Actuarial Methods and Public Pension Funding Objectives: An Empirical Examination

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Abstract

This paper examines the degree to which certain actuarial methods satisfy public pension plan funding objectives. It compares the funding patterns that result from a conventional actuarial approach used by the majority of public plans with patterns that result from the "market value of liability" (MVL) approach. The comparison is made by applying these approaches to a modeled public plan based on historical demographic, economic and investment data over the period from 1978 to 2008. The paper finds that funding under the MVL approach would likely result in rapid and erratic changes to a public plan's normal costs, accrued liabilities and funded levels; due largely to changes in the MVL discount rate. By contrast, conventional funding results in measures that are more stable and predictable over time. Consequently, the paper concludes that the conventional approach is more effective in meeting the funding objectives of public pension plans. The serious instabilities in the MVL measures would most likely lead either to erratic demands on government resources or plan terminations. If the MVL approach were applied, we believe it would ultimately be abandoned as being too unstable for state and local governments.

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Introduction

Recently, there has been considerable discussion within the actuarial community regarding the advantages and disadvantages of applying the "market value of liability" (MVL) to public pension plans. Proponents argue that using the MVL is essential for achieving transparency in financial reporting and for sustaining public pension plans, which they believe are threatened by growing unfunded liabilities, unsustainable benefit promises, investment allocations containing excessive risk, and a propensity of governments to shift costs to future taxpayers.[1] However, many actuaries who work with public plans take issue with this position. They argue against applying the MVL to either financial reporting or plan funding on the grounds that it would misstate public plan costs and liabilities, increase the volatility of contributions, and confuse decision-makers, taxpayers, and the media, all without achieving the stated goal of improving transparency in financial reporting.

Among MVL proponents, there is also debate about how the theory should be applied. Some suggest it should be used to present information in actuarial valuation reports, but not used to determine plan contribution rates. Others suggest that it should be used to determine contribution rates. Still others see it as a useful tool for examining investment risk, but not for measuring plan liabilities or contributions.

Most arguments for and against the MVL approach are based on theoretical constructs. This paper attempts to develop more empirical information about the funding patterns and contribution rates that result from applying MVL measurements, compared with a more

[1] Ennis (2007).

conventional approach, typically used by public plans. This is done by applying the MVL approach to a modeled plan, based on data from a medium-sized, statewide public pension plan, over the period from 1978 through June 2008. The MVL results are then compared with results obtained by applying the more conventional approach. Because constructing a model necessarily requires certain abstractions and simplifications, we consider our results illustrative rather than definitive. Nevertheless, we believe they offer new and useful insights into these different actuarial approaches. The paper concludes with a discussion of how the results relate to public pension funding objectives.

Methodology

Most U.S. public pension plans determine their actuarial costs and liabilities using the entry age normal cost method and a present value discount rate based on the expected long-term returns of plan investments. The entry age normal cost method includes projected future service and salary in the calculation of normal costs and determines contribution rates as a level percent of payroll. In determining plan-funded levels, many public plans average (or "smooth") investment gains and losses into the recognized value of assets over a period of time, typically five years.[2] These smoothing methods are used to mitigate the effects of short-term investment fluctuations on plan costs and liabilities, and to establish contribution rates, which are intended to remain a reasonably level percent of payroll over time. This is referred to as the "conventional approach" throughout the paper.

The MVL approach uses the unit credit actuarial cost method and a discount rate based on risk-free (e.g., U.S. Treasury) bond yields.[3] The unit credit cost method excludes projected future service and salary from the accrued liability, and bases normal costs only on one additional year of service and salary after the valuation date. In determining plan-funded levels under the MVL approach, the market value of assets is used as of the valuation date. The MVL method is intended to determine a "market value" for the plan liabilities, as if the liabilities could be bought and sold in the financial markets. Whether MVL actually reflects the market value of plan liabilities (or even if there is such a market value) are important issues; however, they are outside the scope of this paper.

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[2] Brainard (2008), p. 3. Although a few public plans value assets at market, most average investment gains and losses over three to five years, and sometimes longer.

[3] There is some difference of opinion in the MVL literature regarding whether the discount rate should be based on yields of Treasury bonds or of investment-grade corporate bonds. This paper uses the yields on 30-year Treasury bonds as the risk-free rate.

The modeled public plan in this study is based on historical valuation data (as of June each year) for a medium-sized, statewide public plan covering general employees. Given our experience with public plans, we believe the characteristics of the modeled plan are reasonably representative of other public plans covering general employees and teachers.[4] From 1978 to 2008, the number of active plan members grew from 33,000 to 54,000. During the same period, the average age of active members increased from age 41 to 45, and average years of service increased from nine years to about 11 years. These statistics reflect the general aging and tenure characteristics among general public employees and teachers, and show that the covered workforce is not a closed group. Also during the period, the number of annuitants grew from 6,600 to 30,000, causing the active/annuitant ratio to fall from 5.0 in 1978 to 1.8 in 2008. Additionally, the average age at retirement fell from 64 to 60, and the average age of annuitants fell from 71 to 69. The plan also paid automatic cost-of-living adjustments to annuitants.

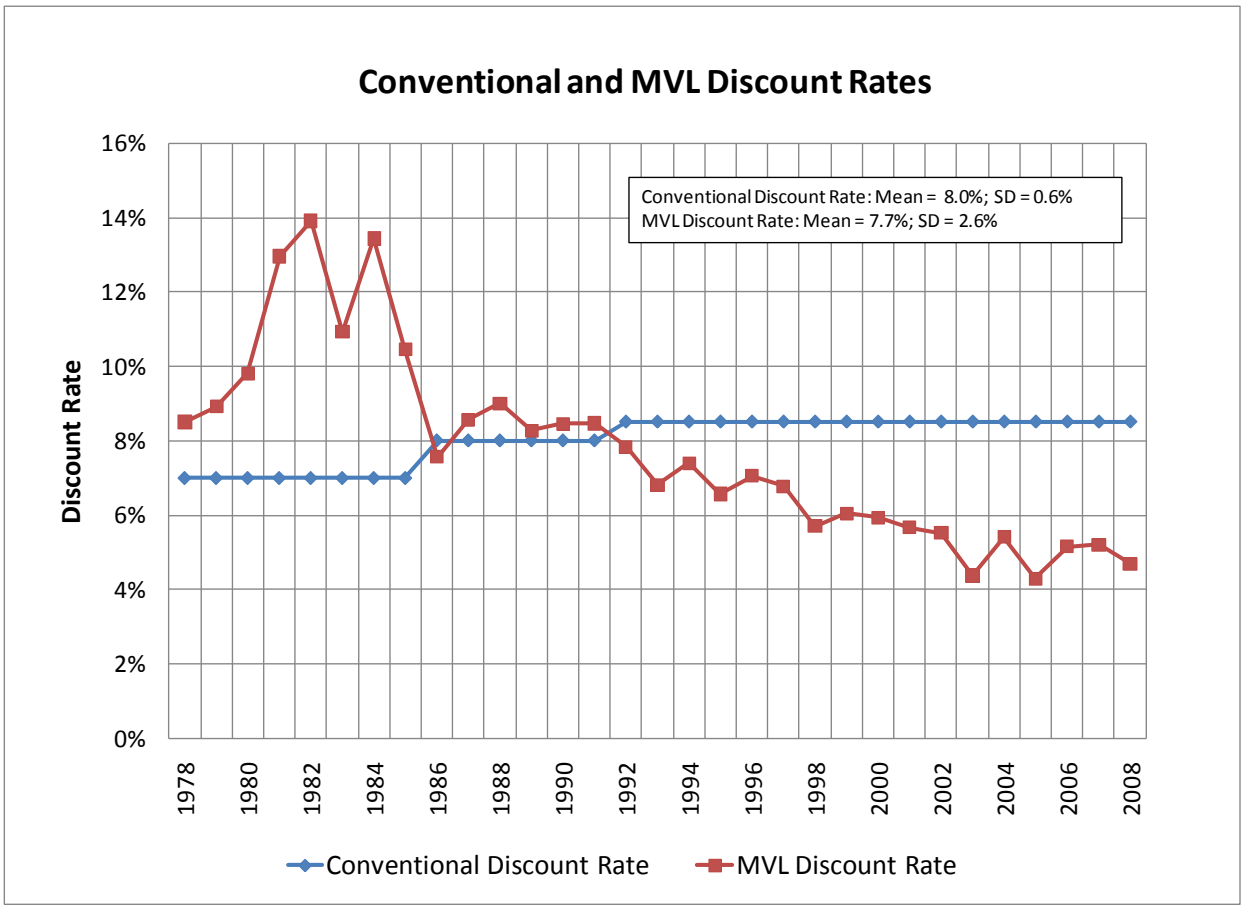
The results we report under the conventional approach are based closely on the actual valuation results of the public plan. However, certain changes were made to improve the consistency of results for the purposes of this study. For example, while the statewide plan's amortization period for unfunded liabilities varied from year to year, it was set to a 30-year open period for the study, and was applied in the same way under both the conventional and the MVL approaches. This was done to simplify the analysis by excluding the variability that would have otherwise resulted from a changing amortization period. Since some public plans use a 30-year open amortization period, we believe the results are still representative of a typical public plan. The impact of shorter amortization periods on MVL contribution rates is discussed on page 22.

[4] Plans for public safety employees have different demographic and benefit characteristics than plans for general employees and teachers. Consequently, the specific results of this study may not necessarily be representative of public safety plans. However, it is likely that the general results would be similar for public safety plans.

The MVL valuation results were derived from the conventional valuation results by applying certain factors developed during a recent MVL study for the plan. First, the actuarial accrued liability (AAL) determined under the entry age normal cost method was converted to the accumulated benefit obligation (ABO) under the unit credit cost method by applying a factor developed from the plan's data. Next the ABO was converted to the MVL by adjusting the ABO to reflect risk-free discount rates (based on annual 30-year Treasury bond yields). This was done by applying a formula reflecting the duration and convexity of plan liabilities. The duration and convexity factors were determined separately for active and annuitant members from plan data. The formula was applied separately to the liabilities of active and retired members, with the duration and convexity factors assumed to be constant over the study period. Finally, MVL normal costs were determined by multiplying the MVL for active members by a normal cost conversion rate based on plan data. Additional information about the methodology is presented in the appendix.

Because the study results are strongly influenced by the discount rates, it is useful to review the history of discount rates over the study period, as presented in Chart 1.

Chart 1



Under the conventional approach, the long-term assumed rate of return on plan investments is used as the discount rate for valuing plan liabilities. For the vast majority of public plans, this discount rate lies in a range from 7.0 percent to 8.5 percent, with many plans using 8.0 percent.[5] For the modeled public plan, the discount rate was 7.0 percent for the first eight years; 8.0 percent for the next six years; and 8.5 percent for the remaining years. Over the 30-year period, the conventional discount rate averaged 8.0 percent, with a standard deviation (labeled "SD" in the chart) of 0.6 percent. By comparison, the average rate of return earned on

[5] Brainard (2008), p. 8.

plan investments over the period (through June 2008) was 10.7 percent, with a standard deviation of 10.2 percent.

Under the MVL approach, a discount rate representing "risk-free" securities is used for valuing plan liabilities. Generally, this is interpreted to mean a discount rate based on long-term government bond yields, although other rates have been suggested by some MVL proponents. Our study uses annual yields on 30-year Treasury bonds as of the June valuation dates. As shown in the chart, these bond yields fluctuated widely during the study period. During the early part of the period, 30-year Treasury yields were very high (almost at 14 percent in 1982 and 1984). In 1986, they fell to 7.6 percent and then remained between 8 percent and 9 percent through 1992, after which they fell erratically over the remainder of the period to below 5 percent in 2008.[6] Over the period, the MVL discount rate averaged 7.7 percent, with a standard deviation of 2.6 percent. Because plan accrued liabilities are inversely proportional to the discount rate, a lower discount rate results in higher accrued liabilities, and vice versa.

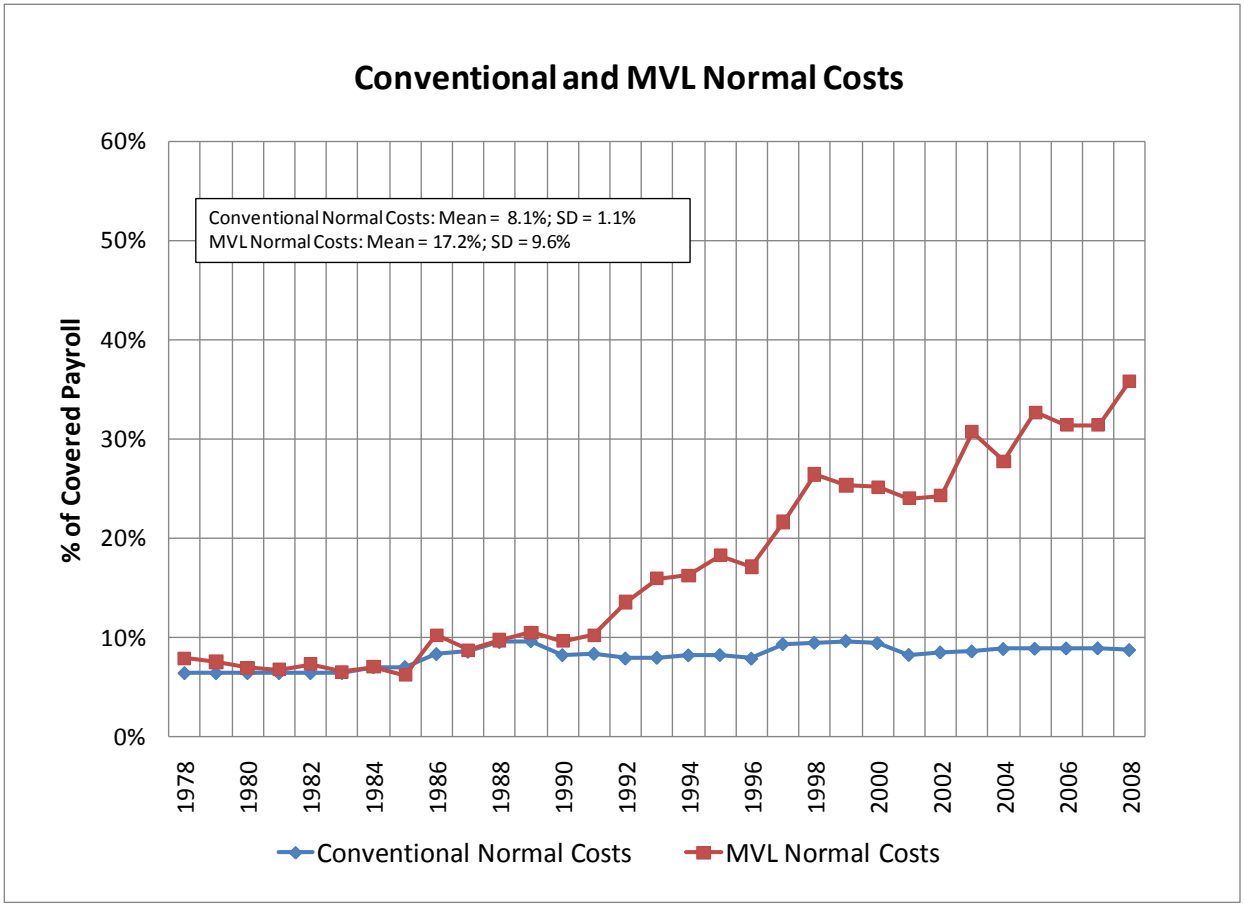
[6] The U.S. Treasury discontinued issuing 30-year Treasury bonds from February 2002 to March 2006. During this time, the Treasury estimated the yield on 30-year Treasury bonds for certain tax purposes using the yield on the 30-year Treasury bond maturing in February 2031. Consequently, some of the fluctuations in Treasury yields between 2002 and 2006 stem from the federal policy decision to discontinue 30-year bonds.

Results

Normal Costs

A plan's normal cost is the present value of benefits attributable to service performed in a given year. Under conventional (entry age normal cost) funding, the normal cost includes benefits attributable to projected service and salary. Under MVL funding, the normal cost includes only benefits attributable to the next year's service and salary. Chart 2 shows normal costs under the conventional and MVL funding approaches.

Chart 2



Conventional normal costs were 6.4 percent of covered payroll in 1978 and remained between 6 percent and 7 percent through 1985, after which they increased to 9.5 percent in the

late 1980s, and then fell to about 8.0 percent in 1992, where they remained through 1996. In 1997, normal costs increased to 9.3 percent, and then fell to around 8.5 percent in 2001, where they remained through 2008. The increases in normal costs were roughly coincident with four benefit increases over the period and the decreases were roughly coincident with increases in the long-term return assumption. For the period as a whole, normal costs averaged 8.1 percent with a standard deviation of 1.1 percent. A key factor in keeping normal costs stable was the use of a long-term expected return assumption.

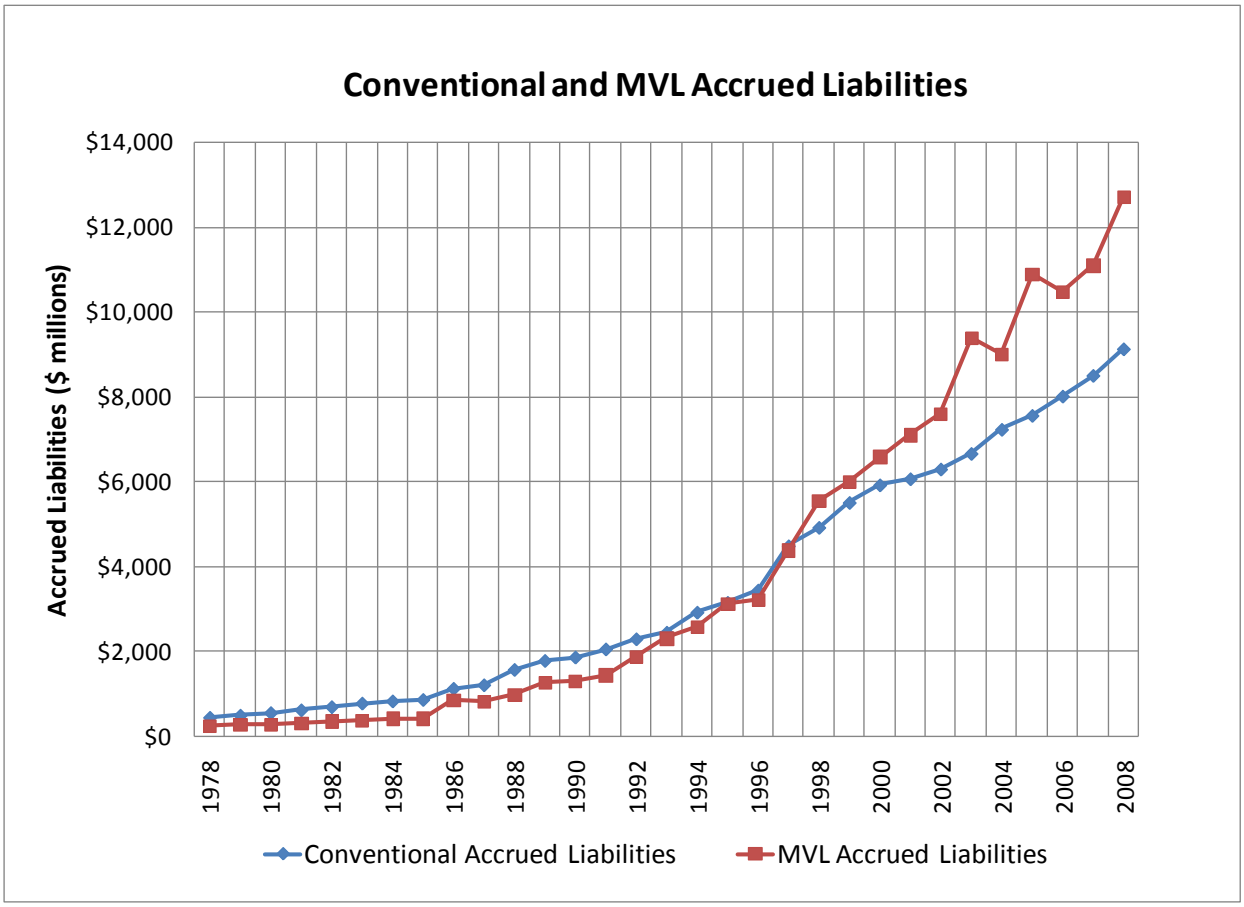
MVL normal costs were 7.9 percent of covered payroll in 1978 and fell to 6.2 percent in 1985. This decline in MVL normal costs was due to sharp increases in the MVL discount rate, from 8.5 percent in 1978 to 13.9 percent in 1982. MVL normal costs rose to 10.2 percent in 1986 (due to the fall in the discount rate) and remained between 9 percent - 10 percent of covered payroll through 1991. After 1991, MVL normal costs increased rapidly and erratically due to declines in the MVL discount rate which continued (with fluctuations) through 2008. MVL normal costs reached 30 percent of covered payroll in 2003 and about 36 percent in 2008. Over the 1978 to 2008 period, MVL normal costs averaged 17.2 percent of covered payroll, with a standard deviation of 9.6 percent. Note that MVL normal costs become more sensitive to changes in the discount rate as the discount rate declines.

Accrued Liabilities

Accrued liabilities are measured as the present value of accrued benefits under the cost method being used. Under the conventional approach, accrued liabilities include projected salary and service in the value of benefits. Under the MVL approach, accrued liabilities include benefits

based only on salary and service as of the valuation date. Chart 3 shows both conventional and MVL accrued liabilities over the 30-year period.

Chart 3



Conventional accrued liabilities were $441 million in 1978 and grew steadily to $9.1 billion in 2008, mostly as a result of an expanding covered payroll and a growing retired life group. MVL accrued liabilities were $248 million in 1978, and remained less than conventional accrued liabilities through 1994, largely due to the high yields on 30-year Treasury bonds during this period. From 1995 through 1997, accrued liabilities under both approaches were roughly the same. However, as 30-year Treasury bond yields declined after 1992, MVL accrued liabilities grew more rapidly and erratically than under the conventional approach, reaching $12.7 billion

in 2008. The erratic growth in MVL liabilities is especially evident in 2003, 2005 and 2008, when MVL liabilities increased by more than $1.6 billion each year, due largely to declines in the MVL discount rate.

One of the claims made by some MVL proponents is that conventional actuarial approaches systematically understate the accrued liabilities of public pension plans. If this were so, one would expect to see MVL accrued liabilities consistently higher than conventional accrued liabilities throughout the study period. However, as shown in Chart 4 below, this is not the case.

Chart 4

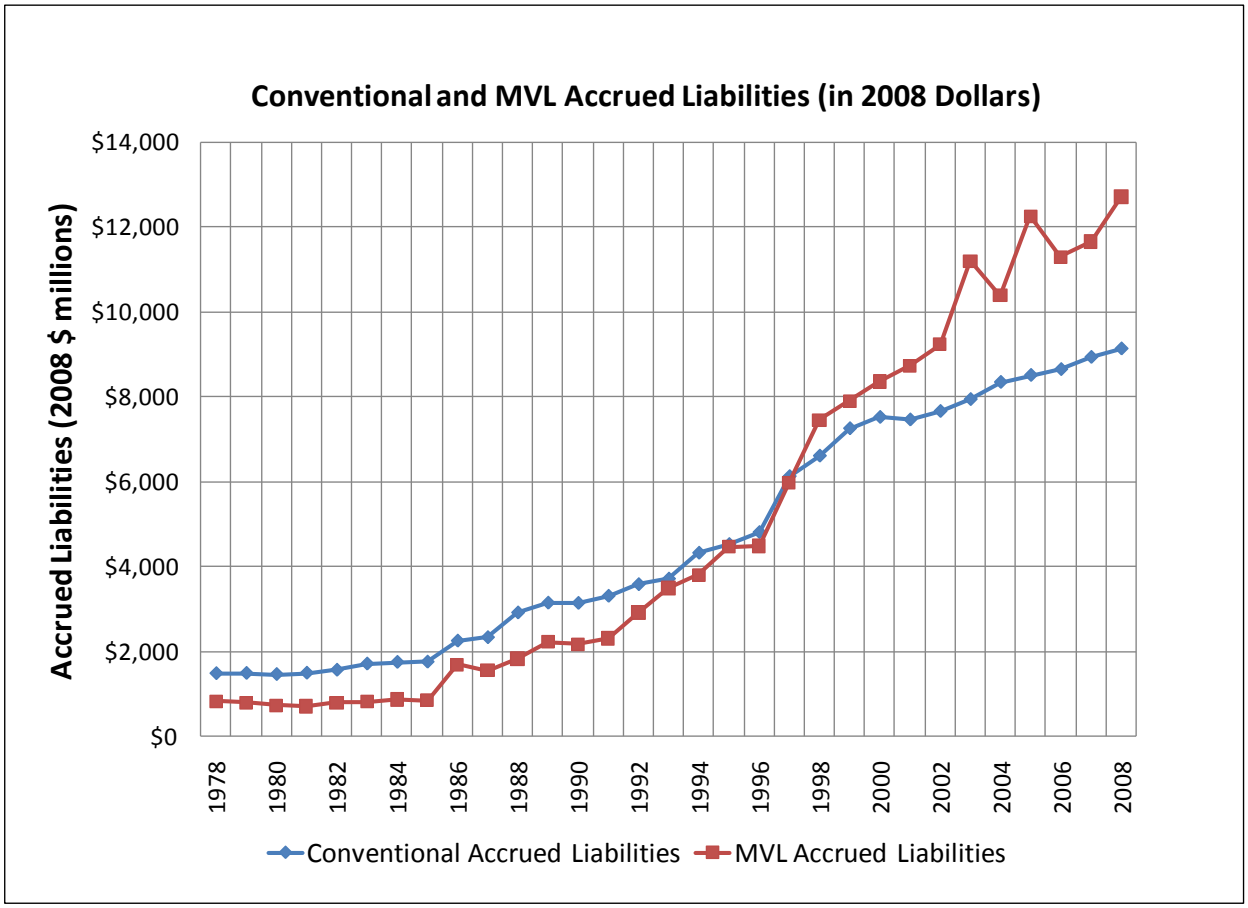


Chart 4 expresses the accrued liabilities shown in Chart 3 as constant 2008 dollars in order to provide a better picture of the relationship between the conventional and MVL values. For the first half of the study period, Chart 4 shows that the MVL accrued liabilities were significantly less than the conventional liabilities, at times only half as high. MVL accrued liabilities only begin to exceed conventional liabilities after 1997, when 30-year Treasury bond yields fell below 6 percent and then declined to nearly 4 percent over the remainder of the period.

Assets

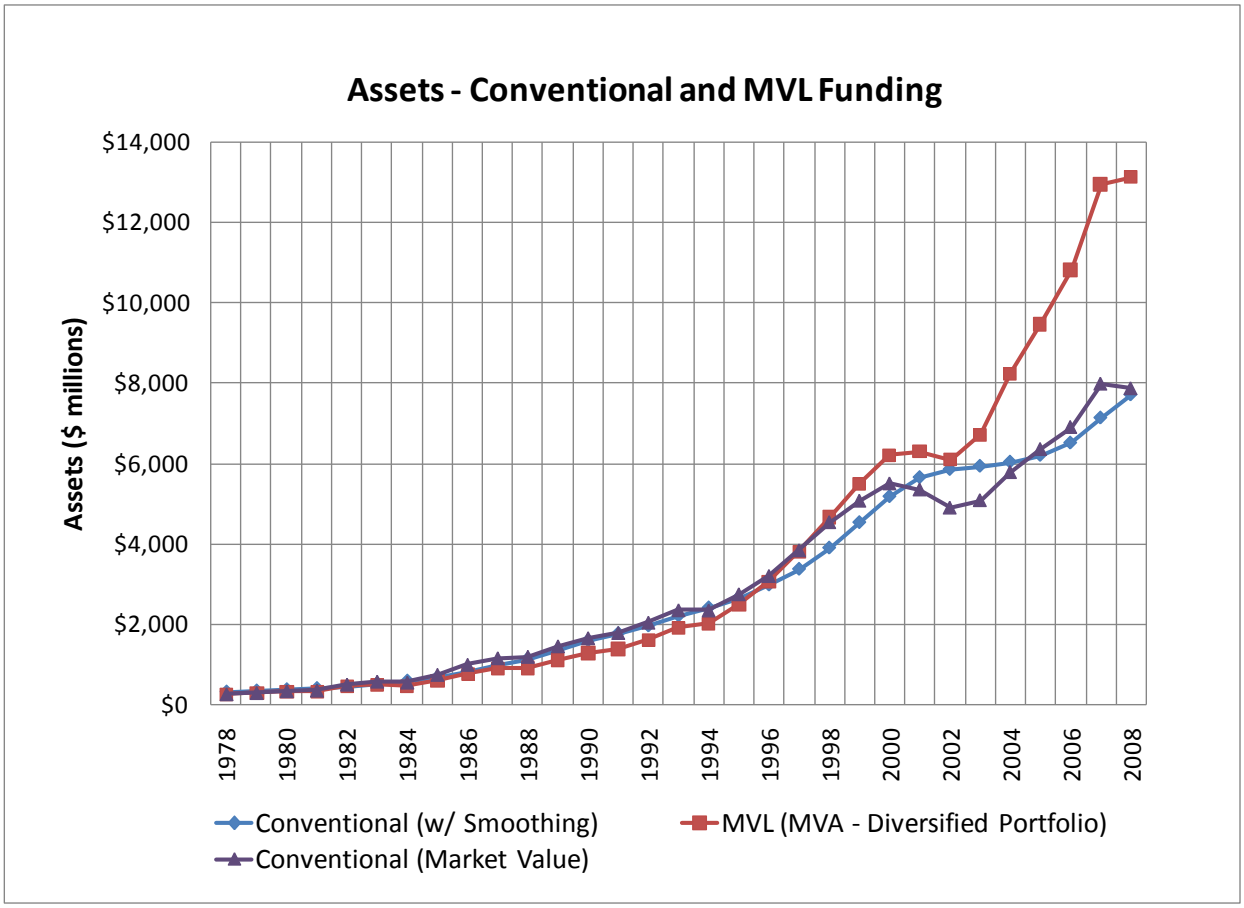
Actuarial valuations for public plans are primarily used to measure funding progress and establish plan contribution rates which, when combined with current assets and future contributions, are sufficient to sustain the plan over time. Under both MVL funding and conventional funding, contributions are made that build up investable assets. For actuarial purposes, under the conventional funding approach, investment gains and losses each year are usually averaged into the recognized value of assets, typically over a period of five years. Under MVL funding, the market value of assets is used, and so investment gains and losses are recognized immediately.

To facilitate comparison, assets under both funding methods are assumed to be invested in accordance with the plan's investment policy. In the late 1970s, the model plan's asset allocation was weighted more toward fixed-income securities, with about 35 percent in equities and 65 percent bonds.[7] However, over time the asset allocation shifted toward equities and by the

[7] As discussed in the Appendix, asset allocations for the model plan prior to 1983 were established using the asset allocations for public plans presented in the Federal Reserve's *Flow of Funds* reports from 1978 to 1982.

late-1990s was roughly 70 percent in equities and 30 percent in bonds. Starting in 2000, a growing portion of the portfolio was also placed in alternative investments. In a later section of this paper, we examine the effect of investing MVL assets solely in long-term government bonds. Chart 5 shows the growth of assets under the conventional and MVL funding approaches.

Chart 5



As shown in Chart 5, under conventional funding, the actuarial value of assets (using five-year smoothing) grew from $300 million in 1978 to $7.7 billion in 2008. Over the period from 1996 to 2000, assets grew rapidly, largely due to high returns in the domestic equities markets. Asset growth tapered off in 2000, due to the equity market declines from 2000 through 2002. Growth resumed in 2003 and continued through June 2008.[8] Chart 5 also shows the market value of assets under conventional funding. Note that asset smoothing evened out the impact of both market gains and market losses throughout the study period.

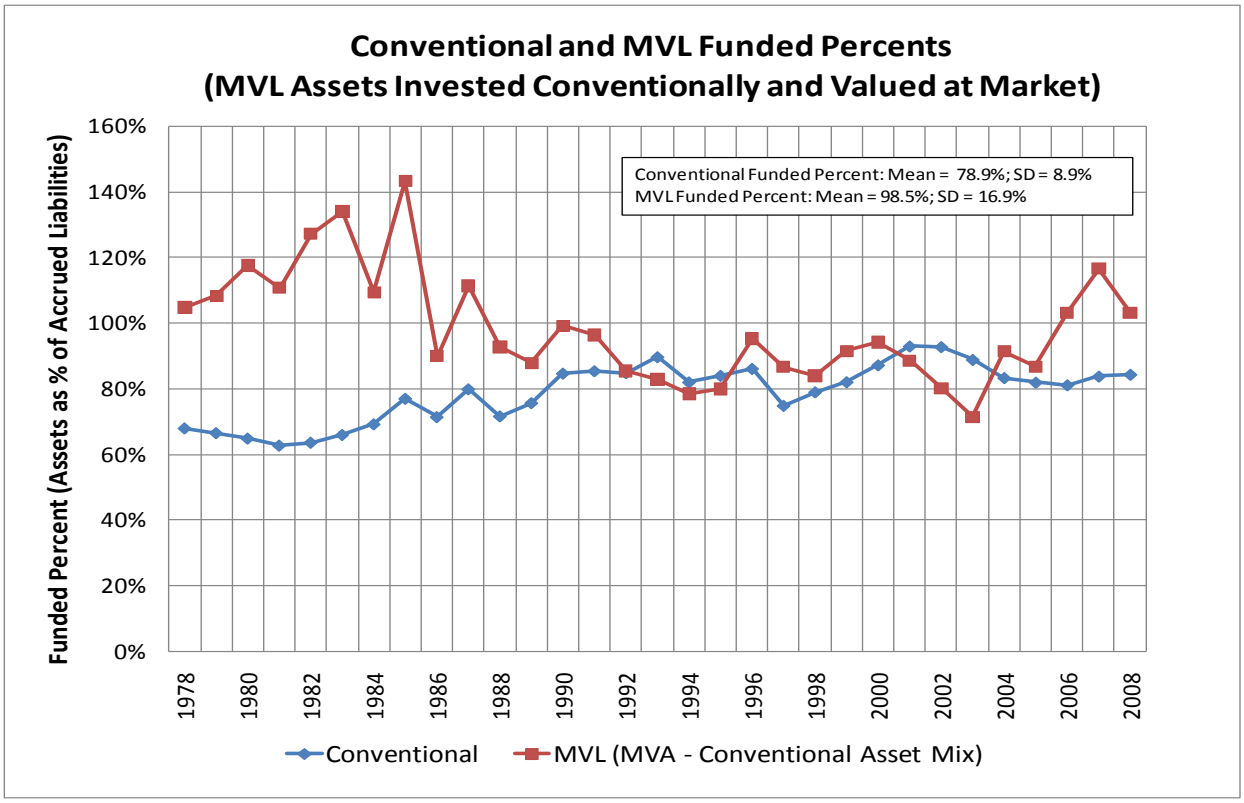
Under MVL funding, the market value of assets grew from $260 million in 1978 to $13.1 billion in 2008. Because assets are not smoothed under the MVL approach, asset growth is more volatile. While assets may appear to have performed better under MVL funding, this is not the case since the same asset allocations are assumed under both methods. The higher level of assets accumulated under MVL funding is due largely to the higher MVL normal costs in the later years, which caused higher contributions to be paid to the plan.

Funded Levels

Funded levels are determined by dividing the value of plan assets by accrued liabilities. Often, funded levels are used by decision makers and the media as a measure of the financial health of a plan. In addition, funded levels may be used to decide whether benefit enhancements are affordable. Chart 6 shows plan-funded levels under conventional and MVL funding.

[8] Given the recent market declines, the value of assets has fallen significantly since June 2008. However, the current decline does not change the historical patterns that are examined in this paper. While it would be useful to examine the current decline, we will leave that for a future paper.

Chart 6



Under conventional funding, the funded level in 1978 was 68 percent. It fell to 63 percent in 1981, and then grew slowly (and with some volatility) to 93 percent in 2001. It then fell again to 81 percent in 2006, and increased to 84 percent in 2008. The mean funded level was 79 percent with a standard deviation of 9 percent. The increases in plan-funded levels over the period from 1978 to 1999 are largely attributable to investment performance, with especially strong returns during the late 1990s. The low rate of annual change in the plan's funded levels is partly attributable to asset smoothing.

Under MVL funding, the funded level was 105 percent in 1978. It grew quickly and erratically to 143 percent in 1985, fell to 90 percent in 1986, rose again to 111 percent in 1987, and then fluctuated between 80 percent and 100 percent until 2003, when it fell to 71 percent. It

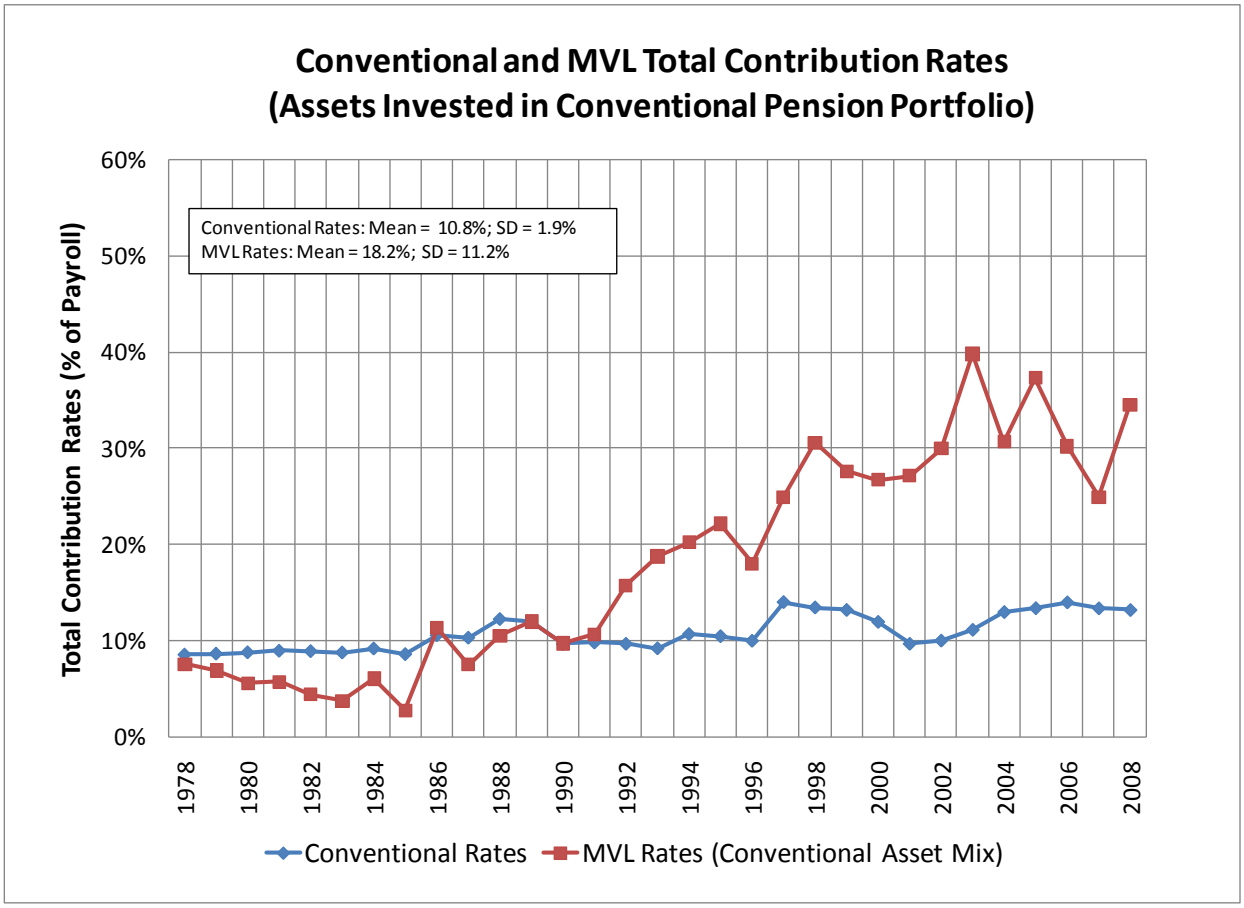
then increased to 117 percent in 2007, and fell to 103 percent in 2008. The mean funded level was 98 percent with a standard deviation of 17 percent. The volatility in the MVL funded level was due to two factors: (1) changes in the liabilities due to changes in the MVL discount rate, and (2) immediate recognition of investment gains and losses in the market value of assets.

Contribution Rates

As mentioned earlier in the paper, two primary purposes of actuarial valuations in the public sector are to measure funding progress and to establish plan contribution rates. Contribution rates are determined by adding plan normal costs together with the amortized value of unfunded (or more than fully funded) accrued liabilities. As a result, when accrued liabilities exceed assets, the amortized value of the unfunded liability is added to the contribution rate. When assets exceed liabilities, the additional assets are amortized to reduce the contribution rate.

For some public plans, an open 30-year period is used for this amortization. Under MVL funding, proponents typically advocate a much shorter amortization period. However, to simplify the analysis, the same 30-year period is used under both approaches. Chart 7 shows the contribution rates as a percent of payroll under both.

Chart 7



In many ways, Chart 7 is similar to Chart 2 showing normal costs. The difference is that Chart 7 includes the additional amounts needed to amortize the unfunded (or more than fully funded) accrued liabilities. Under conventional funding, because the funded level was below 100 percent over the study period, additional contributions were needed to amortize the unfunded liabilities and were added to normal costs. As a result, total contributions were 8.5 percent of covered payroll in 1978 (2.1 percentage points above normal cost that year) and increased to 13.2 percent in 2008 (4.5 percentage points above normal cost). Over the full 30-year period, conventional contribution rates averaged 10.8 percent of covered payroll, with a standard deviation of 1.9 percent.

Under MVL funding, the contribution rates were 7.5 percent of covered payroll in 1978 (0.4 percentage points below normal cost), falling to 2.8 percent in 1985 (3.4 percentage points below normal cost), then sharply increasing to 11.3 percent in 1986 (1.1 percentage point above normal costs), and remaining between 8 percent and 12 percent through 1991. After 1991, contribution rates rose rapidly and erratically to 39.8 percent in 2003 (9.1 percentage points above normal cost), falling to 24.9 percent in 2007 (6.5 percentage points below normal cost), and then jumping again to 34.5 percent in 2008 (1.3 percentage points below normal cost). Over the period, MVL contributions averaged 18.2 percent, with a standard deviation of 11.2 percent. It is interesting to note that under the MVL approach, contributions are low at precisely the times when high investment returns can be locked-in through the purchase of high yielding Treasury bonds. In 1982, for example, 30-year Treasury bond yields were 13.9 percent while MVL contribution rates were only 4.4 percent. Higher contribution rates at the time would have allowed more funds to be invested in the high-yielding Treasury bonds.

As discussed in the section on accrued liabilities above, some MVL proponents claim the conventional approach systematically understates the costs of funding public pension plans. However, if that were the case, one would expect MVL contribution rates to always be higher than conventional contribution rates. However, this is not borne out in Chart 7. For the first half of the 1980s, MVL contribution rates were lower than conventional contribution rates. In fact, in 1985 the MVL contribution rate (2.8 percent) was only one-third of the conventional contribution rate (8.6 percent). Due largely to declines in the MVL discount rate, this relationship reversed in the late 1990s, with MVL contribution rates running about three times conventional contribution rates. Note that in 2003, the MVL contribution rate (39.8 percent) was

almost four times the conventional contribution rate (11.1 percent). Much of the volatility in MVL contribution rates is due to the volatility in MVL normal costs which, in turn is related to the discount rate. The additional volatility in MVL contribution rates is due to the greater variations in funded levels under the MVL approach, as well as the impact of the changing discount rates on the amortization of unfunded liabilities.

It is important to note that the study assumes all contributions were made to the plan in all years under both approaches. However, realistically, it is unlikely that contribution rates of 30 percent (or more) could be paid by the plan's sponsor. Moreover, contribution rates that jump from 30 percent to 40 percent in one year (2003), fall back to 30 percent the next, then jump to 37 percent the next, and fall to 25 percent two years later could well lead to the closing of the plan, or (perhaps more likely) abandonment of the computation method.

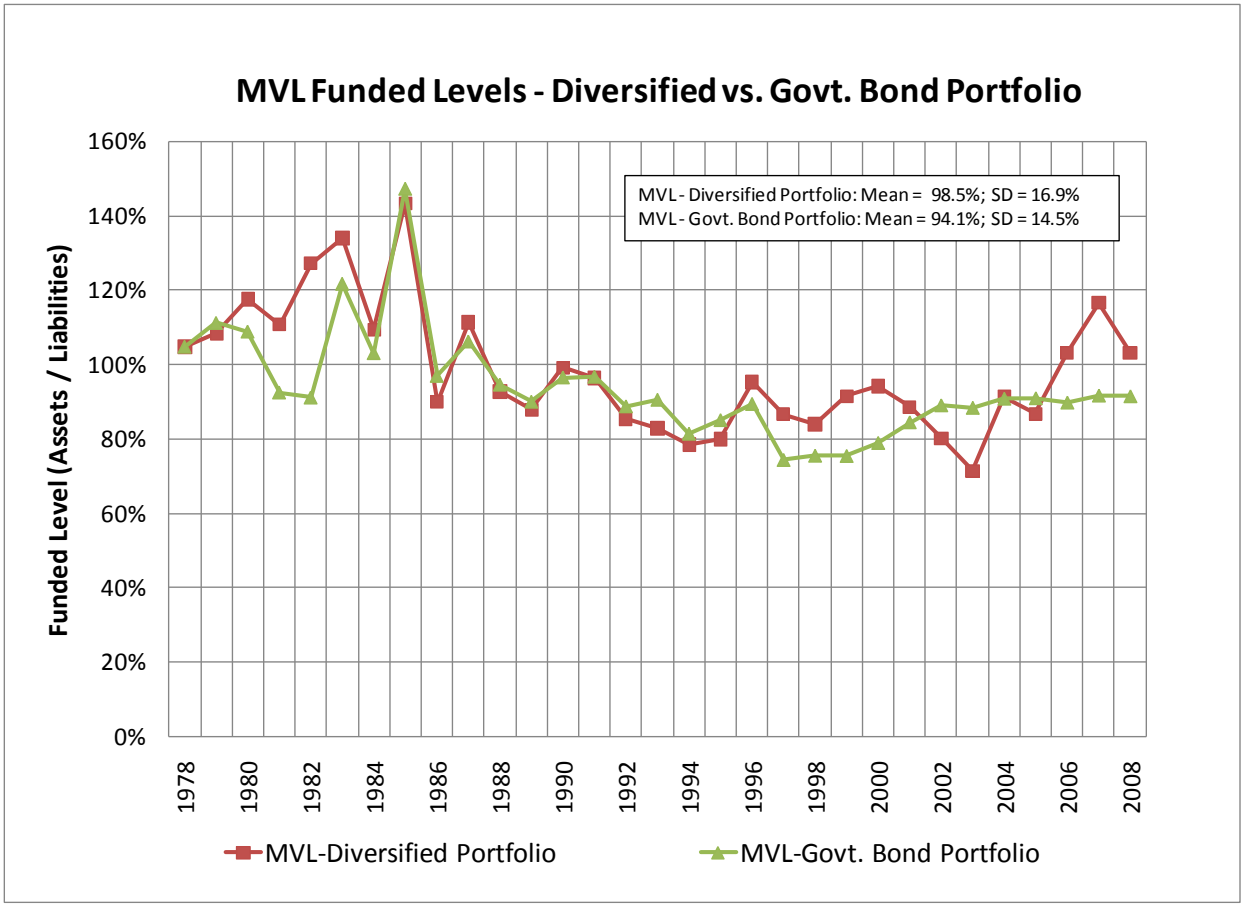
MVL Assets Invested in Long-Term Government Bonds

One potential criticism that might be applied to this study relates to our assumption that MVL assets would be invested in the same asset allocation as under the conventional approach. MVL proponents have noted that volatility in the MVL funded level can be minimized by investing MVL assets in a portfolio of matching securities (e.g., government bonds or similar derivatives) with durations aligned with the plan's accrued liabilities. In this way, increases in accrued liabilities resulting from related declines in the MVL discount rate could be offset by increases in the value of the matching government bonds, whose prices would increase in conjunction with the declines in bond yields.

To examine this further, we modeled investing MVL assets in long-term government bonds using historical annual total returns (income plus price appreciation) earned on such bonds. Although a real matching portfolio would be built using derivatives to synthesize government bonds, the simplified analysis below may provide useful, if not conclusive, information.

Chart 8 shows the MVL funded levels that result from investments in the diversified portfolio compared with the funded levels that result from investments in long-term government bonds. In both cases, the MVL approach is used to determine the accrued liabilities and contribution rates.

Chart 8

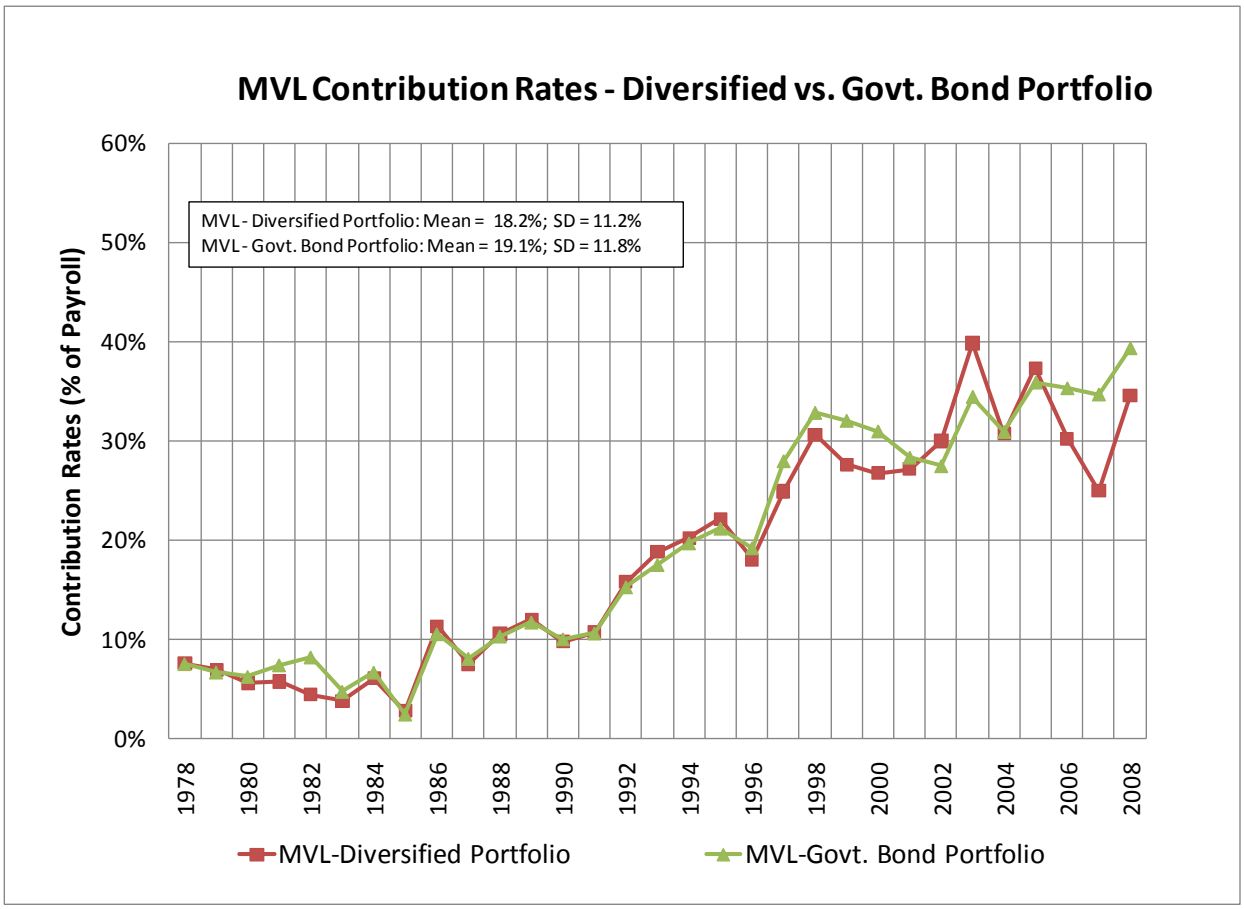


As shown in the chart, considerable volatility in funded levels occurred under both approaches. As one would expect, funded levels based on the diversified portfolio were higher in years when accumulated investment returns were greater than those in the bond portfolio. This was the case from 1980 to 1984, 1996 to 2001, and 2006 to 2008. However, while the fluctuations in MVL funded levels under both portfolios were fairly erratic through the mid-1990s, the volatility in MVL funded levels based on the government bond portfolio declined after 1996. Then, starting in 2000, it trended upward until reaching 90 percent in 2002, where it remained through 2008.

In considering these results, it should be noted that the duration of the long-term government bond portfolio was not perfectly aligned with the duration of the plan liabilities, due to data limitations. Moreover, in determining plan contributions, the unfunded MVL was amortized over an open 30-year period. This may be why the MVL funded ratio using the government bond portfolio does not converge to 100 percent over the length of the projection period.

Chart 9 shows MVL contribution rates under both portfolios. While investing in a government bond portfolio may help to reduce the volatility in funded levels under MVL funding, it does not reduce contributions. For the most part, the MVL contribution rates under the bond portfolio are the same as or higher than those under the diversified portfolio. Even after the MVL funded ratio under the bond portfolio converged to 90 percent in 2002, the related MVL contributions still fluctuated between 30 percent and 40 percent of covered payroll.

Chart 9



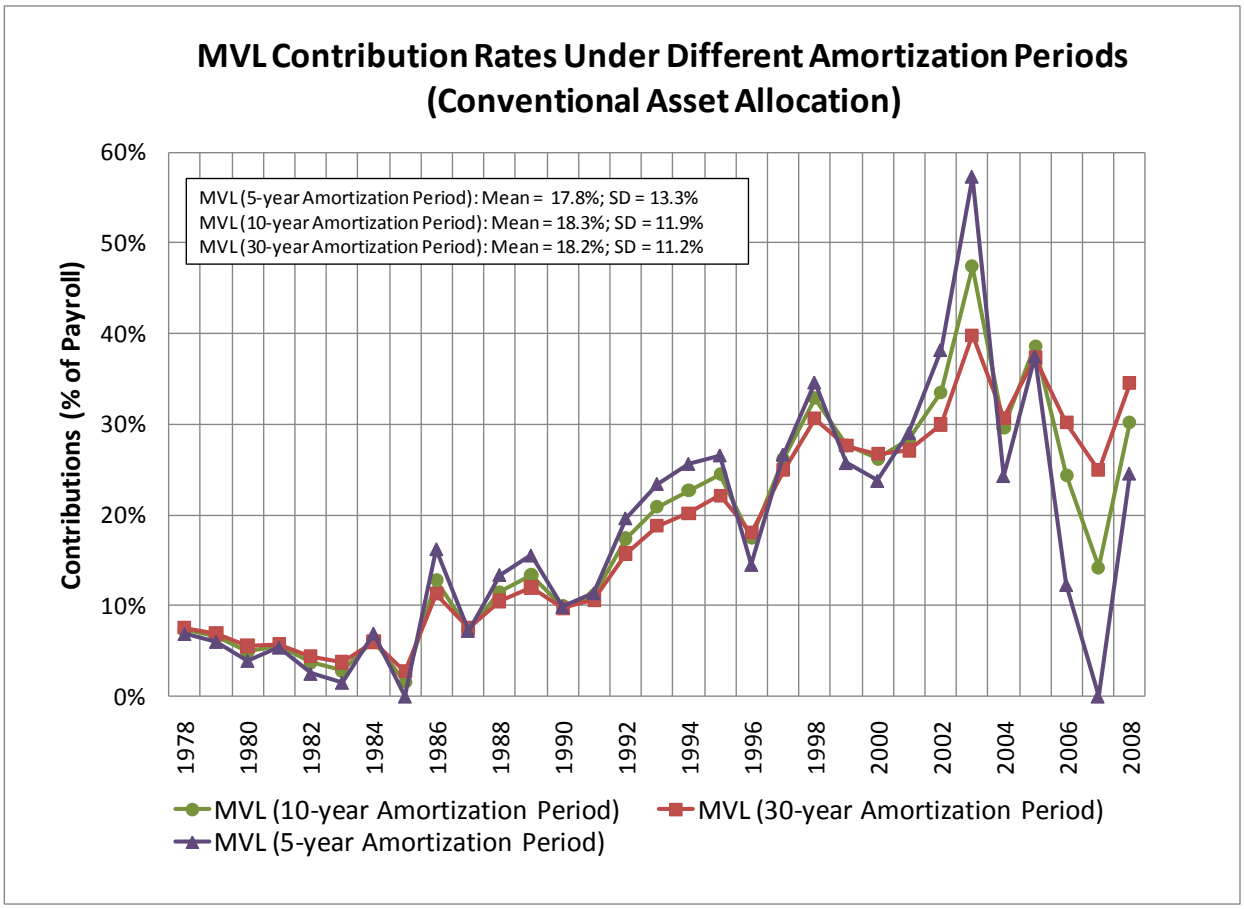
This suggests that even if the plan had successfully hedged the funded ratio by investing in matching (or nearly matching) U.S. Treasury securities, there would still be a great deal of volatility in contribution rates due to volatility in the MVL discount rate. In fact, even if the plan had perfectly hedged its liabilities, the normal costs would still have to be contributed. As shown in Chart 2 on page 8, normal costs based on the MVL discount rate are also highly volatile.

MVL Contributions Based on Shorter Amortization Periods

Chart 10 shows the impact on MVL contributions of lowering the amortization period to five and 10 years. MVL proponents would likely regard a shorter amortization period as more

consistent with the theory underlying MVL funding than the 30-year amortization period used initially in this paper.

Chart 10



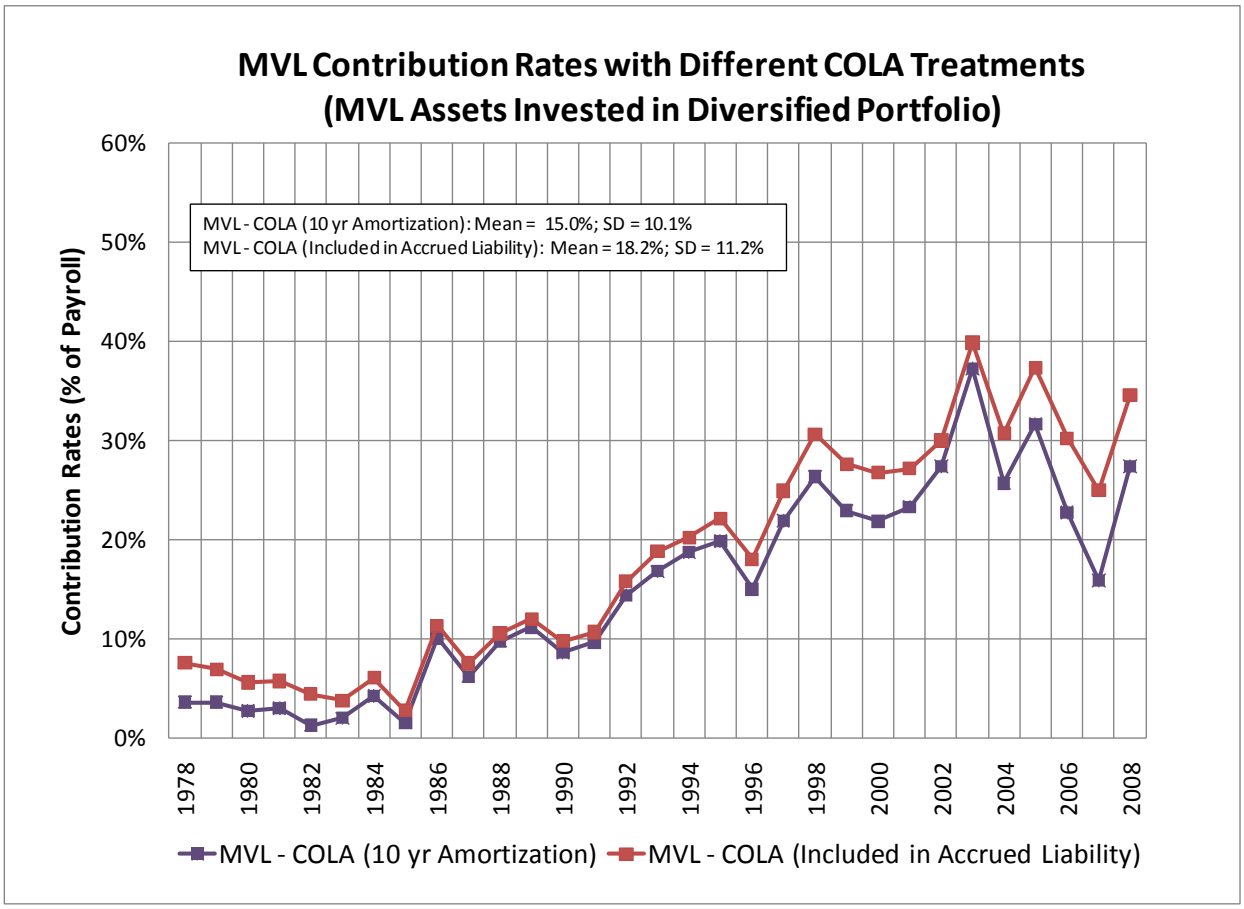
Since shorter amortization periods result in faster recognition of the unfunded accrued liabilities, the effect of the shorter amortization period is to increase the volatility in MVL contribution rates.

MVL Contributions Based on a Different Treatment of COLAs

The initial analysis included the plan's automatic cost-of-living adjustment (COLA) in the accrued liability under the MVL approach. MVL proponents may argue that COLAs (at least

non-guaranteed COLAs) should not be part of the MVL accrued liability and so should be recognized in the unfunded accrued liability on a year-to-year basis. Chart 11 shows the impact on MVL contribution rates when COLAs are included in the unfunded accrued liability only after they are granted and amortized over a 10-year period. This lowers the MVL contribution rates somewhat, but has relatively little impact on their volatility.

Chart 11



Discussion: Public Plan Funding Objectives

Public plan actuarial valuations take place in a public forum, which includes taxpayers, public officials, plan members, and other stakeholders. To be useful, the valuation results must satisfy a variety of objectives, as discussed below.

Objective 1: Valuation Reflects Plan Dynamics

A fundamental principle underlying actuarial valuations is that the results fairly reflect the characteristics of the benefits measured and the purpose for which the valuation is used. Different actuarial methods are used for different purposes. For the purpose of funding an on-going plan, actuarial principles provide that the methods and assumptions should reflect the dynamics of the plan. [9]

Under MVL funding, changes in the discount rates have a strong impact on plan contributions and liabilities, even in the absence of changes in plan benefits. As was shown in Chart 3, declines in the MVL discount rate in 2003, 2005 and 2008 increased the plan's accrued liabilities by $1.6 billion each year, even in the absence of benefit changes to the plan. In addition, increases in the MVL discount rate in 2004 and 2006 resulted in large declines in plan accrued liabilities. Rather than reflecting the underlying dynamics of the plan, the MVL approach reflects the underlying dynamics of its discount rate, in this case U.S. Treasury bonds.

Our analysis also suggests that, under MVL funding, the use of a discount rate based on long-term government bond yields could significantly understate contributions in times of high

[9] Actuarial Standard of Practice No. 4, § 3.11.b. states: "The attribution of normal costs should bear a reasonable relationship to some element of the plan's benefit formula or the participants' compensation for service."

interest rates and overstate contributions in times of low interest rates. As shown in Chart 7, MVL contributions as a percent of covered payroll were one-third of conventional contributions in 1985 (after a period when 30-year Treasury bond yields were over 13 percent) and four times conventional contributions in 2003 (after a period when 30-year Treasury bond yields were under 5 percent). The MVL acts to reduce contributions at times when it is relatively easy to make money in the bond markets.

Objective 2: Stable Contribution Rates

State and local governments are subject to practical constraints when funding their pension plans. Additional revenues needed for additional plan contributions might well require changes in tax rates that can only be obtained through the legislative process or through a popular vote. Consequently, changes in pension contribution rates may be subject to a lengthy and possibly contentious political process.

As a result, public officials prefer actuarial methods that produce stable contributions rates. This may be why the majority of public plans use the entry age normal cost method. This paper has demonstrated that MVL funding would likely produce contribution rates that, during many years, are much higher and more volatile than those produced by conventional funding. This would make it considerably more difficult to obtain legislative approval for plan funding.

Objective 3: Equitable Allocation of Pension Costs

Because taxes are obligatory, the issue of fairness plays a role in determining how public pension costs should be allocated among current and future taxpayers. In addition to improving the stability of contribution rates, the conventional approach also allocates normal costs as a

level percent of payroll over time. Since taxpayer incomes can be assumed to increase at roughly the same rate as payroll, the tax revenues required to pay pension normal costs can remain at roughly the same level of taxpayer income from year to year.[10]

MVL proponents argue that the conventional approach does not recognize the full cost of investment risk and therefore will require future taxpayers to pay more. However, as shown in Chart 7, if MVL funding had been in place from 1978 to 2008, taxpayers in 2003 would have paid contribution rates amounting to 40 percent of covered payroll, 14 times higher than the 2.8 percent they would have paid in 1985. With conventional funding, contributions would have increased from 8.5 percent in 1978 to 13.9 percent in 2006 (1.6 times higher), which is not surprising, given that the benefit multiplier increased from 1.25 percent to 1.70 percent over the period. Using the MVL approach does not necessarily mean that future taxpayers will pay less than (or even the same as) current taxpayers at any given point in time.

Objective 4: Coordination of Accounting and Funding Measures

The evolution of governmental accounting standards over the last 25 years has lead the Governmental Accounting Standards Board (GASB) to conclude that public pension plans are best understood by stakeholders when the related costs and liabilities that are presented in the government's financial reports are the same as those used to actuarially fund the plan.[11] Otherwise, substantial confusion is likely to be created among decision-makers, taxpayers, plan members, and the media.

[10] The GFOA's Recommended Practice: Funding of Public Employee Retirement Systems calls for contributions as a percentage of active member payroll to remain "approximately level from generation to generation."

[11] GASB Statement No. 25, paragraph 131.

If the MVL approach were substituted for the conventional approach in disclosing pension liabilities, and related contribution rates, in government financial reports, considerable confusion would result. This confusion would not only occur in the transition year, when vastly different costs and liabilities would suddenly be reported, but on an ongoing basis as well. Large swings in the contribution rates due to changes in the MVL discount rate would likely confuse and alarm all stakeholders, especially in the absence of plan changes. This could lead to poor policy decisions and ultimately the abandonment of public pension plans.

Even if the MVL were only disclosed as an alternative measure of plan liabilities, confusion would likely result. Given the significant difference between the conventional and MVL accrued liabilities, stakeholders would likely question both. Moreover, MVL liabilities would be highly volatile, with much of the volatility due to changes in the discount rates, rather than changes in the benefits promised by the plan. As a result, its use would be inconsistent with the objectives of transparent financial reporting.

Conclusions

This paper is intended to provide empirical information on the effect that applying MVL principles would have on reported costs, accrued liabilities, and funded levels of public pension plans. The results show that MVL funding would result in rapid and erratic changes to plan normal costs, accrued liabilities, and funded levels as a result of changes in the MVL discount rate. By contrast, conventional funding results in measures that are more stable and predictable over time. Consequently, the conventional approach is more effective at meeting the funding objectives of public pension plans. The serious instabilities in the MVL measures would most likely lead either to erratic demands on government resources or plan terminations. If the MVL approach were applied, we believe it would ultimately be abandoned as being too unstable for state and local governments.

Appendix – Detailed Methodology

The results presented in this paper were developed using a model plan based on historical data from a statewide public plan covering general employees. Historical demographic and economic data for the plan were collected from actuarial reports prepared from 1984 to 2008. For the period from 1978 to 1982, demographic and economic data were extrapolated based on trends exhibited in the valuation reports. Similarly, data regarding the plan's asset allocations from 1983 to 2008 were obtained from the plan's annual financial reports. Asset allocations prior to 1983 were established using the aggregate asset allocations for public plans between 1978 and 1982, as presented in the Federal Reserve's *Flow of Funds* reports.

Conventional Valuation Methodology

For the period from 1983 to 2008, the plan's normal costs and actuarial accrued liabilities (AAL) reported in this paper were based largely on the plan's actuarial valuations. The entry age normal actuarial cost method was used throughout this period, with discount rates reflecting long-term investment return assumptions. These assumptions changed twice: from 7.0 percent to 8.0 percent in 1986, and to 8.5 percent in 1992. The benefit multiplier also changed several times during the period: from 1.25 percent to 1.33 percent in 1984, to 1.5 percent in 1988, to 1.6 percent in 1994, and to 1.7 percent in 2000. The plan provided automatic cost-of-living adjustments based on price inflation for much of the period. For the period before 1983, normal costs and accrued liabilities were determined by applying the methods and assumptions used in the 1983 valuation to the extrapolated demographic and economic data.

The market value of plan assets was determined using investment returns based on historical asset allocations, which varied over time. Over the 30-year period ending June 2008, investment returns averaged 10.7 percent annually, with a standard deviation of 10.2 percent. To obtain the actuarial value of plan assets (AVA), annual investment gains and losses were smoothed into asset values over five years. Plan funded levels were determined by dividing the smoothed actuarial value of assets by the actuarial accrued liability. The unfunded accrued liability (UAL) was determined by subtracting the AVA from the AAL. Plan contributions were determined by adding normal costs to the level percent of payroll amortization of the UAL, using a rolling (open) 30-year amortization period.

While the model plan is based on the historical valuation, certain adjustments were made to simplify the analysis and remove variability that was judged to be extraneous to the study. For example, under the plan's historical valuations, the period for amortizing unfunded liabilities varied from year to year. To eliminate the impact of these changes from the study results, a 30-year open amortization period was used across all years. While this change did cause computed contribution rates to vary from historical contribution rates in some years, the change did not materially affect the contribution rates on average. Computed contribution rates averaged 10.8 percent of covered payroll compared with average historical rates of 11.0 percent over the period.

MVL Valuation Methodology

The MVL valuation results were derived from the conventional valuation results by applying certain factors developed during a recent MVL study for the plan in 2008. First, the

actuarial accrued liability (AAL) determined using the conventional approach was converted to the accrued benefit obligation (ABO) under the unit credit cost method. This was done by applying a conversion factor based on the ratio of the ABO to the AAL determined for the plan in the 2008 study. In addition, adjustments were made to reflect the increasing average age of active members over the study period. Next the ABO was converted to the MVL, by applying a formula reflecting the duration and convexity of the liabilities, specifically:[12]

$$MVL_t = ABO_t + \left\{ \left[\left((re_t - rt_t) * D \right) + \left(\frac{(re_t - rt_t)^2}{2} * C \right) \right] * ABO_t \right\}$$

Where:

re_t= expected return at time t
rt_t = 30-year Treasury yield at time t
D = duration of liabilities
C = convexity of liabilities

The formula was applied separately to the liabilities of active and retired members using factors that reflect the different durations and convexities of their liabilities (also determined in the 2008 study). The duration and convexities of the active and retired liabilities were assumed to be constant throughout the analysis period. MVL normal costs were then determined by multiplying the MVL for active members by a normal cost conversion rate based on the ratio of the MVL normal cost to MVL liabilities, as determined in the 2008 study). MVL unfunded liabilities were also amortized as a level percent of increasing payroll.[13]

[12] McDonald (2006), Formula 7.15. This formula relates changes in bond price to changes in yield to maturity.

[13] MVL funding advocates may argue that under MVL funding, level dollar amortization would be more appropriate. We chose level percent of payroll to minimize the number of variables in the study. In testing, we determined that the use of level dollar amortization would not have affected the overall conclusions, but would have added volatility to the MVL results.

MVL Analysis Using Conventional Asset Allocation

In the first part of the study, contributions and assets are assumed to be invested using the same asset allocation as the conventional approach. Consequently, the market value of plan assets was determined using investment returns based on the historical asset allocations, as was done under the conventional approach. In determining the MVL funded ratio, the market value of assets (MVA) is used (i.e., there was no smoothing of assets). The UAL was calculated by subtracting the MVA from the MVL. Contribution rates were determined by adding normal costs to the amortized value of the UAL. To simplify the analysis, the same open 30-year amortization period was initially used under both the conventional and MVL approaches.

MVL Analysis Using Government Bond Investments

In addition, the study also examines the implications of investing MVL assets entirely in long-term government bonds. The methodology for this is identical to the MVL methodology described in the section above, with the exception that the available assets are assumed to earn returns equivalent to the historical total returns (income plus capital appreciation) earned on long-term government bonds.

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