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submitted by Paulette Tino and Edward Sypher

Asset Valuation Methods under ERISA

Submitted by: Paulette Tino and Edward Sypher

ABSTRACT: When calculating the required contributions for a plan subject to ERISA's minimum funding requirements, it is permissible to set the value of the plan's assets to a figure other than the fair market value of those assets. This paper describes a variety of methods (called asset valuation methods) that are used to determine these values. The paper also discusses the statutory and regulatory requirements for asset valuation methods under ERISA.

The contents of this paper are the opinions of the authors and do not necessarily represent the positions of the Internal Revenue Service. This paper contains references to private letter rulings ("PLRs") issued by the Service. The reader should bear in mind that private letter rulings are binding only with respect to the taxpayer to whom the letter was issued. They may not be used or cited as precedent by others.

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In one way or another, all pension funding methods reflect the value of a plan's assets when determining the required contributions. For this reason, the value placed on those assets plays an important role in the process. Although it might seem logical to use the fair market value of the plan's assets for funding purposes, pension actuaries have long recognized that there are reasons why this is not always the most appropriate choice. Some assets simply do not have a readily ascertainable fair market value. Also, in some contexts, fair market value might not be relevant, even if known. In large plans, volatility in market values can produce unwelcome volatility in annual contributions (and the long-term nature of pension funding doesn't require looking to short-term changes in asset values).

From the very earliest days of pension funding, actuaries have been devising methods for producing asset values that differ from fair market value and that address the concerns noted in the previous paragraph. These methods are called *asset valuation methods* and the results produced by them are called the *actuarial value of assets*. The reader of this paper will see that there are many approaches to devising an asset valuation method, each of them reflecting its own logic. Some methods use the fair market value of assets as a starting point in their calculations; others do not. Some methods distinguish between different types of investment income (i.e., capital gains vs. interest and dividends); others look only to the overall amount of investment income.

All rational asset valuation methods share the common goal of limiting the extent to which fluctuations in asset values will effect the required contributions. To this end, a rational asset valuation method will seek to "smooth out" the recognition of investment earnings. However, there are limits to how far a rational method can go in pursuit of this goal. For example, no rational asset valuation method would call for setting the actuarial value of assets equal to some arbitrary number that was chosen without regard to the assets actually held by the plan. Neither would any rational asset valuation method call for ignoring the fact that contributions were made to the plan or that benefit payments were made from the plan. Despite these fundamental constraints, there is a seemingly endless variety of approaches that can be employed when devising an asset valuation method.

In the American literature, the landmark paper on asset valuation methods is Jackson and Hamilton's [The Valuation of Pension Fund Assets](#) (appearing in *Transactions*, Volume 20, 1968). In that paper, Jackson and Hamilton set forth a six-fold classification of methods, as follows:

1) *Initial cost*

Assets are valued at their initial purchase price, without modification in future years (except that *ad hoc* modifications might be made when deemed appropriate).

2) *Initial cost with formula modifications*

These methods assign each asset a value based on the initial cost, but modified according to some pre-set criterion or formula. The use of amortized (i.e., book) value for bonds is an example of this type of method. Another example is a method which sets asset values equal to their initial cost, but then increases that value over time at an assumed rate.

3) *Combination of initial cost and current market value*

These methods assign actuarial values based on both initial cost and current market value. Some variations set the actuarial value to the average of the cost and current market values; other variations perform “write ups” of the initial cost value based on a function of unrealized capital appreciation.

4) *Current market value*

Assets are valued either at their current fair market value or at their “realizable” value (i.e., current market value less the cost of liquidation).

5) *Adjusted market value*

These methods establish an “adjustment account”. When the market value of the plan’s assets increases at more than a specified rate, a portion of the increase is credited to the adjustment account (and not reflected in the actuarial value of assets). When the market value of the plan’s assets increases at a rate lower than a second specified rate (which is lower than the first specified rate), the adjustment account is reduced and the amount of the reduction is added to the value of the assets. Particular methods of this type differ with regard to when, and by what amount, value will be transferred into and out of the adjustment account.

6) *Present value*

Each asset is given a value equal to the present value of its anticipated cash flows (with the present values based on the valuation interest rate).

The terminology used by Jackson and Hamilton has not become standard (and neither has the terminology used by any other author). Furthermore, many asset valuation methods in current use do not appear to fit squarely into their six-fold classification.

In 1998, the Society of Actuaries sponsored a survey of asset valuation methods used by defined benefit plans in the United States and Canada.¹ This survey received responses for about 13% of all defined benefit plans in the United States. For large U.S. plans (defined as having more than 100 participants), *fair market value* was the most common valuation method, being used by almost half of the surveyed large plans. The second most popular was the *write up* method (under which the actuarial value of assets is determined, at least in part, by a “book value” of assets that reflects an assumed rate of interest). Two other popular methods were *deferred recognition* and *contract value* (the latter term meaning that the plan is invested in insurance company contracts and the insurer-supplied contract value is taken as the actuarial value). For small plans, *fair market value* was used by almost two-thirds of the plans in the survey, with *contract value* being used by most of the others.

In 1988, the American Academy of Actuaries issued Actuarial Standard of Practice No. 4, entitled *Measuring Pension Obligations*. Section 5.2.6 of the Standard (as re-formatted in 1993) addresses the valuation of assets. This section is reproduced in Appendix A of this paper. Briefly stated, the Standard states that an asset valuation method generally should reflect market value, but that it might be appropriate under some circumstances to use methods which do not reflect market value. However, even under these latter circumstances, the current market value of assets should be disclosed.²

¹ Survey of Asset Valuation Methods for Defined Benefit Pension Plans, published by the Society of Actuaries' Committee on Retirement Systems Research. See Appendix E of this paper for more information.

² In December 2001, the Actuarial Standards Board issued an exposure draft of a proposed standard of practice that would replace the guidance described above.

2

STATUTE AND REGULATION

In the early days of pension regulation, the Internal Revenue Service (“Service”) would accept any reasonable asset valuation method, provided it was followed consistently and did not result in the manipulation of values or estimated costs. However, if the method tended to understate the value that would be realized upon sale or redemption of assets, the valuation interest rate would be deemed acceptable only if it took into account the understatement of asset values.³ This position was reiterated in Revenue Ruling 63-11, when the Service stated that “as a general rule, any asset valuation basis will be considered acceptable ... provided (a) it is followed consistently, and (b) it results in costs which are reasonable ...”.⁴

The regulation of asset valuation methods was changed considerably by ERISA.

Code Section 412(c)(2)(A)

Under ERISA, an asset valuation method is permitted only if it is reasonable and if it “takes into account” the fair market value of the assets. These requirements are found in Code section 412(c)(2)(A), which reads:

412(c)(2) Valuation of Assets

(A) In general

For purposes of [Code section 412], the value of the plan’s assets shall be determined on the basis of any reasonable actuarial method of valuation which takes into account fair market value and which is permitted under regulations prescribed by the Secretary [of the Treasury].

The Committee Reports for ERISA contain a lengthy discussion as to why this Code section was enacted. In brief summary, the drafters of the law recognized that “sharp, short-run variations in asset values could significantly affect the required funding

³ See Part VII(E) of the Bureau of Internal Revenue's Bulletin on Section 23(p)(1)(A) and (B) of the Internal Revenue Code: Deduction of Contributions to Pension Plans, published in June 1945. The Code section in the title was the precursor of the modern section 404.

⁴ In that same revenue ruling, the Service identified certain methods which would not be acceptable. These were (i) the use of market value for bonds that were not in default (either cost or amortized values should be used), (ii) valuing assets at the lower of cost or market, and (iii) valuing assets at cost, but reduced by a reserve for market fluctuations.

if fair market value were the only accepted method of valuing assets for funding purposes”. In contrast, however, the drafters also noted that if an asset valuation method did not take account of fair market value, “there may be no relation between a plan’s funding program and the assets actually available to pay benefits”. These conflicting concerns led to the language in Code section 412(c)(2)(A).

Reg. 1.412(c)(2)-1

Reg. 1.412(c)(2)-1, issued by the Treasury Department in November of 1980, addresses the general requirements of Code section 412(c)(2)(A). An annotated outline appears as Appendix B of this paper.

The regulation consists of five paragraphs, (a) through (e). These are:

- (a) Introduction
- (b) Asset valuation method requirements
- (c) Fair market value of assets
- (d) Methods for taking into account the fair market value of certain agreements
- (e) Effective date and transition rules.

We discuss each paragraph separately.

(a) Introduction

This paragraph sets forth the general rules for asset valuation methods.

For defined benefit plans, a reasonable asset valuation method should be “designed to mitigate short-run changes in the fair market value of plan assets” and to produce a smoothing effect by which “investment performance, including appreciation or depreciation in the market value of assets occurring in each plan year, may be recognized gradually over several plan years”. Such methods are appropriate because the funding of plan benefits will generally be based on the assumption that the plan will be continued by the employer and, thus, “short-run changes in the value of plan assets presumably will offset one another in the long term”.

For money purchase plans, the only acceptable basis for valuing assets is fair market value.

The asset valuation method is a part of the plan’s funding method for purposes of Code section 412(c)(3). Thus, any change in the asset valuation method must be approved by the Internal Revenue Service. Over the years, the Service has issued various revenue procedures that granted automatic approval, subject to conditions and restrictions, for certain changes in a plan’s funding method (including, in

some cases, the plan's asset valuation method). As of this writing, the revenue procedure in effect is Rev. Proc. 2000-40. This revenue procedure will be discussed in detail following our discussion of the regulation.

(b) Asset valuation method requirements

If the plan uses any asset valuation method other than fair market value, the method must be described in the Schedule B with enough detail so that another actuary could obtain reasonably similar results.⁵ The method must be used consistently from year to year and any change in the method is considered to be a change in funding method that requires approval under Code section 412(c)(5). A change in asset valuation method that is made solely to reflect a type of asset not previously held by the plan is not considered a change in funding method. A change in the date on which assets are valued is considered to be a change in funding method.

A method will not satisfy the regulation if it is designed to produce a result which is consistently above or below fair market value. Thus, for example, an asset valuation method that sets the actuarial value of assets equal to 95 percent of fair market value would not satisfy the regulation.⁶

An asset valuation method must take into account the fair market value of assets. It may do so in either of two ways. The method can reflect fair market value in a direct manner by using it in the computations underlying the method. Alternatively, if the actuarial value of assets is developed using some procedure that does not reflect fair market value in a direct manner, it can be reflected in an indirect manner by placing upper and lower "corridor limits" on the actuarial value, with the limits based directly on fair market value. The "general" corridor limits are at 80 percent and 120 percent of fair market value. Narrower limits are permitted; wider limits are not. If narrower limits are chosen, they need not be symmetric. For example, a corridor of 80 percent to 100 percent (of fair market value) is acceptable under the regulation.⁷

Subparagraphs (b)(7) and (b)(8) of the regulation describe the computation of an *average value* of assets. This "average value" formerly was an alternative mechanism for satisfying the requirement that the method "take into account" the fair market value. Briefly stated, the results of an asset valuation method were considered acceptable so long as they fell within a corridor of 85 percent to 115 percent of the "average value". However, the enacting legislation for OBRA 87 required that

⁵ For the 2000 plan year, this disclosure is made in an attachment entitled Schedule B, line 6 - Statement of Actuarial Assumptions/Methods. (See page 23 of the instructions to the package containing the 2000 Form 5500 and related schedules.)

⁶ See Example (4) under subparagraph (b)(9) of the regulation.

⁷ See Example (5) under subparagraph (b)(9) of the regulation.

this alternative mechanism “shall have no force and effect with respect to plans other than multiemployer plans”, effective for plan years beginning after 1987.⁸ Although the “average value” method no longer enjoys the regulatory status it once held, it continues to be an acceptable asset valuation method even for non-multi-employer plans, provided that its results are constrained to lie within an acceptable corridor around fair market value. It also continues to be an acceptable method for multiemployer plans (and, for these plans, there is no additional requirement that the result be constrained to remain within a corridor around fair market value). A numerical illustration of the method is shown in our discussion of “Approval 11” in chapter 3 of this paper.

Subparagraph (b)(9) of the regulation contains numerical and descriptive examples of various asset valuation methods. These will be discussed in detail in chapters 3, 4 and 5 of this paper.

(c) Fair market value of assets

The *fair market value* of an asset is defined as “the price at which the property would change hands between a willing buyer and a willing seller, neither being under any compulsion to buy or sell and both having reasonable knowledge of relevant facts”.

The proposed version of the regulation added that the principles of Code section 2031 would apply to the determination of fair market value. This Code section defines a taxpayer’s *gross estate*. The reader should bear in mind that the reference to Code section 2031 was removed when the regulation was finalized. However, various regulations and revenue rulings have been promulgated under Code section 2031 and these might be helpful in estimating the fair market value of non-traded assets. See, in particular, Rev. Rul. 59-60.

The Service publishes an *Internal Revenue Manual*, portions of which are used by its field agents when conducting examinations of pension plans. One chapter of this manual addresses the valuation of assets held by pension plans, with particular attention given to partnerships, real estate and a certain type of insurance policy. Although the focus of the Manual is on the proper valuation of assets for purposes other than funding (e.g., prohibited transactions and plan distributions), some of the material might be useful for funding purposes, as well.⁹

⁸ See section 9303(c) of Public Law 100-203 (“OBRA 87”).

⁹ See Chapter 8 (entitled Valuation of Assets) in section 7.7.1 of the Internal Revenue Manual. The insurance policies discussed in the Manual are described as “springing cash value life insurance”. Briefly stated, these are policies (often, single-premium) under which the cash values in the first few years after purchase are set at artificially low levels compared to the premium.

(d) Methods for taking into account the fair market value of certain agreements

This entire subparagraph of the regulation is “reserved”, even though the original proposed version addressed “insurance agreements” at length. In the years since the final regulation was issued, virtually no formal guidance has been given as to how insurance contracts are to be treated under a reasonable asset valuation method.¹⁰

(e) Effective date and transition rules

Strictly speaking, the requirements of the regulation became effective as of the same date as did ERISA’s minimum funding requirements. However, plans were not required to conform with the regulation’s specific rules until plan years beginning after November 12, 1980. For plans that were required to change their asset valuation methods in order to conform with the regulation, there were two methods by which this could be accomplished. One was the *retroactive recomputation method*, which called for retroactively recomputing the balance in the funding standard account as if the new asset valuation method had been used by the plan for all plan years starting with the first year for which Code section 412 applied. The second method was the *prospective gain or loss adjustment method*. This latter method called for treating the change in asset value as either an experience gain or loss, or as a change in assumptions.

Revenue Procedure 2000-40

As noted above, a change in the asset valuation method is considered to be a change in funding method under Code section 412(c)(5). Pursuant to that Code section, any such change must be approved by the Secretary of the Treasury (but, in practice, the approval comes from the Internal Revenue Service). The general procedure for requesting approval is set forth in Rev. Proc. 2000-41. In addition, the Service will grant automatic approval for changes to certain specified asset valuation methods (but subject to conditions and restrictions). The revenue procedure that grants this automatic approval is Rev. Proc. 2000-40 (herein, the “revenue procedure”). The methods that can receive automatic approval are described in the next chapter of this paper. A summary of these methods is given as Appendix D of this paper.

¹⁰ An intriguing exception can be found in private letter ruling 9342055. All of the plan's assets were invested in contracts backed by the general account of an insurer in rehabilitation. The ruling granted the plan permission to set the value of these contracts equal to a probability-weighted average of the amounts that would be recouped under three future scenarios (i.e., liquidation of the insurer, rehabilitation of the insurer with immediate payout to the plan, and rehabilitation of the insurer with gradual payout to the plan). The probabilities used to weight these three scenarios were chosen by the plan's actuary. In granting its approval, the ruling cited the general principle that a reasonable asset valuation method must reflect fair market value and observed that the stated book values of the contracts no longer reflected fair market value.

Except when the plan is using one of the various versions of the Aggregate funding methods, a change in the asset valuation method will create a change in the unfunded accrued liability for the plan (but, in some cases, the amount of the change might be zero). An amortization base must be established in the funding standard account to reflect this change. For purposes of both Code sections 412 and 404, this amortization base has an amortization period of 10 years. See section 5.03 of the revenue procedure.¹¹

Various conditions and restrictions on automatic approvals are set forth in section 6 of the revenue procedure. One condition is that the plan administrator or an authorized representative of the plan sponsor must agree to the change, and this agreement must be indicated on the Form 5500 for the plan year. Also, automatic approval is not available to change the asset valuation method if that method was changed in any of the four preceding plan years. Thus, for example, if automatic approval was used to change the asset valuation method for a plan year beginning January 1, 2000, automatic approval can not be used to change the asset valuation method until the plan year beginning January 1, 2005.

Furthermore, automatic approval under the revenue procedure is not available under any of the following circumstances:

- The Schedule B has already been filed or the due date for filing it has passed.
- The plan currently either has an outstanding balance of a minimum funding waiver under Code section 412(d) or is using an extended amortization period under Code section 412(e), or if there has been a request for either item for the current plan year.
- The change in method is done in connection with a plan spin-off or a merger of plans. However, this restriction does not apply in many cases. For example, the restriction does not apply in the case of mergers that are *de minimis* within the meaning of Reg. 1.414(l)-1(h). Even if not *de minimis*, automatic approval can still be granted in many other cases. See the “Special Approvals” under sections 4.05 through 4.08 of the revenue procedure for details.
- The plan is currently under examination by the Service. This includes pending examinations, as well as examinations which have progressed either to litigation or to the Appeals level within the Service.

¹¹ The use of a 10-year amortization period for purposes of Code section 412 is relatively recent, generally starting in 1995. Throughout the 1980's and early 1990's, credit bases that resulted from a change in funding method were amortized over 30 years; charge bases were amortized over various periods. See Rev. Procs. 80-50 and 85-29 for more detail.

- The plan was involved in a transaction described in Treasury Release R-2697 in the 15 years prior to date the method is changed. This Treasury Release addresses transactions that lead to a reversion of plan assets to the sponsor, including spin-off/terminations and termination/re-establishments.

If the plan's assets include universal life insurance policies, then automatic approval will be granted only if the cash values of the policies are treated in the same manner as all other assets of the plan.

If the plan is being terminated in the current plan year, the only automatically approved change in asset valuation method is a change to fair market value. Furthermore, even this limited approval is available only if (i) the fair market value of assets (exclusive of contributions receivable) is not less than the present value of all benefit liabilities (whether or not vested) and (ii) a timely notice of intention to terminate has been filed (as applicable) with the Pension Benefit Guaranty Corporation.

Code Section 412(c)(2)(B)

Code section 412(c)(2) also has a subparagraph (B), which reads as follows:

412(c)(2) Valuation of Assets

(A) In general

(B) Election with respect to bonds

The value of a bond or other evidence of indebtedness which is not in default as to principal or interest may, at the election of the plan administrator, be determined on an amortized basis running from initial cost at purchase to par value at maturity or earliest call date. Any election under this subparagraph shall be made at such time and in such manner as the Secretary shall by regulations provide, shall apply to all evidences of indebtedness, and may be revoked only with the consent of the Secretary. In the case of a plan other than a multiemployer plan, this subparagraph shall not apply, but the Secretary may by regulations provide that the value of any dedicated bond portfolio of such plan shall be determined by using the interest rate under [Code section (b)(5)].

The first two sentences under Code section 412(c)(2)(B) were enacted by ERISA; the third sentence was added by OBRA 87.

Regarding the use of amortized value for bonds (and other debt instruments), the Committee Reports for ERISA stated that, so long as bonds were used as "a long-term investment to be held to maturity, it would seem inappropriate to require the plan to change its valuation of the bond in accordance with market fluctuations". In contrast, the

Committee Reports for OBRA 87 offer no explanation as to why the use of amortized value was curtailed. However, note that, in the case of non-multiemployer plans, the OBRA 87 amendment does not prohibit the use of amortized value for bonds. Rather, the amendment simply removes the presumption that the amortized value is an acceptable value. It is still permissible for a non-multiemployer plan to value bonds on an amortized basis, so long as the plan's actuarial value of assets (including the value of non-bond assets) is constrained to lie within an acceptable corridor of fair market value.¹²

As amended by OBRA 87, Code section 412(c)(2)(B) grants the Treasury Department the authority to prescribe (by regulation) special valuation rules for bonds held in a dedicated bond portfolio. No such regulation has yet been issued. It might be of interest to note that dedicated bond portfolios received considerable attention during the early 1980's. Private letter rulings issued during that period took the position that the estimated liabilities funded by a dedicated bond portfolio could be valued at an interest rate different from (and usually higher than) the rate used for other liabilities under the plan. The rulings referred to this as a "dual rate" approach. When approving such approaches, the rulings required that the plan's normal valuation procedure be adjusted to reflect the dual interest rates, and that such adjustments be specified as part of the plan's cost method (not the asset valuation method). The details of the adjustments are beyond the scope of this paper.

A temporary regulation under Code section 412(c)(2)(B) was issued in December 1974 and remains in effect (but only for multiemployer plans). This regulation provides little guidance beyond that which appears in the statute. In December 1982, the Treasury Department proposed a regulation that was slightly more detailed in its guidance. However, this proposed regulation has never become final. Annotated outlines of both the temporary and the proposed regulations appear as Appendix C of this paper.

¹² This point is made clear in the Conference Committee Reports for OBRA 87, which states that the repeal of Code section 412(c)(2)(B) (with respect to plans other than multiemployer plans) causes bonds to be subject to the "general valuation rules".

3

SCHEDULED RECOGNITION METHODS
WITH LINEAR RECOGNITION

There is no standard terminology that is used to describe the various types of asset valuation methods. In this section, we discuss a class of methods which we will call the *scheduled recognition methods*. These methods do not fit squarely into the Jackson/Hamilton six-fold classification described in chapter 1 of this paper. As we are defining the term, a “scheduled recognition method” looks to the year-by-year changes in the market value of assets. For each year, the change in market value that is not attributable to contributions or benefit payments (and, possibly, expenses) is split into two portions. One portion is recognized immediately in the actuarial value of assets; the other is recognized on a gradual basis over future years according to a fixed schedule (hence our name for this class of methods). Particular members of this class of methods differ as to how they define the “split” between the immediate and deferred portions of each year’s investment return, as well as by the schedule used for recognizing the deferred portion.

A well-known example of a scheduled recognition method is the *average value* method described in subparagraphs (b)(7) and (b)(8) of Reg. 1.412(c)(2)-1 (the “regulation”).¹³ This method gives immediate recognition to all changes in market value other than those attributable to capital gains and losses (whether or not realized). Capital gains and losses are recognized on a linear basis over future years. An example of a method which is not a scheduled recognition method is the *cost value* method, which sets the actuarial value of assets equal to the cost value of those assets. Although this method is similar to the *average value* method in that it defers the recognition of capital gains and losses, there is no fixed schedule for recognizing those gains and losses over future years and, hence, it does not meet our definition of a scheduled recognition method.

Before proceeding with our discussion, we wish to make a distinction between a “method” and an “algorithm”. Under ERISA, an asset valuation method comprises more than a mere description of the algorithm that is used for the calculations. A “method” also includes a statement as to how the corridor limits of Reg. 1.412(c)(2)-1(b)(6) will be applied. If the method requires “phase-in” rules (as will often be the case for a newly-established plan), then these rules also must be specified as a part of the method. Finally, the “method” includes a statement as to how the actuarial value of assets will be calculated. In the case of scheduled recognition methods, this final step can be broken down into the two questions of (i) how each year’s investment return is split into “immediate” and “deferred” portions and (ii) the schedule by which the deferred portion will be recognized over future years. In this chapter, we consider only those types of scheduled recognition methods under which the deferred portion is recognized linearly over a

¹³ This method is illustrated in Example (6) of subparagraph (b)(9) of the regulation.

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Fair market value on 1/1	150,000	196,500	238,000
Cash flow during the year:			
Contributions	65,000	62,000	66,000
Benefit payments	22,000	24,000	25,000
Expenses	6,500	7,000	7,500
Interest and dividends	8,000	7,500	7,000
Net Cash Flow	44,500	38,500	40,500
Capital gains during the year:			
Realized	(2,000)	6,000	(8,000)
Unrealized	4,000	(3,000)	(42,500)
Total capital gains	2,000	3,000	(50,500)
Fair market value at 12/31	196,500	238,000	228,000

Figure 3.1: *Data from Example (6) of Reg. 1.412(c)(2)-1(b)(9)*

fixed number of years. Other types of scheduled recognition methods are discussed in chapter 4.

There are six asset valuation methods that receive automatic approval under Rev. Proc. 2000-40 (herein, the “revenue procedure”). A summary of these methods appears in Appendix D of this paper. One of the methods is Approval 10, which is fair market value. The other five are scheduled recognition methods. These are Approvals 11, 12, 15, 16, and 17. Of these five, the two basic methods are Approvals 11 and 15. It will be instructive to compare and contrast these two methods.¹⁴

We start by presenting numerical illustrations based on the data in Example 6 of Reg. 1.412(c)(2)-1(b)(9), which is reproduced in Figure 3.1. In each case, the goal is to determine the actuarial value of assets as of the beginning of Year 4. Assume that, for each method, the averaging period is four years. For the methods that require the calculation of an expected asset value, assume that the valuation interest rate is 7 percent and that all cash flows occur mid-year. Finally, assume that the plan has elected to employ the 80/120 corridor around fair market value (rather than some smaller corridor). Thus, regardless of the results of the calculations, the actuarial value must be restricted to a corridor of 182,400 to 273,600 (i.e., 80 percent and 120 percent of 228,000, which is the fair market value at the beginning of Year 4).

¹⁴ Approvals 12, 16 and 17 are variations of Approvals 11 and 15. The variations provide special "phase-in" rules which will be discussed later in this chapter.

Approval 11: Average market value without phase-in

This method produces results which are identical to those produced by the *average value* method described in subparagraphs (b)(7) and (b)(8) of the regulation. In our example, the actuarial value of assets is equal to the average of four values. The first is the fair market value as of the current valuation date; the other three are the “adjusted values” attributable to the three prior valuation dates. The “adjusted value” for a particular prior valuation date is equal to the fair market value as of that prior date, adjusted for any subsequent cash flows but not adjusted for any subsequent capital appreciation or depreciation (whether realized or unrealized). The four values are shown in the table below. The actuarial value of assets as of the beginning of Year 4 is equal to the arithmetic average of these four adjusted values. This average is 263,875 (which lies within the 80/120 corridor).

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Fair market value as of 1/1	150,000	196,500	238,000	228,000
Net adjustments attributable to:				
Year 3	40,500	40,500	40,500	n/a
Year 2	38,500	38,500	n/a	n/a
Year 1	44,500	n/a	n/a	n/a
ADJUSTED VALUE	273,500	275,500	278,500	228,000

Note that the adjusted values for Year 2 and Year 3 lie outside of the 80/120 corridor for the current valuation date. This is acceptable. The corridor is applied only to the final product of the method, not to any intermediate values.

We have three observations on this method. First, the adjusted values could have been derived by reducing the current fair market value by the amounts of prior capital gains. For example, the adjusted value of 275,500 (i.e., the adjusted value attributable to Year 2) is equal to the fair market value as of 1/1/4 reduced by (47,500), where the latter amount (a negative number) is the sum of the capital gains experienced during Year 2 and Year 3. This alternative calculation will be re-visited later in this chapter when we consider algebraically-equivalent algorithms.

Second, the method illustrated in our numerical example uses an averaging period of four years. The “four” refers to the number of valuation dates in the averaging period, not the number of years encompassed by those valuation dates.

Third, for each valuation date in the averaging period, the method calls for the use of “adjusted values” rather than market values. This is an essential aspect of the method. Without it, contributions and benefit payments that occurred during the averaging period would not have been recognized in full in the actuarial value of assets. As we noted in chapter 1, no rational asset valuation method will fail to give complete and immediate recognition to these items.

Approval 15: Smoothed market value without phase-in

For each valuation date in the averaging period (including the current valuation date), an expected market value of assets is developed and compared to the actual market value of assets. To the extent these two figures are different, the difference is recognized on a linear basis. In our example, the averaging period is four years and, hence, the unexpired investment experience is recognized at a rate of 25 percent per year. The unrecognized portion of each deferred amount starts at 75 percent for the year in which the gain or loss is computed and decreases to 50 percent in the next year and 25 percent in the year after that.

Computation of the expected asset values starts with the market value of assets from the prior year, brought forward with interest at the valuation interest rate. Adjustments are made for contributions and benefit disbursements, giving appropriate regard to the timing of these cash flows.¹⁵

The following table shows the computation of the smoothed market value at the beginning of Year 4. Recall our assumption that the valuation interest rate is 7 percent and that cash flows take place mid-year. Compound interest is used for mid-year cash flows.

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Fair market value as of 1/1	150,000	196,500	238,000	228,000
Expected value of assets at 1/1	150,000	204,980	249,563	297,071
Gain or (Loss)	0	(8,480)	(11,563)	(69,071)
Unrecognized portion from:				
Year 1				0
Year 2				(2,120)
Year 3				(5,781)
Year 4				(51,803)
 SMOOTHED VALUE				 287,704

As an example, the expected value of assets as of the beginning of Year 3 is equal to the sum of (i) 196,500 (i.e., the market value of assets as of the beginning of Year 2) along with one year of interest at 7 percent, plus (ii) 38,000 (i.e., the excess of contributions over benefit payments during Year 2), along with half a year of interest (using compound interest).

The final smoothed value is equal to the fair market value, reduced by the unrecognized portion of any prior investment “gains” and increased by the unrecognized

¹⁵ The revenue procedure does not call for treating plan expenses as disbursements from the fund. In effect, the procedure calls for treating plan expenses as investment losses (and, thus, expenses are reflected in the expected value of assets only to the extent that they are reflected in the valuation interest rate). Although it is possible to construct a methodology that recognizes expenses as disbursements from the fund, a literal reading of the revenue procedure suggests that such a methodology would not receive automatic approval.

portion of any prior investment “losses”. Here, the smoothed value is 287,704, which lies above the 80/120 corridor. Thus, the actuarial value of assets is set equal to the upper end of the corridor, 273,600.

Note that the expected value of assets is based upon the prior year’s market value of assets. Although one can construct a method that gives immediate recognition to expected investment income based on the prior year’s actuarial value of assets, such a method would not be eligible for automatic approval under the revenue procedure.

Algebraic Equivalence

To summarize thus far, we have described two asset valuation methods that are *scheduled recognition* methods. Both methods identify a portion of each year’s investment return and spread the recognition of that portion evenly over a fixed number of years (in our examples, four years). However, the two methods differ with respect to how they define the amount that receives deferred recognition. Under Approval 11, the deferred portion is equal to the capital gains and losses (whether or not realized); under Approval 15, the deferred portion is equal to the unexpected change in market value (measured with reference to the valuation interest rate).

Let us now consider the following asset valuation method.

The actuarial value of assets is equal to the current fair market value, reduced by 3/4 of the capital gains experienced by the plan during the preceding year, 2/4 of the capital gains experienced during the second preceding year, and 1/4 of the capital gains experienced during the third preceding year. For this purpose, capital losses shall be treated as negative gains.

This method is similar to that of Approval 11, in that the deferred portion of each year’s investment return is equal to the capital gains and losses experienced in that year. On the other hand, the algebraic formulation is similar to that of Approval 15, in that it sets the actuarial value of assets equal to the current market value decreased by linearly-decreasing portions of prior deferred amounts. Using the same data as was used before, the computation of the actuarial value of assets under this method is as follows:

Fair market value at beginning of Year 4:	228,000
<u>increased</u> by 75% of capital <u>depreciation</u> in Year 3:	37,875
reduced by 50% of capital appreciation in Year 2:	(1,500)
reduced by 25% of capital appreciation in Year 1:	(500)
ACTUARIAL VALUE	263,875

The actuarial value produced here is the same as was produced in our discussion of Approval 11. This is no coincidence. Indeed, the algorithm just described is “algebraically equivalent” to the algorithm described in our earlier discussion. To prove

this, we start with the observation that the market value of assets, MV , as of any valuation date is equal to the market value of assets as of some initial date, increased by the sum of the yearly changes in market value.

$$MV_t = MV_0 + \sum_{i=0}^{t-1} (MV_{i+1} - MV_i)$$

Under asset valuation methods of the “scheduled recognition” type, the investment return experienced each year is split into two portions: one which is given immediate recognition and another which is recognized gradually over time. We will refer to these portions, respectively, as the “immediate recognition” and “deferred recognition” portions (denoted below as *Imm Rec* and *Def Rec*).

$$MV_t = MV_0 + \sum_{i=0}^{t-1} Contrib_i - \sum_{i=0}^{t-1} BenPmts_i + \sum_{i=0}^{t-1} (Imm Rec_i + Def Rec_i)$$

The algebraic formulation described under Approval 11 calls for the computation of *adjusted values* for each valuation date in the averaging period. Each adjusted value is equal to the market value of assets on the particular valuation date, adjusted for certain amounts that arose after that particular valuation date. These adjustments include contributions and benefit payments, as well as the portions of each year’s investment return that were given immediate recognition. Thus, if the current valuation date is at time t , the adjusted value of assets (denoted *Adj Val*) attributable to the valuation date at time $t - s$ is equal to:

$$Adj Val'_{t-s} = MV_{t-s} + \sum_{i=0}^{s-1} Contrib_{t-s+i} - \sum_{i=0}^{s-1} BenPmts_{t-s+i} + \sum_{i=0}^{s-1} Imm Rec_{t-s+i}$$

But, the market value at time $t - s$ is equal to the market value at time t , reduced by all of the changes in market value that occurred between those two times. Thus,

$$\begin{aligned} Adj Val'_{t-s} &= \left[MV_t - \sum_{i=0}^{s-1} Contrib_{t-s+i} + \sum_{i=0}^{s-1} BenPmts_{t-s+i} - \sum_{i=0}^{s-1} (Imm Rec_{t-s+i} + Def Rec_{t-n+i}) \right] \\ &\quad + \sum_{i=0}^{s-1} Contrib_{t-s+i} - \sum_{i=0}^{s-1} BenPmts_{t-s+i} + \sum_{i=0}^{s-1} Imm Rec_{t-s+i} \\ &= MV_t - \sum_{i=0}^{s-1} Def Rec_{t-s+i} \end{aligned}$$

The actuarial value of assets as of time t is equal to the arithmetic average of all of the adjusted values in the averaging period. If the averaging period is n years, then:

$$\begin{aligned}
 AVA_t &= \frac{1}{n} \sum_{z=t-n+1}^t Adj Val'_z \\
 &= \frac{1}{n} \sum_{z=t-n+1}^t \left\{ MV_t - \sum_{i=z}^{t-1} Def Rec_{t-1-i} \right\} \\
 &= MV_t - \sum_{i=1}^{n-1} \left(\frac{n-i}{n} \right) (Def Rec_{t-i})
 \end{aligned}$$

This final formulation is precisely that of an algorithm that sets the actuarial value equal to the current market value, reduced by linearly-decreasing portions of prior deferred amounts. The algebraic equivalence exists regardless of the value of n (provided, of course, that the value of n is the same in both formulations). However, Approval 11 is available only if n does not exceed five. The same constraint is placed on Approval 15. Both of these constraints are consistent with the general requirement under the regulation's *average value* method (found at Reg. 1.412(c)(2)-1(b)(7)(ii)).¹⁶

The Recursive Algorithm

Thus far, we have shown that an algorithm that sets the actuarial value of assets equal to the arithmetic average of several “adjusted values” is algebraically equivalent to one that sets the actuarial value equal to the current market value of assets, reduced by linearly-decreasing portions of prior deferred amounts. We now consider a third type of algorithm, under which the actuarial value of assets is defined in a recursive manner. Let us adopt a heuristic approach and consider the case where (as in our example) the averaging period is equal to four years. Then, the formulation just derived gives us:

$$\begin{aligned}
 AVA_t &= MV_t - \frac{3}{4} Def Rec_{t-1} - \frac{2}{4} Def Rec_{t-2} - \frac{1}{4} Def Rec_{t-3} \\
 AVA_{t-1} &= MV_{t-1} - \frac{3}{4} Def Rec_{t-2} - \frac{2}{4} Def Rec_{t-3} - \frac{1}{4} Def Rec_{t-4}
 \end{aligned}$$

Subtracting the second equation from the first produces:

$$AVA_t - AVA_{t-1} = MV_t - MV_{t-1} - \frac{3}{4} Def Rec_{t-1} + \frac{1}{4} (Def Rec_{t-2} + Def Rec_{t-3} + Def Rec_{t-4})$$

¹⁶ Nothing in the algebra or the revenue procedure prohibits using a value of n that is greater than five. However, if a plan seeks to change its asset valuation method to one which uses a value greater than five, automatic approval will not be available for the change.

But, we also have the following recursive definition for the market value of assets:

$$MV_t = MV_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + Def Rec_{t-1}$$

Putting this into the previous equation gives:

$$AVA_t = AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + \frac{1}{4} \sum_{i=1}^4 (Def Rec_{t-i})$$

The extension to general values of n is a straightforward exercise in the algebra of summations. We leave this task to the reader and give only the result, as follows:

$$AVA_t = AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + \frac{1}{n} \sum_{i=1}^n (Def Rec_{t-i})$$

This is the recursive expression for the actuarial value of assets under a scheduled recognition method that calls for linear recognition of deferred amounts over n years. If the deferred amounts are defined as capital gains and losses (whether or not realized), then the sum of *Contrib*, *BenPmts* and *Imm Rec* is equal to the net cash flow as defined in the illustration of the regulation's *average value method* (see Example (6) in the regulation).

It might be helpful to compare the recursive expression for the actuarial value of assets with the one for the market value of assets. These expressions are:

$$AVA_t = AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + \frac{1}{n} \sum_{i=1}^n (Def Rec_{t-i})$$

$$MV_t = MV_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + Def Rec_{t-1}$$

Comparing these two expressions shows that the actuarial value of assets under a linear scheduled recognition method (i.e., a scheduled recognition method that calls for linear recognition of the deferred amounts) changes from year to year in a manner that is almost identical to the year-by-year changes in the market value of assets. The sole difference lies in the recognition of the deferred amounts. Whereas the change in market value reflects (in full) the deferred amount that arose in the prior year, the change in

actuarial value reflects the average of the deferred amounts that arose in the previous n years.

When applying the recursive algorithm in a year following one in which the actuarial value of assets was constrained by the corridor limits, there is the question of whether the current year's value should reflect the prior year's value as constrained by the corridor limits or, alternatively, without regard to the prior year's limits. Stated differently, this is the question of whether the corridor limits act merely as a temporary "override" of the results produced under the normal operation of the method or, alternatively, serve to affect the calculations for subsequent years. In order to answer this question, it might be helpful to consider the following simple numerical example.

At time $t = 0$, a plan has assets equal to 130 (and this value had been constant for many years prior to $t = 0$). Assume that there have been no contributions, benefit payments or other disbursements during any year. At $t = 1$, the value of the plan's assets is 150 (which reflects a capital gain of 20). At $t = 2$, the value of the plan's assets is 100 (which reflects a capital loss of 50). The asset value remains at 100 for many years thereafter.

If this plan uses the regulation's *average value* method, with an averaging period of five years and corridor limits of 80 percent and 120 percent, the actuarial value of assets (starting from $t = 0$) will be as follows: 130, 134, 128 (but limited to 120), 122 (but limited to 120), 116, 110, 100 (at $t = 6$ and thereafter). If we were to implement the regulation's average value method using the algebraically-equivalent recursive algorithm, we would expect to derive the same sequence of actuarial values. The reader can verify that this will be the case only if the recursive algorithm starts from the prior year's actuarial value without regard to the prior year's corridor limits.

On the other hand, if the recursive algorithm were to start from the prior year's value after application of the prior year's corridor limits, the sequence of actuarial asset values would be (starting from $t = 0$) 130, 134, 128 (but limited to 120), 114, 108, 102, 92 (at $t = 6$ and thereafter). This sequence is patently unreasonable, because it "resets" to a value of 92 (and not the market value of 100). To see why this happens, note that, under the regulation's average value method, the capital loss of 50 was scheduled to be recognized in five annual installments of (10). However, by allowing the corridor limits to affect the calculations in subsequent years, an "unscheduled" recognition of (8) occurred at $t = 2$. Furthermore, nothing in the algorithm prevented that "unscheduled" loss amount from being recognized a second time in future years.

Allowing the corridor limits to affect the calculations in subsequent years is not necessarily a fatal error, provided the asset valuation method incorporates some supplemental procedure for preventing the "unscheduled" amounts from being recognized more than once. However, this is not commonly done. As our example illustrates, the absence of any such procedure implies that the method should treat the corridor limits merely as causing a temporary "override" of the result that would otherwise have been produced under the method for the year. Thus, when using the recursive algorithm (and unless the method satisfactorily provides otherwise), the actuarial value of assets in a year following one in which the actuarial value was

constrained by the corridor limits should reflect the prior year's value without regard to the prior year's corridor limits.¹⁷

To summarize our discussion of algebraic equivalence, we have described three types of algorithms that can be used to implement an asset valuation method of the "scheduled recognition" type. These are (i) an average of "adjusted values", (ii) market value minus portions of prior deferred amounts, and (iii) a recursive algorithm. Although our discussion in this chapter is limited to linear scheduled recognition methods, we will see in chapter 4 that these three types of algorithms can also be used for methods that call for the non-linear recognition of deferred amounts.

Approvals 12, 16 and 17: The phase-in rules

Consider a newly-established plan that intends to use the regulation's *average value* method with an averaging period of four years. For the first three valuation dates, the plan simply does not have enough experience to satisfy the data requirements of the method. For such a plan, it is necessary to employ some type of "phase in" rule for the initial years.

In the previous section, we demonstrated that the regulation's *average value* method can be implemented using the following algorithm:

$$AVA_t = MV_t - \sum_{i=1}^{n-1} \left(\frac{n-i}{n} \right) (DefRec_{t-i})$$

Viewing the method from the perspective of this algorithm suggests a straightforward solution to the phase-in problem: simply set the value of *Def Rec* to zero for any year prior to the establishment of the plan. To illustrate this approach, we will calculate the actuarial value of assets as of the beginning of Year 2 using the data in Figure 3.1. For the purpose of this illustration, we will assume that the plan was established as of the beginning of Year 1 (and will ignore any question as to how the plan came to have an initial value of assets). The actuarial value of assets at the beginning of Year 2 is 195,000, derived as follows:

¹⁷ This issue concerning the corridor limits is not unique to scheduled recognition methods. It can arise under any method that calls for the use of corridor limits. For example, in chapter 5, we describe a method that sets the actuarial value of capital assets equal to their "book values", which are equal to their initial cost values, increased at a specified assumed rate of capital appreciation. If the actuarial value of assets for a year is constrained by the corridor, there is the question of whether the "book values" of the capital assets should be adjusted to reflect the corridor.

THE PENSION FORUM

Fair market value at beginning of Year 2:	196,500
reduced by 75% of capital appreciation in Year 1:	(1,500)
reduced by 50% of capital appreciation in Year 0:	n/a
reduced by 25% of capital appreciation in Year -1:	n/a
ACTUARIAL VALUE	195,000

Thus far, we have considered the situation of a newly-established plan. However, there are reasons why a “phase in” rule might also be desirable for an existing plan when it changes its asset valuation method. One reason might be the inconvenience of assembling asset information that had not been required under the plan’s prior asset valuation method. A second reason might be the sponsor’s desire to reset the actuarial value of assets to market value without actually adopting “fair market value” as the plan’s asset valuation method. The relevance of this latter reason will be explained below. Approvals 12, 16 and 17 are each intended to provide a type of phase-in rule that can be used for existing plans when they change their asset valuation methods.

Approval 16 provides a phase-in rule that is conceptually similar to the one used in our illustration of the newly-established plan. Under Approval 16, the actuarial value of assets is set equal to the market value of assets as of the date the asset valuation method is changed (a process sometimes called *marking to market*). For years subsequent to the change, the method is identical to the method under Approval 15, except that the only adjustments made to the fair market value are those attributable to deferred amounts (here, unexpected investment income based on the prior year’s market value of assets) that arose after the change.

In our illustration of the newly-established plan, it seemed quite plausible to ignore deferred amounts that would have “arisen” prior to the date the plan was established. In the context of an existing plan, this process might seem arbitrary. This is not the case. To the extent that the new method would otherwise have called for the existence (as of the date the new method was adopted) of unrecognized portions of prior deferred amounts, the “mark to market” caused all such amounts to become immediately recognized as of that date. Thus, deferred amounts that arose prior to the change are not ignored simply as a matter of convenience, but as a necessary consequence of the “mark to market”.

Approval 12 is similar to Approval 16, in that it resets the actuarial value of assets to fair market value and, as a consequence, calls for ignoring the deferred amounts that arose prior to the date the assets were “marked to market”. However, the two approvals differ with respect to the definition of the amounts that are deferred, as well as with respect to the date that the assets are “marked to market”. Regarding the definition of the deferred amounts, Approval 12 applies when deferred recognition is given to capital gains and losses, whether or not realized (unlike Approval 16, which gives deferred recognition to unexpected investment income). Regarding the date the assets are “marked to market”, Approval 12 calls for doing so as of the date one year prior to the

date the new method is adopted (unlike Approval 16, which calls for doing so on the date the new method is adopted). Thus, under Approval 12, the actuarial value of assets as of the date the new method is adopted generally will not be equal to the fair market value of assets as of that date.¹⁸

The method of Approval 12 is a modification of the method of Approval 11 (which, in turn, is the same as the regulation's *average value* method). The "phase-in" is achieved by setting the adjusted values for valuation dates prior to the "mark to market" date equal to the adjusted value for the "mark to market" date. Algebraically, this is equivalent to assuming that all capital gains and losses that arose prior to the "marking to market" have already been recognized. Consequently, it would be possible to implement Approval 12 by using the same algorithm as described under Approval 16 (but keeping in mind that the capital gains and losses that arose in the year immediately prior to the change in method have not yet been recognized).¹⁹

We now turn to Approval 17. Like the method in Approval 12, this method defines the deferred amounts as capital gains and losses (whether or not realized). Unlike Approval 12, the phase-in rule under Approval 17 calls for "marking to market" as of the date the new method is adopted (and, thus, the actuarial value of assets as of that date is equal to their fair market value). In subsequent years, the actuarial value of assets is calculated according to the regulation's *average value* method except that the averaging period is taken to be the lesser of (i) the averaging period called for under the method after it is fully phased-in (and this period may not be greater than five years) and (ii) the number of years (including the then-current year) since the method was adopted. Thus, for example, the averaging period for the valuation performed one year after the method is adopted will be two years, even if the method calls for an averaging period of (say) five years after it is fully phased-in.²⁰

¹⁸ A point of clarification is in order. When we speak of "marking to market" one year prior to the date the new method is adopted, we do not mean that the funding calculations for the prior year reflected the "mark to market". Nor do we mean that the prior year's calculations must be re-done to reflect the "mark to market". Instead, we mean only that the new asset valuation method operates as if the actuarial value of assets had been "marked to market" on the earlier date. For ease of exposition, we will continue to speak of "marking to market" as of a prior date and ask that the reader recognize our true meaning.

¹⁹ Indeed, were it not for the differences in the definition of the deferred amounts and the date the assets are "marked to market", Approvals 12 and 16 would be algebraically equivalent. The interested reader can verify this by re-visiting the expression (on page 3-6) that shows the adjusted value for a prior valuation date equal to the market value as of the current valuation date, reduced by prior deferred amounts. If we set all of the deferred amounts that arose prior to time $t - 1$ equal to zero and then take the average of all of the adjusted values in the averaging period, we will produce an algebraic formulation that is similar to the one in Approval 16 (but reflecting the earlier "mark to market" date).

²⁰ Under Approval 17, deferred amounts that arise during the phase-in period are recognized according to a schedule that is decidedly non-linear. Nonetheless, we have chosen to classify Approval 17 as a linear scheduled recognition method because the non-linear aspect is only temporary. We will revisit the non-linear phase-in in chapter 4.

The following table illustrates the operation of Approvals 12, 16 and 17. Again, we use the data reproduced in Figure 3.1. For purposes of Approval 16 (which requires the calculation of an expected asset value), recall our assumption that the valuation interest rate is 7 percent and that cash flows are assumed to arise mid-year (and compound interest is used for the mid-year cash flows). In all three cases, we assume that the new method was adopted as of the beginning of Year 2 (not Year 1) and that the method calls for an averaging period of four years.

Actuarial value of assets produced under each phase-in rule
 (using the data in Figure 3.1 and assuming the new method was adopted on 1/1/2)
 Figures do not reflect the 80/120 corridor limits

Valuation Date	Approval 12	Approval 16	Approval 17
1/1/2	195,000	196,500	196,500
1/1/3	234,750	246,672	236,500
1/1/4	263,875	285,584	260,667

We have three observations. First, under Approval 12, the actuarial value of assets as of 1/1/4 is equal to the actuarial value as of that same date under Approval 11. Thus, Approval 12 became fully phased-in as of the third valuation date under the method, even though the method calls for an averaging period of four years. This is because, under Approval 12, the “mark to market” occurs one year prior to the date the method is adopted. Second, under Approval 16, the actuarial value of assets as of 1/1/4 is equal to the preliminary value calculated in our discussion of Approval 15, except that the adjustment attributable to the Year 1 experience has been ignored. Third, in the case of Approval 16, we treated plan expenses as investment losses, and not as disbursements from the fund. See our comment in footnote #3.

Concluding Comments

In this chapter, we introduced a class of asset valuation methods which we call the *scheduled recognition* methods. These methods share the following characteristics:

1. Each year, the change in market value is determined. The amount of the change that is not attributable to contributions and benefit payments (and, possibly, expenses) is split into two portions: one which is recognized immediately in the actuarial value of assets and another which is recognized gradually over future years. The latter portion is said to be subject to “deferred recognition”.
2. The deferred amount is given recognition over future years according to a fixed schedule that is specified (either directly or indirectly) by the method.

3. The method is described in terms of the algorithm by which the method is implemented.

Regarding the first item, automatic approvals are available under Rev. Proc. 2000-40 only if the deferred amount is defined either as capital gains (whether or not realized) (see Approvals 11, 12 and 17) or as unexpected investment income based on the prior year's market value of assets (see Approvals 15 and 16). Other definitions of the deferred amount are possible, but are not eligible for automatic approval. For example, it is possible to define the deferred amounts as the portion of each year's investment income that either exceeds or falls below the amounts implied by some specified corridor of yields. As another example (no longer much used), it is possible to define the deferred amounts as the unrealized capital gains and losses (thus giving immediate recognition to realized capital gains and losses).

Regarding the second item, our discussion in this chapter was limited to those scheduled recognition methods which call for linear recognition of the deferred amount over a fixed number of years specified in the method. Automatic approvals to change to these methods are available only if the number of years is not greater than five. We also discussed situations in which it is either necessary or desirable to use a "phase-in" rule for the first few years after a method is adopted. When such a rule is used, it must be specified as a part of the method. Automatic approvals are available under Rev. Proc. 2000-40 for three methods that use "phase-in" rules (see Approvals 12, 16 and 17).

Regarding the third item, we have shown that a particular scheduled recognition method can be described by more than one algorithm, each producing the same results as the others. Thus, for any combination of (i) the definition of the deferred amounts and (ii) the schedule by which those amounts are recognized, the choice of algorithm is largely one of personal preference on the part of the actuary. The automatic approvals in Rev. Proc. 2000-40 make specific reference to this fact by granting approval to "any formulation that is algebraically equivalent" to the algorithm described in the procedure. Nonetheless, it is customary to describe these asset valuation methods in terms of the algorithm by which they are implemented.

Finally, under ERISA, it is necessary for the method to specify that the actuarial value of assets will be constrained to lie within an acceptable corridor around fair market value. See Reg. 1.412(c)(2)-1(b)(6) for details on the corridor limits (but note that the regulation has not yet been changed to reflect OBRA 87's prohibition of the "average value" corridor). The automatic approvals in Rev. Proc. 2000-40 are available only if the asset valuation method defines the corridor to be 20 percent above and below fair market value.

Much of this chapter has been devoted to describing the methods that receive automatic approval under Rev. Proc. 2000-40. A summary of these methods appears as Appendix D of this paper.

4

SCHEDULED RECOGNITION METHODS WITH NON-LINEAR RECOGNITION

In chapter 3, we introduced our definition of the *scheduled recognition* class of asset valuation methods. Briefly stated, we defined these methods to be those that (i) identify a portion of each year’s investment return as the “deferred” portion and (ii) recognize that deferred portion over future years according to a fixed schedule. Our discussion in chapter 3 was limited to those members of the class that called for linear recognition of the deferred amounts. In this chapter, we discuss members of the class that call for non-linear recognition.

Recognition Using Annuities-Certain

Any scheduled recognition method that calls for linear recognition of deferred amounts can be modified to call for recognition using annuities-certain. With this modification, the actuarial value of assets is derived as:

$$AVA_t = MV_t - \sum_{i=1}^{n-1} \frac{\ddot{a}_{\overline{n-i}|}}{\ddot{a}_{\overline{n}|}} (Def Rec_{t-i})$$

For a numerical example, let us define the deferred amounts to be capital gains and losses (whether or not realized). Then, using the data reproduced in Figure 3.1, with an interest rate of 7 percent and an averaging period of 4 years, the actuarial value of assets as of the beginning of Year 4 is found as follows:

Fair market value at beginning of Year 4:	228,000
<u>increased</u> by 77.48% of capital <u>depreciation</u> in Year 3:	39,126
reduced by 53.38% of capital appreciation in Year 2:	(1,601)
reduced by 27.59% of capital appreciation in Year 1:	(552)
ACTUARIAL VALUE	264,973

This amount is within the 80/120 corridor around fair market value and can be accepted as the final actuarial value of assets.

The fractions in the algebraic statement of the method (i.e., the fractions defined in terms of annuities-certain) reflect the portion of the prior years’ deferred amounts that remain unrecognized as of the current valuation date. For any particular deferred amount, the pattern by which it is recognized can be derived by taking first differences of

the sequence of these fractions. The reader can verify that, in our example, the deferred amounts are recognized over four years according to the following pattern: 22.52 percent in the first year, 24.10 percent in the second year, 25.79 percent in the third year and 27.59 percent in the fourth year. The reader also can verify that these amounts all have the same present value at an interest rate of 7 percent.²¹

There is a recursive formulation, as follows:²²

$$\begin{aligned}
 AVA_t &= AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + \sum_{h=1}^n \frac{v^{n-h}}{\ddot{a}_{\overline{n}|}} (Def Rec_{t-h}) \\
 &= AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + \sum_{h=1}^n \frac{(1+i)^h}{\ddot{s}_{\overline{n}|}} (Def Rec_{t-h})
 \end{aligned}$$

Because this expression incorporates an interest-rate factor, we have changed the summation variable to h (thus allowing us to use i as the valuation interest rate). The fractional coefficient in the summation is a closed-form expression for the recognition factors described above.

Regulation Example (7)

Plan G computes the actuarial value of the plan assets as follows: The current fair market value of the plan assets is averaged with the most recent prior adjusted actuarial value. This average value is adjusted up or down toward the current fair market value by 20 percent of the difference between it and the current fair market value of the assets.

As described above, the actuarial value of assets under this method is computed using a two-step process. However, straightforward algebraic analysis shows that this two-step method is equivalent to setting the actuarial value equal to 40 percent of the prior adjusted actuarial value plus 60 percent of the current fair market value. This formulation is simpler to work with than the one described in the regulation and, in our calculations below, we will use the simpler formulation.

²¹ The present-value relationship between the fractions will exist regardless of the interest rate and the value of n . To see this, recall that the difference between the present value of a certain annuity-due with a term of $(k + 1)$ and the present value of one with a term of k is equal to vk . From this basic result, it should be clear that the all of the fractions must be present values of each other.

²² The proof of this is a straightforward exercise in the algebra of summations. To generate the proof, use the formulation given at the beginning of this section to form expressions for the actuarial value of assets at times t and $t + 1$. Simplifying the difference between these two expressions leads to the recursive formulation.

The regulation’s description of the method is imprecise, because it does not specify what is meant by the phrase “most recent prior adjusted actuarial value”. For our calculations, we will define this term to mean the actuarial value determined as of the prior valuation date (without regard to the 80/120 corridor), increased by the net cash flow during the year. For this purpose, the term “net cash flow” means all additions to and reductions in plan assets other than those attributable to capital gains (whether or not realized). Thus, we are defining the term so as to give immediate recognition to the same items that are given immediate recognition under the regulation’s definition of *adjusted value*.

We will provide a numerical illustration based on the data in Figure 3.1. Because the actuarial value of assets on a given valuation date is a function of the actuarial value as of the prior valuation date, we need to reconstruct the computations starting with Year 1. The following table shows the results of these computations.

	<i>Prior Actuarial Value</i>	<i>Prior Cash Flow</i>	<i>Current Value plus Cash</i>	<i>Fair Market Value</i>	<i>40/60 Weighted Average</i>
Beginning of Year 1	n/a	n/a	n/a	150,000	150,000
Beginning of Year 2	150,000	44,500	194,500	196,500	195,700
Beginning of Year 3	195,700	38,500	234,200	238,000	236,480
Beginning of Year 4	236,480	40,500	276,980	228,000	247,592

The preliminary actuarial value of 247,592 is within the 80/120 corridor and is accepted as the final actuarial value as of the beginning of Year 4.

Thus far, we have not shown that this method is a member of the “scheduled recognition” class of methods. However, it can be proved that the actuarial value of assets under this method (prior to application of the corridor limits) is equal to the current fair market value, decreased by portions of the deferred amounts that arose in every year since the method was adopted. Assuming that the method was adopted at time $t = 0$ (and that the value of assets as of that date was “marked to market”), the method can be expressed as:

$$AVA_t = MV_t - \sum_{i=1}^t k^i (DefRec_{-i})$$

where k is the weight given to the prior adjusted actuarial value (in our example, 40 percent). We will prove this by induction.

According to the original formulation of the method, the actuarial value of assets at time $t + 1$ is as follows (where *PAAV* refers to “prior adjusted actuarial value”):

$$AVA_{t+1} = k \cdot PAAV_{t+1} + (1 - k) MV_{t+1}$$

We also have the following:

$$PAAV_{t+1} = AVA_t + Contrib_t - BenPmts_t + Imm Rec_t$$

and

$$MV_{t+1} = MV_t + Contrib_t - BenPmts_t + Imm Rec_t + Def Rec_t$$

Substituting these expressions into the definition of the actuarial value of assets at time $t + 1$, we get:

$$\begin{aligned} k \cdot PAAV_{t+1} + (1-k)MV_{t+1} &= k \cdot AVA_t + k(Contrib_t - BenPmts_t + Imm Rec_t) \\ &\quad + (1-k)MV_t + (1-k)(Contrib_t - BenPmts_t + Imm Rec_t + Def Rec_t) \end{aligned}$$

The reader can verify that this simplifies to:

$$AVA_{t+1} = MV_{t+1} - k(MV_t - AVA_t) - k \cdot Def Rec_t$$

Then, assuming that our proposed expression for the actuarial value of assets is true at time t , we can substitute the proposed expression, as follows:

$$\begin{aligned} AVA_{t+1} &= MV_{t+1} - k \left(MV_t - \left\{ MV_t - \sum_{i=1}^t k^i (Def Rec_{t-i}) \right\} \right) - k \cdot Def Rec_t \\ &= MV_{t+1} - \sum_{i=0}^t k^{i+1} (Def Rec_{t-i}) \\ &= MV_{t+1} - \sum_{i=1}^{t+1} k^i (Def Rec_{t+1-i}) \end{aligned}$$

The final expression is identical to the proposed expression, except that it reflects a valuation at time $t + 1$ instead of time t . Thus, we have proven that if the expression is correct at time t , it is also correct at time $t + 1$. In order to complete the proof, we only need demonstrate that the expression is correct at time 1. This is a straightforward task that is left to the reader (keeping in mind that, by assumption, the actuarial value of assets at time 0 is equal to the market value of assets).

The method also has a recursive formulation, as follows:²³

$$AVA_t = AVA_{t-1} + Contrib_{t-1} - BenPmts_{t-1} + Imm Rec_{t-1} + (1-k) \sum_{i=1}^t k^{i-1} (Def Rec_{t-i})$$

Although it is unlikely that any actuary would use this recursive formulation for their computations, it is useful in that it gives us the pattern by which each deferred amount is recognized over future years. As of the valuation date immediately subsequent to the year in which the deferred amount arose, the recognition factor is $(1 - k)$. For each year thereafter, the recognition factor is equal to the factor for the previous year, multiplied by k . This pattern is an infinite series whose sum is 100 percent.

We have just shown that this asset valuation method is a member of the “scheduled recognition” class of methods, with the deferred amounts being recognized on a non-level basis over all future years. As with other scheduled-recognition methods, the actuarial value of assets under this method (prior to application of the corridor limits) can be viewed as an average of “adjusted values”. In this case, however, the actuarial value is equal to a weighted average of “adjusted values” attributable to every year since the method was adopted (assuming that the actuarial value of assets was “marked to market” as of that date). The formulation is as follows (where $t = 0$ is the valuation date for the year the method was adopted):²⁴

$$AVA_t = k^t \cdot AdjVal_0^t + (1-k) \sum_{z=1}^t k^{t-z} \cdot AdjVal_z^t$$

Recall that we found the regulation’s definition of this method ambiguous, because of its failure to specify the meaning of the term “prior adjusted actuarial value”. In order to proceed with a numerical illustration, we defined the term in a manner analogous to the way an adjusted value is calculated under the regulation’s *average value* method (thus giving deferred recognition to capital gains, whether or not realized). However, other definitions are possible. In particular, it is possible to define the term to mean the prior actuarial value of assets (without regard to the corridor limits), increased with interest at the valuation interest rate and further adjusted for contributions and benefits, along with interest on these items (thus giving deferred recognition to the difference between the actual investment return and the expected investment return). But for this change in the definition of the deferred amounts (and, by consequence, the definition of the immediately-recognized amounts), all of the foregoing algebra would

²³ This formulation can be derived by calculating the difference between the actuarial value of assets at time $t + 1$ and at time t . For each of these two values, use the formulation that sets them equal to the market value of assets at those dates, reduced by the unrecognized portions of prior deferred amounts (i.e., the formulation that was proved on the previous page). Then, the recursive formulation can be obtained with basic algebra.

²⁴ A direct proof can be obtained by manipulating the expression shown on page 4-3, but this would be a tedious exercise in the algebra of summations. An alternative proof can be achieved through induction.

remain unchanged. Thus, this alternative method also produces an actuarial value of assets that is a weighted average of the “adjusted values” for all years since the method was adopted. In this context, however, the term “adjusted value” is not given the same definition as in the regulation. Instead, the “adjusted value” attributable to a prior valuation date in the averaging period is equal to the expected actuarial value of assets as of the current valuation date, based on the actuarial value of assets as of the prior valuation date, adjusted for subsequent contributions, benefit payments and expected investment earnings. This alternative method was approved in private letter ruling 8245038.²⁵

Rev. Proc. 2000-40: Approval 17 (revisited)

In Chapter 3, we classified the method described in Approval 17 as a linear scheduled recognition method, even though the transition period was non-linear. Here, we describe the non-linear aspect of the transition.

In the revenue procedure, the method of Approval 17 is couched in terms of the regulation’s *average value* method. However, we have shown (in chapter 3) that the actuarial value of assets under the average value method can be expressed in an algebraically-equivalent form as being equal to the current market value of assets minus the unrecognized portions of prior deferred amounts. This perspective is particularly useful, because it allows an easy computation of the recognition factors for any year within the “phase-in” period. For example, assume the method is adopted at time t and that the current valuation date is $t + 2$. Also assume that, after the phase-in has been completed, the method calls for an averaging period of four years. When the prior valuation was performed at time $t + 1$, the actuarial value of assets was calculated as if the method called for an averaging period of only two years (not four years). Thus, at time $t + 1$, one-half of the deferred amount that arose during the first year of the new method was recognized and the other half remained unrecognized. Now, at time $t + 2$, the unrecognized portion of that deferred amount is one-third (because the actuarial value of assets is calculated as if the method called for an averaging period of three years). Because two-thirds of the deferred amount has been recognized at time $t + 2$, but only one-half had been recognized the year before, it is quite simple to determine that the newly-recognized portion at time $t + 2$ is equal to one-sixth (which is two-thirds minus one-half).

The following are illustrations of the recognition patterns under Approval 17. Note that Approval 17 is available only if the deferred amounts are defined as capital gains (whether or not realized). Consistent with this constraint, we use the term *NCF*

²⁵ Note that, under this alternative definition of the “prior adjusted actuarial value”, the split of the year’s total investment return into “immediate” and “deferred” portions is not quite the same as the split used in Approval 15 of Rev. Proc. 2000-40. Here, the immediately-recognized portion of the total return reflects expected interest on the prior year’s actuarial value of assets. Under Approval 15, the expected interest is based on the prior year’s market value of assets.

(i.e., net cash flow) to describe the amounts that receive immediate recognition (including contributions and benefit payments). Similarly, we use the term CG (i.e., capital gains) to describe the amounts that receive deferred recognition. The illustrations are based on the recursive formulation of the method. We give two illustrations. The first is for a method that will use an averaging period of four years after the phase-in is complete. The second is for a method that will use an averaging period of five years. Note that, up through time $t + 3$, the recognition factors are the same under both illustrations.

Averaging period (after phase-in) is four years

$$AVA_{t+1} = AVA_t + NCF_t + \frac{1}{2}CG_t$$

$$AVA_{t+2} = AVA_{t+1} + NCF_{t+1} + \frac{1}{6}CG_t + \frac{1}{3}CG_{t+1}$$

$$AVA_{t+3} = AVA_{t+2} + NCF_{t+2} + \frac{1}{12}CG_t + \frac{1}{6}CG_{t+1} + \frac{1}{4}CG_{t+2}$$

$$AVA_{t+4} = AVA_{t+3} + NCF_{t+3} + \frac{1}{4}CG_t + \frac{1}{4}CG_{t+1} + \frac{1}{4}CG_{t+2} + \frac{1}{4}CG_{t+3}$$

Averaging period (after phase-in) is five years

$$AVA_t = MV_t$$

$$AVA_{t+1} = AVA_t + NCF_t + \frac{1}{2}CG_t$$

$$AVA_{t+2} = AVA_{t+1} + NCF_{t+1} + \frac{1}{6}CG_t + \frac{1}{3}CG_{t+1}$$

$$AVA_{t+3} = AVA_{t+2} + NCF_{t+2} + \frac{1}{12}CG_t + \frac{1}{6}CG_{t+1} + \frac{1}{4}CG_{t+2}$$

$$AVA_{t+4} = AVA_{t+3} + NCF_{t+3} + \frac{1}{20}CG_t + \frac{1}{10}CG_{t+1} + \frac{3}{20}CG_{t+2} + \frac{1}{5}CG_{t+3}$$

$$AVA_{t+5} = AVA_{t+4} + NCF_{t+4} + \frac{1}{5}CG_t + \frac{1}{5}CG_{t+1} + \frac{1}{5}CG_{t+2} + \frac{1}{5}CG_{t+3} + \frac{1}{5}CG_{t+4}$$

5

OTHER METHODS

In this chapter, we consider several asset valuation methods which are not members of the “scheduled recognition” class of methods. These methods fall outside the scope of our definition either because they do not call for any determination of the year-by-year change in the market value of assets (and, hence, do not define a specific amount that will be given deferred recognition), or because they do not provide a fixed schedule for recognizing deferred amounts.

We will discuss five methods. These are:

1. Expected value method (applied to capital assets)
2. Corridor based on expected income
3. Unit method
4. Reserve accounts
5. Present value methods

The first four methods are illustrated in Reg. 1.412(c)(2)-1 and our discussion of these methods will each start with a quote from the regulation. The numerical illustrations are based on the data reproduced in Figure 3.1. In some cases, the regulation states that the method is unacceptable solely because of a failure to specify that the results will be constrained to lie within an acceptable corridor around fair market value (or the now-defunct corridor around “average value”). For purposes of our discussion, we remove this concern by assuming that all of the described methods incorporate the standard 80/120 corridor around fair market value.

Regulation Example (1): The expected value method (capital assets)

Plan A considers the value of its assets to be initial cost, increased by an assumed rate of growth of X percent annually. Under the circumstances, the X-percent factor used by the plan is a reasonable assumption.

Under the Jackson/Hamilton classification described in chapter 1 of this paper, this method belongs to the class of *initial cost with formula modifications*. Here, the formula modification consists of assuming that each individual capital asset will increase in value at an annual rate of X-percent.

In the traditional application of this method, the formula modification is made separately for each capital asset held by the plan. The method is applied only to the

plan's capital assets; the actuarial value of any cash assets held on the valuation date is set equal to their fair market value as of the valuation date.

Because the method is applied to individual assets, we will refrain from our usual practice of providing a numerical example based on the data reproduced in Figure 3.1.

Generally, capital assets will create realized income (through interest, dividends, etc.) and this income will be recognized in full when it is realized. To the extent that the income is reinvested in capital assets, the actuarial value of these new assets will start at their cost values and increase at an annual rate of X percent. To the extent that the income is retained as cash (or cash equivalents), the actuarial value will reflect the fair market value of that cash (along with any other cash held by the plan).

For the reasons given in the previous paragraph, a reasonable "X percent" factor will reflect only the anticipated changes in the price of the capital assets. It should not reflect any interest, dividends or other income that will be generated by those assets. Thus, except in rare circumstances, it would not be reasonable to use an "X percent" factor that was equal to the plan's valuation interest rate.

Regulation Example (2): Corridor based on expected income

Plan B computes the actuarial value of its assets as follows: It determines the fair market value of the plan assets. Then the fair market value is adjusted to the extent necessary to make the actuarial value fall within a "5 percent" corridor. This corridor is plus or minus 5 percent of the following amount: the fair market value of the assets at the beginning of the valuation period plus an assumed annual growth of 4 percent with adjustments for contributions and benefit payments during the period.

This description of the method suggests that it is intended to be used for end-of-year valuations. In keeping with our other numerical examples, we will interpret the phrase "fair market value of the assets at the beginning of the valuation period" to mean the fair market value of assets as of the prior valuation date. Also in keeping with our other examples, we will replace the assumed annual growth rate of 4 percent with our assumption of 7 percent.

As of the beginning of Year 3, the fair market value of assets is equal to 238,000. Bringing this amount forward to the beginning of Year 4 (along with contributions and benefit payments), we get a preliminary actuarial value of 297,071. Thus, the "5 percent" corridor runs from 282,217 to 311,924. The fair market value of assets at the beginning of Year 4 is 228,000, which is below the lower end of the "5 percent" corridor. Thus, the adjusted preliminary actuarial value is 282,217. However, this amount lies above the 80/120 corridor and we have a final actuarial value of 273,600.

Regulation Example (3): The unit method

Plan C values its assets by multiplying their fair market value by an index number. The use of the index results in the hypothetical average value that plan assets present on the valuation date would have had if they had been held during the current and four preceding years, and had appreciated or depreciated at the actual yield rates including appreciation and depreciation experienced by the plan during that period.

This is a description of an asset valuation method commonly called the *unit method*. We will provide calculations based on the numerical data reproduced earlier in Figure 3.1. In keeping with that data, we will calculate the hypothetical average value for the current and the preceding three years (and not four years, as stated in the quoted example).

Under the unit method, the fund is viewed as being comprised of a certain number of “units” and the actuarial value of assets as of the valuation date is set equal to (i) the number of units multiplied by (ii) the average value of a unit over the averaging period. At the inception of the method, the value of a unit is set to some arbitrary value and the initial number of units is set equal to the market value of the plan’s assets divided by that initial arbitrary value of a unit. Afterwards, as cash flow occurs, the number of units will change, with the exact amount of the change dependent on the then-current value of a unit. For example, if there is a cash flow of 20,000 into the plan at a time when a unit has a value of 2,000, the number of units in the fund will increase by 10.

In the traditional application of this method, the value of a unit is determined once a year (on the valuation date) and remains fixed for the year. This is the approach we will follow in our calculations.

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Fair market value as of 1/1	150,000	196,500	238,000	228,000
Number of units	150.000	194.500	232.608	272.191
Value of a unit	1,000.00	1,010.28	1023.18	837.65
Net cash flow during year	44,500	38,500	40,500	
Additional units	44.500	38.108	39.582	
Number of units at year-end	194.500	232.608	272.191	

At the beginning of Year 4, the average value of a unit is equal to 967.78. Because there are 272.191 units, the actuarial value of assets is equal to 263,420 (which is within the 80/120 corridor).

The regulatory description quoted above speaks of an “index”. This index is equal to the ratio of (i) the average unit value to (ii) the unit value in effect on the valuation date. Thus, in this example, the actuarial value of 263,420 is equal to the fair

market value of assets (i.e., 228,000) multiplied by an index of 1.15535 (which is equal to 967.78 divided by 837.65).

It might be helpful to examine the algebraic properties of the unit method. For an averaging period of n years, we have:

$$AVA_t = \#Units_t \times \left(\frac{1}{n} \sum_{i=t-n+1}^t Unit\ Value_i \right)$$

Recalling the definition of the unit value and multiplying through gives:

$$AVA_t = \frac{1}{n} \sum_{i=t-n+1}^t \left(MV_i \times \frac{\#Units_t}{\#Units_i} \right)$$

Recall, from the definition quoted at the start of this section, that the unit method is intended to result in “the hypothetical average value that plan assets present on the valuation date would have had if they had been held during the current and four preceding years”. The formulation just derived shows how the unit method achieves this result. It sets the actuarial value equal to the average of “grossed up” market values during the averaging period, where the “gross up” is equal to the ratio between the number of units held on the two valuation dates.

The unit method is not a *scheduled recognition method* (as we defined that term in chapter 3 of this paper). Although we do not do so here, it is possible to recast the algorithm of the unit method into formulations that are reminiscent of the algorithms described under Approvals 11 and 15 of Rev. Proc. 2000-40. In each case, the re-formulated algorithm is slightly, but crucially, different than the algorithms in the revenue procedure. In general, the unit method is not algebraically equivalent to any method described in Rev. Proc. 2000-40.²⁶

The unit method is discussed in detail by Arthur W. Anderson in [Pension Mathematics for Actuaries](#) (section 5.2, “Smoothed Market Value”). Mr. Anderson’s discussion is accompanied by a numerical example that uses the same data as we are using in this paper. However, he produces a different result. The difference is attributable to the underlying assumption as to the “price” of units purchased with net cash flow. Whereas we assumed that units are purchased at the unit value as of the

²⁶ There are exceptions to this statement. First, if the averaging period is equal to one year, the unit method will degenerate to fair market value. Second, and less obvious, if the averaging period under the unit method is two years (and if the average unit value is set equal to the arithmetic average of the current unit value and the prior year’s unit value), then the unit method will be algebraically equivalent to the regulation’s average value method (with an averaging period of two years).

beginning of the year (before recognition of the current year's capital gains), Mr. Anderson assumes that they are purchased at the unit value as of the end of the year (after recognition of capital gains). Either assumption is artificial and is made for the sake of simplicity. A more theoretically-defensible procedure would require determining the unit values as of each date that cash flow arises.

In our numerical illustration, we followed the traditional approach of defining the unit values with reference to the capital gains experienced by the plan. Thus, for each year, the plan's "cash flow" was comprised of contributions, benefit payments and all elements of investment return other than capital gains. Although this approach is typical, other approaches are possible. Under these other approaches, the mechanics of the method would remain unchanged, but the definition of the "cash flow" would be based on a different "split" of the plan's total investment return for the year. For example, an alternative approach might set the "cash flow" equal to contributions, benefit payments and the expected amount of interest to be earned by the plan (using the valuation interest rate). Then, the unit values that would be used to convert this "cash flow" into new units would change in value according to the amount of unexpected investment income earned by the plan.

It is possible to generalize the unit method with regard to the procedure for calculating the average value of a unit. In our numerical illustration, the average value was calculated as the straight arithmetic average of the unit values that existed on each valuation date in the averaging period. As an alternative, for example, one could set the "average" unit value equal to the fitted value (as of the current valuation date) derived from a regression of the unit values on each valuation date in the averaging period.

Regulation Example (5): Reserve account

Plan E values its assets by using a five-year average method with appropriate adjustments for the period. Under the particular method used by Plan E, assets are not valued below 80 percent of fair market value or above 100 percent of fair market value. If the average produces a value that exceeds 100 percent of fair market value, the excess between 100 and 120 percent is recorded in a "value reserve account". In years after one in which the average exceeds 100 percent of fair market value, amounts are subtracted from this account and added, to the extent necessary, to raise the value produced by the average for that year to 100 percent of fair market value.

Under this method, a preliminary actuarial value of assets is set equal to the lesser of the fair market value and the average value. If the average value is the higher figure, then the actuarial value of assets is set equal to the fair market value and the excess of the average value over the fair market value is set aside in the "value reserve account" (but the amount set aside is limited to 20 percent of fair market value). On the other hand, if the average value is the lower figure, the actuarial value of assets is equal to the average value increased by an amount (if any) that had previously been recorded in the "value

reserve account”. If the reserve account is sufficient for the purpose, the actuarial value of assets will be set equal to the fair market value. Otherwise, the actuarial value of assets will be equal to the average value plus the entire amount in the reserve account. In this latter event, the actuarial value will be constrained to be not less than 80 percent of fair market value (thus ensuring that the lower corridor limit is observed).

The regulation’s description does not address the fundamental question of how an amount set aside in the reserve account is treated if, in the immediately subsequent year, it is not needed to increase the preliminary actuarial value of assets to the fair market value. This can happen, for example, if the average value exceeds the fair market value for two (or more) consecutive years. There are two possibilities: (i) allow the “set asides” to accumulate or (ii) have each new “set aside” replace the prior amount. Under the second approach, the amount in the reserve account will always be equal to the excess (if any) of the average value over the fair market value (but limited to 20 percent of fair market value). Under the first approach, there is no such easily-defined relationship between the amount in the reserve account and the fair market and average values.

At first blush, this method is similar to the *adjusted market value methods* described by Jackson and Hamilton (see our discussion in chapter 1 of this paper). However, the Jackson/Hamilton methods use an “adjustment account” to capture portions of the plan’s actual investment return. Under the method discussed here, the smoothing of investment earnings is achieved by using an average-value method; the reserve account is credited only when there are differences between the average value and the fair market value (and, even then, only when the differences cause the average value to be higher than the fair market value). Whereas the amounts in the Jackson/Hamilton adjustment accounts can be accurately described as the deferred portions of prior investment returns, no such description is possible under the regulation’s reserve accounts.

Present Value Methods

Under a *present value* method, the actuarial value of assets is set equal to the present value (at the valuation interest rate) of the assets’ expected future cash flows. Generally, this actuarial value of assets will be different than the observed market value. In its discussion of asset valuation methods, the Committee Reports for ERISA state that “[a]nother alternative method may be to capitalize the current amount of income from each asset as a perpetuity using the plan valuation rate of interest”.²⁷ Thus, the Committee Reports suggest that present value methods might be acceptable for purposes of satisfying the minimum funding standards under Code section 412.

The brief description from the Committee Reports contemplates a single computation based on the aggregate investment income of all of the plan’s assets.

²⁷ See the Committee Report for ERISA section 1013.

Variations are possible. For example, a present-value method might make a separate application of the method for each class of assets held by the plan. Taken to the extreme, a separate application could be made for each individual asset.

Present value methods suffer from two disadvantages. First, the future cash flows for some assets (or classes of assets) are difficult to predict. Even in the case of a traditional fixed-income security such as a bond, practical difficulties can arise if the bond contains a call feature. The valuation of equity investments (including real estate) can raise similar issues. The second disadvantage is more conceptual. Most actuaries in the United States view the selection of a valuation interest rate as being highly dependent on their projection of the future values of plan assets. When viewed from this perspective, present-value methods appear to be putting the proverbial “cart before the horse”, in that the actuary must decide on a valuation interest rate before examining the value of the plan’s assets.²⁸

Whether for these reasons or for others, present value methods have not become popular in the United States. In the Society of Actuaries 1998 survey of asset valuation methods, the percentage of large plans that reported using a present value method was 0.1%. No small plans reported using a present value method.²⁹

²⁸ Regarding the first disadvantage, there is a computational procedure for avoiding the problem of assets with unpredictable cash flows. Under this procedure, it is imagined that all hard-to-value assets have been converted (at their current market prices) into assets that do have predictable cash flows. Then, the actuarial value of these assets is assumed to be equal to the present value (at the valuation interest rate) of the equivalent “predictable” portfolio.

²⁹ These figures do not reflect the number of plans, if any, that used present value methods in combination with other methods. However, the number of plans that reported using a combination of methods of any type was also small.



ACADEMY STANDARD OF PRACTICE

The following is section 5.2.6 of Actuarial Standard of Practice No. 4, entitled *Measuring Pension Obligations*, issued by the American Academy of Actuaries. It is taken from the 1993 re-formatted version.

Valuation of Assets - Relationship to Overall Results

The valuation of assets, the investment return assumption, the determination of the actuarial present values and the intended use of the calculations are interdependent, and one cannot be considered in isolation from the others.

a) Reflection of Market Value

The valuation of assets should generally reflect some function of market value. However, it may be appropriate to use:

1. methods which smooth out the effects of short-term volatility in market value;
2. amortized cost values for evidence of indebtedness; and
3. methods which relate to the investment return assumption used in determining the actuarial present values, such as discounting the expected future cash flow generated by these investments.

If current market value is not used directly, it should nonetheless be disclosed, as should details of the method used.

b) Market Value Not Determinable

Not all types of assets have a readily determinable current market value. Examples include certain insurance contracts and real estate. If market values are not available with respect to significant portions of the assets, the actuary should disclose this fact and the asset valuation method used for such assets.

In December of 2001, the Actuarial Standards Board released an exposure draft of a proposed standard of practice that would be devoted to asset valuation methods. This proposed standard, entitled *Selection of Asset Valuation Methods for Pension Valuations*, is intended to provide detailed guidance that would replace the general guidance quoted above.

B REG. 1.412(c)(2)-1**(a) Introduction**

- (1) In general. This section states the general purpose of the regulation. It also states that an asset valuation method is considered to be part of the plan's funding method under Code section 412(c)(3).
- (2) Exception for certain bonds, etc. The regulation does not apply to bonds or other debt instruments. [*Note:* This provision of the regulation does not reflect the change in law under OBRA '87. See the text of this paper for a discussion of this point.]
- (3) Money purchase pension plan. These plans must use fair market value for satisfying the requirements of Code section 412(c)(2)(A).
- (4) Defined benefit plans.
 - (i) The asset valuation method must satisfy the requirements of paragraph (b) (below).
 - (ii) The purpose of the rules in paragraph (b) is to mitigate short-run changes in the fair market value of plan assets.
 - (iii) The rules of paragraph (b) are designed to produce a "smoothing" effect.

(b) Asset valuation method requirements

- (1) Consistent basis.
 - (i) The asset valuation method must be used consistently and any change in the method is a change in the plan's funding method under Code section 412(c)(5).
 - (ii) A method will not fail to be considered "consistent" merely because it is based only on the period of time elapsed since the method was adopted.

- (2) Statement of plan's method. The method used to determine the actuarial value of assets must be specified in the actuarial report. However, the method used to determine the fair market value of assets need not be specified. Any change in the asset valuation method intended to reflect a type of asset not previously held by the plan is not considered a change in the plan's funding method.
- (3) Consistent valuation dates. A change in the day (e.g., first day or last day of the plan year) on which assets are valued is a change in the plan's funding method.
- (4) Reflect fair market value. The valuation method must take into account the fair market value, either by:
- (i) making use of the fair market value (as determined under paragraph (c), below),
 - or
 - (ii) making use of the average value of the plan's assets, as determined under paragraph (b)(7), below.

This can be done either in the computation of the actuarial values or by placing an upper and lower limit on the actuarial value. [*Note:* The use of the average value in clause (ii) was repealed by OBRA 87.]

- (5) Results above and below fair market value or average value. A method is unreasonable if it is designed to produce results which will be consistently above or below fair market value or average market value. A method is acceptable if it is designed to produce a result which consistently falls between fair market value and average value. [*Note:* The use of average market value for this purpose was repealed by OBRA 87.]
- (6) Corridor limits
- (i) An asset valuation method must result in an actuarial value of assets that is not less than 80 percent of the current fair market value or more than 120 percent of current fair market value. [*Note:* The regulation also permitted a corridor of 85 percent to 115 percent around the average market value as defined under paragraph (b)(7). This latter provision was repealed by OBRA 87.]
 - (ii) An asset valuation method is not unreasonable merely because it produces a preliminary value that lies outside the corridor of clause (i). However, it must adjust the preliminary value to the

nearest corridor limit. A plan may establish a corridor that is narrower than the one(s) described in clause (i).

(7) Average value. The average value of plan assets is determined by:

- (i) Determining the fair market value of assets at least annually,
- (ii) Adding the fair market value as of the valuation date to the adjusted values (as defined below in paragraph (b)(8)) for prior plan years (no more than four), and
- (iii) Dividing by the number of values added together in clause (ii).

(8) Adjusted value

- (i) The adjusted value of assets for a prior valuation date is equal to the fair market value of assets as of that date, with adjustments for subsequent changes in asset value other than those that result from the purchase, sale or exchange of plan assets, or from the receipt of payment on a debt obligation held by the plan.
- (ii) In order to determine the adjusted value of assets for a prior valuation date, add to the fair market value all additions to the plan assets as of that date, excluding appreciation in the fair market value of assets. “Additions” include contributions to the plan, interest and dividends paid to the plan and any asset not taken into account as of the prior valuation date, but taken into account for the current valuation date.
- (iii) From the amount determined in (ii), subtract all reductions in plan assets since the prior valuation date. “Reductions” include benefits paid by the plan, as well as any asset taken into account as of the prior valuation date but not taken into account for the current valuation date.

(9) Examples

These examples are discussed in the text of this paper and are not repeated here.

(c) Fair market value of assets

(1) General rules. Except as otherwise provided, the fair market value of the plan’s assets is the price at which the property would change hands between a willing buyer and a willing seller, neither being under any

compulsion to buy nor sell and both having reasonable knowledge of relevant facts.

(2) RESERVED

(d) Methods for taking into account the fair market value of certain agreements [RESERVED]

(e) Effective date and transition rules

- (1) Effective date. The regulation applies to plan years for which Code section 412 or ERISA section 302 apply.
- (2) Special rules for certain plan years. For plan years beginning before 11/12/80, amounts determined under Code section 412 did not need to have been computed in conformance with the regulation. However, they must have been computed using reasonable methods of asset valuation that took into account the fair market value of assets.
- (3) Plan years beginning on or after November 12, 1980. Paragraphs (a) through (c) apply starting with the first valuation of plan assets made for a plan year to which Code section 412 applies that begins on or after November 12, 1980. The statement of the asset valuation method must be included with the plan's actuarial report for that year, as well as for all subsequent reports.
- (4) Effect of change of asset valuation method. Plans which are required to change asset valuation methods in order to comply with paragraphs (a) through (c) of the regulation must do so no later than the time specified in paragraph (e)(3). Any difference in the actuarial value of assets caused by this change must be taken into account either by (i) either of the methods described in paragraphs (e)(5) and (e)(6) or (ii) any other method for which the Service gives prior approval under Code section 412(c)(5) (i.e., the Code section that addresses changes in funding methods). [*Note:* Read literally, the scope of this provision relates only to changes made to comply with paragraphs (a), (b) and (c), and not paragraph (d). Presumably, paragraph (d) was not mentioned because it is "reserved".]
- (5) Retroactive recomputation method.
 - (i) Under this method, the plan's credit balance is recomputed as of the beginning of the first plan year for which it uses its new

asset valuation method. The recomputed credit balance is determined by applying the new method retroactively as of the first plan year to which Code section 412 applies.

- (ii) Beginning with the first plan year for which the new method is used, the plan computes the normal cost and the amortization charges and credits based on the retroactive application of the new asset valuation method.
 - (iii) If the recomputation produces a funding deficiency as of the end of the first plan year for which the plan uses its new method, an additional contribution may be necessary. The retroactive recomputation may also create accumulated funding deficiencies for earlier years. In such cases, the rules of Code section 412(c)(10) apply. These rules address the time when contributions are deemed to be made.
- (6) Prospective gain or loss adjustment method.
- (i) Under this method, the plan applies its new asset valuation method no later than the valuation date for the first plan year beginning after November 12, 1980.
 - (ii) The difference between the value of assets under the old and new method may be treated as arising from an experience gain or loss, or as arising from a change in actuarial assumptions. This choice may be made regardless of the type of funding method used by the plan.
 - (iii) However, the treatment discussed in (ii) must be consistent with the treatment of such items under the plan's funding method. Thus, for example, if the plan is using the aggregate method, the change in asset values must be spread over future years as part of the normal cost.



REGULATIONS UNDER CODE SECTION 412(C)(2)(B)

As originally enacted, Code section 412(c)(2)(B) provided plans with the option of valuing bonds and other evidences of indebtedness at their amortized values (rather than their fair market values). Two regulations have been issued under this Code section. The first, Reg. 11.412(c)-11, was a temporary regulation issued in December of 1974. This regulation remains in effect. The second, Prop. Reg. 1.412(c)(2)-2, was a proposed regulation issued in December of 1982 and never made final. Both regulations were issued prior to OBRA 87, which repealed Code section 412(c)(2)(B) for non-multiemployer plans. Thus, the temporary regulation applies only to multiemployer plans (and the same will be true for the proposed regulation if it becomes final).

The regulations follow the statute by speaking of “bonds and other evidences of indebtedness”, but never define precisely what is meant by the term “other evidences of indebtedness”. For ease of exposition, we will simply refer to “bonds” and ask the reader to understand that we do not intend to restrict the statute’s broader notion.

Also, the regulations use the term “amortized value” without ever defining it. Thus, it is not clear whether the regulations intend that amortized values must be computed on the basis of the bond’s internal rate of return, or whether other methods (such as the so-called *straight line method*) might also be used. Neither do the regulations address practical difficulties that might arise when computing an amortized value, such as those created when a bond has coupons that are either “floating” or “adjustable” or when a bond issue is subject to partial redemptions because of a sinking-fund feature.

The following are annotated outlines of the two regulations.

Reg. 11.412(c)-11: *Election with respect to bonds*

- (a) **In general:** At the election of the plan administrator, a plan may choose to value its bonds at their amortized value. This election applies only to bonds that are not in default as to principal or interest. The amortization basis shall run from initial cost at purchase to the amount payable at maturity (or, if the bond is callable prior to maturity, the earliest call date).
- (b) **Manner of making election:** The election shall be made by statement attached to the Schedule B.

- (c) **Effect of election:** Once an election is made, it applies to all bonds that are not in default as to principal or interest, including those that are purchased subsequent to the election. When in default, the bond is subject to the fair market value requirement of Code section 412(c)(2)(A) until such time as it is no longer in default.
- (d) **Consent to revoke required**
- (1) In general. The election may be revoked only with the consent of the Secretary.
 - (2) Manner of obtaining permission for revocation. [RESERVED]

Prop. Reg. 1.412(c)(2)-2: Bond valuation election

- (a) **Scope of election**
- (1) In general. The election described in Code section 412(c)(2)(B) generally applies to all bonds (including those acquired by merger). The election applies only to defined benefit plans. Defined contribution plans must value bonds on the basis of their fair market value.
 - (2) Exception. The election does not apply with respect to bonds when they are in default as to principal or interest.
 - (3) Convertible debt. For purposes of this section, debt instruments which are convertible into equity securities shall be treated as evidences of indebtedness until conversion occurs. This rule will take effect 90 days after the regulation is adopted.
- (b) **Effect of election**
- (1) In general. The effect of making the election is to cause all bonds held by the plan to be valued at their amortized values (rather than on a fair market basis).
 - (2) Amount amortized.
 - (i) In general. The amount to be amortized is equal to the difference between the initial cost of the bond when acquired by the plan and its redemption value at the end of the amortization period. If the bond had been purchased prior to the time that the

election was made by the plan, the amortized value must be determined as if the election had always been in effect with respect to that bond.

- (ii) **Spinoffs**. The amount amortized after a spinoff is based on the initial cost to the plan that acquired the bond (and not the value to the plan after the spinoff).
 - (iii) **Mergers**. The amount amortized after a merger is based on the cost to the plan which first elected to value its bonds on an amortized basis. If the bond was acquired by any merging plan before the election was made with respect to the bond, the premium or discount shall be amortized in accordance with paragraph (b)(2)(i).
- (3) **Amortization period**. The amortization period runs from the date the plan acquires the bond until its maturity date. If the bond contains a call feature, the amortization period runs until the earliest call date.
- (c) **Effect of default:** Once an election is made, it applies to all bonds that are not in default as to principal or interest. When in default, the bond is subject to the fair market value requirement of Code section 412(c)(2)(A).
- (d) **Manner of making election.** The election is to be made by the plan administrator. It shall be made in the form of a statement attached to the Schedule B for the first year for which the election is to apply.
- (e) **Revocation of election**
- (1) **Effect**. After a plan has received the Service's consent to revoke its election, all plan assets are to be valued under Code section 412(c)(2)(A).
 - (2) **Consent**. A revocation of the election is a change in funding method under Code section 412(c)(5) for which approval from the Service must be obtained.
 - (3) **Mergers**. If a plan acquires a bond by merger and that bond had been valued at its amortized value prior to the merger, then consent must be obtained from the Service in order to value the bond on a basis other than amortized value.

D AUTOMATIC APPROVALS

UNDER REV. PROC. 2000-40

There are six asset valuation methods that receive automatic approval under Rev. Proc. 2000-40. One of these is Approval 10, which is fair market value. The other five are scheduled recognition methods (a term defined in chapter 3 of this paper). The following chart compares and contrasts the elements of these five methods.

Note that this chart does not specify the algorithms that can be used to implement the methods. As discussed in chapter 3 of this paper, these methods can be implemented using any one of a variety of algebraically-equivalent algorithms.

	<i>Approval 11</i>	<i>Approval 12</i>	<i>Approval 15</i>	<i>Approval 16</i>	<i>Approval 17</i>
Name	Average value	Average value, modified to use phase-in	Smoothed market value	Smoothed market value (with phase in)	Average value, modified to use alternative phase-in
Definition of the deferred amounts	Capital gains (whether or not realized)	Capital gains (whether or not realized)	Unexpected investment income (based on the prior year's market value of assets)	Unexpected investment income (based on the prior year's market value of assets)	Capital gains (whether or not realized)
Averaging Period (in years)	Not greater than five	Not greater than five	Not greater than five	Not greater than five	After phase-in is complete, not greater than five. Before then, averaging period varies.
Ignore deferred amounts that arose prior to the date the new method was adopted?	No	Yes, except for the amount that arose in the year immediately prior to the date the new method was adopted.	No	Yes	Yes
Corridor limits	80% to 120% of fair market value	80% to 120% of fair market value	80% to 120% of fair market value	80% to 120% of fair market value	80% to 120% of fair market value



FURTHER READING

Although many texts on pension funding will discuss asset valuation methods, most do so only in a perfunctory fashion. The following three texts treat asset valuation methods in more detail:

1. Winklevoss, Howard E. 1993. *Pension Mathematics with Numerical Illustrations* (2nd ed.). Pension Research Council of the Wharton School of the University of Pennsylvania and the University of Pennsylvania Press (Philadelphia).

The discussion of asset valuation methods is in the chapter on “Statutory Funding Requirements”. It consists largely of a discussion of several particular methods, in each case providing an algebraic formulation of the method. The section also contains the results of a stochastic study intended to measure the volatility and bias in each of the methods.

2. McGill, Dan M. and Grubbs, Jr., Donald S. 1991. *Fundamentals of Private Pensions* (6th ed.) Pension Research Council of the Wharton School of the University of Pennsylvania and the University of Pennsylvania Press (Philadelphia).

The section on asset valuation methods is in the chapter on “Management of Plan Assets: Operations I”. The discussion relates primarily to the statutory requirements.

3. Anderson, Arthur W. 1990. *Pension Mathematics for Actuaries* (2nd edition). Published in Wellesley, Massachusetts by the author.

An entire chapter is devoted to “Assets”. The discussion is wide-ranging and starts with fundamental theoretical considerations. There is a section on asset valuation methods (including a numerical illustration of the unit method). Other sections describe the “new money” method and the valuation of insurance contracts (both group and individual).

There are few papers that discuss asset valuation methods. However, several such papers were published in the August 2001 edition of the [Pension Forum](#) (published by the Pension Section of the Society of Actuaries). This volume contains the results of the survey that was mentioned in chapter 1 of this paper. It also contains three other papers on asset valuation methods.

The valuation of assets in the pre-ERISA years is discussed in the following.

1. Jackson, Paul H. and Hamilton, James A. 1968. "The Valuation of Pension Fund Assets". *Transactions of the Society of Actuaries* (Vol. 20, Part 1, No. 58).
2. Discussion by several actuaries. "Valuation of Assets". 1961. *Transactions of the Society of Actuaries* (Volume 13, Part 2, Number 58).
3. Dyer, Jr., John K. "Valuation of Equity Investments for Pension Fund Purposes". *The Proceedings, 1962 - 1963, of the Conference of Actuaries in Public Practice* (Volume 12).
4. Trowbridge, C. L. and Farr, C. E. 1976. *The Theory and Practice of Pension Funding*. Homewood, Illinois: Richard D. Irwin, Inc.

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