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The Evolution Of Averaging Mechanics Used In The Actuarial Asset Valuation Method Of The New York City Retirement Systems

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Abstract: For the last thirteen years, actuarial valuations of the New York City Retirement Systems (“NYCRS”) have included an Actuarial Asset Valuation Method (“AAVM”) based on a five-year moving average of Market Values. During this period, however, the underlying mechanics of the averaging process have been changed twice and there have been three Market Value Restarts (“MVRs”). This article focuses primarily on the changes in the averaging mechanics of the five-year averaging process with specific focus on:

- *The definitions of what earnings are averaged.*
- *What percentages of those earnings are averaged into the Actuarial Asset Value (“AAV”) each year.*

Background—Overview of Changes

A five-year average of Market Values AAVM was first used for all assets in the June 30, 1988 actuarial valuations of the NYCRS. These actuarial valuations were used to determine employer contributions payable for Fiscal Year 1989 (i.e., July 1, 1988 to June 30, 1989).

Before that time the NYCRS utilized an AAVM that included an averaging method for valuing equities and valued fixed income securities at amortized cost.

Since that time, however, there have been two major changes in the averaging mechanics used in the AAVM, specifically:

- June 30, 1991: What earnings are averaged, and
- June 30, 1996: How rapidly those earnings are averaged.

Note: there have also been three Market Value Restarts employed in the last thirteen years (i.e., as of June 30, 1991, June 30, 1995 and June 30, 1999) and these will be discussed briefly at the end of this article.

Although this may seem like a significant number of changes to the AAVM over a limited number of years, each change in the AAVM had its purpose and was chosen by the Actuary who has sole responsibility for its selection. It should also be noted that the choice of AAVM for the NYCRS is not subject to Internal Revenue Service (“IRS”) rules or regulations.

The bulk of this article will focus on the evolution of the averaging mechanics used in the AAVM of the NYCERS.

Typical AAVM in use before June 30, 1991

The AAVM chosen for the June 30, 1988 actuarial valuations of the NYCERS was one of the versions of the five-year average of Market Values AAVM prescribed in IRS Regulation 1.412(c)(2)-1 and commonly in use at that time ("Typical AAVM").

Under this Typical AAVM total investment return was divided into two components: "Cash Income" (i.e., bond coupons, stock dividends, etc.) and "Appreciation" (i.e., the difference between the total investment return and Cash Income). Cash Income was then recognized immediately and Appreciation was averaged into the Actuarial Asset Value at a rate of 20% per year.

This Typical AAVM methodology generally works quite well. It does however, for most asset allocations, have a conservative bias in that it produces Actuarial Asset Values that are expected, on average, to lag Market Values.

Illustration of Problems with Typical AAVM

The expected lag of AAV behind Market Value ("MV") for the Typical AAVM may not be the best choice for an "averaging" method but it does reflect the underlying characteristics of the assets being valued. To the extent that any Appreciation is expected, that Appreciation gets averaged into the AAV over time. Since most portfolios are not expected to provide returns from only Cash Income, there is expected Appreciation and, hence, an expectation that AAV will lag MV.

Beyond the issue of the expected lag of AAV behind MV, the Typical AAVM can also produce anomalous results during periods when asset allocations are changing. This problem was illustrated in a somewhat dramatic fashion when two of the five NYCERS who, prior to 1990, were then entirely invested in fixed income securities ("Bonds"), decided to diversify 50% of their assets into equity securities ("Stocks").

Typically, Stocks have greater expected returns than Bonds but provide less expected Cash Income and, during such a diversification process, it is possible for the Actuarial Asset Value to actually be less in a more diversified portfolio than in an undiversified portfolio, even if the diversified portfolio earned more and had a greater Market Value.

This can happen, of course, because Bonds tend to have greater levels of Cash Income than do Stocks and, under the Typical AAVM, all Cash Income is included in AAV but Appreciation is averaged into AAV.

For example, assume that the total expected return is 6% per year for Bonds and 10% per year for Stocks, and that the expected Cash Income components are 6% and 2%, respectively. Then, by deduction, the expected Appreciation component equals 0% for Bonds and 8% for Stocks.

For a 50% Bonds/50% Stocks portfolio, total expected return would be 8%, split equally between Cash Income and Appreciation.

Then, during a year in which earnings and income exactly equal those expected, MV would increase 6% for an all Bonds portfolio, 10% for an all Stocks portfolio and 8% for a 50% Bonds/50% Stocks portfolio.

Under the Typical AAVM, for the first year of averaging, the AAV in this example would increase 6.0% for an all Bond portfolio but only 4.8% (i.e., 4% Cash Income plus 20% of 4% Appreciation) for a 50% Bonds/50% Stocks portfolio.

Taken to a greater extreme, the AAV for the all Stocks portfolio would increase only 3.6% (i.e., 2% Cash Income plus 20% of 8% Appreciation). This consequence of the Typical AAVM had the potential to occur for two of the NYCERS since their asset allocations were adjusted to include more Stocks during Fiscal Years 1991, 1992 and 1993. The resulting impact on the AAV was difficult to explain and, given that asset diversification was done primarily to increase expected returns, difficult to justify.

Consequently, the Typical AAVM was revised effective with the June 30, 1991 actuarial valuations.

Prior AAVM Effective June 30, 1991

Effective with the June 30, 1991 actuarial valuations, the averaging mechanics employed in the Actuarial Asset Valuation Method for the NYCERS was modified to average “Unexpected Return” instead of averaging Appreciation. This methodology will be referred to as the Prior AAVM.

For the NYCERS Unexpected Return (“UR”) has been defined as the difference between the total investment return and the expected total investment return (“Expected Return”).

Expected Return for a Fiscal Year has been defined as the Actuarial Interest Rate (“AIR”) as of the prior June 30 multiplied by the AAV as of that prior June 30 adjusted for cash flow during the Fiscal Year.

Note: although there are significant benefits to defining Expected Return as the AIR multiplied by Market Value instead of AAV, using MV causes future projections of employer contributions to show actuarial gains and/or losses from investments whenever the earnings projected are based on AAV.

Under the Prior AAVM, Unexpected Returns were recognized in the AAV at a uniform rate of 20% per year, or at a cumulative rate of 20%, 40%, 60%, 80% and 100% over a period of five years.

In addition, under the Prior AAVM, the AAV was no longer limited to any corridor (e.g., AAV was not constrained to equal between 80% and 120% of MV).

Modified AAVM Effective June 30, 1996

As one component of an overall review of actuarial assumptions and methods as of June 30, 1995, the Actuary reestablished Actuarial Asset Value to equal Market Value as of that date.

Effective as of June 30, 1996, the averaging mechanics employed in the Prior AAVM were revised to better fit with the environment within which the NYCERS were then and are now continuing to operate. Except for a modest period of phase in as noted hereafter, this Modified AAVM changed the pattern at which Unexpected Returns are recognized over five years.

Specifically, under the Modified AAVM Unexpected Returns are recognized at a rate of 10%, 15%, 20%, 25% and 30% per year, or at a cumulative rate of 10%, 25%, 45%, 70% and 100% over a period five years. Again, AAV calculated under the Modified AAVM is not constrained to any corridor around MV.

Note: Because employers had already adjusted their Fiscal Year 1997 budgets assuming that the Prior AAVM methodology would continue in effect and Fiscal Year 1996 had significant investment gains that were already being anticipated in employer budgets, the UR for Fiscal Year 1996 was scheduled to be phased into the Modified AAVM at a cumulative rate of 20%, 35%, 45%, 70% and 100% over five years.

Reasoning for Modified AAVM—Financial Impact

To understand the impact of investment gains or losses on employer contributions to the NYCERS, consider a “One-Standard Deviation Event” (“OSDE”). As used herein, an OSDE represents the change in the rate of return on investments that would occur if actual returns were one standard deviation from those expected.

Back in 1991, the asset allocation policies of most of the NYCERS were approximately 50% Stocks/50% Bonds. Using reasonable risk/return expectations, a OSDE would occur if the rate of return on the portfolio for one year equaled approximately 10% greater or less than the expected rate of return (e.g., either -2.0% or +18.0% given a hypothetical AIR assumption of 8.0% per annum).

By 1996, with asset allocation policies of 70% Stocks/30% Bonds, a OSDE would result in a rate of return on the portfolio for one year equal to plus or minus approximately 12% of the expected rate of return (e.g., either -4.0% or +20.0% given a hypothetical AIR assumption of 8.0% per annum).

The Evolution of Averaging Mechanics

This difference reflects the somewhat greater expected volatility of the portfolios. Note: the increased volatility of the 70% Stocks/30% Bonds portfolios is less than it would have otherwise been but for further diversification of the asset subclasses that were utilized in the 50%/50% portfolios.

Nevertheless, this increased expected volatility, together with the substantial increase in the amount of assets held by the NYCERS, largely due to the extraordinary investment returns of the 1990s, results in the increased likelihood each year that there could be a substantial impact on employer contributions to the NYCERS from either good or poor investment performance.

To illustrate, the following Table I compares the impact of a OSDE based upon the June 30, 1990 and June 30, 1996 assets of the NYCERS and the asset allocation policies generally in effect or adopted in conjunction with the actuarial assumptions and methods effective at those dates.

TABLE I		
Impact of a One Standard Deviation Event on Employer Contributions to the NYCERS (\$ Millions)		
	As of June 30	
ITEM	1990	1996
MV of Assets	\$40,800	\$66,100
Percentage Gain/Loss on Account of a One Standard Deviation Event	10%	12%
Dollar Gain/Loss on Account of a One Standard Deviation Event	\$ 4,080	\$ 7,932
Impact on Employer Contributions		
• Prior AAVM	\$ 82	\$ 159
• Modified AAVM	\$ 41	\$ 79
Employer Contributions for Following Fiscal Year	\$ 1,750	\$ 1,470
Impact on Employer Contributions as a Percentage of Employer Contributions		
• Prior AAVM	4.7%	10.8%
• Modified AAVM	2.3%	5.4%

As illustrated in Table I, the theoretical impact on Fiscal Year 1997 employer contributions of a hypothetical One Standard Deviation Event under the Modified AAVM as of June 30, 1996 equaled \$79 million. This is little different than the impact on Fiscal Year 1991 employer contributions of a hypothetical OSDE under the Prior AAVM as of June 30, 1990 (i.e., \$82 million).

As a percentage of employer contributions, a hypothetical OSDE using the Modified AAVM would have represented only a slightly greater percentage impact on Fiscal Year 1997 employer contributions (i.e., 5.4%) than a OSDE using the Prior AAVM would have represented as a percentage of Fiscal Year 1991 employer contributions (i.e., 4.7%).

Of course, by the fourth year following a significant investment gain or loss, the year-to-year resulting change in employer contributions would be greater under the Modified AAVM than under the Prior AAVM (i.e., a phase-in amount of 25% of Unexpected Return during the fourth year under the Modified AAVM versus 20% under the Prior AAVM).

Overall, however, relative to the Prior AAVM and cumulative phase-in schedule of 20%, 40%, 60%, 80% and 100% over five years, the Modified AAVM with its cumulative phase-in schedule of 10%, 25%, 45%, 70% and 100% over five years delays the impact of investment gains and losses. In particular, if an investment loss has occurred, the Modified AAVM provides employers with more time to react and prepare for the consequent increases in their contributions.

Brief Overview of Market Value Restarts

As noted earlier, during the past nine years there have been three Market Value Restarts under the AAVM used for the NYCERS.

The June 30, 1991 MVR was motivated by the need for employer budget relief but was undertaken in an economic environment that was still fully consistent with that in effect as of the most recent review of the economic actuarial assumptions (i.e., June 30, 1990).

The June 30, 1995 MVR and the June 30, 1999 MVR were undertaken in conjunction with overall reviews of actuarial assumptions and methods and were designed to reestablish consistency between the asset and liability sides of the actuarial balance sheets.

Although the author believes each of these MVRs was fully justified on its own merits under the specific economic conditions then existing, he is also fully cognizant of the fact that MV was always greater than AAV when a MVR was undertaken.

The author also acknowledges that the popularity of a MVR seems to be highly correlated with the amount of budgetary relief that a MVR would create and with the budgetary needs that exist.

General Observations, Comments and Summary

It is generally agreed that one of the primary purposes of an Actuarial Asset Valuation Method is to reduce the impact of short-term fluctuations in the value of assets used for actuarial valuation purposes. By doing so, it is possible to reduce the volatility of employer pension contributions.

In recent years the assets of the NYCERS have grown significantly and the portfolios have been diversified. More assets, subject to greater expected fluctuations in value, suggested that the AAVM be reviewed to see if it was still doing the job for which it was intended.

Those reviews led to changes in the AAVM for the NYCERS.

In 1991 the changes avoided having increased rates of return on a Market Value basis create lesser rates of return on an Actuarial Asset Value basis.

In 1996 the changes reduced the short-term impact of unexpected investment gains and losses.

Table II at the end of this article presents the formulas used to calculate Actuarial Asset Values used in the actuarial valuations of the NYCERS from June 30, 1988 to June 30, 2000 and those that are expected to be used for June 30, 2001 to June 30, 2003.

The author believes that the evolution of the averaging mechanics in the AAVM used by the NYCERS from the Typical AAVM to the Prior AAVM to the Modified AAVM has improved the ability of employers participating in the NYCERS to respond to adverse investment markets and has reduced the potential demands for other changes in actuarial assumptions and methods that could have longer-term, more damaging impacts on funding.

Of course, only a bear market, unseen in the 1990's, will test the robustness of the Modified AAVM to achieve its objectives.

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TABLE II

Formulas Used to Calculate
Actuarial Asset Values

$$AAV_{6/30/88} = MV_{6/30/88} - .80 * A_{FY88} - .60 * A_{FY87} - .40 * A_{FY86} - .20 * A_{FY85}$$

$$AAV_{6/30/89} = MV_{6/30/89} - .80 * A_{FY89} - .60 * A_{FY88} - .40 * A_{FY87} - .20 * A_{FY86}$$

$$AAV_{6/30/90} = MV_{6/30/90} - .80 * A_{FY90} - .60 * A_{FY89} - .40 * A_{FY88} - .20 * A_{FY87}$$

$$AAV_{6/30/91} = MV_{6/30/91}$$

$$AAV_{6/30/92} = MV_{6/30/92} - .80 * UR_{FY92}$$

$$AAV_{6/30/93} = MV_{6/30/93} - .80 * UR_{FY93} - .60 * UR_{FY92}$$

$$AAV_{6/30/94} = MV_{6/30/94} - .80 * UR_{FY94} - .60 * UR_{FY93} - .40 * UR_{FY92}$$

$$AAV_{6/30/95} = MV_{6/30/95}$$

$$AAV_{6/30/96} = MV_{6/30/96} - .80\# * UR_{FY96}$$

$$AAV_{6/30/97} = MV_{6/30/97} - .90 * UR_{FY97} - .65\# * UR_{FY96}$$

$$AAV_{6/30/98} = MV_{6/30/98} - .90 * UR_{FY98} - .75 * UR_{FY97} - .55 * UR_{FY96}$$

$$AAV_{6/30/99} = MV_{6/30/99}$$

$$AAV_{6/30/00} = MV_{6/30/00} - .90 * UR_{FY00}$$

$$AAV_{6/30/01} = MV_{6/30/01} - .90 * UR_{FY01} - .75 * UR_{FY00}$$

$$AAV_{6/30/02} = MV_{6/30/02} - .90 * UR_{FY02} - .75 * UR_{FY01} - .55 * UR_{FY00}$$

$$AAV_{6/30/03} = MV_{6/30/03} - .90 * UR_{FY03} - .75 * UR_{FY02} - .55 * UR_{FY01} - .30 * UR_{FY00}$$

Reflects phase in of Fiscal Year 1996 Unexpected Return.

The Evolution of Averaging Mechanics

$AAV_{6/30/xx}$ = Actuarial Asset Value as of June 30, xx (19xx or 20xx).

$MV_{6/30/xx}$ = Market Value as of June 30, xx.

A_{FYxx} = Appreciation for Fiscal Year xx. Equals Total Return for Fiscal Year xx minus Cash Income for Fiscal Year xx.

CF_{FYxx} = Cash Flow for Fiscal Year xx. Equals total contributions minus disbursements for Fiscal Year xx.

UR_{FYxx} = Unexpected Return for Fiscal Year xx. Equals Total Return for Fiscal Year xx minus Expected Return for Fiscal Year xx.

Expected Total Return for Fiscal Year xx: Equals $(AAV_{6/30/xx-1}) + .5 * CF_{FYxx}$ times AIR_{FYxx} .