GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

MISSISSIPPI PREPAID AFFORDABLE COLLEGE TUITION PROGRAM

ACTUARIAL AUDIT OF JUNE 30, 2012 PRICING CALCULATIONS AND VALUATION - PHASE II

APRIL 19, 2013

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
One Towne Square
Suite 800
Southfield, MI 48076-3723
248.799.9000 phone
248.799.9020 fax
www.gabrielroeder.com

April 19, 2013

Board of Trustees
Mississippi Prepaid Affordable College Tuition Program
501 North West Street, Suite 1101
Jackson, MS 39201

Attention: Ms. Lynn Fitch, State Treasurer

Re: MPACT Actuarial Audit

Dear Trustees:

Presented in this report are the results of Phase II of an actuarial audit of the June 30, 2012 Pricing Calculation and June 30, 2012 Actuarial Valuation of the Mississippi Prepaid Affordable College Tuition Program (MPACT) performed by Bryan, Pendleton, Swats & McAllister, LLC (BPS&M). The results are presented in the following format:

I. Executive Summary

II. Pricing Report
   A. Review of Assumptions and Methods
   B. Replication of Results

III. Actuarial Valuation Audit
   A. Review of Assumptions and Methods
   B. Replication of Results

IV. Other Program Considerations

The purposes of Phase II of this audit are to 1) replicate the results of the current actuary based on the current methods and assumptions, 2) review the appropriateness of the current methods and assumptions and make recommendations to improve methods and assumptions, where warranted, and 3) identify areas of the program that could be changed to enhance the soundness.

For convenience, all of Phase I is included in this report. This Phase provides additional details, not included in Phase I for many of our recommendations. This report replaces all prior draft versions of Phase II.

This study was performed at the request of the College Savings Plans of Mississippi Board of Directors (Board). It may be shared with other interested parties only with the permission of the Board. If shared with other parties, it should be shared in its entirety or with just the (entire) Executive Summary section.

This study was performed by actuaries with significant experience with valuing public sector retirement systems (which closely resemble the MPACT program). There are currently no Actuarial Standards of Practice which specifically refer to pre-paid tuition plans. We have followed the guidance from the Actuarial Standards of Practice on pensions due to their similar nature.

We would like to acknowledge the cooperation of Mr. Michael Brister with the audit phase of this study. His cooperation was key in the successful completion of this report.

It is important to remember that actuarial calculations are based on assumptions regarding future events. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

We have developed a projection tool to model the sensitivity of valuation results to certain assumptions/experience, such as investment return and tuition increases to help the Board understand the risks associated with such assumptions/experience.

There are currently no Actuarial Standards of Practice that specifically refer to prepaid tuition plans. We have followed the guidance from the Actuarial Standards of Practice on pensions due to their similar nature.

David Kausch is a Member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

GRS is independent of the plan sponsor.

Respectfully submitted,

Kenneth G. Alberts

David T. Kausch, FSA, EA, FCA, MAAA

KGA/DTK:sc

SECTION I

EXECUTIVE SUMMARY

Executive Summary

Pricing

GRS has reviewed the assumptions/methods used in the pricing of MPACT contracts. We have identified several methods and assumptions that we believe should be reviewed prior to the next price setting, in order to better align the pricing and actual program costs:

- Investment Return. The current return assumption of 7.8% is within the 25th to 75th percentile range (commonly referred to as the best estimate range) based on our analysis and MPACT's current target allocation. The plan is only expected to meet or exceed the current assumption 43% of the time. The median expected rate is 7.0% (this is the rate that the plan is expected to meet or exceed 50% of the time). In addition, the Office of the State Treasurer has indicated that the plan has averaged a return of 4.8% on investments since inception. If the rate were decreased to a rate that was at or below the median (and no other changes were made), the unfunded liability would increase above $100 million;
- Use of a Single Interest Rate. Given the shorter investment horizons of this kind of a program versus other defined benefit plans (such as retirement plans), annual investment return experience is expected to be more volatile over the average participation period. We therefore recommend consideration of using select and ultimate interest rates for pricing;
- Use of a Single Tuition Increase Assumption. Given the relatively short participation period, we recommend using a select (or select and ultimate) set of assumption increases for pricing. Under the current pricing method, there is no way to recover losses that occur when tuition increases are higher than assumed over periods that are close to the average participation period;
- Incidence of Benefit Payments, Refunds and Change of Beneficiary. We recommend that this activity be routinely reviewed to determine if this activity is resulting in additional costs that should be captured in the pricing. There is currently no method for recovering lost income when delinquent or inactive accounts resume payment under the current policy. According to the Office of the State Treasurer, the MPACT plan currently has 849 delinquent accounts;
- Expense Loading. We recommend a change in the way that administrative expenses are captured in the pricing. Currently this is captured by lowering the interest rate. We believe a more appropriate method would be to increase the price by a factor (such as 5%) to account for administrative expenses;
- Contract Terms. We recommend that participants be charged when the terms of the contract are changed, based on an actuarially determined cost calculation;
- Weighted Average Tuition (WAT) Development. We recommend that the WAT for 2-year colleges be determined using the same method as the 4-year college WAT development;
- Bias Load. A "Bias Load" is used to measure the cost of participants' tendency to select more expensive schools at a rate higher than the weighting issued to determine the WAT. The valuation currently recognizes that this activity is occurring. However, the pricing does not recognize this activity. This allows some participants to benefit from the pricing by paying a cost based on the average tuition and then select a school with an above average tuition. We recommend recognizing this activity in the pricing by including a Bias Load in the development of the pricing (based on MPACT experience);

Executive Summary

Pricing (Concluded)

- Adjudication. We recommend that MPACT review adjudication procedures on a regular periodic basis (such as every 5 years). MPACT staff provided GRS information from the "grid" regarding payments made to schools from MPACT. The information detail did not produce a uniform per credit hour cost for some schools. MPACT staff states that contracts are sold by the year using WAT and schools are paid by the semester from the grid allowing for potential problems. There was not enough detail in the grid for us to fully audit the actual payment process. In addition, this process was outside the scope of this engagement;

- Credit Hour Derivation. MPACT is charged by in state public schools through the use of the "grid." The "grid" is a chart produced by the schools that breaks the annual cost of tuition into a per credit hour cost. The derivation of the credit hours used in the development of pricing is based on a 32 credit hour year. This means that the pricing, which is developed on an annual basis, is converted to credit hours by dividing the annual costs by 32 (i.e., one credit hour equals 1/32 of the annual cost). At some point, the schools started charging MPACT, based on a 24 credit hour year, which is shown in the "grid." This means that MPACT is paying 1/24 of the annual costs for each credit hour. We recommend that MPACT change its development of the per credit hour costs to match the way the schools develop the per credit hour cost. We also recommend that MPACT monitor the schools development of the per credit hour charge and adjust current contracts if the schools change their methods again and monitor the timing of the "grid" to ensure that pricing is based on the most recent data available.

GRS was able to replicate the current actuary's computation of pricing well within tolerance. In addition, GRS was able to replicate the current actuary's payment plan calculations within reasonable tolerances. It is important to remember that successful replication is not necessarily an indicator of method and assumption reasonableness or appropriateness.

Executive Summary

Actuarial Valuation

GRS has reviewed the assumptions/methods used in the actuarial valuation and generally find them to be reasonable. However, there are a few differences in the manner in which certain assumptions and methods are handled in the valuation versus the pricing. Those assumptions and methods are:

- Discount Rate and Expense Loading. The methods used for the investment return and expense loading differ between the pricing and the valuation. While the methods appear to produce similar results in the aggregate, we recommend using methods that are more similar to enhance transparency. In addition, we recommend reviewing the investment return assumption. While the current 7.8% rate of return is within the "best estimate" range, it is above the median, under the current allocation. This may justify lowering the assumption;
- Bias Load. We recommend lowering the bias load, based on experience;
- Contracts that are Past Expected Matriculation Date (and have not matriculated). The current assumption is that these contracts will matriculate immediately. Data suggests that they will not. We recommend assuming 75% of remaining overdue contracts will matriculate in each future year.

GRS was able to replicate valuation results within reasonable tolerance. It is important to remember that successful replication is not necessarily an indicator of method and assumption reasonableness or appropriateness. Replication indicates that the current valuation shows a fair representation of the MPACT funded position, based on the current assumptions and methods. During our review, we discussed changing some of the methods and assumptions to better model actual experience. Such changes would change the measurement of the plan's funded status. While several different areas are discussed, the assumed rate of investment return has one of the largest effects on valuation results. The funded status of the plan is approximately 77%, based on current valuation methods and assumptions as of June 30, 2012. Each 100 basis point change (between 4% and 10%) in the assumed rate of investment return will change the funded status by approximately 400-500 basis points (i.e., if the investment return assumption were lowered to 6.8%, the unfunded actuarial accrued liability would increase, resulting in a funded status of approximately 72%-73%, assuming no other changes in methods and assumptions).

Other Program Considerations

- Using a Claims Reserve Model. Since this program operates much like an insurance contract, we recommend the Board build up a claims reserve equal to 15% to 20% of expected future payments. For pricing, this means adding an amount to the price to account for the reserve (in addition to the WAT, Bias load and Expense load). For the valuation, this means adopting a funding target in excess of 100% (such as 115% to 120%). Policy issues would need to be developed to handle the difference under this kind of model (such as how to achieve the target, what to do if the target is surpassed, etc.). This could involve a side fund that was used to stabilize funded status of the plan and/or a dividend/reduction feature (a hybrid element that had both a defined benefit feature like the current plan combined with a defined contribution feature);

- Charging for Investment and Inflation Risk. As an alternative way to build a claims reserve, the pricing model could be based on risk free investment return assumptions (such as municipal bond rates). However, this might be a less flexible approach. In periods of low inflation, this approach could raise prices to the point at which they become unaffordable;

- Limiting Downside Exposure. One example of downside exposure is higher tuition payments due to tuition increases in excess of those included in the development of the pricing. Allowing payments to occur beyond 4 years after matriculation increases the likelihood that the tuition payments actually made will increase more than assumed in the pricing. We can limit this downside exposure by reducing the 10-year period that accounts may be used after matriculation age is reached. This could be achieved by:
    - Only providing a tuition guarantee if matriculation occurs within a fixed period of graduation (such as 3 years);
    - Only providing a tuition guarantee for a shorter fixed period (such as 6 years after matriculation);
    - Forfeiting unused credits upon college graduation.

SECTION II

PRICING REPORT

A. Review of Assumptions and Methods

The following assumptions are used in the developing of pricing:

Assumed Rate of Return, Net of Investment Fees:	7.3%.
Assumed Rate of Tuition Increases	
o **Four Year Colleges:**	6.5%.
o **Two Year Colleges:**	6.0%.
Incidence of Benefit Payments	
o **If paid before schooling starts (beneficiary is under age 5):**	Benefit payments (Matriculation) begin at age 18 and are paid in consecutive years at the full time rate.
o **If paid after schooling starts:**	Benefit payments (Matriculation) begin the semester after graduation from high school (assuming one grade is completed per year in the future) and are paid in consecutive years at the full time rate.
Refunds/Cancellations:	None.
Election of Program Changes:	None.
Election of Change of Beneficiary:	None.
Expense Loading	
o **Lump Sum Payments:**	$3 per year from date of payment to date of assumed matriculation (benefit commencement).
o **Monthly Installments:**	$2 per month of original contract term.
Contract Terms:	No changes in contract terms are assumed, once initiated.
Pricing Methodology:	Based on weighted average tuition (WAT) rate increased to assumed year of payment, based on tuition rate increase assumption and discounted to payment date based on net investment return assumption.
Timing of Tuition Payments:	Once per year at beginning of year.
WAT Development	
o **4-Year College:**	Weighted on prior year's in-state enrollment.
o **2-Year College:**	Weighted based on average in-state enrollment over the last two years.
Bias Load:	None.

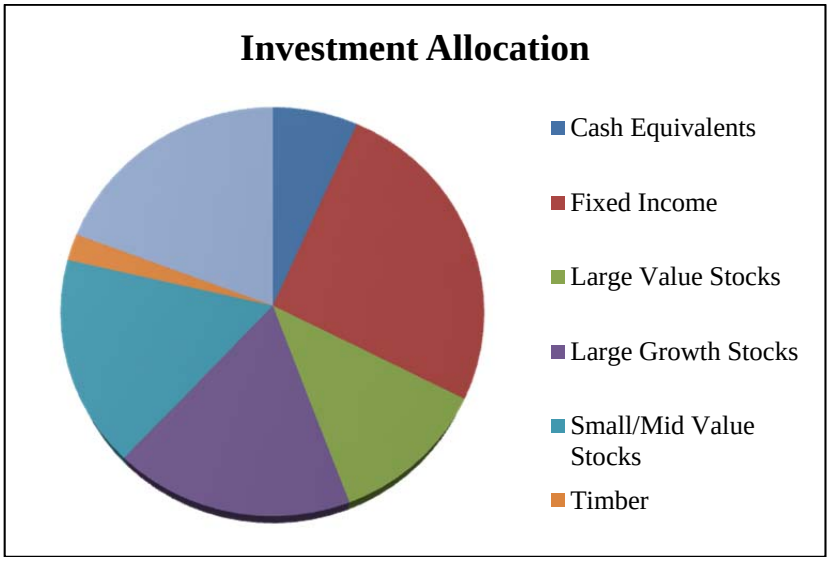
Review of Investment Return Assumption

MPACT's investment allocation, as of June 30, 2012, is:

Table 1

• Cash Equivalents	6.70%
• Fixed Income	25.70%
• Large Value Stocks	11.90%
• Large Growth Stocks	17.70%
• Small/Mid Value Stocks	16.60%
• Timber	2.10%
• International Stocks	19.30%

Graph 1



The rate of return assumption should be based on expected inflation, expected real returns for each asset class and the investment horizon.

The investment horizon should reflect the average amount of time funds remain under investment. For a typical retirement system, this period is quite long. However, for a pre-paid tuition program it may be much shorter. The timeframe should be evaluated in two pieces: 1) the period prior to benefit commencement and 2) the length of the expected payout. Table 2 on the following page illustrates how these time frames differ between retirement systems and pre-paid tuition programs.

Table 2

	Typical Retirement System	Prepaid Tuition Program
	Investment Horizon Prior to Benefit Commencement	
Minimum time frame	5-10 years	1 year
Maximum time frame	35-45 years	18 years
Typical	15-25 years	6-8 years
	Benefit Commencement Period	
Minimum time frame	1 payment	1 payment
Maximum time frame	50-70 years	10 years
Typical time frame	20-30 years	2-4 years

Because of the shorter time frame the prepaid tuition program has over the pension plan, shorter term investment outlooks need to be considered.

Table 3 shows that the average of the 8 investment consultants' capital market assumptions results in an average mean return of 7.8% when normalized to the current 3% price inflation assumption. Table 4 shows that the plan has a 39.6% chance of meeting or exceeding the assumed investment rate of return of 7.8% based on the average capital market assumptions of 8 investment consultants. If the investment return assumption were lowered to 7%, this probability would increase to 50%. Due to the short investment horizon (which results in increased volatility), the Board may wish to set the assumption even lower to raise the probability of meeting or exceeding the assumed rate of return above 50%.

Table 4 also shows the expected return over the next 20 years for a portfolio based on the current MPACT asset allocation and 8 different investment consultant's capital market assumptions. It also shows the probability of achieving the assumed 7.8% return over that period based on those same capital market assumptions.

Review of Investment Return Assumption

Table 3

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)
(1)	(2)	(3)	(4)	(5)	(6)
1	6.3%	2.5%	3.8%	3.0%	6.8%
2	7.5%	3.0%	4.5%	3.0%	7.5%
3	7.0%	2.5%	4.5%	3.0%	7.5%
4	8.0%	3.3%	4.7%	3.0%	7.7%
5	7.5%	2.5%	5.0%	3.0%	8.0%
6	7.4%	2.4%	5.0%	3.0%	8.0%
7	7.8%	2.5%	5.3%	3.0%	8.3%
8	7.8%	2.2%	5.7%	3.0%	8.7%
Average	**7.4%**	**2.6%**	**4.8%**	**3.0%**	**7.8%**

All returns are annual returns gross of expenses.

Table 4

Investment Consultant	Distribution of 20-Year Average Geometric Nominal Return			Probability of Exceeding 7.80%
	25th	50th	75th	
(1)	(2)	(3)	(4)	(5)
1	4.3%	6.1%	8.0%	27.0%
2	4.8%	6.7%	8.6%	34.6%
3	4.9%	6.8%	8.7%	35.9%
4	4.6%	6.7%	8.9%	37.1%
5	5.5%	7.3%	9.1%	42.4%
6	5.9%	7.5%	9.1%	44.4%
7	5.5%	7.4%	9.4%	45.2%
8	5.8%	7.8%	9.9%	50.4%
Average	**5.2%**	**7.0%**	**9.0%**	**39.6%**

All returns are annual returns gross of expenses.

If the investment return assumption were lowered, as discussed above, the measurement of the funded status of the plan would decrease. The funded status of the plan is approximately 77%, based on the assumed investment return of 7.8%. Each 100 basis point change (between 4% and 10%) in the investment return assumption will change the funded status approximately 400-500 basis points (i.e., a 6.8% assumption would result in an increase in the unfunded actuarial accrued liability resulting in a funded status of approximately 72%-73% if there are no other changes in methods and assumptions).

Review of Investment Return Assumption

Under current actuarial standards, assumptions that fall within a "reasonable range" are generally acceptable. The 25th through 75th percentile range is commonly used to define the reasonable range for investment return assumptions. Table 4 shows that the current investment return assumption of 7.8% is within this reasonable range. However, it is above the median of 7.0% (this is the rate that the plan is expected to meet or exceed 50% of the time).

GRS reviewed the historical information on contract purchase and determined the following:

- The average time from contract purchase to matriculation (weighted by contract cost) is 7.8 years;
- The average payment period is 5 years;
- The average benefit payment period is 4 years.

Based on this information, the average investment time horizon is approximately 8 years. Under an 8-year horizon, the reasonable range is as follows:

Table 5

Investment Consultant	Distribution of 8-Year Average Geometric Nominal Return			Probability of Exceeding
	25th	50th	75th	7.80%
(1)	(2)	(3)	(4)	(5)
1	3.2%	6.1%	9.1%	34.9%
2	3.7%	6.7%	9.7%	40.1%
3	3.8%	6.8%	9.8%	41.0%
4	3.3%	6.7%	10.2%	41.8%
5	4.5%	7.3%	10.1%	45.2%
6	4.9%	7.5%	10.1%	46.5%
7	4.4%	7.4%	10.6%	47.0%
8	4.7%	7.8%	11.1%	50.2%
Average	**4.1%**	**7.0%**	**10.1%**	**43.3%**

All returns are annual returns gross of expenses.

While the median does not change, the range of results between the 25th and 75th percentiles increases from roughly 400 basis points to 600 basis points, indicating that year to year results are expected to be more volatile. As such, it may be appropriate to use a lower rate of return for the pricing to reflect this shorter investment horizon. One other possibility would be to use different interest rates depending on the expected investment horizon (length of time between contract initiation and matriculation). Such an arrangement would be akin to using forward interest rates and would look something like Table 6.

Sensitivity Analysis and Modeling

GRS has developed a projection tool to measure the effects of different assumptions on valuation results. With this tool, the user can enter the assumed rate of investment return as well as the year by year actual (future) rate of investment return and actual future rate of tuition increases to see how that will affect the funded status of the plan. Below are two screen shots of the projection tool. The first is based on current valuation assumptions and matching actual future experience (see Figure 1). The second is based on valuation assumptions regarding tuition increases and a 7.0% assumed rate of investment return and a 7.0% actual rate of future investment experience (see Figure 2).

Figure 1

Mississippi Prepaid Affordable College Tuition Program

Input	
Assumed Rate of Investment Return	7.80%
Geometric Average of Actual Rates of Investment Returns Entered in Column D	7.80%

Estimated Valuation Results		
Present Value of future tuition and fees	$	392,906,102
Present Value of Future Contract Payments	$	48,094,160
June 30, 2012 Assets	$	265,125,878
Unfunded Liability	$	(79,686,064)
Funded Status		79.72%
Year insolvent		2024

Input

Year Beginning July 1	Actual Investment Return During Year	Actual Tuition Increase for Universities	Actual Tuition Increase for Junior Colleges/CC	Market Value of Assets at BOY	Projected Tuition Payments (BOY)*	Projected Administrative Expenses	Projected Contract Payments (BOY)	Market Value of Assets at EOY
2012	7.80%	n/a	n/a	265,125,878	31,699,457	1,584,973	11,231,201	262,032,315
2013	7.80%	6.50%	6.00%	262,032,315	32,655,210	1,632,761	9,544,041	255,796,879
2014	7.80%	6.50%	6.00%	255,796,879	34,656,892	1,732,845	7,985,323	245,129,078
2015	7.80%	6.50%	6.00%	245,129,078	36,727,662	1,836,383	6,680,727	229,878,930
2016	7.80%	6.50%	6.00%	229,878,930	33,716,513	1,685,826	5,422,454	215,491,171
2017	7.80%	6.50%	6.00%	215,491,171	35,056,252	1,752,813	4,498,026	197,468,182
2018	7.80%	6.50%	6.00%	197,468,182	37,682,114	1,884,106	3,820,139	174,336,426
2019	7.80%	6.50%	6.00%	174,336,426	38,690,791	1,934,540	3,198,243	147,588,266
2020	7.80%	6.50%	6.00%	147,588,266	39,540,512	1,977,026	2,535,607	117,077,630
2021	7.80%	6.50%	6.00%	117,077,630	40,322,582	2,016,129	1,911,977	82,629,665
2022	7.80%	6.50%	6.00%	82,629,665	40,240,689	2,012,034	1,422,333	45,059,619
2023	7.80%	6.50%	6.00%	45,059,619	38,699,103	1,934,955	1,118,538	5,976,539
2024	7.80%	6.50%	6.00%	5,976,539	37,867,625	1,893,381	810,138	(35,546,328)

Figure 2

Mississippi Prepaid Affordable College Tuition Program

Input	
Assumed Rate of Investment Return	7.00%
Geometric Average of Actual Rates of Investment Returns Entered in Column D	7.00%

Estimated Valuation Results		
Present Value of future tuition and fees	$	415,307,776
Present Value of Future Contract Payments	$	49,169,245
June 30, 2012 Assets	$	265,125,878
Unfunded Liability	$	(101,012,653)
Funded Status		75.68%
Year insolvent		2023

Input

Year Beginning July 1	Actual Investment Return During Year	Actual Tuition Increase for Universities	Actual Tuition Increase for Junior Colleges/CC	Market Value of Assets at BOY	Projected Tuition Payments (BOY)*	Projected Administrative Expenses	Projected Contract Payments (BOY)	Market Value of Assets at EOY
2012	7.00%	n/a	n/a	265,125,878	31,794,568	1,589,728	11,231,201	259,980,877
2013	7.00%	6.50%	6.00%	259,980,877	32,753,668	1,637,683	9,544,041	251,592,916
2014	7.00%	6.50%	6.00%	251,592,916	34,761,669	1,738,083	7,985,323	238,693,982
2015	7.00%	6.50%	6.00%	238,693,982	36,838,751	1,841,938	6,680,727	221,162,602
2016	7.00%	6.50%	6.00%	221,162,602	33,820,416	1,691,021	5,422,454	204,448,773
2017	7.00%	6.50%	6.00%	204,448,773	35,164,406	1,758,220	4,498,026	184,065,864
2018	7.00%	6.50%	6.00%	184,065,864	37,798,377	1,889,919	3,820,139	158,571,547
2019	7.00%	6.50%	6.00%	158,571,547	38,810,165	1,940,508	3,198,243	129,490,454
2020	7.00%	6.50%	6.00%	129,490,454	39,662,508	1,983,125	2,535,607	96,707,058
2021	7.00%	6.50%	6.00%	96,707,058	40,446,997	2,022,350	1,911,977	60,080,166
2022	7.00%	6.50%	6.00%	60,080,166	40,364,827	2,018,241	1,422,333	20,457,791
2023	7.00%	6.50%	6.00%	20,457,791	38,818,494	1,940,925	1,118,538	(20,525,907)
2024	7.00%	6.50%	6.00%	(20,525,907)	37,984,460	1,899,223	810,138	(63,771,414)

This projection tool can be used to estimate the valuation results based on other combinations of assumed rates of return, actual future rates of return and actual future rates of tuition increases.

Review of Investment Return Assumption

Table 6

Specifc Year Prior to Matriculation	Annual Investment Return Assumption
Years 1-5	5.00%
Years 6-10	6.00%
Years 11-15	6.50%
Years 16-18	7.00%
Average	6.03%

Graph 2

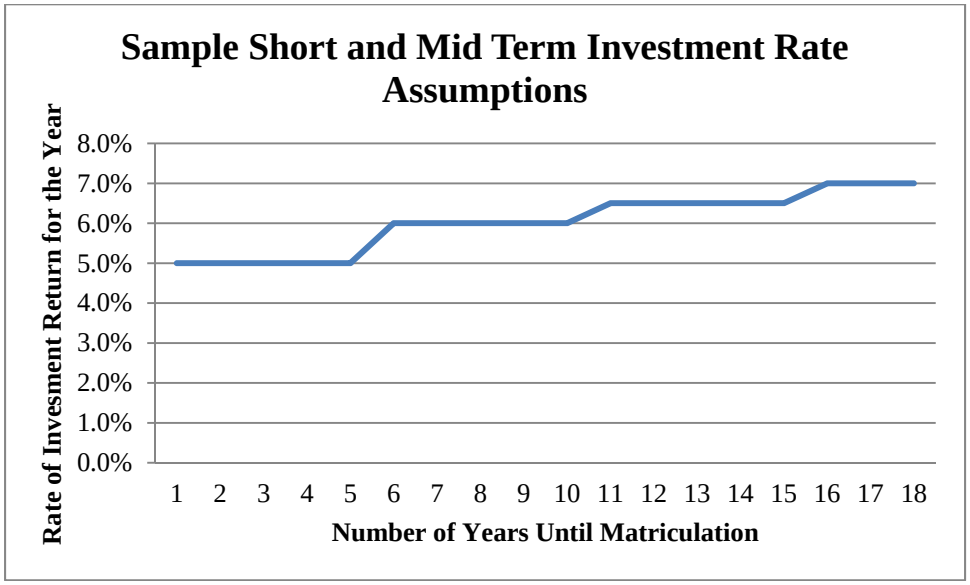


Table 6 is an illustration of a set of possible interest rates. GRS is not necessarily recommending this particular set of rates. If this concept is adopted, we would first discuss what percentile each quinquennial period should target and then we could recommend several alternatives for the Board to choose from.

Recommendations:

- Consider lowering the investment return assumption closer to the median of 7% in the pricing and the valuation;
- Consider reflecting short term (0 to 10 years) and mid-term (10-20 years) investment expectations in the pricing.

Review of Tuition Increase Assumption

The historical tuition information reported in the BPS&M report supports a long term tuition increase assumption in the range of 6.0% - 6.5% for 4-year schools and 5.35% - 5.75% for 2-year schools. However, both types of institutions have experienced several years where tuition increases were well in excess of the assumed increase. For beneficiaries that are in the program for several years, these higher than average increases were offset by other years with lower than average increases in tuition. However, if for example, a participant purchases a contract for a 12th grader the year before one of these above average increases, they are underpaying for participation. While, in theory, this underpayment would be offset by someone purchasing a contract for a 12th grader the year before a lower than average increase, the timing of these offsets could create a short-term cash flow problem.

We therefore believe that this assumption should be reconsidered, based on the length of time between payment and matriculation. To establish a tuition increase assumption for all 18 possible time periods from payment to matriculation would minimize the potential losses from short term tuition increases, but would maximize the complexity of the calculation. Using only one tuition increase assumption for all 18 possible time periods from payment to matriculation would maximize the potential losses from short term increases (or alternatively, overcharge longer term participants), but would minimize the complexity. We therefore recommend that the Board consider something in between, such as using 2-4 different tuition increase assumptions. For example, the Board could use a set of assumptions like the following:

Table 7

Year(s) After Contract	Annual Tuition Increase Assumption	Cumulative Tuition Increase Assumption
1	10.0%	10.0%
2	10.0%	21.0%
3	10.0%	33.1%
4	10.0%	46.4%
5	10.0%	61.1%
6	10.0%	77.2%
7	6.0%	87.8%
8	6.0%	99.1%
9	6.0%	111.0%
10	6.0%	123.7%
11	6.0%	137.1%
12	6.0%	151.3%
13	4.0%	161.4%
14	4.0%	171.8%
15	4.0%	182.7%
16	4.0%	194.0%
17	4.0%	205.7%
18	4.0%	218.0%
Average (Arithmetic, Geometric)	6.7%	6.6%

Graph 3

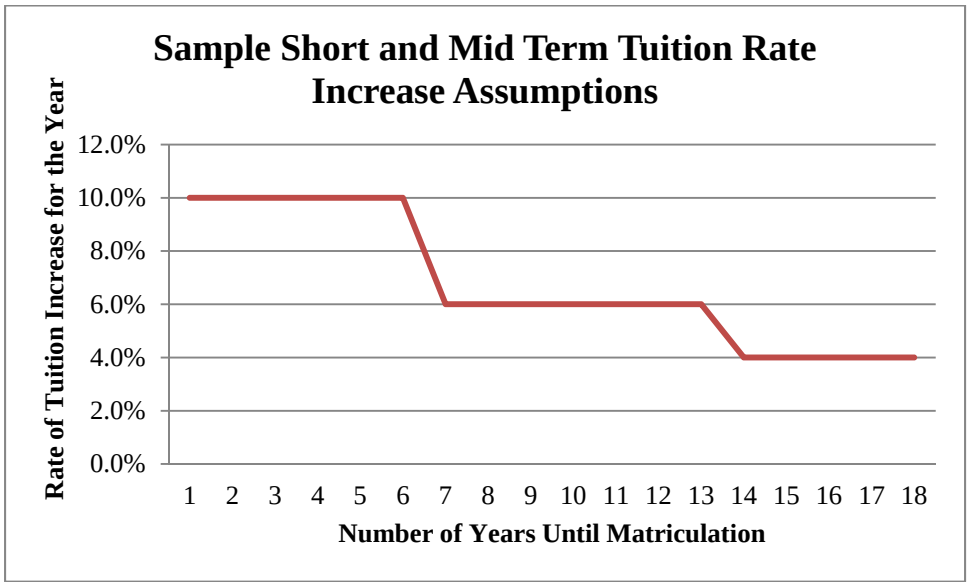


Table 7 is an illustration and not necessarily a specific GRS recommendation. If this concept is adopted, we recommend seeking input from the colleges about expected short-term increases as well as input from the State regarding short term changes in State financing of State colleges and universities. After that information is collected and reviewed, we could recommend several alternatives for the Board to choose from. For purposes of this discussion, short-term is considered less than 10 years; mid-term is considered 10-19 years and long term is considered 20+ years.

Recommendation:

- Consider reflecting short-term and mid-term tuition increase expectations in the pricing.

Incidence of Benefit Payments, Refunds, Changes and Changes of Beneficiary

We find these assumptions to be generally reasonable and do not currently recommend changes to them. However, the changes of beneficiary and delinquency can result in additional costs. We understand that MPACT currently does not analyze this activity and does not charge for this potential additional cost. We recommend that this activity be routinely studied (such as in conjunction with a regular 5-year experience study) so that the Board can determine if it is appropriate to charge members for this activity.

Recommendation:

- None

Expense Loading

Administrative expenses were approximately $1.3 million per year in FY 2011 and FY 2012. Expenses that were directly collected for 2011 and 2012 were $3 per participant that has not matriculated plus $2 per month for participants making monthly payments. In addition, there is an indirect charge for expenses that occurs by using a discount rate of 7.3% in the development of the pricing (0.5% lower than the assumed long term rate of return on assets). This indirect charge equates to a different administrative charge (as a percent of the tuition costs) for each participant, depending on the length of time between contract payment and matriculation. For example, a member that pays a lump sum in 12th grade has paid an administrative charge approximately equal to 1% of their tuition while a member who pays a lump sum in 2nd grade pays an administrative charge approximately equal to 5% of their tuition. In addition, the administrative charge is only funded if the investment return meets or exceeds the assumed return of 7.8%. So, the administrative charges for members who entered the program as 12th graders in 2000 were never funded because the investment market during their participation time never produced enough returns.

It is also important to note that whenever the fund actually earns less than the assumed rate of investment return (currently 7.8%), it will not collect sufficient revenue to cover administrative expenses under this method.

We recommend one of the following changes for future fiscal years:

1. Establish an expense load in the development of the cost of the program based on a projected administrative expense;
2. Pay administrative expenses from funds outside of the program; or
3. Directly fund administrative expenses from State sources.

An example of suggestion 1 compared to the current method would be as follows:

Table 8

	Cost Based on Current Assumptions	Current Expense Method	Alternate Expense Method 1 (Based on 5% Expense Load)
2012 WAT	$ 6,145	$ 6,145	$ 6,145
Lump Sum Cost for 12th Grader	25,708	25,886	26,993
Lump Sum Cost for 2nd Grader	22,771	24,020	23,909

The additional $3 and $2 charges related to administrative expenses that would vary with the length of time a member participates in the program do not appear to generate a material amount of revenue. While we have no objection to such a charge, we recommend that the charge either be re-analyzed to be more closely related to the cost of the annual administration/paper work or be included with the method used above.

Recommendations:

- Change the way that expenses are reflected in the pricing;
- Eliminate the flat dollar charges and unify the way expenses are reflected in the pricing.

Contract Terms

We believe that the assumption regarding no changes in future contract terms is appropriate. However, we believe it is appropriate to charge participants when contract terms change. Consider the following (theoretical) example:

A participant purchases a contract for a 5th grader based on 5 years of payments, started in 2012. The lump sum cost of the contract, based on the 2012 pricing is $24,564 (before the $3 per year to matriculation charge). This amount is expected to grow to $41,556 by the date of matriculation, based on the 7.8% gross rate of return. Assume the contract holder makes the first two years of payments and then stops for 3 years, then makes the final payment in month 60. They would have made 24 payments of $493 and one payment of $17,748 ($493 x 36 + $15). At matriculation, MPACT would have accumulated $38,435 on behalf of this beneficiary (assuming actual earnings were 7.8% each year). MPACT would be short by $3,121 or approximately 7.5% of the expected cost at time of matriculation. Note, the extra $15 in the final payment is our understanding of the additional late charges that would occur under this situation. Currently, there is no mechanism to make up this difference other than experience gains. We recommend that MPACT re-evaluate the costs to determine if additional costs should be assessed before allowing any changes in contract terms. An analysis of how much contract terms may have cost MPACT in the past was outside of the scope of this project.

Recommendation:

We recommend that contract holders be charged for the lost income that MPACT was expected to earn when members restart payments after being late or delinquent. Alternatively, MPACT could just reduce the available credit hours by the amount of the lost income.

B. Replication of Results

WAT Development

We have reproduced the WAT (Weighted Average Tuition) development. The WAT is basically an average of the tuition charged by participating schools, weighted by their resident enrollment. It is the basis on which the costs of the program are established. In addition, for participants who chose private or out-of-state schools, the WAT is used to determine the benefit payable upon matriculation.

We find the WAT development for both the 4-year and the 2-year colleges to be reasonable. However, we see no justification for using different methods (WAT for 4-year colleges is weighted on current enrollment; WAT for 2-year colleges is weighted on average of last two year enrollments). The replication chart shows that using the current 4-year method for the 2-year WAT would have produced results that were not materially different for the 2012 WAT calculation. We therefore recommend using the current 4-year method for both the 4-year WAT and the 2-year WAT. Tables 9 and 10 show that GRS was able to reasonably replicate BPS&M's WAT calculation for both the 4-year college and the 2-year college.

Recommendation:

- Unify the calculation for determining the WAT for 4-year and 2-year colleges.

Table 9

WAT Development for 4-Year Colleges

	Resident Student Enrollment	BPS&M Weighting	GRS Computation of Weighting	Tuitions Reported to BPS&M	Proportionate Fee Based on Weighting
Alcorn State University	3,464	5.15%	5.15%	$ 5,712	$ 294.17
Delta State University	3,626	5.39%	5.39%	5,724	308.52
Jackson State University	7,372	10.96%	10.96%	5,988	656.28
Mississippi State University	17,828	26.51%	26.51%	6,264	1,660.59
Mississippi University for Women	2,207	3.28%	3.28%	5,316	174.36
Mississippi Valley State University	2,043	3.04%	3.04%	5,628	171.09
University of Mississippi	16,734	24.89%	24.89%	6,282	1,563.59
University of Southern Mississippi	13,970	20.78%	20.78%	6,336	1,316.62
Total	67,244				
WAT -- GRS Calculation					$ 6,145.23
WAT BPS&M Calculation					$ 6,145.00

Table 10

WAT Development for 2-Year Colleges

	Fall 2010 In State Enrollment	Fall 2011 In State Enrollment	GRS Calculated Average	BPS&M Calculated Average Enrollment	GRS Calculated Weighting	BPS&M Calculated Weighting	2013 Fees and Tuition Reported to BPS&M	Proportionate Share of Tuition	Weighting if Based Only on 2011 Enrollment	Proportionate Share of Tuition
Coahoma CC	2,696	2,676	2,686	2,686	3.35%	3.35%	2,300	77.05	3.47%	79.81
Copiah-Lincoln CC	3,799	3,428	3,614	3,614	4.51%	4.51%	2,100	94.71	4.44%	93.24
East Central CC	2,617	2,425	2,521	2,521	3.14%	3.14%	2,110	66.25	3.14%	66.25
East Mississippi CC	5,306	4,836	5,071	5,071	6.32%	6.32%	2,450	154.84	6.27%	153.62
Hinds CC	12,791	11,800	12,296	12,296	15.33%	15.33%	2,060	315.8	15.29%	314.97
Holmes CC	6,404	6,172	6,288	6,288	7.84%	7.84%	2,138	167.62	8.00%	171.04
Itawamba CC	7,742	7,278	7,510	7,510	9.36%	9.36%	2,000	187.2	9.43%	188.6
Jones County JC	5,323	4,687	5,005	5,005	6.24%	6.24%	2,380	148.51	6.07%	144.47
Meridian CC	3,980	3,584	3,782	3,782	4.72%	4.72%	2,244	105.92	4.64%	104.12
Mississippi Delta CC	3,392	3,205	3,299	3,299	4.11%	4.11%	2,450	100.7	4.15%	101.68
Mississippi Gulf Coast CC	10,072	9,398	9,735	9,735	12.14%	12.14%	2,472	300.1	12.18%	301.09
Northeast Mississippi CC	3,614	3,324	3,469	3,469	4.33%	4.33%	2,172	94.05	4.31%	93.61
Northwest Mississippi CC	8,370	7,798	8,084	8,084	10.08%	10.08%	2,250	226.8	10.10%	227.25
Pearl River CC	5,014	4,658	4,836	4,836	6.03%	6.03%	2,300	138.69	6.04%	138.92
Southwest Mississippi CC	2,096	1,906	2,001	2,001	2.50%	2.50%	2,090	52.25	2.47%	51.62
Total	83,216	77,175	80,197	80,197					100.00%	
WAT -- GRS Calculation								2,230.49		2,230.29
WAT -- BPS&M Calculation								2,230.00		2,230.00

Bias Load

The valuation used a 3% bias load to account for participants being more likely to select higher cost schools than the current statewide enrollment. This activity is not currently accounted for in the pricing, resulting in a potential undercharging to current participants. We have tested the load by recalculating the WAT based on the average in state enrollment of MPACT participants. That calculation produces a WAT that is approximately 1.6% higher than the WAT based on all in-state enrollment for 4-year colleges and approximately 2.6% lower for 2-year colleges, as shown in the tables on the following page. We recommend that the bias load be adjusted based on that analysis and included in the pricing.

Table 11

WAT Development for 4-Year Colleges Based on Participant Enrollment -- All Years

	Participant Enrollment	GRS Computation of Weighting	Tuitions Reported to BPS&M	Proportionate Fee Based on Weighting
Alcorn State University	97	0.28%	$ 5,712	$ 15.99
Delta State University	1,207	3.54%	5,724	202.63
Jackson State University	223	0.65%	5,988	38.92
Mississippi State University	14,044	41.19%	6,264	2,580.14
Mississippi University for Woman	513	1.50%	5,316	79.74
Mississippi Valley State University	25	0.07%	5,628	3.94
University of Mississippi	12,487	36.63%	6,282	2,301.10
University of Southern Mississippi	5,497	16.12%	6,336	1,021.36
Total	34,093	99.98%		
Participant Enrollment WAT				$ 6,243.83
In-State Enrollment WAT				$ 6,145.00
Bias				1.6%

Table 12

WAT Development for 2-Year Colleges Based on Participant Enrollment -- All Years

	Participant Enrollment	GRS Calculated Weighting	2013 Fees and Tuition Reported to BPS&M	Proportionate Share of Tuition
Coahoma CC	2	0.02%	2,300	0.46
Copiah-Lincoln CC	478	5.75%	2,100	120.75
East Central CC	491	5.90%	2,110	124.49
East Mississippi CC	54	0.65%	2,450	15.93
Hinds CC	2,333	28.05%	2,060	577.83
Holmes CC	199	2.39%	2,138	51.1
Itawamba CC	922	11.09%	2,000	221.8
Jones County JC	1,185	14.25%	2,380	339.15
Meridian CC	353	4.24%	2,244	95.15
Mississippi Delta CC	309	3.72%	2,450	91.14
Mississippi Gulf Coast CC	7	0.08%	2,472	1.98
Northeast Mississippi CC	400	4.81%	2,172	104.47
Northwest Mississippi CC	769	9.25%	2,250	208.13
Pearl River CC	614	7.38%	2,300	169.74
Southwest Mississippi CC	200	2.41%	2,090	50.37
Total	8,316			
Participant Enrollment WAT				2,172.49
In-State Enrollment WAT				2,230.00
Bias				-2.6%

In Tables 11 and 12, a participant was counted once for each semester of attendance of either the fall or spring semesters. We also performed this calculation for only the last 3 years and found no material difference from the calculations for all years. The portion of payments corresponding to those at in-state guaranteed schools represents approximately 75% of all participant payments.

Recommendation:

We recommend the following:

1. Bias Load For Pricing -- to be added to WAT to determine cost
    a. Include a 2.6% load on the development of costs for 4-year schools
    b. Include a 0.0% load on the development of costs for 2-year schools
2. Bias Load for Valuation
    a. Increase liabilities by 2% to account for the bias (this is approximately equal to 75% x 2.6%) for future attendance at 4-year colleges
    b. Increase liabilities by 0% to account for the bias for future attendance at 2-year colleges

Note, we are recommending that the cost of the contract be the WAT plus an increase for the Bias Load, we are not recommending that the Bias Load be part of the WAT calculation. The WAT is used to determine the payout to participants electing out of state or private colleges. If it were increased, then payments to participants electing out of state or private colleges would also be increased. By maintaining the WAT calculation, as is, and then increasing the pricing for the Bias, the pricing becomes more reflective of actual system costs, without unintentionally increasing payments to participants electing out of state or private colleges.

Payment Plans

GRS was not able to exactly replicate every monthly payment plan amount in the 2012 pricing report. However, our calculations were reasonably close to the current actuary's calculation in most cases (within 2%). Given the other recommendations regarding pricing contained herein, GRS felt that further investigation of this difference was not warranted.

Recommendation:

- None.

Price Setting/Adjudication

During the process of discussing data needs with MPACT staff and collecting data, GRS was given information from the "grid" regarding payments made to schools from MPACT. The information detailed did not produce a uniform per credit hour cost for some schools. We understand that there is a 3-phase adjudication process in place to ensure that the correct payments are made to each school. In addition, we understand that annual statements are sent to each beneficiary indicating the number of credit hours used and the number of credit hours remaining in their accounts. There was not enough detail in the grid for us to fully audit the actual payment process. In addition, an audit of the actual payment process was outside the scope of this engagement.

Recommendation:

- While MPACT's adjudication procedures appear to be sufficient, we recommend that the procedures be periodically reviewed (such as every 5 years) to ensure that the procedures continue to be kept up to date.

Fees

From time to time fees that are considered to be payable by the plan have changed. When such a change has occurred in the past, we understand it has applied to participants whose purchase price was determined prior to the change. In other words, they received a benefit that they did not fund. To the extent that such a change is: 1) de-minimus; and 2) the fund has an adequate reserve to cover the change, it will likely not have a large impact on the funded status of the plan. However, given the current funded status of the plan, any change in the payment of fees to include fees beyond what was included in the pricing could result in accelerating insolvency.

Recommendation:

- Only pay fees that were included in the calculation of the WAT at the time the participant's benefit was priced.

Credit Hour Derivation

MPACT is charged by in state public schools through the use of the “grid.” The “grid” is a chart produced by the schools that breaks the annual cost of tuition into a per credit hour cost. The derivation of the credit hours used in the development of pricing is based on a 32 credit hour year. This means that the pricing, which is developed on an annual basis, is converted to credit hours by dividing the annual costs by 32 (i.e., one credit hour equals 1/32 of the annual cost). At some point,

the schools began charging MPACT, based on a 24 credit hour year as shown in the "grid". This means that MPACT is paying 1/24 of the annual costs for each credit hour. We understand this was a change by the schools that was implemented after MPACT was created.

Recommendation:

- MPACT should change its development of the per credit hour costs to match the way the schools develop the per credit hour cost;
- MPACT should monitor the schools development of the per credit hour charge and adjust current contracts (and future pricing methods) if the schools change their methods again;
- MPACT monitor the timing of the "grid" to ensure that pricing is based on the most recent data available.

SECTION III

ACTUARIAL VALUATION AUDIT

A. Review of Assumptions and Methods

The following assumptions are used in the soundness valuation:

Assumed Rate of Return:	7.8%.
Assumed Rate of Tuition Increases	
o **Four Year Colleges:**	6.5%.
o **Two Year Colleges:**	6.0%.
Incidence of Benefit Payment	
o **If paid after schooling starts (beneficiary is under age 5):**	Benefit payments (Matriculation) begin at age 18 and are paid in consecutive years at the full time rate.
o **If paid after schooling starts:**	Benefit payments (Matriculation) begin the semester after graduation from high school (assuming each one grade is completed per year in the future) and are paid in consecutive years at the full time rate.
Refunds/Cancellations:	None.
Death and Disability:	None.
Election of Program Changes:	None.
Election of Change of Beneficiary:	None.
Expense Loading:	Liabilities are increased by 5% to account for administrative expenses in excess of expenses included in price setting.
Contract Terms:	No changes in contract terms are assumed, once initiated.
Bias Load:	3%.

Other assumptions not detailed in report:

Timing of Payments:	One payment per year, occurring in July.
Full Time Status:	Participants are assumed to be enrolled full time in all future semesters.
Participants with Mixed Plans:	Participant is assumed to move to a 4-year school as soon as the junior college credit hours are expired.

- Remaining credits at the end of the assumed attendance period are assumed to be paid the semester after projected graduation.
- If participant is projected to change schools (due to a mixed program) the projected WAT is assumed to be paid during enrollment in the second school.
- If a Community College plan was purchased, but participant is enrolled in a 4-year College/University, the projected Community College WAT was used.
- If a 4-year College/University plan was purchased, but the participant is enrolled in a Community College, the projected 4-year College/University WAT was used.

GRS believes that the methods and assumptions used in the valuation are generally reasonable. However, we note that there are differences in the manner in which the assumptions are handled in the valuation from the way they are handled in the pricing. In particular, the following assumptions and methods are handled differently:

- Discount Rate
- Expense Loading
- Bias Load

Discount Rate and Expense Loading

While the two expense loading methods appear to produce similar aggregate results, we believe that the process would be more transparent if the methods were more uniform. We have discussed proposed changes in the pricing section that would be similar to the methods currently used for the valuation.

We believe there is justification for using different interest rates on the pricing, based on the expected investment horizon for the average contract holder (currently 8 years). Under the current asset allocation, the median expected return is 7%, as shown on page II-4, which may justify lowering the investment return assumption.

Recommendation:

- Consider lowering the assumed rate of investment return closer to the median

Bias Load

We find the use of a Bias Load to be reasonable and appropriate in the valuation. We recommend that the Bias Load be based on plan's experience. Pages II-11 through II-14 show the details of the plan's actual experience.

Recommendation:

1. Bias Load For Pricing -- to be added to WAT to determine cost
    a. Include a 2.6% load on the development of costs for 4-year schools
    b. Include a 0.0% load on the development of costs for 2-year schools
2. Bias Load for Valuation
    a. Increase liabilities by 2.0% to account for the bias (this is approximately equal to 75% x 2.6%) for future attendance at 4-year colleges
    b. Increase liabilities by 0% to account for the bias for future attendance at 2-year colleges

Note the 75% factor in the development of the bias load is to reflect the fact that the analysis of the development of the 2.6% load did not account for those members electing private/out of state schools or refunds.

Unmatriculated Contracts Past Date of Matriculation

Contracts that have not matriculated and are past matriculation date are assumed to matriculate immediately. We believe this is a reasonable assumption. However, to the extent that those contracts do not matriculate, this assumption may overstate the underfunding and accelerate the depletion date of the program. Based on the June 30, 2012 data, MPACT expects to pay out $23.9 million on behalf of contracts that have matriculated or are due to matriculate in fall 2012.

In addition, there are $10 million of payments that could be triggered if all the participants that are past matriculation decide to matriculate in the current year.

Assuming that all contracts that are past matriculation, matriculate immediately is a reasonable assumption in the absence of evidence to the contrary. However, the data suggests that the average past due period of those contracts that are past matriculation is approximately 2½ years.

Recommendation:

Therefore, we recommend that only 75% of remaining unmatriculated accounts be assumed to matriculate each year in the future.

B. Replication of Results

Table 13 indicates the GRS valuation results and compares them with the BPS&M Results:

Table 13

	BPS&M	GRS	Percentage Difference
Market Value of Assets	$ 265,125,878	$ 265,125,878	0.00%
Present Value of Future Contract Payments	47,879,884	48,094,160	0.45%
Present Value of Future Tuition and Fee Payments	407,429,782	405,539,000	-0.46%
Surplus/(Deficit)	(94,424,020)	(92,318,962)	-2.23%
Funded Status	76.82%	77.24%	

Table 13 indicates that GRS was able to replicate BPS&M's results well within reasonable tolerances.

SECTION IV

OTHER PROGRAM CONSIDERATIONS

Claims Reserve

This program operates much like an insurance contract. Essentially, the contract holder is purchasing insurance on 1) the future investment returns and 2) the future increase in tuition. Since it operates like an insurance contract, it should be administered like an insurance contract. We therefore recommend the buildup of a claims reserve that is equal to 15% to 20% of expected future claims. This has implications in both the pricing and the valuation. In the pricing, there should be a cost element to account for the claims reserve. This can be accomplished by loading the actual costs by the amount of the reserve. In the valuation, this means that the funding target is 100% plus the adopted reserve (115% to 120%).

If the claims reserve is adopted, then the Board should also set up parameters that address how to handle the situation when the funded status falls out of the target range (either above or below). Some ideas that could be explored include:

1. Establishing a State funded reserve. This would be a side reserve that state contributions would flow into when needed. For example, if a claims reserve range of 15%-20% was adopted, then the state would make an annual contribution to the reserve fund whenever the funded status was below 115% and the reserve fund would make a refund to the State whenever the funded status was above 120%;
2. Establishing a dividend feature with a reduced guarantee. Under this idea, MPACT would only guarantee up to 3 years of tuition payments. The cost of the contract would be established based on the expected 3 years of tuition payments plus expenses plus a reserve load. The reserve load would be based on the expected cost of the fourth year of tuition, plus expenses plus 10%. Each contract holder would receive a dividend type account. Initially, that account would be credited with the contributions to fund the fourth year. Any future gains or losses on the operation of the fund would add to or reduce the credits in the dividend fund. In essence, this would be like a DB plan for the first three years and a DC plan for the fourth year. A similar arrangement would need to be developed for purchases of less than 4 years, so that every contract holder would have both kinds of accounts. In addition, some level of state contributions may still be needed in the event of a protracted down market or protracted period of tuition increases.

Other Program Changes for Consideration

To limit the downside exposure, we recommend reducing the 10-year period that accounts may be used after matriculation. We suggest the following modifications:

1. In order to maintain the guarantee, accounts must matriculate by the earlier of 3 years after actual high school graduation or 5 years after anticipated date of graduation made at contract initiation.
2. Guarantee will only be good for up to 6 years after matriculation.
3. Credits unused upon college graduation are forfeited.