Wisconsin Retirement System Financial Report

Calendar Year 2019

WISCONSIN DEPARTMENT OF EMPLOYEE TRUST FUNDS

Wisconsin Retirement System

Financial Report

Calendar Year 2019

Wisconsin Department of Employee Trust Funds
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Joe Chrisman
State Auditor

Independent Auditor's Report on the Financial Statements and Other Reporting Required by *Government Auditing Standards*

Senator Robert Cowles and
Representative Samantha Kerkman, Co-Chairpersons
Joint Legislative Audit Committee

Members of the Employee Trust Funds Board and
Mr. Robert J. Conlin, Secretary
Department of Employee Trust Funds

Report on the Financial Statements

We have audited the accompanying Statement of Fiduciary Net Position, Statement of Changes in Fiduciary Net Position, and the related notes for the Wisconsin Retirement System as of and for the year ended December 31, 2019.

Management's Responsibility for the Financial Statements

Management of the Department of Employee Trust Funds (ETF) is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America. This includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, which is issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on these financial statements.

Opinion

In our opinion, the financial statements referred to in the first paragraph present fairly, in all material respects, the financial position of the Wisconsin Retirement System as of December 31, 2019, and the respective changes in the financial position for the year then ended, in accordance with accounting principles generally accepted in the United States of America.

Emphases of Matters

As discussed in Note 1 to the financial statements, the financial statements referred to in the first paragraph present only the Wisconsin Retirement System and do not purport to, and do not, present fairly the financial position of the State of Wisconsin as of December 31, 2019, the changes in its financial position, or where applicable, its cash flows for the year then ended, in accordance with accounting principles generally accepted in the United States of America.

As discussed in Note 3 to the financial statements, the financial statements include investments that do not have readily ascertainable market prices and are valued based on a variety of third-party pricing methods. However, because of the inherent uncertainty of valuation, those estimated values may differ from the values that would have been used had a ready market for the investments existed.

Our opinion was not modified with respect to these matters.

Other Matter

Required Supplementary Information—Accounting principles generally accepted in the United States of America require that the Management's Discussion and Analysis on pages 7 through 16, and the following information found on pages 61 through 63 be presented to supplement the financial statements: the Wisconsin Retirement System Schedules of Changes in Net Pension Liability (Asset) and Related Ratios, the Wisconsin Retirement System Schedule of Required Employer Contributions, and the Wisconsin Retirement System Schedule of Investment Returns, which include the related note. Such information, although not a part of the financial statements, is required by the Governmental Accounting Standards Board, which considers it to be essential for placing the financial statements in an appropriate operational, economic, or historical context. In accordance with auditing standards generally accepted in the United States of America, we have applied certain limited procedures to the required supplementary information that included inquiries of management about the methods of preparing the information. We further compared the information for consistency with management's responses to our inquiries, the financial statements, and other knowledge we obtained during our audit of the financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to do so.

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards*, we have also issued a report, which was dated September 28, 2020, and published as report 20-14, on our consideration of ETF's internal control over financial reporting; our tests of its compliance with certain provisions of laws, regulations, and contracts; and other matters. The purpose of that report is solely to describe the scope of our testing of internal control over financial reporting and compliance and the result of that testing, and not to provide an opinion on the effectiveness of ETF's internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* and should be used when considering ETF's internal control over financial reporting and compliance.

LEGISLATIVE AUDIT BUREAU

Joe Chrisman
State Auditor

September 28, 2020

Management's Discussion and Analysis

Management of the Wisconsin Department of Employee Trust Funds (ETF) presents this discussion and analysis of the financial activities for the year ended December 31, 2019. This narrative is intended to supplement the financial statements which follow and should be read in conjunction with the note disclosures, which are an integral part of the financial statements.

ETF administers a defined benefit pension trust and other employee benefit plans for approximately 648,000 members, retirees, and beneficiaries. The following discussion and analysis is intended to serve as an introduction to Wisconsin Retirement System's (WRS) financial statements.

» *Financial Statements*

The WRS is reported as a Fiduciary Fund. Fiduciary funds are used to account for resources held for the benefit of parties outside the government whose funds are restricted for purposes of the trust. The financial statements include:

- Statement of Fiduciary Net Position
- Statement of Changes in Fiduciary Net Position
- Notes to Financial Statements

The Statement of Fiduciary Net Position provides a snapshot of account balances at a point in time. It reports the assets available for future payments to benefit recipients, along with any liabilities that are owed as of the statement date. The full accrual basis of accounting is used.

The difference between assets and liabilities represents the net value of assets held in trust for future benefit payments. This amount is called "Net Position - Restricted for Pensions".

The Statement of Changes in Fiduciary Net Position displays the effect of financial transactions that occurred during the calendar year. Additions less deductions equals the net increase (decrease) in net position. This net increase (decrease) reflects the change in the value of net position that occurred during the year.

Notes to the Financial Statements are an integral part of the financial statements and provide additional information that is essential for a comprehensive understanding of the data reported in the financial statements. The notes describe the accounting and administrative policies under which ETF operates, significant account balances and activities, material risks, obligations, contingencies and subsequent events, if any.

The Required Supplementary Information (RSI) includes:

- Schedule of Changes in Net Pension Liability (Asset) and Related Ratios
- Schedule of Required Employer Contributions
- Schedule of Investment Returns

The financial statements and related notes are prepared in accordance with Generally Accepted Accounting Principles (GAAP) established by the Governmental Accounting Standards Board (GASB).

» Financial Highlights

Overall Net Position of WRS increased by $15.4 billion or 15.9% from $96.7 billion in 2018 to $112.1 in 2019. The was primarily a result of higher returns on investments due to favorable market conditions.

The WRS funding ratio under the funding methodology used to establish required contributions continues to be approximately 100% as of December 31, 2019. Under the GASB financial reporting method, the WRS is 103% funded as of December 31, 2019.

As of December 31, 2019, the WRS had a Net Pension Asset of $3.2 billion compared to a Net Pension Liability of $3.6 billion as of December 31, 2018. The increase of approximately $6.8 billion is primarily attributable to gains on investments due to more favorable market conditions in 2019. The Total Pension Liability increased from $100.3 billion in 2018 to $108.9 billion in 2019.

» Analysis of WRS Financial Activity

The WRS is a cost-sharing, multiple-employer public employee retirement system established by the State of Wisconsin to provide pension benefits for state and local government employees. The system is administered in accordance with Chapter 40 of the Wisconsin Statutes. ETF, under the direction of the ETF Board, is responsible for administration of the WRS, including collecting contributions from employers and paying retirement benefits to WRS participants. The State of Wisconsin Investment Board (SWIB) is responsible for managing WRS investments.

The system's funding objective is to meet its long-term benefit obligations through contributions and investment income. Contributions and the income from investments provide the reserves needed to finance the benefits provided under the programs.

The following tables show comparative summaries of the WRS net position and the changes in the WRS net position for 2019 and 2018.

SUMMARY OF WRS NET POSITION

AT DECEMBER 31
(In Millions)

	2019	2018	$ Change	% Change
Assets				
Cash and Cash Equivalents	$ 4,668	$ 4,037	$ 631	15.6 %
Receivables	7,046	4,049	2,997	74.0
Investments at Fair Value	125,332	108,313	17,019	15.7
Securities Lending Collateral	471	467	4	0.9
Prepaid Expenses	32	10	22	220.0
Capital Assets	4	6	(2)	(33.3)
Total Assets	**$ 137,553**	**$ 116,882**	**$ 20,671**	**17.7 %**
Liabilities				
Core Investment Due To Other Benefit Programs	$ 3,983	$ 3,494	$ 489	14.0 %
Variable Investment Due To Other Benefit Programs	20	17	3	17.6
Obligation Under Reverse Repurchase Agreements	9,845	8,834	1,011	11.4
Investment Payables	6,035	3,800	2,235	58.8
Securities Lending Collateral Liability	471	467	4	0.9
Other Payables	5,106	3,533	1,573	44.5
Total Liabilities	**$ 25,460**	**$ 20,145**	**$ 5,315**	**26.4 %**
Net Position Restricted for Pensions	**$ 112,093**	**$ 96,737**	**$ 15,356**	**15.9 %**

SUMMARY OF CHANGES IN WRS NET POSITION

FOR THE YEAR ENDED DECEMBER 31
(In Millions)

	2019	2018	$ Change	% Change
Contributions	$ 2,034	$ 2,003	$ 31	1.5 %
Net Investment Income	19,049	(4,050)	23,099	570.3
Other Income	1	1	0	0
Total Additions	**$ 21,084**	**$ (2,046)**	**$ 23,130**	**1,130.5 %**
Benefits/Benefit Expenses	$ 5,690	$ 5,556	$ 134	2.4 %
Administrative Expenses	34	32	2	6.3
Other Expenses	4	0	4	100.0
Total Deductions	**$ 5,728**	**$ 5,588**	**$ 136**	**2.4 %**
Loss due to Impairment of Capital Assets	**$ 0**	**$ (25)**	**$ 25**	**100.0 %**
Net Increase (Decrease) in Net Position	**$ 15,356**	**$ (7,659)**	**$ 23,015**	**300.5 %**
Net Position - Beginning of Year	**$ 96,737**	**$ 104,396**	**$ (7,659)**	**(7.3)%**
Net Position - End of Year	**$ 112,093**	**$ 96,737**	**$ 15,356**	**15.9 %**

Cash and Cash Equivalents

Cash and Cash Equivalents increased by $631 million, or 15.6%, when comparing calendar year-end 2019 to 2018. The majority of the increase in cash and cash equivalents is attributed to SWIB holding an increase in securitized cash positions within certain synthetic portfolios. Securitized cash is invested in derivative instruments which provide SWIB with similar returns as if the physical securities were held, but with a greater degree of liquidity. Securitized cash positions can fluctuate throughout the year depending on a variety of conditions. At calendar year-end 2019, SWIB used its securitized cash positions to adjust risk and exposure to desired levels for internal portfolio restructuring/rebalancing activities. Additionally, increased liquidity was reserved to accommodate the funding of a new investment strategy in early 2020.

Also, SWIB utilized derivatives to implement strategic investment positions. Derivatives used for these strategies require defined levels of cash to conservatively provide for adequate levels of margin, near-term benefit payments, and to adjust risk to desired levels.

The increase in cash and cash equivalents was partially offset by the maturity of a short-term foreign discount bill held at calendar year-end 2018 that was used within an active investment strategy. The cash received upon maturity was subsequently reinvested in longer term investments.

Short-term investments with maturities generally less than three months are included in Cash and Cash Equivalents.

Receivables

The balance in Receivables increased by $3.0 billion, or 74.0%, when comparing calendar year-end 2019 to 2018. Most of this increase is due to an increase in the balance for Investment Sales Receivable, which is dependent upon the timing and settlement of pending sales transactions. The year-over-year increase was due to an ongoing transition at calendar year-end. The transition reallocated balances within the same asset class from a passive, externally managed account to an active, internally managed account. Other routine rebalancing activities, where investment positions were sold but pending settlement, also contributed to the change in Receivables at December 31, 2019.

About one third of the Receivables balance relates to SWIB's use of To Be Announced (TBA) securities. TBA securities are derivative contracts that consist of mortgage-backed securities (MBS) issued by the Government National Mortgage Association, a government entity, and by government-sponsored enterprises, such as the Federal National Mortgage Association or the Federal Home Loan Mortgage Corp. The term TBA is derived from the fact that the actual MBS that will be delivered to fulfill a TBA trade is not designated at the time the trade is made. Instead, the specific pool of mortgages making up the MBS is announced 48 hours prior to the established trade settlement date. Eligibility rules and standards for MBS pools deliverable into TBA contracts ensure that delivered MBS pools are fungible. TBA securities sold create a receivable on the Statement of Fiduciary Net Position because payment for TBA securities is not made until the settlement date.

Prepaid Expenses

Prepaid Expenses increased by $22 million as of December 31, 2019 versus the prior year-end balance. This change is not representative of a change in total expenses, but rather reflects a difference in timing for the billing and payment of the Core Retirement Investment Trust (Core Fund) operating budget expenses in 2019, as compared to the prior year.

Securities Lending Collateral and Securities Lending Collateral Liability

Securities Lending Collateral and Securities Lending Collateral Liability increased by $4 million as of December 31, 2019, compared to December 31, 2018. These collateral balances represent cash received as collateral for securities lending transactions. SWIB increased its overall securities lending activity in 2019. The decrease in cash received as collateral was offset by an increase in securities received as collateral. The use of securities as collateral provides a more efficient option for securities lending activities, and therefore, reduced the demand for cash collateral in 2019.

Cash received as collateral for securities borrowed can be used by SWIB's internally managed portfolios to back short positions. As discussed later in this section, SWIB increased its internal shorting capacity in 2019. Investment policies permit the use of both cash and treasury securities as collateral to back short positions. The use of treasury securities as collateral provides a more efficient option to increase SWIB's internal shorting capacity. As a result, the demand for cash to be used as collateral for short positions decreased in 2019.

Obligation Under Repurchase Agreements

Obligation Under Reverse Repurchase Agreements increased by $1.0 billion, or 11.4% , when comparing calendar year-end 2019 to 2018. Reverse repurchase agreements involve the sale of assets with the simultaneous agreement to repurchase those assets for a pre-determined price, plus interest, at a future date. The proceeds from these agreements are invested in Treasury Inflation-Protected Securities (TIPS). During 2019, SWIB increased its capacity to participate in reverse repurchase agreements, providing a low-cost way to obtain financing needed to maintain SWIB's strategic allocation targets. The increase in reverse repurchase agreements corresponds with the overall increase in the Core Fund's assets under management.

Investment Payables

Investment Payables increased by $2.2 billion as of December 31, 2019, or 58.8%, versus the prior year-end balance. The majority of this increase is due to investment purchases payable, which is dependent upon the timing and settlement of pending purchase transactions. Corresponding with the increases in the Receivables balance, the increase in Investment Payables was due to a pending transition at calendar year-end. The transition reallocated balances within the same asset class from a passive, externally managed account to an active, internally managed account. Other routine rebalancing activities, where investment positions were purchased but pending settlement, also contributed to the change in Investment Payables at December 31, 2019.

The Investment Payables balance also comprises SWIB's use of To Be Announced (TBA) securities, which accounts for about half of the balance at calendar year-end 2019. Purchased TBA securities create a payable on the Statement of Fiduciary Net Position because payment for TBA securities is not made until the settlement date.

Other Payables

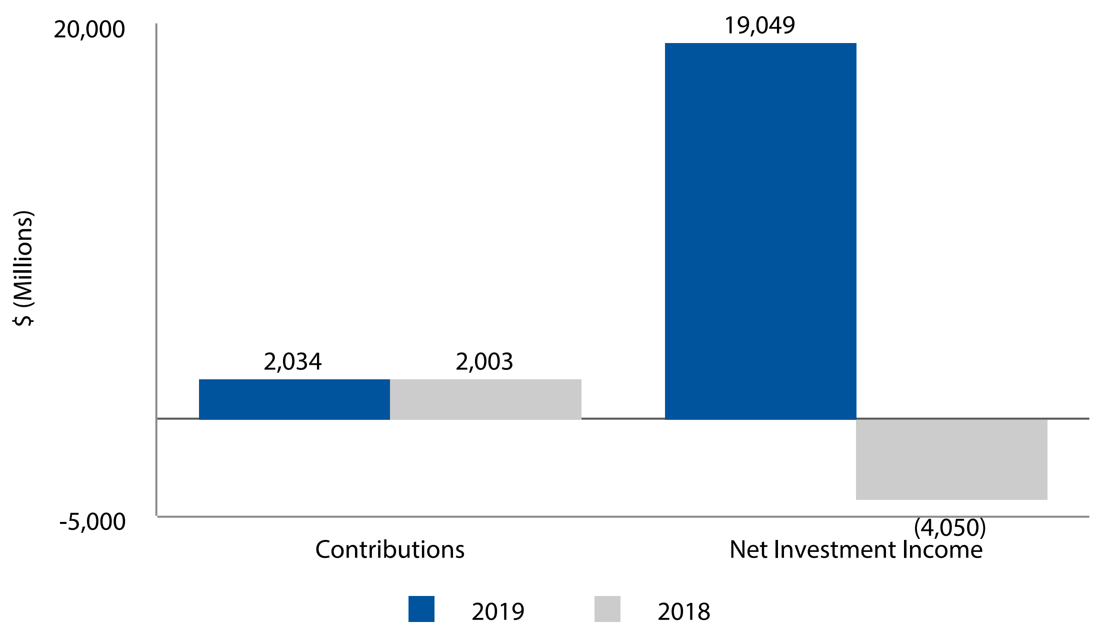
Other Payables increased by $1.6 billion, or 44.5%, when comparing calendar year-end 2019 to 2018. The balance primarily relates to Short Sell Obligations. Short sale transactions are created when a security not owned by the portfolio is sold in anticipation of purchasing the security at a lower price in the future. The increase in short sales is largely due to an internal equity strategy that magnifies active risk positions including the use of shorting to take advantage of securities that are deemed to be mispriced. The increased use of this strategy incorporates the use of long and short positions to take advantage of securities that are deemed to be either undervalued or overvalued. This strategy is expected to provide a more balanced impact from active positions and provide the ability to better manage risk.

Contributions and Investment Earnings

The retirement benefits provided by the WRS are funded from pension trust fund revenue. The primary sources of revenue are investment income generated from the investment of plan assets and contributions for active members made by members and their employers.

Total contributions and investment earnings for the year ended December 31, 2019, was $21.1 billion compared to $(2.0) billion in December 31, 2018. As the chart below shows, contributions remained relatively stable at about $2.0 billion, while investment income increased by $23.1 billion. The increase during 2019 is primarily attributable to more favorable market conditions, with a total Core Fund gross-of-fee investment return of 19.9% compared to (3.3)% for the previous calendar year, and a total Variable Retirement Investment Trust (Variable Fund) gross-of-fee investment return of 28.6%, compared to (7.9)% in 2018.

Contributions and Net Investment Income



The assets of the WRS are valued at fair market value and are invested in the Core Fund and the Variable Fund, which are collectively the Retirement Funds. All WRS members have at least half, if not all, of their pension contributions invested in the Core Fund. The Core Fund is a diversified, balanced fund invested for the long-term needs of the WRS. Diversification helps to stabilize the effects of market changes. The investment objective of this trust fund is to meet or exceed an average of 7.0% annual nominal return over the long-term. This objective is based on market rate of return and actuarial assumptions needed to meet the obligations of the WRS. The Variable Fund allows active employees participating in the WRS to put up to half of their pension fund contributions into this global stock fund. Approximately 15% of WRS members participate in the Variable Fund. By statute, the Variable Fund invests in stocks and provides participants the potential for higher returns in exchange for higher risk. The investment objective of the Variable Fund is to meet or exceed broad equity market indices over a full market cycle.

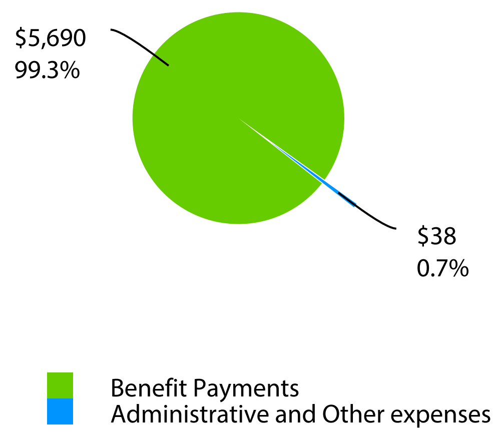
SWIB is responsible for managing the assets of the WRS. See Note 3 for additional information on Investments and Securities Lending Transactions.

Expenses - Deductions from Plan Net Position

The primary expenses of the WRS include annuity benefits for retirees and beneficiaries, refunds of contributions to former members, and expenses associated with the administration of the retirement plans. Benefit payments for 2019 totaled $5,690 million, an increase of $134 million or 2.4% over the 2018 amount of $5,556 million. This was due to the number of retired participants increasing from 209,059 as of December 31, 2018, to 215,070 as of December 31, 2019. Administrative and Other expenses of approximately $38 million accounted for less than 1% of the deductions to net position in 2019.

Investment expenses are deducted from investment income and were $840 million in 2019, an increase of 21.5% from $691 million in 2018. Approximately 85% of this change is due to an increase in transaction-related expenses from interest and dividends paid to counterparties as a result of increases in reverse repurchase agreements and short sale transactions as previously discussed. While short sale transactions are open, the Retirement Funds may incur dividend and interest expense and as such, payments must be remitted to the security lender during the course of the loan. The remaining increase in Investment Expense is primarily from increased base fees paid to external managers due to increased assets under management with such managers.

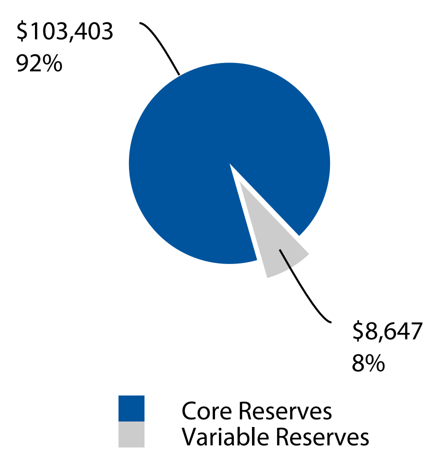
Expenses as of December 31, 2019
(In Millions)



Retirement Reserves

The funds accumulated by the WRS to meet current and future obligations to retirees and beneficiaries are derived from the excess of revenue over expenses. Reserves have been established to reflect legal restrictions established by Wisconsin Statutes on the use of funds. The higher level of funding a plan achieves, the larger the accumulation of assets and the greater the investment income potential. In 2019 revenues exceeded expenses, leading to an increase of $15 billion in the retirement reserves. The increase was primarily related to the increase in investment earnings in 2019. The reserves are invested in either the Core Fund or the Variable Fund. Approximately 92% of the reserves are invested in the Core Fund and 8% are invested in the Variable Fund.

Total Reserves Core vs. Variable
(In Millions)



SUMMARY OF PENSION PLAN RESERVE BALANCES
FOR THE YEARS ENDED DEC 31
(In Millions)

Total Reserves	2019	Increase (Decrease)	2018*
Annuity	$ 63,658	$ 3,448	$ 60,210
Employee	19,272	997	18,275
Employee Additional	215	14	201
Employer	23,389	654	22,735
Market Recognition Account (WRS Only)	5,516	10,245	(4,729)
Total Reserves	**$ 112,050**	**$ 15,358**	**$ 96,692**

**Amounts for the prior year include restatement of prior year balances between annuity, employee and employer reserves.*

Members, Retirees, Beneficiaries and Employers

Approximately 260,000 active members were employed with 1,516 WRS-participating employers as of December 31, 2019. The number of inactives, retirees and other annuitants totaled 388,235 at year-end. Total members served by the WRS in 2019 was approximately 648,000 as shown in the following tables.

DISTRIBUTION OF ACTIVE MEMBERS
AT DECEMBER 31

	December 31, 2019		December 31, 2018	
	Number	Percent of Total	Number	Percent of Total
General	134,166	51.6 %	133,132	51.6 %
Teachers	102,330	39.3	101,235	39.3
Elected/Executive/Judges	1,322	0.5	1,317	0.5
Protective with Social Security	19,665	7.5	19,450	7.5
Protective without Social Security	2,768	1.1	2,777	1.1
Total Active Members	**260,251**	**100.0 %**	**257,911**	**100.0 %**

DISTRIBUTION OF INACTIVES, RETIREES, AND BENEFICIARIES
AT DECEMBER 31

	December 31, 2019		December 31, 2018	
	Number	Percent of Total	Number	Percent of Total
Inactive Members:				
Terminated Participants	169,261	43.6 %	170,869	44.5 %
Alternate Payees	3,904	1.0	4,053	1.1
Retirees and Beneficiaries:				
Retirement Annuitants	207,362	53.4	201,466	52.4
Disability Annuitants	6,289	1.6	6,214	1.6
Death Beneficiary Annuitants	1,419	0.4	1,379	0.4
Total Inactive and Retiree Members	**388,235**	**100.0 %**	**383,981**	**100.0 %**

The number of participating employers by category as of 2019 and 2018, was:

DISTRIBUTION OF EMPLOYERS
AT DECEMBER 31

Employer	2019	2018
State Agencies, UW & Public Authorities	56	56
Cities	188	188
Counties	71	71
Villages	274	271
Towns	272	265
School Districts	421	422
Cooperative Educational Service Agencies	12	12
WI Technical College System Districts	16	16
Special Districts	206	206
Total Employers	**1,516**	**1,507**

Actuarial Valuations and Funding Progress - Pension Plan

ETF's actuarial consultant performs an actuarial valuation of the WRS each year to determine funding requirements and establish contribution rates. The funding policy provides for periodic employer contributions at actuarially determined rates that will remain relatively level over time as a percentage of payroll and will accumulate sufficient assets to meet the costs of all benefits when due. The latest valuation of the pension plan was performed by Gabriel Roeder Smith & Company (GRS). Under the funding methodology, the WRS is approximately 100% funded as of December 31, 2019. For financial reporting purposes, a funding ratio is calculated in accordance with GASB pension accounting standards. Under these standards, the WRS was 103% funded as of December 31, 2019.

» *Financial Contact*

This financial report is designed to provide a general overview of the program's finances. Questions concerning any of the information provided in this report should be addressed to ETF at P.O. Box 7931, Madison, Wisconsin, 53707-7931.

Wisconsin Retirement System
Statement of Fiduciary Net Position
December 31, 2019
(In Thousands)

	Pension Trust Fund
Assets:	
Equity In Pooled Cash & Cash Equivalents	$ 4,668,015
Securities Lending Collateral	471,467
Prepaid Expenses	32,151
Receivables:	
Contributions Receivable	147,862
Prior Service Contributions Receivable	10,850
Benefit Overpayments Receivable	2,242
Due From Other Benefit Programs	4,218
Miscellaneous Receivables	1,095
Securities Lending Income Receivable	2,448
Interest and Dividends Receivable	386,662
Investment Sales Receivable	6,490,811
Total Receivables	7,046,188
Investments at Fair Value:	
Equities	66,011,290
Fixed Income Investments	36,427,253
Limited Partnerships	14,770,360
Multi Asset Investments	5,353,262
Real Estate	1,374,070
Preferred Securities	481,730
Convertible Securities	4,067
Foreign Currency Contracts	8,316
Options Contracts	(6,028)
Financial Futures Contracts	(29,913)
Swaps	24,037
To Be Announced Securities	913,743
Total Investments	125,332,187
Capital Assets - Net of Accum. Depreciation	3,532
Total Assets	137,553,540
Liabilities:	
Core Investment Due To Other Benefit Programs	3,983,479
Variable Investment Due To Other Benefit Programs	20,256
Obligation Under Reverse Repurchase Agreements	9,844,991
Short Sell Obligations	4,464,308
Securities Lending Collateral Liability	471,467
Collateral Due to Counterparty	104,964
Benefits Payable	399,642
Unearned Revenue	19
Due To Other Benefit Programs	7,671
Miscellaneous Payables	129,324
Investment Payables	6,034,661
Total Liabilities	25,460,782
Net Position - Restricted for Pensions	$ 112,092,758

The accompanying notes are an integral part of the financial statements.

Wisconsin Retirement System
Statement of Changes in Fiduciary Net Position
For the Year Ended December 31, 2019
(In Thousands)

	Pension Trust Fund
Additions:	
Contributions:	
Employer Contributions	$ 1,046,942
Member Contributions	987,662
Total Contributions	2,034,604
Investment Income:	
Net Increase (Decrease) in Fair Value of Investments	18,124,357
Interest	767,917
Dividends	1,386,282
Securities Lending Income	41,981
Other	250,489
Less:	
Investment Income Distributed to Other Benefit Programs	(673,484)
Investment Expense	(839,819)
Securities Lending Rebates and Fees	(8,902)
Net Investment Income	19,048,821
Interest on Prior Service Receivable	526
Miscellaneous Income	195
Total Additions	21,084,146
Deductions:	
Benefits and Refunds:	
Retirement, Disability, and Beneficiary	5,646,263
Separation Benefits	44,106
Carrier Administrative Expenses	399
Administrative Expenses	33,799
Other Expenses	3,902
Total Deductions	5,728,469
Net Increase (Decrease)	15,355,677
Net Position - Beginning of Year	96,737,081
Net Position - End of Year	$ 112,092,758

The accompanying notes are an integral part of the financial statements.

NOTES TO FINANCIAL STATEMENTS

1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The Wisconsin Retirement System (WRS) is a cost-sharing, multiple-employer public employee retirement system established and administered by the State of Wisconsin to provide pension benefits for state and local government employees. The system is administered in accordance with Chapter 40 of the Wisconsin Statutes. The Department of Employee Trust Funds (ETF) is responsible for administration of the WRS, including collecting contributions from employers and paying retirement benefits to WRS participants, and the State of Wisconsin Investment Board (SWIB) is responsible for managing WRS investments.

» *Presentation Basis*

The financial statements of the WRS have been prepared by ETF in conformity with Generally Accepted Accounting Principles (GAAP) for government units as prescribed by the Governmental Accounting Standards Boards (GASB).

The assets and operations of the WRS are accounted for as a Fiduciary Fund. The WRS fund is used to account for the collection of member and employer contributions; investment of assets; and payment of retirement, disability, and death benefits to former employees, and their beneficiaries, of the State of Wisconsin and participating local governments in Wisconsin.

ETF is not a general-purpose government and does not present government-wide statements. The WRS is included in the State of Wisconsin financial reporting entity and is presented in the State's Comprehensive Annual Financial Report as a "Pension and Other Employee Benefit Trust Fund." The WRS is reported as a separate fund in ETF's separately issued Comprehensive Annual Financial Report.

Department-wide administrative expenses, capital assets, and general fund activities are most closely associated with the WRS fund and have been blended with the WRS for presentation. All material intrafund transactions have been eliminated from fund financial statements.

» *Measurement Focus and Basis of Accounting*

The WRS fund is accounted for using the flow of economic resources measurement focus and the accrual basis of accounting. Under the accrual basis of accounting, contributions are recognized in the accounting period in which the underlying earnings on which the contributions are based are paid and the employer has made a formal commitment to provide the contributions. Benefits and refunds are recognized when due and payable in accordance with the terms of the WRS. Security transactions and the related gains and losses are recorded on a trade date basis. Dividend income is recorded on the ex-dividend date, and interest income is accrued as earned.

» *Investments*

The assets of the WRS are valued at fair value and are invested in the Core Fund and the Variable Fund, which are collectively the Retirement Funds. Earnings are allocated between the WRS and other benefit programs invested in the Retirement Funds based on the average balance invested for each program. Earnings allocated to other benefit programs are classified as “Investment Income Distributed to Other Benefit Programs” on the Statement of Changes in Fiduciary Net Position. The total amount invested by the other benefit programs included in the Retirement Funds is presented as “Core Investment Due To Other Benefit Programs” and “Variable Investment Due To Other Benefit Programs” on the Statement of Fiduciary Net Position.

The State of Wisconsin Investment Board (SWIB) manages the Retirement Funds with oversight by the SWIB Board of Trustees, as authorized in Wis. Stat. § 25.17. SWIB is not registered with the Securities and Exchange Commission as an investment company.

» *Funding Value of Assets*

While investments are valued at fair value for financial statement presentation, a funding value of assets is used in evaluating the funded status of the WRS and in determining future contribution requirements. Funding value does not include deferred market gains and losses that have not yet been distributed from the Market Recognition Account (MRA) to the program reserves. See Note 7 for further explanation of the MRA. As of December 31, 2019, the funding value of reserves was $106.6 billion.

» *Administrative Expenses*

ETF administrative costs are financed by a separate appropriation and are allocated to each benefit plan administered by ETF in accordance with Wis. Stat. § 40.04. The sources of funds for this appropriation are investment earnings and third-party reimbursements received from the various programs administered by ETF. Administrative expenses allocated to the WRS for the year were approximately $33.8 million.

SWIB incurs expenses related to investing the trust funds. As authorized by Wis. Stat. § 25.187 (2), these costs are charged directly to the investment income of each trust fund.

» *Capital Assets*

Capital assets consist of office furniture and equipment and computer software (purchased or externally acquired and internally generated software). ETF capitalizes furniture and equipment, and purchased computer software with a purchase price in excess of $5,000, and internally-generated software and other intangible assets in excess of $1 million. Assets are depreciated on a composite basis over an estimated life, ranging from 5 to 20 years, using the straight-line method of depreciation.

As of December 31, 2019, the total value of capital assets was $12.3 million, less accumulated depreciation of $8.8 million for a net capital asset value of $3.5 million. The net capital asset value primarily relates to internally-generated software.

» *Amounts Due To/From Other Benefit Programs*

In addition to the WRS, ETF administers other employee benefit programs for public employees. Amounts due from or to the WRS and other benefit programs administered by ETF, as of December 31, 2019, consist of the following:

Due To/From Other Benefit Programs
As of December 31, 2019
(In Thousands)

Wisconsin Retirement System	Due To Other Benefit Programs	Due From Other Benefit Programs
Employee Reimbursement Accounts & Commuter Benefits	0	71
Health Insurance	128	371
State Retiree Health Insurance	0	93
Local Retiree Health Insurance	17	12
Life Insurance	0	337
State Retiree Life Insurance	0	34
Local Retiree Life Insurance	0	46
Duty Disability Insurance	1,336	0
Income Continuation Insurance	0	239
Accumulated Sick Leave Conversion Credit Program	4,502	532
Supplemental Health Insurance Conversion Credit Program	1,688	2,451
Deferred Compensation	0	32
Total	7,671	4,218

Totals may vary from the financial statements due to rounding.

The outstanding balances between benefit programs primarily result from the time lag between when actual receipts and disbursements are made and when those amounts are allocated between benefit programs. All liabilities are expected to be paid within one year of the balance sheet date.

» *Use of Estimates*

The preparation of financial statements in accordance with GAAP requires management to make estimates that affect amounts reported herein. Due to the inherent uncertainty involved, actual results could differ from those estimates.

2 ACCOUNTING CHANGES

ETF adopted Governmental Accounting Standards Board (GASB) Statement No. 84, "Fiduciary Activities" for the year ended December 31, 2019. The statement provides guidance regarding the identification of fiduciary activities for accounting and financial reporting purposes and how those activities should be reported. The implementation of this Statement did not result in significant changes to the presentation of the WRS financial statements.

3 DEPOSITS, INVESTMENTS AND SECURITIES LENDING TRANSACTIONS

» *Valuation of Securities*

The investments of the Retirement Funds are reported in the Statement of Fiduciary Net Position at fair value as prescribed by GASB and per section 25.17(14) of the Wisconsin Statutes. Unrealized gains and losses are reflected in the Statement of Changes in Fiduciary Net Position as "Net Increase (Decrease) in Fair Value of Investments."

The fair value of the Retirement Funds' assets is obtained or estimated in accordance with a pricing hierarchy established with SWIB's custodian, Bank of New York Mellon (BNY Mellon). As prescribed by the hierarchy, a variety of independent pricing sources are used to price assets based on type, class, or issue.

When a portfolio includes securities or instruments for which the custodial bank does not receive fair value information from its vendor pricing sources, a variety of third-party pricing methods are used, including appraisals, pricing models, and other methods deemed acceptable by industry standards.

The "Equity in Pooled Cash and Cash Equivalents" account reported on the Statement of Fiduciary Net Position consists of short-term investments which are used to meet the liquidity requirements of the Retirement Funds. Equity in Pooled Cash and Cash Equivalents held by the Retirement Funds can include cash on deposit, foreign currencies, cash posted as collateral to counterparties, repurchase agreements, certificates of deposit, U.S. Treasury Bills, short-term investment funds, and other U.S. or foreign liquid financial instruments with maturities that are generally less than three months. Equity in Pooled Cash and Cash Equivalents are reported at fair value or cost, which approximates fair value.

Privately-held debt, which is included in "Fixed Income Investments" on the Statement of Fiduciary Net Position, is priced using approaches that value each holding based on the best available information using the following hierarchy of pricing sources:

1. Custodian-supplied prices for assets that can be priced in accordance with the pricing hierarchy established with SWIB's custodian
2. Prices provided by a third party with expertise in the debt market

For private market investments where no readily ascertainable market value exists, including limited partnerships and real estate pooled funds, fair value is estimated based on the net asset value as reported by the general partner. The capital account balance as stated in the most recent available quarterly reporting period is adjusted for subsequent cash flows to derive fair value. The financial statements of the limited partnerships and real estate pooled funds are audited by independent auditors annually.

Certain portfolios make investments in privately-held companies alongside a strategic partner, who often employ independent valuation agents and use a variety of methodologies such as reviews of subsequent financing rounds, discounted cash flow analyses, cash flow multiples analyses, reviews of market comparable sales or metrics, and reviews of third-party appraisals.

Real estate properties wholly owned by SWIB are valued by independent appraisers every three years. In years when appraisals are not performed, properties are informally appraised by the asset advisor. Each year, audited financial statements are prepared for each property.

SWIB employs portfolio strategies which involve investments across multiple asset classes. The "Multi Asset Investments" account on the Statement of Fiduciary Net Position consists primarily of hedge funds. SWIB values hedge funds based on monthly statements or estimated returns received from each of the hedge fund's administrators. A third-party administrator's responsibility is to independently account for the hedge fund's activity and calculate the net asset value of the fund. Generally, hedge fund administrators price financial instruments traded in active markets based on quoted market prices or binding dealer quotations. For certain over-the-counter instruments, fair value is determined based on valuation models used by the administrator or independent valuation agent. Annually, the financial statements prepared by the administrator are audited by independent auditors.

Derivative financial instruments are marked to fair value daily, with valuation changes recognized in income during the period the instruments are held and when the instrument is sold or expires. The nature and use of derivative instruments is discussed later in this note.

A limited number of securities are carried at cost. Certain non-public or closely-held investments are not reported at fair value, but are carried at cost since no independent quotation is available to estimate fair value for these securities.

» *Credit Risk*

Credit risk is the risk that an issuer or other counterparty to an investment will not fulfill its obligations to SWIB. Fixed income credit risk investment guidelines outline the minimum ratings required at the time of purchase by individual portfolios, or groups of portfolios, based on the portfolios' investment objectives. In addition, some fixed income portfolios are required to carry a minimum weighted average rating at all times. Information regarding SWIB's credit risk related to derivative instruments is discussed later in this note.

The table entitled Credit Quality Distribution displays the lowest credit rating assigned by nationally recognized statistical rating organizations on debt securities held by the Retirement Funds as of December 31, 2019. Included in this table are fixed income securities, including certain short-term securities, classified as "Equity in Pooled Cash and Cash Equivalents" on the Statement of Fiduciary Net Position. Also included are interest rate sensitive investments held in the Retirement Funds' securities lending collateral reinvestment pools, which are managed by SWIB's custodian. Additional information regarding the securities lending program is discussed later in this note.

The table also includes SWIB's investment in commingled fixed income funds which are not rated. Although the funds themselves are not assigned ratings, external management investment guidelines govern minimum credit quality standards for the investments within each portfolio. These standards are determined based on the investment objectives and risk parameters of each fund.

Retirement Funds
Credit Quality Distribution
As of December 31, 2019
(In Thousands)

Rating	Fair Value	% of Total
AAA/Aaa	$ 501,441	1.2 %
A-1/P-1	5,682	0
AA/Aa	23,279,226	56.5
A-2/P-2	238,456	0.6
A	2,599,258	6.3
BBB/Baa	4,857,290	11.8
BB/Ba	1,893,733	4.6
B	1,290,841	3.1
CCC/Caa or below	259,063	0.6
Not Rated	1,477,792	3.6
Commingled Fixed Income Funds	4,835,231	11.7
Total	$ 41,238,013	100 %

SWIB held $9.8 billion in reverse repurchase agreements at December 31, 2019. Investment guidelines permit certain portfolios to enter into reverse repurchase agreements, which are a sale of securities with a simultaneous agreement to repurchase the securities in the future at the same price plus a stated rate of interest. The market value of the securities underlying reverse repurchase agreements exceeds the cash received, providing the counterparty a margin against a decline in market value of the securities. If the counterparty defaults on their obligation to sell these securities back to SWIB or provide cash of equal value, SWIB could suffer an economic loss equal to the difference between the market value of the underlying securities plus accrued interest and the agreement obligation, including accrued interest.

SWIB enters into reverse repurchase agreements with various counterparties and such transactions are governed by master repurchase agreements. Master repurchase agreements are negotiated contracts and contain terms in which SWIB seeks to minimize counterparty credit risk. SWIB also controls credit exposures by limiting trades with any one counterparty to stipulated amounts. The counterparty credit exposure is managed through the transfer of margin, in the form of cash or securities, between SWIB and the counterparty. The Retirement Funds' counterparty credit exposure for reverse repurchase agreements at December 31, 2019 is summarized in the table entitled Reverse Repurchase Agreements, Counterparty Credit Exposure.

Retirement Funds Reverse Repurchase Agreements Counterparty Credit Exposure As of December 31, 2019 (In Thousands)		
Fair Value of Collateral Held by Counterparty		$ 10,115,115
Less:		
Cash due to Counterparty	9,844,991	
Collateral and Interest due to Counterparty	173,503	
Total due to Counterparty		10,018,494
Net Counterparty Credit Exposure		$ 96,621

The cash proceeds from reverse repurchase agreements are reinvested by the Retirement Funds. The maturities of the purchases made with the proceeds of reverse repurchase agreements are not necessarily matched to the maturities of the agreements. The agreed-upon yields earned by the counterparty for the reverse repurchase agreements held were between 0.98% and 2.13% at December 31, 2019. Portfolio guidelines require agreements to mature between one and 90 days.

The cash due to counterparties resulting from reverse repurchase agreements is reported as "Obligation Under Reverse Repurchase Agreements" and the interest due to counterparties is included in "Investment Payables" on the Statement of Fiduciary Net Position. The underlying assets, as well as the reinvested proceeds, are reported in the "Investments at Fair Value" section on the Statement of Fiduciary Net Position.

» Custodial Credit Risk

Deposits - Custodial credit risk related to deposits is the risk that, in the event of the failure of a depository financial institution, SWIB will not be able to recover deposits that are in possession of an outside party. Cash deposits totaled $367.0 million as of December 31, 2019. Of the total, $61.2 million was collateralized by securities borrowed. Depository insurance covered another $47.4 million of the total. The remaining deposits, totaling $258.4 million, were uninsured and uncollateralized. These uninsured deposits represent the U.S. dollar equivalent of balances held in foreign currencies in SWIB's custodian's nominee name, cash posted as collateral for derivative transactions, and cash collateral posted in excess of the market value of securities borrowed by SWIB for short sales. In addition to cash deposits, the Retirement Funds also held $66.3 million in certificates of deposit, all of which were covered by depository insurance as of December 31, 2019.

Investments - Custodial credit risk for investments is the risk that, in the event of failure of the counterparty to a transaction, SWIB will not be able to recover the value of investments that are in the possession of an outside party. The Retirement Funds held five repurchase agreements totaling $411.5 million as of December 31, 2019. These repurchase agreements were tri-party agreements held in a short-term cash management portfolio managed by SWIB's custodian. The underlying securities for these agreements were held by the tri-party agent, not in SWIB's name.

SWIB's custodial credit risk policy addresses the primary risks associated with safekeeping and custody. It requires that SWIB's custodial institution be selected through a competitive bid process and that the institution be designated a "Systemically Important Financial Institution" by the U.S. Federal Reserve. The policy also requires that SWIB be reflected as beneficial owner on all securities entrusted to the custodian and that SWIB have access to safekeeping and custody accounts. The custodian is also required to be insured for errors and omissions and must provide SWIB with an annual report on internal controls, prepared in accordance with the Statement on Standards for Attestation Engagements. Furthermore, SWIB management has established a system of controls for the oversight of services and related processes of the custodian. SWIB's current custodial bank was selected in accordance with these guidelines and meets all requirements stipulated in the custodial credit risk policy.

» *Concentration of Credit Risk*

Concentration of credit risk is the risk of loss attributed to the magnitude of an organization's investment in a single issuer. SWIB limits concentrations of credit risk by establishing investment guidelines for individual portfolios or groups of portfolios that generally restrict issuer concentrations in any one company or Rule 144A securities to less than 5% of the portfolio's market value. The Retirement Funds did not hold any investments with a single issuer, exclusive of investments issued or explicitly guaranteed by the U.S. government, representing 5% or more of the Retirement Funds' value at December 31, 2019.

» *Interest Rate Risk*

Interest rate risk is the risk that changes in interest rates will adversely affect the fair value of an investment. SWIB uses a number of different methods to manage interest rate risk. Fixed income instruments held by the Retirement Funds include investments with variable rate securities, stepped rate securities, securities with no coupon, such as discount notes, and coupons that range between 0.0% and 13.75% at December 31, 2019.

Generally, SWIB analyzes long or intermediate term portfolios' interest rate risk using various duration calculations. Modified duration, which is stated in years, is the measure of price sensitivity of a fixed income security to an interest rate change of 100 basis points. The calculation is based on the weighted average of the present values for all cash flows. Some investments are analyzed using an option-adjusted duration calculation which is similar to the modified duration method. Option-adjusted duration incorporates the duration-shortening effect of any embedded call provisions in the securities. Duration statistics are weighted by the dollar value of the position to compute an average duration for each investment type.

Short-term portfolios' interest rate risk is analyzed using the weighted average maturity to next reset. Weighted average maturity is the maturity of each position in a portfolio weighted by the dollar value of the position to compute an average maturity for the portfolio as a whole. This measure indicates a portfolio's sensitivity to interest rate changes: a longer weighted average maturity implies greater volatility in response to interest rate changes.

SWIB's investment guidelines related to interest rate risk vary by portfolio. Some fixed income portfolios are required to be managed within a range of a targeted duration, while others are required to maintain a weighted average maturity at or below a specified number of days or years.

The table entitled Interest Rate Sensitivity by Investment Type presents the aggregated interest rate exposure for the Retirement Funds' assets at December 31, 2019. Weighted average maturity, where reset dates are assumed to be the effective maturity date for the security, is presented for repurchase agreements and short-term pooled investments. Longer-term instruments held by the Retirement Funds are presented using modified duration, as this measure more accurately states the interest rate sensitivity of these investments. The duration statistic is calculated utilizing reset dates for some floating rate instruments, such as term loans. Information about the interest rate sensitivity of derivative contracts is discussed later in this note.

SWIB invests in securities with contractual cash flows, such as asset-backed securities and U.S. government agencies. These types of structured product investments may be highly sensitive to interest rate changes in that they can be subject to early payment in a period of declining interest rates. The resulting changes in timing, or possible reduction in expected total cash flows, affect the fair value of these securities.

Retirement Funds
Interest Rate Sensitivity by Investment Type*
As of December 31, 2019
(In Thousands)

Investment Type	Fair Value	Weighted Average Duration (years)	Weighted Average Maturity (days)
U.S Treasury Inflation Protected Securities	$ 16,848,689	7.4	
Corporate Bonds & Private Placements	10,789,513	6.4	
U.S Treasury Securities	5,343,008	8.4	
Foreign Government/Agency Bonds	1,889,736	6.9	
Repurchase Agreements	411,534		2
Asset Backed Securities	387,359	1.9	
U.S Government Agencies	286,913	3.2	
Commercial Paper	251,331		22
Municipal Bonds	194,700	11.4	
Commingled Funds			
Short Term Cash Management	3,758,685		20
Emerging Market Fixed Income	998,688	5.9	
Exchange Traded	77,857	5.8	
Total	$ 41,238,013		

*Excludes derivatives

» *Foreign Currency Risk*

Foreign currency risk is the risk that changes in exchange rates will adversely impact the fair value of an investment. It includes the risk that currencies in which a portfolio's investments are denominated, and currencies in which a portfolio has taken on a long (short) active position, will decline (appreciate) in value relative to the U.S. dollar.

Foreign currency exchange rates may fluctuate significantly for a number of reasons, including the forces of supply and demand in the foreign exchange markets, actual or perceived changes in interest rates, intervention by U.S. or foreign governments or central banks, currency controls, or political developments in the U.S. or abroad.

SWIB's policies include foreign currency risk management objectives relating to each individual portfolio. These guidelines address the foreign currency management activities permitted for each portfolio based on the portfolio mandates, risk tolerances, and objectives. SWIB also employs discretionary currency overlay strategies at the total fund level when currency market conditions suggest such strategies are warranted.

Additional information related to the management of foreign currencies through the use of derivative instruments is discussed later in this note.

The table entitled Currency Exposures by Investment Type present the Retirement Fund investments which were exposed to foreign currency risk at December 31, 2019.

Retirement Funds
Currency Exposure by Investment Type
December 31, 2019
Stated in U.S. Dollars
(In Thousands)

Currency	Cash & Cash Equivalents	Equities	Fixed Income	Limited Partnerships	Preferred Securities	Financial Futures Contracts	Options	Short Sell Obligations	Total
Australian Dollar	$ 8,908	$ 930,656	$ 23,022	$ 0	$ 0	$ (356)	$ 0	$ (148,626)	$ 813,604
Brazilian Real	66	102,495	2,128	0	14,877	0	0	0	119,566
Canadian Dollar	12,170	1,596,517	18,136	0	0	558	0	(219,290)	1,408,091
Chilean Peso	15	11,902	0	0	0	0	0	0	11,917
Czech Republic Koruna	66	605	0	0	0	0	0	0	671
Denmark Krone	349	350,857	0	0	0	0	0	(37,957)	313,249
Euro Member Countries	30,353	5,567,118	237,609	988,410	288,100	777	0	(593,006)	6,519,361
Hong Kong Dollar	1,138	996,645	0	0	0	0	0	(24,091)	973,692
Hungarian Forint	0	11,164	0	0	0	0	0	0	11,164
Indian Rupee	61	46,719	0	0	0	0	0	0	46,780
Indonesian Rupiah	132	22,806	0	0	0	0	0	0	22,938
Israeli Shekel	250	29,958	0	0	0	0	0	(4,007)	26,201
Japanese Yen	16,241	4,063,228	0	0	0	75	0	(477,368)	3,602,176
Korea (South) Won	51	243,352	0	0	400	0	0	0	243,803
Malaysian Ringgit	501	9,077	8,905	0	0	0	0	0	18,483
Mexican Peso	758	14,416	24,109	0	0	0	0	0	39,283
New Zealand Dollar	783	46,133	14,996	0	0	0	0	(11,763)	50,149
Norwegian Krone	458	117,254	0	0	0	0	0	(34,284)	83,428
Philippine Peso	294	10,269	0	0	0	0	0	0	10,563
Poland Zloty	304	28,962	4,802	0	0	0	0	0	34,068
Russian Ruble	5	0	0	0	0	0	0	0	5
Singapore Dollar	3,943	265,440	0	0	0	0	0	(23,931)	245,452
South African Rand	883	51,062	21,499	0	41	0	0	0	73,485
Sweden Krona	113	490,788	3,658	2,726	0	0	0	(75,618)	421,667
Swiss Franc	458	1,446,884	0	0	0	0	0	(128,825)	1,318,517
Taiwan New Dollar	3	176,227	0	0	0	0	0	0	176,230
Thailand Baht	0	43,762	0	0	0	0	0	0	43,762
Turkish Lira	2	73,904	0	0	0	0	0	0	73,906
United Kingdom Pound	21,413	2,881,269	18,843	270,639	46	623	0	(199,774)	2,993,059
Total	**$ 99,718**	**$ 19,629,469**	**$ 377,707**	**$ 1,261,775**	**$ 303,464**	**$ 1,677**	**$ 0**	**$ (1,978,540)**	**$19,695,270**

1) Commingled funds (including limited partnerships and other pooled vehicles) represent investments where the Retirement Funds own only a portion of the overall fund. While the overall fund may be denominated in U.S. dollars, the underlying investments may be exposed to foreign currency risk in various currencies. Commingled funds are shown in the denomination used by the fund for financial reporting.

2) Short Sell Obligations are reported as liabilities on the Statement of Fiduciary Net Position. They are included in the above table because they have exposure to foreign currency risk.

3) Investment types holding instruments denominated only in U.S. Dollars are not included in the above table. At calendar year-end, these include: Convertible Securities, Multi Asset Investments, Real Estate, TBAs, Option Contracts, Swaps and Obligation Under Reverse Repurchase Agreements.

4) Values may not add due to rounding.

» *Fair Value of Investments*

Fair value measurements of the investments held by the WRS are categorized by the hierarchy established by generally-accepted accounting principles. The hierarchy, which has three levels, is based on the valuation inputs used to measure the fair value of the investment.

Level 1 - Investments reflect unadjusted quoted prices in active markets for identical assets.

Level 2 - Investments reflect prices that are based on inputs that are either directly or indirectly observable for an asset (including quoted prices for similar assets), which may include inputs in markets that are not considered to be active.

Level 3 - Investments reflect prices based upon valuation techniques in which significant inputs or significant value drivers are unobservable.

The fair value hierarchy gives the highest priority to Level 1 inputs and the lowest priority to Level 3. When the inputs used to measure fair value fall within different levels of the hierarchy, the level within which the fair value measurement is categorized is based on the lowest level input that is significant to fair value. The categorization of investments within the hierarchy is based upon the pricing transparency of the instrument and does not represent the investment's overall risk.

Commingled investments are not categorized under the fair value hierarchy but are disclosed within this note as investments measured at net asset value (NAV).

The fair value measurements of investments as of December 31, 2019, are found in the table entitled Investments by Fair Value Level.

Retirement Funds
Investments by Fair Value Level
As of December 31, 2019
(In Thousands)

Asset Type	Fair Value Level 1	Fair Value Level 2	Fair Value Level 3	TOTAL
Cash Equivalents				
Certificates of Deposit	$ 0	$ 47,303	$ 16,002	$ 63,305
Commercial Paper	0	0	251,331	251,331
Corporate Bonds & Private Placements	0	0	759	759
Total Cash Equivalents	0	47,303	268,092	315,395
Equities				
Domestic	38,596,296	21,307	39,438	38,657,041
International	19,583,916	0	45,553	19,629,469
Total Equities	58,180,212	21,307	84,991	58,286,510
Fixed Income				
Asset Backed Securities	0	380,652	6,707	387,359
Corporate Bonds & Private Placements	0	10,140,094	62,006	10,202,100
Exchange Traded Funds	77,857	0	0	77,857
Foreign Government/Agency Bonds	0	1,889,736	0	1,889,736
Municipal Bonds	0	194,700	0	194,700
U.S. Government Agencies	0	286,813	0	286,813
U.S. Treasury Inflation Protected Securities	0	16,848,689	0	16,848,689
U.S. Treasury Securities	68,068	5,274,940	0	5,343,008
Total Fixed Income	145,925	35,015,624	68,713	35,230,262
Real Estate	0	0	1,374,070	1,374,070
Preferred Securities				
Domestic	0	129,310	48,957	178,267
International	303,464	0	0	303,464
Total Preferred Securities	303,464	129,310	48,957	481,731
Convertibles	0	3,540	527	4,067
Derivatives				
Foreign Exchange Contracts	0	8,316	0	8,316
Futures	(29,912)	0	0	(29,912)
Options	(6,027)	(2)	0	(6,029)
Swaps	0	24,037	0	24,037
To Be Announced Securities	0	913,743	0	913,743
Total Derivatives	(35,939)	946,094	0	910,155
Equity Short Sales	(4,464,308)	0	0	(4,464,308)
Total	**$ 54,129,354**	**$ 36,163,178**	**$ 1,845,350**	**$ 92,137,882**

Securities classified as Level 1 are generally valued at the official closing price (usually the last trade price). Such investments generally include exchange-traded securities such as equities, preferred stock, certain derivative instruments, and exchange-traded funds. U.S. Treasury Bills and only the most recently-issued U.S. Treasury Notes and Bonds are classified as Level 1 as available pricing for these securities is similarly reliable to exchange-traded securities.

Securities classified as Level 2 are valued using observable inputs provided by third-party pricing services generally using either a bid evaluation or a matrix-pricing technique. Bid evaluations may include market quotations that are based on yields, maturities, call features, and ratings. Matrix-pricing is used to value securities based on their relationship to benchmark market prices for securities with similar interest rates, maturities, and credit ratings. Pricing in this level may also include market approaches that incorporate benchmark interest rates. Debt securities comprise the majority of the Level 2 investments as they are generally traded using a dealer market, with lower trading volumes than Level 1 securities. Over-the-counter derivative instruments, such as swaps, TBAs, and foreign exchange contracts, are also included in Level 2 as they are priced using a market approach that considers benchmark interest rates and foreign exchange rates.

Level 3 investments are generally valued using significant inputs that are unobservable to the marketplace. This may occur if an investment is illiquid or its value is based on estimates. For the WRS, such investments primarily include directly-held real estate, which is valued using appraisals that include significant unobservable inputs. Asset Backed Securities included in Level 3 represent private placements that are valued at purchase price when third-party valuations are unavailable. Equities, convertibles, and preferred securities included in the Level 3 hierarchy are generally privately-held securities valued using valuation models such as price multiples incorporating public company comparables, discounted cash flows and milestone valuation models. In some instances of privately-held preferred securities, fair value is determined based on recent financing rounds. Bank loans, which are included in corporate bonds and private placements within the Level 3 category, are priced by vendors using proprietary models which may incorporate unobservable inputs. Cash and Cash Equivalents included in level 3 represent securities priced at cost. Typically, due to their short-term nature, cost approximates fair value for these investments. Other factors such as infrequent trading, inactive market, or adjusted quoted prices may also result in Level 3 measurements.

» *Investments Measured at NAV*

The fair value of investments in certain fixed income funds, private equity limited partnerships, stock funds, real estate limited partnerships, and hedge funds are based on the investments' net asset value (NAV) per share (or its equivalent), provided by the investee. The December 31, 2019 investments valued using NAV are shown in the table entitled Investments Measured at NAV and include commingled/pooled funds, private equity, and real estate limited partnerships.

Retirement Funds
Investments Measured at NAV
As of December 31, 2019
(In Thousands)

Investments Measured at NAV	Fair Value	Unfunded Commitments(8)	Redemption Frequency	Redemption Notice Period (9)
Cash and Cash Equivalents (1)	$ 3,758,685	$ 0	Daily	Same Day
Fixed Income (2)	1,477,172	323,275	Daily, N/A	5 days, N/A
Private Equity Limited Partnerships (3)	9,175,514	6,218,971	N/A	N/A
Equities (4)	7,724,778	0	Daily, Monthly	2-30 days
Real Estate Limited Partnerships (5)	5,594,846	1,808,954	Quarterly, Annually, N/A	30-90 days, Other, N/A
Hedge Funds (6)	5,353,262	680,748	Various	Various
Total (7)	$ 33,084,257	$ 9,031,948		

(1) This category consists of short-term cash funds with the investment objective of safety of principal and liquidity while earning a competitive money market rate of return. The short-term cash funds have daily liquidity with same day notice.

(2) This category includes a long-only fixed income manager (68%), which can invest across the credit quality spectrum, in varying geographies, and can include derivatives, high yield and structured securities. The long-only manager requires a redemption notice period of 5 days and has daily liquidity. The remaining 32% of this category includes LLCs which invest in private real estate debt. These LLC investments distribute earnings over the life of the investment. The majority of these LLC investments have an average, estimated remaining life of less than 5 years. One LLC investment has an estimated remaining life of 5-10 years.

(3) Private Equity Limited Partnerships include direct, co-investments with existing SWIB general partners, direct secondary investments and fund of funds. These investments are illiquid and are generally not resold or redeemed. Distributions from each fund will be received as the underlying investments are liquidated. The table entitled Limited Partnerships - Estimated Remaining Life provides an estimate of the period over which the underlying assets are expected to be liquidated. However, as of December 31, 2019, it is probable that approximately 4% of these investments will be sold in the secondary market. Buyers for these investments have been identified and the sale of these investments is expected to occur during 2020.

(4) This category includes long-only equity managers (68%) with various fundamental, quantitative and other approaches spanning various styles, geographies and market cap weights. The majority of these long-only manager investments can be redeemed monthly with between 10 and 15 business days' notice. One long-only manager investment can be redeemed daily with 30 days' notice. The remaining 32% of this category represents emerging markets equity index funds with an investment strategy designed to track the return of the given segment of the emerging equity markets. These investments can be redeemed daily with 2 days' notice.

(5) This category includes funds that invest directly in real estate and real estate related assets. Approximately 72% of these investments are generally not resold or redeemed. Distributions from each fund will be received as the underlying investments are liquidated. The table entitled Limited Partnerships - Estimated Remaining Life provides an estimate of the period over which the underlying assets are expected to be liquidated. The remaining 28% of this category consists of open-ended funds that invest directly in real estate and real estate related assets. The majority of these investments can be redeemed quarterly with between 30 and 90 days' notice. One fund can be redeemed annually with notice provided in the first quarter of the calendar year.

(6) Hedge Fund investments are private investment funds that seek to produce absolute returns using a broad range of strategies. In certain instances, Hedge Fund investments are structured as limited partnerships, whereby participants receive distributions over the life of the fund. Estimated remaining life for the majority funds structured as limited partnerships within the portfolio is between 5-10 years. One fund has an estimated remaining life of greater than 10 years. Additional information relating to Hedge Funds can be found later in this note.

(7) WRS had additional commitments of approximately $1.5 billion, relating to funds that had secured commitments but not yet called capital as of December 31, 2019.

(8) WRS had additional unfunded commitments of approximately $190,356, relating to assets measured at fair value.

(9) Redemption terms described for NAV investments reflect contractual agreements and assume withdrawals are made without adverse market impact under normal market conditions.

» *Private Equity and Real Estate Limited Partnerships*

The Private Equity Limited Partnerships participated in the following investment strategies at December 31, 2019:

Buyout - This strategy acquires shares of a private company to gain a controlling interest.
Mezzanine - This strategy provides mezzanine debt to finance leveraged buyouts, recapitalizations, and corporate acquisitions.
Special Situations - This strategy can invest in public and private companies undergoing financial distress, a turnaround in business operations, or which are believed to be undervalued because of a discrete extraordinary event.

Venture Capital - This strategy invests in companies with potential for significant growth (generally small to early stage emerging firms).

The Real Estate Limited Partnerships generally consisted of the following investment strategies at December 31, 2019:

Core - Core investments are expected to deliver a significant percentage of their return from income and should demonstrate lower volatility than Opportunistic and Value investments due to lower leverage, higher occupancy, and asset location.
Value - Value investments typically have significant near-term leasing, repositioning, and/or renovation risk. This strategy is expected to have modest initial operating revenues with potential for substantial income growth and will likely encounter greater volatility than Core strategies, but lower volatility than Opportunistic strategies.
Opportunistic - Opportunistic investments usually have significant development, lease-up, financial restructuring, and/or liquidity risk with little or no initial operating income. This strategy typically uses the highest leverage, is expected to achieve most of its return from future capital gains, and is likely to encounter greater volatility than Core and Value strategies.

Limited partnerships are generally structured to provide distributions to participants of the fund as the holdings of the partnership are liquidated over time. The table entitled Limited Partnerships - Estimated Remaining Life illustrates the distribution of estimated remaining liquidation periods for the Retirement Funds' private equity and real estate limited partnership holdings as of December 31, 2019.

Retirement Funds
Limited Partnerships - Estimated Remaining Life
As of December 31, 2019
(In Thousands)

	Estimated Remaining Life*				
Limited Partnership Type	**< 5 Years**	**5 - 10 Years**	**> 10 Years**	**N/A**	**Total**
Private Equity	$ 2,256,199	$ 5,160,913	$ 1,758,402	$ 0	$ 9,175,514
Real Estate	567,233	3,388,701	54,071	1,584,841	5,594,846
Total	$ 2,823,432	$ 8,549,614	$ 1,812,473	$ 1,584,841	$ 14,770,360

* Estimated remaining life represents subjective estimates, assuming normal market conditions.

N/A investments represent open-ended funds that are readily redeemable.

» *Hedge Funds*

Hedge Fund investments are private investment funds that seek to produce absolute returns using a broad range of strategies. The Retirement Funds participated in the following Hedge Fund strategies at December 31, 2019:

Long-Short Equity - This strategy invests both long and short in publicly-traded stocks. These managers vary in their use of short selling and leverage.
Event-Driven - This strategy seeks to gain an advantage from pricing inefficiencies that may occur before or after a corporate action or related event, such as a merger, spinoff, earnings call, bankruptcy, or restructuring.

Tactical Trading - This strategy invests their holdings in indexes, commodities, interest rate instruments, and currencies as a result of relative value or directional forecasts from a systematic or discretionary approach.
Relative Value - This strategy uses a range of fixed income arbitrage, insurance linked, long/short credit, and/or quantitative strategies that seek to take advantage of price differentials.
Multistrategy - This strategy employs a wide range of strategies and instruments in managing assets.

When redeeming Hedge Fund investments, the agreements governing the investment often require advanced notice and may restrict the timing of withdrawals. The table entitled Hedge Fund Redemption Timing depicts redemption terms, independent of other contractual restrictions like lock-up periods as discussed below, for SWIB's Hedge Fund investments at December 31, 2019.

Retirement Funds
Hedge Fund Redemption Timing
As of December 31, 2019
(In Thousands)

Redemption Frequency	Redemption Notice Period (days)	Fair Value
Monthly	5 - 90	$ 1,387,487
Quarterly ([1])	30 - 90	3,240,880
Semi - Annual ([2])	30	41,947
Other ([1]) ([3])	45 - 90, N/A	682,948
Total		$ 5,353,262

([1]) These categories include funds that are in the process of being fully redeemed, with final distribution expected in 2020.

([2]) This category includes funds that have a funding date of January 1st, 2020. SWIB was contractually obligated to wire funds to the fund manager prior to the funding date.

([3]) This category includes funds that are subject to rolling locks, whereby the fund automatically re-locks unless a withdrawal request is submitted. This category also includes funds that are structured as limited partnerships, whereby withdrawals are not permitted but the participants receive distributions over the life of the fund.

Hedge Fund agreements can also include "lock-up" periods, which restrict investors from redeeming their investment during a specified time frame. Lock-up periods help portfolio managers mitigate liquidity risks. Lock-ups can be "hard," where redemptions are not permitted for a specified time period, or "soft," where redemptions are permitted provided the investor pays a penalty. In certain instances, a fund may have both hard and soft lock-up restrictions. In addition, in certain investments, hedge fund managers may be allowed to institute a "rolling" lock-up. A fund with a rolling lock-up period requires investors to commit to an initial lock-up period, and, if the investor does not submit a redemption notice within a set time prior to expiration of the lock-up, the lock-up is reset.

The table entitled Hedge Fund Lock-ups reflects the lock-up terms for the Hedge Fund investments held at December 31, 2019.

Retirement Funds
Hedge Fund Lock-ups
As of December 31, 2019
(In Thousands)

Hedge Fund Lock Type	Initial Duration of Lock (Years)	Year of Lock Expiration		Fair Value
Hard Lock (1)(2)	1 - 3	2020 - 2022	$	589,911
Soft Lock	1	2020		91,067
Rolling Lock (1)	2 - 3	2020 - 2022		449,222
None (1)	N/A	N/A		4,121,524
Other (3)	N/A	N/A		101,538
Total			$	5,353,262

(1) These categories include funds that are in the process of being fully redeemed, with final distribution expected in 2020.

(2) This category includes funds that have a funding date of January 1st, 2020. SWIB was contractually obligated to wire funds to the fund manager prior to the funding date.

(3) This category includes funds that are structured as limited partnerships, whereby withdrawals are not permitted but the participants receive distributions over the life of the fund.

Similar to lock-ups, hedge fund agreements also commonly incorporate gating restrictions. An investor-level gate limits redemption on a particular redemption date to a specified percentage of the investor's account value, while a fund-level gate may limit total investor withdrawals on a particular redemption date to a percentage of aggregated fund-level (or master fund-level) net asset value. In certain instances, funds can have both investor- and fund-level gates in place. Such funds are reflected in the "Investor Level" category. The table entitled Hedge Fund Gates summarizes the Hedge Fund Gates in place at December 31, 2019.

Retirement Funds
Hedge Fund Gates
As of December 31, 2019
(In Thousands)

Hedge Fund Gate Type	Gate Range		Fair Value
Investor Level (1)(2)	12.5% - 25%	$	1,878,988
Fund Level (1)	8.33% - 30%		1,049,221
None (1)	N/A		2,323,515
Other (3)	N/A		101,538
Total		$	5,353,262

(1) These categories include funds that are in the process of being fully redeemed, with final distribution expected in 2020.

(2) This category includes funds that have a funding date of January 1st, 2020. SWIB was contractually obligated to wire funds to the fund manager prior to the funding date.

(3) This category includes funds that are structured as limited partnerships, whereby withdrawals are not permitted but the participants receive distributions over the life of the fund.

» *Derivatives Instruments*

A derivative instrument, as defined by GASB Statement No. 53, is a financial instrument or other contract that has all of the following characteristics:

- **Settlement factors -** It has (1) one or more reference rates and (2) one or more notional amounts or payment provisions or both. Those terms determine the amount of the settlement or settlements and, in some cases, whether or not a settlement is required.
- **Leverage -** It requires no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors.
- **Net settlement -** Its terms require or permit net settlement, it can readily be settled net by a means outside the contract, or it provides for delivery of an asset that puts the recipient in a position not substantially different from net settlement.

Derivative instruments may be used to implement investment strategies for the Retirement Funds. All derivative instruments are subjected to risk analysis and monitoring processes at the portfolio, asset class, and fund levels. Investment guidelines define allowable derivative activity for each portfolio and are based on the investment objectives which have been approved by the Board of Trustees. Where derivative instruments are permitted, guidelines stipulate allowable types and the manner and degree to which they are to be used.

Gains and losses for all derivative instruments are reported in the Statement of Changes in Fiduciary Net Position as “Net Increase (Decrease) in Fair Value of Investments.” SWIB invests in derivative investments directly as well as indirectly through commingled or pooled investments. Information relating to investments held in commingled funds has not been separately disclosed in the financial statements or the accompanying footnotes, consistent with GASB reporting requirements.

A derivative instrument can take the form of an individually negotiated contract between the Retirement Funds and a specific counterparty. These types of negotiated positions are known as over-the-counter (OTC) contracts. OTC contracts can be structured as either “uncleared” or “cleared.”

Uncleared OTC contracts are non-standardized bilateral contracts between counterparties and do not include the use of a centralized intermediary, such as a clearinghouse. Uncleared OTC transactions are subject to regulatory requirements with respect to data reporting and recordkeeping, trading relationship documentation, business conduct standards, portfolio reconciliation, and margin collection and posting. For these transactions, master netting agreements and credit support annexes governing the credit relationship and collateral exchange between two parties are put in place to mitigate counterparty credit risk.

Cleared OTC contracts offer additional protections to trade participants. These types of transactions employ the use of an intermediary between counterparties. The intermediary, known as a clearinghouse, serves to facilitate trading and mitigate risks. While not completely standardized, these contracts involve a high degree of standardization. Once cleared, the clearinghouse steps in as the counterparty to all trades. Regulatory bodies govern the tools and procedures for risk mitigation such as margin requirements and daily mark-to-market.

In addition to trading OTC, derivative contracts can also be transacted on established exchanges. These types of contracts are called “exchange-traded” and are completely standardized. Like cleared OTC contracts, the clearinghouse is an intermediary to the trade, reducing risks and standardizing the exchange of margin. The table entitled Derivative Contract Types summarizes the differences between OTC and exchange-traded contracts.

Retirement Funds Derivative Contract Types		
Uncleared (OTC)	**Cleared (OTC)**	**Exchange-Traded**
Trades negotiated over-the-counter	Trades negotiated over-the-counter	Trades executed on organized exchanges
Customized trade terms are agreed upon by counterparties	Trades limited to standardized terms	Trades limited to standardized terms
Traded bilaterally between counterparties	Trades are submitted through a clearinghouse, which is counterparty	Trades are booked with exchange's clearinghouse, which is counterparty
Margin (collateral) often exchanged but subject to negotiation between counterparties.	Mandatory margin requirements	Mandatory margin requirements
Common example: Forward Contracts	Common example: Credit Default Swaps	Common example: Futures Contracts

Collateral postings are commonplace for derivative contracts and vary based on the type of contract traded. SWIB posted $247.9 million in cash and $287.7 million in securities as collateral for derivatives positions as of December 31, 2019. More information regarding collateral requirements is included below.

Uncleared OTC Derivative Instruments

Inherent in the use of uncleared OTC derivative instruments, the Retirement Funds may be exposed to counterparty credit risk. Counterparty credit risk is the risk that a derivative instrument counterparty may fail to meet its payment obligations under the terms of the derivative contract. SWIB seeks to mitigate this risk through counterparty credit evaluations and approvals, counterparty credit limits, and exposure monitoring procedures. Additionally, policies have been established which seek to implement master netting arrangements with counterparties that permit the closeout and netting of transactions with the same counterparty upon the occurrence of certain events, such as payment default, rating downgrade, bankruptcy, illegality, or force majeure. Agreements may also require daily collateral postings to further mitigate credit risk.

The table entitled OTC Derivative Instruments Subject to Counterparty Credit Risk, summarizes, by credit rating, the Retirement Funds' exposure to counterparty credit risk relating to uncleared OTC contracts as of December 31, 2019, without respect to any collateral or netting agreement.

Retirement Funds
OTC Derivative Instruments Subject to Counterparty Credit Risk
As of December 31, 2019
(In Thousands)

Counterparty Credit Rating	FX Receivables	Swap Receivables	To Be Announced Securities[1]	Warrants [1,2]	Total [3]
AA	$ 814,883	$ 0	$ 0	$ 0	$ 814,883
A	3,588,471	570,776	3,568	0	4,162,815
BBB	632	0	0	0	632
Not Rated	0	0	0	9,126	9,126
					$ 4,987,456

[1]Exposure to counterparty credit risk for To Be Announced Securities and Warrants is limited to unrealized gains on open positions.

[2] Warrants issued by privately held company that is not rated by statistical credit rating organization.

[3] Aggregate amount of liabilities included in master netting arrangements was $4.9 billion at December 31, 2019.

The aggregate fair value of receivables relating to uncleared OTC derivative contracts was $5.0 billion at December 31, 2019. This amount represents the maximum loss that would be recognized at the reporting date if all counterparties failed to perform as contracted. This maximum exposure is reduced to $0 at December 31, 2019 when counterparty collateral and master netting arrangements are taken into account. The number of uncleared OTC counterparties with credit exposure at year end was 16.

Cleared OTC and Exchange-Traded Derivative Instruments

Counterparty credit risk is mitigated by an intermediary for cleared OTC and exchange-traded derivative contracts. For these types of derivative investments, a clearinghouse interposes itself as counterparty to all trades and extends a guarantee that trades will be settled as originally intended. To ensure performance, margin requirements are imposed. The requirements are established with the intent to cover nearly all expected price changes based on market risk. Margin payments are settled daily based upon the price movements of the contracts, thereby significantly reducing counterparty credit risk.

» *Foreign Currency Spot and Forward Contracts*

Foreign Currency Spot and Forward contracts are uncleared OTC agreements between two parties to exchange designated currencies at a specific time in the future. No cash is exchanged when a foreign exchange spot or forward contract is initiated. Depending upon market movements, forward contracts may require collateral postings either to SWIB or to counterparties. Spot contracts are exempt from collateralization. For deliverable contracts, amounts due are paid or received on the contracted settlement date. In other instances (most often in emerging markets), contracts are established as non-deliverable forwards (NDFs). Unlike deliverable contracts, NDFs are only settled in U.S. dollars.

Currency exposure management is permitted through the use of currency derivative instruments. Direct hedging of currency exposure back to the U.S. dollar is permitted when consistent with the strategy of the portfolio. Cross-currency exposure management seeking to transfer out of an exposed currency and into a benchmark currency is permitted. In select portfolios, currencies of non-benchmark countries may be held through the use of forward contracts, provided that the notional value of any single non-benchmark currency does not exceed 5% of the market value of the portfolio. SWIB may employ discretionary currency overlay strategies at the total fund and asset class level when currency market conditions suggest such strategies are warranted.

Losses may arise from future changes in the value of the underlying currency, or if the counterparties do not perform under the terms of the contract. Spot and forward contracts are valued daily with the changes in fair value included in "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position. The net receivable or payable for spot and forward contracts is reflected as "Foreign Currency Contracts" on the Statement of Fiduciary Net Position. The table entitled Foreign Currency Spot and Forward Contracts presents the fair value of foreign currency spot and forward contract assets and liabilities held by the Retirement Funds as of December 31, 2019.

Retirement Funds
Foreign Currency Spot and Forward Contracts
December 31, 2019
(In Thousands)

Currency	Notional (local currency)	Fair Value ($US)	Unrealized Gain(Loss) ($US)
Foreign Currency Contract Receivables			
Australian Dollar	169,256	$ 119,003	$ 2,778
Brazilian Real	102,088	25,317	673
Canadian Dollar	160,675	123,913	2,260
Chilean Peso	29,174,841	38,820	1,284
China Yuan Renminbi	224,055	32,083	225
Colombian Peso	11,004,997	3,341	172
Czech Republic Koruna	685,751	30,291	446
Danish Krone	131,480	19,763	135
Egypt Pound	83,596	5,193	297
Euro Member Countries	217,705	244,549	1,587
Hong Kong Dollar	294,084	37,738	147
Hungarian Forint	1,396,858	4,744	45
Indian Rupee	3,239,107	45,258	128
Indonesian Rupiah	488,170,073	34,925	570
Israeli Shekel	44,234	12,826	67
Japanese Yen	23,251,938	214,081	(176)
Korea (South) Won	13,623,395	11,819	167
Mexican Peso	453,320	23,752	478
New Zealand Dollar	38,255	25,811	836
Norway Krone	3,472,087	395,194	15,513
Peru Sol	24,161	7,278	121
Philippine Peso	243,844	4,794	7
Poland Zloty	129,143	34,101	658
Russian Ruble	2,148,307	34,353	1,074
Singapore Dollar	70,747	52,632	628
Sweden Krona	3,365,807	360,430	7,927
Switzerland Franc	196,298	202,817	2,897
Taiwan New Dollar	421,359	14,164	242
Thailand Baht	144,028	4,817	41
Turkish Lira	35,801	5,944	(93)
United Kingdom Pound	110,722	146,720	1,420
U.S. Dollar	2,087,515	2,087,515	0
Total Receivables		4,403,986	42,554
Foreign Currency Contract Payables			
Australian Dollar	(173,633)	$ (122,069)	$ (2,375)
Brazil Real	(41,887)	(10,402)	(494)
Canadian Dollar	(206,831)	(159,505)	(2,702)
Chile Peso	(11,288,902)	(15,025)	(555)
China Yuan Renminbi	(95,244)	(13,605)	(47)
Colombian Peso	(29,410,088)	(8,928)	(444)
Czech Republic Koruna	(192,988)	(8,524)	(178)
Denmark Krone	(387,406)	(58,216)	(497)
Euro Members Countries	(1,258,125)	(1,414,686)	(15,835)
Hong Kong Dollar	(239,147)	(30,690)	(74)
Hungarian Forint	(3,148,823)	(10,695)	(141)
Indian Rupee	(609,796)	(8,496)	(66)
Indonesia Rupee	(166,546,392)	(11,960)	(255)
Israeli Shekel	(16,586)	(4,815)	(25)
Japanese Yen	(27,795,081)	(255,844)	(237)
Korea (South) Won	(6,128,397)	(5,317)	(157)
Mexican Peso	(259,381)	(13,707)	(304)
New Zealand Dollar	(97,944)	(66,125)	(1,901)
Norway Krone	(193,690)	(22,043)	(830)
Peru Sol	(21,716)	(6,542)	(136)
Philippines Peso	(197,765)	(3,890)	(15)
Poland Zioty	(11,437)	(3,020)	(74)
Singapore Dollar	(43,861)	(32,621)	(331)
South African Rand	(210,668)	(14,985)	(697)
Sweden Krona	(816,924)	(87,293)	(1,153)
Switzerland Franc	(117,301)	(121,211)	(1,346)
Taiwan New Dollar	(455,505)	(15,312)	(68)
Thailand Baht	(123,684)	(4,137)	(53)
Turkish Lira	(16,590)	(2,736)	14
United Kingdom Pound	(190,791)	(252,782)	(3,560)
U.S. Dollar	(1,610,489)	(1,610,489)	0
Total Payables		(4,395,670)	(34,536)
Net		$ 8,316	$ 8,018

» *Futures Contracts*

A futures contract is an exchange-traded agreement to buy or sell a financial instrument, index, or commodity at an agreed upon price and specified date in the future.

The fair value of futures contracts represents the unrealized gain(loss) on the contracts, since trade inception, and is reflected as "Financial Futures Contracts" on the Statement of Fiduciary Net Position. Futures contracts are marked to market daily, based upon the closing market price of the contract at the board of trade or exchange on which they are traded. Gains and losses resulting from investments in futures contracts are included in the "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position.

Futures contracts involve, to varying degrees, risk of loss in excess of the margin deposited with the clearinghouse. Losses may arise from future changes in the value of the underlying instrument.

Futures contracts may be entered into for purposes such as the following:

- To efficiently gain or adjust market exposures for rebalancing,
- To adjust sector, interest rate, or duration exposures, and
- To securitize cash or act as a substitute for cash market transactions.

The table entitled Futures Contracts presents the Retirement Funds investments in futures contracts as of December 31, 2019.

Retirement Funds
Futures Contracts
As of December 31, 2019
(In Thousands)

Futures Contract Description	Position	Expiration	Notional Amount	Fair Value*
Commodity	Long	Jan 20 - Apr 20	$ 88,416	$ 2,664
	Short	Jan 20 - Mar 20	(33,093)	(113)
Currency	Long	Mar 20	87,918	1,284
	Short	Mar 20	(38,785)	(194)
Equity Index	Long	Jan 20 - Mar 20	2,117,002	11,988
	Short	Jan 20 - Apr 20	(284,674)	(5,644)
Fixed Income	Long	Mar 20	9,782,696	(65,436)
	Short	Mar 20	(3,096,191)	25,539
Total			$ 8,623,289	$ (29,912)

* Fair Value includes foreign currency gains(losses).

The table entitled Futures Contracts with Interest Rate Sensitivity presents the interest rate sensitivity of fixed income futures contracts as of December 31, 2019. Duration, which is stated in years, is the measure of price sensitivity of a fixed income security to an interest rate change of 100 basis points. Duration statistics presented in this table are weighted by the notional value of each position to compute an average duration for the contract types held.

Retirement Funds
Futures Contracts with Interest Rate Sensitivity
As of December 31, 2019
(In Thousands)

Contract Type	Position	Notional Amount	Fair Value	Weighted Average Duration (Years)
U.S. Treasury Notes	Long	$ 7,792,879	$ (17,697)	3.5
U.S. Treasury Notes	Short	(2,672,240)	23,501	6.4
U.S. Treasury Bonds	Long	1,989,817	(47,739)	17.0
U.S. Treasury Bonds	Short	(6,721)	211	18.1
Foreign Government Bonds	Short	(417,230)	1,827	5.1
Total		$ 6,686,505	$ (39,897)	

» *Options*

An option contract gives the purchaser of the contract the right, but not the obligation, to buy (call) or sell (put) the security or index underlying the contract at an agreed upon price on or before the expiration date of the contract. The seller of the contract is subject to market risk, while the purchaser is subject to credit risk and market risk, to the extent of the premium paid to enter into the contract.

Trust fund rebalancing policies and certain portfolio investment guidelines permit the use of exchange-traded and OTC options. Investment guidelines allow options to be used to improve market exposure efficiency, enhance expected returns, or provide market exposure hedges. Exchange rules require that the seller of short exchange-traded options contracts cover these positions either by collateral deposits in the form of cash or by pledging, in escrow, the actual securities that would be transferred to the option purchaser in the event the option contract were exercised. In the case of OTC options, investment guidelines mitigate counterparty credit risk by establishing minimum credit ratings and requiring master netting agreements with provisions for collateral exchanges.

The fair value of options contracts is based upon the closing market price of the contract and is reflected as "Options Contracts" on the Statement of Fiduciary Net Position. Gains and losses as a result of investments in options contracts are included in the "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position. The table entitled Options Contracts presents the fair value of options contracts as of December 31, 2019. The Retirement Funds did not hold OTC options at December 31, 2019.

Retirement Funds
Options Contracts
As of December 31, 2019
(In Thousands)

Description	Contract Type	Position	Exchange-Traded (EXCH) vs. OTC	Expiration	Notional	Fair Value	Unrealized Gain (Loss)
Equity	CALL	Short	EXCH	Jan 20 - Apr 20	$ (18,648)	$ (620)	$ (166)
Equity	PUT	Short	EXCH	Jan 20 - May 20	(56,123)	(499)	759
Equity	PUT	Long	EXCH	Jan 20 - Feb 20	8,901	251	(49)
Equity Index	CALL	Short	EXCH	Jan 20 - Mar 20	(226,155)	(4,342)	(2,643)
Equity Index	PUT	Short	EXCH	Jan 20 - Mar 20	(226,155)	(852)	1,861
Equity Index	PUT	Long	EXCH	Jan 20 - Mar 20	26,748	29	(51)
Fixed Income Index	PUT	Long	EXCH	Feb 20	2032	4	(2)
Total					$ (489,400)	$ (6,029)	$ (291)

» *Swaps*

Swaps are negotiated contractual agreements between two parties that can be cleared or uncleared OTC investments. As is specified in SWIB's investment guidelines, swaps may be used as an alternative to physical securities when it is deemed advantageous for portfolio construction. In addition, swaps may be used to adjust asset class exposures for the Retirement Funds. Guideline limits and soft risk parameters for each portfolio are applied to the aggregate exposures which includes both physical and synthetic securities. A synthetic security is a security or combination of securities that mirrors the properties of another reference security.

Throughout the calendar year, the Retirement Funds held positions in Total Return Swaps (TRS) and Credit Default Swaps (CDS). The table entitled Open Swap Positions lists the open swap contracts held at December 31, 2019.

Retirement Funds
Open Swap Positions
As of December 31, 2019
(In Thousands)

Type	Maturity Date	Reference Rate	Notional Amount	Fair Value	Unrealized Gain (Loss)
Credit Default	Dec-24	NA (1)	$ 215,000	$ 5,574	$ 99
Credit Default	Dec-24	NA (1)	39,600	3,815	(30)
Credit Default	Dec-24	NA (2)	30,000	(1,009)	26
Credit Default	Dec-24	NA (2)	(155,000)	(4,019)	74
Total Return	Jan-20	Pay Equity Index Return, Receive 3-month LIBOR plus Spread	(110,414)	(33)	(33)
Total Return	Jan-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	54,384	4,690	4,690
Total Return	Apr-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	54,834	5,072	5,072
Total Return	Jun-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	63,943	826	826
Total Return	Jul-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	54,834	5,072	5,072
Total Return	Sep-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	56,054	1,554	1,554
Total Return	Dec-20	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	98,566	(262)	(262)
Total Return	Feb-21	Pay 3-month LIBOR plus Spread, Receive Equity Index Return	57,982	2,757	2,757
Total			$ 459,783	$ 24,037	$ 19,845

(1) SWIB sold credit protection in exchange for periodic payments

(2) SWIB bought credit protection in exchange for periodic payments

The open CDS contracts represent cleared OTC positions where SWIB sold (bought) credit protection. Under the terms of the contracts, SWIB receives (pays) periodic payments and, in exchange, agrees to pay (receive) a formula-determined amount to counterparties for losses incurred if stipulated credit events occur. CDS spreads are sensitive to credit spread and interest rate changes. The fair value of CDS is determined using the closing price as reported by the applicable clearinghouse.

The open TRS contracts represent uncleared OTC positions where SWIB receives (pays) the return of the underlying equity index, in exchange, agrees to pay (receive) the stipulated rate benchmark. The rate benchmark is based on the 3-month London Interbank Offering Rate (LIBOR) and is sensitive to interest rate changes. The fair value for TRS is determined based on the change in quoted market price of the underlying equity index and represents the unrealized gain (loss) on the contracts since trade inception.

The fair value of CDS and TRS is reflected as "Swaps" on the Statement of Fiduciary Net Position. Gains and losses resulting from investments in swap contracts are included in the "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position.

» *To Be Announced Securities*

To be announced mortgage-backed (TBA) securities are uncleared OTC forward contracts consisting of mortgage-backed securities (MBS) issued by Government National Mortgage Association, a government entity, and by government-sponsored enterprises such as, the Federal National Mortgage Association or the Federal Home Loan Mortgage Corp. The term TBA is derived from the fact that the actual MBS that will be delivered to fulfill a TBA trade is not designated at the time the trade is made. Instead, the specific pool of mortgages comprising the MBS is announced 48 hours prior to the established trade settlement date. Eligibility rules and standards for MBS pools deliverable into TBA contracts ensure that delivered MBS pools are fungible. Payment for TBA securities is not made until the settlement date.

Certain portfolio investment guidelines allow for both long and short TBA positions. To mitigate counterparty credit risk, guidelines establish minimum credit ratings and require master netting agreements which include provisions for collateral exchanges.

TBAs, much like their underlying MBS securities, may be highly sensitive to interest rate changes. This is because the MBS pool on which these forward contracts are based can be subject to early payment in a period of declining interest rates. The price of TBAs can fluctuate as the marketplace predicts changes in timing, or possible reductions in expected cash flows, associated with a change in interest rates. The table entitled TBA Contracts includes the interest rate sensitivity of TBA contracts as of December 31, 2019. Duration, which is stated in years, is the measure of price sensitivity of a fixed income security to an interest rate change of 100 basis points. Duration statistics presented in this table are weighted by the fair value of each position to compute an average duration for the contracts held.

Retirement Funds
TBA Contracts
As of December 31, 2019
(In Thousands)

Position	Contract Maturity	Fair Value	Unrealized Gain (Loss)	Weighted Average Duration (Years)
Long	Jan 20	$ 2,976,944	$ 3,341	3.0
Short	Jan 20	(2,063,201)	(2,644)	3.2
Total		$ 913,743	$ 697	

The fair value of TBAs is reflected in "To Be Announced Securities" on the Statement of Fiduciary Net Position. The unrealized gain/loss associated with these contracts is included within the "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position.

» *Warrants*

A warrant is a contract that entitles the holder to buy the underlying stock of the issuing company at a specified price. Warrants and options are similar in that the two instruments allow the holder special rights to buy securities. However, warrants differ from options in that they provide additional financing to the issuing company when exercised.

As of December 31, 2019, SWIB held warrant contracts giving SWIB the right to purchase 169,582 shares of preferred stock at a price of 1 Euro per share. SWIB was issued these warrants in 2017 in conjunction with an investment in a privately held company. The $9.3 million fair value of these warrants is based upon a third-party valuation and is included in "Equities" on the Statement of Fiduciary Net Position. The associated unrealized gain of $9.1 million is included in the "Net Increase (Decrease) in Fair Value of Investments" on the Statement of Changes in Fiduciary Net Position.

» *Securities Lending Transactions*

State statutes and Board policies permit SWIB to use investments of the Retirement Funds to enter into securities lending transactions. These transactions involve the lending of securities to broker-dealers and other entities in exchange for collateral, in the form of cash or securities, with the simultaneous agreement to return the collateral for identical securities in the future. SWIB's custodian acts as an agent in lending the Retirement Funds' directly-held domestic and international securities. When the Retirement Funds' securities are delivered to a borrower as part of a securities lending agreement, the borrower is required to place collateral with the lending agent equal to at least 102% of the loaned securities' fair value, including interest accrued, as of the delivery date, so long as the securities and the collateral are denominated in the same currency. In the event that securities are loaned against collateral denominated in a different currency, the borrower is required to place collateral with the lending agent totaling at least 105% of the loaned securities' fair value, including interest accrued, as of the delivery date. Collateral is marked to market daily and adjusted as needed to maintain the required minimum level. Pledging or selling non-cash collateral securities cannot be done without a borrower default. On December 31, 2019, the fair value of the securities on loan to counterparties was approximately $12.0 billion.

Cash collateral is reinvested by the lending agent in two separate pools, a U.S. dollar cash collateral pool and a pool denominated in Euros. These pools are administered in accordance with contractual investment guidelines which are designed to minimize the risk of principal loss and provide a modest rate of return. Investment guidelines limit credit and liquidity risk by restricting new investments to overnight repurchase agreements collateralized with high quality U.S. government, U.S. government agencies, and sovereign debt securities. To further reduce credit risk, SWIB's custodian provides indemnification to SWIB against counterparty default. The earnings generated from the collateral investments, plus or minus the rebates received from or paid to the dealers and less fees paid to agents, results in the net earnings from lending activities, which are then split on a percentage basis with the lending agent. Cash from the U.S. dollar pool may be posted as collateral relating to short sale transactions and it earns the Overnight Bank Funding rate plus 10 basis points. Additional information relating to short sales is discussed later in this note.

At December 31, 2019, the Retirement Funds had minimal credit risk exposure to borrowers as loans are collateralized in excess of 100%. In addition to the cash collateral reinvestment indemnification, the contract with the lending agent requires it to indemnify the Retirement Funds if the borrowers fail to return the loaned securities and the collateral is inadequate to replace the securities lent. The Retirement Funds are also indemnified against losses resulting from violations of investment guidelines.

The majority of security loans are open-ended and can be terminated on demand by the Retirement Funds or the borrower. Maturities of investments made with cash collateral are not necessarily matched to the maturities of the securities loaned because most loans do not have a fixed maturity date. The risk that SWIB would be unable to return collateral to securities borrowers upon termination of the loan is mitigated by the highly liquid nature of investments held in the collateral reinvestment pools. The average maturities of the loans and the average maturities of the assets held in the collateral reinvestment pools were similar at December 31, 2019.

Securities lending is allowed in certain commingled fund investments. As an investor in such funds, SWIB does not own the underlying securities and does not separately report on securities lending activity. All earnings of these funds are reported in the Statement of Changes in Fiduciary Net Position as "Net Increase (Decrease) in Fair Value of Investments."

» *Short Sell Obligations*

The Retirement Funds may sell a security it does not own in anticipation of purchasing the security later at a lower price. This is known as a short sale transaction. For the duration of the short sale transaction, a liability is recorded under "Short Sell Obligations" on the Statement of Fiduciary Net Position. The liability presented on the Statement of Fiduciary Net Position represents the fair value of the shorted securities necessary for delivery to the purchaser and is marked-to-market daily. Realized and unrealized gains and losses associated with short sales are recorded on the Statement of Changes in Fiduciary Net Position, in the "Net Increase (Decrease) in Fair Value of Investments" account. Prior to executing a short sale, SWIB borrows the security from a party currently holding it. While the transaction is open, the Retirement Funds incur expenses for securities borrowing costs. In addition, as a security borrower, the Retirement Funds may incur dividend and interest expense as such payments must be remitted to the security lender during the course of the loan. During the duration of the borrow, there may be corporate action elections requiring the borrower to deliver items such as cash or securities to the lender. Expenses resulting from short sales are included in "Investment Expense" on the Statement of Changes in Fiduciary Net Position.

Risks arise from short sales due to the possible illiquidity of the securities markets and from potential adverse movements in security values. The cost to acquire the securities sold short may exceed the amount of proceeds initially received, as well as the amount of the liability recorded as "Short Sell Obligations" in the Statement of Fiduciary Net Position. Short sales expose the short seller to potentially unlimited liability as there is no upward limit on the price a shorted security can reach. Certain portfolio guidelines permit short sales and mitigate risks in various ways, including: limiting the total value of short sales as a percentage of portfolio value, establishing portfolio versus benchmark tracking error limits, and monitoring other statistical and economic risk measures of the portfolio. Investment performance and risk associated with each portfolio is measured against benchmarks and monitored by management.

When a short sale occurs, the shorting portfolio must borrow the security and deliver it to the buyer. If the shorted security is owned by another Retirement Fund portfolio, investment policies allow the borrowing of the shorted securities from other Retirement Fund portfolios, including inter-fund borrowings. In addition to borrowing securities from existing Retirement Fund portfolios, SWIB may borrow securities from external sources. These borrowings are facilitated by SWIB's custodian.

Except in the case of borrowings within the same trust fund, the Retirement Funds are required to post collateral to the lender, at the required rate of 102% for in-currency loans and 105% for cross-currency loans. The Retirement Funds posted $62.9 million in cash and $2,925.6 million in securities as collateral to security lenders representing $87.4 million in excess of the fair market value of the securities borrowed as of December 31, 2019. If the security lender recalled the security and SWIB was not able to supply the lender with the security, the lender would be permitted to use SWIB's collateral to fund the purchase of the security.

» *Investment Policy and Asset Allocation*

As part of its Fiduciary responsibilities, SWIB is required by section 25.15(2)(b) of the Wisconsin Statutes "To diversify investments in order to minimize the risk of large losses, unless under the circumstances it is clearly prudent not to do so, considering each trust's or fund's portfolio as a whole at any point in time." SWIB exercises this duty in part by establishing its investment policy and by setting the asset allocation.

SWIB's Board of Trustees has established the asset allocation pursuant to a comprehensive and ongoing evaluation of the appropriate risk and return standards for each fund under management. The Board of Trustees consists of nine members meeting specific requirements as follows:

- Six Governor-appointed and State Senate-approved members, including:
  - Four with at least ten years investment experience
  - One with at least ten years financial experience and who works for a local government participant in the Local Government Investment Pool
  - One additional member
- Educator participant in the WRS appointed by the Teachers Retirement Board
- Non-educator participant in the WRS appointed by the Wisconsin Retirement Board
- Secretary of the Department of Administration or designee

The Board of Trustees-approved investment policy is intended to assist in development of a diversified portfolio of investments within acceptable risk parameters. The policy represents a delegation of standing authority to the SWIB's Executive Director and investment managers within the organization to make prudent investments within the investment guidelines, pursuant to sections 15.02(4) and 25.15(2) of the Wisconsin Statutes and section IB 2.02 of the Wisconsin Administrative Code.

Additionally, the Investment Committee (IC) was created to provide oversight of SWIB investments within the parameters established by the Board of Trustees. Oversight includes analysis of risk and investment returns of the portfolios, asset classes, and Core and Variable Funds. The IC is responsible for proposing to the Board of Trustees changes to the WRS investment policy, approving investment guidelines or strategies for internally-managed portfolios, approving the general strategies for each asset class, and for approving new investment instruments and derivatives strategies. The Board of Trustees reserves all rights to modify and amend IC guidelines at any time at its discretion.

The IC approved WRS Investment Guidelines include several policies, including a derivatives use policy, rebalancing procedures, and a leverage use policy. The derivatives use policy sets forth the objectives, monitoring, and reporting guidelines relating to derivative investments. The rebalancing procedures used in both mandatory and discretionary asset class rebalancing are described in the Investment Guidelines, and the leverage use policy describes SWIB's leverage philosophy. The total amount of financial leverage is approved by the Board of Trustees through the WRS asset allocation process.

The Board of Trustees adopts the Retirement Funds' asset allocation policy, based on recommendations by the IC, the Board of Trustees's asset allocation consultant, Chief Investment Officer, and Managing Director of Asset and Risk Allocation. SWIB undertakes a comprehensive review of its strategic asset allocation plan every other year, including asset/liability modeling, to determine a suitable target allocation for each asset class included in the Core and Variable Funds, and an annual review to assess whether any interim adjustments should be made. The strategic nature of these reviews contemplates a long-term time horizon over which potential results are evaluated. This exercise is not an attempt to predict short-term market movements, but an effort to understand the long-term impacts of poor, normal, and above average market results.

In addition to potential future market impact, SWIB also contemplates the objectives of the funds, the impact of actuarial analysis, and the soundness of investment return and risk expectations. SWIB's asset allocation policies reflect the Board of Trustees's program of risk allocation that involves reducing equity exposure by leveraging low-volatility assets, such as "fixed income" securities. This investment strategy results in Core Fund strategic targets which exceed 100% of invested assets. Currently, the Board has approved an asset allocation target of 10% financial leverage for the Core Fund subject to an allowable range of up to 15%.

SWIB's asset allocation review process also includes assumptions regarding expected rates of return. Long-term (e.g., 30-year) expected real rates of return on pension plan investments are determined using a building block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected real rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. The table entitled Asset Allocation Targets and Expected Returns presents the policy asset allocation targets and the best estimates of expected geometric rates of return for each major asset class as of December 31, 2019.

Retirement Funds
Asset Allocation Targets and Expected Returns
As of December 31, 2019

Core Fund Asset Class	Asset Allocation %	Long-Term Expected Nominal Rate of Return %	Long-Term Expected Real Rate of Return %
Global Equities	49 %	8.0 %	5.1 %
Fixed Income	24.5	4.9	2.1
Inflation Sensitive Assets	15.5	4.0	1.2
Real Estate	9	6.3	3.5
Private Equity/Debt	8	10.6	7.6
Multi-Asset	4	6.9	4.0
Total Core Fund	110 %	7.5 %	4.6 %
Variable Fund Asset Class			
U.S. Equities	70 %	7.5 %	4.6 %
International Equities	30	8.2	5.3
Total Variable Fund	100 %	7.8 %	4.9 %

New England Pension Consultants Long Term US CPI (Inflation) Forecast: 2.75%
Asset Allocations are managed within established ranges, target percentages may differ from actual monthly allocations

For purposes of determining asset allocation targets, investments may be categorized differently than they are within the financial statements. For example, SWIB's management considers inflation-sensitive assets separately from other "fixed income" investments for asset allocation purposes.

» *Annual Money-Weighted Rate of Return*

Money-weighted rate of return expresses investment performance, net of pension plan investment expense, adjusted for the changing amounts actually invested. For the year ended December 31, 2019, the money-weighted rate of return for the Core Fund was 19.49% and 28.80% for the Variable Fund.

4 DESCRIPTION OF THE WISCONSIN RETIREMENT SYSTEM

The WRS is a cost-sharing, multiple-employer public employee retirement system established and administered by the State of Wisconsin to provide pension benefits for state and local government employees. WRS benefits and other plan provisions are established by Chapter 40 of the Wisconsin Statutes. Benefit terms may only be modified by legislation. ETF, under the direction of the ETF Board, is responsible for the administration of the WRS.

» *Employee Trust Funds Board*

The ETF Board has general oversight of ETF, appoints the ETF Secretary and oversees administration of the benefit programs, other than group insurance and deferred compensation. The ETF Board is comprised of 13 members, including:

- the Governor or the Governor's designee on the Group Insurance Board;
- the Administrator of the Department of Administration's Division of Personnel Management or the Administrator's designee;
- 4 members appointed by the Teachers Retirement Board (an advisory board to the ETF Board);
- 4 members appointed by the Wisconsin Retirement Board (an advisory board to the ETF Board);
- a public member who is not a participant in or beneficiary of the WRS, with at least 5 years of experience in actuarial analysis, administration of an employee benefit plan or significant administrative responsibility in a major insurer;
- a WRS annuitant; and
- a participant in the WRS who is a technical college or public school district educational support personnel employee.

» *WRS Employers*

The WRS is open to all public employers in Wisconsin. Participation is optional, except that participation is mandatory for school districts with respect to teachers, some municipalities with respect to police and firefighters, and all counties except Milwaukee County. As of December 31, 2019, the number of participating employers was:

State Agencies, UW & Public Authorities	56
Cities	188
Counties	71
Villages	274
Towns	272
School Districts	421
Cooperative Educational Service Agencies	12
Wisconsin Technical College System Districts	16
Special Districts	206
Total Employers	1,516

» WRS Membership

All eligible employees of a participating employer who are expected to work at least 1,200 hours per year (880 hours per year for teachers and school district educational support employees) must be covered by the WRS. As of December 31, 2019, the WRS membership consisted of:

Current Employees:	
General	134,166
Teachers	102,330
Elected / Executive / Judges	1,322
Protective with Social Security	19,665
Protective without Social Security	2,768
Total Current Employees	**260,251**
Inactive Participants:	
Terminated Participants	169,261
Alternate Payees	3,904
Total Inactive Participants	**173,165**
Retirees and Beneficiaries Currently Receiving Benefits:	
Retirement Annuitants	207,362
Disability Annuitants	6,289
Death Beneficiary Annuitants	1,419
Total Annuitants	**215,070**
Total Participants	**648,486**

Approximately 1,850 inactive participants are receiving Long-Term Disability Insurance benefits.

» WRS Benefits

The WRS provides retirement benefits as well as death and disability benefits. Vesting requirements have changed over time, as follows:

- Participants in the system prior to January 1, 1990 were fully vested at the time they met participation requirements;
- For participants entering the system from January 1, 1990, to April 23, 1998, creditable service in each of five years was required for vesting;
- All active participants in the system at any time from April 24, 1998 to June 30, 2011 are fully vested; and
- 2011 Wisconsin Act 32 generally required participants hired on or after July 1, 2011 to have five years of creditable service to be vested.

Employees who retire at or after age 65 (54 for protective occupations and 62 for elected officials and executive service retirement plan participants, if hired on or before 12/31/2016) are entitled to a retirement benefit based on a formula factor, their final average earnings, and creditable service. Formula factors are shown in the table below:

Employment Category	Service Before 1/1/2000	Service Between 2000 and 2011	Service After 2011
General and Teachers	1.765%	1.6%	1.6%
Executive and Elected	2.165	2.0*	1.6*
Protective with Social Security	2.165	2.0	2.0
Protective without Social Security	2.665	2.5	2.5

*2011 Wisconsin Act 10 changed the Executive and Elected formula factor from 2.0% to 1.6%. The effective date of the change varies among different employee categories, and generally applies to the service earned after Act 10 effective date (i.e. June 29, 2011).

Final average earnings is the average of the participant's three highest annual earnings periods. Creditable service includes current service and prior service for which a participant received earnings and made contributions as required. Creditable service also includes creditable military service. The retirement benefit will be calculated as a money purchase benefit based on the member's contributions plus matching employer's contributions, with interest, if that benefit is higher than the formula benefit.

Vested participants may retire at or after age 55 (50 for protective occupations) and receive an actuarially-reduced benefit. Participants terminating covered employment prior to eligibility for an annuity may either receive member-required contributions plus interest as a separation benefit or leave contributions on deposit and defer application until eligible to receive a retirement benefit.

» *Post-Retirement Adjustments*

The Employee Trust Funds Board may periodically adjust annuity payments from the retirement system based on annual investment performance in accordance with s. 40.27, Wis. Stat. An increase (or decrease) in annuity payments may result when investment gains (losses), together with other actuarial experience factors, create a surplus (shortfall) in the reserves, as determined by the system's consulting actuary. Annuity increases are not based on cost of living or other similar factors. For Core annuities, decreases may be applied only to previously granted increases. By law, Core annuities cannot be reduced to an amount below the original, guaranteed amount (the "floor") set at retirement.

The Core and Variable Fund annuity adjustments granted during the past 10 years are as follows:

Year	Core Adjustment (%)	Variable Adjustment (%)
2010	(1.3)	22.0
2011	(1.2)	11.0
2012	(7.0)	(7.0)
2013	(9.6)	9.0
2014	4.7	25.0
2015	2.9	2.0
2016	0.5	(5.0)
2017	2.0	4.0
2018	2.4	17.0
2019	0.0	(10.0)

The negative Core annuity adjustments from 2010 to 2013 were primarily due to the Fund's $21.0 billion investment decline in 2008, caused by the global economic crisis. Core Fund gains and losses are recognized over a five-year period.

» *Long-Term Receivables*

The "Prior Service Contributions Receivable" on the Statement of Fiduciary Net Position represents the WRS unfunded actuarial accrued liability (UAAL), determined under the plan's Frozen Initial Liability funding methodology. This liability is being amortized as a level percentage of payroll over a 40-year period beginning January 1, 1990, for employers in the WRS prior to 2009. The remaining balance is expected to be fully amortized by December 31, 2029. Liabilities for employers joining the WRS beginning in 2009 are amortized over 30 years. Interest is assessed on the outstanding liability at year-end at the assumed earnings rate. The level-percentage-of-payroll amortization method results in a relatively lower dollar contribution in earlier years than in later years, when payrolls have increased. During the early years of the amortization period, payments made are less than annual interest assessments, resulting in an increase in the liability. As payrolls increase annually, prior service payments increase proportionally until they exceed annual interest and ultimately fully liquidate the liability at the end of the amortization period. State law requires the accrued retirement cost to be funded. As of December 31, 2019, the receivable balance was $10.9 million.

» *Variable Retirement Option*

Prior to 1980, WRS participants could opt to have one-half of their required contributions and matching employer contributions invested in the Variable Fund. Retirement benefits were adjusted for the difference between the investment experience of the Core Fund and the Variable Fund. Provisions for allowing members to withdraw from the Variable Fund were added with the passage of Chapter 221, Laws of 1979. The Variable Fund was closed to new membership after April 30, 1980. 1999 Wisconsin Act 11 reopened the Variable Fund for existing and future participants, effective January 1, 2001. As of December 31, 2019, there were 53,510 active and inactive members and 41,777 annuitants participating in the Variable Fund.

» *Municipal Police and Firefighters Pension Group*

As of March 31, 1978, administration of certain local funds for police officers and firefighters was assumed by the Wisconsin Retirement Fund. This included approximately 2,000 members. As of December 31, 2019, approximately 33 annuitants or their beneficiaries remained in the system. This group was closed to new members after January 1, 1948.

The liability for retirement benefits for these annuitants is funded by the employers, as benefit payments are made. Annuity reserves for these police and firefighter annuities are established by a transfer from the employer accumulation reserve at the time the annuity is approved. Earnings on these reserves are used to fund annuity adjustments on the same basis as for WRS annuitants. The unfunded liability for these annuitants as of December 31, 2019, was $0.7 million.

» *Annuity Supplement - General Fund*

As authorized under 1985 Wis. Stats. § 40.27 (1), the State's General Fund provides certain supplemental annuity benefits to annuitants receiving a continuing annuity on or before September 1974. The benefit is subject to continuation of the appropriation by the Legislature. ETF serves as a clearing agent for its payment. Total supplemental annuity benefits paid were approximately $68,000 in December 31, 2019.

5 CONTRIBUTIONS REQUIRED AND MADE

» *Required Contributions*

Contribution rates are determined by the "entry age normal with a frozen initial liability" actuarial method. This is a "level contribution" actuarial method intended to keep employer and member contribution rates at a level percentage of payroll over the years. This method determines the amount of contributions necessary to fund: 1) the current service cost, which represents the estimated amount necessary to pay for benefits earned by the members during the current service year plus actuarial gains or losses arising from the difference between actual and assumed experience; and 2) the prior service cost, which represents the estimated amount necessary to pay for unfunded benefits earned prior to the employer becoming a participating employer in the WRS and the past service cost of benefit improvements. The 2019 contribution requirements were determined by the December 31, 2017, actuarial valuation.

Member contributions are deducted from the member's salary and remitted to ETF by the participating employer. Employers generally may not pay the member required contribution. The member required contribution is one-half of the actuarially-determined contribution rate for General category members, which includes teachers and members in the Executive and Elected Official category. By statute, member required contributions for Protective occupation category members are the same rate as General category members. Employers are required to contribute the remainder of the actuarially-determined contribution rate.

Contribution rates in effect during 2019 by employment category were:

Employment Category	Employer Current	Employer Prior *	Member	Total
General, Teachers, Executive & Elected Officials	6.55%	0.02%	6.55%	13.12%
Protective Occupation with Social Security	10.55%	0.00%	6.55%	17.10%
Protective Occupation without Social Security	14.95%	0.09%	6.55%	21.59%

*The employer prior service contribution rate is a weighted average of individual employer rates.

Contributions required and made during 2019 were:

	Contributions (In Millions)	Percentage of Payroll
Employer Current Service	$ 1,045.0	7.05%
Employer Prior Service*	$ 4.3	0.03%
Member Required	$ 971.9	6.55%

*Employer prior service contributions are recorded on the Statement of Fiduciary Net Position as a reduction in the Prior Service Contribution Receivable. Contributions include both mandatory and voluntary payments received from participating employers. Some prior service contributions received after year end are included in Contributions, but are not in the determination of Prior Service Contributions Receivable. This is due to a difference in how these payments are treated for actuarial and financial reporting purposes.

Employers also contributed approximately $271,000 in reimbursement for benefits paid under the s. 62.13, Wis. Stat, Police and Firefighters Pension Program.

» *Member and Employer Additional Contributions*

Contributions in addition to those required contributions by members and/or employers may be made to the retirement system. These contributions are held in separate reserve accounts and are subject to certain restrictions as to amount, form of benefit payments, tax status, etc.

6 NET PENSION LIABILITY (ASSET) OF PARTICIPATING EMPLOYERS - WRS

The components of the Net Pension Liability (Asset) of the participating employers at December 31, 2019, were as follows (In Millions):

Total Pension Liability*	$ 108,868.30
Plan Fiduciary Net Position**	112,092.76
Participating Employer's Net Pension Liability (Asset)	$ (3,224.46)
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	102.96%

*Includes the impact of known Market Recognition account deferred gains/losses on the liability for dividend payments.

** Immaterial differences may exist between the Plan Fiduciary Net Position used in the actuarial valuation and that reported in the Statement of Fiduciary Net Position, due to the timing of the actuarial valuation.

Additional information as of the latest actuarial valuations follows:

Actuarial Valuation Date:	December 31, 2018
Measurement Date of Net Pension Liability (Asset):	December 31, 2019
Actuarial Cost Method:	Entry Age Normal
Asset Valuation Method:	Fair Value
Long-Term Expected Rate of Return:	7.0%
Discount Rate:	7.0%
Salary Increases:	
Inflation	3.0%
Senior/Merit	0.1% - 5.6%
Mortality:	Wisconsin 2018 Mortality Table
Post-retirement Adjustments:*	1.9%

*No post-retirement adjustments is guaranteed. Actual adjustments are based on recognized investment return, actuarial experience and other factors. 1.9% is assumed annual adjustments based on the investment return assumption and the post-retirement discount rate. Includes the impact of known Market Recognition Account deferred gains/losses on the liability for dividend payments.

Actuarial assumptions are based upon an experience study conducted in 2018 that covered a three-year period from January 1, 2015 to December 31, 2017. The Total Pension Liability for December 31, 2019, is based upon a roll-forward of the liability calculated from the December 31, 2018 actuarial valuation.

A single discount rate of 7.0% was used to measure the Total Pension Liability for the current and prior year. The discount rate is based on the expected rate of return on pension plan investments. Because of the unique structure of the WRS, the 7.0% expected rate of return implies that a dividend of approximately 1.9% will always be paid after reflecting known changes in the Market Recognition Account. For purposes of the single discount rate, it was assumed that the dividend would always be paid.

The projection of cash flows used to determine the single discount rate assumed that plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the difference between actuarially determined contribution rates and the member rate. Based on these assumptions, the pension plan’s fiduciary net position was projected to be available to make all projected future benefit payments (including expected dividends) of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the Total Pension Liability.

» *Sensitivity of the Net Pension Liability (Asset) to Changes in the Discount Rate*

The following presents the plan's Net Pension Liability (Asset), calculated using a single discount rate of 7.0%, as well as what the plan's Net Pension Liability (Asset) would be if it were calculated using a single discount rate that is one percentage point lower or one percentage point higher (In Millions):

	1% Decrease (6.0%)	Current Discount Rate (7.0%)	1% Increase (8.0%)
Total Pension Liability	$ 120,396.31	$ 108,868.30	$ 100,249.79
Plan Fiduciary Net Position	112,092.76	112,092.76	112,092.76
Net Pension Liability (Asset)	$ 8,303.55	$ (3,224.46)	$ (11,842.97)

Amounts may not foot due to rounding.

For the WRS, the determination of liabilities also depends on the assumed dividend that is linked to the interest rate used in the liability calculation. Therefore, the following table shows an alternative set of Sensitivity Analysis, which varies the assumed dividend in conjunction with the change in the discount rate. For the liabilities shown below, the assumed dividend was 1.0% for the 6.0% discount rate, 1.9% for the 7.0% discount rate, and 2.9% for the 8.0% discount rate (In Millions):

	1% Decrease (6.0%)	Current Discount Rate (7.0%)	1% Increase (8.0%)
Total Pension Liability	$ 113,514.72	$ 108,868.30	$ 105,347.92
Plan Fiduciary Net Position	112,092.76	112,092.76	112,092.76
Net Pension Liability (Asset)	$ 1,421.96	$ (3,224.46)	$ (6,744.84)

Amounts may not foot due to rounding.

7 STATUTORY RESERVES

The following reserves have been established to reflect legal restrictions on the use of pension trust funds.

» *Employee Accumulation Reserve*

As authorized by Wis. Stats. § 40.04 (4), this reserve includes all required and voluntary member contributions, including contributions made by the employer on behalf of the employee. This reserve may only be used to pay lump sum benefits or transfers to the Annuity Reserve to fund annuities. All legal restrictions on use of this reserve were met during the year. The Employee Accumulation Reserve is fully funded.

Employee Accumulation Reserve balances (In Millions) as of December 31, 2019, were:

	Core	Variable	Total
Employee Required	$ 17,215.9	$ 2,056.3	$ 19,272.2
Employee Additional	198.4	16.6	215.0
Total	$ 17,414.3	$ 2,072.9	$ 19,487.2

Amounts may not foot due to rounding.

» *Employer Accumulation Reserve*

As authorized by Wis. Stat. § 40.04 (5), this reserve includes all required employer contributions, including contributions for amortization of the unfunded accrued actuarial liability. This reserve may only be used to pay lump sum benefits or transfers to the Annuity Reserve to fund annuities. All legal restrictions on use of this reserve were met during the year. The Employer Accumulation Reserve is 100.00% funded.

Employer Accumulation Reserve balances (In Millions) as of December 31, 2019, were:

	Core	Variable	Police & Firefighters	Total
Employer Accumulation	$ 21,333.9	$ 2,056.3	$ 0.0	$ 23,390.2
Less: Unfunded Actuarial Accrued Liability	0.0	0.0	(0.7)	(0.7)
Net Employer Accumulation	$ 21,333.9	$ 2,056.3	$ (0.7)	$ 23,389.5

Amounts may not foot due to rounding.

» *Annuity Reserve*

As authorized by Wis. Stat. § 40.04 (6), this reserve includes the present value of all annuities. The present value of new annuities is transferred from the Employee Accumulation Reserve and the Employer Accumulation Reserve to the Annuity Reserve. This reserve may only be used for the payment of annuities and death benefits to annuitants. All legal restrictions on use of this reserve were met during the year. The Annuity Reserve is fully funded.

Annuity Reserve balances (In Millions) as of December 31, 2019, were:

	Core	Variable	Police & Firefighters	Total
Annuity Reserve	$ 59,138.4	$ 4,517.4	$ 2.3	$ 63,658.1

» *Market Recognition Account*

As authorized by Wis. Stat. § 40.04 (3), this reserve is used to smooth the flow of investment income into the Employee, Employer, and Annuity Reserves and other benefit plans invested in the Core Fund. Under the Market Recognition Account (MRA), all investment income, including realized and unrealized market gains and losses, is deposited into the MRA. At year-end, income equal to the assumed earnings rate is recognized. Any surplus or shortfall in earnings is recognized equally over five years.

Year-end balances in the MRA (In Millions) for the last five years after annual distributions were as follows:

As of:	MRA
December 31, 2015	$ (3,404)
December 31, 2016	$ (3,086)
December 31, 2017	$ 3,273
December 31, 2018	$ (4,916)
December 31, 2019	$ 5,712

8 CONTINGENCIES, RELATED PARTIES, UNUSUAL EVENTS, & SUBSEQUENT EVENTS

» *Loss Contingencies*

On September 5, 2008, the Internal Revenue Service (IRS) provided SWIB with a "Notice of Transferee Liability". This claim seeks taxes, penalties, and interest relating to the sale of Shockley Communications Corporation (SCC) stock in 2001.

SWIB is classified as a tax-exempt entity by the IRS. However, the IRS asserts that the shareholders' sale of SCC stock in 2001 should have been characterized as a sale of assets by SCC, on which SCC should have paid income taxes. Based on the theory of transferee liability, the IRS asserts that the former SCC shareholders, including SWIB, are liable for SCC's unpaid taxes, penalties, and interest.

SWIB has filed a petition in the United States Tax Court contesting the proposed IRS assessment. The principal shareholders of SCC were issued similar notices from the IRS and have been litigating their case through the Tax Court and United States Court of Appeals. In April 2014, SWIB and the IRS agreed to stay the Tax Court proceeding with respect to SWIB pending the resolution of the tax case initiated by the principal shareholders of SCC challenging the IRS' characterization of the SCC sale. In 2015, the Tax Court found that the principal shareholders of SCC were liable as putative transferees for the tax, penalties, and interest owed by SCC related to its sale. In October 2017, the 11th Circuit Court of Appeals upheld the 2015 Tax Court opinion with respect to the principal shareholders of SCC; concluding its litigation. Because SWIB has separate and distinct arguments from the principal shareholders of SCC, the Tax Court granted SWIB the opportunity to pursue its case with the Court. In 2018, SWIB's tax counsel and the IRS filed briefs with the Tax Court. In January 2020, SWIB was informed that the Tax Court had ruled in favor of the IRS. While SWIB has the option to appeal, as well as the ability to negotiate the final payment amount with the IRS, the adverse ruling from the Tax Court makes it more likely that SWIB's liability exposure will be higher than previously estimated.

Although SWIB's case is still ongoing, SWIB determined it was prudent to accrue a potential loss from the SCC transaction based on the Tax Court's adverse opinions against the principal shareholders and SWIB. SWIB's potential liability, as a putative transferee of SCC assets, is reasonably estimated to be between $30.0 million and $59.6 million as of December 31, 2019. Although results may differ, this estimated range of loss is based on a possible settlement strategy with the IRS and the maximum potential liability to the IRS for the taxes, interest, and potential penalties of SCC based on the Tax Court's decision against the principal shareholders and SWIB. Accordingly, since calendar year 2015, SWIB has accrued a loss of $30 million, which represents the estimated minimum amount of the possible loss to which SWIB believes it may be exposed. Of the total $30 million accrued loss, $10 million was accrued in calendar year 2019 to account for the Tax Court's most recent adverse ruling.

In the ordinary course of operations, SWIB may be party to other various legal actions. SWIB's Chief Legal Counsel handles these matters either directly or with assistance of outside legal counsel. As of December 31 2019, these matters are not anticipated to have a material financial impact on the WRS's financial position.

» *Related Party Transactions*

During the calendar year, the Core Fund entered into reverse repurchase agreement transactions with the State Investment Fund (SIF), for which the investment assets are managed by SWIB, as a counterparty. The transactions were governed by a master repurchase agreement, and investment guidelines limit exposure with the SIF to $3.0 billion. Credit exposure is also managed through the transfer of margin between the Core Fund and SIF. As of December 31, 2019, the Core Fund held $1.9 billion in a bilateral reverse repurchase agreement with the SIF. The repurchase agreement was an overnight agreement collateralized with U.S. Treasury securities in the amount of 102%. The Core Fund enters into similar reverse repurchase agreement transactions with other counterparties. The Core Fund is also a participant in the SIF, with an investment totaling $2.7 billion at December 31, 2019. The SIF is a short-term, commingled fund with the investment objective of safety of principle and liquidity while earning a competitive money market rate of return.

» *Subsequent Events*

On March 8, 2019, ETF filed a complaint in Dane County Circuit Court against Vitech. The complaint intends to remedy damages suffered when Vitech breached its contract with ETF by failing to fulfill its promises according to the provisions of the contract. In response to the complaint, Vitech filed a counterclaim against ETF.

Each party filed Summary Judgment motions in circuit court. At hearings held in April and May 2020 the circuit court denied both motions. As a result, the complaint and counterclaim will move forward towards trial. The parties are currently engaged in discovery activities. The resolution of this dispute is not anticipated to have a material effect on the WRS's financial position.

REQUIRED SUPPLEMENTARY INFORMATION

Wisconsin Retirement System
Schedules of Changes in Net Pension Liability (Asset) and Related Ratios
(In Millions)

Calendar Year Ended, December 31	2019	2018	2017	2016	2015	2014	2013
Total Pension Liability							
Service Cost	$ 1,902.5	$ 1,860.9	$ 1,842.9	$ 1,814.1	$ 1,787.9	$ 1,757.0	$ 1,745.0
Interest on the Total Pension Liability	6,888.1	7,169.7	6,627.2	6,372.4	6,347.1	6,089.3	5,680.7
Difference between Expected and Actual Experience[1]	5,473.3	(4,968.3)	4,459.5	150.3	(4,247.3)	437.3	2,659.9
Assumption Changes	0.0	361.5	0.0	0.0	1,412.0	0.0	0.0
Benefit Payments	(5,646.3)	(5,516.2)	(5,211.3)	(5,022.9)	(4,823.6)	(4,540.2)	(4,224.7)
Refunds of Member Contributions	(44.1)	(40.2)	(38.4)	(39.3)	(37.6)	(34.4)	(33.3)
Net Change in Total Pension Liability	8,573.5	(1,132.6)	7,679.9	3,274.6	438.5	3,708.9	5,827.7
Total Pension Liability - Beginning	100,294.8	101,427.3	$ 93,747.4[2]	90,129.7	89,691.2	85,982.2	80,154.6
Total Pension Liability - Ending (a)	$ 108,868.3	$ 100,294.8	$ 101,427.3	$ 93,404.3	$ 90,129.7	$ 89,691.2	$ 85,982.2
Plan Fiduciary Net Position							
Employer Contributions[3]	$ 1,046.9	$ 1,030.5	$ 1,017.6	$ 963.1	$ 977.7	$ 987.8	$ 914.7
Member Contributions	987.7	973.0	965.5	921.9	937.2	941.9	871.3
Pension Plan Net Investment Income	19,049.5	(4,049.4)	14,875.4	7,273.1	(673.1)	4,891.0	11,347.3
Benefit Payments	(5,646.3)	(5,516.2)	(5,211.3)	(5,022.9)	(4,823.6)	(4,540.2)	(4,224.7)
Refunds of Member Contributions	(44.1)	(40.2)	(38.4)	(39.3)	(37.6)	(34.4)	(33.3)
Pension Plan Administrative Expense	(34.2)	(31.6)	(26.1)	(20.4)	(22.7)	(24.0)	(22.9)
Other[4]	(3.9)	(25.4)	0.0	0.0	0.0	0.0	0.0
Net Change in Plan Fiduciary Net Position	15,355.7	(7,659.4)	11,582.7	4,075.4	(3,642.1)	2,222.0	8,852.4
Plan Fiduciary Net Position - Beginning	96,737.1	104,396.5	92,813.8[5]	88,504.7	92,146.8	89,924.7	81,072.3
Plan Fiduciary Net Position - Ending (b)	$ 112,092.8	$ 96,737.1	$ 104,396.5	$ 92,580.1	$ 88,504.7	$ 92,146.8	$ 89,924.7
Net Pension Liability(Asset) - Ending (a) - (b)	$ (3,224.5)	$ 3,557.7	$ (2,969.1)	$ 824.2	$ 1,625.0	$ (2,455.6)	$ (3,942.5)
Plan Fiduciary Net Position as a Percentage of Total Pension	102.96%	96.45%	102.93%	99.12%	98.20%	102.74%	104.59%
Covered Employee Payroll	$ 14,832.5	$ 14,301.4	$ 13,943.1	$ 13,706.0	$ 13,530.5	$ 13,219.5	$ 12,884.8
Net Pension Liability(Asset) as a Percentage of Covered Employee Payroll	(21.74)%	24.88%	(21.29)%	6.01%	12.01%	(18.58)%	(30.60)%

Immaterial differences may exist between the amounts in this schedule and those reported in the Statement of Changes in Fiduciary Net Position

Amounts may not foot due to rounding.

1 Starting with 2015, this item includes the impact of known Market Recognition account deferred gains/losses on the liability for dividend payments.

2 As of calendar year 2017, the Long-Term Disability Insurance (LTDI) program is reported within the Wisconsin Retirement System (WRS). Beginning of year liabilities for 2017 were adjusted by $343,079,422 to reflect the LTDI program.

3 Employer contributions shown in the above tables includes Employer Required Contributions in addition to Early Retirement Contributions and Additional Contributions paid by employer on behalf of employee.

4 Other for 2018 relates to an impairment loss on a capital asset.

5 As of calendar year 2017, the LTDI program is reported within the WRS. Beginning of year net position for 2017 was adjusted by $233,691,533 to reflect the LTDI program.

Wisconsin Retirement System
Schedule of Required Employer Contributions
(In Millions)

Calendar Year Ending December 31,	Actuarially Determined Contributions	Actual Contributions	Contribution Deficiency (Excess)	Covered Payroll	Actual Contributions as a % of Covered Payroll
2013	905	905	0	12,885	7.02%
2014	977	977	0	13,220	7.39%
2015	968	968	0	13,531	7.15%
2016	954	954	0	13,706	6.96%
2017	1,015	1,015	0	13,943	7.28%
2018	1,028	1,028	0	14,301	7.19%
2019	1,045	1,045	0	14,832	7.05%

Wisconsin Retirement System
Schedule of Investment Returns
Last Ten Calendar Years
Annual Money-Weighted Rate of Return (IRR), Net of Investment Expenses

	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Core Trust Fund	19.49 %	(3.56)%	15.85 %	8.29 %	(0.63)%	5.44 %	13.18 %	13.40 %	1.25 %	11.92 %
Variable Trust Fund	28.80 %	(7.61)%	23.27 %	10.49 %	(1.11)%	7.24 %	28.78 %	16.94 %	(3.02)%	15.23 %

NOTES TO REQUIRED SUPPLEMENTARY INFORMATION

Significant methods and assumptions used in calculating Wisconsin Retirement System Actuarially Determined Contributions:

Valuation Date:	December 31, 2017
Actuarial Cost Method:	Frozen Entry Age
Amortization Method:	Level Percent of Payroll-Closed Amortization Period
Amortization Period:	30 Year closed from date of participation in WRS
Asset Valuation Method:	Five Year Smoothed Market (Closed)
Actuarial Assumptions	
Net Investment Rate of Return:	5.5%
Weighted based on assumed rate for:	
Pre-retirement:	7.2%
Post-retirement:	5.0%
Salary Increases	
Inflation:	3.2%
Seniority/Merit:	0.1%-5.6%
Post-retirement Benefit Adjustments:	2.1*

*No post-retirement adjustment is guaranteed. Actual adjustments are based on recognized investment return, actuarial experience and other factors. 2.1% is the assumed annual adjustment based on the investment return assumption and the post-retirement discount rate.