

Wisconsin Retirement System

*Limited Scope Audit of the December 31, 2009
Actuarial Valuations*

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August 17, 2011

State of Wisconsin
Legislative Audit Bureau
c/o Diann Allsen
Suite 500
22 East Mifflin Street
Madison, WI 53703

Re: **Limited Scope Audit of the December 31, 2009 Actuarial Valuation
for the Wisconsin Retirement System (WRS)**

Ladies and Gentlemen:

We are pleased to present the results of Segal's audit of the December 31, 2009 actuarial valuation. The purpose of this audit is to conduct a review of the actuarial methods, assumptions, and procedures employed by the Wisconsin Retirement System. This audit includes the following:

1. **Report review** – a review of the valuation report and results and how they comply with actuarial standards, and whether such valuation reflects appropriate disclosure information under any required reporting.
2. **Methods and assumptions review** – an analysis and benchmarking of the actuarial assumptions (including a review of the most recent experience study) and a review of the actuarial methods (including the Experience Amortization Reserve and actuarial asset value smoothing period and corridor) utilized in determining the funded status and accrued liability as of December 31, 2009 for compliance with generally accepted actuarial principles.
3. **Test lives and data review** – discussion of the procedures used to validate the participant data and the test lives selected, with a detailed review of the findings.

This review was conducted under the supervision of Kim Nicholl, a Fellow of the Society of Actuaries, a member of the American Academy of Actuaries and an Enrolled Actuary under ERISA, and Matthew Strom, a Fellow of the Society of Actuaries, a member of the American Academy of Actuaries and an Enrolled Actuary under ERISA. This review was conducted in accordance with the standards of practice prescribed by the Actuarial Standards Board.

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The assistance of the Department of Employee Trust Funds (ETF) staff and Gabriel Roeder Smith & Company (GRS) is gratefully acknowledged.

We appreciate the opportunity to serve as an independent actuarial advisor for WRS and we are available to answer any questions you may have on this report.

Sincerely,



Kim Nicholl, FSA, MAAA, EA
Senior Vice President and Actuary



Matthew A. Strom, FSA, MAAA, EA
Consulting Actuary

kn/ms/js

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Executive Summary

The State of Wisconsin Legislative Audit Bureau (Audit Bureau) retained The Segal Company to conduct an independent review of the System's current actuarial calculations, assumptions and methods. The Audit Bureau requested an assessment of the validity of the data used in the valuation, a review of the appropriateness of the current funding method and procedures, and commentary on the market recognition account, including whether other pension investment smoothing mechanisms, such as corridors, would be advisable. The Audit Bureau also asked for an evaluation of both economic and non-economic assumptions and whether the assumptions currently being used are consistent with the System's experience. Finally, the Audit Bureau requested a review of the actuarial report and most recent experience analysis and to determine if there is consistency in the presentation of the actuarial results and whether they are consistent with professional standards.

The objective of a **limited scope audit** (actuarial review) of any system is to provide validation that the liabilities and costs of the Fund are reasonable and being calculated as intended. This audit is not a full replication of the actuarial valuation results, but rather is a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the System. These key components are the data, the benefits valued, the actuarial assumptions and funding method used, and the asset valuation method employed. The valuation report and the valuation output for a select group of test lives provide the detail necessary to validate each of these key components.

We reviewed all information supplied to us. We also requested and reviewed additional information provided by GRS. Finally, we considered the reasonableness of the actuarial assumptions and methods in the context of our own experience, and those of other state and local pension systems.

In summary, we found the following:

1. GRS is processing the data files provided to them by ETF in a reasonable and accurate manner, and participants are being removed from the active lives valuation and added to the retired lives valuation at the appropriate time;
2. The economic assumptions are generally within norms for the peer group, with the investment return right in the middle of the peer group range;
3. Certain of the demographic actuarial assumptions should be reviewed in detail as part of the next experience review, particularly mortality and the number of retirees that elect optional forms of payment;
4. The asset valuation method is being applied correctly and in our opinion, the five-year smoothing method accomplished with the market recognition account is reasonable and meets

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Executive Summary

actuarial standards; and

5. With the exception of items noted in Section II, benefits valued for selected test lives are consistent with those stated in the actuarial valuation report.

These items are described more fully in this report.

We recommend these enhancements to the valuation process:

1. Enhance the understandability of certain areas in the valuation report by improving the exhibits that contain asset information (with assistance from ETF) and expanding upon the description of the actuarial cost method;
2. Apply an assumption to incorporate elections of optional forms of payment to capture the subsidy in conversion factors for members retiring after normal retirement age;
3. Provide additional detail with respect to certain assumptions, methods and calculations used in the valuation; and
4. Consider proposing to the Legislature an “asset corridor” if the Board is concerned that the actuarial value of assets remain within a defined percentage of market over the long term.

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Executive Summary

Conclusions

This audit validates the findings of the 2009 actuarial valuations. We believe the stated methods and assumptions were properly employed in determining the cost of the Plan.

The data appears complete and with a cursory analysis of the information supplied by ETF staff, we were able to closely match the participant counts reported by GRS. We were able to match all test life results within an acceptable degree of accuracy. Most of the differences disclosed in Section II of this report are minor and in some cases even offsetting. All parameters and methods appear consistent with current GASB standards and generally accepted actuarial practices as promulgated in the various Actuarial Standards of Practice applicable to WRS.

Finally, we offer ideas to improve the quality and understanding of the valuation report. Several suggestions and recommendations are made throughout this document. We would classify them as either: a) “cosmetic” suggestions to enhance the valuation process or report; b) something to be examined during the next experience review; and c) something that may affect the cost of the plan. Where we make a comment in this regard in this report, we have indentified the location in the margin with the following icons:



Enhancement to valuation process or report



Examine during next experience review



May affect the cost of the plan

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Section I: Purpose, Scope and Methodology of the Audit

Purpose of the Audit

The State of Wisconsin Legislative Audit Bureau (Audit Bureau) retained The Segal Company to conduct an independent review of the System's current actuarial calculations, assumptions and methodology. The Audit Bureau requested an assessment of the validity of the data used in the valuation, a review of the appropriateness of the current funding method and procedures, an evaluation of both economic and non-economic assumptions, and a review of the actuarial report and most recent experience analysis and to determine if there is consistency in the presentation of the actuarial results and whether they are consistent with professional standards.

Scope of the Audit

This actuarial audit has a specified, limited scope in its review. A full scope audit would include performing the 2009 actuarial valuation from start to finish, in essence, a parallel valuation. This limited scope audit reviews the valuation already performed, through reviewing the benefits, assumptions, and methods, without a full replication of the actuarial valuation results. This review is conducted by analyzing detailed output of certain selected test lives from the membership group.

By not performing a full parallel valuation, the following assumptions are made:

1. The current actuary's valuation system is accurately applying each assumption consistent with the test life review; and
2. The valuation system is adding together liabilities appropriately for each decrement (retirement, turnover, disability, and death), for each member, and over the entire population (meaning no participant group is being "dropped off" and no particular liabilities are being omitted).

What a limited scope audit can provide is:

1. Assurance that appropriate benefits are being valued;
2. Confirmation that the valuation system is accurately applying decrements to the test lives;
3. Confirmation that the program is valuing benefits as described in the valuation report and consistent with applicable statutes;
4. A measurement of economic actuarial assumptions against a peer group and hence an assessment of their reasonableness;

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Section I: Purpose, Scope and Methodology of the Audit

5. A review of the reasonableness of actuarial funding and asset valuation methods; and
6. An indication as to whether the liabilities and contribution rates shown are not reasonable or are incorrectly calculated.

Methodology of the Audit for the 2009 Actuarial Valuation

The purpose of this audit is to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, methods, and valuation results. The limited scope review is not the same as an actuarial valuation, but represents a “second opinion” of the findings and processes included in the valuation.

The measurement of the reasonableness of the funding levels encompasses three key analyses:

1. A verification of the benefits being projected for future payment;
2. A verification of the appropriateness of the actuarial assumptions that are used in calculating the liability; and
3. A verification of the appropriateness of the funding and asset valuation methods.

Benefits Analysis

Critical to projecting future benefits is receiving complete and accurate data. We reviewed the process by which data is prepared for the actuarial valuation, including:

1. An assessment of the completeness of the data; and
2. A review of the data screening process employed.

We developed computer models that generated test life output, which enabled us to compare our test life results with GRS’s results. These models also allowed us to confirm that the GRS valuation projects benefits in a manner consistent with the Benefit Provisions summary in the valuation report, and that the summary is consistent with state statutes applicable to the Wisconsin Retirement System. For purposes of this study, we regard differences of less than 3% to be immaterial for the Total Present Value of Benefits (PVB) and 5% to be immaterial for the review of census data.

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Assumptions Analysis

The second critical component in assessing the reasonableness of the funding levels is in the selection and the application of the actuarial assumptions. With respect to the assumptions, we;

1. Reviewed the Three-Year Experience Study report for the period covering January 1, 2006 to December 31, 2008;
2. Benchmarked the economic assumptions against a survey of state and local employee retirement systems; and
3. Examined individual test life calculations.

Methods Analysis

The third component in assessing funding levels is the selection and application of the actuarial cost method (including the method for amortizing the unfunded actuarial accrued liability) and the asset valuation method (including smoothing techniques). This includes items unique to a particular system, such as WRS' Experience Amortization Reserve.

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Section II: Review of Report and Validation of Benefits Valued

Data Used in the Valuation

We independently obtained data files directly from ETF and GRS. With minimal data scrubbing, we found that the counts for the active and retired files were relatively close, and within the 5% threshold we established for determining materiality of differences.

All data for actives, inactives, annuitants and beneficiaries was provided as of the valuation date (December 31, 2009). GRS provided us with a detailed description of their data process for reconciling census data from the prior valuation date to the current date and their checks for the reasonability of data. Based on the description provided, it appears that GRS has a sound procedure in place to handle missing data. Given the large size of the data, this shortens the amount of staff time spend on data reconciliation (for both GRS and ETF) without sacrificing any material accuracy in the valuation results. We would, however, recommend GRS include an upper limit on the number of records they adjust for missing data, if not done so already.



One specific item to note with respect to summary demographic information on pages I-10 and I-11 deals with member account balances. For valuation purposes, GRS removes the Variable Excess/Deficiency amount from the individual's employee account balance, then adds the entire sum of the Variable Excess/Deficiency amounts for all employees into the actuarial liability. However, for the demographic summary information shown in the report, we do not believe that active/inactive member employee account balances should be adjusted by the Variable Excess/Deficiency amount reported by ETF.



An additional part of our data validity review was addressing the transition of participants from active to annuitant status and whether participants are being removed from the active lives valuation and added to the retired lives valuation at the appropriate time. We isolated approximately 14,200 records from the active lives file that were reported with an end of year status of "closed." Of these 14,200 members, we were able to match nearly 8,400 of them to new records in the retired lives data. The remaining 5,800 "non-matched" records were coded as either having withdrew their employee contribution balance from the fund, or receiving a lump sum benefit. There were, however, approximately 50 records that had a reported date of termination between December 2008 and November 2009, having age and service combinations meeting retirement eligibility criteria, that were reported as "active, employment not terminated." It is unclear from the data we received from ETF why those members were not coded as "closed" and transferred to the retired lives valuation. Despite the uncertainty of these 50 records, we feel confident that GRS is transferring members from the active lives valuation to the retired lives valuation at the appropriate time.

The table that follows summarizes our determination of key data elements as compared to those shown in the valuation report.

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December 31, 2009 Analysis of Participant Data					
Active		Number	Annual Payroll (\$M)	Average Age	Average Service
General	Segal	240,511	\$11,142.1	46.2	11.8
	GRS	240,401	\$11,098.1	46.2	11.9
	% Difference	0.0%	0.4%	0.0%	-0.8%
Executive & Elected	Segal	1,434	\$101.4	54.9	13.5
	GRS	1,427	\$101.0	54.7	13.5
	% Difference	0.5%	0.4%	0.4%	0.0%
Protective w/ SS	Segal	20,209	\$1,125.7	40.3	12.4
	GRS	20,205	\$1,124.1	40.4	12.4
	% Difference	0.0%	0.1%	-0.2%	0.0%
Protective w/o SS	Segal	2,733	\$189.0	41.3	14.4
	GRS	2,733	\$189.0	41.3	14.4
	% Difference	0.0%	0.0%	0.0%	0.0%
Total	Segal	264,887	\$12,558.2	45.7	11.9
	GRS	264,766	\$12,512.2	45.8	12.0
	% Difference	0.0%	0.4%	-0.2%	-0.8%
Inactive Members					
General	Segal	135,240		46.3	2.9
	GRS	135,650		46.3	3.0
	% Difference	-0.3%		0.0%	-3.3%
Executive & Elected	Segal	573		53.6	4.5
	GRS	577		53.7	4.6
	% Difference	-0.7%		-0.2%	-2.2%
Protective w/ SS	Segal	4,265		40.3	3.7
	GRS	4,296		40.3	3.7
	% Difference	-0.7%		0.0%	0.0%
Protective w/o SS	Segal	195		43.2	7.1
	GRS	198		43.4	7.3
	% Difference	-1.5%		-0.5%	-2.7%
Total	Segal	140,273		46.2	3.0
	GRS	140,721		46.1	3.0
	% Difference	-0.3%		0.2%	0.0%

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December 31, 2009 Analysis of Participant Data				
In Payment Status - Core		Number	Valuation Benefits	Average Benefits
Regular Retirement	Segal	142,941	\$3,300,951,419	\$23,093
	GRS	143,261	\$3,295,602,244	\$23,004
	% Difference	-0.2%	0.2%	0.4%
Disabled	Segal	6,483	\$138,563,181	\$21,373
	GRS	6,224	\$138,533,846	\$22,258
	% Difference	4.5%	0.0%	-4.0%
Death In-Service	Segal	1,145	\$15,206,999	\$13,281
	GRS	1,186	\$15,177,846	\$12,798
	% Difference	-3.5%	0.2%	3.8%
Total	Segal	150,569	\$3,454,721,599	\$22,944
	GRS	150,671	\$3,449,313,936	\$22,893
	% Difference	-0.1%	0.2%	0.2%
In Payment Status - Variable				
Regular Retirement	Segal	34,181	\$234,760,458	\$6,868
	GRS	33,264	\$234,457,946	\$7,048
	% Difference	2.8%	0.1%	-2.6%
Disabled	Segal	1,272	\$4,549,472	\$3,577
	GRS	1,237	\$4,549,472	\$3,677
	% Difference	2.8%	0.0%	-2.7%
Death In-Service	Segal	330	\$1,310,983	\$3,973
	GRS	335	\$1,310,983	\$3,913
	% Difference	-1.5%	0.0%	1.5%
Total	Segal	35,783	\$240,620,913	\$6,724
	GRS	34,836	\$240,318,401	\$6,899
	% Difference	2.7%	0.1%	-2.5%

As previously mentioned, we were able to match most information reported by GRS to within 5% with minimal data scrubbing.

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Valuation Report

GRS provides a comprehensive actuarial valuation report, which generally includes enough information for an individual to gain a clear understanding of the financial picture of the System. With respect to increasing the usefulness and understanding of the valuation report, we offer the following comments:



1. In the non-retired members valuation report, the change in normal cost rates for each subgroup are presented, but not the actual normal cost rate itself. It would improve the readability of the report to understand the magnitude of the change in normal cost rates relative to the totals.
2. Throughout the report, it is unclear what the true System assets are, either on a “market value” basis or an “actuarial value” basis. Therefore, as a reader, we – nor any layperson reading the report – cannot gain a true understanding of the funded status of the plan. There is no way to reconcile the various asset values shown throughout the report with one another (e.g., “total system assets used in the valuation” of \$78.9B on page I-25 Left, with net assets in trust of \$70.0B on page II-2, with the funding value of the Core Investment Trust of \$77.0B on page III-3). Our understanding is that substantially all of the financial information reported in the valuation report is provided to GRS by ETF. It is also our understanding that the financial information contains asset values for retirement systems that are not part of WRS. We suggest that ETF simplify the presentation of WRS financial information so that the market and actuarial values of assets can more easily be understood by the reader, and only include information relevant to WRS.
3. Page I-22 of the report shows the adjustment in liability due to the Variable Adjustment as a line item under “Active Participants.” However, our understanding is that a portion of this adjustment is related to inactive participants.
4. Since there are two valuation reports for each year – one for retired lives and one for non-retired lives – we recommend that any number contained in one report that is originated in the other be footnoted with a reference to its location in the other report. For example, the “present retired” amount of \$39.7B from page I-22 of the non-retired lives report should indicate that it was calculated in the retired lives valuation report.
5. To enhance the understandability of the actuarial valuation report, ETF should consider whether the two separate reports should be combined, thus showing the information for all participants in the System. By doing so, it is our opinion that the information contained in the reports would be better understood by the users of the reports. For example the current two reports could be sections of a larger bound report than includes a third section which presents the valuation results for the System as a whole.

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6. The layout of the valuation report could be modified to improve the understandability of the information presented. We recommend that ETF consider revising the layout of the valuation report to be as follows:
 - a. Management summary and certification
 - b. Summary of participant data
 - c. Summary statement of income and expenses on a market value basis
 - d. Development of actuarial value of assets
 - e. Development of the unfunded actuarial accrued liability
 - f. Analysis of actuarial gain or loss for the plan year
 - g. Development of actuarially determined contribution rates
 - h. GASB 25/27 schedules
 - i. Actuarial cost method and actuarial assumptions
 - j. Outline of plan provisions
 - k. Glossary of actuarial terms

Projected Benefits in the Valuation

We requested specific test lives in order to compare the benefit amounts projected in the valuation against our understanding of the WRS benefits summarized in the valuation report as well as Chapter 40, Subchapter II of the Wisconsin State Statutes that govern the System.

We reproduced the benefits payable and the present value of future benefits for 6 active members, 6 deferred vested members, 5 disability retirees, 7 service retirees, and 6 beneficiaries to verify their accuracy. We did not run a “parallel” valuation, which is beyond the scope of this audit. We reviewed in detail the calculations for these test lives to determine whether GRS correctly projected plan benefits and whether the costs and liabilities were determined in accordance with the actuary’s stated methods and assumptions. We also requested several calculations from ETF for actual retirements that occurred during 2009. For these same individuals, GRS provided active and retired liability information as of December 31, 2008 and December 31, 2009, respectively.

Based on our review of the individual test life calculations and actual ETF benefit calculations, we have the following observations and/or recommendations:

1. Active members are valued assuming the single life annuity normal form of payment is elected. However, there is a subsidy in the optional form of payment conversion factors applicable to formula benefit calculations for members who commence benefits after a certain age (62 for non-protectives and Normal Retirement Age for protectives). Since the rates of retirement are such that a portion of each active member is assumed to retire

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beyond age 62 (Normal Retirement Age for protectives), the value of this subsidy is not currently being included in the actuarial valuation. We recommend including an assumption as to the percentage of active members electing an optional form of payment (for example, 25% elect single life annuity, 50% elect 50% joint and survivor, 25% elect 100% joint and survivor) so that the value of the subsidy will be reflected in the valuation results. A review of recent retirement choices will provide data on which to base this assumption.



2. We recommend that the System and GRS review the conversion factors applied to the pre-retirement death benefit for active employees. The factor used for decrement ages beyond age 62 (Normal Retirement Age for protectives) appears too low and the PVB related to the active-death decrement may be understated. The member handbook indicates “*the benefit is computed as if the member retired and elected a 100% Joint & Survivor the day before they died,*” which seems to imply they receive the subsidized factor.
3. GRS is using a simplification approach to value the additional post-65 component of the LTDI benefit. However, in each of the six sample test lives we reviewed, the simplified method appears to overstate the value of the disability benefit. GRS may wish to consider revising their valuation programming to reflect the disability benefit calculation as described in the law (if their valuation system can accommodate it), or revise their simplification approach.
4. Three of the six deferred vested member sample lives included credit for pre-2000 benefit service. However, each of these three members’ expected benefit calculated by GRS is entirely based on the post-2000 accrual percentage. Assuming this coding was not isolated to these three cases, the PVB for deferred vested members with pre-2000 benefit service will be understated for all those where the formula benefit yields a greater present value than the Money Purchase formula.
5. For the most part, our review of actual WRS calculations revealed that GRS’s valuation programming is consistent with the System’s internal calculations.



The test life comparison exhibits on the following pages summarize the calculations performed by Segal and GRS and show the differences by each decrement in the present value of benefits (PVB), as well as the ratio of Segal’s result to GRS’. We regard differences of less than 3% to be acceptable for the Total PVB and in most cases, we matched results within this 3% range. Therefore – except for the comments made in items 2 through 4 above – we believe the liabilities of the System are being valued consistently with the description of plan provisions, actuarial assumptions, and actuarial methods stated in GRS’ valuation report.

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However, as noted in item 1 above, we recommend that GRS include some provision in the non-retired lives valuation to account for the subsidized optional forms of payment available to members retiring after normal retirement age. For illustration purposes, we estimated the impact on two of the sample lives (Actives #3 and #4) of using an assumption that 80% of active members would elect a 100% joint and survivor annuity at retirement and 20% would elect a single life annuity. Under this approach, the PVB of Active #3 would increase by 4.2% and the PVB of Active #4 would increase by 5.7%.



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December 31, 2009 Valuation

Test Life Comparison

Actives Members (Age/Svc)	Active 1 (56/2)		Active 2 (30/7)		Active 3 (40/13)	
	GRS	Segal	GRS	Segal	GRS	Segal
Present Value of Benefits						
Retirement	\$60,785	\$60,271	\$158,932	\$160,517	\$488,266	\$492,851
Termination	846	835	15,920	15,116	13,306	18,455
Disability	894	889	1,742	1,552	11,401	10,484
Death	1,247	1,311	2,755	2,797	6,025	6,559
Total PVB	\$63,772	\$63,305	\$179,349	\$179,982	\$518,998	\$528,349
Ratio of Segal/GRS		99.3%		100.4%		101.8%
Actives Members (Age/Svc)	Active 4 (50/15.5)		Active 5 (25/0.99)		Active 6 (60/20)	
	GRS	Segal	GRS	Segal	GRS	Segal
Normal Cost						
Retirement	\$204,206	\$207,695	\$62,756	\$63,451	\$247,054	\$246,831
Termination	10,022	7,405	9,560	7,152	0	0
Disability	3,687	3,438	1,502	1,283	3,667	3,649
Death	8,366	10,097	726	875	3,782	4,923
Total Normal Cost	\$226,281	\$228,635	\$74,544	\$72,761	\$254,503	\$255,403
Ratio of Segal /GRS		101.0%		97.6%		100.4%

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December 31, 2009 Valuation Test Life Comparison

Deferred Vested Members (Age)	Deferred Vested 1 (55)		Deferred Vested 2 (30)		Deferred Vested 3 (39)	
	GRS	Segal	GRS	Segal	GRS	Segal
Expected Benefit Amount	\$1,823	\$1,823	\$8,591	\$8,591	\$21,709	\$22,177
Ratio of Segal/GRS		100.0%		100.0%		102.2%
Present Value of Benefits	\$14,311	\$14,615	\$43,538	\$43,538	\$107,618	\$104,301
Ratio of Segal/GRS		102.1%		100.0%		96.9%
Deferred Vested Members (Age)	Deferred Vested 4 (50)		Deferred Vested 5 (24)		Deferred Vested 6 (60)	
	GRS	Segal	GRS	Segal	GRS	Segal
Expected Benefit Amount	\$20,619	\$21,951	\$787	\$787	\$7,726	\$8,450
Ratio of Segal/GRS		106.5%		100.0%		109.4%
Present Value of Benefits	\$191,034	\$191,034	\$5,025	\$5,389	\$192,136	\$191,614
Ratio of Segal/GRS		100.0%		107.2%		99.7%

Deferred Vested #3, #4 and #6 are all reported with pre-2000 benefit service credit. GRS is estimating their retirement benefit amount in the valuation by applying all service to the post-2000 benefit formula multiplier. Deferred Vested #3, #5 and #6 are all reported with a Variable Money Purchase Account balance. The reason for the difference in PVB for those individuals is discussed on page 12.

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Test Life Comparison

In Pay Status Members (Age)	Retired 1 (66)		Retired 2 (81)		Retired 3 (81)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$28,754	\$28,754	\$32,305	\$32,305	\$2,774	\$2,774
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$360,869	\$360,464	\$198,367	\$198,293	\$17,035	\$17,029
Ratio of Segal/GRS		99.9%		100.0%		100.0%
In Pay Status Members (Age)	Retired 4 (63)		Retired 5 (63)		Retired 6 (82)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$22,976	\$22,976	\$11,033	\$11,033	\$21,441	\$21,441
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$287,395	\$287,265	\$137,999	\$137,936	\$147,547	\$147,530
Ratio of Segal/GRS		100.0%		100.0%		100.0%

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Test Life Comparison

In Pay Status Members (Age)	Retired 7 (82)		Beneficiary 1 (77)		Beneficiary 2 (77)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$10,083	\$10,083	\$4,449	\$4,449	\$2,865	\$2,865
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$69,391	\$69,383	\$33,237	\$33,213	\$21,402	\$21,387
Ratio of Segal/GRS		100.0%		99.9%		99.9%
In Pay Status Members (Age)	Beneficiary 3 (75)		Beneficiary 4 (84)		Beneficiary 5 (84)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$44,684	\$44,684	\$20,971	\$20,971	\$3,656	\$3,656
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$416,636	\$416,363	\$127,016	\$126,918	\$22,142	\$22,125
Ratio of Segal/GRS		99.9%		99.9%		99.9%

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

December 31, 2009 Valuation

Test Life Comparison

In Pay Status Members	Beneficiary 6 (85)		Disabled 1 (59)		Disabled 2 (45)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$13,453	\$13,453	\$32,038	\$32,038	\$40,321	\$40,321
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$77,273	\$77,214	\$407,888	\$407,707	\$733,395	\$733,302
Ratio of Segal/GRS		99.9%		100.0%		100.0%
In Pay Status Members	Disabled 3 (59)		Disabled 4 (80)		Disabled 5 (80)	
	GRS	Segal	GRS	Segal	GRS	Segal
Annual Benefit Amount	\$52,575	\$52,575	\$30,034	\$30,034	\$4,645	\$4,645
Ratio of Segal/GRS		100.0%		100.0%		100.0%
Present Value of Benefits	\$735,230	\$734,929	\$114,854	\$114,672	\$177,653	\$17,737
Ratio of Segal/GRS		100.0%		99.8%		10.0%

We believe the PVB provided for Disabled #5 included an extraneous digit and should have been \$17,765, in which case the ratio of Segal's result to GRS' result would be 99.8%.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

As part of our analysis, we have reviewed the principal assumptions used in the actuarial valuation and the experience study report for the three-year period ending December 31, 2008. For this purpose, we have reviewed the assumptions for reasonableness based on a cursory examination of the census data as well as assumption setting methodology we have typically seen used for systems like WRS. We also compared the current set of economic assumptions to those used by a peer group of 125 systems covering state and local employees.

Investment Return: The System's 7.80% assumption, when compared to the peer group, is right in the middle of the range of 7.00% to 8.50% (based on valuations primarily covering fiscal years ending in 2009 and 2010). The 7.80% assumption appears to be comprised of two parts: an inflation assumption of 3.50% and an assumption for real rate of return (net of investment expenses) of 4.30%. The inflation assumption is on par with the average of the peer group. However, the assumption for real rate of return is slightly less than the average of the peer group. The 7.80% assumption appears reasonable for the System.

While not part of this particular study, it should be pointed out that the assumed return was lowered to 7.20% for the December 31, 2010 actuarial valuation.

Salary Scale: For all members, the salary scale assumption is comprised of an age component (for merit and seniority) ranging from 0.3% to 6.0% and a real wage inflation rate of 4.0%. The recent experience study resulted in minor changes to the merit/seniority increase assumption for some participant subgroups, primarily impacting those with less than 15 years of service. These changes appear reasonable, based on the summary data shown in the report. As long as increases in future wages (over the long term) are expected to be similar to recent past experience, the current assumption is appropriate.

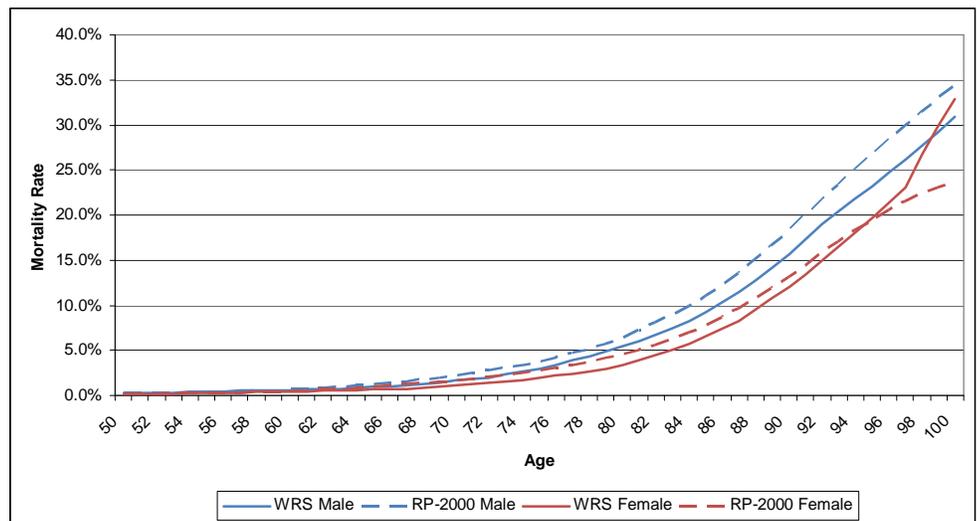
Both the investment return and salary progression assumptions use the same 3.5% underlying inflation rate (4.0% wage inflation rate), and it appears that a consistent economic model for assumption setting is being used.

Mortality: The mortality rates assumed for healthy annuitants and beneficiaries are based on the "Wisconsin Projected Experience Table – 2005". The illustrative rates shown in the report tie back to the underlying tables, with adjustments as described.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

Based on the data from the experience study report, the recommended tables appear to match recent mortality experience closely in aggregate. We also compared the mortality rates to a newer, standard published mortality table (RP-2000 Combined) for consistency in the “shape” of the rates by age. While the expected future lifetime of an individual produced by an older table with a projection may be approximately the same as a current RP-2000 table, the mortality “pattern” across ages can be noticeably different. As a result, the PVB for the same individual could be materially different, especially in a plan that provides post-retirement benefit increases.



As demonstrated in the table above, the pattern of mortality rates from the WRS tables is highly consistent with the pattern of rates from the RP-2000 tables over all rates for males and for all but the highest ages for females. While we would typically recommend setting the mortality assumption to be based on an unprojected current table with appropriate age setbacks/setforwards as necessary, continued use of the “Wisconsin Projected Experience Table – 2005” (with appropriate adjustments) appears reasonable. We would recommend that GRS test recommended mortality assumptions from future experience studies against rates from then-current mortality tables for consistency in the pattern of rates. In addition, we recommend that GRS examine the rationale/reasonableness for the difference in the pattern of female mortality rates at ages 95+ illustrated in the graph above.



Although the ratio of actual to expected post-disability retirement

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

appears reasonable in total, the mortality assumption appears to be too low at ages prior to 70 and too high at ages 80 and above. As part of the next experience review, we recommend that GRS compare the recommended post-disability mortality assumption to a standardized table to ensure reasonableness.



Benefit Election:

Currently, all retirement benefits are valued assuming members elect the single life annuity form of benefit payment. However, there is a subsidy in the optional form of payment conversion factors applicable to formula benefit calculations for members that are beginning to receive benefits after a certain age (62 for non-protectives and Normal Retirement Age for protectives). Since the rates of retirement are such that a portion of each active member is assumed to retire beyond age 62 (Normal Retirement Age for protectives), the value of this subsidy is not currently being included in the actuarial valuation. We recommend including an assumption as to the percentage of active members electing an optional form of payment (with the “Liability Adjustment” disclosed on page III-10 of the valuation report lowered accordingly).



Marriage:

The valuation assumes all active members are married for purposes of death-in-service benefits, and males are assumed to be three years older than females. We recommend the actual marital status and spouse age difference of relatively new retirees (as a proxy for active members) be examined in the next experience review, even if use of a 100% marriage assumption for death-in-service benefits continues in future valuations.



Retirement Rates:

The valuation employs retirement rates from age 55 to age 75 (50 to 70 for protectives). As a result of the last experience review study, most of the retirement rates for non-protective occupation employees were adjusted to allow for larger probabilities of retirement at ages beyond 65. We have observed a trend toward later ages for retirement in recent experience studies completed for other public employers. If this trend continues, the late retirement benefit subsidy noted earlier will become even more of an issue than it is today.

The benefit commencement age assumption for inactive members with a deferred vested benefit should be separately identified in the valuation report. We understand this assumption to be age 62 for

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

executive and elected, age 55 for protective occupations, and age 65 for all others. Since age 54 is the earliest unreduced retirement age for protectives, consideration should be given to using an age 54 commencement assumption for this group.



Turnover Rates:

GRS has used a select and ultimate approach for separation from active service, based on select rates that apply during a member's first 10 years of service. We support the use of this format for turnover rates, and suggest that GRS continue this approach for as long as experience review data suggests that it is appropriate.

New termination rates developed in the experience review were set such that the rates generally produce fewer expected terminations relative to the actual experience over the review period. However, on a liability weighted basis, the rates are not expected to produce significant actuarial gains or losses.

Disability Rates:

Disabilities are explicitly assumed in the valuation. The rates adopted as part of the recent experience study were developed by gender and by participant group. However, by dividing the experience into such fine categories, the actual occurrence of disabilities for some of the groupings is too small on which to reliably base an assumption. We would recommend aggregating some of the groups with like characteristics in order to have a larger experience base to set the assumption.



Demographic assumptions that were developed using a liability-weighted approach should be re-examined in the next experience review using an assumption for optional form of payment election that reflects the subsidized payment forms.

Overall, the economic and demographic actuarial assumptions adopted by the System are reasonable and consistent with generally accepted actuarial standards and practices contained in Actuarial Standard of Practice No. 27 covering economic assumptions and Actuarial Standard of Practice No. 35 covering demographic and non-economic assumptions. In future experience investigation reports, when discussing recommendations for adjusting assumptions so that the ratio of actual to expected experience is something other than 100%, we recommend that GRS state the rationale.



Wisconsin Retirement System

Section IV: Validation of Funding and Asset Valuation Methods

Funding Method for Liabilities

The funding method prescribed by statute for WRS is the frozen initial liability (FIL) actuarial cost method. For the most part, the description of the method stated in the actuarial valuation report is sufficient, though we found one part of it to be confusing and contradictory. The second paragraph on page III-1 states that “...experience gains or losses in any year are amortized (spread) over the average future working lifetime of the group – a period of approximately 13 years”, but the standard period for gain/loss amortization under the Experience Amortization Reserve policy is set at 20 years.

The amortization of unfunded accrued liability for determination of the contribution rate and Annual Required Contribution (ARC) under GASB 25 is based on the frozen initial unfunded liability described above. The amortization is based on a closed period and is expected to be completed by 2029 (twenty years from the valuation date). Under the FIL funding method, typically, when a change in benefit provisions or actuarial assumptions occurs, the FIL unfunded actuarial liability is adjusted by the amount of the change in the Entry Age Normal actuarial liability. However, GRS includes the impact of changes in actuarial assumptions in the Experience Amortization Reserve. Ultimately, the impact of assumption changes are reflected in the WRS cost as an amortization component, but the treatment is different from what would typically be done under the FIL cost method. Because of this different treatment, we recommend that GRS enhance the description of the actuarial valuation method to highlight this alternative approach.



We find the current method to be reasonable, though only 7 of the 125 plans in the peer group use this cost method (most use entry age normal). One item we would point out is that public pension accounting as required by the Governmental Accounting Standards Board (GASB) is currently under review and indications are, for financial reporting purposes, the required actuarial cost method will be entry age normal. Therefore, if entry age normal is required as the reporting method for GASB, the actuary may have to adjust the liabilities that are used for reporting purposes or generate a second set of liabilities.



Experience Amortization Reserve

The Experience Amortization Reserve (EAR) is established under Section 40.04(1) of the Wisconsin Statutes in an attempt to stabilize contribution rates by amortizing certain actuarial gains and losses over time. Typical experience gain/loss recognition under the FIL actuarial cost method would result in amortization over the expected future working lifetime of the active member population. The EAR methodology allows for increased flexibility for setting the period that experience gains and losses (as well as increases/decreases in actuarial liability due to

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Section IV: Validation of Funding and Asset Valuation Methods

changes in actuarial assumptions) will be amortized. While under a traditional approach to FIL, experience gains and losses would be amortized over the average future working lifetime of the active group (approximately 13 years in the case of WRS), the EAR has a standard amortization period of 20 years.

In this manner, experience gains and losses are recognized over a longer period of time than they otherwise would be under the standard FIL approach. However, for a public pension system such as WRS, 20 years is not an unreasonably long period for gain/loss amortization. For comparison purposes, similar experience gains and losses in “immediate gain/loss actuarial cost methods” (e.g., entry age normal and projected unit credit) are amortized over 7 years in single-employer private sector pension plans and 15 years in multiemployer Taft-Hartley pension plans.

Annual Adjustment for Variable Fund

Variable Annuity Fund participation allows retirees to share in the actual investment return experience of the Fund by providing for a mechanism to increase and decrease variable annuities in force. Simply stated, the adjustment to variable annuities in force as of any December 31 is the amount necessary to align the present value of variable annuity payments with the Variable Annuity Reserves. For example, if the present value of variable annuities was \$100 and the Variable Annuity Reserves equaled \$110, then the amount of each variable annuity in force would be increased by 10% such that the new present value of variable annuity payments would match the current value of Variable Annuity Reserves. If in the subsequent year, the Variable Annuity Reserves decreased to \$105, the amount of each variable annuity in force would be decreased by 4.5% (i.e., 100% minus 105 divided by 110). If the ratio of Variable Annuity Reserves to the present value of variable annuities in force would result in a change to variable annuities of less than 2%, no change is made for that year and the investment gain/loss is rolled over to the following year.

Given the purpose of the Variable Annuity Fund and variable annuity participation by WRS members, we find the methodology for determining the change in variable annuities to be reasonable and appropriate. However, taking a broader look at how variable annuity participation affects current retirees’ benefits, we note that a significant amount of investment risk is transferred to the member. One of the fundamental properties of a defined benefit plan is that the majority of investment risk is placed with the employers and not on the members. This direct relationship between the changing value of the Variable Annuity Reserves and the amount of retirees’ variable annuities runs contrary to that basic defined benefit philosophy. However, since members elect to participate in the Variable Annuity Fund, it is presumed that they are aware of the investment risk they are undertaking.

The section of the Retired Lives valuation report titled “Discussion of Variable Annuity Change”

Wisconsin Retirement System

Section IV: Validation of Funding and Asset Valuation Methods

consists largely of a reconciliation of the State of Wisconsin Investment Board published investment return to the percentage adjustment applied to variable annuities in force. This reconciliation appears reasonable and is informative for the reader, but does not have a direct impact on the methodology used for calculating the variable annuity adjustment.

Asset Valuation Method

In compliance with Section 40.04(3) of the Wisconsin Statutes, assets in the Core Investment Trust are valued using the Market Recognition Account (MRA). This method smoothes investment gains and losses for each fiscal year by recognizing these gains and losses evenly over a five-year period. The MRA method does not impose a corridor that places limits on the spread between actuarial value of assets (AVA) and market value of assets (MVA).

An essential part of the public sector budgeting process is that material budget items, including pension contributions, should have a level cost pattern from year to year to the extent possible. Segal recognizes the importance of this requirement and assists clients in establishing reasonable methodologies for recognizing investment gains and losses and limiting the potential volatility that may result in increased contributions due to investment results.

The actuary's guide for determining the reasonableness of an asset smoothing method is Actuarial Standard of Practice (ASOP) No. 44. The following is an excerpt from this ASOP that establishes the qualities a reasonable asset smoothing method must exhibit.

From the Actuarial Standard of Practice No. 44

- 3.3 *Selecting Methods Other Than Market Value -- If the considerations in section 3.2 have led the actuary to conclude that an asset valuation method other than market value may be appropriate, the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. The qualities of such an asset valuation method include the following:*
- a. *The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.*
 - b. *The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:*
 1. *The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.*
 2. *Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary*

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Section IV: Validation of Funding and Asset Valuation Methods

deems reasonable, if the investment return assumption is realized in future periods.

In lieu of satisfying both (1) and (2) above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period.

Two key principles arise from ASOP 44. These are that acceptable asset smoothing must create asset values that fall within a reasonable range around market value and are recognized in a reasonable period of time. In lieu of satisfying both of these principles, a smoothing method could satisfy the requirements if, in the actuary's professional judgment, the range around market value is sufficiently narrow or the differences are recognized in a sufficiently short period.

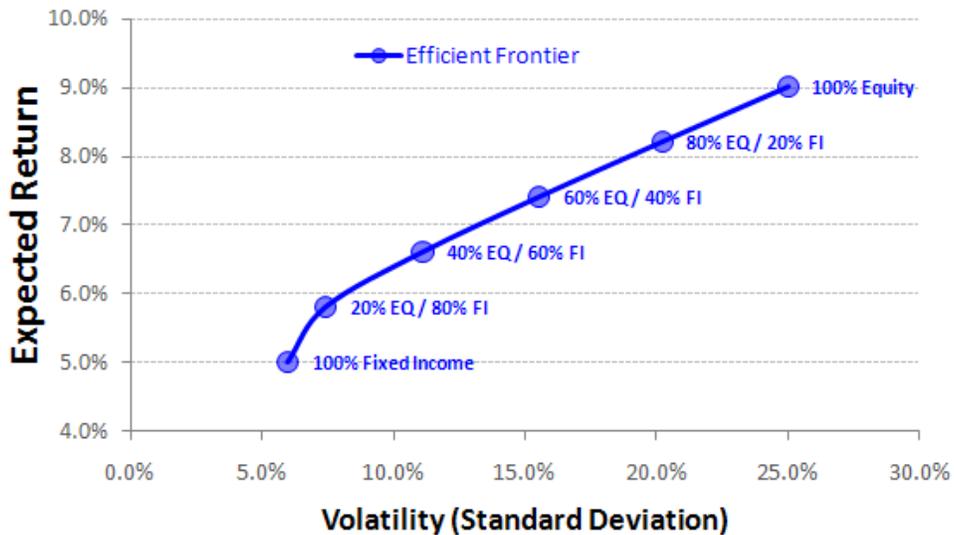
Segal has established an internal policy, which is consistent with others in the actuarial community, that five years is a sufficiently short period to constitute a reasonable asset smoothing method. Therefore, it is our opinion that the method utilized by WRS is reasonable.

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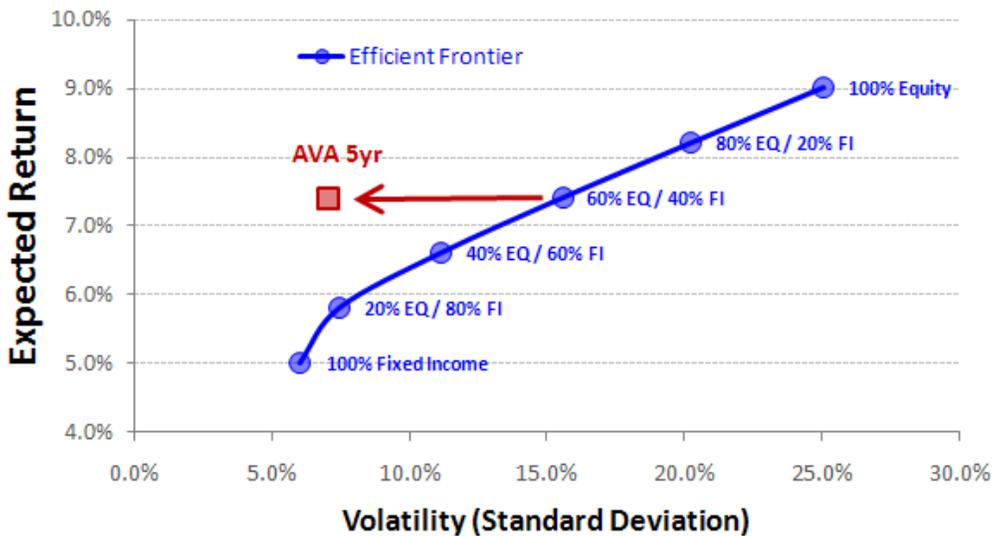
Section IV: Validation of Funding and Asset Valuation Methods

Implications of Corridors

Even though the asset methodology is reasonable, a corridor adds additional limitations to the actuarial value. Retirement systems invest in a variety of ways to establish risk and reward trade-offs in a manner to enhance overall investment performance. When plotted on a graph, and presuming illustrative “efficient portfolios,” the following directional result emerges.



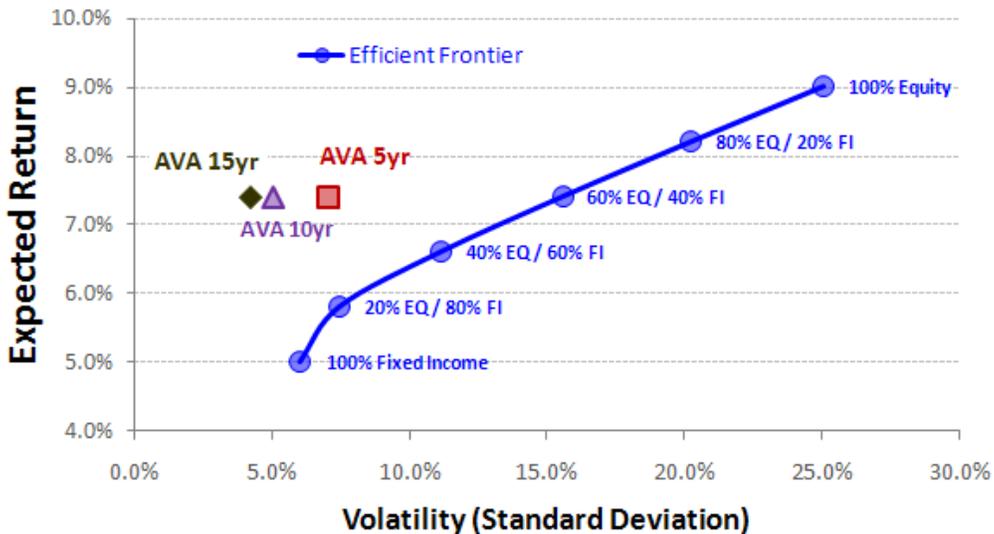
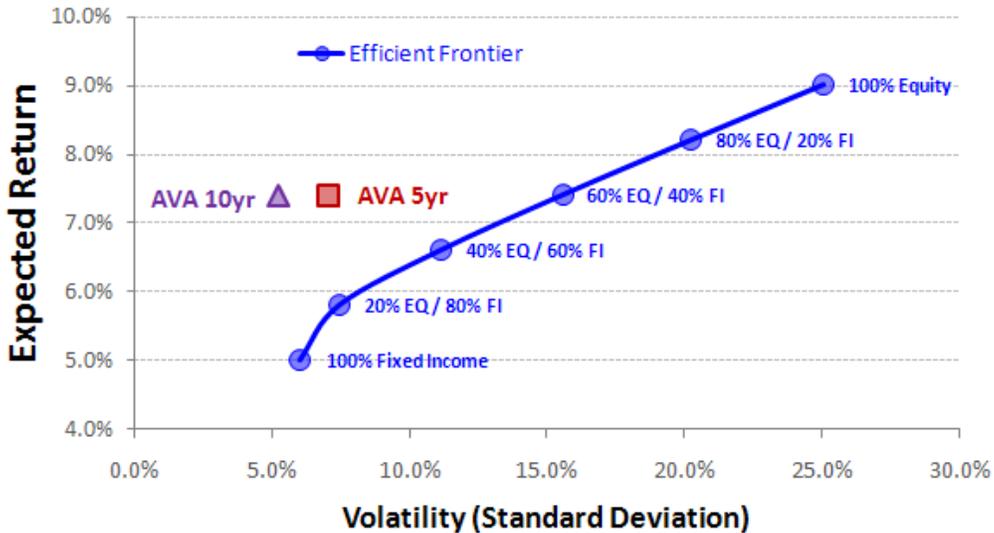
To reduce the volatility of annual investment returns on the AVA, application of a five-year smoothing period lowers the expected volatility in a 60/40 equity to fixed income portfolio to about a 20/80 portfolio volatility expectation (while leaving the expected return unchanged).



Wisconsin Retirement System

Section IV: Validation of Funding and Asset Valuation Methods

Further lengthening of the smoothing period yields diminishing volatility reduction as shown in the following graphs.



The above results should not be used as an excuse to “chase” assumed return or to justify greater asset volatility. In fact, long-term return volatility is only marginally affected by a smoothing method as the plan’s return experience works its way through the system. These results allow a system, which has developed a reasonable asset allocation policy, to mitigate the impact of annual return volatility.

Corridors around the market value of assets further limit the possibility that actuarial value will stray too far from market. The following table illustrates the potential long-term risk associated

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Section IV: Validation of Funding and Asset Valuation Methods

with an asset method that does not utilize a corridor.

Ratio of AVA to MVA (in 20th forecast year)				
	Years of Asset Smoothing			
Range of AVA / MVA	2	5	10	15
90% - 110%	76%	56%	37%	30%
80% - 120%	97%	87%	66%	56%
70% - 130%	100%	96%	83%	74%
60% - 140%	100%	99%	92%	85%
50% - 150%	100%	100%	95%	90%

Reading the above table, we find that a system using a five-year smoothing method with no corridor has a 96% probability of being no more than 30% from the market value of assets in 20 years. For 10-year smoothing the probability drops to 83%. Thus, longer smoothing periods have a greater need for an asset corridor to protect against excessive deviation from market value.

If the smoothing method were to be modified to include a 30% corridor, then the probability of being within 30% of MVA becomes 100% rather than the 96% probability without a corridor. The overlay of a corridor requiring a spread of no more than 30% between MVA and AVA has a relatively low impact in estimating the future ratio between these two asset measures. However, if the System desires to have an AVA that strays no more than 20% away from market value, then it would be beneficial to implement a 20% corridor since without one, there is a 13% probability that in 20 years AVA will not be within 20% of MVA. Introducing such a corridor is an additional tool in managing the spread between the actuarial value and the market value of assets. The trade-off for using a corridor is the potential restrictions on smoothing, which may increase volatility in the investment return recognized each valuation.

Wisconsin Retirement System

Section V: Conclusions and Recommendations

This limited scope audit reviewed the data used, the benefits valued, and the actuarial methods and assumptions employed in the December 31, 2009 actuarial valuation. The test lives provided by the actuary reflect the plan provisions of WRS as stated in the 2009 actuarial valuation report. These test lives also demonstrate the application of the actuarial assumptions to the benefits as stated in the valuation report. The actuarial assumptions, methods, and procedures are reasonable and reflect the benefit promises made to WRS members. All parameters and methods appear consistent with GASB 25.

Below we summarize our recommendations for your consideration:

A. Data

1. Implement tolerance checks for missing and inconsistent data to shorten amount of time spend on data reconciliation.
2. Remove the adjustment for the value in the Variable Excess/Deficiency data field for the total account balance information shown in the valuation report.

B. Valuation Report

1. Improve the information relative to system assets (on both market value and actuarial values) so that financial information can more easily be reconciled by the reader.
2. Enhance the description of the actuarial cost method to reflect differences from the standard treatment of frozen initial liability.
3. Consider combining the two valuation reports into one and modifying the layout of the valuation report to enhance understandability.

C. Projected Benefits

1. Include an assumption for election of optional forms of payment to capture the subsidy in conversion factors for members retiring after normal retirement age.
2. Reflect the pre-2000 benefit multiplier for deferred vested members.

D. Assumptions and Methods

1. Test recommended mortality assumptions from future experience studies against rates from then-current mortality tables for consistency in the pattern of rates.
2. Consider an age 54 commencement assumption for protective employees with a deferred vested benefit.

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Section V: Conclusions and Recommendations

3. Aggregate some of the groups with like characteristics in order to have a larger experience base to set the disability incidence assumption.
4. Consider adopting an “asset corridor” if it is desirable that the actuarial value of assets are always within a defined percentage of the market value over the long term.

To reiterate our summary from Section 1, the plan’s actuary appears to have reasonably valued the expected liability of the System. They have applied the methodology consistently and their report generally conforms to accepted actuarial principle and practices. In this report, we have noted areas that we believe will improve the usefulness and clarity of the System’s annual actuarial valuation. We are available to discuss any aspect of our review with System staff or the System’s actuary.