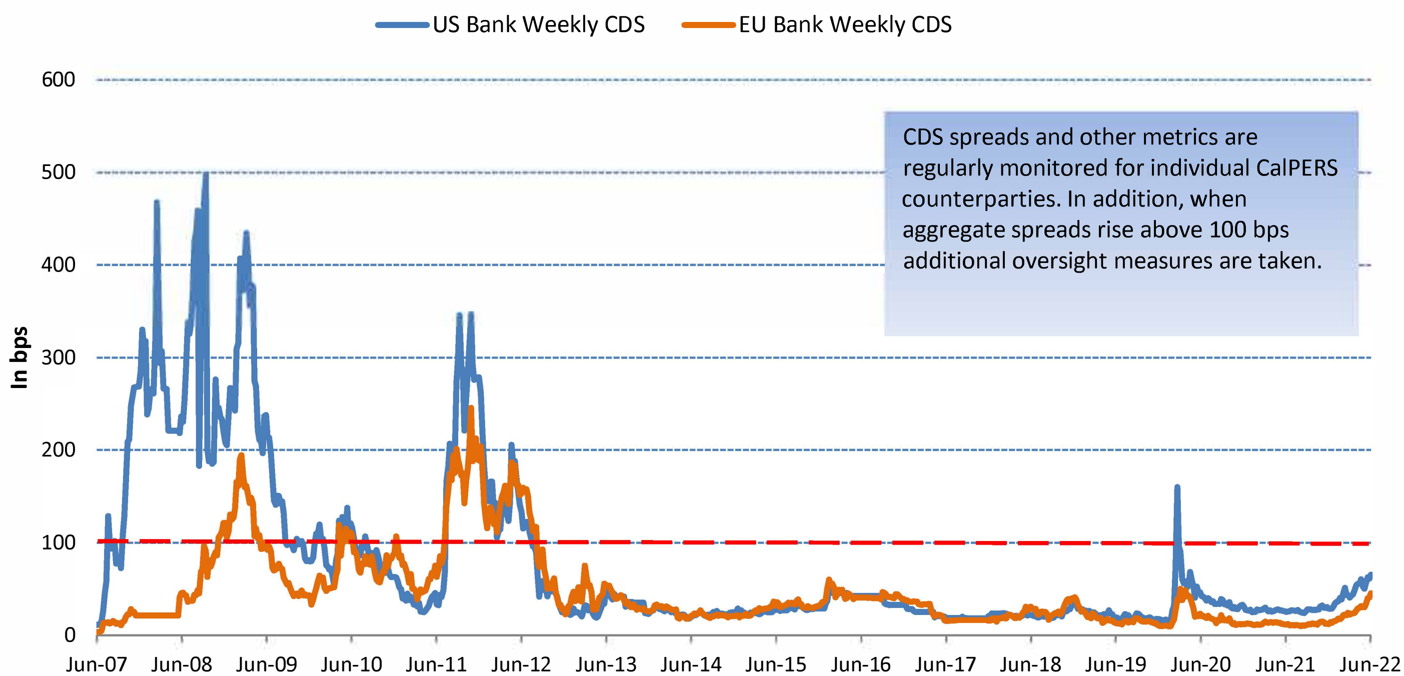
Counterparty risk is the risk that, in the event a counterparty fails, CalPERS would not have received enough collateral to cover the value cost in the contract with such counterparty. CalPERS seeks to control this risk through counterparty credit evaluations and approvals, counterparty credit limits, posting collateral, monitoring procedures and entering into market accepted standard agreements.

CalPERS holds positions in swaps, options, futures, rights and warrants, forward foreign currency exchange, repurchase and reverse repurchase, forward purchase and securities lending contracts. In addition, external investment managers might also hold such instruments. External investment managers are required to have strict guidelines to manage and control counterparty risk. This report describes exposures directly contracted by CalPERS, and not by the external investment managers.

This Counterparty Risk section presents these exposures as required and governed by the CalPERS Investment Policy. The Policy is intended to ensure that CalPERS has effective operational, risk management, and compliance controls in place governing the counterparty risk arising within the investment process.

Historical Bank Credit Default Swap Spreads

From June 2007 - Present



Source: Bloomberg

COUNTERPARTY RISK (CONTINUED)

Derivatives are used to efficiently manage the risk of the overall investment portfolio and to support financing activities. Through the use of derivatives, the risks that are bound together in traditional cash market investments can be separated and managed independently. CalPERS Over the Counter (OTC) Derivative Investments include contingent features that require CalPERS or the Counterparty to post collateral in the event that the fair value surpasses a specified contractual threshold. CalPERS contracts derivatives on bilateral contracts ("Over the Counter") or via Futures Exchanges ("Exchange Traded"). Counterparty Risk and Custodial Risk arise from these features.

Counterparty Risk in "Over the Counter" Derivatives by Type of Contract ($ M)

International Swaps and Derivatives Association (ISDA) Master Agreement
Includes FX forwards, equity swaps, interest rate swaps, cross-currency swaps, total return swaps, and options

Counterparty	Net Mark to Market Total (+) = CalPERS is due money (-) = CalPERS owes money	Collateral Posted (+) = CalPERS has posted (-) = Counterparty has posted	Net Exposure (+) = CalPERS exposed to Counterparty
Bank of Montreal	(5.5)	5.6	0.0
Bank of America N.A.	5.6	(5.6)	(0.0)
BNP Paribas	49.6	(49.7)	(0.0)
Barclays Bank PLC	7.0	(7.0)	(0.0)
Citigroup N.A.	(0.0)	0.0	(0.0)
Canadian Imperial Bank of Commerce	(0.4)	0.5	0.2
Credit Suisse International	43.9	(43.9)	(0.0)
Deustche Bank AG	19.1	(18.6)	0.5
Goldman Sachs Intl	300.3	(293.1)	7.2
HSBC Bank USA	9.7	(10.0)	(0.3)
JP Morgan Chase	40.0	(38.4)	1.6
Morgan Stanley Capital Services Inc.	52.8	(46.8)	6.0
Royal Bank of Canada	(21.8)	23.1	1.3
Standard Chartered Bank	37.8	(37.6)	0.1
Societe Generale	17.3	(15.2)	2.2
State Street Bank & Trust	8.1	(8.2)	(0.0)
UBS AG	29.7	(38.7)	(8.9)
Wells Fargo Bank	36.9	(36.9)	0.0
Total	**630.2**	**(620.4)**	**9.9**

Master Securities Forward Transaction Agreement (MFSTA)
Includes forward purchase/sale of mortgage bonds and TBAs

Counterparty	Net Mark to Market Total (+) = CalPERS is due money (-) = CalPERS owes money	Collateral Posted (+) = CalPERS has posted (-) = Counterparty has posted	Net Exposure (+) = CalPERS exposed to Counterparty
Barclays Capital Inc.	(0.1)	0.3	0.2
Citigroup Global Markets, Inc.	(1.1)	1.1	0.0
Credit Suisse AG, New York Branch	(0.4)	0.4	0.0
Goldman Sachs & Co.	(1.0)	1.0	0.0
Merrill Lynch, Pierce, Fenner, Smith	(4.6)	4.6	0.0
Morgan Stanley & Co. LLC	(4.3)	4.3	0.0
Wells Fargo Securities	(0.3)	0.3	0.0
Total	**(11.9)**	**12.1**	**0.2**

Custodial risk is the risk that, in the event a depository institution or counterparty fails, CalPERS would not be able to recover the value of its deposits, investments, or collateral securities. This risk arises in exchange traded derivatives, where CalPERS posts margin to engage in exchange traded derivatives via a Futures Commission Merchant (FCM). FCMs are highly regulated financial entities that accept orders for exchange traded contracts in Central Clearing Counterparties (CCPs). Collateral posted at the FCM is mostly used to meet the margin requirements at the CCPs. The collateral below has been provided to the FCM to post at the CCPs on behalf of CalPERs and bridging operational, timing and processing gaps in collateral transfer.

Futures Commission Merchant (FCM) Exposure
Includes exchange traded futures

Counterparty	Collateral Posted
Citigroup Global Markets Inc.	418.7
BOFA Securities Inc.	295.6
Total	**714.4**

Source: Aladdin

COUNTERPARTY RISK (CONTINUED)

Investment guidelines permit certain portfolios to enter into collateralized loans of securities to borrow or lend securities. CalPERS has positions in repurchase, reverse repurchase and securities lending contracts. CalPERS is a cash borrower in reverse repurchase agreements and a cash lender in repos. CalPERS lends securities via Sec lending and receives either cash or other securities as collateral.

Counterparty risk is mitigated because the market value of the securities posted in a collateralized loan agreement exceeds the cash received, providing the counterparty a margin against a decline in market value of the securities. If the counterparty defaults, the lender could suffer an economic loss equal to the difference between the market value of the underlying securities plus accrued interest and the agreement obligation, including accrued interest.

Counterparty Risk in Collateralized Loans by Type of Contract
($ M)

Master Repurchase Agreement (MRA) Includes repurchase and reverse purchase agreements			
Counterparty	Loan Amount (+) = CalPERS is due money (-) = CalPERS owes money	Collateral Posted (+) = CalPERS has posted (-) = Counterparty has posted	Net Exposure (+) = CalPERS exposed to Counterparty
Bank of America Securities Inc.	(1,903.3)	1,885.6	(17.6)
Barclays Capital Inc.	100.0	(102.0)	(2.0)
Citigroup Global Markets Inc.	500.0	(510.0)	(10.0)
Canadian Imperial Bank of Commerce	782.0	(802.0)	(20.0)
Deustche Bank Securities Inc.	387.1	(397.1)	(10.0)
Goldman Sachs & Co.	156.8	(171.8)	(15.0)
HSBC Bank	(213.9)	216.8	2.9
JP Morgan Securities LLC	(1,027.2)	1,053.6	26.4
MUFG Securities	(681.5)	681.4	(0.0)
NATIXIS	(535.0)	535.3	0.3
Royal Bank of Canada	395.5	(414.8)	(19.3)
SBMC	1,000.0	(1,020.0)	(20.0)
Standard Chartered	1,003.9	(1,029.3)	(25.4)
State Street Bank & Trust Company	250.0	(255.0)	(5.0)
Toronto Dominion	(597.9)	587.8	(10.0)
Truist Securities Inc.	100.0	(102.0)	(2.0)
Wells Fargo Securities, LLC.	(323.6)	316.5	(7.1)
Total	**(606.9)**	**473.2**	**(133.7)**

Securities Lending Agreement (SLA) Includes collateralized loan of securities			
Counterparty	Market Value of Securities Out on Loan (+) = CalPERS lent securities	Collateral Posted (Cash or Securities) (+) = CalPERS has posted (-) = Counterparty has posted	Net Exposure (+) = CalPERS exposed to Counterparty
ABN AMRO Group N.V.	0.0	(0.0)	(0.0)
Bank of Montreal	26.9	(28.4)	(1.6)
Bank of New York Mellon	23.0	(23.5)	(0.5)
Bank of Nova Scotia	3,198.0	(3,372.6)	(174.7)
BankAmerica	155.3	(160.0)	(4.7)
Barclays Group	6,051.6	(6,430.5)	(378.9)
BNP Paribas Group	794.3	(841.8)	(47.4)
Citigroup	83.2	(89.8)	(6.5)
Credit Agricole	173.1	(176.6)	(3.5)
Credit Suisse Group	649.8	(674.6)	(24.8)
Deutsche Bank Group	0.2	(0.3)	(0.1)
Goldman Sachs Group	12,093.1	(12,381.1)	(288.0)
Healthcare of Ontario Pension Plan	2,731.4	(2,924.3)	(192.9)
HSBC Group	48.3	(52.3)	(4.0)
ING Group	3.3	(3.6)	(0.3)
J.P. Morgan Group	1,756.6	(1,820.7)	(64.1)
Macquarie Bank Group	1.0	(1.2)	(0.2)
Mitsubishi UFJ Financial Group	199.9	(210.6)	(10.8)
Mizuho Financial Group Inc.	148.9	(151.9)	(3.0)
Morgan Stanley Group	297.2	(340.7)	(43.5)
NATIXIS group	2,026.4	(2,202.1)	(175.7)
Nomura Holdings, Inc.	2.4	(2.5)	(0.1)
Royal Bank of Canada	459.5	(492.1)	(32.6)
Societe Generale Group	1,901.3	(2,099.7)	(198.5)
TD Securities	23.7	(24.2)	(0.5)
UBS Group	3,548.3	(3,878.4)	(330.1)
Wells Fargo & Co.	0.4	(0.4)	(0.0)
Total	**36,397.1**	**(38,384.0)**	**(1,986.9)**

Source: Aladdin, eSec Lending