CLIFFWATER LLC

Los Angeles • New York

Texas County & District Retirement System
Texas Pension Review Board
Investment Practices & Performance Evaluations - Summary

April 2, 2020

Requirement

Texas Government Code §802.109 requires Texas public retirement systems with at least $30 million in assets to complete an Investment Practices and Performance Evaluation (adopted October 17, 2019)

- Systems with assets > $100 million or more must complete this review every 3 years
- Performed by an independent firm
  - A firm may have a relationship with the retirement system, but cannot directly or indirectly manage assets (defined as managing system assets or having sole responsibility for selecting/terminating investment managers)
- Must be filed with the system's governing body no later than May 1, 2020

Evaluation Components

Evaluation components:

- Analysis of any **investment policy or strategic investment plan** adopted by the retirement system and the retirement system 's compliance with that policy or plan;
- A detailed review of the retirement system's investment asset allocation, including:
  - the process for determining target allocations
  - the expected risk and expected rate of return, categorized by asset class;
  - the appropriateness of selection and valuation methodologies of alternative and illiquid assets
  - future cash flows and liquidity needs
- A review of the appropriateness of investment fees and commissions paid by the retirement system
- A review of the retirement system's governance processes related to investment activities, including investment decision-making processes, delegation of investment authority, and Board investment expertise and education; addressing transparency, investment knowledge/expertise and accountability.
- A review of the retirement system's investment manager selection and monitoring process.

Summary

TCDRS is unique compared to other retirement systems in that it is a saving based or cash-balance plan, not a traditional defined benefit plan

- Not a “one size fit all” plan; employers can customize
  - No contribution holidays; employers must pay 100% of contribution; no funding from State of Texas
- TCDRS has an aggregate 8% annual crediting rate rather than a liability discount rate
  - Any return shortfall is automatically amortized into future employer contribution rates

TCDRS has a comprehensive investment policy & governance practices

- Investment policy is thorough and fully descriptive of roles, responsibilities, processes & procedures
  - Updated as needed; reviewed by external fiduciary counsel
  - External actuaries are active participants in the process
  - Consistent asset allocation process
  - Defined and measurable investment objectives
  - Systematic hiring and firing processes
  - Disciplined monitoring processes
- Governance practices are well established and have been developed over time
  - Use of Policy Governance model documented in the Board of Trustee’s Policy Manual
  - Board training as required by the Pension Review Board and TCDRS Board Policy
  - Full transparency

Cliffwater Disclosures

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Texas County & District Retirement System
Texas Pension Review Board
Investment Practices & Performance Evaluations

April 2020

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Investment Practices and Performance Evaluation

Texas County & District Retirement System
As of December 31, 2019

Introduction:
When evaluating TCDRS' investment practices, strategy and performance, it is important to recognize that the Texas County & District Retirement System (TCDRS) has unique features that keep the system financially sound and help manage risk. TCDRS partners with more than 780 Texas counties and governmental districts to provide retirement, disability and survivor benefits to more than 305,000 Texans.

TCDRS is a **savings-based** or **cash-balance** plan, ***not*** a traditional defined benefit plan. Employees save for their own retirement over the length of their careers. At retirement, TCDRS benefits are based on the employee's final savings balance and employer matching. This feature makes costs more predictable for participating employers.

TCDRS is not a one-size-fits-all system. Each employer, regardless of how large or small, maintains its own customized plan of retirement benefits. Employers can choose how much their employees save for retirement, their level of employer matching, and their plan's retirement eligibility requirements. Most importantly, employers have the flexibility and local control to adjust their benefits each year based on their needs and budgets. By changing the amount employees are saving or their employer matching rate, an employer can change how much they need to contribute to fund their benefits. This level of flexibility is not standard in most traditional pension plans. This design allows employers to share investment risk with their employees.

While every employer plan in TCDRS is different, they have one thing in common: They are all responsibly funded. Employers must pay 100% of their required contribution rate. There are no contribution holidays. TCDRS receives no funding from the State of Texas. If rates rise, employers may lower benefits for immediate budget relief. In addition, the system has other built-in tools to help manage risk, including a reserves fund that is currently over $1.1 billion as of Dec. 31, 2018. The reserves fund can be used to offset future adverse plan experience. In addition, nearly one-third of employers make additional contributions to their plans to offset future adverse experience and to create budget stability.

(1) Analysis of any investment policy or strategic investment plan adopted by the retirement system and the retirement system's compliance with that policy or plan.

The Texas County & District Retirement System ("TCDRS" or the "System") maintains a written investment policy statement (IPS) which is available to the public on tcdrs.org. It is established by the TCDRS Board of Trustees (the "Board"). The Policy provides a foundation from which to oversee the management of the investment of System assets. The Policy is intended to allow for sufficient flexibility to capture investment opportunities yet provide parameters to ensure prudence and care in the management of the investment program.

The Policy documents TCDRS' investment objectives, policies, guidelines and procedures. It also outlines the duties and responsibilities and provides guidance to the fiduciaries of the System including the Board of Trustees, individual members of the Board ("Trustees"), the Investment Officer, staff professionals, investment consultants, performance measurement analysts, external investment managers, custodians, securities lending agents and others who exercise discretionary authority or control over the management or disposition of System assets.

In addition, the Policy states the standards and disciplines adopted so that Trustees can effectively evaluate the performance of the System staff, investment managers, investment consultants and others. This Policy also serves as compliance with Section 845.301(f) of the TCDRS Act, which requires that the Board establish written investment objectives concerning the investment of assets of the System.

The IPS, attached as Exhibit 1, contains the major categories typically included in an institutional quality investment policy. The policy is clearly written and contains measurable objectives for the asset allocation, asset classes and investment managers. The IPS is reviewed by the Board's fiduciary counsel.

On a quarterly basis, the Investment Officer reports to the Board on (a) the overall performance of the System's investments, (b) the investment performance of the investment managers of each asset class within the TCDRS portfolio, (c) the status of the asset allocation plan, (d) all transactions managed internally, including performance of such transactions, as applicable, (e) any material infractions (of which the Investment Officer is aware) of third party providers and managers retained by the Board to invest, settle or safekeep the System's investment assets, and (f) any other matters requested by the Board from time to time. This quarterly reporting process has been followed under stress test conditions over the past 20 years. This quarterly report is a standard component of the Board package and it is available to the public.

The IPS is reviewed quarterly and is modified, as appropriate, at the Board's discretion. The last revision to the IPS was in April 2019 when the IPS was updated to include the new asset allocation targets and capital market assumptions.

(2) A detailed review of the retirement system's investment asset allocation, including: (A) the process for determining target allocations;

The primary means through which the Board ensures that the System achieves the System Investment Objective is through an asset allocation plan. This is documented in the IPS and is updated on an annual basis. The asset allocation plan is developed based on a set of capital market assumptions adopted by the Board as set forth in the IPS in Table 3 of Exhibit A. These assumptions provide the primary basis from which the Board can determine whether the selected asset allocation plan is designed to attain the System Investment Objective. TCDRS provides the public with full transparency, including a video on its website and description of the allocation process and a listing of the current capital market assumptions on tcdrs.org.

On a quarterly basis, the Investment Officer provides the Board with a report on the status of the System's asset allocation plan, and the Board formally reviews the System's asset allocation plan not less than annually. In the course of its review, the Board considers current capital market assumptions, the existing allocation percentages and priorities, and possible modification to the asset allocation plan and the list of asset classes.

The asset allocation plan identifies the asset classes in which the System may invest and the corresponding allocation percentages for each such class. The Board's asset allocation plan is set forth in the IPS in Table 1 of Exhibit A. These allocation percentages are market-value based and specify the minimum, maximum, and target percentages authorized by the Board for each asset class.

These minimum, maximum, and target percentages provide the framework for allocating assets of the System. Within these funding restrictions, and in light of ever-changing market conditions, the Investment Officer allocates funds to approved investment managers or authorized investment vehicles in a manner that, in the Investment Officer's judgment, enhances the System's ability to achieve the System Investment Objective over the long term. In the event an asset class exceeds the maximum allocation percentage or is below the minimum allocation percentage established for such class, the Board authorizes the Investment Officer to rebalance assets in a manner consistent with this Policy in order to bring the allocation percentage within the allowable range for the asset class.

The asset allocation is integrated with the overall investment objective of the System (the "System Investment Objective"), which is to attain an 8% annualized return net of fees over a long-term period (30 years or more), while diversifying the portfolio in such a manner in order to (1) achieve an acceptable level of risk in light of the investment return objective and (2) reduce the volatility of short-term investment returns in order to provide stability in benefit costs.

The Board periodically reviews and evaluates the System Investment Objective, considering, among other factors, TCDRS benefit design, expected future returns and risk on invested assets, employer cost volatility and future expected cash flows as the System matures. The System's actuaries, both internal and external, are integrated into the conversation as is the Investment Officer and investment consultants.

The asset allocation process uses capital market assumptions (expected return, risk, correlation) for each asset class. The covariance matrix, along with appropriate constraints, are used to develop an efficient frontier of asset mixes that maximize return at differing risk levels. This is standard in the industry and the System has consistently applied this process since diversifying out of the 100% bond portfolio in 1995. The System does not implement a tactical asset allocation. Instead, target weights are established to each asset class as well as permissible ranges around the targets.

Each year, Cliffwater conducts a study of state pension performance, included as an attachment. The most recent, "An Examination of State Pension Performance, 2000-2018" as of March 2019, covers 66 state pensions that use June 30 as their fiscal year end and report investment and other financial data as of that calendar date. The source of the data is the respective systems' comprehensive annual financial reports ("CAFRs"). Collectively, the 66 state pensions reported $2.7 trillion in assets at June 30, 2018. The TCDRS actual asset allocation as of June 30, 2018, is shown below compared to the state weighted average from that survey. The NACUBO report as of June 30, 2018, is the source for the asset allocation for large endowments with assets greater than $1 billion.

	June 30, 2018 Actual		
		Endowments	
	State Wtd Avg	>$1 bn	TCDRS
Global equity	47%	32%	38%
Fixed income	22%	9%	5%
Cash	1%	1%	1%
Private Equity	9%	19%	15%
Real Estate	7%	5%	4%
Real Assets	5%	7%	4%
Hedge Funds	3%	19%	22%
Private Debt	2%	0%	4%
Risk Parity	1%	0%	0%
Other/Credit	3%	8%	7%
Total	100%	100%	100%

Due to its unique construct, the TCDRS asset allocation differs from the typical state pension plan and is more comparable to a large endowment. Unlike the typical public defined benefit pension plan that relies on annual contributions approved by the respective contributing body, TCDRS is a savings plan whereby any shortfall/excess versus the 8% annual crediting rate is automatically amortized into the participating system's annual rate reset. Additionally, unlike most state pensions that are in a net cash outflow situation, TCDRS is approximately net cash flow neutral such that TCDRS can withstand a higher level of illiquidity than a typical state pension plan. Given these circumstances, TCDRS has maintained an asset allocation policy more comparable to a large endowment, focusing on return generation while balancing risk through diversification. As such, there is a lower exposure to public stocks and bonds with a higher exposure to private equity, hedge funds and credit investments.

(B) the expected risk and expected rate of return, categorized by asset class;

The TCDRS Board reviews the asset allocation (including assumptions, targets and ranges) on an annual basis. The asset allocation plan is developed based on a set of capital market assumptions adopted by the Board as set forth in the attached IPS in Table 3 of Exhibit A and available on tcdrs.org. These assumptions provide the primary basis from which the Board can determine whether the selected asset allocation plan is designed to attain the System Investment Objective and are shown below. The approach used by the system is sound, consistent with best practices and results in a well-diversified portfolio.

TCDRS Capital Market Assumptions

As of Jan. 1, 2019

ASSET CATEGORY (PORTFOLIO)	EXPECTED RETURN	EXPECTED RISK*
U.S. Equities	7.10%	17.00%
International Equities — Developed	7.10%	18.00%
International Equities — Emerging	7.60%	26.00%
Global Equities	7.40%	17.70%
Hedge Funds	5.60%	4.45%
Strategic Credit	6.09%	5.86%
Distressed Debt	8.90%	11.00%
Direct Lending	9.65%	12.00%
Private Equity	10.10%	20.00%
REITs	5.85%	22.00%
Commodities	4.25%	18.00%
Master Limited Partnerships	7.05%	17.00%

Private Real Estate Partnerships	8.00%	30.00%
TIPS	2.70%	7.00%
Investment-Grade Bonds	3.30%	4.00%
Cash and Cash Equivalents	2.30%	2.00%

* Measured as one standard deviation.
See the correlation table from the TCDRS Investment Policy.

The asset allocation plan identifies the asset classes in which the System may invest and the corresponding allocation percentages for each such class. The Board's asset allocation plan, designed to achieve the System's Investment Objective, is set forth in the attached IPS in Table 1 of Exhibit A and are shown below.

TCDRS Asset Allocation Parameters

Asset Class (Portfolio)	Measurement Benchmark (Index)	Min %	Max %	Target %
U.S. Equities	Dow Jones U.S. Total Stock Market Index	7%	18%	10.5%
Global Equities	MSCI World (net) Index	0%	6%	2.5%
Intl Equities – Developed Markets	MSCI World ex USA (net) Index	6%	16%	10%
Intl Equities – Emerging Markets	MSCI Emerging Markets (net) Index	3%	11%	7%
Investment-grade Bonds	Bloomberg Barclays US Aggregate Bond Index	1%	15%	3%
Strategic Credit[1, 2]	FTSE High-Yield Cash-Pay Capped Index	5%	19%	12%
Direct Lending[1, 2]	S&P/LSTA Leveraged Loan Index	4%	18%	11%
Distressed Debt[1]	Cambridge Associates Distressed Securities Index[5]	1%	5%	2%
TIPS	Bloomberg Barclays US 10 Year Breakeven Inflation Index	0%	3%	0%
REIT Equities	67% FTSE NAREIT All Equity REITs Index +33% S&P Global REIT (net) Index	0%	5%	2%
Commodities	Bloomberg Commodities Index	0%	3%	0%
Master Limited Partnerships	Alerian MLP Index	1%	5%	3%
Private Real Estate Partnerships[2]	Cambridge Associates Real Estate Index[3]	1%	10%	6%
Private Equity[2]	Cambridge Associates Global Private Equity & Venture Capital Index[4]	10%	26%	18%
Hedge Funds[2]	Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index	5%	20%	13%
Cash Equivalents[2]	90-day US Treasury	0%	10%	0%

[1]Although Strategic Credit, Direct Lending, and Distressed Debt are part of and subject to the investment guidelines of the Private Equity Program, the objectives and performance characteristics of these investments are more similar to credit investments and, thus, such investments are placed in separate asset classes as opposed to Private Equity.

[2] Due to the extended period required to transact in Hedge Funds, Strategic Credit, Direct Lending, Private Equity and Private Real Estate asset classes, the benchmarks for these asset classes will be incorporated into the TCDRS Policy Index at their actual weights until they approach their target allocations. Unfunded target allocations of the Strategic Credit, Direct Lending, Private Equity and Private Real Estate asset classes will be netted against overallocations to Cash Equivalents and Hedge Funds. Any remaining unfunded target allocations will then be invested equally between U.S. Equity and Investment-Grade Bonds with the TCDRS Policy Index weights for each increased accordingly.

[3] Includes vintage years 2007-present of Quarter Pooled Horizon IRRs.
[4] Includes vintage years 2006-present of Quarter Pooled Horizon IRRs.
[5] Includes vintage years 2005-present of Quarter Pooled Horizon IRRs.

The capital market assumptions used are developed by the System's investment consultant and are designed to be viewed over a 10-year time frame. The return forecast consists of cash yield and growth expectations by asset class. Short term tactical components, such as valuation changes, are not included in the long-term return forecasts. Manager alpha is assumed to equal zero in asset classes that are known to exhibit market efficiency and where active management has proved challenging. For these asset classes, typically public markets, the expected return assumptions would reflect what would be earned by a passive (index fund) investor where diversification is broadest, and expenses are small. However, in a number of alternative asset classes, such as private equity and hedge funds, alpha component is added to long term expected return. These expected returns from alpha are re-examined annually based upon measurement of past alpha generation, and changes are made accordingly.

Return volatility and correlation forecasts rely upon calculations using monthly historical returns when the asset class is liquid and broadly captured by an index that is accepted industry-wide. However, returns for many of the major alternative asset classes, including private equity, private debt, and real estate, are quarterly in frequency with values determined by accounting or appraisal standards that frequently understate true volatility and correlation. This occurs because valuations are done by professionals, as opposed to market traders, tend to be less frequent and backward looking. The result is a time series of returns (values) that exhibit lower periodic change and serial correlation, which together is characterized as "smoothing." In the capital market assumptions, the asset returns are statistically "unsmoothed" for those indices representing private asset classes.

(C) and the appropriateness of selection and valuation methodologies of alternative and illiquid assets; and

As noted, the primary means through which the Board ensures that the System achieves the System Investment Objective is through an asset allocation plan. This is documented in the IPS and is updated on an annual basis. The asset allocation plan is developed based on a set of capital market assumptions adopted by the Board as set forth in the IPS in Table 3 of Exhibit A and tcdrs.org. These assumptions provide the primary basis from which the Board can determine whether the selected asset allocation plan is designed to attain the System Investment Objective.

The asset allocation plan identifies the asset classes in which the System may invest and the corresponding allocation percentages for each such class, both for liquid and illiquid, alternative asset classes. The Board's asset allocation plan is set forth in the IPS in Table

1 of Exhibit A. These allocation percentages are market-value based and specify the minimum, maximum, and target percentages authorized by the Board for each asset class. TCDRS has been investing in alternative asset classes since 2005 and has developed the level of staffing and expertise since that time to match the increase in exposure to alternative investments.

The IPS defines "alternative investments" and they include investments within one of the following classes:

- Private equity – investments in business made through means other than through publicly-traded securities such as buyout investments and venture capital.
- Distressed debt – investments in the debt of financially distressed companies.
- Direct lending – investments in privately originated debt to companies or to real estate investors, including through business development companies, as well as other yield oriented non-correlated funds including, but not limited to, royalty streams and aviation leases.
- Strategic credit – investments primarily in debt instruments that provide return opportunities driven by dislocations in the capital markets or by credit risk.
- Hedge funds – investment strategies with the goal of achieving positive returns with a degree of independence from movements in financial markets and independent of traditional performance benchmarks.
- Real assets – investments in assets that have a return linked to inflation, such as energy related investments and other commodity-based investments.
- Real estate – investments that have an ownership interest in either timber or direct real estate properties, either income or non-income producing.

Alternative investments are typically made through an interest in a limited partnership but also may be made through another vehicle (e.g., separate account, commingled fund, offshore entity, etc.), as appropriate for the individual investment. As such, it is important to understand the governing documents of the alternative investment as this outlines the valuation methodology used for the respective fund.

Each alternative investment category has their own set of investment guidelines and performance measurement standards that are detailed in the attached IPS. The selection and monitoring/measurement process for alternative investments is described in the response to question (5) that follows.

A separate operational due diligence report is performed on each of the alternative investments prior to selection. This review focuses on risk assessment and a best practices review in order to place the firm in context to other firms. As part of this review, the following categories are evaluated:

- Governance. Focus is on the business management structure that includes business professionals and processes focused on legal, regulatory and compliance, advisory board interaction as well as business risk management practices including liability insurance and disaster recovery plans and use of placement agents.

- Operations Infrastructure. Private asset funds should have experienced operating staff to manage all non-investment functions, with duties segregated to ensure proper controls. The firm's service providers and technology infrastructure are reviewed.

- Processes. Look for well-defined processes and procedures that are structured to mitigate risk in the areas of financing, transparency, and disclosure, as well as the quality of ongoing information provided to investors. A review of the quarterly and annual audited financial statements is performed and there is a detailed review of fees and expenses charged to the fund.

- Valuation. This review covers all aspects of valuation from methodology, valuation sources, review process, advisory board oversight, and accounting processes.

TCDRS reviews each of the alternative investment funds' audited financial statements and these valuations are aggregated into the TCDRS CAFR, which is reviewed by its external auditing firm.

(D) future cash flows and liquidity needs;

Annually TCDRS works with an outside consulting actuary to conduct cash flow projections on an open group basis over the next decade. TCDRS is only slightly cash-flow negative over the next 10 years. As liquidity is not currently an issue for the system, the two main risks considered by the Board when making investment decisions are 1) the long-term risk that investment return combined with employer and employee contributions will not be enough to pay future benefit claims; and 2) the short-term risk of year-to-year volatility impacting employers' rates.

Because TCDRS employers have to pay required contributions which are adjusted each year for actual investment performance, TCDRS manages risk closely. The System does significant work educating employers on how their benefit costs might fluctuate under various market scenarios and explaining the tools available to control plan costs and manage risks. Employers have the ability to manage rate volatility risk by adjusting benefits annually. Employers may change how much employees are saving and/or employer matching. In addition, employers may choose to make additional contributions to pay down liabilities faster and create a buffer for future adverse experience.

Employers are provided customized rate modeling that shows the impact of benefit/funding scenarios on the employer rate under various economic conditions based on our current asset allocation and capital market assumptions. In addition, the employers have access to an online tool, the Plan Customizer, that allows employers to model benefit changes and additional contributions and to see the impact they may have on their employees' benefits, and the employer's costs and liabilities. Each employer receives annually, in the summary valuation report, a stress test that shows the employer contribution rate under negative economic scenarios. As a result of education efforts, over one-third of TCDRS' more than 780 employers make additional contributions creating plan-level reserves for the future.

TCDRS has system-wide tools to help manage risk. In addition, to managing risk in the portfolio, TCDRS maintains a reserves fund (currently over $1.1 billion as of Dec. 31, 2018) to help offset future adverse experience.

As of Dec. 31, 2018, TCDRS was nearly 89% funded. TCDRS does not receive funding from the State of Texas. Each plan is funded by employers, members and investment earnings. TCDRS has a conservative funding policy ensuring that employers fund the plans responsibly. By paying 100% of the required contribution rate every year, employers are paying for their current employees' future benefits and are paying down any unfunded liabilities within 20 years. The weighted-average amortization period of TCDRS plans is 12.6 years, one of the lowest in the state. Due to TCDRS' disciplined funding policy, the unique nature of the savings-based benefit accrual, and annually resetting employer rates to account for demographic, investment and benefit changes; plans are continually kept in balance. Thus, changes in liabilities and investment and demographic experience do not have the same impact on investment strategy as these factors may have in other plans.

The Board has established a funding policy available at tcdrs.org to govern the actuarial program and to ensure responsible, disciplined funding. The funding policy governs how TCDRS determines the employer contributions required to ensure that benefits provided to TCDRS members are funded in a reasonable and equitable manner. The goals of TCDRS' funding policy are to fully fund benefits over the course of employees' careers, to ensure intergenerational equity and to balance rate and benefit stability with the need for the plan funding to be reflective of current plan conditions. In addition, the Board's governance policy requires TCDRS to ensure that actuarial assumptions are coordinated appropriately with the TCDRS Investment Policy.

The Board hires independent outside consulting actuaries to conduct an annual valuation to measure the funding status and to determine the required employer contribution rate for each employer plan. The valuation of each employer plan is based on the system funding policy and the assets, benefits and participant profile of each participating employer plan.

In the valuation process, assumptions are used to estimate liabilities and to determine the amount of funding required from the employer. These assumptions reflect a long-term perspective. A complete listing of all actuarial assumptions can be in found in the annual systemwide valuation report. The investment return assumption is forward-looking and is used to determine how much funding for benefits is estimated to come from investment earnings versus employer contributions.

The TCDRS Board periodically reviews and revises the assumptions as necessary to reflect best estimates of future experience. Every four years, the TCDRS consulting actuary, hired by the Board, conducts an experience study. TCDRS assumptions are compared to plan experience and to future expectations. Changes to the assumptions are recommended as needed, and the Board adopts actuarial assumptions to be used in the annual valuation based on the results of this study. Each year the actuary also confirms the reasonableness of the assumptions.

An audit is required of every experience study and must be performed by another independent auditing actuary to review the consulting actuary's analysis, conclusions and recommendations for accuracy, appropriateness and reasonableness. The reviewing actuary independently analyzes economic assumptions to test the results and recommendations of the consulting actuary. In addition, audits are also conducted every four years on the annual valuation.

TCDRS current investment return assumption is 8%. The most recent experience study to review TCDRS' economic and demographic assumptions was as of December 31, 2017. Two independent actuarial firms both concurred that the investment return assumption was reasonable. The evaluation was based on TCDRS' capital market assumptions and asset allocation, which is significantly different than traditional public plans and more comparable to the endowment and foundation universe. In addition, the consulting actuary has annually monitored the investment return assumption for reasonableness.

As previously noted, TCDRS has unique measures in place to manage risk associated with investment volatility and the investment return assumption, including a $1 billion reserves fund (as of Dec. 31, 2018) that may be used to offset future adverse experience. In addition, the system resets rates annually based on investment experience and requires the employers to fund any liabilities over a conservative 20-year period. The average amortization period in the system is 12.6 years. The employers also have the unique ability to adjust benefits, liabilities and costs each year based on their local needs and budgets by adjusting how much employees are saving and the employer matching.

(3) A review of the appropriateness of investment fees and commissions paid by the retirement system;

TCDRS reports all investment returns "net of fees". Because of this, the investment results reported on tcdrs.org and in publications and financial reports are the actual values available for TCDRS use.

Fees compensate investment managers for their time and expertise. For TCDRS, these fees are paid out of investment earnings. TCDRS provides full transparency on fees by reporting both management and carried interest fees on tcdrs.org and in their annual financial report. As defined in the IPS, the TCDRS Investment Officer is responsible for managing the administrative investment operations of the System.

TCDRS is focused on ensuring that their resources (e.g., investment management fees, personnel time, etc.) will be expended in the asset classes where there is a higher probability of consistent manager outperformance or where index funds are not available (e.g., alternative investments). Given this, the entire TCDRS US equity exposure is in index funds, over 40% of the developed non-US equity exposure is in index funds and 10% of emerging markets exposure is in index funds. For the remaining public market asset classes, active management is used in global equity, core fixed income, MLPs, REITs, and credit. The public market managers, along with their fee schedules, are formally reviewed every three years.

TCDRS uses active management in alternative investments (e.g., private equity, distressed debt, direct lending, strategic credit, hedge funds, real assets, real estate). Because of the level of diligence and operational flexibility required to make certain alternative investments in a timely and prudent manner, the Board has established a process for the approval of alternative investments that is documented in the IPS.

Investment management fees for alternative investments, such as hedge funds, private credit, private real estate and private equity, are higher than fees for more traditional investments, such as public market equities. There are also manager incentives associated with alternative investments. The objective of these incentives is to align the investment manager's interests with TCDRS' interests.

Alternative investment fees generally fall into three categories:

- Management fees: These typically range from 1.5% to 2% of invested assets (hedge funds, direct lending and opportunistic credit) or committed capital (private equity, private real estate, distressed debt). They are intended to compensate the general partner for its costs in operating the partnership.
- Profit sharing (also called "carried interest"): These fees incentivize and align the general partner's interest with TCDRS' interests. The carried interest represents the general partner's share of the partnership's profits, typically 20%, with 80% going to the limited partners such as TCDRS. Generally, an agreed rate of return, or preferred return, must first be surpassed before carried interest is earned by the general partner. After this, there is a "waterfall" as to how investment gains are distributed to the general partner and to the limited partners. To incentivize general partners to maintain performance, periods of negative performance may result in previously accrued carried interest being reduced or "clawed back".
- Fund expenses: These reflect administrative items, exclusive of investment related expenses.

During investment, operational and legal due diligence, fees paid to investment managers are evaluated to determine if they are consistent with four objectives:

1. An alignment of interests between investor and manager.

   The first part of this is evaluating any "asymmetry". Managers are sharing in the upside (profits) but not necessarily the downside (losses). One possible way to mitigate this problem is to ensure that managers are investing a significant fraction of their own capital into the same investment or fund (also known as "GP commitment"). While indirect, at least the manager has more motivation to mitigate losses knowing its own money is at risk. Conversely, sometimes a concern arises if the manager has too much money invested in the fund, causing the manager to become too risk averse for fear of losing significant personal assets.

   A second part of the evaluation is known as "crystallization", or the frequency with which performance fees are paid. Ideally, performance fees are paid only when the investor exits the fund. All profits and losses are fully netted against each other and over time. Anything less and the investor is at risk of paying a performance fee on profits which potentially cannot be recaptured if losses follow afterward.

Many private equity funds pay performance fees as each asset is realized (sold). A "clawback" provision in the legal documents can protect investors if performance fees are paid on early profits from realizations but are followed later by realized losses. Hedge funds, however, generally pay performance fees annually on realized and unrealized net gains. Sometimes, a year of sizable investment gains can generate performance fees that are not recouped when followed by a year of investment losses. A mitigating factor is that hedge funds generally have a "high water mark" where future performance fees will not be paid until cumulative past losses have been recovered.

2. Fees which are largely conditional upon the manager exceeding a <u>performance benchmark</u> for measuring true excess return, either from alpha or alternative beta, that cannot otherwise be replicated passively.

   Very few performance fees charged by alternative investment managers today are tied to profits above a performance benchmark, as suggested above. In the case of hedge funds, the performance benchmark is most frequently a zero percent return. However, during the due diligence on hedge funds, an "alpha split simulator" is used that incorporates fee, expense, and investment assumptions to derive a distribution of alpha, fees, and fractional percent of alpha likely to be earned by the investor versus the hedge fund.

   Private equity and debt managers also calculate performance fees on total profits without reference to a market benchmark. However, they almost always have a "preferred return", generally 8.0%, below which they earn no performance fee. If performance is above the preferred return, manager performance fees often "catch up" to what the manager would have earned absent the preferred return.

3. A level of fees that represents a <u>fraction share</u> of expected gross excess return and where that fraction is inversely related to the uncertainty in excess return.

   As noted previously, during the due diligence on hedge funds, an "alpha split simulator" is used that incorporates fee, expense, and investment assumptions to derive a distribution of alpha, fees, and fractional percent of alpha likely to be earned by the investor versus the hedge fund.

4. <u>Fund expenses</u> that reflect only administrative items, exclusive of investment related expenses.

   As part of the operational review, the fund is compared to a list of best practices with respect to transparency and disclosures, including side letters, placement agent fees, related party transactions and all fees and expenses. A review of the quarterly and annual audited financial statements is performed and there is a detailed review of fees and expenses charged to the fund.

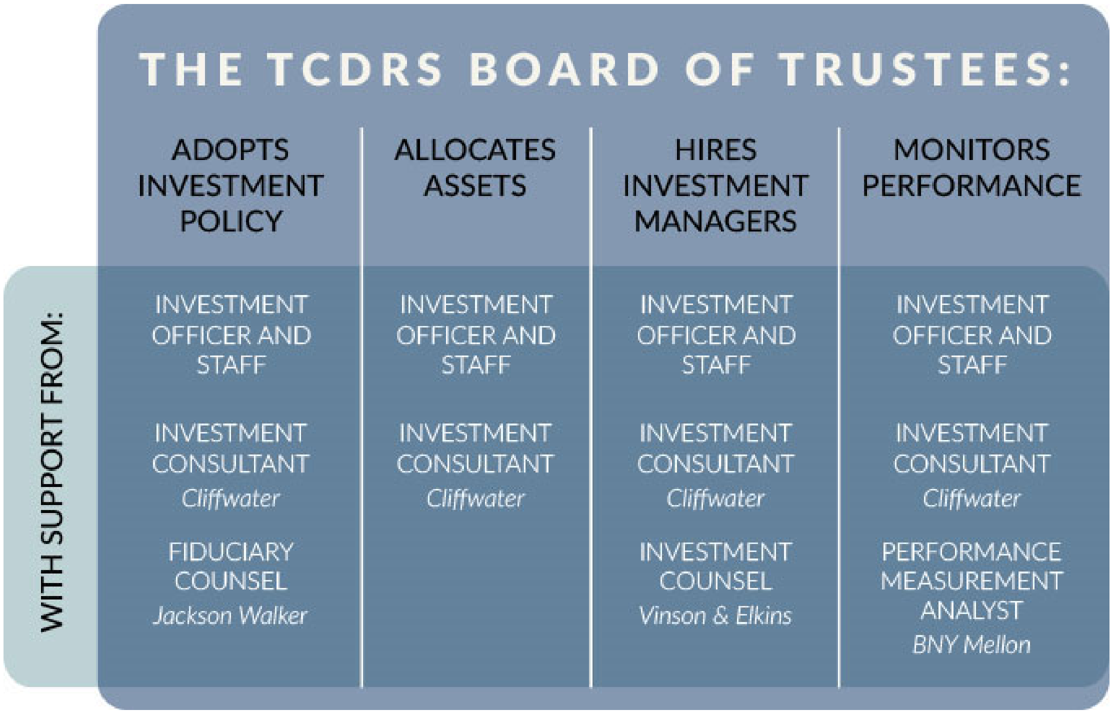
TCDRS' external legal counsel reviews all governing fund documents prior to agreement. TCDRS is very focused on being early in the legal negotiation process in order to change and/or influence the final set of legal documents, if needed. TCDRS staff, external legal counsel and consultants work together to minimize the amount of fees that TCDRS ultimately pays with the goal of ensuring that each set of legal documents encapsulates the previously noted objectives. To further minimize fees, TCDRS focuses its size and economies of scale with respect to investment structuring such as having customized separate accounts, negotiating "most-favored nations clauses", negotiating relationship discounts, getting GP ownership stakes if seeding new investment strategies, etc.

TCDRS collects and reviews all fees and expenses annually. TCDRS provides full transparency on fees by reporting both management and carried interest fees on tcdrs.org and in their annual financial report.

(4) A review of the retirement system's governance processes related to investment activities, including investment decision-making processes, delegation of investment authority, and Board investment expertise and education; addressing transparency, investment knowledge/expertise and accountability.

The TCDRS Board of Trustees provides leadership for the system and is responsible for overseeing the investment of TCDRS assets. The Board adopts the investment policy, allocates assets, hires legal firms, consultants, custodians, investment managers and monitors performance. They receive assistance from the Investment Officer and staff, along with professional firms they have hired in carrying out that responsibility. TCDRS investments are managed by an experienced team with diverse skills and responsibilities. The internal team is supported by consultants, custodians, legal firms and external managers. Both staff and consultants work together to make informed, responsible decisions about TCDRS investments. Staff and consultants perform extensive due diligence for the Board before recommending the hiring of investment managers and monitor those investment managers as they work toward specific goals, investing funds according to TCDRS investment policy. Oversight of investment managers includes reviews of operations, on-site visits, background checks, reviews of financial information and continuous monitoring after hire. All board-hired contracts, including the investment consultant, are reviewed annually as part of the governance policy process with an in-depth contract review conducted every four years.

A video on Investment Oversight is available to the public at tcdrs.org.



The nine-member Board is comprised of system members and retirees appointed by the governor and confirmed by the Texas Senate. TCDRS trustees serve staggered six-year terms and have oversight of all system operations, including strategic direction, the annual budget, policy determination, legislative proposals and investment policy. The Board appoints an executive director to manage the day-to-day operations of TCDRS and an investment officer to oversee TCDRS investments.

The Board governs using the Policy Governance model and has a Board of Trustees' Policy Manual that outlines the strategic goals of the organization and clearly defines the roles, responsibilities and limitations of the board, executives and staff. In addition, the board maintains a written investment policy statement that documents TCDRS' investment objectives, policies, guidelines and procedures; outlines the duties and responsibilities, and provides guidance to the fiduciaries of the System.

Board meetings are publicly posted and held quarterly. The meetings are typically one day in length with over 50% of each meeting devoted to investment-related matters. Board policy, the investment policy, meeting agendas and minutes are all posted to the website, tcdrs.org. Meeting minutes contain summaries of discussion items, actions taken by the board and records of votes on motions.

Board training is required by the Pension Review Board and the TCDRS Board Policy. The Pension Review Board requires a minimum of seven hours of accredited core training during the first year of appointment as a trustee and four hours of continuing education during subsequent two-year periods. Core training includes the following topic areas: Investments, Benefits Administration, Fiduciary Matters, Governance, Ethics, Actuarial Matters and Risk Management. In addition, the TCDRS Board Policy requires Trustees to complete an orientation at TCDRS' offices and attend at least one continuing education program as designated by the board every two years. Board members are briefed on available educational opportunities annually. All Board members are current on training requirements.

Both passive and active styles of asset management are used. Funds managed in the passive style, seek to match the performance of an established market index (e.g., the Dow Jones U.S. Total stock Market Index) by investing in the same securities as the index. Asset classes that are passively managed include: U.S. equities, International developed equities (partial), and International emerging equities (partial).

With investments managed in the active style, investment managers try to exceed the performance of a market index by actively selecting securities that they believe will outperform and avoiding those they think will underperform. Asset classes that are managed actively at TCDRS include: global equities, international developed equities (partial), emerging market equities (partial), hedge funds, credit investments, private equity, real assets, and investment-grade bonds.

Quarterly the Board monitors the effectiveness of the investment program, considers any needed changes to the investment policy, reviews governance processes and monitors performance. See other sections of this report for more detailed information.

(5) A review of the retirement system's investment manager selection and monitoring process.

Selection Process

The Board is ultimately responsible for the selection of investment managers to manage the portfolios within the asset classes. However, the Investment Officer and appropriate investment consultants will assist the Board in the selection process.

For publicly traded securities investment managers, the Investment Officer and appropriate investment consultant will conduct the initial search for investment managers for publicly-traded securities portfolios and perform the due diligence required in connection with the search. The process for this search will include developing the criteria for the investment mandate, determining the appropriate managers for the investment mandate, and interviewing the most qualified candidates. The appropriate investment consultant and Investment Officer will consult following the search process and jointly recommend a candidate or candidates to the Board. The

Board will evaluate such candidate(s) and make the final selection of an investment manager. Managers are evaluated based upon:

- the stability and general experience of the firm;
- client relations;
- quality, stability, depth and experience of personnel;
- philosophy/process
- performance
- fees
- TCDRS portfolio fit

TCDRS is focused on ensuring that TCDRS resources (e.g., investment management fees, personnel time, etc.) will be expended in the asset classes where there is a higher probability of consistent manager outperformance or where index funds are not available (e.g., alternative investments). Given this, the entire TCDRS US equity exposure is in index funds, over 40% of the developed non-US equity exposure is in index funds and 10% of emerging markets exposure is in index funds. For the public markets, active management is used in global equity, core fixed income, MLPs, REITs, and credit.

TCDRS uses active management in alternative investments (e.g. private equity, distressed debt, direct lending, strategic credit, hedge funds, real assets, real estate). Because of the level of diligence and operational flexibility required to make certain alternative investments in a timely and prudent manner, the Board has established a process for the approval of alternative investments that is documented in the IPS.

The alternative investment consultant and the Investment Officer will periodically present to the Board for approval a list of recommended investments in each alternative investment asset class. These alternative investments will be recommended based on the alternative investment consultant’s analysis and due diligence performed on such alternative investments.

Once the Board has approved the list of recommended investments, the Investment Officer and the alternative investment consultant will select investments from such list to carry out the annual plan for each of the alternative investment asset classes. The investments will be selected in a manner intended to enable TCDRS to meet its long-term return objectives set forth for the respective asset class. The investment objectives and guidelines for the respective asset classes of alternative investments are set forth in the respective sections of the IPS. Once an investment is selected, the alternative investment consultant's analysis for each selected investment will be set forth in a report and made available to the Board.

In selecting investment vehicles for recommendation, the Investment Officer and the investment consultant providing services with respect to one or more alternative asset classes shall comply with the IPS and shall endeavor to select the highest quality managers available that will enable the various alternative asset programs to meet their long-term return objectives within the parameters established by the guidelines included in the IPS. In connection with this process, the alternative investment consultant shall conduct extensive due diligence on potential alternative investments for the purpose of making recommendations to the Board. Selection of alternative asset vehicles will take into consideration the following criteria:

- Quality and stability of the firm and investment team;
- Previous investment track record of the investment vehicle manager;
- Proposed investment strategy;
- Ability of investment vehicle manager to demonstrate capability to generate superior returns;
- Operational capabilities;
- Legal and economic terms governing the partnership or other vehicle;
- Alignment of interests; and
- TCDRS portfolio fit.

Recognizing the importance of vintage year diversification and the importance of striving to achieve adequate portfolio diversification by investing in different types of alternative asset investments, in different partnerships or other vehicles, with managers representing various investment styles, industries and geographic concentrations, the Investment Officer and alternative investment consultant will develop an annual plan for alternative investments in private equity, private real estate, and distressed debt and present each such plan to the Board. This annual plan will reflect a pace of commitments that, considering forecasted cash flows, is expected to achieve the

System's targeted allocation to the alternative asset class over a reasonable time period. This annual plan will be integrated with the existing portfolio and the prevailing economic environment and market conditions.

Not all recommended alternative investments on the list approved by the Board will be completed for reasons including, but not limited to, unavailability of capacity on the part of the approved alternative investment, selection(s) by the Investment Officer and alternative investment consultant among approved alternative investments with similar strategies, and an inability to successfully negotiate legal and/or economic terms. Counsel employed by TCDRS will review and assist in the negotiation of each approved alternative investment's governing legal documents.

In addition to approving the list of recommended investments, the Board may authorize the Investment Officer to invest in alternative investments that have not previously been presented to the Board if an investment opportunity arises on which action must be taken prior to the next meeting of the Board. An authorization of this type will identify the asset classes in which the Investment Officer has such approval and place both aggregate and individual dollar limits for such investment. The Investment Officer shall promptly notify the Board of any investments made pursuant to this provision, and the Board will ratify such investments at its next regularly scheduled meeting.

Investment legal counsel for the System reviews the agreement or agreements governing the relationship between the System and all selections made pursuant to investment manager, consultants, custodian selection prior to execution of the agreement or agreements by the authorized officer of the System. Evidence of such review will be included with the agreement or agreements that are retained as part of the records of the System.

Monitoring Process

In terms of performance monitoring, the Board retains a performance measurement analyst to report performance of the System's investments based upon a total return using time-weighted rate of return calculations. Performance is calculated on a monthly basis on a gross and net of fee basis. These reports (a) set forth the overall investment performance of the System's investments and the performance of individual investment managers within asset classes and (b) compare the overall performance of the System's investments with the System's Investment Objective set forth in the IPS and the TCDRS Policy Index. The Board formally reviews these reports on a quarterly basis. These reports are provided on a summary and detailed level with verbal explanation to address differing levels of investment knowledge/expertise.

Additionally, performance measurement benchmarks for each asset class are reviewed and approved by the Board. The performance measurement benchmarks for each asset class, previously shown, are set forth in the IPS, Table 1 of Exhibit A. Based on the benchmarks approved for each asset class and the target asset allocation of the System, a composite benchmark for the overall portfolio of the System will be established and referred to as the "TCDRS Policy Index." This composite benchmark will be utilized in monitoring the overall investment performance of the System's investments.

Investment guidelines and objectives are also established for each publicly-traded securities investment manager, they are incorporated into each respective investment manager agreement and (1) establish relative and/or absolute performance expectations, which are a function of the efficiency of the asset class and the type of investment strategy employed, (2) delineate which investments and strategies the manager is permitted to use to achieve its performance objectives, and which investments and strategies the manager is prohibited from using, and (3) specify the characteristics a manager's portfolio is expected to display. If TCDRS is invested in a commingled investment vehicle, the manager is expected to adhere to the guidelines governing the respective vehicle. The individual investment manager portfolio parameters are set forth in the IPS, Table 2 of Exhibit A and are shown below.

Investment Manager Parameters

Asset Classes (Portfolios)	Investment Manager	Investment Style	Long-term Performance Objective
U.S. Equities	State Street Global Advisors	Passive	Replicate return of Dow Jones U.S. Total Stock Market Index before fees
International Equities - Developed	State Street Global Advisors	Passive	Replicate return of MSCI World ex USA (net) Index before fees
	Marathon-London International Fund	Active	Annualized net returns > 150 bps* over MSCI EAFE (net) Index over rolling 5-year periods
International Equities - Emerging	State Street Global Advisors	Passive	Replicate return of MSCI Emerging Markets (net) Index
	Dimensional Fund Advisors	Active	Annualized net returns > 100 bps* over MSCI Emerging Markets (net) Index
	JP Morgan, Marshall Wace, and Wellington	Active	Annualized net returns > 200 bps* over MSCI Emerging Markets (net) Index
Global Equities	Viking Long Fund,	Active	Annualized net returns > 200 bps* over MSCI World (net) Index
	Marshall Wace		Annualized net returns > 200 bps* over MSC ACWI (net) Index
TIPS	Western Asset Management Co.	Active	Annualized net returns > 15 bps* over Bloomberg Barclays US 10 Year Breakeven Inflation Index
	Jennison Associates	Active	Annualized net returns > 50 bps* over Bloomberg Barclays US

Investment-grade Bonds	Dodge & Cox Prudential Investment Mgmt.		Aggregate Bond Index & rank in top half of managers with similar objectives over 3-5 year horizon
Distressed Debt	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Distressed Securities Index[3]
Direct Lending	Portfolio of Managers	Active	Annual net returns > S&P/LSTA Leveraged Loan Index
Strategic Credit	Portfolio of Managers	Active	Annualized net returns > FTSE High-Yield Cash-Pay Capped Index
REIT Equities	Cohen & Steers	Active	Annualized net returns > 200 bps* over FTSE NAREIT All Equity half of managers with similar objectives over 3 to 5-year horizon
	Dimensional Fund Advisors (global)	Active	Annual net returns > S&P Global REIT (net) Index
Commodities	Wellington Management Co., LLP Gresham Investment Management	Active	Annualized net returns > 100 bps over Bloomberg Commodities Index
Master Limited Partnerships	Harvest Fund Advisors	Active	Annualized net returns > Alerian MLP Index
Private Real Estate Partnerships	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Real Estate Index [1]
Private Equity	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Global Private Equity & Venture Capital Index[2]
Hedge Funds	Portfolio of Managers	Active	Annual net returns > Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index
Cash Equivalents	Investment Officer	Active	Realize competitive, overnight returns

*A return of one hundred basis points (bps) is equivalent to a 1% return.
[1] Includes vintage years 2007-present of Quarter Pooled Horizon IRRs.
[2] Includes vintage years 2006-present of Quarter Pooled Horizon IRRs.
[3] Includes vintage years 2005-present of Quarter Pooled Horizon IRRs.

Performance evaluation criteria are established for each of the alternative investment categories. For hedge funds, performance will be evaluated relative to peer universes and by the asset category benchmark as set forth in the IPS, Table 1 of Exhibit A. For private market investments (e.g. private equity, real estate, distressed debt, direct lending, strategic credit), individual investment vehicle performance, as measured by the internal rate of return, will be evaluated compared to the performance of respective peer universes and vintage years, as reflected by the Private Equity Program benchmark; provided, however, the Strategic Credit, Distressed Debt and Direct Lending components within the Private Equity Program will instead be evaluated compared to the asset class benchmarks set forth in the IPS on Table 1 of Exhibit A.

The operations of an investment manager will be monitored by the Investment Officer and appropriate investment consultants to ensure compliance with (a) the manager's investment objectives and guidelines or with the applicable investment guidelines and performance objectives for alternative investments, as applicable, (b) the terms of this Policy, and (c) the TCDRS Act and other applicable law.

If an investment manager (1) fails to conform to the applicable investment objectives and guidelines and performance objectives, (2) fails to operate in a safe and sound manner, (3) experiences a material change in ownership or personnel that impacts the reasons TCDRS initially hired the investment manager, or (4) violates the terms of the investment manager agreement or other governing agreement, this Policy, the TCDRS Act, or other applicable law, the Investment Officer is authorized to take appropriate remedial action. Remedial action may include immediate termination. The Investment Officer shall promptly report to the Board any remedial action taken pursuant to the IPS.

For the publicly traded securities investment manager, in addition to the monitoring described above, an investment consultant will periodically, but no less frequent than once every three years, perform a formal evaluation of the performance of the publicly-traded securities investment managers. After considering the evaluations and recommendations of the appropriate investment consultant, the Board determines what action, if any, should be taken with respect to the investment managers. The Investment Officer maintains a schedule for these periodic reviews.

Additionally, in connection with monitoring alternative investments, the Investment Officer and staff and/or alternative investment consultant conducts portfolio reviews and on-site due diligence as necessary. Site visits are also performed to confirm that appropriate infrastructure is in place to support the investment process.

With respect to the monitoring of alternative investments, the System also takes appropriate advantage of the rights offered to TCDRS through limited partnership agreements or other governing agreements. In addition to regular performance and portfolio reviews, meetings with alternative investment managers and site visits, the Investment Officer monitors adherence to partnership agreements and other governing agreements by reviewing allocations, distributions, expenses, restrictions, valuations, amendments, potential conflicts of interest, reporting requirements, and timely expiration of investment periods.

Changes in asset allocation, investment risk decisions, asset class portfolio structures and liquidity preferences will also result in a review of the respective investment managers involved in the asset class being changed.

Independent Firm Disclosures:

1. **Summary of qualifications.**

Cliffwater LLC was founded in 2004 and provides consulting services on over $74 billion in assets under management to institutional clients.

2. **A statement indicating the nature of any existing relationship between the firm and the system being evaluated.**

Cliffwater provides non-discretionary consulting services to TCDRS.

3. **A list of the types of remuneration received by the firm from sources other than the retirement system for services provided to the system.**

None.

4. **A statement acknowledging that the firm, or its related entities, is not directly or indirectly managing investments of the system.**

Cliffwater, or its related entities, does not directly or indirectly manage investments of the system.

TCDRS Investment Policy

Revised, April 11, 2019

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STATEMENT OF POLICIES FOR INVESTMENT OF THE ASSETS OF THE TEXAS COUNTY & DISTRICT RETIREMENT SYSTEM

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1. Introduction and Purpose

The Texas County & District Retirement System ("TCDRS" or the "System") was created to help Texas counties and districts provide reliable, reasonable retirement benefits for their employees. Investments are an important part of how those retirement benefits are funded. Our benefits are advance-funded, which means employers and employees save in advance, over the course of the employee's career, for the benefit at retirement. Because benefits are funded in advance, almost 80% of each benefit dollar comes from investment earnings.

This Investment Policy (the "Policy") is established by the TCDRS Board of Trustees (the "Board"). The Policy provides a foundation from which to oversee the management of the investment of System assets. The Policy is intended to allow for sufficient flexibility to capture investment opportunities yet provide parameters to ensure prudence and care in the management of the investment program.

The Policy documents TCDRS' investment objectives, policies, guidelines and certain procedures. It also outlines the duties and responsibilities and provides guidance to the fiduciaries of the System including The Board of Trustees, individual members of the Board ("Trustees"), the Investment Officer, staff professionals, investment consultants, performance measurement analysts, external investment managers, custodians, securities lending agents and others who exercise discretionary authority or control over the management or disposition of System assets.

In addition, the Policy states the standards and disciplines adopted so that Trustees can effectively evaluate the performance of the System staff, investment managers, investment consultants and others. This Policy also serves as compliance with Section 845.301(f) of the TCDRS Act which requires that the Board establish written investment objectives concerning the investment of assets of the System.

2. System Investment Objective

The overall investment objective of the System (the "System Investment Objective") is to attain an 8% annualized return net of fees over a long-term period (30 years or more), while diversifying the portfolio in such a manner in order to (1) achieve an acceptable level of risk in light of the investment return objective and (2) reduce the volatility of short-term investment returns in order to provide stability in benefit costs.

The Board will periodically review and evaluate the System Investment Objective, considering, among other factors, TCDRS benefit design, expected future returns and risk on invested assets, employer cost volatility and future expected cash flows as the System matures.

3. Asset Allocation Plan

A. In General

The primary means through which the Board ensures that the System achieves the System Investment Objective is through an asset allocation plan. The asset allocation plan will be developed based on a set of capital market assumptions adopted by the Board as set forth in Table

3 of Exhibit A. These assumptions provide the primary basis from which the Board can determine whether the selected asset allocation plan is designed to attain the System Investment Objective.

The asset allocation plan identifies the asset classes in which the System may invest and the corresponding allocation percentages for each such class. The Board's asset allocation plan is set forth in Table 1 of Exhibit A. These allocation percentages are market-value based and specify the minimum, maximum, and target percentages authorized by the Board for each asset class.

These minimum, maximum, and target percentages provide the framework for allocating assets of the System. Within these funding restrictions, and in light of ever-changing market conditions, the Investment Officer allocates funds to approved investment managers or authorized investment vehicles in a manner that, in the Investment Officer's judgment, enhances the System's ability to achieve the System Investment Objective over the long term. In the event an asset class exceeds the maximum allocation percentage or is below the minimum allocation percentage established for such class, the Board authorizes the Investment Officer to rebalance assets in a manner consistent with this Policy in order to bring the allocation percentage within the allowable range for the asset class.

B. Reporting and Review of Asset Allocation Plan

On a quarterly basis, the Investment Officer will provide the Board with a report on the status of the System's asset allocation plan, and the Board will formally review the System's asset allocation plan not less than annually. In the course of its review, the Board will consider current capital market assumptions, the existing allocation percentages and priorities, and possible modification to the asset allocation plan and the list of asset classes. Tables 1, 2 and 3 in Exhibit A are updated by Board action to reflect changes of asset classes, allocation parameters, and capital market assumptions.

4. Investment Monitoring

A. In General

For each asset class within the asset allocation plan, performance measurement benchmarks, investment objectives and guidelines will be established. These benchmarks, objectives and guidelines will form the basis for monitoring the investments of the System.

(1) Performance Measurement Benchmarks. The Investment Officer and investment consultants will recommend the performance measurement benchmarks for each asset class for review and approval by the Board. The performance measurement benchmarks for each asset class are set forth in Table 1 of Exhibit A. The Investment Officer and investment consultants will monitor the continued appropriateness of the performance measurement benchmarks and will recommend modifications to the benchmarks as necessary. Table 1 of Exhibit A will reflect any modifications to the benchmarks approved by the Board.

Based on the benchmarks approved for each asset class and the target asset allocation of the System, a composite benchmark for the overall portfolio of the System will be established and referred to as the "TCDRS Policy Index."[1] This composite benchmark will be utilized in monitoring the overall investment performance of the System's investments.

(2) Investment Objectives and Guidelines. TCDRS uses investment objectives and guidelines for asset classes to achieve the desired return and control risk on a portfolio-wide basis. Investment objectives and guidelines will be established for each asset class and set forth the performance expectations and the role of the asset class in the portfolio.

With respect to publicly-traded securities, investment guidelines and objectives will be established for each investment manager and will be incorporated into each respective investment manager agreement and will (1) establish relative and/or absolute performance expectations, which are a function of the efficiency of the asset class and the type of investment strategy employed, (2) delineate which investments and strategies the manager is permitted to use to achieve its performance objectives, and which investments and strategies the manager is prohibited from using, and (3) specify the characteristics a manager's portfolio is expected to display. If TCDRS is invested in a commingled investment vehicle, the manager is expected to adhere to the guidelines governing the respective vehicle.

The investment objectives and guidelines for the respective asset classes of alternative investments are set forth in Section 11, 12, and 13 of this Policy.

B. Performance Monitoring

The Board retains a performance measurement analyst to report quarterly performance of the System's investments based upon a total return using time-weighted rate of return calculations. These reports will (a) set forth the overall investment performance of the System's investments and the performance of individual investment managers within asset classes and (b) compare the overall performance of the System's investments with the System's Investment Objective set forth in Section 2 and the TCDRS Policy Index.

C. Qualitative Due Diligence

In addition to performance measurement, the Investment Officer and investment consultants will perform qualitative due diligence of the external investment managers in accordance with Section 9. In the broadest sense, the monitoring process is intended to confirm that the reasons TCDRS initially hired the manager still exist. This monitoring and review process should determine whether there has been any material deviation from the investment philosophy and process, the personnel responsible for management of the product are still in place, the organization continues to be stable, performance meets expectations, and the manager strictly adheres to investment guidelines or performance objectives set forth in the manager agreement with the System, or with respect to alternative investments, the guidelines and objectives set forth in this Policy.

[1]The benchmarks for the Hedge Funds, Strategic Credit, Direct Lending, Private Equity, and Private Real Estate asset classes will be incorporated into the TCDRS Policy Index at their actual weights, as opposed to their target allocations, until they approach their target allocations due to the extended period required to transact in these asset classes. Unfunded target allocations of the Strategic Credit, Direct Lending, Private Equity and Private Real Estate asset classes will be netted against overallocations to Cash Equivalents and Hedge Funds. Any remaining unfunded target allocations will then be invested equally between U.S. Equity and Investment-Grade Bonds and the TCDRS Policy Index weights for each increased accordingly.

D. Internal Review

To the extent available for review, the investment staff of the System monitors individual transactions to determine compliance with the TCDRS Act, this Policy, industry standards, and contractual provisions. Material exceptions are promptly reported to the Board.

E. External Audit

Annually the external auditor (1) reviews the system of internal controls of the investment process and (2) performs additional tests as are necessary to develop an opinion as to the accuracy, in terms of the financial statements as a whole, of the investment data presented within the System's annual report.

5. Standards of Care; Ethics; Prohibited Investments

A. Standards of Care

Section 67, Article XVI, Texas Constitution, is incorporated into the TCDRS Act and provides the Board's overriding standard of care as to the investment of System assets. This Section of the Texas Constitution provides, in relevant part, that the Board "shall exercise the judgment and care under the circumstances then prevailing that persons of ordinary prudence, discretion, and intelligence exercise in the management of their own affairs, not in regard to speculation, but in regard to the permanent disposition of their funds, considering the probable income therefrom as well as the probable safety of their capital."

The investment operations of the Board are also guided by the standard of review specified in the Property Code, Texas Trust Code, Section 117.004(b). This standard provides that the Board's "investment and management decisions respecting individual assets must be evaluated not in isolation but in the context of the trust portfolio as a whole and as a part of an overall investment strategy having risk and return objectives reasonably suited to the trust."

Fiduciary standards of conduct also apply to the System staff, external investment managers, investment consultants, performance measurement analyst, custodian, securities lending agent and others who exercise discretionary authority or control over the management or disposition of System assets.

B. Ethics; Placement Fees; Political Contributions

The assets of the System will be invested in accordance with all applicable laws, regulations and applicable Texas constitutional provisions including, but not limited to, Chapter 572 of the Texas Government Code and the Texas Trust Code. The Trustees, Investment Officer, and System employees in performing the investment operations of the System shall also comply with all applicable laws relating to ethics and the TCDRS Code of Ethics. In addition, all investments of the System will comply with the TCDRS Policy for Placement Agents and Political Contributions, attached to this policy as Exhibit B.

C. Prohibited Investments under Chapter 808 of the Texas Government Code

The assets of the System will be invested in accordance with Chapter 808 of the Texas Government Code (Prohibition on Investment in Companies that Boycott Israel). The Investment Officer and staff shall perform all actions necessary to ensure compliance with Chapter 808, including possible divestment of certain investments, to the extent such divestment is not otherwise excepted under Chapter 808 and such divestment is otherwise consistent with the fiduciary duties of the Trustees and the Investment Officer as contemplated by Texas Government Code Section 808.005.

6. Duties and Responsibilities of the Board of Trustees

Pursuant to the TCDRS Act, the Board is responsible for all investing activities, including:

- adopting an asset allocation plan and allocating assets of the System to various asset classes in accordance with such plan;
- selecting an Investment Officer to supervise investment operations for the Board;
- selecting private professional investment consultants and investment managers to assist in investing the assets of the System;
- selecting performance measurement analysts;
- selecting the System's custodians; and
- selecting the System's securities lending agents.

In fulfilling its duties, the Board will:

- develop an Investment Policy, periodically review such Policy, and modify such Policy in the Board's discretion or as recommended by the Investment Officer as circumstances warrant;
- establish an asset allocation plan based on capital market assumptions adopted by the Board and review such asset allocation plan no less frequently than on an annual basis;
- approve performance measurement benchmarks for all assets classes and monitor investment performance utilizing such benchmarks;
- monitor the investments of the System through quarterly reports from the Investment Officer and staff, performance measurement analyst, investment consultants, and others regarding various aspects of the investments of the System, including investment performance, adherence to manager investment objectives and guidelines, cash flow concerns, and transactions; and
- obtain such information, reports, expert advice and assistance with respect to Board actions as is necessary to exercise Board responsibilities prudently.

7. Duties and Responsibilities of the Investment Officer

A. In General

The Board will appoint an Investment Officer to supervise the investment operations on behalf of the Board (the "Investment Officer"). The Investment Officer manages the TCDRS investment funds pursuant to this Investment Policy and subject to the TCDRS Act, the TCDRS Code of Ethics, and all other applicable law and policies of the Board.

B. Duties and Responsibilities

The duties and responsibilities of the Investment Officer will include:

- allocating those assets of the System that are held for investment purposes in accordance with the asset allocation plan adopted by the Board and among such investment managers as the Board has selected;
- monitoring each investment manager and reporting to the Board regarding their performance and compliance with the provisions of the TCDRS Act, manager investment guidelines, and the policies and procedures adopted by the Board regarding investments;
- managing the investment of the portion of System assets that the Board allocates for internal investment, including selecting which securities to purchase, hold, and sell among those assets, in accordance with the policies and procedures adopted by the Board;
- reporting quarterly to the Board on the investment operations of the System as described below;
- conducting evaluations of investment service providers and investment managers for recommendations to the Board and monitoring the performance of selected providers and managers pursuant to Sections 8 and 9; and
- managing the administrative investment operations of the System, including, but not limited to, executing or terminating investment or service contracts.

C. Investment Officer's Report

The Investment Officer will report quarterly to the Board on (a) the overall performance of the System's investments, (b) the investment performance of the investment managers of each asset class within the TCDRS portfolio, (c) pursuant to Section 3B, the status of the asset allocation plan, (d) all transactions managed internally, including performance of such transactions, as applicable, (e) any material infractions (of which the Investment Officer is aware) of third party providers and managers retained by the Board to invest, settle, or safekeep the System's investment assets, and (f) any other matters requested by the Board from time to time.

D. Powers and Authority

The Investment Officer and employees selected by the Investment Officer and who work under his or her supervision may take all actions necessary to carry out the investment directions of the Board provided such actions are consistent with the terms of the TCDRS Act and other applicable law, this Policy, and the TCDRS Code of Ethics. Such actions include, but are not limited to:

- committing System funds for purchasing of securities and making other authorized investments;
- transferring funds from the accounts at the System's custodian to (1) TCDRS sub-accounts of said custodian managed on behalf of TCDRS by investment managers, (2) various investment vehicles selected by the Board, such as collective or pooled trusts or alternative investment funds, and (3) the depository account of TCDRS;

- selling securities and other interests in investment vehicles owned by the System;
- executing documents needed to carry out the investment activities of the System, including, without limitation, documents necessary for (1) the transfer of bonds, stocks and other securities, (2) the pledge, substitution and release of securities pledged to secure funds at the custodian, and (3) the subscription documentation of acquisition of interests in private market investment funds; and
- authorizing drafts against funds of the System on deposit in the operating accounts with the custodian for the purchase of securities or the transfer of funds authorized above.

E. Authority of Investment Officer to Protect the System's Interests

TCDRS understands that it is important to have the ability to quickly respond to unexpected changes in market conditions, particularly in times of volatility or financial crisis.

For the purpose of better protecting or enhancing the System's interests and achieving the System Investment Objective over the long term, in addition to and without limiting the duties, responsibilities, powers and authority already provided in this Section 7, the Investment Officer has the authority to take action with respect to any investment matter (including, without limitation, the authority to invest additional funds) involving a situation or condition for which the time to act is limited and for which it is reasonable to believe that the failure to take prompt action may adversely affect the System's interests and objectives. By way of example, and not limitation, the Investment Officer has the authority to invest additional funds in response to a capital call when the time to act is limited and it is reasonable to believe that the failure to promptly respond may adversely affect the System's interests and objectives.

If and to the extent the Investment Officer takes action pursuant to the authority provided by this Section 7E, the Investment Officer shall promptly notify the Board and provide an account of the action taken and the relevant facts and circumstances that led to the decision to take such action.

F. Evaluation of Performance

Consistent with the terms of the Board of Trustees' Policy Manual, the Board will (1) monitor the performance of the Investment Officer to ensure his or her actions are consistent with the System Investment Objectives, the terms of this Policy, the investment directions provided by the Board, and the System's Code of Ethics and (2) conduct a formal annual evaluation of the performance of the Investment Officer.

8. External Investment Service Providers

A. Investment Consultant

(1) In General. The Board will retain one or more investment consultants to provide investment data, analysis, and recommendations to assist the Board and investment staff in making optimum investment decisions. The Investment Officer will assist the Board in selecting investment consultants and monitoring their performance.

(2) Duties and Responsibilities. An investment consultant will provide services as requested by the Board and staff, which may include:

- developing appropriate investment policies;
- evaluating and recommending asset allocation alternatives;
- conducting due diligence on and searches for investment managers, custodians, or securities lending agents;
- assisting the Board in the development of investment manager guidelines and objectives;
- analyzing on-going investment performance of the System and individual managers and reporting such analysis to the Board on a quarterly basis;
- presenting to the Board formal evaluations of individual external managers;
- analyzing the financial condition of the plan;
- participating in benefit design issues; and
- providing any other investment-related services or advice that the Board or staff may request from time to time.

B. Performance Measurement Analyst

The Board will retain a performance measurement analyst to evaluate and analyze the investment results of the System's investment assets for which reliable and appropriate measurement methodology and procedures exist. The measurement analyst will provide written reports to the Board on a quarterly basis as described in Section 4B.

C. Custodian and Securities Lending Agents

(1) Custodian. The Board will retain a custodian to hold and account for the System's securities and cash available for investment. The custodian will maintain and make available information concerning the holdings and transactions of the System to the Board, the Investment Officer and staff, the investment consultants, the performance measurement analyst, and external investment managers. With respect to cash available for investment purposes, the custodian has the authority to invest such cash in accordance with Section 10. If the Board retains investment managers to manage the System's portfolios through collective investment funds, the investment managers so selected may also be appointed as custodians of the System's cash and securities for the purpose and with the authority described herein.

(2) Securities Lender. The Board may authorize an appointed custodian or other qualifying entity to lend the securities of the System. The terms by which the securities lending program is conducted shall be reflected in the applicable contractual agreements and Board actions regarding these appointments.

D. Investment Legal Counsel

The Board will retain one or more attorneys or law firms to serve as outside investment counsel for the purpose of assisting the Investment Officer and investment staff with legal matters related to the investment operations of the System. Such matters may include the review and negotiation of contracts and other investment documentation related to external investment service providers or investment managers and handling any litigation related to investment operations.

E. Selection, Monitoring, and Review of Investment Providers

(1) Selection. Unless otherwise provided above, the initial search for candidates for appointments made under this Section 8 will be conducted by the Investment Officer. The Investment Officer (or the Board) may seek the assistance of investment consultants or other external consultants in performing the search and related due diligence. Following a thorough and diligent search, the Investment Officer will recommend qualifying candidates to the Board for evaluation and final selection. All appointments made pursuant to this Section 8 require the final approval of the Board. Appropriate legal counsel for the System will review the agreement or agreements governing the relationship between the System and all appointments made pursuant to this Section 8 prior to execution of the agreement or agreements by the authorized officer of the System. Evidence of such review will be included with the agreement or agreements that are retained as part of the records of the System. The external investment providers selected by the Board are set forth on Exhibit C.

(2) Monitoring and Review. Unless otherwise provided in this Section 8, the operations and performance of the service providers in this Section 8 will be monitored by the Investment Officer. Any misconduct or violations of the terms of the applicable service agreement, this Policy, the TCDRS Act, or TCDRS Code of Ethics committed by a provider will be reported to the Board by the Investment Officer during his or her quarterly report. Consistent with the TCDRS Board of Trustees' Policy Manual, the Board will periodically review and evaluate the performance of appointees in this Section 8. In such evaluation, the Board may solicit the comments and recommendations of the Investment Officer, other investment staff, and other external consultants.

9. Investment Managers

A. Selection

In accordance with the asset allocation plan, assets in the TCDRS investment portfolio are subdivided into the asset classes shown in Table 1 of Exhibit A. The Board is ultimately responsible for the selection of investment managers to manage the portfolios within the asset classes. However, the Investment Officer and appropriate investment consultants will assist the Board in the selection process.[2] Specific selection procedures for publicly-traded investment managers and alternative investment managers are set forth in Section 9C and 9D below. The current investment managers of the various asset class portfolios are listed in Table 2 of Exhibit A.

[2] As provided under the TCDRS Code of Ethics, potential investment managers may not contact or solicit trustees directly regarding investment management services, funds or products. All solicitations and inquiries with respect to investment management opportunities should be directed to the Investment Officer or appropriate investment consultant of TCDRS. Direct contact or communication with trustees for the purpose of soliciting business opportunities may disqualify an investment manager from consideration.

B. Monitoring and Remedial Action

The operations of an investment manager will be monitored by the Investment Officer and appropriate investment consultants to ensure compliance with (a) the manager's investment objectives and guidelines or with the applicable investment guidelines and performance objectives for alternative investments, as applicable, (b) the terms of this Policy, and (c) the TCDRS Act and other applicable law. The general monitoring of System investment is discussed in Section 4, and specific monitoring procedures for publicly-traded investment managers and alternative investment managers are set forth in Section 9C(2) and 9D(4) below.

If an investment manager (1) fails to conform to the applicable investment objectives and guidelines and performance objectives, (2) fails to operate in a safe and sound manner, (3) experiences a material change in ownership or personnel that impacts the reasons TCDRS initially hired the investment manager, or (4) violates the terms of the investment manager agreement or other governing agreement, this Policy, the TCDRS Act, or other applicable law, the Investment Officer is authorized to take appropriate remedial action. Remedial action may include immediate termination. The Investment Officer shall promptly report to the Board any remedial action taken pursuant to this Section 9B.

C. Publicly-Traded Securities Investment Managers

(1) Selection and Board Approval Process. The Investment Officer and appropriate investment consultant will conduct the initial search for investment managers for publicly-traded securities portfolios and perform the due diligence required in connection with the search. The process for this search will include developing the criteria for the investment mandate, determining the appropriate managers for the investment mandate, and interviewing the most qualified candidates. The appropriate investment consultant and Investment Officer will consult following the search process and jointly recommend a candidate or candidates to the Board. The Board will evaluate such candidate(s) and make the final selection of an investment manager.

(2) Monitoring. As described in Section 4, the Investment Officer, in conjunction with an investment consultant, will monitor the operations of the investment managers selected by the Board to determine compliance with the investment guidelines and objectives established for the investment manager. With the assistance of the reports of the Investment Officer, an investment consultant, and/or performance measurement analyst, the Board will also review and monitor the investment performance of each investment manager on a quarterly basis.

(3) Periodic Review. In addition to the monitoring described above, an investment consultant will periodically, but no less frequent than once every three years, perform a formal evaluation of the performance of the publicly-traded securities investment managers. After considering the evaluations and recommendations of the appropriate investment consultant, the Board will determine what action, if any, should be taken with respect to the investment managers. The Investment Officer will maintain a schedule for these periodic reviews.

D. Alternative Investment Managers

(1) Alternative Investments—defined. For purposes of this Policy, "alternative investments" are investments within one of the following classes:

- Private equity – investments in business made through means other than through publicly-traded securities such as buyout investments and venture capital.
- Distressed debt – investments in the debt of financially distressed companies.
- Direct lending – investments in privately originated debt to companies or to real estate investors, including through business development companies, as well as other yield oriented non-correlated funds including, but not limited to, royalty streams and aviation leases.
- Strategic credit – investments primarily in debt instruments that provide return opportunities driven by dislocations in the capital markets or by credit risk.
- Hedge funds – investment strategies with the goal of achieving positive returns with a degree of independence from movements in financial markets and independent of traditional performance benchmarks.
- Real assets – investments in assets that have a return linked to inflation, such as energy related investments and other commodity based investments.
- Real estate – investments that have an ownership interest in either timber or direct real estate properties, either income or non-income producing.

Alternative investments are typically made through an interest in a limited partnership but also may be made through another vehicle (e.g., separate account, commingled fund, offshore entity, etc.), as appropriate for the individual investment.

(2) Selection. TCDRS has developed a process to source, evaluate, and select these investment opportunities as they arise. In selecting investment vehicles for recommendation, the Investment Officer and the investment consultant providing services with respect to one or more alternative asset classes (an "alternative investment consultant") shall comply with this Policy and shall endeavor to select the highest quality managers available that will enable the various alternative asset programs to meet their long-term return objectives within the parameters established by these guidelines. In connection with this process, the alternative investment consultant shall conduct extensive due diligence on potential alternative investments for the purpose of making recommendations to the Board. Selection of alternative asset vehicles will take into consideration the following criteria:

- Quality and stability of the firm and investment team;
- Previous investment track record of the investment vehicle manager;
- Proposed investment strategy;
- Ability of investment vehicle manager to demonstrate capability to generate superior returns;
- Operational capabilities;
- Legal and economic terms governing the partnership or other vehicle;
- Alignment of interests; and
- TCDRS portfolio fit.

Recognizing the importance of vintage year diversification and the importance of striving to achieve adequate portfolio diversification by investing in different types of alternative asset investments, in different partnerships or other vehicles, with managers representing various investment styles, industries and geographic concentrations, the Investment Officer and alternative investment consultant will develop an annual plan for alternative investments in private equity, private real estate, and distressed debt and present each such plan to the Board. This annual plan will reflect a pace of commitments that, considering forecasted cash flows, is expected to achieve the System's targeted allocation to the alternative asset class over a reasonable time period. This annual plan will be integrated with the existing portfolio and the prevailing economic environment and market conditions.

(3) Board Approval Process. Because of the level of diligence and operational flexibility required to make certain alternative investments in a timely and prudent manner, the Board has established a process for the approval of alternative investments.

The alternative investment consultant and the Investment Officer will periodically present to the Board for approval a list of recommended investments in each alternative investment asset class. These alternative investments will be recommended based on the alternative investment consultant's analysis and due diligence performed on such alternative investments.

Once the Board has approved the list of recommended investments, the Investment Officer and the alternative investment consultant will select investments from such list to carry out the annual plan for each of the alternative investment asset classes. The investments will be selected in a manner intended to enable TCDRS to meet its long-term return objectives set forth for the respective asset class. The investment objectives and guidelines for the respective asset classes of alternative investments are set forth in Section 11, 12, and 13 of this Policy. Once an investment is selected, the alternative investment consultant's analysis for each selected investment will be set forth in a report and made available to the Board.

Not all recommended alternative investments on the list approved by the Board will be completed for reasons including, but not limited to, unavailability of capacity on the part of the approved alternative investment, selection(s) by the Investment Officer and alternative investment consultant among approved alternative investments with similar strategies, and an inability to successfully negotiate legal and/or economic terms. Counsel employed by TCDRS will review and assist in the negotiation of each approved alternative investment's governing legal documents.

In addition to approving the list of recommended investments, the Board may authorize the Investment Officer to invest in alternative investments that have not previously been presented to the Board if an investment opportunity arises on which action must be taken prior to the next meeting of the Board. An authorization of this type will identify the asset classes in which the Investment Officer has such approval and place both aggregate and individual dollar limits for such investment. The Investment Officer shall promptly notify the Board of any investments made pursuant to this provision, and the Board will ratify such investments at its next regularly scheduled meeting.

(4) Monitoring. As described in Section 4, the Investment Officer, in conjunction with the alternative investment consultant, will monitor the operations of the alternative investments selected by the Board to determine compliance with the applicable investment guidelines and objectives. In the monitoring process for alternative investments, the Investment Officer and staff and/or alternative investment consultant will extend the initial due diligence into a formal process which regularly seeks to determine whether the manager is meeting the applicable alternative asset program's investment objectives and guidelines, as well as other requirements. In the broadest sense, the monitoring process is intended to determine whether the initial reasons for selecting the investment vehicle remain valid and focuses on the following:

- Compliance with reporting and valuation requirements;
- Continuity of investment philosophy and process;
- Stability of personnel and organization; and
- Performance and risk management.

Additionally, in connection with monitoring alternative investments, the Investment Officer and staff and/or alternative investment consultant shall conduct portfolio reviews and on-site due diligence as necessary. Site visits will also be performed to confirm that appropriate infrastructure is in place to support the investment process.

With respect to the monitoring of alternative investments, the System will also take appropriate advantage of the rights offered TCDRS through limited partnership agreements or other governing agreements. In addition to regular performance and portfolio reviews, meetings with alternative investment managers and site visits, the Investment Officer will monitor adherence to partnership agreements and other governing agreements by reviewing allocations, distributions, expenses, restrictions, valuations, amendments, potential conflicts of interest, reporting requirements, and timely expiration of investment periods.

E. Legal Review and Terms and Conditions

Investment legal counsel for the System will review the agreement or agreements governing the relationship between the System and all selections made pursuant to this Section 9 prior to execution of the agreement or agreements by the authorized officer of the System. Evidence of such review will be included with the agreement or agreements that are retained as part of the records of the System.

In addition, the Board may establish policies relating to the terms and conditions for investment agreements as set forth in Exhibit D. The Investment Officer may waive any requirements or directives for terms and conditions of investment agreements set forth in the Board's policy if the Investment Officer believes proceeding with such investment without such terms and conditions is in the best interests of the System.

10. Investment Guidelines and Performance Measurement Standards for Internally Managed Assets

A. Cash Equivalents

Cash equivalents may be invested in investment grade instruments and funds that are safe, sound, liquid and provide competitive returns. Additionally, the Board may select entities to serve as custodians of the System's cash available for investment and may authorize the custodians to invest the cash so held in short-term securities**.**

11. Investment Guidelines and Performance Measurement Standards for Private Equity Portfolios

A. Introduction

The following investment guidelines and objectives govern the implementation of the Private Equity Program. The Private Equity Program includes venture capital, buyout and real asset investments, which comprise the Private Equity asset allocation of the System, as well as Distressed Debt, Strategic Credit, and Direct Lending asset allocations of the System.

B. Investment Objective

The investment objective of the Private Equity Program is to enhance the total fund performance through the investment in non-publicly-traded securities by generating a long-term rate of return that exceeds that of publicly-traded equities. Private equity investments are expected to be illiquid and long-term in nature.

Given the above investment objective, the overall expectations of the Private Equity Program and its various components are as follows:

- *Overall Expectation for Private Equity Program*: Over the long-term, performance of the Private Equity Program is expected to exceed the TCDRS U.S. Equity asset class benchmark by 3%, net of fees and expenses.

- *Overall Expectation for Distressed Debt Component*: Over the long term, performance of the Distressed Debt component of the Private Equity Program is expected to exceed that of the TCDRS Strategic Credit asset class benchmark by 3%, net of fees and expenses.

- *Overall Expectation for Direct Lending Component:* Over the long term, performance of the Direct Lending component is expected to exceed that of the TCDRS Strategic Credit asset class benchmark by 2%, net of fees and expenses.

- *Overall Expectation for Strategic Credit Component*: Over the long term, the Strategic Credit component is expected to exceed that of the TCDRS Strategic Credit asset class benchmark, net of fees and expenses.

The long-term investment performance objectives of the Private Equity Program and its various components are set forth in Table 2 of Exhibit A.

The Distressed Debt, Direct Lending, and Strategic Credit components of the Private Equity Program will have performance benchmarks appropriate for credit asset classes, and such performance benchmarks will be utilized when incorporating the allocation of these components of the Private Equity Program into the TCDRS Policy Index.

C. Investment Guidelines

(1) Private Equity Investments. Investment is authorized in vehicles that invest in a broad array of various non-publicly-traded securities, including but not limited to:

- *Buyout Investments* include investments in acquisitions, growth equity, recovery investments, subordinated debt, and special situations (a class which represents a diversified strategy across many sub-classes). Investments are made across the market capitalization spectrum and typically involve the purchase of a control position (primarily majority positions, with some minority positions) in an established company and may include the use of leverage. Investments are typically made in years one through six and returns typically occur in years three through ten. Investments may be made in companies that are either U.S. or non-U.S. domiciled.
- *Venture Capital Investments* include investments in companies in a range of stages of development from start-up/seed-stage, early stage, and later/expansion stage. Investments are typically made in years one through six and returns typically occur in years four through ten. Investments may be made in companies that are either U.S. or non-U.S. domiciled.
- *Distressed Debt Investments* include investments in the debt instruments of companies which may be publicly traded or privately held that are financially distressed and are either in bankruptcy or likely candidates for bankruptcy. Typical holdings are senior and subordinated debt instruments and bank loans. Equity exposure is acceptable as debt positions are often converted to equity during the bankruptcy reorganization process. Investments are typically made in years one through five and returns typically occur in years three through ten. Investments may be made in companies that are either U.S. or non-U.S. domiciled.
- *Direct Lending Investments* include investments primarily in privately originated debt and preferred equity instruments to companies (including through business development companies) and privately originated senior and mezzanine debt for real estate investors that provide return opportunities resulting from dislocations in the capital markets. Direct lending investments may also include other types of yield oriented non-correlated funds including, but not limited to, royalty streams and aviation leases. Investments may be made that are either U.S. or non-U.S. domiciled.
- *Strategic Credit Investments* include investments primarily in debt instruments that provide return opportunities resulting from dislocations in the capital markets or from credit risk. Investments may be made in companies that are either U.S. or non-U.S. domiciled.
- *Real Asset Investments* include investments in assets that have a return linked to inflation, such as energy related investments and other commodity based investments.

Real estate and timber investments are excluded from this category. Investments may be made in companies that are either U.S. or non-U.S. domiciled.

- *Co-Investments* include direct investments in companies made alongside the System's existing general partners and may include both control positions or non-control positions where there are significant governance rights and control provisions. They may include buyout, growth equity and real asset investments and may be in companies that are U.S. or non-U.S. domiciled. Co-investments are subject to the specific guidelines set forth in Section 11C(10) below.

(2) Private Equity Investment Targets. For the Private Equity Program, the targeted and range of investment exposures, measured at fair value, to the various private equity investment classes are shown in the following table:

Style	Target	Minimum	Maximum
Buyout	50%	30%	70%
Venture Capital	20%	10%	35%
Non-U.S.	20%	5%	30%
Real Assets	10%	0%	25%
Co-investments	0%	0%	10%
Total	100%		

Note: The Non-U.S. exposure refers to where the partnership or other vehicle is domiciled. The real asset exposure refers to the targeted strategy of the partnership or other vehicle.

The targets for the Distressed Debt, Direct Lending and Strategic Credit components of the Private Equity Program are listed in Table 1 of Exhibit A as separate investment allocations.

It is recognized that it may take an extended period for the Private Equity Program to be fully invested and that there may be deviations from the previously mentioned targets during the initial funding period.

(3) Investment Vehicles. The vehicles for private equity investments are typically limited partnerships, but may also include other entities such as limited liability companies or offshore corporations. These investment vehicles may invest in any type of security throughout the capital structure.

(4) Industry/Geographic Concentration. TCDRS shall endeavor to limit the potential for any one investment to negatively impact the long-term results of the Private Equity Program by investing across a variety of industries and geographic locations. For investments in venture capital, it is recognized that opportunities may be most readily available in a relatively limited number of industries.

(5) Investment Vehicle Concentration. Other than Strategic Credit or Direct Lending funds, TCDRS shall not comprise more than 30% of any one investment vehicle, inclusive of assets in a master fund and/or offshore fund. Any one investment vehicle may not comprise more than 10% of the Private Equity Program once it is fully invested, calculated on a committed capital basis. The optimum number of investment vehicles in the portfolio and the maximum exposure to any one investment vehicle varies with time and will be evaluated as part of the annual plan for the Private Equity Program.

(6) Investment Timing. TCDRS shall strive to limit the potential for any one investment to negatively impact the long-term results of the Private Equity Program by investing across business cycles and vintage years. Investments shall be selected with the goal of gaining exposure to the array of financing stages by opportunistically exploiting the best investments at different stages of the business cycle.

(7) Liquidity. Private equity investments are illiquid and typically have expected holding periods of 10-12 years. Investments are typically held until maturity and selling prior to maturity may result in realizing a sales price that reflects a discount to fair market value. Liquidity risk is managed by minimizing the possibility of forced sales that may arise from exceeding maximum exposure limits or lowering asset allocation targets to private equity investments.

(8) Distributed Securities. TCDRS shall ordinarily direct the sale of securities distributed by its investment vehicles as soon as practically possible and strive to not impair the value of the security.

(9) Performance Evaluation. The individual investment vehicle performance, as measured by the internal rate of return, will be evaluated compared to the performance of respective peer universes and vintage years, as reflected by the Private Equity Program benchmark; provided, however, the Strategic Credit, Distressed Debt and Direct Lending components within the Private Equity Program will instead be evaluated compared to the asset class benchmarks set forth on Table 1 of Exhibit A. **It is recognized that immature private equity investments will ordinarily have a "J-curve effect" whereby there are low to negative returns in the initial years due to the payment of investment management fees during a period when investments are typically carried at cost and returns have not been realized.**

(10) Co-Investment Guidelines

Category	Guideline
Annual capital deployment	Not to exceed 10% of targeted private equity annual commitments
GP relationship	May only co-invest with the System's existing general partners
Max equity size	Not more than $25 million co-investment in any transaction determined at the time of initial co-investment
Max equity ownership per deal	Not more than 40% of the direct investment (combined ownership through the fund and co-investment) determined at the time of initial co-investment
Max number of deals per year	10
Investment style	No co-investments in venture capital
Investment strategy	Co-investments must be consistent with the general partner's strategy, focus and skill set
Control	May only invest in companies where the Investment Group (consisting of general partner, co-investment partners and affiliated funds) has control or is in a non-control position but has significant governance rights and control provisions
Board representation	General Partner must have at least one Board seat
Investment vehicle	Prefer partnership structure to limit liability, but investment can be made directly as well
Terms	On substantially similar or better terms and conditions as provided to the primary partnership or the partnership in which the System is invested

12. Investment Guidelines and Performance Measurement Standards for Private Real Estate Portfolios

A. Introduction

The following investment guidelines govern the implementation of the Private Real Estate Program.

B. Investment Objective

The investment objective of the Private Real Estate Program is to enhance the total fund performance through the investment in non-publicly-traded vehicles that invest in a broad array of real estate properties and ventures by generating a long-term rate of return that exceeds that of publicly-traded real estate securities. Private real estate investments are expected to be illiquid and long-term in nature.

Given the above investment objective, the overall performance expectation of the Private Real Estate Program is to, over the long-term, exceed the Private Real Estate Program benchmark as set forth in Table 1 of Exhibit A. Performance of the Private Real Estate Program will also be compared against such benchmark.

C. Investment Guidelines

(1) Private Real Estate Investments. Investment is authorized in vehicles that invest in a broad array of real estate properties and ventures, including but not limited to:

- *Real Estate Partnerships* include investments in private vehicles (e.g. limited partnerships or limited liability companies) that have an ownership interest in direct real estate properties, either income-producing or non-income producing. The investment strategies may include those defined as “value-added” or “opportunistic.” “Value added” strategies derive their return from both income and appreciation. “Opportunistic” strategies derive their return primarily through appreciation. Investments may be made in companies that are either U.S. or non-U.S. domiciled.
- *Timber Partnerships* include investments in private vehicles (e.g., limited partnerships or limited liability companies) that have an ownership interest in properties where the majority value of the property is derived from income producing timber. Investments may be made in companies that are either U.S. or non-U.S. domiciled.

(2) Private Real Estate Investment Targets. For the Private Real Estate Program, the targeted and range of investment exposures to the various private real estate investment classes are shown in the following table:

Style	Target	Minimum	Maximum
Value Added	20%	0%	30%
Opportunistic	80%	60%	100%
Timber	0%	0%	20%
Total	100%		

It is recognized that it may take an extended period of time for the Private Real Estate Program to be fully invested and that there may be deviations from the previously mentioned targets during the initial funding period.

(3) Investment Vehicles. The vehicles for private real estate investments are typically partnerships but may also include other entities such as limited liability companies or offshore corporations. These investment vehicles may invest in a broad array of real estate properties and ventures.

(4) Property Type/Geographic Concentration. TCDRS shall endeavor to limit the potential for any one investment to negatively impact the long-term results of the Private Real Estate Program by investing across a variety of property types and geographic locations.

(5) Investment Vehicle Concentration. TCDRS shall not comprise more than 30% of any one investment vehicle, and any one investment vehicle may not comprise more than 10% of the Private Real Estate Program once it is fully invested, calculated on a committed capital basis. The optimum number of investment vehicles in the portfolio and the maximum exposure to any one investment vehicle varies with time and will be evaluated as part of the annual plan for the Private Real Estate Program.

(6) Investment Timing. TCDRS shall strive to limit the potential for any one investment to negatively impact the long-term results of the Private Real Estate Program by investing across business cycles and vintage years.

(7) Liquidity. Private real estate investments are illiquid and typically have expected holding periods of 8-10 years. Investments are typically held until maturity and selling prior to maturity may result in realizing a sales price that reflects a discount to fair market value. Liquidity risk is managed by minimizing the possibility of forced sales that may arise from exceeding maximum exposure limits or lowering asset allocation targets to private real estate investments.

(8) Distributed Securities. TCDRS shall ordinarily direct the sale of securities distributed by its investment vehicles as soon as practically possible and strive to not impair the value of the security.

(9) Performance Evaluation. The individual investment vehicle performance, as measured by the internal rate of return, will be evaluated compared to the performance of respective peer universes and vintage years, as reflected by the Private Real Estate Program benchmark set forth on Table 1 of Exhibit A. **It is recognized that immature private real estate investments will ordinarily have a "J-curve effect" whereby there are low to negative returns in the initial years due to the payment of investment management fees during a period when investments are typically carried at cost and returns have not been realized.**

13. Investment Guidelines and Performance Measurement Standards for Hedge Fund Portfolios

A. Introduction

The following investment guidelines govern the implementation of the Hedge Fund Program.

B. Investment Objective

The investment objective of the Hedge Fund Program is to utilize a portfolio of hedge funds to achieve positive returns with a degree of independence from movements in equity and fixed income markets and independent of traditional performance benchmarks. Hedge funds represent a distinctive investment style that is different from traditional, long-only funds. A fundamental difference is that hedge fund managers may use a wider range of investment techniques, such as leverage, short selling and derivatives to achieve their objectives. A portfolio of hedge funds is expected to deliver an absolute return with a risk level between that of stocks and bonds. The portfolio should also have a low correlation with other asset classes and therefore help diversify TCDRS. As such, the objective of the Hedge Fund Program is to reduce the volatility of the TCDRS total fund while continuing to maximize returns in a variety of market environments.

Given the above investment objective, the overall expectation and performance of the Hedge Fund Program will be compared against the benchmark for the Hedge Fund Program as set forth on Table 1 of Exhibit A.

C. Investment Guidelines

(1) Hedge Fund Styles. Investment is authorized in hedge funds that use a broad array of various hedge fund styles, including but not limited to:

- *Market Neutral strategies* such as equity market neutral, fixed income arbitrage, and convertible bond arbitrage.
- *Event Driven strategies* such as risk arbitrage, merger arbitrage, activist and other event-driven strategies.
- *Credit/Distressed strategies* such as capital-structure arbitrage, fixed-income arbitrage, and distressed debt/equity.
- *Equity long/short strategies* where there is combination of long and short positions primarily in publicly-traded equities, with a net market exposure less than that of the overall equity market. Strategies may be focused on U.S., non-U.S., and/or specialty mandates.
- *Global Macro strategies* such as all market portfolios, opportunistic long-only, managed futures, currency, dedicated short selling strategies or other specialty strategies.
- *Multi-strategies* where hedge funds invest using a combination of previously described strategies.

(2) Hedge Fund Investment Targets. For the Hedge Fund Program, the targeted and range of investment exposures to the various hedge fund styles are shown in the following table:

Style	Target	Minimum	Maximum
Market Neutral	5%	0%	20%
Event Driven	10%	0%	30%
Credit/Distressed	30%	15%	40%
Equity Long/Short	35%	15%	50%
Global Macro	15%	0%	30%
Multi-Strategy	5%	0%	15%
Total	100%		

(3) **Investment Vehicles.** The vehicles for hedge fund investments are typically a variety of commingled vehicles, such as limited partnerships, limited liability companies, or offshore corporations. Separately managed accounts and "fund of one" structures may also be utilized.

(4) **Investment Constraints.** No more than 15% of the Hedge Fund Program's market value of assets may be invested in any single Multi-Strategy hedge fund, and no more than 15% of the Hedge Fund Program's market value of assets may be invested in any single-strategy hedge fund (Market Neutral, Event Driven, Credit/Distressed, Equity Long/Short, Global Macro). The weightings to individual funds and exposures may temporarily exceed the limits previously indicated to the extent that lock-up periods or other liquidity restrictions with respect to a hedge fund prevent an immediate reallocation.

(5) **Liquidity.** Individual hedge fund investments may have specified liquidity parameters defining lock-up periods and withdrawal frequency. Liquidity risk is managed by monitoring and maintaining a schedule of the liquidity of the individual hedge funds and aggregating it at the total Hedge Fund Program level.

(6) **Distributed Securities.** TCDRS shall ordinarily direct the sale of securities distributed by its investment vehicles as soon as practically possible and strive to not impair the value of the security.

(7) **Performance Evaluation Benchmark.** The performance of individual hedge funds will be evaluated relative to peer universes, as measured by the Hedge Fund Program's benchmark on Table 1 of Exhibit A.

14. Proxy Voting

TCDRS recognizes that publicly-traded securities and other assets of the System include certain ancillary rights, such as the right to vote on shareholder resolutions at companies' annual shareholders' meetings. The investment managers may be authorized to vote proxies or respond to "corporate action notifications" on such securities all in accordance with the contracts between the System and such managers. Each appropriate investment manager contract will include proxy voting guidelines that have been reviewed by the Investment Officer and an investment consultant.

15. Review and Modification of Investment Policy

The Board will review this Policy on a regular basis and may modify this Policy from time to time at the Board’s discretion. Modifications to the Policy may also be submitted for consideration to the Board by the Investment Officer as circumstances warrant.

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Exhibits

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Exhibit A

Tables for Asset Allocation Parameters, Individual Investment Manager Portfolio Parameters, and Capital Market Assumptions

Table 1. Asset Allocation Parameters

Asset Class (Portfolio)	Measurement Benchmark (Index)	Min %	Max %	Target %
U.S. Equities	Dow Jones U.S. Total Stock Market Index	7%	18%	10.5%
Global Equities	MSCI World (net) Index	0%	6%	2.5%
Intl Equities – Developed Markets	MSCI World ex USA (net) Index	6%	16%	10%
Intl Equities – Emerging Markets	MSCI Emerging Markets (net) Index	3%	11%	7%
Investment-grade Bonds	Bloomberg Barclays US Aggregate Bond Index	1%	15%	3%
Strategic Credit[1, 2]	FTSE High-Yield Cash-Pay Capped Index	5%	19%	12%
Direct Lending[1, 2]	S&P/LSTA Leveraged Loan Index	4%	18%	11%
Distressed Debt[1]	Cambridge Associates Distressed Securities Index[5]	1%	5%	2%
TIPS	Bloomberg Barclays US 10 Year Breakeven Inflation Index	0%	3%	0%
REIT Equities	67% FTSE NAREIT All Equity REITs Index +33% S&P Global REIT (net) Index	0%	5%	2%
Commodities	Bloomberg Commodities Index	0%	3%	0%
Master Limited Partnerships	Alerian MLP Index	1%	5%	3%
Private Real Estate Partnerships[2]	Cambridge Associates Real Estate Index[3]	1%	10%	6%
Private Equity[2]	Cambridge Associates Global Private Equity & Venture Capital Index[4]	10%	26%	18%
Hedge Funds[2]	Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index	5%	20%	13%
Cash Equivalents[2]	90-day US Treasury	0%	10%	0%

[1]Although Strategic Credit, Direct Lending, and Distressed Debt are part of and subject to the investment guidelines of the Private Equity Program, the objectives and performance characteristics of these investments are more similar to credit investments and, thus, such investments are placed in separate asset classes as opposed to Private Equity.

[2] Due to the extended period required to transact in Hedge Funds, Strategic Credit, Direct Lending, Private Equity and Private Real Estate asset classes, the benchmarks for these asset classes will be incorporated into the TCDRS Policy Index at their actual weights until they approach their target allocations. Unfunded target allocations of the Strategic Credit, Direct Lending, Private Equity and Private Real Estate asset classes will be netted against overallocations to Cash Equivalents and Hedge Funds. Any remaining unfunded target allocations will then be invested equally between U.S. Equity and Investment-Grade Bonds with the TCDRS Policy Index weights for each increased accordingly.

[3] Includes vintage years 2007-present of Quarter Pooled Horizon IRRs.
[4] Includes vintage years 2006-present of Quarter Pooled Horizon IRRs.
[5] Includes vintage years 2005-present of Quarter Pooled Horizon IRRs.

Table 2. Individual Investment Manager Portfolio Parameters

Asset Classes (Portfolios)	Investment Manager	Investment Style	Long-term Performance Objective
U.S. Equities	State Street Global Advisors	Passive	Replicate return of Dow Jones U.S. Total Stock Market Index before fees
International Equities - Developed	State Street Global Advisors	Passive	Replicate return of MSCI World ex USA (net) Index before fees
	Marathon-London International Fund	Active	Annualized net returns > 150 bps* over MSCI EAFE (net) Index over rolling 5-year periods
International Equities - Emerging	State Street Global Advisors	Passive	Replicate return of MSCI Emerging Markets (net) Index
	Dimensional Fund Advisors	Active	Annualized net returns > 100 bps* over MSCI Emerging Markets (net) Index
	JP Morgan, Marshall Wace, and Wellington Management Co., LLP	Active	Annualized net returns > 200 bps* over MSCI Emerging Markets (net) Index
Global Equities	Viking Long Fund, LP	Active	Annualized net returns > 200 bps* over MSCI World (net) Index
	Marshall Wace		Annualized net returns > 200 bps* over MSC ACWI (net) Index
TIPS	Western Asset Management Co.	Active	Annualized net returns > 15 bps* over Bloomberg Barclays US 10 Year Breakeven Inflation Index
Investment-grade Bonds	Jennison Associates Dodge & Cox Prudential Investment Mgmt.	Active	Annualized net returns > 50 bps* over Bloomberg Barclays US Aggregate Bond Index & rank in top half of managers with similar objectives over 3-5 year horizon
Distressed Debt	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Distressed Securities Index[3]
Direct Lending	Portfolio of Managers	Active	Annual net returns > S&P/LSTA Leveraged Loan Index
Strategic Credit	Portfolio of Managers	Active	Annualized net returns > FTSE High-Yield Cash-Pay Capped Index
REIT Equities	Cohen & Steers	Active	Annualized net returns > 200 bps* over FTSE NAREIT All Equity REITs Index & rank in top half of managers with similar objectives over 3 to 5-year horizon
	Dimensional Fund Advisors (global)	Active	Annual net returns > S&P Global REIT (net) Index
Commodities	Wellington Management Co., LLP Gresham Investment Management	Active	Annualized net returns > 100 bps over Bloomberg Commodities Index
Master Limited Partnerships	Harvest Fund Advisors	Active	Annualized net returns > Alerian MLP Index
Private Real Estate Partnerships	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Real Estate Index [1]
Private Equity	Portfolio of Managers	Active	Annual net returns > Cambridge Associates Global Private Equity & Venture Capital Index[2]
Hedge Funds	Portfolio of Managers	Active	Annual net returns > Hedge Fund Research, Inc. (HFRI) Fund of Funds Composite Index
Cash Equivalents	Investment Officer	Active	Realize competitive, overnight returns

*A return of one hundred basis points (bps) is equivalent to a 1% return.
[1] Includes vintage years 2007-present of Quarter Pooled Horizon IRRs.
[2] Includes vintage years 2006-present of Quarter Pooled Horizon IRRs.
[3] Includes vintage years 2005-present of Quarter Pooled Horizon IRRs.

Table 3. Capital Market Assumptions---Expected Return, Risk and Correlations between Asset Classes

(Adopted April 11, 2019)

	Public Equity				Fixed Income	Cash	Real Assets					Private Equity	Hedge Funds	Credit		
	U.S. Stock	Dev. Intl Stocks	Emerging Mkt Stocks	Global Stocks	Inv Grade Bonds	LIBOR (cash)	10-yr TIPS	Public REITs	MLPs	Commodities	Pvt RE Funds	Private Equity	Hedge Funds	Distressed Debt	Direct Lending	Strategic Credit
Return (%Geometric)	7.10	7.10	7.60	7.40	3.30	2.30	2.70	5.85	7.05	4.25	8.00	10.10	5.60	8.90	9.65	6.09
Risk (%)	17.00	18.00	26.00	17.70	4.00	2.00	7.00	22.00	17.00	18.00	30.00	20.00	4.45	11.00	12.00	5.86
<u>Correlations:</u>																
U.S. Stock	1.00	0.85	0.85	0.90	0.00	0.00	0.00	0.70	0.50	0.35	0.60	0.80	0.70	0.65	0.65	0.60
Dev. Intl Stocks	0.85	1.00	0.80	0.90	0.00	0.00	0.15	0.65	0.50	0.50	0.55	0.70	0.70	0.60	0.60	0.60
Emerging Mkt Stocks	0.85	0.80	1.00	0.85	0.05	0.05	0.15	0.65	0.54	0.55	0.50	0.60	0.65	0.60	0.60	0.60
Global Stocks	0.90	0.90	0.85	1.00	0.00	0.00	0.10	0.65	0.51	0.45	0.50	0.70	0.70	0.60	0.60	0.60
Inv Grade Bonds	0.00	0.00	0.05	0.00	1.00	0.05	0.80	0.15	-0.05	0.05	0.00	0.00	0.00	0.19	0.19	0.00
LIBOR (cash)	0.00	0.00	0.05	0.00	0.05	1.00	-0.05	-0.15	0.00	-0.10	0.00	0.00	-0.10	-0.15	-0.15	0.00
10-yr TIPS	0.00	0.15	0.15	0.10	0.80	-0.05	1.00	0.20	0.15	0.35	0.00	0.00	0.15	0.30	0.30	-0.10
Distressed Debt	0.65	0.60	0.60	0.60	0.19	-0.15	0.30	0.65	0.65	0.35	0.70	0.65	0.70	1.00	0.80	0.80
Public REITs	0.70	0.65	0.65	0.65	0.15	-0.15	0.20	1.00	0.35	0.25	0.65	0.60	0.55	0.65	0.65	0.30
Pvt RE Funds	0.60	0.55	0.50	0.50	0.00	0.00	0.00	0.65	0.35	0.10	1.00	0.60	0.20	0.70	0.70	0.30
Private Equity	0.80	0.70	0.60	0.70	0.00	0.00	0.00	0.60	0.50	0.20	0.60	1.00	0.30	0.65	0.80	0.50
Hedge Funds	0.70	0.70	0.65	0.70	0.00	-0.10	0.15	0.55	0.60	0.60	0.20	0.30	1.00	0.70	0.70	0.70
Commodities	0.35	0.50	0.55	0.45	0.05	-0.10	0.35	0.25	0.40	1.00	0.10	0.20	0.60	0.35	0.35	0.60
MLPs	0.50	0.50	0.54	0.51	-0.05	0.00	0.15	0.35	1.00	0.40	0.35	0.50	0.60	0.65	0.65	0.30
Direct Lending	0.65	0.60	0.60	0.60	0.19	-0.15	0.30	0.65	0.65	0.35	0.70	0.80	0.70	0.80	1.00	0.80
Strategic Credit	0.60	0.60	0.60	0.60	0.00	0.00	-0.10	0.30	0.30	0.60	0.30	0.50	0.70	0.80	0.80	1.00

Source: Cliffwater LLC

Based on the asset allocation plan adopted by the Board and the capital market assumptions set forth above, the expected annualized investment return of the System is 8.3% and the expected risk is 12.4%.

Exhibit B

TCDRS Policy for Placement Agents and Political Contributions

In order to ensure the integrity and independence of the investments of the System and conformity with applicable fiduciary, ethical, and legal standards, the System will not knowingly invest with an investment manager or investment vehicle if (a) the manager or vehicle directly or indirectly pays finder's fees, brokerage fees, or similar fees or commissions ("Placement Fees"), other than to an officer, member, partner, or employee of such manager or vehicle, as a result of the System's investment with such manager or vehicle, (b) the manager or vehicle directly or indirectly pays any compensation or benefits to a Trustee, officer, or key employee (as defined in the TCDRS Code of Ethics) of the System (a "System Representative") or, to such investment manager's or vehicle's knowledge, to an immediate family member of such Trustee, officer, or key employee in connection with the System's investment, or (c) the System will bear any Placement Fees in connection with any investment, whether or not the Placement Fees arise as a result of the System's investment.

In addition, the System will not knowingly invest with an investment manager or investment vehicle if the manager or vehicle (or any officer, director, employee or owner of such manager or vehicle) has within the two previous years made a political contribution to a Trustee who is an elected official. Investment managers and vehicles with whom the System invests should also be aware that, for purposes of compliance with applicable law, Trustees are appointed under Texas Government Code section 845.002, which provides "The governor shall appoint the members of the board of trustees with the advice and consent of the senate."

In conjunction with this Policy, an investment consultant, when performing due diligence on prospective investments of the System, shall inquire as to the payment and expensing of Placement Fees and provide any relevant information to the Investment Officer.

Additionally, any investment manager or vehicle that contracts with the System should represent or confirm through provisions in its contract that such investment manager or vehicle (a) has not directly or indirectly paid, and no person is entitled to, Placement Fees in connection with the System's investment, (b) has not directly or indirectly paid compensation or benefits to any System Representative or, to such investment manager's or vehicle's knowledge, an immediate family member of a System Representative, in connection with the System's investment, (c) the System will not bear any Placement Fees, and (d) within the two previous years no political contributions have been made by the investment manager or vehicle (or any officer, director, employee or owner of such investment manager or vehicle) to any Trustee who is an elected official. Any investment manager or vehicle that contracts with the System should also acknowledge that Trustees are appointed under Texas Government Code section 845.002, as provided above.

The foregoing notwithstanding, in the event that an investment manager or vehicle cannot make the representations, confirmations or acknowledgements set forth in clauses (a), (b) or (c) above, the investment manager or vehicle shall disclose the relevant transactions or circumstances that prevent it from agreeing to such contractual provisions, and the Investment Officer and System legal counsel will determine whether or not (1) alternative contractual representations or acknowledgements are appropriate and (2) the investment will otherwise satisfy the purpose of this Policy and applicable law; and, if so determined by the Investment Officer and System legal counsel, the System may make such investment.

Exhibit C

List of Investment Service Providers

In managing the assets of the System, the Board has retained the following providers of investment services to assist in the management of investment assets:

Investment Service Providers

Investment Services Provided	**Provider**
Custodian	• BNY Mellon Corporation (Boston, MA)
Securities Lending Agents	• BNY Mellon Corporation (Boston, MA)
Performance Measurement Analyst	• BNY Mellon Corporation (Boston, MA)
Investment Consultant (General)	• Cliffwater, LLC (Marina del Rey, CA)
Investment Consultant (Private Equity)	• Cliffwater, LLC (Marina del Rey, CA)
Investment Consultant (Real Estate)	• Cliffwater, LLC (Marina del Rey, CA)
Investment Consultant (Hedge Funds)	• Cliffwater, LLC (Marina del Rey, CA)
Legal Counsel	• Vinson & Elkins LLP • Jackson Walker L.L.P. • DLA Piper LLP

Whenever the System changes investment service providers on action by the Board, this table shall automatically be amended to reflect such action.

Exhibit D

Policy for Terms and Conditions of Investment Agreements

It is the policy of the System in connection with its investments that the System:

- will not agree to the arbitration of disputes arising out of or in connection with such investment;

- will not agree to consent to jurisdiction or venue in any courts other than applicable state or federal courts of the State of Texas;

- will require the investment manager, investment vehicle and such investment vehicle's general partner, managing member or investment manager to agree to bring any action which such investment manager or such general partner, managing member or investment manager of an investment vehicle (for itself or on behalf of the investment vehicle) may institute against the System only in applicable state or federal courts of the State of Texas; and

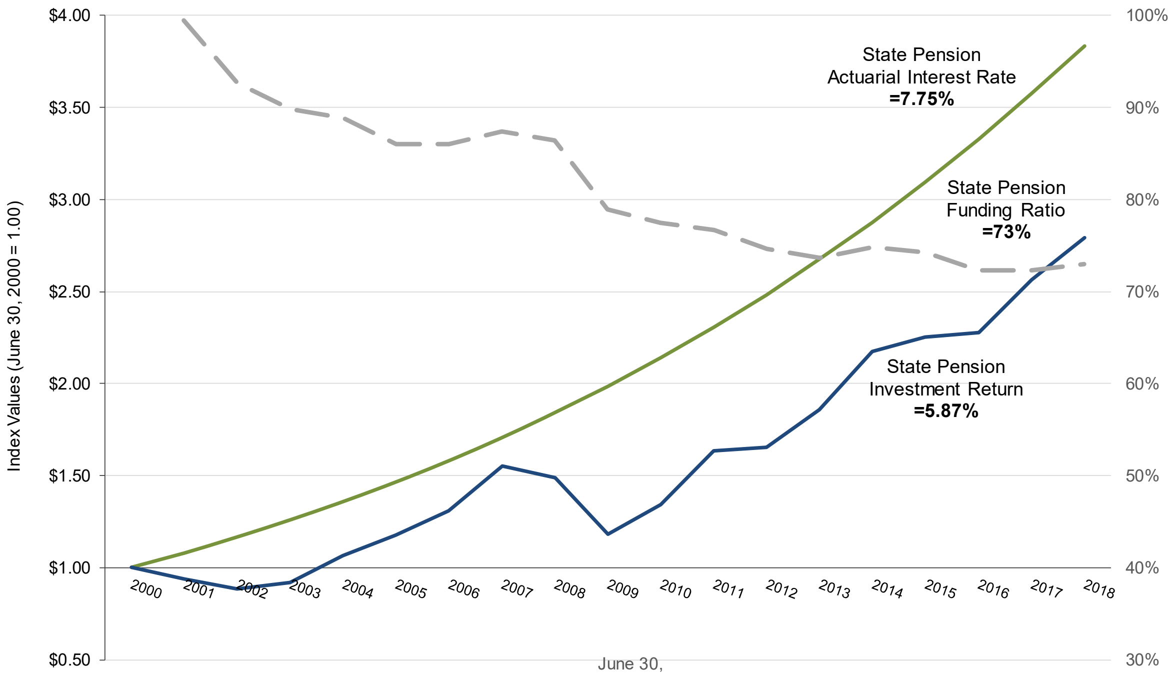
- will not agree to any representation, warranty or covenant which requires or could be construed to require the System to institute, or to join in, any proceeding in any state or federal court without the System's express consent.

An Examination of State Pension Performance, 2000 to 2018

March 2019

This annual study tracks the financial condition of state pension plans over time. Its purpose is to provide feedback that potentially better informs investment policy. Of course, each state pension has its own set of unique circumstances but understanding the experiences and actions of state pensions collectively should prove valuable to decision makers in executing their fiduciary responsibility.

Exhibit 1: Pension Performance, Actuarial Rates, and Funding Ratios
18 Fiscal Years ending June 30, 2018



Source: State Retirement System CAFRs, Cliffwater LLC calculations

The three lines in Exhibit 1 capture the progression of state pensions for the June 30 fiscal years from 2000 to 2018.[1] The 2000 start date was selected because (1) state pensions were largely fully funded then, a byproduct of a long and strong bull market of the prior decade and (2) the period includes two significant bear markets and two bull markets, a seemingly fair representation of full market cycles. Since that time, state pensions have collectively earned an asset-weighted annual return equal to 5.87%, badly trailing their 7.75% collective asset-weighted actuarial interest rate assumption. The almost two percentage point

[1] See Definitions and Methodologies for description of the data.

performance shortfall contributed greatly to a decline in pension funding ratios (assets divided by liabilities) from close to unity in 2000 to 73% (0.73) in 2018. The ratio of cumulative state pension investment return ($2.79) to cumulative actuarial interest return ($3.87) equals 0.72, roughly equal to the 0.73 collective funded ratio provided in fiscal 2018 state pension financial reports. While other events undoubtedly have impacted pension funding, among them the failure of some states to make required contributions[2], outdated mortality tables, and unfunded benefit improvements, the failure of actuaries to properly assess long term asset return is clearly the primary factor in pension underfunding today.

Consultant 10-year return forecasts for diversified institutional pension portfolios average 5.95%[3], which is slightly above the 5.87% actual state pension return over the past 18 years and well below the current (fiscal 2018) 7.23% asset-weighted actuarial interest rate assumption. Achieving the 7.23% collective asset-weighted actuarial rate will be a challenge and a more likely outcome will be continued budgetary pressures as states find they must make up for shortfalls in asset performance through additional unscheduled pension contributions.

Study Design and Data

We draw our findings entirely from data and descriptive narrative provided in the Comprehensive Annual Financial Reports ("CAFRs") published by state pension systems, unless otherwise noted. We select this data source because, unlike commonly used commercial universes, it is a closed group absent of selection biases, and represents results for large institutional investors.

Unfortunately, however, state pensions still are not consistent in their reporting of fees. Most of the performance measurement industry still reports returns before investment fees, and consequently some fraction of returns presented in this report is before fees. This is certainly true for public stock and bond asset classes, where approximately one-quarter of states report returns net-of-fees, one-quarter report gross-of-fees, and one-half make no mention of whether returns are net or gross. Our strong suspicion is that where the treatment of fees is not reported, returns are gross-of-fees.

An exception is alternative investments (private real assets, private real estate, private equity, and hedge funds) where returns are almost always reported net-of-fees. This is because either they are based on cash flows where fees are already netted, or in the case of hedge funds, performance is calculated on net asset value ("NAV") from the fund administrator where fees are always deducted.

Because of the industry's inconsistency in the netting of fees, our results should be viewed as a mix of net and gross returns where traditional asset classes generally, but not always, will be reported gross-of-fees and alternative asset classes almost always will be reported net-of-fees.

The study covers 66 state pensions that use June 30 as their fiscal year end and report investment and other financial data as of that calendar date. Collectively, the 66 state pensions reported $2.7 trillion in assets at June 30, 2018. In those cases where multiple in-state pensions are managed under one investment board with a single investment strategy, performance for those multiple in-state pensions is counted once and not duplicated. There are 11 state pensions excluded who use December 31 as their fiscal year end and another 5 state pensions that have fiscal year ends other than June 30 or December 31. While this report details findings only for the 66 fiscal June 30 state pensions, Cliffwater regularly conducts similar analyses on the other 16 state pensions with findings that are consistent with the study group.

The report references two types of averages. When citing industry-wide statistics such as found in Exhibit 1 the "asset-weighted" average is used, which weights individual state pension values by state pension assets. The largest state pension in the data set is Calpers, with a 11% asset weighting over the 18-year

[2] States contributed an average of 93% of their actuarial recommended contribution (ARC) over the 18-year period, though contribution rates made by some states were far lower, including Illinois, New Jersey and Pennsylvania.
[3] "Survey of Capital Market Assumptions: 2018 Edition", Horizon Actuarial Services, LLC.

time period. When citing statistics for individual asset classes an "average" value is sometimes presented which represents a simple average of individual state pension values.

18-Year Performance across State Pensions

Exhibit 2 plots 66 individual state pension cumulative returns together with the asset weighted investment and actuarial averages from Exhibit 1.

Exhibit 2: 18-Year Cumulative State Pension Returns:
June 30, 2000 to June 30, 2018

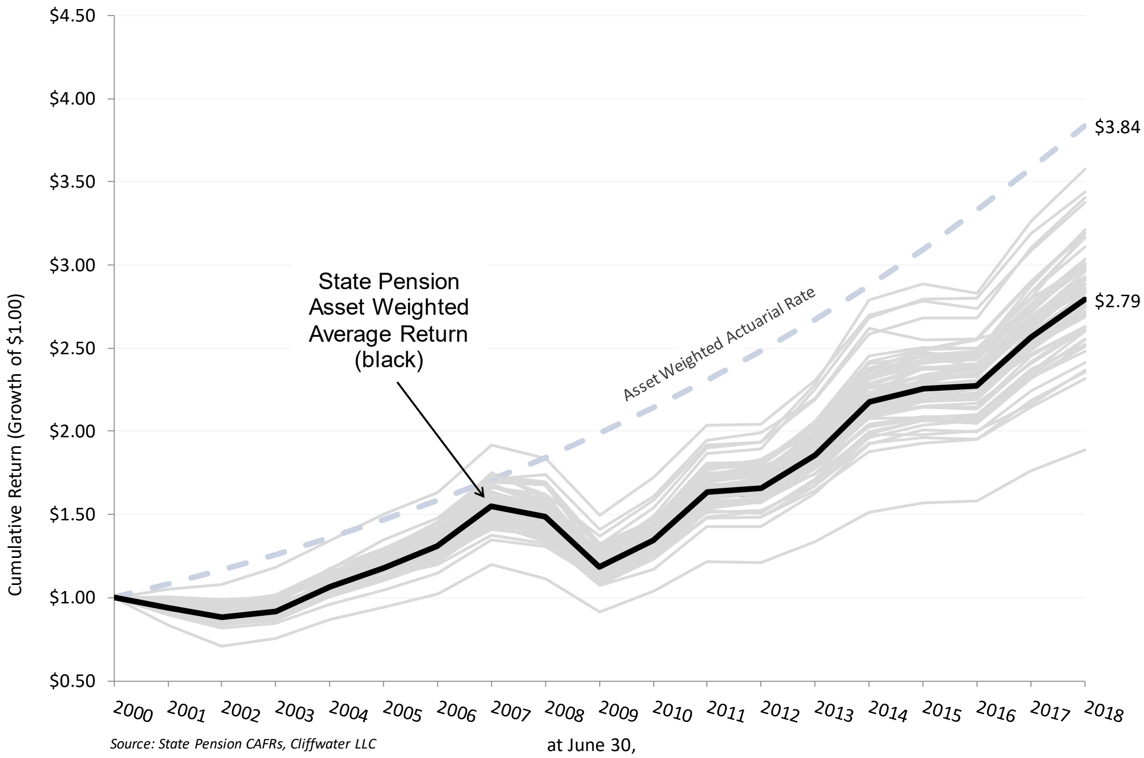


Exhibit 2 shows that none of the 66 individual state pensions exceeded the asset weighted actuarial rate of growth. Our study also finds that no state pension investment return exceeded its unique actuarial rate over the same period. The average asset/actuarial return deficit was -1.92%, annualized, and the smallest deficit was -0.42%.

Exhibit 2 also reflects a meaningful dispersion in individual state pension returns over the 18-year study period, which is captured also in Exhibit 3. Comparisons across state pensions is often discouraged. The argument is that each state pension has its own unique objectives and risk tolerance which is reflected in policy portfolios that are a byproduct of asset allocation studies. However, policy benchmarks measure only the implementation of policy and not the policy itself, which studies show have an outsized impact on return. This is also becoming important as asset allocation studies have migrated from standard models using standard asset classes to more complex risk-based models with non-standard asset classes. Comparing state pension performance may be a useful way to benchmark the asset allocation and governance processes used by state pensions.

Exhibit 3: State Pension Return Dispersion, Fiscal Years 2001 to 2018

	Return	Growth of $1.00
Highest	7.34%	$3.58
25th Percentile	6.24%	$2.97
Median Return	5.88%	$2.80
75th Percentile	5.65%	$2.69
Lowest	3.60%	$1.89

The 18-year returns for the 66 state pensions reflect the characteristics of a normal distribution. The difference between a first and third quartile return equals a modest 59 basis points (6.24% minus 5.65%) but that difference compounded over 18 years produces a 28-percentage point difference in cumulative return (197% minus 169%). There are 6 state pensions whose 18-year returns differ from the 5.88% asset weighted average return at a statistically significant level (t-statistic greater than 2.0 or less than -2.0). There are 3 states that outperform the group average at a level considered statistically significant and 3 states that underperformed at a statistically significant level. It is likely worth studying all 6 state pensions to understand both best practices and lessons learned.

Return and Risk

General stock and bond movements, measured by the MSCI ACWI and Bloomberg Barclays Aggregate Bond Indices, drive state pension performance for any individual fiscal year, as illustrated in Exhibit 4.

Exhibit 4: State Pension Return Distributions for Fiscal Years 2001 to 2018, And 18-Year Annualized Returns

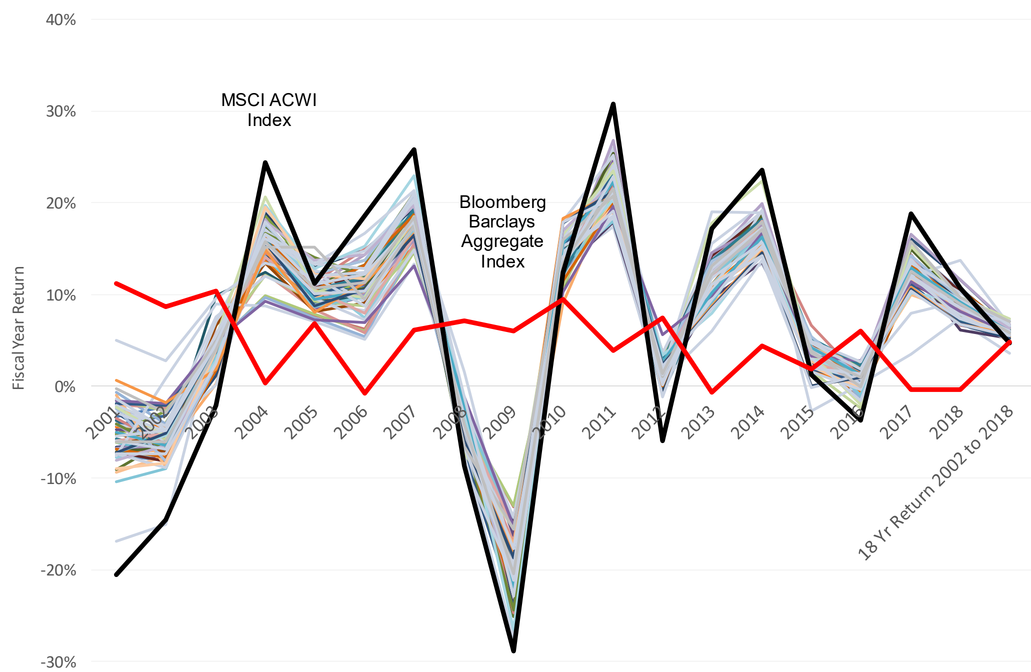


Exhibit 4 plots fiscal year-to-year returns for each of the 66 state pensions, ending with 18-year annualized return. Each line represents one state pension. Also shown are fiscal year returns for global stocks (MSCI ACWI Index) and U.S. bonds (Bloomberg Barclays Aggregate Bond Index).

Cumulative, annualized 18-year returns are plotted at the far right in Exhibit 4. The ups and downs of individual years are offset to achieve longer term returns more in line with expectations. Notice also that while state pension returns for individual years appear well bounded and largely explained by general stock and bond returns. Over longer 10-year periods, differences in state pension returns are less impacted by differences in overall risk-taking.

Exhibit 4 illustrates the importance of stock price movements on individual fiscal year state pension returns and suggests that volatility in state pension assets is largely equity related. Our study finds a high but not unexpected 0.92 R-squared between individual state pension fiscal year returns and the MSCI ACWI Index. While global stock movements explain most of state pension asset volatility, the average state pension risk, measured by standard deviation of fiscal year returns, equals 10.59% over the 18-year study period versus 17.26% for the MSCI ACWI Index. The average state pension equity beta equals 0.59. Together, these risk measures demonstrate that state pension return and risk are driven by stock markets. Impressive also is the high correlation among individual state pension returns. The average state fund has a 0.97 R-squared with the asset weighted state pension composite return, with the lowest value equaling 0.88. Collectively, these statistics suggest that the future health of public pension systems is intertwined with the performance of the global stock markets.

10-Year and 18-Year State Pension Asset Class Performance

Exhibit 5 plots individual state pension returns and risk by major asset class. The returns cover the shorter 10-year period ending June 30, 2018 where a larger sample set of asset class returns is available compared to the 18-year sample set, particularly for private equity, real estate, and absolute return. Exhibit 6 provides statistics summarizing the asset class return data displayed in Exhibit 5.

Exhibit 5: State Pension Asset Class Return and Risk for 10 Years ending June 30, 2018

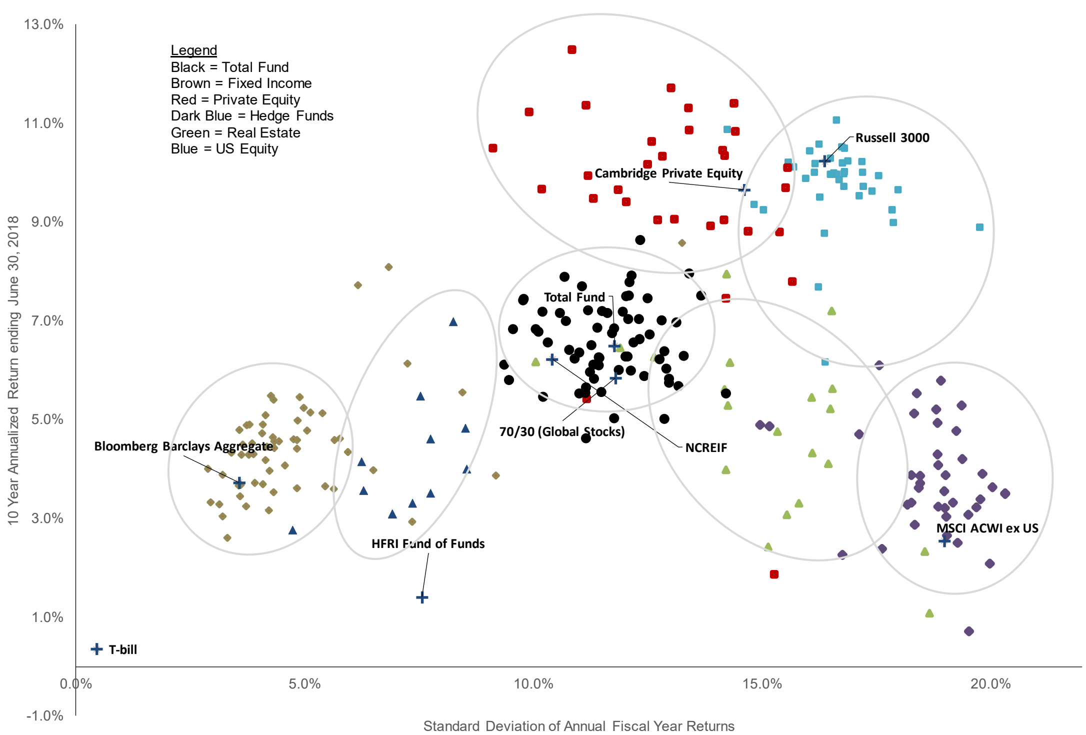


Exhibit 6: State Pension 10-Year Returns by Major Asset Class

	Total Fund	US Stocks	Non-US Stocks	Fixed Income	Real Estate	Private Equity	Absolute Return
Highest Return	8.64%	11.06%	6.10%	8.58%	7.94%	13.44%	6.98%
25th Percentile	7.17%	10.19%	4.72%	4.89%	6.17%	11.24%	4.66%
Median Return	6.54%	9.95%	3.62%	4.43%	5.27%	10.10%	3.78%
75th Percentile	6.00%	9.50%	3.22%	3.71%	4.01%	9.06%	3.25%
Lowest Return	4.63%	2.64%	0.71%	2.60%	-0.54%	1.87%	2.76%
Average Return	6.49%	9.85%	3.78%	4.64%	4.32%	10.05%	3.87%
Benchmark Return	5.84%	10.23%	2.54%	3.72%	6.22%	9.65%	1.41%
Benchmark Percentile	80%	18%	89%	74%	23%	64%	100%
25th - 75th Mid Range	1.16%	0.69%	1.50%	1.18%	2.16%	2.18%	1.41%
Count	66	38	40	59	34	37	12

Benchmarks:

Total Fund	70% Global Stocks (MSCI ACWI), 30% Fixed Income
US Stocks	Russell 3000 Index
Non-US Stocks	MSCI ACWI ex US Index
Fixed Income	Bloomberg Barclays Aggregate Bond Index
Real Estate	NCREIF Index (NPI)
Private Equity	Cambridge Associates Private Equity Index
Absolute Return	HFRI Fund of Funds Index

Exhibits 7 plots the longer 18-year return and risk for individual state pension asset classes with the return statistics provided in Exhibit 8. The sample set gets smaller than the 10-year sample but large enough to draw meaningful observations. Absolute return figures are not shown as those asset class returns do not extend back to June 30, 2000.

Exhibit 7: State Pension Asset Class Average Return and Risk for 18 Years ending June 30, 2018

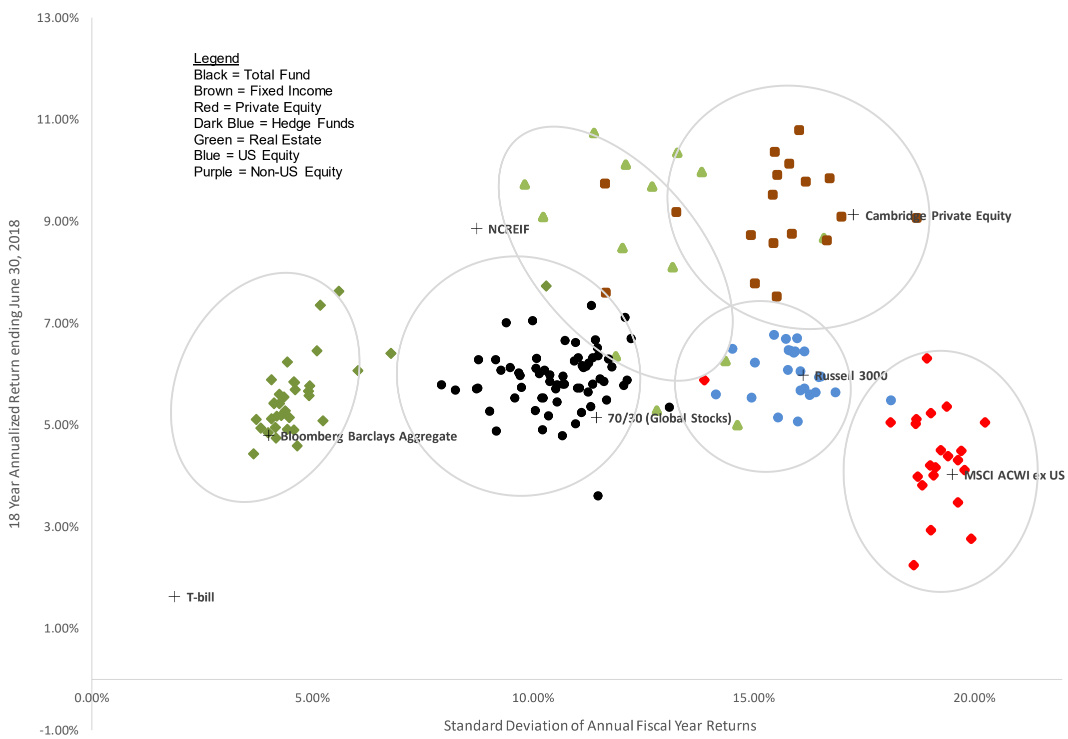


Exhibit 8: State Pension 18-Year Returns by Major Asset Class

	Total Fund	US Stocks	Non-US Stocks	Fixed Income	Real Estate	Private Equity
Highest Return	7.34%	6.77%	6.30%	7.72%	10.73%	13.01%
25th Percentile	6.24%	6.45%	5.05%	5.84%	9.90%	9.89%
Median Return	5.88%	5.95%	4.34%	5.43%	8.88%	9.19%
75th Percentile	5.65%	5.61%	3.99%	5.09%	6.78%	8.68%
Lowest Return	3.60%	5.07%	2.24%	4.44%	4.99%	7.52%
Average Return	5.87%	6.29%	4.64%	5.46%	8.28%	9.31%
Benchmark Return	5.15%	5.98%	4.03%	4.80%	8.85%	9.12%
Benchmark Percentile	93%	49%	71%	92%	51%	54%
25th - 75th Mid Range	0.59%	0.84%	1.06%	0.75%	3.12%	1.21%
Count	66	25	22	34	14	19

Benchmarks:

Total Fund	70% Global Stocks (MSCI ACWI), 30% Fixed Income
US Stocks	Russell 3000 Index
Non-US Stocks	MSCI ACWI ex US Index
Fixed Income	Bloomberg Barclays Aggregate Bond Index
Real Estate	NCREIF Index (NPI)
Private Equity	Cambridge Associates Private Equity Index

Key performance takeaways from Exhibits 1-7 are:

1. **State Pension Historical Returns**. State pensions collectively and individually struggle to earn their actuarial interest assumptions over longer time periods. Their 5.87% and 6.49% asset-weighted annualized returns over the last 18 and 10 years, respectively, fell well short of 7.75% and 7.61% asset-weighted actuarial interest assumptions for the same time periods.
2. **State Pension Expected Returns**. Shortfalls in state pension returns are most likely to continue. Horizon Actuarial Services finds a 5.95% expected long-term return for institutional portfolios from a survey of investment consultants. Cliffwater forecasts a higher 6.92% expected return for state pensions, but still below the most recent 7.23% asset-weighted fiscal 2018 actuarial interest rate.
3. **State Pension Relative Returns**. The 6.49% asset-weighted state pension return over the last 10 years fell within a wide 4.63% to 8.64% range for individual state returns, with the top performing state pension outperforming the bottom performing state pension by a cumulative 72% over 10 years, demonstrating the potential for significant financial consequences (positive and negative) underlying individual state investment policy and implementation decisions.
4. **Active versus Passive**. State pensions benefited from not embracing a 100% passive strategy. Ninety-three percent (93%) of state pensions outperformed a passive 70%/30% mix of global stocks and US bonds over the 18-year period, and eighty percent (80%) of state pensions outperformed a passive 70%/30% mix of global stocks and US bonds over the recent 10-year period and.
5. **Risk-Taking.** State pension returns are variable year to year, with an average annual standard deviation of return equal to 11.65%, measured over the last 10 fiscal years. Standard deviations for individual state pensions ranged from a low of 9.35% to a high of 14.21%, suggesting some meaningful differences in risk-taking among state pensions. By comparison, standard deviations for global equities and US bonds were 17.37% and 3.6%, respectively, with a 70%/30% portfolio annual standard deviation equal 11.80%. However, contrary to expectations, differences in 10-year state pension returns appear unrelated to standard deviation of return, with a -0.01 cross-sectional correlation between 10-year return and risk and a 0.09 cross-sectional correlation between 18-year return and risk. These statistics suggest that differences in state pension returns

had more to do with differences in asset allocation implementation, rather than asset allocation policy.[4]

6. **US Equity.** Most state pension US equity returns continue to lag the broad Russell 3000 Index return. The Russell 3000 Index ranks in the 49th and 18th percentiles against reported state pension US equity returns for 18-year and 10-year periods, an outcome which will likely continue the reallocation of US equity assets from active to passive management.
7. N**on-US Equity.** Unlike US equities, most state pensions have produced non-US equity returns that exceed the MSCI ACWI ex US Index, the most common non-US benchmark index. Covering the 18-year and 10-year time periods, 70% and 89%, respectively, of state pensions exceeded index returns. Excess returns are not necessarily attributable to emerging markets, which underperformed the non-US developed equity markets over the shorter 10-year period.
8. **Fixed Income.** State pension fixed income returns successfully outperform the Bloomberg Barclays Aggregate Bond Index return, returning 5.46% and 4.64% over the last 18-year and 10-year periods, respectively, compared to index returns of 4.80% and 3.82%, respectively. State pensions generally achieve these above-index returns by taking more credit exposure compared to the index through allocations to non-investment grade bonds and bank loans. For example, the Bloomberg Barclays High Yield Bond Index returned 7.38% and 8.19%, for the same 18-year and 10-year periods, respectively. State pensions that overweight credit within their traditional fixed income portfolios have been rewarded over time, but during market downturns, such as fiscal 2009, the average state pension underperformed the Bloomberg Barclays Aggregate Bond Index by 3.81%.
9. **Private Equity** continues its history of providing state pensions the highest asset class returns, with average returns equal to 9.31% and 10.05%, respectively, over the 18-year and 10-year study periods. These returns outperform public market equivalent (PME) returns by 3.49% and 1.58%, respectively, over the 18-year and 10-year study periods. PME returns reflect a 70% weighting to the US stocks (Russell 3000 Index) and 30% weighting to non-US stocks (MSCI ACWI ex US), weights reflecting Cliffwater qualitative and quantitative assessment of private equity geographic allocations.[5] The state pension private equity returns are also above the Cambridge Private Equity Benchmark returns of 9.12% and 9.65%, respectively, for the 18-year and 10-year study periods. Finally, private equity returns vary widely across state pensions suggesting that implementation is a critical factor in individual state private equity return outcomes.
10. **Real Estate.** Individual state pension real estate returns varied the most of any asset class over the 18-year and 10-year study periods, likely reflecting different investment approaches to this asset class. There is equally a very wide range in measured return volatility. Real estate returns equaled 8.28% and 4.32%, respectively, over the 18-year and 10-year periods, falling short of the 8.85% and 6.22% returns for the NCREIF Index of private equity over the same time periods. Some state pensions include publicly traded REITs as part of what is an asset class largely comprised of private real estate investments. The presence of public REITs, if held consistently, should have helped both 18-year and 10-year outcomes because the NAREIT Index of equity REITs returned 10.77% and 7.94%, respectively, for those periods equaled.

[4] Allocators worry that risk calculations for private equity and real estate are understated due to a potential for "smoothing" of returns in the valuation process. The presence of smoothing can be discovered by measuring serial correlation among returns. We find little evidence of smoothing in private equity returns. The serial correlation of private equity returns over the longer 18-year period measures 0.20, roughly equal to the 0.17 serial correlation found in the Russell 3000 Index. The average serial correlation for state pension real estate returns equals a higher 0.33, suggesting slightly higher risk levels than those calculated.

[5] A regression using the average state pension private equity return as the dependent variable and the S&P 500 and the MSCI ACWI ex US indices as independent variables finds a "best-fit" weighting of 60% S&P 500 and 40% MSCI ACWI ex US. Our selection of 70% S&P 500 and 30% MSCI ACWI ex US reflects our preference for an approach that relies on fundamental analysis of company holdings in determining PME index weights.

11. **Absolute Return.** Hedge fund returns have far exceeded benchmark HFRI Fund-of-Funds Index returns but their absolute level, averaging 3.78% over the last 10-year period, fell well short of investor expectations. Returns extending back to 18 years are not available for this asset class.

12. **Real Assets, Private Debt, and Risk Parity.** Return histories among state pensions for other alternative assets consist of only a few years in most instances. Nonetheless, returns have so far been good. Looking just at the most recent June 30, 2018 fiscal year, real assets, private debt, and risk parity earned average returns equal to 8.22% (33), 8.52% (18), and 7.01% (7), respectively, close to the asset-weighted average 8.85% (66) total state pension return for the year.[6]

State Penson Asset Allocation

State pension boards and staffs are fully aware of the investment challenges ahead and began some time ago to gradually shift their asset allocation strategies to include the use of alternative investments. These alternative investments consist primarily of allocations to private equity, private real estate, hedge funds (aka absolute return), private debt and private real assets. Exhibit 9 shows the historical growth in state pension allocations to alternative investments for the time period 2006 to 2018.

Allocations to alternatives increased dramatically soon after the 2008 Financial Crisis, rising from 10% of total assets in 2006 to 21% in 2011, and thereafter steadily increased to 30% of total assets at June 30, 2018. Most of the increase in alternatives had come from public equities, which fell from 61% in 2006 to 47% in 2017. However, over the 2018 fiscal year the increased allocation to alternatives by state pensions has come from reductions in fixed income and cash.

The shift to alternatives over the past decade is a byproduct of lower expected returns from traditional asset classes, especially fixed income, and the desire to avoid potential sharp drawdowns that can come from public equities. Alternatives are perceived as potentially meeting these dual objectives of return and lower volatility. The tradeoff is less liquidity, investment complexity, and higher fees compared to traditional asset classes.

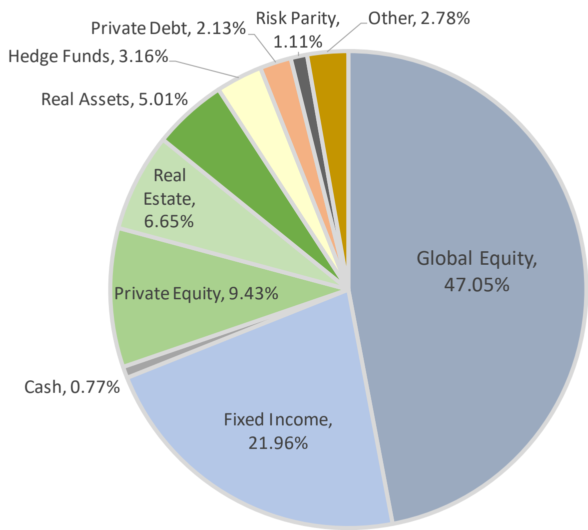
Exhibit 9: Overall State Pension Asset Allocation
(as of fiscal year-end June 30)

	2006	2011	2012	2013	2014	2015	2016	2017	2018	Change from 2006 to 2018
Public Equities	61%	51%	49%	50%	51%	50%	48%	47%	47%	-14%
Fixed Income	26%	25%	25%	22%	23%	23%	24%	23%	22%	-4%
Alternatives	10%	21%	24%	25%	24%	24%	26%	26%	30%	20%
Cash	2%	3%	2%	3%	2%	3%	2%	3%	1%	-1%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Exhibit 10 provides a detailed breakdown of the types of alternative investments that comprise the 30% allocation by state pensions.

[6] Number of state pensions reporting returns in parenthesis.

Exhibit 10: Actual State Pension Allocations, June 30, 2018



All categories of alternative investments have grown since 2006, when they equaled 10% of total assets. Private equity allocations have more than doubled, from 4.1% in 2006 to 9.4%, a 4.7% increase. Real estate grew more modestly, from 4.4% in 2006 to 6.7% in 2018, a 2.3% increase. The remaining 14% additional allocation to alternatives, outside private equity and real estate, has been directed to alternatives that had little or no representation in state pensions in 2006.

The largest single beneficiary of increased alternative allocations is real assets, which includes a range of substrategies such as commodities, energy & mining, infrastructure, and agriculture. Infrastructure and energy represent the largest sub-strategies within real assets. Real assets are expected to provide a high single digit return that is positively correlated with unexpected inflation. Their 5.0% June 30, 2018 allocation is further described in Exhibit 11, which shows for each alternative investment not only their percentage of total state assets, repeated from Exhibit 10, but also allocations for only those state pensions making allocations, and the highest allocation among the state pensions. For example, real assets represent 5.0% of total state pension assets, a higher 7.6% of state pension assets when only state pensions with real asset allocations are counted, and a 25% allocation for the state with the greatest percentage allocation to real assets.

Exhibit 11: State Pension Alternative Allocations
at June 30, 2018

	Private Equity	Real Estate	Real Assets	Hedge Funds	Private Debt	Risk Parity	Other
All States, Asset-Weighted	9.4%	6.7%	5.0%	3.2%	2.1%	1.1%	2.8%
Average of States with Allocations	9.9%	7.9%	7.6%	7.5%	6.5%	7.0%	5.8%
Highest State Allocation	24.4%	17.2%	25.0%	25.8%	18.7%	12.1%	12.9%

Hedge funds grew from 0.3% in 2006 to 3.2% at June 30, 2018, but most of the growth occurred immediately after 2008 and allocations have remained roughly unchanged over the past several years. Still, of those states investing in hedge funds, their average allocation equals 7.5% and some states allocate much higher amounts.

Private debt is the newest and fastest growing alternative investment, representing 2.1% of total state pension assets, and averaging 6.5% of total assets among state pensions with dedicated allocations. Actual allocations to private debt are higher, as most assets within the "Other" category represent opportunistic credit investments. The interest in private debt stems from the desire for high and immediate cash flow with low volatility, potentially filling the void in the northwest corner of Exhibits 5 and 7 above.

Risk parity is an allocation strategy that can combine both traditional asset classes and alternatives, and where asset classes contribute equally to total portfolio risk. Risk Parity portfolios become optimal mean-variance portfolios when leverage is unrestricted and asset classes have identical Sharpe Ratios[7], allowing correlations to drive optimal asset weights. Allocations to risk parity remain small at 1.1% of total assets and largely unchanged in recent years.[8]

Finally, many state pensions designate an "Other", "Opportunistic", or "Innovation" asset class that is dedicated to investment strategies that can't be classified as part of their traditional or designated alternative investments. These other alternatives have been income in nature with the intent to achieve high cash flow but low correlation to equities. Re-insurance, life settlements, and credit opportunities are examples.

Conclusion

The purpose for our annual state pension study has been to aid in the understanding of the asset performance achieved by state pensions. State pensions overall have been successful stewards of assets over our 18-year study period, achieving returns that captured the opportunities presented by global markets, and then some.

However, we find significant differences among individual state pension 10-year returns, mostly unexplained by simple differences in asset allocation or risk-taking. Some state pensions just appear more effective in implementing asset allocation compared to others.

We recommend that fiduciaries overseeing state pensions continue to allocate resources towards maximizing the return potential from its asset classes, paying attention to differences in how state pensions implement within asset classes.

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[7] Sharpe Ratio equals excess return, defined as total return minus risk-free rate, divided by risk.
[8] See Cliffwater Research, "Risk Parity" (January 2018) for a detailed description.