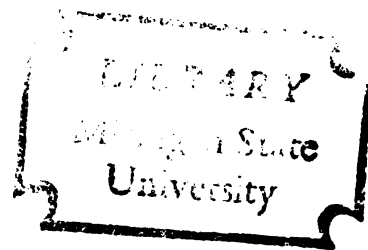


ACCOUNTING FOR COMMON STOCKS
FOR CHURCH PENSION FUNDS -
AN EMPIRICAL EVALUATION

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
WILLIAM JOHN MORRIS, JR.
1971



This is to certify that the
thesis entitled
ACCOUNTING FOR COMMON STOCKS
FOR CHURCH PENSION FUNDS -
AN EMPIRICAL EVALUATION

presented by

William John Morris, Jr.

has been accepted towards fulfillment
of the requirements for

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Floyd W. Winkler
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Date December 18, 1970

ABSTRACT

ACCOUNTING FOR COMMON STOCKS FOR CHURCH PENSION FUNDS - AN EMPIRICAL EVALUATION

by

William John Morris, Jr.

The general subject of this research effort is the valuation of equity securities held as a long term investment. An example would be securities held in a pension fund, where the objective is to provide a specified retirement income amount at a distant future date. At what amount should the investment in equity securities be carried on the balance sheet in the published financial statements?

The purpose of this study is to provide a useful answer to the question posed above for a specific situation, a church pension fund. Church pension funds issue published financial statements, giving rise to a need for valuation of common stocks. A research methodology was developed to provide a useful solution to this problem. This research methodology is summarized below:

1. Development of the accounting objectives based upon usefulness.
2. Development of specific criteria an accounting method should possess; the specific criteria being based upon the accounting objectives.
3. Development of a mathematical model to measure the effectiveness of accounting methods in meeting the criteria.
4. Testing of alternative accounting methods by use of actual

data and by simulation.

5. Use of the model to rate the accounting methods, and selection based upon this rating.

The research has been conducted as proposed. The results can be summarized as follows:

1. Accounting objective: equitable allocation of earnings to participants.

2. Specific criteria: a) closeness to market value.

b) stability of yield

3. Mathematical model: $C^2 = [w] C_v^2 + C_y^2$; where C_v^2 is a measure of closeness to market value, C_y^2 is a measure of stability of yield, and $[w]$ is a weighting factor.

4. Test alternative accounting methods: book values and yields computed for twenty-one selected accounting methods for an actual church fund and for a fund simulated by the researcher. A high correlation of results between the funds was observed.

5. Rate accounting methods: six acceptable methods ranked in order; the other fifteen methods rated inferior.

Each accounting method specifies a formula for computing the carrying value of the equity securities. The accounting methods recommended specify the valuation of equity securities which best meet the objectives of church pension funds.

Historical Cost Method

The study revealed that the Historical Cost Method of accounting for common stocks is the least efficient method to achieve the

William John Morris, Jr.

objectives of church pension funds. It is recommended that the Historical Cost Method of accounting be abandoned by all funds presently using this method.

Current Market Value Method

The study also revealed that the Current Market Value Method of accounting is very inefficient in achieving the objectives of church pension funds and is not an acceptable alternative to the Historical Cost Method. Any one of the six methods rated acceptable would be strongly preferred as an alternative to the Current Market Value Method.

Recommended Methods of Accounting

The conclusions of the study regarding recommended accounting methods are summarized below.

The following three methods are highly recommended and ranked in the order listed:

1 and 2. Two Minimization Formula Methods developed by the researcher, equally ranked.

3. Moving Average Market Value Method, based upon an average of 5 years.

The following method is considered acceptable but ranked much lower than the above methods:

4. 20% Write-up each Year of the Difference between Adjusted Book Value and Market Value.

For those pension funds with high utility preferences for closeness to market value, two additional methods are considered acceptable.

William John Morris, Jr.

Donald J. Bevis stated in the lecture series sponsored by Michigan State University that the great problem of the Seventies is bringing the recognition of current values into financial statements.¹ Perhaps the approach taken in this research study can be of assistance in seeking solutions to this problem.

¹Donald J. Bevis, "Distinguished Accountants Videotape Series, Sidney Davidson and Donald J. Bevis" (East Lansing, Michigan: Michigan State University Lecture on August 3, 1970).

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William John Morris, Jr.

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CHAPTER I

INTRODUCTION

A. PURPOSE

The general subject of this research effort is the valuation of equity securities held as a long term investment. An example would be securities held in a pension fund, where the objective is to provide a specified amount of retirement income amount at a distant future date. The term equity security will be used interchangeably with the term common stock. "Common stock is defined as a stock which is subordinate to all other stocks of the issuer."¹ At what amount should the investment in equity securities be carried on the balance sheet in the published financial statements?

The purpose of this study is to provide a useful answer to the question posed above for a specific situation, a church pension fund. Church pension funds issue published financial statements, giving rise to a need for valuation of common stocks. Since the funds are also subject to annual audits, the valuation acceptable for audit purposes and for published financial statements should be in agreement. A significant problem in the determination of a valuation for common stocks is the lack of a specific criterion to determine the method of valuation.

¹Accounting Principles Board, APB Opinion No. 15: Earnings Per Share (New York: American Institute of Certified Public Accountants, May, 1969), p. 273.

Many church pension plans are participatory plans. A participatory plan is a pension plan whereby the benefits paid are a function of the earnings of the pension fund. The amount credited to the participant on a periodic basis as a distribution of earnings determines the benefits to be paid. The method of valuation of common stocks will affect the periodic earnings credits and therefore the benefits paid to a participant.

B. BACKGROUND

General - Private Pension Funds

A private pension fund is organized to administer specific funds for a group of employees. These employees have specific employment characteristics such as a common employer, common work tasks, or membership in a common union. The fund should operate in accordance with instructions set out in a pension plan trust agreement.

The principal relationships are those among employee, employer, and pension fund management. The employee is the beneficiary covered by the pension plan trust agreement. The employer is the organization that employs the beneficiary, usually makes a substantial contribution towards payment of pension plan benefits, and is usually responsible for the liabilities imposed in the trust agreement. Pension fund management acts as a custodian of the pension fund and has varying responsibilities for investment policies as determined in the pension plan trust agreement.¹

¹Joe J. Cramer, Indiana Business Information Bulletin 55: Accounting and Reporting Requirements of the Private Pension Trust, (Indiana University: Foundation for Economics and Business Studies: 1965), 6-8.

The general purpose of the pension fund is to receive cash during an employee's work years, invest the funds to earn a return, and pay amounts to the employee during retirement or at other times under conditions specified in the trust agreement. The receiving and investing process for a specific employee may be continuous for 20 to 40 years before payment begins. This is a long term process. Long term goals and objectives should therefore be primary considerations of management policy,¹ and should be given primary consideration in determining accounting and reporting policies.²

The investment function is a significant activity of the fund. A change of 1% in the average return for the fund assets over the work life of an employee can have a significant effect upon the amount available for retirement benefits and upon contributions required to fund the benefits. Assume contributions to an employees account in a retirement plan are \$50 a month or \$600 a year. Assume also that the employee participates in the plan for 40 years prior to retirement. The total contributions over the 40 year period are \$24,000. If the pension fund earnings are credited to the participant's account at a 3% rate over the 40 years, the balance in the account at the end of the 40 years would be \$45,919. If the credits to the account are at a 4% rate, the balance in the account at the end of 40 years would be \$57,777. The balance in the account credited at 4% is in excess of 25% greater than the balance in the account credited at 3%.

¹Ibid., p. 12, "The long-run solvency of the pension trust, the crucial issue"

²Ibid., p. 77, 85.

Church Pension Environment

A church pension fund is a private pension fund set aside to provide retirement and related benefits for employees of a specific church group. The church group is usually a denomination such as Southern Baptist Convention, United Methodist Church or United Presbyterian Church in the USA. A church pension fund has at least two characteristics that distinguish it from many other private pension funds:

1) Many private pension funds have a single corporate entity responsible for the contributions to the fund. Such a corporate employer can therefore specify the amount of risk of loss of principal it is willing to take in order to increase investment earnings and reduce its pension contributions. Most church pension funds do not have a single corporate entity that the fund can look to in case of a deficit of funds. A church pension fund cannot ordinarily afford high risks of loss of principal and expected earnings. The implications of this environment are that a church pension fund must specify a low risk investment policy and attempt to maximize return within this low risk. It would not seem unusual for average return to be lower for a church pension fund than for many corporate pension funds.

2) Church pension funds are virtually free of governmental control. There are presently no highly restrictive tax laws governing the amount of contribution the employer may make to the pension fund,¹ since the employers are normally tax exempt institutions such as

¹There are certain restrictions on the amount of the pension contribution provided by the employer. These restrictions are based upon the salary of the employee and affect the tax status of the employee and not that of the employer.

churches, educational institutions, hospitals, etc. The church pension funds are exempt from the major reporting requirements for private pension funds imposed by the federal government under the Welfare and Pension Plan Disclosure Act of 1958, subsequently amended in 1962.¹ States do not generally regulate investments, benefit provisions or reporting policies for church pension funds as they do for insurance companies and bank trust departments. The limits of the regulations imposed upon the church pension funds are the legal requirement to meet the contractual obligations of the trust agreement and the requirement to meet the general duties of a trustee as interpreted by the courts. The implication of this freedom from governmental control is that investment decisions and reporting practices are unencumbered by many of the institutional constraints that restrict other private pension funds.

Environmental Assumptions

Since the purpose of this research effort is to provide a useful solution to a specific problem, the solution will be subjected to the following environmental constraints:

1) Present user needs for specific information will be accepted. For example, actuaries use a single rate of return to compute liabilities. No consideration will be given to the fact that a probability distribution of rates of return might provide a better base to compute the liabilities.

2) The study will not be bound by present technicalities of

¹President's Committee on Corporate Pension Funds and Other Private Retirement and Welfare Programs, Public Policy and Private Pension Programs, A Report to the President on Private Employee Retirement Plans, (Washington: U.S. Government Printing Office, January, 1965), p. 14.

generally accepted accounting principles, but the philosophical base of present generally accepted accounting principles and reporting standards will be accepted. For example, the method of valuing equity securities should provide an objective measure, not necessarily historical cost, although some subjective estimate may be better according to some criteria.

Additional environmental factors that will be excluded from consideration in this research are the effects of the Federal Income Tax laws and institutional regulation prescribed by the various governmental agencies. One of the major reasons for the selection of church pension funds is that these funds have relatively few constraints placed upon their accounting and their investment activity by governmental laws and regulations.

C. METHOD

There does not seem to be an explicit statement of purpose of financial reporting for church pension funds and thus no explicit statement of criteria to guide in selection of methods of valuation. Therefore, development of criteria to provide a ranking of various accounting valuation methods will be a major part of the dissertation. The criteria will be the result of a theoretical development based on management and/or participant objectives for equity securities for church pension funds.

A mathematical model will be developed incorporating the specified criteria. Various alternative accounting methods, including some of those commonly used in current practice and some experimental, will be applied to the common stock portfolios of a theoretical pension fund

and an actual pension fund. Annual yields and book values over a long period of time will be computed by each accounting method. The mathematical model, having the benefit of hindsight, will utilize the computed yields and book values to rate each accounting method. The most efficient methods¹ will be selected and recommended for use. Other characteristics of the accounting methods will be observed and results reported.

D. SIGNIFICANCE

There have been many articles written concerning accounting for equity securities and studies have been made evaluating investment performance. Apparently there have been no studies made using an actual pension fund showing the effects on the financial statements of using alternative accounting methods.² The major contribution of the proposed study is:

- a. The development of an explicit statement of criteria to judge accounting methods, and development of a model to incorporate these criteria. The ideas embodied in the model are not original. The explicit statement and model are original contributions.

¹John E. Freund, Mathematical Statistics (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962), pp. 218-219. An estimator is said to be a most efficient estimator if its mean square error (MSE) is at least as small as that of any other estimator. The mathematical model developed in the study has some of the mathematical properties of the MSE.

²Paul H. Jackson and James A. Hamilton, "The Valuation of Pension Fund Assets," Society of Actuaries - Transactions, XX (1969), 386-417. This related study was undertaken. This study used alternative accounting methods applied to corporate pension funds to determine effect on the annual pension contribution of the corporation. This study did not evaluate the effects on the pension fund financial statements.

b. The subjecting of the proposed methods of accounting to an actual case history and evaluating each accounting method on the basis of observed results. Historical cost is the present method in use by a large number of pension funds. Various other methods are also in use, including current market value. The study exposes to pension fund management the effects of using the alternative accounting methods. This would provide the means of selection of accounting methods on a more informed basis than is presently available.

The results of the research may provide the foundation for generalizability beyond church pension funds. Future research efforts could compare and distinguish between church pension funds and other institutional investors in equity securities to determine the extent the results of this research effort can be extended beyond church pension funds.

CHAPTER II

DEVELOPMENT OF CRITERIA

A. CRITERIA SUMMARIZED

Usefulness to eligible participants of the pension fund and the management of the fund will provide the bases for judging accounting methods. The primary use of financial reports (and valuation methods) is to compute annual income that equitably allocates earnings to participants.

The critical theoretical question with regard to the valuation of common stock is the allocation of the difference between the purchase price and sales price to accounting periods. This is the amount represented by the gain or loss on sale of common stock when accounting by the Historical Cost Method. Allocation of this difference to provide a constant rate of return over the holding period is the method that equitably allocates earnings to participants and meets the other required uses for information.

Estimation of the rate of return for each common stock prior to sale is the major problem facing the accountant. Two characteristics of an increase in the value of common stock at a constant rate are (1) stability of yield and (2) closeness to market value. Therefore, the objective method of estimation, that has demonstrated its ability over long periods of time to provide the best combination of stable earnings and closeness to market value, is the appropriate method of

accounting for common stocks.

B. USEFULNESS OF THE INFORMATION

Usefulness will be adopted in this research effort as the basis for the search of a method of valuation of equity securities.¹ "In establishing . . . standards, the all-inclusive criterion is the usefulness of the information."²

What is meant by usefulness? The notion of usefulness implies that some person (or group) is thereby informed re: some purpose. That method of accounting for common stock investments for church pension funds that meets the needs of users of the financial statements in a most efficient manner will be judged the better method. Users and their needs are the subject of the next sections.

C. USERS

The principal users of financial data for church pension funds are the employers, the employees and management of the fund. These are the principals that have a financial interest in the performance of the fund. There may be other distant users such as other pension funds or society in general, but these users are remote and will not be given consideration in this study. The basic philosophy embodied in our federal constitution of separation of church and state is one of the

¹ Elden S. Hendricksen, Accounting Theory (Homewood, Illinois: Richard D. Irwin, 1965), p. 98; Cramer, Private Pension Trust, p. 59.

² American Accounting Association, A Statement of Basic Accounting Theory (Chicago, Illinois: American Accounting Association, 1966), p. 3.

major reasons that government has not acted as an interested party in the affairs of church pension funds.

The term "participants" will be used to identify the employee-employer group.

D. USES

There are two basic types of pension plans that can be offered. These will be referred to as participatory and non-participatory.

The participatory plan is a pension plan whereby the benefits paid are based upon the balance accumulated in the employees account upon retirement. The earnings credited to the employee's account annually are based upon the earnings of the pension fund. The amount credited to the employees account as a distribution of earnings determine the benefits to be paid. Variable annuity plans are a sub-set of this classification.

The non-participatory plan is a plan whereby benefits are a fixed contractual obligation of either the pension fund or the employer. The current benefits paid are not a function of the current earnings of the pension fund. Benefits will generally be changed for a non-participatory plan through amendment of the contract as a result of a change in the long term rate of return. Participants in the non-participatory plans have a financial interest in the method of computing earnings of the pension fund, although only indirectly.

A pension fund can offer either type of plan or a combination of the plans. Where the information requirements differ for each type of plan, designation of the type of plan will be noted in the discussion.

The uses are:

1. Allocation of earnings to participants.
2. Other uses
 - a. Stewardship
 - b. Evaluation of management
 - c. Computation of actuarial liability
 - d. Amending pension plan benefits.

Allocation of Earnings to Participants

Many pension funds offer participatory plans whose benefits are based upon the amount in the employee's account upon retirement. For this type of pension plan, earnings credited to the employee's account on an annual basis directly affect the benefits received. The most important use for the published accounting information is to provide a basis for allocation of amounts to the employees.

The earnings from investments in common stocks are the algebraic sum of the cash flows. Proper allocation to each time period of these flows is necessary in order to give employees an equitable share of the earnings. The allocation method is frequently determined by an agreement between the participants and the managers of the fund. This method can be made explicitly in a written agreement or can be from a general understanding.

In order to provide a flexible program for participants, some pension funds offer optional plans based upon the method of allocation of earnings to the participants of the fund. One type of plan, frequently referred to as a variable annuity, specifically requires that earnings be allocated to the participants on the basis of cash receipts

from dividends plus changes in market value of the investments for each time period. Contributions by participants for this type of plan are generally segregated into a separate fund.

Other participatory plans usually provide for the current period earnings to be allocated on the basis of a rate of return on the participants investment in the fund. Sometimes these plans will guarantee some minimum rate of return with participation in any excess earnings.

If earnings are understated, benefits are transferred from present participants to future participants. If earnings are overstated, excess benefits are given to present employees at the expense of future employees. If earnings credits fluctuate significantly, participants will be less able to project their own benefits, and the uncertainty of benefits will make the pension plan less desirable from the viewpoint of both the employee and employer.

In those cases where the contract between the pension fund and the participant is explicit in its statement of the method of determination of periodic earnings, then this specified method must be used. For participants in a variable annuity fund a method of allocation of earnings to time periods based upon market value changes is needed.

If the contract between the pension fund and the participant is not explicit in defining the method of determining periodic earnings, then an equitable rate of return is needed. An equitable rate will be discussed in the next section.

Other Uses

It can be demonstrated that the method of valuation of common

stocks that provides an equitable allocation also meets the other specified uses. Since determination of earnings to provide an equitable distribution to participants would in general take precedence over other uses, argument in support of the above statement is not considered necessary. The stewardship function will be discussed since there are certain aspects of this use that any method must satisfy.

Stewardship. An important function of reporting is management's report to the participants on its stewardship of the assets entrusted to the pension fund and on the ways in which the assets have been utilized.

The outside auditor's opinion covering the financial reports of the pension fund is an important aspect in discharging this stewardship function in reporting. Consequently, the financial reporting must meet standards acceptable to the independent CPA. Acceptable methods will be discussed in the next section.

The method of valuation should also be one that can be made understandable to a non-financial expert. This understanding is important in order to maintain confidence in management by the participants. Unintelligible methods could lead to the impression of manipulation by management. Since understanding differs in all people, management should have the option of selecting, from among several acceptable alternative methods, the method that its constituents can most easily understand. Methods that become commonly accepted do develop a credibility because of their general use. Commonly used methods also become better understood because of the more widespread interest in them. Therefore, methods that are clearly inferior are not justified on the basis of simplicity alone.

In summary, to perform the stewardship function, the common stocks must be valued in accordance with the standards of the accounting profession.

Summary of Information Requirements

The information needed can be condensed to the following items:

1. Current earnings that equitably allocate earnings to participants.
 - a. Current market changes or other specified method.
 - b. Equitable rate of return on assets.
2. Valuation method not in violation with the standards of the accounting profession.

E. ALTERNATIVE METHODS OF ALLOCATION OF TOTAL INCOME

Earnings from investments in common stocks are the algebraic sum of the cash flows. The uses stated in the previous section require accountability by periods, and therefore, a major objective in accounting for common stocks is to allocate these earnings to specific time periods.

For purposes of this presentation, a distinction is drawn between theoretical allocation methods and accounting methods. An understanding of this distinction is essential to comprehend the remainder of the chapter.

1. Accounting methods are defined as methods capable of implementation in the actual world of uncertainty. These methods make no assumption of future knowledge.
2. Theoretical allocation methods are defined as the methods

of allocation of income assuming a knowledge of future income, sales price and date of sale for a given security at date of purchase.

An illustration will be used to examine the theoretical basis for allocation of total income, as defined above, to specific time periods. The discussion in this section assumes a known total earnings, only methods of allocation being in question. The next section deals with the case of an uncertain future sale price for common stocks.

Assume a stock was purchased December 31, 1965 for \$100, no dividends will be paid and the stock will be sold for \$146 on December 31, 1969. How should the \$46 of earnings be allocated to time periods? See Table I for a display of the facts assumed.

TABLE I
COMMON STOCK DATA
FACTS ASSUMED

	12/31/65	12/31/66	12/31/67	12/31/68	12/31/69
Cost.	\$100.00				
Sales price					\$146.00
Market value.	100.00	\$95.00	\$120.00	\$150.00	146.00
Dividends		. .	. .	. .	. .
Earnings per share. .		6.00	7.00	10.00	10.00

Let us now review the possible bases for allocation of income and select the theoretical allocation method that satisfies the

information needs that have been established. This is a discussion of theoretical allocation methods and not specific accounting applications.

The basic methods of allocation are:

- I. Allocate the entire amount (\$46 in the example) in the period of sale (Historical Cost Method) or allocate to periods subsequent to sale.
- II. Allocate equal amounts (\$11.50 per year in the example) (Equal Amounts Method) or some other arbitrary amount each year.
- III. Allocate based upon the reported earnings of the company in which the investment has been made (Earnings Method) or on the basis of some other indicator of economic progress of the company.
- IV. Allocate based upon the market changes in each of the respective time periods (Current Market Value Method).
- V. Allocate amounts based upon a rate of return (10% per year in the example) that when applied to the purchase price of the investment, will generate an amount that will equal the sales price when the investment is sold (Constant Rate of Return Method).

See Figures 1 and 2 for illustrations for the allocation methods.

Use 1: Equitable Allocation of Earnings to Participants

The primary use for valuation of common stocks is the determination of an equitable allocation of earnings to participants. Allocation of earnings must be in accordance with the provisions of the

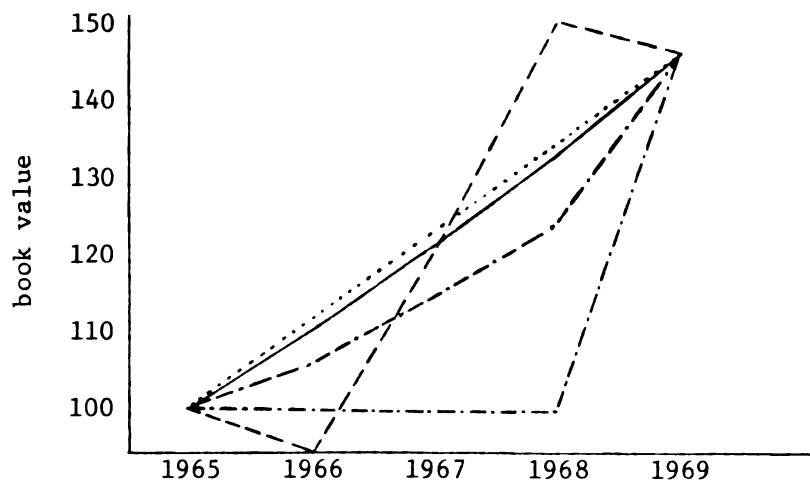


FIGURE 1

BOOK VALUE OF COMMON STOCK
RECORDED BY VARIOUS ALLOCATION METHODS

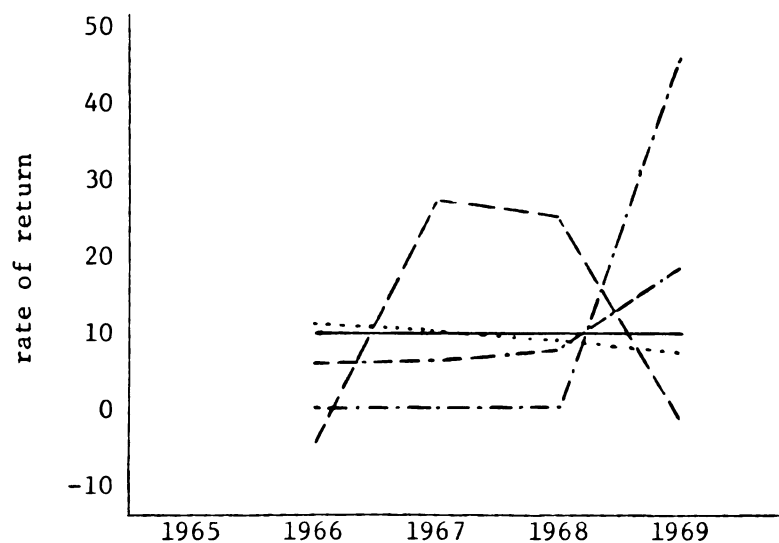


FIGURE 2

ANNUAL RATE OF RETURN COMPUTED ON BOOK VALUE
OF COMMON STOCK RECORDED BY VARIOUS ALLOCATION METHODS

- I. ·-·-· = cost
- II. ····· = equal amount
- III. -·-·- = earnings
- IV. - - - - = market
- V. ——— = rate of return

pension plan.

In those cases where the pension plan is specific with regards to the method of allocation of earnings, equitable allocation means allocation in accordance with the plan specifications. For a typical variable annuity plan, earnings must be determined on the basis of periodic market changes in the common stock investments. This is allocation method IV. This research study is not concerned with those cases where the allocation method is specified.

For other plans, in which the method of determining the earnings of the pension fund are not specified, equitable allocation must be supported by the inherent equity of the allocation method. Each of the five methods of allocation described above will be examined by logical reasoning to determine the relative equity of the methods. This research study will be concerned only with plans in which the method of determining earnings are not specified in the pension plan.

Method I. Historical Cost. A definite purpose in investing in equity securities is to achieve an increment in value of the investment through growth in the value of the assets of the company in which the investment is made. The participants in the fund whose cash is being used to make this investment should share in this growth. Therefore one attribute of an equitable method of allocation would be some systematic method of allocation during the holding period of the asset. By this criterion, Method I, Historical Cost or allocation of the income in a period subsequent to sale of the asset, is clearly less equitable (since the increment does not all occur, presumably, at sale date) than other methods that apportion the increment in value during the holding period for the common stock.

Method II. Equal Amount. Allocation of an equal dollar amount each year results in a declining annual rate of return. This is the result of an increasing investment base applied to a constant amount of earnings. See Figure 2 for an illustration of this declining rate. To allocate on the basis of equal amounts favors early participants over the later participants by awarding a higher rate of return without a significant reason for so doing. It would appear that all amounts of investment should be treated equally in the absence of some specific reason for not so doing. Therefore, to allocate equal dollar amounts each year would be clearly inferior to method V., allocation on the basis of a constant rate of return, which treats each dollar of investment equally.

Any arbitrary method of allocation of earnings to apportion income to participants would open management of the pension fund to criticism and possible lawsuit for being unfair. Therefore, any method of allocation should rely on its inherent equity and not be an arbitrary method of allocation specified by management.

Method II can be discarded as being inferior to other methods as an equitable method of allocation.

Method III. Earnings. Economic factors such as earnings of the company in which the investment is made, might be considered as the basis for an equitable method of allocation of income. However, the change in the value of the common stock from the date of purchase to the date of sale is the result of many factors of which "interim", i.e., annual earnings are only one factor.

The market value at the date of sale (sales price) is the result of the market's appraisal of the future earnings of the company.

Past levels, stability and direction of earnings are important factors that are used in judging future earnings. However, it is the future earnings that are valued at that point in time, not past or current earnings. The market price is the result of a consensus evaluation of all economic factors (including earnings) affecting the company. Thus, it would appear that a change in market price would be a method of allocating income superior to the use of the underlying current earnings of the company or some other single economic factor.

Method III can be discarded as inferior to Method IV as an equitable method of allocation of income.

Methods IV and V. Current Market Value and Constant Rate of Return. At this point Method IV, allocation on the basis of market changes, and Method V, allocation on the basis of a constant rate of return have been judged superior to other methods of allocation as being equitable. The purpose and intention of management and the participants are important factors in determining an equitable method of allocation of income.

In those cases where a church pension fund offers a variable annuity plan as an option, and the participant elects not to choose it, it is clear that the intention of the participant is to avoid the short term risks of annual market fluctuation. Therefore, to treat each dollar of investment equally and apportion earnings on the basis of constant rate of return is clearly the more equitable method of allocation of earnings.

For other church pension funds where optional plans based upon current market changes are not available, treatment of each dollar of investment equally would be the more defensible position as an equitable

method of allocation of earnings, than to subject participant's annual earnings to the emotionalism and instability of annual market fluctuations.

Method V, the Constant Rate of Return Method, which treats each dollar of investment equally, meets the requirement of equitable allocation of earnings for pension plans where a method is not specified in the pension plan agreement.

Use 2: Allocation by Methods Acceptable to the Accounting Profession

The method must not be in violation of generally accepted accounting principles. Pronouncements of the Accounting Principles Board (APB) and its predecessor are considered as specifying generally accepted accounting principles. The APB has not specifically dealt with the subject of valuation of common stocks for financial reporting purposes, although the Board in APB 8 gives indirect attention to the item in discussing the determination of the provision for pension cost for corporate entities with pension plans.

The Board believes unrealized appreciation and depreciation should be recognized in the determination of the provision for pension cost on a rational and systematic basis that avoids giving undue weight to short-term market fluctuations.¹

Items not specifically covered by pronouncements of the APB are subject to considerable latitude in their treatment. The general criteria applied to valuation of common stocks would include:

1. Measurement by an objective method.
2. A value that is reasonable in the judgment of the auditor.

¹Accounting Principles Board, APB Opinion No. 8: Accounting for the Cost of Pension Plans (New York: American Institute of Certified Public Accountants, November, 1966), p. 80. See also discussion on pages 78-80.

Method V, the Constant Rate of Return Method, appears to provide a basis for accounting methods that are objective and reasonable. Method V recognizes unrealized appreciation and depreciation on a rational and systematic basis that avoids giving undue weight to short-term market fluctuations.

Summary of Allocation Methods

In general, allocation of the increment in market value of common stock during the holding period best meets the needs of the users if allocation of income is on the basis of a constant rate of return over the holding period. It is concluded that Method V, the Constant Rate of Return Method, is the best theoretical method of allocation of income for investments in equity securities by church pension funds. This theoretical allocation method is applicable to all church pension plans where the earnings allocation method is not specified in the plan agreement.

F. ESTIMATION

The question has been answered concerning the most useful method of allocation of income to accounting periods. A Constant Rate of Return, Method V, has been determined the most useful method of allocation of appreciation or depreciation for equity securities. This determination was made on the assumption that the total income from an investment in a common stock is known (\$46 in the example displayed in Table I). However, total income, including appreciation, is not known until after the investment has been sold. The problem of estimation of this amount prior to sale is the difficult problem facing the accountant.

Referring to theoretical allocation methods discussed in the preceding section, there are two characteristics of the constant rate of return method that can be observed from the example.

1. One characteristic is a stable earnings rate. That is, the earnings rate does not fluctuate from period to period. Therefore stability of yield is a characteristic of the constant rate of return method.
2. Another characteristic is that the sales price equals the computed value at the time of sale with no adjustment required. That is, equality of market price and a computed value at a specified time in the future for a specific equity security owned is a characteristic of the Constant Rate of Return Method. Since the specific time of sale is not known, closeness to market value at all times would provide closeness to market value at the time of sale.

Thus, two desirable characteristics of a method of estimation to approximate the constant rate of return method of allocation of income would be stability of yield and closeness to market value.

Projecting a specific future expected rate of return for each particular stock would involve subjective estimates of such return. The success of such a method would depend upon the ability of the estimator. This ability is an unknown factor and would not provide a useful guide for accounting for common stocks. In addition, any subjective method of estimation is not readily capable of audit verification and would not likely meet criteria of objectivity as a method in accordance with generally accepted accounting principles.

A more useful approach would be to select an objective method

(formula) that has performed as the most efficient method in the past. For accounting purposes, most acceptable methods of estimation are selected on the basis of past performance (bad debt expense computations, rules for obsolescence, etc.). Therefore, a specific computational method that has exhibited the characteristics of the Constant Rate of Return Method most efficiently over the past would be a logical method to select as a method for estimation for the future.

It has been observed that two characteristics of the Constant Rate of Return Method of allocation of income are stability of yield and closeness to market value. Methods of estimation can be judged as reasonable methods based upon their past performance. Therefore, the accounting method that best meets the needs of church pension funds will be judged on the basis of its past performance over a long period of time. The criteria for judging will be closeness to market value and stability of yield.

CHAPTER III

ACCOUNTING METHODS

These criteria for judging accounting methods have been established: (1) closeness to market value, and (2) stability of yield. Accounting methods will be judged by these criteria on the basis of their past performance over a long period of time. Various alternative accounting methods to be studied will now be selected.

There are an infinite number of formulas that can be devised as methods of accounting for common stocks. Jackson and Hamilton list 37 methods in a single article.¹

A. BASIS FOR SELECTION

In order to reduce the many possibilities to a reasonable number of methods for study, methods will be selected to the following bases:

1. Those methods presently in use.
2. Those methods that have a theoretical appeal in terms of the criteria specified in this study.

The methods selected should include a representative cross-section of classes of alternative methods. The classification method developed by Jackson and Hamilton in their study provide logical groupings and

¹Jackson, "Valuation of Assets," 412-415.

will be utilized to orderly present alternative methods of accounting.¹

Methods Presently in Use

In June, 1969, the Chase Manhattan Bank published the results of a survey of corporate pension funds.² There were 502 funds that provided useable responses to their survey. This recent survey will be cited as the source for accounting methods presently in use by corporate pension funds. It will be referred to as The CMB Study.

Approximately 51% of the funds (255) use the historical cost method of accounting.³ The other 242 firms giving information on accounting methods use some type of write-up method.⁴ The CMB Study lists the following seven methods that over 80% of the 242 firms use:

- I. Long range appreciation method.
- II. Long range yield method.
- III. Write-up of some percent each year of the difference between adjusted book value and market value.
- IV. Use of an "earnings method" whereby book value is adjusted for the difference between common stock dividends and the actual per share earnings.
- V. Utilize a moving average market value based on the average of several years.
- VI. Assets are valued at full market value.

¹Ibid., p. 389-390.

²Theodore G. Kane, Survey on Pension Fund Financing (New York: The Chase Manhattan Bank, N. A., June 1969).

³Ibid., Table 10a.

⁴Ibid., Table 11.

VII. Write-up adjusted book value by amount required to equate with interest rate assumption.

All of these methods will be tested in this study.

The following methods with modification have been used by church pension funds in their financial reporting and/or to determine earnings available for credit to participants:¹

1. Historical cost.
2. Write-up of some percent each year of the difference between adjusted book value and market value.
3. Long range appreciation method.
4. Market value less a reserve.

These methods with their respective modifications will be included in the study.

The accounting methods included in this study on the basis of present use are those methods cited above.

Methods with Theoretical Appeal

In the preceding chapter desirable characteristics of an accounting method were specified. They are:

1. Closeness to market value.
2. Stability of yield.
3. Systematic allocation of appreciation (depreciation) during the holding period of the asset.
4. Objective method of valuation.

¹"Important Developments of the Year" as reported by the Administrative Office of each Board (The 1969 Church Pensions Conference); interviews with selected pension board personnel, 1970.

One of the criteria specified as a desirable characteristic for an accounting method was closeness to market value. In order for any method to bear some systematic relationship to market value, current market price must be included in the formula, either as a direct computation or as a delimiting factor in the computation. Any method that does not include market value as specified above will be close to market value only by chance. Changes in economic conditions of the market and/or investment strategy could render such methods as inadequate, in terms of the criteria established in this paper. Therefore, a method with a theoretical appeal must include market value in the formula.

Stability of yield is another desirable characteristic. One of the objections cited to the use of current market value as a method of accounting is the wide fluctuation in yield that results from its use.¹ Any method that averages market values or specifically considers stability of earnings in the computation would tend to improve upon the current market value method in terms of stability of yield. Therefore, a method with theoretical appeal will use some form of averaging of market values or will specifically provide for stability of yield.

Methods that defer recognition of gain or loss after date of sale of investments or give recognition of gain or loss before acquisition of the asset would be rejected on the basis of not being equitable. A method with theoretical appeal must attempt a systematic allocation of appreciation (depreciation) during the holding period of the asset.

Subjective methods will be rejected. A method that requires periodic review and revision of parameters based upon judgment is

¹Cramer, Reporting Requirements, p. 80.

considered subjective. Methods that require projections of investment results to select current parameters will also be considered subjective since opinions about future results are subjective. Methods with these characteristics do not meet the criteria of objectivity cited in the preceding chapter.

Additional methods will be selected for testing on the basis of theoretical appeal. Methods with theoretical appeal will be obtained from suggestions proposed in the literature and will be developed by the researcher.

Frequently the methods suggested in the literature are the methods presently in use and classified in the CMB Study.¹ Jackson and Hamilton in their study utilized a group of formulas in the adjusted market value classification worth further consideration.² A representative method described in their article will be included in this study. This method will be labeled "Market value with variable adjustment".

Two additional methods will be considered that were not given specific reference in the articles reviewed. One method is a modified market value method that averages market values and projects a value by use of a least squares trend line. The other method will be called a minimization formula. The method is a variable percentage write-up method. The percentage is changed each year to maximize stability of yield and closeness to market value in some predetermined ratio.

¹Kane, Pension Fund Financing, Table 11.

²Jackson, "Valuation of Assets," p. 415.

Representative Cross-Sections of Types of Methods

The classification developed by Jackson and Hamilton will serve as criteria to determine a representative cross-section of accounting methods.¹ The assignment of a method to a specific classification is based upon this researcher's judgment. These classifications and the accounting methods to be included in this study are as follows:

- I. Initial cost.
 - a. Historical Cost Method.
- II. Initial cost with formula modification.
 - a. Long Range Yield Methods.
 - b. Long Range Appreciation Methods.
 - c. Write-up Adjusted Book Value by an Amount Required to Equate Earnings Yields with Interest Rate Assumption Methods (Minimum Yield).
 - d. Earnings Methods.
- III. Modification based upon both initial cost and current market value.
 - a. Write-up some Percent each Year of the Difference between Adjusted Book Value and Market Value Methods (Percentage Write-up).
 - b. The Minimization Formula Methods.
- IV. Current market value.
 - a. Current Market Value Method (Market Value).
- V. Adjusted market value methods.
 - a. Market Value, Less a Reserve Method.

¹Ibid., 389-390.

- b. Moving Average Market Value Methods, based upon average of several years (Moving Average).
- c. Least Squares Trend Line Methods, based upon market value for several years (Trend Line).
- d. Market Value with Variable Adjustment Methods (Variable Adjustment).

VI. Present value methods.

- a. None.

Methods of accounting representative of each class except Class VI have been included in this study. No Class VI, the present value methods, have been included. These methods are generally impractical. They require valuation of each common stock at the discounted value of future earnings. Future earnings are the algebraic sum of the future cash flows; these future cash flows are future dividends plus the future sale price. None are reported to be presently in use. They do not have the characteristics for theoretical appeal cited above. Current market value is not considered in the formula. They require highly subjective estimates of future cash flows. The methods give recognition to future market appreciation at date of purchase.

B. GENERAL CHARACTERISTICS OF ACCOUNTING METHODS

To obtain a better understanding of the description of each method there are several characteristics that are worthy of discussion.

Individual and Aggregate Methods

Formulas can be applied to each of the individual common stocks. They can also be used to adjust portfolio aggregate amounts by means of

a portfolio valuation reserve. These formulas value the individual stocks using one of the basic methods, initial cost or current market value. The portfolio valuation reserve is analogous to a reserve for bad debts which is applicable to all accounts receivable and not to a specific account.

Certain of the formulas by their nature can be applied only to individual stocks. Other formulas are intended only for use as portfolio reserves. Some of the formulas can be applied either on an individual stock basis or on a portfolio reserve basis.

The major advantages of the individual methods are:

1. Asset bases, earnings, yields, and gains on sale are measured for each stock in the same way that portfolio amounts are measured. This information can be useful in analyzing details of operating results and current status of the investment accounts.

2. Gain or loss on sale of a specific stock can be determined. Gain or loss on sale of a stock is not determinable with aggregate methods of accounting. Gains can be estimated by use of allocation methods. However, all allocation methods are somewhat arbitrary in nature.

The major advantages of the aggregate methods of accounting are:

1. Relative simplicity in application.
2. Less fluctuation in the important variables than computations based upon individual measures. The use of portfolio reserves may tend to provide a more stable yield measurement than methods applied to individual stocks.

It is not the purpose of this paper to select a preference for

either the individual or aggregate methods of accounting. Both types will be tested. One method will be tested by both methods of application. The issues in the controversy are not critical in terms of the criteria developed earlier, with one exception. Provision must be made in the application of aggregate methods for non-deferral of gains or losses on sales of stocks after date of sale.

Earnings and Asset Valuation Methods

Accounting methods can vary in their approach to computing earnings and asset values. One group such as the long range yield method, computes earnings from the prescribed formula. Asset values at year end are the residual balances that result from computed earnings. Other methods, such as the write-up of percentage difference between adjusted book value and market value, compute asset values from the prescribed formula. Earnings for the year are the amounts that result from the change in asset values. This distinction is made for the purpose of understanding of each particular method and will be noted in the description of the accounting.

Parameters, Constraints and Alternative Procedures

The application of various methods involve selection of parameters, constraints, and procedural alternatives. Examples of parameters are (1) rates of yield or appreciation, (2) percentages for annual adjustment or reserve limits, or (3) number of years for averaging. An example of constraints are maximum or minimum values based upon current market value or historical cost value. An example of a procedural alternative is the optional treatment of a gain on sales. A gain can be included in current earnings or deducted from the

valuation reserve.

The parameters selected for study will include those most frequently in use according to the CMB Study, those known to be in use by church pension funds, and other reasonable alternatives sufficient to provide a representative test of the accounting method.

The constraints and procedural alternatives will be selected on a basis consistent with the criteria specified above. Many procedural alternatives have little effect on yields and book values. In those cases where the researcher judges the alternatives would result in immaterial differences, selection will be based upon ease of application. In those cases where available alternative constraints or procedures are in accord with criteria specified for theoretical appeal, and significant differences may result, several modifications of the method will be included in the study.

C. DISCUSSION OF EACH ACCOUNTING METHOD

The following outline will be a guide in presenting a verbal description of each accounting method:

1. General purpose.
2. Description of the accounting.
3. Basis of selection.
4. Parameters, constraints, and alternative procedures.

The methods will be presented in order according to the classification listed previously. The mathematical formulas for each method are detailed in the APPENDIX.

I. Initial Cost

a. Historical Cost Method

General purpose. The Historical Cost Method is designed to meet the requirements for the stewardship function. All adjustments to the records are the direct result of transactions with independent organizations. The method provides " . . . an internally consistent accounting system which enables the trustee to demonstrate that every dollar received has been properly held, invested, or applied to pay benefits, in accordance with the terms of the trust agreement."¹

Description of the accounting.

1. The Historical Cost Method is applied to each individual stock.
2. It is an asset valuation method. A common stock is valued at the purchase price until sold.
3. Earnings are the sum of dividends received plus the gains recorded for individual stocks.
4. Gains are recorded at the time of sale of shares of stock. The amount is the differential between the sales price and the purchase price of the stock.

Basis of selection.

1. The basis of selection of the Historical Cost Method is its wide use by pension funds. Over 50% of the corporate pension funds² as well as many church pension funds use this method.

¹Jackson, "Valuation of Assets," p. 396.

²Kane, Pension Fund Financing, Table 10a.

2. The method lacks theoretical appeal. Historical Cost Method does not use market value in its formula. Stability of yield is not inherent in the method, although by proper timing of transactions stability of yield can be achieved. The method is an objective method of valuation. It does not systematically allocate appreciation during the holding period.

Parameters, constraints, and alternative procedures.

1. Parameters - none

2. Constraints - One possible constraint is the use of the lower of cost or market. Study of the Historical Cost Method is justified by its wide use. There is no reference to use of the lower of cost or market in the CMB Study and therefore the method will not be included in the study.

3. Alternative procedures - If there have been multiple purchases of an individual stock at different prices per share, there are alternative methods to compute cost of sales. These alternatives include: first-in, first-out; last-in, first-out; and average cost. For this study average cost will be used. It is not believed by the researcher that significant differences would result by use of other alternative procedures.

II. Initial Cost Methods with Formula Modifications

All methods in this classification do not consider market value in the formula. Therefore, they are subject to this common criticism. They will in general be close to market value only by chance when applied consistently over a long period of time. Present use is the

basis of selection for methods in classification II. The choice of parameters will be those parameters most widely used.

a. Long Range Yield Method

General purpose. The reporting of a stable yield is the purpose of the Long Range Yield Method. Annual earnings are computed by the estimated long run earnings rate.

Description of the accounting.

1. The Long Range Yield Method is applied to aggregate portfolio amounts. The individual stocks are valued by the historical cost method of accounting.

2. It is an earnings method. Earnings are computed by application of the selected yield to the asset base of the portfolio.

3. The asset value of the portfolio is the aggregate value of the individual stocks valued by the Historical Cost Method plus a valuation reserve. The valuation reserve is cumulative. The periodic adjustment is the difference between earnings computed by the Historical Cost Method and earnings specified above.

Basis of selection.

1. Present use by pension funds is the basis for selection.

2. The method lacks theoretical appeal. All methods of this class do not use market value in the formula. Stability of yield is a characteristic of this method. Selection of the rate may be very subjective. If the appropriate rate is selected, appreciation is systematically allocated during the holding period. Otherwise, appreciation may be either anticipated or deferred.

Parameters, constraints and alternative procedures.

1. Parameters - The rate of yield is the critical parameter to be selected. Both 6% and 7% are used by several firms.¹ The literature frequently suggests 7%.² A 7% yield will be tested. A study by Fisher and Lorie published in 1968 presented information indicating that a 9% return was reasonable for long term investments in common stock.³ While there is no objective basis for selection of 9% for a study simulating accounting results beginning in 1945, a 9% yield will be tested as a matter of interest.

2. Constraints - In order to insure that realized gains are included in income, a constraint will be included. The method will be modified so that the portfolio asset value will not be less than the valuation based upon historical cost measurements.

3. Alternative procedures - none.

b. Long Range Appreciation Methods

General purpose. The reporting of a stable rate of appreciation is the purpose of the Long Range Appreciation Method. Annual appreciation recognized as earnings are computed by the estimated long run appreciation rate.

¹Ibid., Table 12b.

²Jackson, "Valuation of Assets," p. 413; Cramer, Reporting Requirements, p. 82; Frederick P. Sloat, "Valuation of Equities Held in Retirement Plan Trust Funds," The Lybrand Journal, Vol. 45, No. 4 (1964), p. 44; Thomas Gainer and Walton Kingbury, "Pension Plans ... A Survey and Commentary based on 163 Actual Plans," The Price Waterhouse Review (Autumn, 1966), p. 17.

³Lawrence Fisher and James H. Lorie, "Rates of Return on Investments in Common Stock: The Year-by-year Record, 1926-65," Journal of Business, XXXX, No. 3 (July, 1968), p. 296.

Description of the accounting.

1. The Long Range Appreciation Method is applied to aggregate portfolio amounts. The individual stocks are valued by the Historical Cost Method of accounting.

2. It is an earnings method. Earnings are the sum of the dividends received plus an amount computed by application of the selected appreciation rate to the asset base of the portfolio.

3. The asset value of the portfolio is the aggregate value of the individual stocks valued by the Historical Cost Method plus a valuation reserve. The valuation reserve is cumulative. The periodic adjustment is the difference between earnings computed by the Historical Cost Method and earnings specified above. This adjustment is the difference between realized gains recorded by the Historical Cost Method and the appreciation computed above.

Basis of selection.

1. Present use by pension funds is the basis for selection.

2. The comments concerning theoretical appeal for the Long Range Yield Method are equally applicable to the Long Range Appreciation Method. It lacks theoretical appeal.

Parameters, constraints and alternative procedures.

1. Parameters - The rate of appreciation is the critical parameter to be selected. Over 70 percent of those reporting percentages in the CMB Study use 3% appreciation.¹ The average rate of appreciation for the Standard & Poor's price index for 500 common stocks for

¹Kane, Pension Fund Financing, Table 12a.

the period from 1918 to 1960 was 3.84%¹ Three percent is suggested in the literature.² One church pension fund uses 6% appreciation as the basis for earnings credits available to the participants. Both 3% and 6% appreciation will be selected to test this method.

2. Constraints - In accordance with the reasoning set forth in the discussion of the Long Range Yield Method, this method will be modified so that the portfolio asset value will not be less than the valuation based upon historical cost measurements.

3. Alternative procedures - One church pension fund imposes as additional constraint. The annual addition to earnings for appreciation is eliminated when the fund value is equal to or exceeds 80% of market value. This modification will be tested.

c. Write-up Adjusted Book Value by an Amount Required to Equate Earnings Yields with the Interest Rate Assumption Method (Minimum Yield)

General purpose. Sufficient earnings each year to meet the actuarial interest requirements are reported by use of the Minimum Yield Method.

Description of the accounting.

1. The Minimum Yield Method is applied to aggregate portfolio amounts. The individual stocks are valued by the Historical Cost Method.

¹Harold G. Fraine, Valuation of Securities Holdings of Life Insurance Companies (Homewood, Illinois: Richard D. Irwin, Inc.), p. 98.

²Jackson, "Valuation of Assets," p. 413; Cramer, Reporting Requirements, p. 82; Sloat, "Valuation of Equities," p. 43; Gainer, "Survey and Comentary," p. 17.

2. It is an earnings method. Subject to certain constraints, earnings are the greater of the dividends received or an amount sufficient to provide a yield equal to the actuarial rate of interest.

3. The asset value of the portfolio is the aggregate value of the individual stocks valued by the Historical Cost Method plus a valuation reserve. The valuation reserve is cumulative. The periodic adjustment is the difference between earnings computed by the Historical Cost Method and earnings specified above.

Basis of selection.

1. Present use is the basis for selection.
2. The comments concerning theoretical appeal for the Long Range Yield Method are equally applicable to the Minimum Yield Method. It lacks theoretical appeal.

Parameters, constraints and alternative procedures.

1. Parameters - The actuarial interest rate is the critical parameter to be selected. Of the 12 firms in the CMB Study using this method, 4 use 6% actuarial interest rate.¹ All others use a lesser rate. Six percent will be utilized to test this method. Yields for dividends based upon the Historical Cost Method would probably equal or exceed 6%, and, therefore, it would be redundant to test the method at lower rates of return.

2. Constraints - In accordance with the reasoning set forth in the discussion of the Long Range Yield Method, the Minimum Yield Method will be modified so that the portfolio asset value will not be

¹Kane, Pension Fund Financing, Table 14.

less than the valuation based upon the historical cost measurements.

3. Alternative procedures - none.

d. Earnings Methods

General purpose. Use of the Earnings Method assumes that a change in the intrinsic value of the common stock has a one to one relationship with undistributed earnings. The purpose is to assign to the value of the stock that portion of earnings not paid to the investor in dividends.

Description of the accounting.

1. The Earnings Method is applied to each individual stock.
2. It is an earnings method. Earnings recorded by the pension fund are the sum of that portion of the earnings reported by the industrial firm applicable to the shares owned by the fund plus gains on sales of individual stocks.
3. A common stock is valued at the initial cost plus cumulative earnings less dividends received.
4. The amount of gain on sales is the difference between the sales price and the asset value computed above.

Base of selection.

1. Present use by pension funds is the primary basis of selection.
2. The method does not meet all of the criteria for theoretical appeal. Market value is not included in the formula. Similar to the Historical Cost Method, stability of yield is not inherent in the method, although by proper timing of transactions stability of yield

can be achieved. The method is an objective method of valuation and systematically allocates portions of the appreciation during the holding period.

Parameters, constraints and alternative procedures.

1. Parameters - none
2. Constraints - none
3. Alternative procedures - There are alternative procedures to compute cost of sales under certain conditions. Average cost will be used to test the Earnings Method. See the Historical Cost Method for discussion.

III. Modification Based upon Both Initial Cost and Current Market Value

- a. Writeup some Percent each Year of the Difference between Adjusted Book Value and Market Value Method (Percentage Write-up)

General purpose. Smoothing of the adjustment to market value by taking only a portion of the difference between book value and current market value periodically is the purpose for use of the Percentage Write-up Method.

Description of the accounting.

1. The Percentage Write-up Method is applied to aggregate portfolio amounts. The individual stocks are valued by the Historical Cost Method of accounting.
2. It is an asset valuation method. The asset value of the Portfolio is the aggregate value of the individual stocks valued by the Historical Cost Method plus a valuation reserve. The valuation

reserve is cumulative. Realized gains recorded by the Historical Cost Method are deducted from the valuation reserve. The specified percentage of the difference between the current market value and the adjusted book value, after deduction for realized gains, is added to the valuation reserve.

3. Earnings are the sum of the dividends received plus the adjustment to the valuation reserve computed above.

Basis of selection.

1. Present use is a basis for selection. According to the CMB Study, this method is the most widely used, write-up method of accounting.¹

2. The method also meets all of the criteria for theoretical appeal. The method considers market value in the formula. It smooths the adjustment to market value and therefore specifically provides for stability of yield. Selection of the percentage adjustment would depend upon the pension fund's weighting of the two factors above, not a projection of future values, and therefore the method is objective. The formula attempts to systematically allocate appreciation during the holding period of the asset.

Parameters, constraints and alternative procedures.

1. Parameters - The percentage to be applied to the difference between current market price and adjusted book value to obtain the periodic adjustment is the parameter to be selected. Ten and twenty Per cent are the most frequently used percentages according to the

¹Ibid., Table 11.

CMB Study.¹ One church pension fund uses a 50% write-up. All three percentages will be used to test this method. They should provide a representative test.

2. Constraints - This method will be modified so that the portfolio asset value will not be less than the valuation based upon historical cost measurements. See the Long Range Yield Method for discussion.

3. Alternative procedures - There are alternative ways to treat realized gains on sales of stocks. However, these are generally impractical refinements of the method described above and are not recommended for use.

b. Minimization Formula Methods

General purpose. The Minimization Formula Methods are designed to optimize the recorded asset values in terms of specified criteria. The factors to consider in this study are reported yields and current market values. The purpose for the use of the minimization is to compute annual book values considering both current market values and stability of yield.

Description of the accounting.

1. The minimization formulas can be applied to each individual stock or to aggregate portfolio amounts. The aggregate method will be discussed in this section. The individual stocks are valued by the Historical Cost Method of accounting.

¹Ibid., Table 12c.

2. It is an asset valuation method. The asset value of the portfolio is obtained from a formula. The formula was derived to minimize both the change in yield from the preceding period and the deviation from current market value according to a specified relationship. The derivation of the formula is shown in the APPENDIX. The valuation reserve is the total value obtained above less the aggregate value of the individual stocks valued by the Historical Cost Method plus the change in the valuation reserve computed above.

Basis of selection.

1. The method is not reported to be presently in use.
2. The method was selected for its theoretical appeal. It was designed specifically to meet the criteria of consideration of market value and stability of yield. The method is objective in terms of its application and attempts to systematically allocate appreciation during the holding period of the asset.

Parameters, constraints and alternative procedures.

1. Parameters - The relative weight given to each factor is the parameter to be selected. In the absence of any evidence to do otherwise, equal weight will be assigned to the factors to give a representative test of the method.

2. Constraints - none

3. Alternative procedures

a. The method can be modified to consider additional factors, such as conservatism. This study will be restricted to the use of the two primary factors developed in Chapter II.

b. The method can be applied to individual stocks as

well as portfolio totals. Because of the theoretical appeal of this method it will be tested on individual stocks and portfolio totals.

IV. Current Market Value Method.

General purpose. The Current Market Value Method is designed to equate accounting measures with the objective of measuring investment performance.¹ Market value changes are recorded as they occur. Periodic earnings are the result of market value changes.

Description of the accounting.

1. The current market value is applied to each individual stock.
2. It is an asset valuation method. A common stock is valued at the current market value.
3. Earnings are the sum of the dividends plus the gains recorded for individual stocks.
4. Gains represent, (a) the market appreciation during the period for stocks held at the end of the period, and (b) the difference between the sales price and market value at the beginning of the period for stocks sold during the period.

Basis of selection.

1. Present use is a basis for selection. Its use is not extensive. Only 18 of the 497 firms in the CMB Study specified using the Current Market Value Method. The method ranked fifth out of eight

¹Peter O. Dietz, "Measuring Pension Fund Performance," Financial Executive, XXXVII (November, 1969), 20-21.

methods specified in that study.¹

2. The method lacks theoretical appeal because of the fluctuating yields that result from its use. The method is discussed widely in the literature² and therefore deserves to be included in the study on that basis alone.

Parameters, constraints and alternative procedures.

1. Parameters - none
2. Constraints - none
3. Alternative procedures - none

V. Adjusted Market Value Methods

a. Market Value, Less a Reserve

General purpose. The Market Value, Less a Reserve Methods are designed to recognize market appreciation but on a conservative basis. Conservatism with regards to current market value is the general purpose of these methods.

Description of the accounting.

1. The Market Value, Less a Reserve Methods are usually applied to aggregate portfolio amounts. The individual stocks are valued by the Current Market Value Method.
2. It is an asset valuation method. The asset value of the

¹ Kane, Pension Fund Financing, Table 11.

² Fraine, Life Insurance Companies, p. 10; Jackson, "Valuation of Assets," p. 392; Cramer, Reporting Requirements, 80-81; Sloat, "Valuation of Equities," 38-41; Gainer, "Survey and Commentary," p. 16.

portfolio is the aggregate value of the individual stocks valued by the Current Market Value Method less a valuation reserve. The valuation reserve is the lesser of (1) a percentage of the current market value, (2) an amount computed by any one of many formulas. The most commonly recommended formula is the difference between the current market value and the historical cost valuation. When this formula is applied the portfolio is valued at the greater of the Historical Cost Method or a percentage of current market value.

3. Earnings are the sum of the earnings computed by the Current Market Value Method plus the change in the valuation reserve.

Basis of selection.

1. Present use by a church pension fund is the basis of selection.

2. The method has limited theoretical appeal by the criteria established in this study, since conservatism is the primary objective.

Parameters, constraints and alternative procedures.

1. Parameters - The percentage to be applied to current market value to obtain the reserve is the parameter to be selected. Ten, twenty, and thirty-three percent should provide a representative test of the accounting method and will be selected for testing. The church pension fund uses a 20% reserve.

2. Constraints

a. Since conservatism is the objective and market value is the maximum value logically permitted, this constraint will be observed.

b. The reserve percentage is in reality a constraint

and represents the minimum value for the portfolio.

3. Alternative procedures

a. Since the method specifies upper and lower constraints, any other method of accounting can be used in combination with this method. Use of these constraints are particularly appropriate for methods in Classification I and II that do not consider market value in the formula. However, testing of this method will be restricted to use with the Historical Cost Method and the method discussed below.

b. One church pension fund is using the following modification to compute earnings when there is less than a maximum size reserve: One percent of the total current market value is deducted from earnings and added to the reserve. Earnings are dividends received less this 1% charge.

b. Moving Average Market Value based upon the average of several years (Moving Average)

General purpose. Stability of yield in the use of market value is the general purpose of the Moving Average Method.

Description of the accounting.

1. The Moving Average Method is applied to each individual stock.
2. It is an asset valuation method. Each stock is valued at the average market value computed over a specified number of years.
3. Earnings are the sum of the dividends received plus the gains recorded for the individual stocks.
4. Gains recorded are (a) the changes in value during the

period as computed above for stocks held at the end of the year and (b) the difference between the sales price and the average value at the beginning of the year for stocks sold during the year.

Basis of selection.

1. Present use is a basis for selection. This is one of the methods cited in the CMB Study.¹

2. The method also meets all of the criteria for theoretical appeal. It considers market value and smooths the adjustment to market value by averaging values. The method is objective. The formula with proper modification attempts to systematically allocate appreciation during the holding period of the asset.

Parameters, constraints and alternative procedures.

1. Parameters

a. The number of years to average market value is the critical parameter to select. Since the method attempts to smooth earnings by averaging market value, the time period is somewhat related to business cycles. In discussing the length of time to average, Fraine cites that the arithmetic mean length of business cycles from 1854 to 1958 to be 4-1/6 years. The conclusion is that a 5 year moving average is a desirable length of time.² Of the 27 funds using the method, 23 selected 5 years as the length of time.³ Although 3 years is sometimes mentioned in the literature, 5 years is most

¹Kane, Pension Fund Financing, Table 11.

²Fraine, Life Insurance Companies, p. 115.

³Kane, Pension Fund Financing, Table 12d.

frequently suggested.¹ Therefore, a 5 year moving average was selected. A single parameter for number of years is considered sufficient to adequately test the method.

b. Other parameters that can be considered are the respective weights given to each year in averaging values. In the absence of specific reasons for considering a specific alternative, equal weighting will be applied to each year in this study.

2. Constraints - A strict application of a 5 year moving average market value would imply valuing purchases at an amount other than the price paid on the date of purchase. In order to systematically allocate appreciation during the holding period only market values on and subsequent to the date of purchase will be considered in computing the average market value.

3. Alternative procedures

a. There are several possible methods to modify the Moving Average Method to consider only values subsequent to the date of purchase. The following method will be used by this researcher:

(1) Purchase price at date of purchase will be considered the initial market value.

(2) If the number of time periods subsequent to the date of purchase is less than 5, purchase price will be weighted sufficiently to bring the total number of time periods to 5.

(3) If the number of time periods is greater than or equal to 5, purchase price will be disregarded in computing the moving average.

¹Jackson, "Valuation of Assets," p. 414; Cramer, Reporting Requirements, p. 81.

It is the opinion of this researcher that other alternatives would not significantly alter the evaluation of the Moving Average Method.

b. In a manner similar to the Historical Cost Method, the Moving Average Method offers alternative procedures to compute cost of sales. Average cost will be used in this study.

c. Least Squares Trend Line based upon market value for several years (Trend Line)

General purpose. Stability of yield in the use of market value is the general purpose of the Trend Line Method. Closeness to market value is also a purpose of the method as it projects a current average value.

Description of the accounting.

1. The Trend Line Method is applied to each individual stock.
2. It is an asset valuation method. Each stock is valued at the projected value. The projected value is computed by use of a trend line based upon the market values for a specified number of years. The least squares method is used to compute the trend line.
3. Earnings are the sum of the dividends received plus the gains recorded for the individual stocks.
4. Gains recorded are (a) the changes in value during the period as computed above for stocks held at the end of the year and (b) the difference between the sales price and the average value at the beginning of the year for stocks sold during the year.

Basis of selection.

1. The method is not reported to be presently in use.
2. The method was selected for its theoretical appeal. It

is a modification of the Moving Average Method that should be closer to market value than the Moving Average Method. It considers market value and average market value to obtain some stability of yield. The method is objective. The formula with proper modification attempts to systematically allocate appreciation during the holding period.

Parameters, constraints and alternative procedures.

1. Parameters.

a. The number of years to average market value is the critical parameter to select. Five years will be selected. The reasons discussed for the Moving Average Method apply to the Trend Line Method.

b. Various weights can be assigned to each year in computing the trend line. In the absence of specific reasons for considering a specific alternative, equal weights will be applied to each year.

2. Constraints - Only market values on or subsequent to the date of purchase will be considered in computing the projected value. See the Moving Average Method for discussion of this constraint.

3. Alternative procedures.

a. The procedures described for the Moving Average Method will be used for the Trend Line Method to adjust for stocks owned less than 5 years.

b. The shapes of the trend line are alternative procedures that can be applied to the Trend Line Method. Examples of alternatives are linear, quadratic, exponential and logarithmic. For purposes of this research the linear trend line will be tested.

The discussion concerning refinements of the method beyond a linear trend line is similar to the discussion for weighting.

c. Another alternative procedure is to project a value for year 4 instead of year 5, that is for year $t-1$. This alternative would provide a compromise between the Moving Average Method and the projected value for the Trend Line Method. See Figure 3 for an illustration. Using the hypothetical data from Table 1 in Chapter II, the

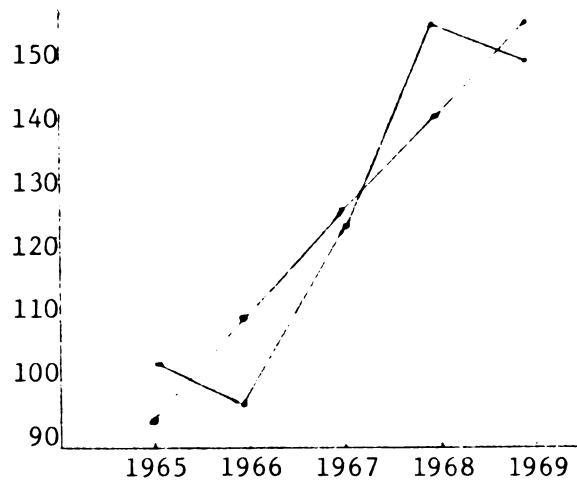


FIGURE 3

LEAST SQUARES TREND LINE OF MARKET VALUE
DATA FROM TABLE 1

5 year Moving Average Method would provide a book value of \$122.20 which is the value on the trend line for 1967. The book value for Trend Line Method would be \$151.60 which is the value on the trend line for 1969. The value for year $t-1$, 1968, would be \$136.90 which is the mid-point value between the Trend Line Method and the Moving Average Method. This alternative need not be tested to represent the

respective methods.

d. Market Value with a Variable Adjustment
Methods (Variable Adjustment)

General purpose. In this study, methods with the designation "Market Value with Variable Adjustment" refer to a specific group of methods suggested by Jackson and Hamilton.¹ The authors consider market value as the appropriate method of value portfolios but believe unreasonable fluctuation should be screened from annual valuations. The objectives of the methods are to achieve some stability of yield around the actuarial rate of return in the use of market values for valuation and to achieve an element of conservatism in the valuation.

Description of the accounting.

1. These Variable Adjustment Methods are applied to aggregate portfolio amounts. The individual stocks are valued by the Current Market Value Method.

2. These are earnings methods. The earnings are functions of the actuarial rate of interest, the change in market value during the period, dividend income and the ratio of the book value of the fund to the market value of the fund. The functional relationships for the alternative selected for testing are specified in the APPENDIX.

3. The asset value of the portfolio is the aggregate value of the individual stocks valued by the Current Market Value Method less a valuation reserve. The reserve is cumulative. The periodic adjustment

¹Jackson, "Valuation of Assets," 393-395.

is the difference between earnings computed by the Current Market Value Method and earnings specified above.

Basis of selection.

1. The methods are not reported to be presently in use.
2. The methods were recommended in the literature and generally meet the criteria for theoretical appeal. The methods consider market value in the formula, specifically provide for stability of yield and attempt to systematically allocate appreciation during the holding period of the asset. The use of the actuarial rate of interest may be considered subjective, however the method generally fits the notion of an objective method of valuation.

Parameters, constraints and alternative procedures.

1. Alternative procedures - There are seven modifications suggested in the Jackson and Hamilton article.¹ The alternative procedures must be specified before selection of parameters. The various alternatives specify the amounts to be added or deducted from the valuation reserve based upon the amount of deviation in earnings from some mean yield. The actuarial rate of interest is recommended as an alternative to a mean yield. The modification selected for study appeared representative of methods suggested. Except for the actuarial rate of interest, the parameters and constraints are specified in the article.

2. Parameters - The actuarial rate of return is the critical parameter to be selected. A 4% actuarial interest rate will be used to test this method. Approximately 40% of the corporate pension funds

¹Ibid., p. 415.

included in the CMB Study¹ use 4% for actuarial purposes. The mean percentage for those church pension funds reporting to the December, 1969 Church Pensions Conference was 3.9%²

3. Constraints

- a. Current market value is the maximum value of the portfolio.
- b. The annual earnings will not be less than the actuarial rate of return, subject to the above constraint.
- c. The annual earnings will not exceed an amount based upon the actuarial interest rate, plus 10%, plus an amount based upon the valuation reserve at the beginning of the year.

D. SUMMARY OF METHODS SELECTED

Twelve methods have been selected for study. With the various alternative parameters, constraints and procedures the total methods have been expanded to twenty one. Nine of the twelve methods are presently in use. Five meet all of the criteria for theoretical appeal.

¹Kane, Pension Fund Financing, Table 6.

²Kenneth H. Ross, "Notes on Annual Statistical Reports of Participating Pension Funds" (paper presented at the 55th annual meeting of the Church Pensions Conference, New York, December 4 and 5, 1969), p. 9.

CHAPTER IV

RESEARCH DESIGN

A mathematical model will be developed incorporating the criteria specified in Chapter II. The accounting methods selected in Chapter III will be applied to the common stock portfolios of a theoretical pension fund and an actual pension fund. Annual yields and book values over a long period of time will be computed by each accounting method. The mathematical model, having the benefit of hindsight, will utilize the computed yields and book values to rate each accounting method. The most efficient methods will be selected and recommended for use. Other characteristics of the accounting methods will be observed and results reported.

A. THE MODEL

Formulation of the Model

The criteria for judging accounting methods has been determined to be, (a) closeness to market value, and (b) stability of yield. These are the characteristics to be measured by the model. The accounting method with the smallest aggregate deviation from a measure of these characteristics is the optimal method.

Let C_v = a measure of closeness to market value; coefficient of variation between book value (as determined by the specific accounting method) and current market value.

Let C_y = a measure of stability of yield; coefficient of variation
between yield (as determined by the specific accounting
method) for time (t) and time (t-1).

$$\text{Let } C^2 = C_v^2 + C_y^2$$

$$\therefore C = \sqrt{C_v^2 + C_y^2}$$

This is the basic model. The C , C_v and C_y values are the amounts to be determined. Evaluation of results will be based upon resultant values of these variables. The accounting method with the smallest C or C^2 value is the optimal method.

Formal statistical methods will not be used to reach conclusions. However, the notion of relative variance as described in classical statistics is the basis for the measures developed in this study.¹

C_v^2 . The coefficient of variation between book value and market value, C_v , will be defined in the formula below. It is a measure of the percentage deviation of book value from the corresponding current market value. It is stated as follows:

$$C_v^2 = \frac{1}{N} \sum_{t=1}^N \left[\frac{B_{jt} - M_t}{M_t} \right]^2$$

C_v = Coefficient of variation
between book value and
market value

B_{jt} = Book value for accounting
method (j) at time (t)

M_t = Market value at time (t)

N = Number of years

¹Taro Yamane, Elementary Sampling Theory (Englewood Cliffs,
N. J.: Prentice-Hall, Inc., 1967), 33-37.

The formula is derived as follows:

$$|B_{jt} - M_t| = \text{The absolute value of the difference between the computed book value for accounting method (j) and the market value. This is the closeness to market value for time period (t).}$$

$$\frac{|B_{jt} - M_t|}{M_t} = \text{The percentage difference between computed book value for accounting method (j) and the market value. This is the relative closeness to market value for time period (t).}$$

$$\left[\frac{B_{jt} - M_t}{M_t} \right]^2 = \text{The squared percentage deviation between the computed book value for accounting method (j) and the market value.}$$

$$\sum_{t=1}^N \left[\frac{B_{jt} - M_t}{M_t} \right]^2 = \text{The sum of the squared deviations over all time periods.}$$

$$\frac{1}{N} \sum_{t=1}^N \left[\frac{B_{jt} - M_t}{M_t} \right]^2 = \text{The average variation over all time periods. Dividing by N is not necessary unless comparisons over unequal time periods are made.}$$

C_y^2 The coefficient of variation between yield for time (t) and time (t-1), will be defined in the formula below. It is a measure of the relative change in earnings. It is stated as follows:

$$C_y^2 = \frac{1}{N} \sum_{t=1}^N [Y_{jt} - Y_{j(t-1)}]^2$$

C_y = Coefficient of variation between yield for time (t) and time (t-1).

Y_{jt} = Yield for time (t) based upon the accounting method (j).

$Y_{j(t-1)}$ = Yield for time (t-1).

The formula is derived as follows:

$|Y_{jt} - Y_{j(t-1)}|$ = The absolute value of the difference between the yield for accounting method (j) from time (t-1) to time (t). A stable yield has a small change in yield from period to period. Yield is a ratio. This difference represents the relative change in earnings.

$(Y_{jt} - Y_{j(t-1)})^2$ = The squared deviation between yield for time (t) and time (t-1) for accounting method (j).

$\sum_{t=1}^N (Y_{jt} - Y_{j(t-1)})^2$ = The sum of the squared deviations over all time periods.

$\frac{1}{N} \sum_{t=1}^N (Y_{jt} - Y_{j(t-1)})^2$ = The average variation over all time periods. Dividing by N is not necessary unless comparisons over unequal time periods are made.

Squared deviations. The squared deviations have been selected rather than the absolute deviations. The mathematical property of

squared deviations to magnify large amounts in relationship to many small amounts is the reason for this choice. Small differences between book value and market value are of little consequence. Likewise, small fluctuations in yield from period to period are not significant. A single large deviation that results from the use of a particular accounting method will result in a large C or C^2 computed value. As a result such an accounting method will be assigned a low ranking.

Weighting. The relative weighting assigned to the C_v^2 or C_y^2 factor depends upon the relative importance of each factor to each pension fund. This is a matter of individual choice. There does not appear to be any theoretical grounds for assigning a particular set of weights as being the universal set of correct weights. For purposes of this study, equal weights will be assigned the factors for the initial evaluation of accounting methods.

Computation of yield. Yield will be computed as follows:

$$Y_{jt} = E_{jt} / (B_{j(t-1)} + P_t - S_{jt})$$

$$E_{jt} = \text{Earnings for time (t) by accounting method (j).}$$

$$B_{j(t-1)} = \text{Book value for time (t-1) by accounting method (j).}$$

$$P_t = \text{Purchases at cost for time (t), adjusted for part year holdings.}$$

$$S_{jt} = \text{Cost of sales for time (t) by accounting method (j), adjusted for part year holdings.}$$

The alternative methods to compute yields are to, (1) base the yield on the accounting method being tested as per above, or (2) base

the yield on some universal amount such as current market value. The formula for the latter method is as follows:

$$Y_{jt} = E_{jt} / (M_{(t-1)} + P_t - S_t)$$

$M_{(t-1)}$ = Market value for time (t-1).

S_t = Sales for time (t) priced at market value for time (t-1),
adjusted for part year holdings.

For method (1) the relative change in the C_y^2 value among the various accounting methods is a function of two variables, the earnings and the book value. For method (2) the relative change in the C_y^2 value among the various accounting methods is a function of one variable, the earnings. The denominator is a constant over all accounting methods. A more consistent yield measure among the accounting methods is the major argument for use of the constant base. The effects of the varying earnings can be isolated. However, this argument is not relevant to the purpose of this study. The purpose is to judge the accounting methods. The relevant yield computation to be tested should be the one that produces the value that would be reported for the accounting method when in use.

One of the variables in the yield computation is cost of sales. For aggregate methods of accounting, no specific cost of sales is determined for the individual stocks sold. When aggregate methods of accounting are used, the individual stocks are valued by the Historical Cost or Current Market Value Methods. A valuation reserve is computed which is applicable to the portfolio, but not assigned to individual stocks. (See Chapter III, General Characteristics of Accounting Methods, for review of aggregate methods.) For purposes of computing

yield an estimate for cost of sales will be computed as follows:

1. As specified in Chapter III, cost of sales will be computed for the individual stocks by the Historical Cost or Current Market Value Methods, whichever method is used to value the individual stocks.

2. The cost of sales amount for time (t) will be adjusted by the ratio of the valuation reserve to the book value of the portfolio for time (t-1).

Characteristics of the Model

Example. An example will be used to explain some of the characteristics of the model. Table 2 illustrates how the model ranks the theoretical allocation methods discussed in Chapter II, assuming the facts given in Table 1 in that chapter. This is hypothetical and is not necessarily representative of the results that would be obtained from the study. The yields and book values are graphed in Figures 1 and 2 of Chapter II.

TABLE 2
RANK OF ALLOCATION METHODS

Method	Rank	C^2	$= C_v^2$	$+ C_y^2$
I. Historical cost	5	10.59	3.54	7.05
II. Equal allocation	2	1.06	1.05	.01
III. Earnings	3	1.51	1.17	.34
IV. Current market value	4	7.12	-	7.12
V. Constant rate of return	1	0.95	0.95	-

NOTE: The ranking is based upon information assumed in Table 1, Chapter II.

Ranking. The use of the model provides a means of assignment of an ordinal ranking of the accounting methods. The rankings are assigned in inverse order by C^2 value. This ranking provides the initial judgment about accounting methods. In this illustration the constant rate of return theoretical allocation method has the lowest C^2 value, 0.95, and therefore would be ranked number one. The historical cost method has the highest C^2 value, 10.59, and would be ranked as the poorest method.

A review of the C^2 values reveals that the value for the equal allocation method is very close to the value for the constant rate of return method, 1.06 to 0.95. Based upon the closeness of these numbers, it would be difficult to support a recommendation of the superiority of the constant rate of return method without additional evidence. From a review of the numbers it can be judged that both methods are superior to the historical cost and current market value methods. It becomes clear that an ordinal ranking from this single test does not give sufficient evidence for final recommendations. Additional judgments including consideration of the cardinal values of the numbers are required in order to draw conclusions from the use of the model.

Closeness to market value. The C_v^2 value measures closeness to market value for each allocation. As noted in Table 2, the C_v^2 amount for the current market value method equals zero. This method is by definition the optimal method in terms of closeness to market value.

The data from Table 1 is for a relatively short period of time. All methods in the illustration converge on market value at the end of the sample time period. As a result the example does not illustrate clearly the effects on closeness to market value of those methods

that do not consider market value in the formula. For those two theoretical allocation methods that require execution of a sale to converge on market value, adjustment in the C_v^2 amount excluding the effect of the sale is as follows:

<u>Method</u>	<u>C_v^2 amount</u>	
	<u>Table II</u>	<u>Adjusted</u>
I. Historical cost	3.54	5.92
III. Earnings	1.17	1.37

Without convergence at the terminal period, both methods have a larger C_v^2 value than the other methods illustrated and give some indication of a trend of higher deviations from market value.

Conclusions about the specific methods cannot be drawn from the illustrated results. The example does demonstrate how the model evaluates closeness to market value and should rate higher those methods that consider market value in the formula.

Stability of yield. The C_y^2 value measures stability of yield for each allocation method. If it were possible to have a crystal ball and use the constant rate of return method as in the example, then the C_y^2 value for this method equals zero. This method is by definition the optimal method in terms of stability of yield.

In contrast, the current market value method, illustrating fluctuating values and resulting yields that range from large positive amounts to negative amounts has a C_y^2 value that is very large. Even though the current market value method shows a $C_v^2 = 0$, this method ranks a poor fourth out of five methods when ranking the methods on the C^2 value.

Large changes in yield will give an accounting method a low rank. Any method, such as the historical cost method, subject to large gains or losses when sales occur should rank in a low position. In this illustration the historical cost method had no fluctuation in earnings during the first three periods and a large gain in the final period. As a result the C_y^2 amount for the historical cost method almost equaled the C_y^2 amount for the current market value method with its highly fluctuating earnings, 7.05 to 7.12.

Again conclusions about the methods cannot be drawn from the illustrated results. The example does demonstrate how the model evaluates fluctuating yields. Those methods that systematically allocate appreciation during the holding period, Methods II, III and V, rated higher than the methods that did not.

Combined effects. The C^2 value measures the combined effects of closeness to market value and stability of yield. In the illustration the constant rate of return method ranked first in overall results. The criteria for the model was based upon an analysis of this theoretical method and therefore, would be expected to rank first when considering a single investment. Although a set of facts could be formulated where some other method would outrank method V, this would be unusual.

The methods that, (a) consider market value in the formula, and (b) average market appreciation over time to smooth the effects of changes in market value or specifically provide for stability of yield, would be expected to have relatively low C^2 values and rank as the best methods. Methods II, IV and V consider market value in the formula. Method II, equal allocation, averages appreciation over time. Method V,

constant rate of return, specifically provides for stability of yield. Methods II and V ranked as the best methods in the illustration.

B. THE SAMPLE

The accounting methods selected for evaluation will be tested with a sample of two funds over a specific time period. These sample funds will be an actual church pension fund and a theoretical pension fund.

The Actual Pension Fund

Description of the fund. The church pension fund selected for testing will be referred to as the AB Fund. The AB Fund is a member of the Church Pensions Conference.¹ It is one of the largest pension funds submitting information to this Conference with total assets in excess of \$200,000,000. The AB Fund provides retirement benefits on a voluntary basis for all personnel working for a church or agency affiliated with the church group represented by this fund. It has been in existence since 1918. The investments in common stocks have ranged from 15% to 25% of the total assets of the fund. Over \$50,000,000 are currently invested in common stocks.²

¹The Church Pensions Conference represents a group of 29 Church and other non profit pension boards that meet annually to exchange information and attend seminars on current developments in the pension field. Included as a presentation of the Fifty-Fifth Annual Meeting in 1969 was the report by Kenneth H. Ross, "Notes on Annual Statistical Reports of Participating Pension Funds", p. 5 which indicated total assets for this group of \$1,992 million.

²Information on the AB Fund has been obtained from published annual reports and internal information furnished by management of the fund.

Over the period to be tested the AB Fund averaged 66 stocks in its common stock portfolio. It had an average rate of increase in investment of approximately 20%. This represents a fairly high rate of sustained growth. The AB Fund had an average annual turnover in its common stock portfolio of approximately 10%. A 10% turnover would be representative of a buy and hold type of investment philosophy. There were seven years in which the turnover was less than one percent and three years in which the turnover was greater than 25%. These three years of high turnover indicate a non-consistent application of the buy and hold philosophy. This non-consistency along with the general tendency of holding stocks a long period of time should provide an interesting test of accounting methods.

With changing leadership and with dynamic attitudes concerning investment goals and the relative worth of types of investment, investment policies towards common stocks have undergone many changes during the life of the AB Fund. Therefore, tests over a long period of time utilizing this pension fund would test the composite of several investment strategies, mixed with the various economic and psychological conditions of the market.

While no one fund can be called typical of all church pension funds, the AB Fund is of sufficient size and age to provide a representative test of accounting methods for the church pension funds.

Description of the accounting. The data gathering and application of accounting methods to this fund is the major empirical effort of this dissertation.

For the period covered in the study, the detailed transactions

for each common stock have been obtained. These are the purchases, sales and stock splits. The number of shares, amount and year and month of the transaction have been recorded. If there are multiple transactions of one type for a common stock in the same year, the transactions have been combined into a single transaction. An average month for the transaction has been estimated and recorded.

Additionally, the cash dividends received during each year and the market value at December 31 of each year have been recorded for each stock owned.

Advantages. The chief advantage for the use of an actual pension fund as opposed to purely simulation is that actual investment decisions are tested under actual market conditions.

Disadvantages. There are two principal disadvantages to the use of one actual pension fund:

1. One disadvantage is the use of a single fund. The fund selected may not be representative. The investment results for the AB Fund when evaluated against the model, may reach conclusions that would be different for the average of the other church pension funds. This is an inherent disadvantage with a small sample. This disadvantage is exaggerated by the use of one fund.

2. Another disadvantage results from the use of actual pension funds. Accounting methods and investment decisions are not independent. Management is sometimes influenced in its investment decisions by the effects these decisions have on reported results. Management can be influenced in another manner. Any accounting method in use over a sufficient length of time establishes some credibility. In spite of

initial knowledge of the biases of specific accounting methods, management tends to believe the reported results and act accordingly. For these reasons, the use of differing accounting methods may result in alternative investment decisions and lead to differing investment results. Therefore, research conducted studying the effects of the use of alternative accounting methods for an actual pension fund suffer from some unknown amount of inaccuracy, since changing accounting methods may also change portfolio results. The results from any empirical research that is conducted with this type of limitation must be treated with some reservations unless a test is performed to overcome this bias.

The Theoretical Pension Fund

Description of the fund. A theoretical fund has been simulated. The Dow Jones Industrial Index, The Index, has been used to provide the basic information. The theoretical fund will be referred to as the Dow Fund. Quarterly earnings, dividends and quoted prices have been obtained from The Dow Jones Investor's Handbook.¹ Shares of The Index have been purchased and sold at the price currently quoted in The Index. All transactions take place at the end of a calendar quarter. The simulated activity for the Dow Fund takes place concurrently with the time period selected for study for the AB Fund.

The investment strategy has been specified. The initial investment is 100 shares. Ten shares of The Index have been purchased annually. Twenty shares of The Index have been sold every five years. They

¹Maurice L. Farrell, ed., The Dow Jones Industrial Handbook, 1970 (Princeton, New Jersey: Dow Jones Books, 1970), 24-26.

were sold in blocks of ten shares. This results in a net growth of 30 shares every five years. Shares were selected rather than specific dollar amounts because of the ease of implementation. The results should not be materially affected by the form of specification. The general trend of The Index since the Great Depression has been increasing over time. Selection of a constant number of shares results in an increasing dollar amount of purchases over the period of the study.

Stock selection and timing of transactions were by random choice. Each year's purchases were designated as a separate stock. The quarter in which the purchase was made was selected at random. The year and quarter for each sale of 20 shares was selected at random. The division of shares sold into blocks of 10 shares is for the purpose of assigning a specific stock sold. The determination of the stock sold was by random selection.

The Dow Fund averaged 9 stocks in its portfolio. It had an average rate of increase in investment of approximately 8%. This represents a modest rate of sustained growth. The Dow Fund had an average rate of turnover of approximately 3%. This is a very low turnover. Since stock sales and purchases were on a very systematic basis, the Fund should provide a contrast with the non-consistencies of the AB Fund.

Description of the accounting. Each year's purchases have been accounted for as a separate stock. Where applicable, the accounting was the same as for the AB Fund.

Advantages. Independence between investment strategy and accounting methods is one of the principal advantages of the use of a simulated fund. The stock selection is not influenced by the accounting

method in use.

Disadvantages. The major disadvantage of the use of simulation is that replication of actual investment decisions cannot be duplicated on an economically feasible basis by methods presently known. See the study by Clarkson for an example of the complex nature of the simulation of investment decisions.¹

Time Period

A historical time period will be selected for study. One objection to the use of past time periods is that there is no guarantee that what occurred in the past will repeat itself. The general use of the historical approach to select acceptable accounting methods is one argument in favor of the use of historical time periods. While this may be sufficient, a stronger argument can be presented for use of historical time periods. The purpose of the study is to determine the accounting method that best meets the criteria established in this paper. An accounting method that has been tested under many economic conditions, various psychological states of the stock market, and changes in the investment strategies; and has demonstrated its superiority would continue to rate highest in accordance with the established criteria under new factual situations.

The time period covered should be of sufficient length to include a variety of economic conditions and investment opportunities. The researcher believes that the twenty five years ended in 1969 provide a time period of sufficient length and variety to provide a fair

¹Geoffrey P. E. Clarkson, Portfolio Selection: A Simulation of Trust Investment (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962).

test of the accounting methods. This time period includes the immediate post war period with its boom and recession. The Korean War with its rapid economic expansion and economic controls followed. During the 1950's there was generally a steady economic expansion interrupted by mild recessions in 1954, 1958 and 1960. During the early 1960's there was steady economic expansion, full employment, and a relatively stable monetary unit.¹ With the entry into Viet Nam in 1965 the economic balance was upset by rapid expansion into war production and an inflationary cycle began. The period ended in 1969 with a recession in process.

During the period investor attitudes underwent several changes. . . . In the late 1940's, in spite of considerable postwar prosperity, you could buy the best-known and most highly regarded common stocks at seven or eight times their annual earnings per share. Most people were still anticipating the big postwar depression that was often predicted but never arrived.

Then in the decade of the 1950's the mood gradually changed to one of optimism, and stock prices rose as investors came more and more to expect further increases in earnings and dividends per share. By the late 1950's the rise in market prices had far outrun increases in earnings and dividends, as stock buyers estimated optimistically future improvement in the financial abilities of business corporations. Despite occasional recessions, this period of favorable estimates continued into the 1960's. . . . The

¹Harry Sauvain, Investment Management (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967, 3d ed.), 140-142, 192-194.

long-term upward trend in the average price-earnings ratio is an excellent measure of the change in investors' attitudes from fear of the worst to hope for the best.¹

During the 1960's a cyclical market was experienced with peaks in 1961, 1965 and 1968 followed by sharp declines in the market. The market peak in 1965 reflected by the Dow Jones Industrial Index was not reached again in the remainder of the decade.² The price earnings ratio for The Index dropped from 24.2 in 1961 to 13.6 in 1969.³

The time period selected for study in the 25 years ended in 1969 and should provide a rigorous test for the accounting methods.

C. THE EVALUATION

The accounting methods described in Chapter III will be applied to the sample funds described above over the 25 year period from 1945 through 1969. The annual yields based upon each accounting method will be computed. The yields, book values and market values will be used to compute the values required in the model, C_v^2 , C_y^2 and C^2 . These values will be used to evaluate the accounting methods.

Initial Evaluation

The initial evaluation will be based upon equal weighted factors for the 25-year time period. The methods will be ranked in inverse order by aggregate C^2 value for each of the funds.

¹Ibid., 140-141.

²Farrell, Investor's Handbook, p. 24.

³Ibid.

Comparison of funds. The respective ranking of the accounting methods by each fund will be compared for the degree of correlation. The results will be analyzed and significant differences explained. Should there remain unexplained significant differences, the sample will be enlarged to include additional simulation models. Should the results demonstrate that the AB Fund is not representative, the sample will be expanded to include additional pension funds.

The results will be evaluated as follows:

1. A very high degree of correlation would indicate universal applicability of results.
2. Mixed results, with high correlation among certain pairs of funds and low correlation among other pairs would require analysis to determine factors that affect general applicability of results.
3. A low correlation among funds after expansion of the sample would indicate a unique solution for each fund.

Comparison of accounting methods. The ordinal ranking and relative values for each method will be reviewed. From this evaluation a group of acceptable methods will be determined. In addition, paired comparisons will be made to determine those methods that are clearly better than other specific methods.

Expanded Tests and Evaluation

Additional tests will be performed upon the sample funds in order to obtain additional information about the effects of varying certain factors in the model.

Sensitivity analysis. The original model utilized equal

weighting for the C_v^2 and C_y^2 factors. A sensitivity analysis will be performed by varying the weights to the factors. The results of this analysis should determine the range in which certain methods demonstrate their advantages. The C_v^2 factor, deviations from market value, will be weighted over the range from 0.01 to 20.0. This weighting should provide a reasonable range. Weighting beyond the end points would be equivalent to evaluating a single factor and omitting the effects of a two-factor model.

Time period analysis. As one additional test, the time periods will be shortened to determine whether certain methods performed differently during specific time periods. Overlapping periods of 10 years will be tested.

Summary of the Evaluation Process.

The ordinal ranking of the accounting methods will be the primary basis for judging and selection of the best accounting method. This judgment will be modified by a study of the respective "C" values. The results will be amplified by use of sensitivity analysis and variable time period analysis.

A group of accounting methods that are acceptable for use as judged on the basis of the criteria established in this paper will be selected. For those acceptable methods the characteristics that would make a particular method more desirable under alternative sets of conditions and more desirable under alternative sets of utility preferences will be set forth.

CHAPTER V

RESULTS - EVALUATION OF TESTS

Annual yields and book values have been computed over the time period from 1945 through 1969 for each sample fund by the accounting methods specified in Chapter III. The internal rate of return for each fund has been computed.

The C_v^2 , C_y^2 and C^2 values indicated in the mathematical model have been computed. The results will be reported. These results will be evaluated in this chapter to determine the extent of general applicability of the results among pension funds and across time periods.

A. REPORTING OF RESULTS

The results are displayed in Table 3 and 4. They are based upon equal weighted factors for the 25 year time period of the study. The formula is, $C^2 = (1.0) C_v^2 + (1.0) C_y^2$, in which C_v and C_y are defined in Chapter IV.

The 25 year time period resulted in 23 "C" values. The initial balance at the end of 1945 is utilized to compute yield for 1946. Since 1946 was the initial year for yield information, 1947 is the first year for which a C_y value was available. The values displayed in the tables are the sum of the "C" values for each time period. Since all time periods are of equal length, it was not

TABLE 3

VALUES RESULTING FROM APPLICATION OF MATHEMATICAL MODEL TO SAMPLE FUND ACCOUNTING RESULTS

Accounting Method	A B FUND				DOW FUND			
	Rank	C ²	C ² _v	C ² _y	Rank	C ²	C ² _v	C ² _y
Ia Historical cost	21	2.7734	2.6321	0.1413	21	5.6615	5.5901	.0706
IIa Long range yield	7%	2.7064	2.5823	0.1241	19	5.6314	5.5601	.0707
Long range yield	9%	2.3378	2.3024	0.0354	18	5.2178	5.2016	.0162
I R R, initialized at cost	22	2.8197	2.8197	0.0000	14	1.9141	1.9141	--
I R R, initialized at market	14	2.0907	2.0907	0.0000	13	1.6287	1.6287	--
IIb Long range appreciation	3%	2.3860	2.3443	0.0417	16	4.1383	4.1360	.0023
Long range appreciation	6%	1.5640	1.5637	0.0003	11	1.5578	1.5567	.0011
Long range app, modified	3%	2.4277	2.3832	0.0445	17	4.6072	4.5970	.0102
IIc Minimum yield	6%	2.7647	2.6287	0.1360	20	5.6360	5.5681	.0679
IId Earnings	--				15	2.3044	2.2787	.0257
IIIIa Percent write-up	10%	1.1179	1.0166	0.1013	12	1.8960	1.8392	.0568
Percent write-up	20%	0.5854	0.4828	0.1026	6	.8774	.8028	.0746
Percent write-up	50%	0.3091	0.0871	0.2220	4	.3825	.1366	.2459
IIIIb Minimization formula, aggregate	1	0.1927	0.1023	0.0904	1	.2993	.1520	.1473
Minimization formula, individual	2	0.2022	0.1027	0.0995	2	.3275	.1561	.1714
IVa Current market value	8	1.0121	0.0000	1.0121	9	1.2500	--	1.2500
Va Market value, less a reserve	10%	1.1830	0.2192	0.9638	10	1.4550	.2300	1.2250
Market value, less a reserve	20%	1.7474	0.8013	0.9461	14	2.0607	.8630	1.1977
Market value, less a reserve	33%	2.1668	1.7240	0.4428	15	3.3686	2.2236	1.1450
Mkt value, less a res, mod	20%	1.1382	0.6999	0.4384	8	1.0543	.6951	.3592
Vb Moving average	5yr	0.4126	0.3738	0.0388	5	.5210	.4746	.0464
Vc Trend line	5yr	0.2590	0.0532	0.2058	3	.3589	.0918	.2671
Vd Market value with var adjustment	7	0.8443	0.5784	0.2659	7	1.0490	.6696	.3794

NOTE: The rank is assigned in inverse order by "C2" value.

TABLE 4
ORDINAL RANKING OF ACCOUNTING METHODS RANKED IN INVERSE ORDER BY "C" VALUES

Accounting Method	C ²				C ² _v				C ² _y			
	AB FUND		DOW FUND		AB FUND		DOW FUND		AB FUND		DOW FUND	
Ia Historical cost	21		21		21		21		21	13		10
IIa Long range yield	19	7%	19		19		19		19	11		9
Long range yield	16	9%	18		16		16		18	3		5
I R R, initialized at cost	22		14		22		22		15	1		1
I R R, initialized at market	14		13		15		15		13	1		1
IIb Long range appreciation	17	3%	16		17		17		16	5		3
Long range appreciation	12	6%	11		13		13		12	2		2
Long range app, modified	18	3%	17		18		18		17	6		4
IIb Minimum yield	20	6%	20		20		20		20	12		8
IIc Earnings	-		15		-		-		16	-		6
IIIa Percent write-up	9	10%	12		12		12		14	9		7
Percent write-up	6	20%	6		8		8		10	10		11
Percent write-up	4	50%	4		3		3		3	15		14
IIIB Minimization formula, aggregate	1		1		4		4		4	7		12
Minimization formula, individual	2		2		5		5		5	8		13
IVa Current market value	8		9		1		1		1	21		21
Va Market value, less a reserve	11	10%	10		6		6		6	20		20
Market value, less a reserve	13	20%	14		11		11		11	19		19
Market value, less a reserve	15	33%	15		14		14		15	18		18
Mkt value, less a res, mod	10	20%	8		10		10		9	17		16
Vb Moving average	5	5yr	5		7		7		7	4		6
Vc Trend line	3	5yr	3		2		2		2	14		15
Vd Market value with var adjustment	7		7		9		9		8	16		17

necessary to include the factor $\frac{1}{N}$ in computing "C" values.

The AB Fund has generally lower average "C" values than the Dow Fund. These lower values are due to smaller deviations from market values which are measured by the C_v^2 factor. As noted in Table 5, the AB Fund has a higher turnover rate than the Dow Fund. It would be expected that as the general market values increase over time, the fund that has a long holding period would have higher deviations from market value for those accounting methods that do not adjust adequately for changes in market value. The results are consistent with expectations.

It is interesting to note from Table 3 that the C_v value for the internal rate of return method (IRR), initialized at market, is higher for the AB Fund than for the Dow Fund, 2.0907 to 1.6287. These are both large numbers. Earnings based upon the IRR of each fund provide values. These book values are closer to market value for the Dow Fund than for the AB Fund. Use of the respective IRR for each fund to compute "C" values results in applying a different parameter value to each fund. In contrast, a parameter value was assigned to an accounting method. This value was applied consistently to both sample funds. The parameter values selected have generally resulted in conservative asset values. Therefore the C_v^2 amounts are lower for the fund with the lower internal rate of return, the AB Fund. This is an additional factor leading to lower "C" values. It is probable that applying higher parameter values for certain accounting methods would result in C_v^2 values for the AB Fund greater than for the Dow Fund.

The values, C_y^2 , that measure stability of yield do not appear to be significantly different between the funds. Contradictory results

TABLE 5
COMPARATIVE STATISTICS
FOR THE SAMPLE FUNDS

	AB FUND	DOW FUND
Average number of stocks held.	66	9
Annual rate of growth.	19%	8%
Annual turnover rate	9%	3%
Internal rate of return.	9.2%	11.2%
"C" Values		
Mean		
C^2	1.4390	2.3320
C_v^2	1.1790	2.0080
C_y^2	.2600	.3240
Median		
C^2	1.1830	1.5578
C_v^2	.8013	.8630
C_y^2	.1241	.0746

are noted by a comparison of the mean and median C_y^2 values from Table 5. The C_y^2 value for the Market Value Method is lower for the AB Fund than for the Dow Fund although the amounts do not vary significantly 1.0121 to 1.2500. The C_y^2 value for the Historical Cost Method is higher for the AB Fund than for the Dow Fund, .1413 to .0706. The AB Fund sold a substantial amount of stock in 1964 at a sizable gain. As a result the change in yield for Historical Cost Method was .22 in 1964 and .24 in 1965. Seventy-five percent of the total C_y^2 value, .1413, resulted in these two years.

The median values for the individual factors, C_v^2 and C_y^2 are fairly

close for the two funds. For approximately one-half of the accounting methods, current market value is a significant element in the formula. These methods would not be greatly affected by the holding period for the investment. The C_v^2 values for these methods should not vary greatly among the funds. This is reflected in C_v^2 median values of .8013 for the AB Fund and .8630 for the Dow Fund. Assessment of the relationship of the median C_y^2 value is not readily apparent. Fluctuations in yield result from a combination of two factors: (1) fluctuation in market value and, (2) timing of sales transactions and realization of gains. The fluctuations in yield due to changes in market value were greater for the Dow Fund. The fluctuations in yield due to timing of transactions was greater for the AB Fund. These resulted in median C_y^2 values for the AB Fund of .1241 and for Dow Fund of .0746.

B. COMPARISON OF FUNDS

The primary evaluation of the accounting methods will be based upon the ordinal rankings of the methods. The rankings have been assigned in inverse order by the "C" values. The ordinal rankings are displayed in Tables 3 and 4. For this method to have some universal applicability, there should be some consistency of ranking between funds. Causes for significant inconsistencies should have attributes that can be identified for specific funds. Data relative to the consistency of ranking is included in Table 6. The average difference in rank between the AB Fund and Dow Fund is less than one.

TABLE 6
COMPARATIVE RANKING
BETWEEN SAMPLE FUNDS

Differences between ranks of corresponding accounting methods	Number of Accounting Methods		
	C^2	C_v^2	C_y^2
0	11	11	6
1	7	6	5
2	2	4	6
3	-	-	1
4	1	-	1
5	-	-	2
Average deviation.	.71	.67	1.62
Rank correlation	.980	.986	.933

Evaluation of Reliability of Ranking

Spearman's formula for rank correlation¹ will be used to evaluate the comparative rankings for the AB Fund and the Dow Fund. The coefficient of rank correlation is given by

$$r_{\text{rank}} = 1 - \frac{6(\sum D^2)}{N(N^2-1)}$$

where D = differences between ranks of corresponding accounting methods
of the AB Fund and the Dow Fund

N = number of accounting methods.

The values in the formula for the C^2 value are as follows:

$$\sum D^2 = 31$$

$$N = 21$$

¹Murray R. Spiegel, Shaum's Outline of Theory and Problems of Statistics (New York: McGraw-Hill Book Company, 1961), p. 246.

The coefficient of rank correlation is a positive 0.980. This is a very high degree of correlation. The two diverse funds; with different growth rates and patterns, different turnover rates and patterns, different mixes of investments; give substantially identical results. The coefficient of rank correlation for the individual factors is also very high, .986 for the C_v factor and .933 for the C_y factor. As a result of this very high degree of correlation, further testing can proceed without increasing the size of the sample. The differences in ranking are so small, they can be attributed to chance causes. It will be assumed that there are no general attributes of church pension fund common stock portfolios that would cause significant differences in the ordinal ranking of accounting methods when measured over the specified time period from 1945 to 1969.

C. COMPARISON OF TIME PERIODS

The primary evaluation of the accounting methods will be based upon the ordinal rankings of the methods. Because the ranking obtained from this study covered such a long period of time, 1945 - 1969, there is some justification for generalization to other long periods of time. However, to establish more specifically whether generalization is justified, an analysis of various time periods will be performed.

Time Periods Tested

The 23 year period, 1947 - 1969, has been subdivided into 10 year periods as follows:

1947 - 1956
 1950 - 1959
 1955 - 1964
 1960 - 1969

Ten year time periods have been selected. With typical investment horizons being 5 years or less and average economic cycles being less than 5 years,¹ ten years is of sufficient length to be considered a long period of time. At the same time ten year is short enough to cover specific market periods that may be characterized with distinctive attributes. For example, the period 1950 to 1959 covers what is frequently referred to as "... the bull market of the fifties".² Any attributes of sub time periods that are contained within the period, 1947 - 1969, that would cause a significant difference in rankings of accounting should be discovered by use of the overlapping time periods. Although the time period 1947 - 1956 overlaps the time period 1955 - 1964 by two years, this will be considered a non-overlapping time for purposes of analysis.

Evaluation of the Reliability of Ranking

Spearman's formula for rank correlation³ is used to evaluate the rankings across the various time periods. The rankings of accounting methods for all ten year time periods for each fund are compared with the rankings for the time period 1947 - 1969 and with each other. The rank correlation coefficients, RCC's, are displayed in Table 7.

The RCC's across all time periods specified for both funds range from a low .936 to a high of .994. The average RCC when comparing the non-overlapping ten year time periods is .960 for the AB Fund and .953

¹Fraine, Insurance Companies, p. 115.

²Benjamin Graham, David L. Dodd and Sidney Cottle, Security Analysis (New York: McGraw-Hill Book Company, 4th ed., 1962) p. 423.

³Spiegel, Problems of Statistics, p. 246.

for the Dow Fund. The average RCC's, when comparing the overlapping time periods and the total time period with the sub-time periods, were higher than the RCC's for the non-overlapping periods. These high correlation coefficients mean that there is a high degree of consistency of ranking of the accountings methods across time periods. The implication from these findings are that conclusions derived from this study are not limited to the specific time period under study.

The lowest RCC's were obtained when comparing the time period from 1947 - 1956 with other time periods. The RCC's between this period and the other non-overlapping periods averaged .953 for the AB Fund and .942 for the Dow Fund. The RCC's comparing all other time periods were greater than .970. It is possible that during the early period of the study there was some effect because the accounting methods were in a transient state. After a steady state was obtained a higher degree of consistency was maintained.

D. SUMMARY

The purpose of the dissertation is to select the optimal method of accounting for use in the financial statements of church pension funds. The primary basis of selection will be based upon an ordinal ranking of accounting methods. The rankings were assigned in inverse order by "C" values developed from the study. Comparison of these rankings between the sample funds and across various time periods has revealed an unusually high degree of consistency of ranking. Precise statements concerning general applicability of rankings of the accounting methods studied in this research effort are not permitted by the techniques employed. However, it is apparent that the results are not

TABLE 7

COEFFICIENT OF RANK CORRELATION
BETWEEN TIME PERIODS

Periods	AB FUND		DOW FUND			
	Total Period 47-69	Overlapping Periods	Non- overlapping Periods	Total Period 47-69	Overlapping Periods	Non- overlapping Periods
<u>47-56</u>	.981			.956		
47-56 and 50-59.		.975			.969	
47-56 and 55-64.			.945			.936
47-56 and 60-69.			.962			.949
<u>50-59</u>	.990			.982		
50-59 and 55-64.		.976			.982	
50-59 and 60-69.			.974			.974
<u>55-64</u>	.985			.982		
55-64 and 60-69.		.992			.975	
<u>60-69</u>	.991			.994		
Average.	.987	.981	.960	.978	.975	.953

limited to the pension funds included in this study and to the specified time period, 1945 - 1969.

CHAPTER VI

RESULTS - PRELIMINARY EVALUATION OF ACCOUNTING METHODS

The results of the application of the mathematical model to the annual yields and book values over the time period 1945 - 1969 have been reported. The computed amounts, "C" values, are in Table 3, Chapter V. Ordinal rankings have been assigned the accounting methods based upon these computed "C" values. See Table 4, Chapter V. There is a high degree of consistency of ranking of accounting methods between the sample funds and across time periods. Each accounting method selected for study will be evaluated by comparison of the "C" values and rankings with the "C" values and rankings for other accounting methods.

A. SELECTION CRITERIA

Those accounting methods, that are better by the criteria established in this study, will be screened from the twenty-one methods and subjected to additional scrutiny including a sensitivity analysis. The study of accounting methods within each Classification will be covered together. The Classifications and related accounting methods included therein are defined in Chapter III and listed in Tables 3 and 4, Chapter V. The following outline will be utilized in the discussion of each Classification:

1. Description of the classification.
2. Ordinal ranking.
3. Closeness to market value.
4. Stability of yield.
5. Evaluation and selection of better methods.

Each accounting method will be compared with the other methods within the classification and with the Historical Cost Method or the Current Market Value Method. The Historical Cost Method has many advantages for bookkeeping and audit. It is presently used by over 50% of the corporate pension funds.¹ A method would have to be a significant improvement by the reporting criteria established in this paper to justify changing from the Historical Cost Method. The Current Market Value Method also has certain advantages in objectivity and simplicity of use. Therefore an accounting method would have to be a significant improvement over the Current Market Value Method to justify its use as an alternative to the Current Market Value Method.

For selection as a better method, an accounting method must adhere to the following requirements:

1. The accounting method must clearly demonstrate its superiority over either the Historical Cost Method or the Current Market Value Method. The "C" values must be significantly lower for the method being evaluated than for one of the methods above.

2. The accounting method must not be outranked by another accounting method in the same Classification on all factors measured. Other factors considered in the screening are:

¹Kane, Pension Fund Financing, Table 10a.

1. Highest ranking method.
2. "C" values close to the values for the highest ranking method.
3. Best method within a Classification.
4. Very high ranking in one factor.
5. Theoretical appeal as defined in Chapter III.

The AB Fund will be used as the primary fund for evaluation of accounting methods. The Dow Fund will be cited to support the discussion or to present supplementary information. All ranks and values discussed will refer to the AB Fund unless otherwise noted.

B. SELECTION OF BETTER ACCOUNTING METHODS

Internal Rate of Return

The internal rate of return, I R R, for each fund was computed for the time period ending December 31, 1969. Rates were computed initializing at both the historical cost values and market values. For the AB Fund, the initial difference between market value and historical cost had accumulated over a period of years since the initial acquisition of common stocks. For the Dow Fund the historical cost values were based upon initial purchases of the Dow Jones Industrial Index made in 1945. The rates selected for use were those rates that when applied to the respective funds over the entire time period, computed a book value in 1969 that was closer to the market value of the fund than other possible rates. The rates were rounded up to the nearest 0.1%, (0.001). They are presented in Table 8.

The I R R differs from the theoretical allocation method designated as the Constant Rate of Return Method described in Chapter II in two respects.

TABLE 8

INTERNAL RATE OF RETURN, 1946 - 1969
COMPARISON WITH OTHER DATA

	AB FUND			DOW FUND		
	Rate of Return	C ² _v	C ² _y	Rate of Return	C ² _v	C ² _y
<u>Values</u>						
I R R - initial year valued at						
Historical cost	.099	2.82	-	.118	1.91	-
Market value	.092	2.09	-	.110	1.63	-
Mean		1.44	1.18		2.33	.32
Median		1.18	.80		1.56	.07
<u>Ranks</u>						
Initial year valued at						
Historical cost	22	22	1	14	15	1
Market value	14	15	1	12	13	1
Mean	12	13	17	15	15	16
Median	11	11	11	11	11	11

1. The Constant Rate of Return Method described in Chapter II assumes a separated accounting for each stock. The participant is allocated earnings on a constant rate of return basis from the cash flows from each investment. See Chapter II for further discussion. Therefore, portfolio returns are not constant but are changing over the life of the fund with changing investment opportunities and asset mixes.

2. All investments held at the end of the period, 1969, were valued at the stated market value. To equate the I R R Method with the Constant Rate of Return would have required stating ending asset balances at the discounted value of the future cash flows. Future cash flows are unknown at the present time.

The rates of return computed represent a constant rate of earnings that could have been credited to the participants reserves each year during the period and the reserves at the end of 1969 would equal the market value of the assets of the fund. The rate of return is a historical computation for a specific time period. For a period ending in a year other than 1969, 1970 for example, the rate does not apply. The I R R should not be used to evaluate investment performance. See Dietz for discussion of the uses for the internal rate of return and the average rate of return.¹

The I R R Method is not an accounting method. It is a past rate developed for a specific historical time period and varies for each specified time period. The rate is not known until after a time period is completed. An accounting method requires selection of parameters in advance of its use. The parameters must be retained

¹Dietz, "Fund Performances," 20-29.

for relatively long periods of time to provide useful evaluations of results of operations. A change of a parameter may require an exception in the opinion covering the financial statements by the outside auditor and a restatement of prior periods to conform to the consistency standard of the accounting profession.¹ The I R R may be useful in selecting parameters for certain of the accounting methods and for non-accounting purposes.

Overall ranking. As noted in Table 8 when initialized at market value the overall ranking for the I R R method was fourteenth for the AB Fund and twelfth for the Dow Fund. The C^2 value was 2.09 for the AB Fund. This should be compared with a 1.18 for the median value, 2.77 for the accounting method ranking last and .19 for the accounting method ranking first. The ranking was twenty-second when initialized at historical cost. The C^2 value was 2.82.

Closeness to market value. The I R R Method was ranked fifteenth in closeness to market values for the AB Fund and thirteenth for the Dow Fund. The 2.09 C_v^2 value for the AB Fund is compared with 2.63 for the accounting method rated last. Since there was no change in yield over the test period, the entire C^2 value was attributed to deviation of book value from market value. As noted in Table 9 the median deviation for the AB Fund was 23% with a maximum deviation for one year of 51%. The poor results for the I R R Method could include the following causes:

¹Committee on Auditing Procedures, SAP No. 33: Auditing Standards and Procedures (New York: American Institute of Certified Public Accountants, 1963), 42-44. It is not clear in the Statement whether a change in the parameter would be a Type A change requiring an exception with regards to consistency or a Type B change that does not require an exception in the accountants.

TABLE 9

FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
INTERNAL RATE OF RETURN METHOD
1947 - 1969

Yearly Percentage Deviation From Market Value	Initialized at Market Value				Initialized at Historical Cost			
	A B FUND		DOW FUND		A B FUND		DOW FUND	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
Over 50%	1	1			1	1		
40% to 50%	4	5	1	1	8	9	4	4
30% to 40%	6	11	8	9	6	15	6	10
20% to 30%	4	15	6	15	1	16	4	14
10% to 20%	5	20	3	18	4	20	4	18
5% to 10%	1	21	2	20	1	21	4	22
1% to 5%	1	22	2	22	1	22	1	23
Less than 1%	1	23	1	23	1	23	-	23
Median deviation		23%		26%		36%		29%
Maximum deviation		51%		41%		55%		46%
1969 deviation		-%		2%		-%		2%

1. The market values for the ending year, 1969, were low. The rate of return was lower than a rate projected through a "normalized" market value. A higher rate of return ending with a book value considerably in excess of the 1969 market value would have probably reduced the C_v^2 amount.

2. The rate of return for the portfolio is not constant. Different rates are earned during differing market conditions with different portfolio mixes. The I R R is not responsive to market conditions between the terminal points and therefore subject to large deviations in market value. Approximately 2/3 of the total C_v^2 amount was accumulated in the 8 years, 1958-1965. With the market drop in 1966, the C_v^2 amounts dropped and remained lower for the remainder of the period. See Table 9 for the frequency distribution of percentage deviations from market value.

Evaluation. The use of the I R R is not an accounting method and is not classified as a better method for further study. Even if it were, its use did not produce favorable results. Even though the C_y^2 value is zero, the method is fourteenth in overall ranking for the AB Fund. The internal rate of return measured over a span of 25 years was not responsive to changing market conditions. Although not conclusive, this would indicate that the use of a single rate of return over a very long period of time would very likely produce book values that are very unrealistic when related to current market values.

I. Historical Cost

The Historical Cost Method is an asset valuation method applied to each individual stock. Stocks are valued at the purchase price until

sold. Gain or loss is recognized at the time of sale. During the holding period the market value would tend to move away from the purchase price, therefore the C_v^2 amount would tend to become large as holding periods lengthen. At the time of sale the resulting gain would result in a substantial change in yield. This would result in large C_y^2 values for time periods in which substantial sales are made. The stability of yield C_y^2 values and the closeness to market value C_v^2 values are largely the results of the discretion of the investment manager in executing investment transactions.

The rankings are somewhat biased against the Historical Cost Method. For thirteen of the accounting methods that are aggregate methods, the historical cost value of the portfolio is the constraint for a maximum deviation from market value. The effect of this constraint is, that for the thirteen methods, C_v^2 would always be less than or equal to C_v^2 for the Historical Cost Method.

Ranking. As noted in Table 10, the Historical Cost Method ranked last among accounting methods tested for both funds. The C^2 value 2.77 compares with 1.44 for the mean value and 1.18 for the median of the AB Fund, with similar comparative values for the Dow Fund. The only value that exceeded the C^2 value for the Historical Cost Method was the C^2 value for the I R R Method initialized at historical cost for the AB Fund.

Closeness to market value. The Historical Cost Method has the largest C_v^2 amount of any accounting method for either fund. This large C_v^2 amount, 2.63 for the AB Fund and 5.59 for the Dow Fund, caused the Historical Cost Method to rank last in the ordinal rankings of accounting methods.

TABLE 10

COMPARISON WITH OTHER DATA
I. HISTORICAL COST METHOD

	AB FUND		DOW FUND	
	C^2_v	C^2_y	C^2_v	C^2_y
<u>Value</u>				
Historical cost	2.77	2.63	5.66	5.59
I R R - init. value at		.14		.07
historical cost	2.82	2.83	1.91	1.91
Mean	1.44	1.18	2.33	2.01
Median	1.18	.80	1.56	.86
		.10		.07
<u>Rank</u>				
Historical cost	21	21	21	21
I R R - initial value at		13		10
historical cost	22	22	14	15
Mean	12	13	15	15
Median	11	11	11	11

TABLE 11
 FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATION FROM MARKET VALUE
 I. HISTORICAL COST METHOD
 1947 - 1969

Yearly percentage deviation from market value	A B FUND		DOW FUND	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
Over 50%	2	2	14	14
40% to 50%	5	7	3	17
30% to 40%	5	12	3	20
20% to 30%	5	17	-	20
10% to 20%	4	21	3	23
5% to 10%	2	23	-	23
1% to 5%	-	23	-	23
Less than 1%	-	23	-	23
Median deviation		31%		54%
Maximum deviation		56%		62%
1969 deviation		6%		47%

As noted in Table 11, the median deviation for the AB Fund was 31% and for the Dow Fund was 54%. These large differences illustrate one of the major objections to the Historical Cost Method of accounting. The higher C_v^2 amount for the Dow Fund illustrates the effect of long holding periods and low turnovers on the Historical Cost Method of accounting.

A comparison of the C_v^2 values for the Historical Cost Method with the I R R Method illustrate the effect on the ranking of this method because of the use of the historical cost valuation as a constraint on certain accounting methods. Application of a 9.9% rate of return unconstrained by historical cost valuations resulted in a C_v^2 amount, 2.82, which is in excess of the C_v^2 amount for the Historical Cost Method, 2.63. This will be cited further in the discussion of methods where selection of an earnings parameter is required of the accounting method.

Stability of yield. The Historical Cost Method ranked thirteenth for the AB Fund and tenth for the Dow Fund by ranking of the C_y^2 values. The C_y^2 values had little effect upon the overall ranking. If the C_y^2 values were zero, the Historical Cost Method could have improved its ranking from twenty-first to nineteenth.

As noted in Table 12 the median annual change in yield for the AB Fund is .03 and for the Dow Fund is .02. These represent small average changes in yield. However, the rankings for the method were not exceptional. The C_y^2 values were .14 for the AB Fund and .07 for the Dow Fund. It should be noted that the maximum change in yield is .24 for the AB Fund and .17 for the Dow Fund. Investigation of these maximums provides an explanation for these rankings. The AB Fund sold a

TABLE 12

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
I. HISTORICAL COST METHOD
1947 - 1969

Annual Change in Yield	A B FUND		DOW FUND	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
.40 to .50				
.30 to .40				
.20 to .30	2	2		
.10 to .20	-	2	2	2
.05 to .10	6	8	3	5
.01 to .05	12	20	10	15
.00 to .01	3	23	8	23
Median change		.03		.02
Maximum change		.24		.17

substantial amount of stock in 1964 at a sizable gain. This affected the C_y^2 values for 1964 and 1965. The total C_y^2 amount for those two years was .105 which accounted for over 75% of the total C_y^2 value. For the Dow Fund a small amount of stock was sold at a sizable gain in 1955. This affected the C_y^2 values for 1955 and 1956. The total C_y^2 amount for those two years was .052 which accounted for over 70% of the total C_y^2 value. This sensitivity to unusual yields in a single year because of the effect of realized gains is a characteristic of the Historical Cost Method.

Evaluation. The Historical Cost Method cannot be classified as one of the better methods. The method does meet the mandatory criteria. It is one of the standards that other methods must improve upon for consideration and is in a classification by itself. However, the Historical Cost Method is not close to the highest ranking method. It is the lowest ranking. It does not rank very high in any factor, the best ranking being tenth in stability of yield for the Dow Fund. It does not meet the criteria for theoretical appeal defined in Chapter III.

The critical items for its success in scoring well in the factors measured are turnover of assets and timing of realized gains to smooth earnings. However, it is not desirable to make investment decisions in order to meet accounting objectives.

II. Initial Cost with Formula Modification

The accounting methods included in the classification, initial cost with formula modification are:

- a. Long Range Yield Methods.
- b. Long Range Appreciation Methods.

c. Write-up Adjusted Book Value by an Amount Required to Equate Earnings Yields with Interest Rate Assumptions (Minimum Yield Method).

d. Earnings Method.

Methods a., b., and c. are aggregate methods and method d. is an individual method. All of the methods are earnings methods. They compute earnings by a formula and the asset values at year end are the residual balances that result from computed earnings.

For the aggregate methods earnings are a function of some parameter applied to the asset base. For the Long Range Yield Method a 7% and 9% yield have been used. For the Long Range Appreciation Method a 3% and 6% appreciation have been used. In addition a modified 3% method has been used. For the Minimum Yield Method a 6% minimum yield has been used. The earnings method does not require selection of parameters. A total of seven methods have been included in this classification.

The general purpose of these groups are to recognize some market value appreciation and provide stable earnings over time. This should result in low C_y^2 values. The theoretical weakness of these methods is the lack of use of market value in the formula. Over time these methods can deviate significantly from market value and the C_v^2 value would be large.

Methods a., b. and c. form a homogeneous group. Since all of the methods in this classification are modifications of the Historical Cost Method, these methods will be compared with that method and with each other.

Ranking. As noted in Table 13, the methods in Classification II ranged in rank from twelfth and twentieth for the AB Fund and eleventh

TABLE 13

COMPARISON WITH OTHER DATA
II. INITIAL COST WITH FORMULA MODIFICATION METHODS

	AB Fund			DOW FUND		
	C^2	C_v^2	C_y^2	C^2	C_v^2	C_y^2
<u>Values</u>						
Historical cost	2.77	2.63	.14	5.66	5.59	.07
I R R, init. at hist. cost	2.82	2.82	.00	1.91	1.91	.00
Mean	1.44	1.18	.26	2.33	2.01	.32
Median	1.18	.80	.10	1.56	.96	.07
Long range yield						
7%	2.70	2.58	.12	5.63	5.56	.07
9%	2.34	2.30	.04	5.22	5.20	.02
Long range appreciation						
3%	2.39	2.34	.04	4.14	4.14	.002
6%	1.56	1.56	.001	1.56	1.56	.001
3% modified	2.43	2.38	.05	4.61	4.60	.01
Minimum yield						
6%	2.76	2.63	.13	5.64	5.57	.07
Earnings				2.30	2.28	.02
<u>Ranks</u>						
Historical cost	21	21	13	21	21	10
I R R, init. at hist. cost	22	22	1	14	15	1
Mean						
Median	11	11	11	11	11	11
Long range yield						
7%	19	19	11	19	19	0
9%	16	16	3	18	18	5
Long range appreciation						
3%	17	17	5	16	16	3
6%	12	13	2	11	12	2
3% modified	18	18	6	17	17	4
Minimum yield						
6%	20	20	12	20	20	8
Earnings				15	16	6

and twentieth for the Dow Fund. As expected all of these methods outperformed the Historical Cost Method. See Table 14 for data showing the effect of the historical cost constraint upon the individual methods. There is a positive correlation between the number of years constrained and the closeness of the C^2 value to the amount for the Historical Cost Method.

The Minimum Yield Method, IIc, a historical cost or minimum yield, whichever is greater, method, is only slightly improved over the Historical Cost Method. Using a 6% interest rate, the maximum used in practice, approximately 80% of years, the funds were valued at the Historical Cost Method amount. The C^2 value was only slightly better than for the Historical Cost Method. The method ranked twentieth for both funds.

The Long Range Yield Method using 7% and 9% yields had an average rank of eighteenth. The 9% yield slightly outperformed a 7% yield. The IRR for the AB Fund was 9.2%. Use of this rate with an unconstrained minimum value did not improve significantly over the Long Range Yield Method. Because of the higher internal rate of return, 11.0%, and more steady growth rate for the Dow Fund, the C^2 values for the IRR Method, were significantly lower for the IRR Method than for the Long Range Yield Method applied at 7% and 9% rates. However, the ranking for the IRR Method was not much improved over the rankings for the Long Range Yield Method. The Long Range Yield Method performed better than the Minimum Percentage Yield Method and the Historical Cost Method.

The Long Range Appreciation Method using 3% and 6% appreciation had an average rank of fourteenth. The method using a 6% appreciation

was significantly better than the other methods in this classification in both ranking and C^2 values. Use of historical cost values as a minimum constraint did not affect this method. The C^2 values were almost identical for each fund, 1.56 rounded to two decimal places. The modified method with a 20% reserve ranked lower than the non-modified Long Range Appreciation Methods.

The Earnings Method was initially tested with the Dow Fund. The method ranked fifteenth with a 2.30 C^2 value, compared with 1.56 for the median. Considerable effort would be required to obtain earnings information for the AB Fund. In view of the relatively poor showing of this method with the Dow Fund and the very high correlation of results between the AB Fund and the Dow Fund, it was considered unnecessary to test the Earnings Method for the AB Fund. It will be evaluated from the Dow Fund. Its ranking has been omitted from all statistics in the study. The Earnings Method can be viewed as a variable yield or variable appreciation method. It ranked better than the Long Range Yield Methods and about the same as the average of the Long Range Appreciation Methods.

Effects of parameters. The parameter for Classification II methods is the percentage to be applied to the investments base to determine all or part of the earnings. The selection of the parameter significantly affects the results.

As noted in Table 14, for the Long Range Yield Method, 7% yield applied to the AB Fund resulted in almost half of years valued at historical with the C^2 value very little different from the Historical Cost Method. Increasing the rate 2% to a 9% yield resulted in a valuation at the end of 1969 slightly in excess of market value. A

TABLE 14

NUMBER OF YEARS BOOK VALUE EQUALED HISTORICAL COST VALUE, C² VALUE AND RANK
 II. INITIAL COST WITH FORMULA MODIFICATION
 1947 - 1969

Method	AB FUND			DOW FUND		
	No. of Years	C ² Value	Rank	No. of Years	C ² Value	Rank
Historical cost	22	2.77	21	23	5.66	21
Long range yield						
7%	11	2.71	19	19	5.63	19
9%	7	2.34	16	3	5.22	18
10%		2.12	15			
Long range appreciation						
3%	8	2.39	17	-	4.14	16
6%	-	1.56	12	-	1.56	11
3% modified	13	2.43	18	5	4.61	17
Minimum yield						
6%	20	2.76	20	18	5.64	20

10% rate was computed although not included in the statistics. The 10% rate resulted in a C^2 value of 2.12, compared with 2.33 for the 9% rate. This C^2 value is high, only slightly improved over the 9% rate, and results in a value at the end of 1969, 4% greater than market value. A rate greater than 10% applied to the AB Fund could lead to book value considerably in excess of market value at the terminal period. Therefore there is a relevant range of rates for the Long Range Yield Method. The relevant range of rates for the AB Fund for the period 1945 through 1969 was between 7% and 10%.

For the Long Range Appreciation Method a 6% appreciation significantly outperformed 3% appreciation for both funds. The C^2 values for the 6% parameter were considerably lower and the rankings were five places higher. However, the 1969 book values exceeded market value for both funds for the 6% appreciation parameter. For the AB Fund this excess of book over market approximated 7% and exceeded all 21 other methods.

For those methods where earnings is a fixed percentage of an investment base, selection of the earnings parameter is critical to achieve acceptable results. Selection of a parameter too high can result in values significantly in excess of market value. Selection of values too low can result in book values considerably lower than market value and are little improvement over the Historical Cost Method. Based upon the results of this study, it appears that there is a narrow range of relevant parameters.

Closeness to market value. As noted in Table 13, the methods in Classification II have large C_v^2 amounts and rank low in closeness to market value. This reflects their insensitivity to market value

TABLE 15

FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
II. INITIAL COST WITH FORMULA MODIFICATION
1947 - 1969

A B FUND												
Yearly Percentage Deviation From Market Value	Long Range Yield			Long Range Appreciation			Minimum Yield					
	7%			3%			6%			6%		
	No. of Years	Cumu- lative No. of Years	No. of of Years	No. of Years	Cumu- lative No. of Years	No. of of Years	No. of Years	Cumu- lative No. of Years	No. of of Years	No. of Years	Cumu- lative No. of Years	No. of of Years
Over 50%	1	1	1	1	1	1	1	1	1	1	2	2
40% to 50%	6	7	4	4	5	1	1	1	4	5	5	7
30% to 40%	5	12	7	7	12	7	8	7	7	12	5	12
20% to 30%	5	17	4	5	17	5	13	5	5	17	5	17
10% to 20%	4	21	4	4	21	3	16	5	5	22	4	21
5% to 10%	1	22	2	1	22	5	21	1	1	23	2	23
1% to 5%	1	23	1	1	23	2	23	-	-	23	-	23
Less than 1%	-	23	-	-	23	-	23	-	-	23	-	23
Median deviation	31%		31%	31%		27%		31%		31%		31%
Maximum deviation	56%		52%	52%		43%		52%		52%		56%
1969 deviation	4%		1%	3%		7%		6%		6%		5%

changes. The C_v^2 amounts ranged from 1.56 to 2.63 for the AB Fund and 1.56 to 5.57 for the Dow Fund. The median C_v^2 amounts are .80 for the AB Fund and .86 for the Dow Fund. The methods ranked from thirteenth through twentieth for the AB Fund and twelfth through twentieth for the Dow Fund.

The 6% Long Range Appreciation Method ranked highest in this group for both Funds with a C_v^2 amount of 1.56. This method has a median deviation of 27% and a maximum deviation of 43% for the AB Fund. See Table 15 for comparison with other Classification II methods. This compares with a 31% median deviation and 56% maximum deviation for the Historical Cost Method. The 6% Long Range Appreciation Method is an improvement over the Historical Cost Method, but has very high average deviations from market value.

The Earnings Method is not subject to the necessity of selection of parameters. It ranked sixteenth in closeness to market value for the Dow Fund. The 2.28 C_v^2 amount is a considerable improvement over the 5.59 C_v^2 amount for the Historical Cost Method, but ranks behind the 6% Appreciation Method.

Stability of yield. As noted in Table 13, the methods in Classification II have low C_y^2 values and rank high in the measurements of stability of yield. This reflects the purpose of these methods to provide stability of yield. The C_y^2 amounts ranged from .001 to .13 for the AB Fund and .001 to .07 for the Dow Fund. The median amounts are .10 for the AB Fund and .07 for the Dow Fund. The methods ranked from second through twelfth for the AB Fund and second through ninth for the Dow Fund. The C_y^2 amounts that are different from near zero for certain of these methods are the result of the operation of historical cost

TABLE 16

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
 11. INITIAL COST WITH FORMULA MODIFICATION
 1947 - 1969

Annual Change in Yield	A B FUND									
	Long Range Yield			Long Range Appreciation			Minimum Yield			Cumulative No. of Years
	7%	No. of Years	Cumu- lative No. of Years	3%	No. of Years	Cumu- lative No. of Years	6%	No. of Years	Cumu- lative No. of Years	
.40 to .50										
.30 to .40										
.20 to .30	2	2								2
.10 to .20	-	2		1	1					2
.05 to .10	4	6	5	5	6					7
.01 to .05	8	14	3	3	9					20
.00 to .01	9	23	15	14	23					23
Median change	.02		.00	.01		.003		.01		.03
Maximum change	.22		.09	.10		.008		.10		.24

minimum value constraint.

The 6% Long Range Appreciation Method ranked highest in this group for both funds with C_v^2 amounts of .0003 and .0011 respectively. The 3% Long Range Appreciation Method was close for the Dow Fund with a C_y^2 value of .0023. The 6% Appreciation Method has a median change in yield of .003 and a maximum change of less than .01. See Table 16 for comparison with other Classification II methods. This compares with a median change of .030 and a maximum change of .240 for the Historical Cost Method. The 6% Long Range Appreciation Method is a significant improvement over the Historical Cost Method with no significant change in yield from year to year.

The Earnings Method ranks higher than the Historical Cost Method in the measurement of stability of yield, sixth and tenth rankings respectively. The $.26 C_y^2$ value is considerably less than the C_y^2 for the Historical Cost Method, .71. The recognition of a portion of the appreciation during the holding period results in lower gains on sales of stocks and less fluctuation. The Earnings Method ranks high along with other Classification II methods in the measurement stability of yield.

Evaluation. The methods in Classification II do not rank among the highest methods. The methods range from slightly better to significantly better than the Historical Cost Method. They ranked very poorly in the measurement of closeness to market value. The methods ranked among the better methods in the measurement of stability of yield.

The methods do not meet the criteria for theoretical appeal defined in Chapter III. They do not consider market value in the formula. All of the methods, except the Earnings Method, are subjective. They require projections of earnings to select the parameters.

Selection of the proper earnings parameter is critical for success of these methods.

It will be observed that in general there is a positive correlation of ranking in this classification between the C_v^2 and C_y^2 and C^2 values. The method that ranks highest in the measurements of stability of yield also ranks highest in the measurements of closeness to market value. It should be noted that all parameters selected were conservative. Therefore the statement about positive correlation between the factors is restrictive to conservative parameters. Because of this correlation of factors among the methods tested in Classification II, the selection of better methods does not depend upon the relative preference for either factor. The method with the lower C^2 value can be judged the better method.

The highest ranking method in Classification II is the 6% Long Range Appreciation Method. This method is a significant improvement over the Historical Cost Method in each factor measured and was not outranked in all factors by any method in the same classification. The method was not high ranking overall, twelfth. However, it was the best in its classification and ranked highest of any accounting methods in the measurement of stability of yield. Although it does not meet the criteria of theoretical appeal, it will be included for further study as one of the better methods.

All other methods in Classification II will be rejected, since the 6% Appreciation Method outranks the other methods in all factors and Classification II methods do not rank very well.

IV. Current Market Value

The Current Market Value Method is an asset valuation method applied to each individual stock. Stocks are valued at the current quoted market price. Gain or loss is recognized as the market value changes periodically. The C_v^2 amounts for this method is zero since current market value is the standard for judging closeness to market value. Because of the widely fluctuating market values, large C_y^2 values would result from this method.

Ranking. The Market Value Method ranked eighth for the AB Fund and ninth for the Dow Fund. The C^2 values were slightly less than the median value. It is interesting that the C^2 values for the current market value method were lower than for the I R R Method. See Table 17. The fluctuations in relative earnings from year to year for the current market value were less than the percentage deviation between book value and market value for the rate return of the funds.

Stability of yield. The total C^2 value for the Current Market Value Method is the C_y^2 value. As expected, this method ranked last in stability of yield for both funds.

As noted in Table 18 the median annual change in yield for the AB Fund is .13 and for the Dow Fund is .19. This represents a very large average change in yield. The average annual yield, mean of annual yields, by the Market Value Method, was .126 for the AB Fund and .127 for the Dow Fund. The average annual change in yield was greater than the average yield. For the AB Fund, 13 of the 23 years exceeded a change in yield of .10, and for the Dow Fund 17 of the 23 years exceeded .10.

Evaluation. The Current Market Value Method cannot be classified

TABLE 17

COMPARISON WITH OTHER DATA
IV. CURRENT MARKET VALUE METHOD

	AB FUND			DOW FUND		
	C	C _v	C _y	C	C _v	C _y
<u>Value</u>						
Market value	1.01	-	1.01	1.25	-	1.25
Rate of return initialized at market	2.09	2.09	-	1.63	1.63	-
Mean	1.44	1.18	.26	2.33	2.01	.32
Median	1.18	.80	.10	1.56	.86	.07
<u>Rank</u>						
Market value	8	1	21	9	1	21
Rate of return	14	15	1	13	13	1

TABLE 18

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
IV. CURRENT MARKET VALUE METHOD
1947 - 1969

Annual Change in Yield	A B FUND		DOW FUND	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
.40 to .50	2	2	2	2
.30 to .40	2	4	3	5
.20 to .30	3	7	4	9
.10 to .20	6	13	8	17
.05 to .10	4	17	2	19
.01 to .05	3	20	4	23
.00 to .01	3	23	-	23
Median change		.13		.19
Maximum change		.48		.48

as one of the better methods. The method does meet the mandatory criteria. It is one of the standards that other methods must improve upon for consideration and is in a classification by itself. However, the Current Market Value Method is not close to the highest ranking method. It is an unacceptable method because of the high fluctuation in yield.

V. Adjusted Market Value Methods.

The accounting methods included in the classification, Adjusted Market Value Methods are:

- a. Market Value, Less a Reserve.
- b. Moving Average Market Value, based upon average of several years.
- c. Least Squares Trend, based upon average of several years.
- d. Market Value with Variable Adjustment.

The Market Value, Less a Reserve Method is not homogeneous with the other methods and will be treated separately.

Market Value, Less a Reserve.

The Market Value, Less a Reserve Method is an asset valuation method applied to aggregate portfolio amounts. The individual stocks are valued by the Current Market Value Method. The method values the portfolio at the greater of the valuation by the Historical Cost Method or a percentage of the current market value of the portfolio. Reserve percentages of 10%, 20% and 33% have been selected for use. A modified 20% reserve method is included. This modified method is more fully described in Chapter III. A total of four methods are included in this analysis.

The purpose of this method is to provide for recognition in income of market appreciation on a conservative basis. The reserve percentage provides a built-in deviation from market value and the C_v^2 amount would be large.

Since the methods are modifications of the Current Market Value Method, they will be compared with that Method. Historical cost values affect the valuation by these methods and will also be utilized for comparison.

Ranking. As noted in Table 19, the Market Value, Less a Reserve Methods range from tenth to fifteenth for the AB Fund and eighth to fifteenth for the Dow Fund. They tend to cluster together in the middle rankings behind the Current Market Value Method. The C^2 values range from 1.14 to 2.16 for the AB Fund and 1.05 to 3.36 for the Dow Fund.

The 10% reserve ranks highest. As the amount of reserve is increased, the methods rank lower. Use of a reserve in combination with the Historical Cost Method increases the C^2 value above the Market Value Method. The Modified Reserve Method adds to the reserve through a 1% annual charge and deducts market losses from the reserve. The formula results in a method that ranks highest among this group of methods and ranks higher than the current market value method for the Dow Fund, eighth and ninth respectively.

Closeness to market value. With the exception of the 33% reserve, the methods are equal or better than the median C_v^2 value. The 10% reserve ranks sixth in closeness to market value. Table 20 illustrates the effect of the various reserve percentages on the C_v^2 amounts. Because of large deviation between historical cost and market

TABLE 19

Va MARKET VALUE, LESS A RESERVE COMPARATIVE "C" VALUE DATA

	AB FUND			DOW FUND		
	C^2	C_v^2	C_y^2	C^2	C_v^2	C_y^2
<u>Values</u>						
Current market value	1.01	-	1.01	1.25	-	1.25
Historical cost	2.77	2.63	.14	5.66	5.59	.07
I R R - init. at market	2.09	2.09	-	1.63	1.63	-
Mean	1.44	1.18	.26	2.33	2.01	.32
Median	1.18	.80	.10	1.56	.86	.07
Market value, less a reserve						
10%	1.18	.22	.96	1.45	.23	1.22
20%	1.75	.80	.95	2.06	.86	1.20
33%	2.16	1.72	.44	3.36	2.22	1.14
Modified 20%	1.14	.70	.44	1.05	.70	.35
<u>Ranks</u>						
Current market value	8	1	21	9	1	21
Historical cost	21	21	13	21	21	10
I R R - init. at market	14	15	1	13	13	1
Mean						
Median	11	11	11	11	11	11
Market value, less a reserve						
10%	11	6	20	10	6	20
20%	13	11	19	14	11	19
33%	15	14	18	15	11	19
Modified 20%	10	10	17	8	9	16

TABLE 20

FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
Va. MARKET VALUE, LESS A RESERVE
1947 - 1969

Yearly Percentage Deviation From Market Value	A B FUND							
	10%		20%		33%		Modified 20%	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
Over 50%								
40% to 50%					12	12		
30% to 40%				17	5	17	13	13
20% to 30%			4	21	4	21	7	20
10% to 20%	21	21	2	23	2	23	3	23
5% to 10%	2	23	-	23	-	23	-	23
1% to 5%	-	23	-	23	-	23	-	23
Less than 1%	-	23	-	23	-	23	-	23
Median deviation	10%		20%		31%		20%	
Maximum deviation	10%		20%		33%		20%	
1969 deviation	6%		6%		6%		5%	

values these reserves were generally at maximum value. Table 20 illustrates this effect. Even for the 33% reserve eleven of the 23 years are at the maximum value for the AB Fund. The C_v^2 amount for the 10% reserve was .22 for the AB Fund and .23 for the Dow Fund. The C_v^2 amount for the 33% reserve was 1.72 for the AB Fund and 2.22 for the Dow Fund. This compares with 2.63 for the AB Fund and 5.59 for the Dow Fund for the Historical Cost Method. The methods are a significant improvement over the Historical Cost Method in closeness to market value.

Stability of yield. The Market Value, Less a Reserve Methods rank very low in the measurements of stability of yield. They rank from seventeenth to twentieth for the AB Fund and sixteenth through twentieth for the Dow Fund. The 10% and 20% reserves had very slight improvement on the Current Market Value Method for both funds. As noted in Table 21, the median annual change in yield for these methods was .12 compared with .13 for the Current Market Value Method.

The only method with a significant improvement over the Current Market Value Method was the Modified 20% Reserve with a C_y^2 amount of .44 for the AB Fund and a C_y^2 amount of .35 for the Dow Fund. However, these amounts are high. The median annual change for the AB Fund is .09. The C_y^2 amounts for the Historical Cost Method were .14 and .07 respectively.

Evaluation. The Market Value, Less a Reserve Methods do not rank among the highest methods. The methods ranked from slightly worse than the Current Market Value Method. They had average rankings in the measurement of closeness to market value. They ranked very poorly in the measurement of stability of yield. The methods do not meet the mandatory criteria for significant improvement over the

TABLE 21

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
Va. MARKET VALUE, LESS A RESERVE
1947 - 1969

Annual Change in Yield	A B FUND							
	10%		20%		33%		Modified 20%	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
.40 to .50	2	2	1	1				
.30 to .40	2	4	3	4	1	1	1	1
.20 to .30	2	6	2	6	2	3	3	4
.10 to .20	7	13	8	14	4	7	7	11
.05 to .10	5	18	4	18	10	17	3	14
.01 to .05	2	20	4	22	5	22	2	16
.00 to .01	3	23	1	23	1	23	7	23
Median deviation	.12		.12		.07		.09	
Maximum deviation	.49		.50		.37		.35	

Current Market Value Method. The methods will be rejected for further consideration.

The modified method did perform better than the other methods. This demonstrates the possibility of utilizing the Market Value, Less a Reserve Method in combination with a method that provides for stability of yield. The Reserve Method can provide the lower constraints for a combined method. Under these conditions the reserve methods might perform sufficiently better than the Current Market Value Method and rate consideration as an alternative to that method.

Adjusted Market Value Methods, Exclusive of Reserve Methods

The Moving Average and Trend Line Methods are asset valuation methods applied on an individual stock valuation basis. The asset values are based upon the average market value over a five year period. The Market Value with a Variable Adjustment Method is an earnings method applied to the entire portfolio. Earnings are a function of the actuarial rate of interest, the change in market value during the period, dividend income and the ratio of the book value to the market value of the fund.

The general purposes of these methods are to recognize market value changes, but to smooth out the recognition over time. This should result in C_y^2 values that are less for the above methods than for the Current Market Value Method. Since the methods are modifications of the Current Market Value Method, they will be compared with that method and with each other.

Ranking. As noted in Table 22, the adjusted market value methods ranked very high; third, fifth, and seventh for both funds.

TABLE 22

V. ADJUSTED MARKET VALUE METHODS
COMPARATIVE "C" VALUE DATA

	AB FUND			DOW FUND		
	C^2	C_v^2	C_y^2	C^2	C_v^2	C_y^2
<u>Values</u>						
Current market value	1.01	-	1.01	1.25	-	1.25
Historical cost	2.77	2.63	.14	5.66	5.59	.07
I R R - init. at market	2.09	2.09	-	1.63	1.63	-
Mean	1.44	1.18	.26	2.33	2.01	.32
Median	1.18	.80	.10	1.56	.86	.07
5 yr moving average	.41	.37	.04	.52	.47	.05
5 yr trend line	.28	.05	.21	.36	.09	.27
Market value with var adj.	.84	.58	.26	1.05	.67	.38
<u>Ranks</u>						
Current market value	8	1	21	9	1	21
Historical cost	21	21	13	21	21	10
I R R - init. at market	14	15	1	13	13	1
5 yr moving average	5	7	4	5	7	6
5 yr trend line	3	2	14	3	2	15
Market value with var adj.	7	9	16	7	8	17

The C^2 values ranged from .26 to .84 for the AB Fund and .36 to 1.05 for the Dow Fund. These values compare with C^2 values of 1.01 and 1.25 for the Current Market Value Method and 1.18 and 1.56 for the median values. The Trend Line Method ranked third, the Moving Average Method ranked fifth and the Market Value With Variable Adjustment Method ranked seventh.

Closeness to market value. These methods all have lower C_v^2 values than the median value. With small C_v^2 amounts these methods rank high in the measurement of closeness to market value. This reflects their sensitivity to market value changes. The C_v^2 amounts ranged from .05 to .58 for the AB Fund and .09 to .67 for the Dow Fund.

The Trend Line Method ranked second to the Current Market Value Method for the ranking of C_v^2 values. This method, which projects values based upon average market values, resulted in a maximum deviation over the 23 year period for the AB Fund of 9% and 16 years with less than a 5% deviation. See Table 23 for a frequency distribution of durations. The Trend Line Method provides values that are very close to market value.

The Moving Average Method ranked seventh in the ranking of C_v^2 values for both funds. This method, based upon the mean value of the recent market values, resulted in a maximum deviation over the 23 year period for the AB Fund of 23% and 12 years with less than a 10% deviation. The Moving Average Method provides values that are reasonably close to market value but with significantly greater deviations than the Trend Line Method. This superiority of the Trend Line Method is because the Trend Line Method specifically considers the direction of the movement of market value, ie. up or down, and the Moving

TABLE 23

FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
V. ADJUSTED MARKET VALUE METHODS
1947 - 1969

Yearly percentage deviation from market value	A B FUND					
	5 Year Moving Average		5 Year Trend Line		Market Value With Variable Adjustment	
	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years	No. of Years	Cumulative No. of Years
Over 50%						
40% to 50%						
30% to 40%						
20% to 30%	4	4			7	7
10% to 20%	7	11			8	15
5% to 10%	6	17		7	2	17
1% to 5%	5	22		14	3	20
Less than 1%	1	23		23	3	23
Median deviation		9%		4%		12%
Maximum deviation		23%		9%		28%
1969 deviation		2%		3%		-

Average Method does not.

The Market Value with Variable Adjustment ranked lower than the Moving Average Method for both funds.

Stability of yield. The Moving Average Method ranked high in the measurement of stability of yield, fourth for the AB Fund and sixth for the Dow Fund. The Moving Average Method had a maximum change in yield of .07 and a median annual change of .025. See Table 24 for a frequency distribution for annual change of yield amounts. Use of this method results in a relatively stable yield.

The other two methods did not rank very highly. The C_y^2 values for the Trend Line Method are ranked fourteenth for the AB Fund and fifteenth for the Dow Fund. Use of the Trend Line Method provided a relatively unstable yield with a maximum change in yield of .22 and a median change of .06. The reasons cited above for the superiority of the Trend Line Method in providing values closer to market value are the factors that caused the relatively unstable yield for this method. The Market Value with Variable Adjustment Method ranked lower than the other methods in the measurements of stability of yield.

All of these methods are significant improvements on the Current Market Value Method in the measurement of stability of yield. The C_y^2 value for the Trend Line Method is .21 for the AB Fund. The C_y^2 value for the Current Market Value Method is 1.01 for the AB Fund. This improvement results from the smoothing of the adjustment to market value for the methods evaluated in this section.

Evaluation. The adjusted market value methods evaluated in this section rank among the highest methods. They ranked from slightly better to significantly better than the Current Market Value Method.

TABLE 24

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
V. ADJUSTED MARKET VALUE METHODS
1947 - 1969

Annual Change in Yield	A B FUND					
	5 Year		5 Year		Market Value	
	Moving Average		Trend Line		With	
	No. of Years	No. of Years	No. of Years	Cumulative No. of Years	Variable Adjustment No. of Years	Cumulative No. of Years
.40 to .50						
.30 to .40						
.20 to .30			1	1	2	2
.10 to .20			6	7	8	10
.05 to .10	7	7	8	15	4	14
.01 to .05	12	19	8	23	7	21
.00 to .01	4	23	-	23	2	23
Median change		.025		.06		.07
Maximum change		.07		.22		.25

These methods had very high rankings in the measurement of closeness to market value. They ranked from very high to slightly below average in the measurement of stability of yield. All of these methods meet the criteria for theoretical appeal defined in Chapter III. The Trend Line Method is ranked very high, second, in closeness to market value. The Moving Average Method is ranked very high, fourth for the AB Fund, in stability of yield. In general all of the methods can be considered as better methods and considered for further analysis.

The Market Value with Variable Adjustment Method was outranked by both the Moving Average Method and the Trend Line Method on all factors measured for both funds. It will therefore be excluded from further consideration as a recommended method. The Moving Average and the Trend Line methods will be included in the extended analysis.

III. Modification Based upon both Initial Cost and Current Market Value

The accounting methods included in the classification, Modification Based upon both Initial Cost and Current Market Value are:

a. Write-up Some Percent of the Difference between Adjusted Book Value and Market Value (Percentage Write-up Method).

b. Minimization Formula Methods.

Method a., Percentage Write-up Method, is an aggregate method. Method b., Minimization Formula Methods have been applied on both an individual common stock and an aggregate portfolio bases. Both of the methods are asset valuation methods. They compute the asset value at the end of a period by a formula and the earnings for the period are computed from the differential between the beginning and ending asset values.

For the Percentage Write-up Method, the asset value is computed

TABLE 25

III. MODIFICATION BASED UPON BOTH INITIAL COST AND CURRENT MARKET VALUE
COMPARATIVE "C" VALUE DATA

	AB FUND			DOW FUND		
	C^2	C_v^2	C_y^2	C^2	C_v^2	C_y^2
<u>Values</u>						
Current market value	1.01	-	1.01	1.25	-	1.25
Historical cost	2.77	2.63	.14	5.66	5.59	.07
I R R - init. at market	2.09	2.09	-	1.63	1.63	-
Mean	1.44	1.18	.26	2.33	2.01	.32
Median	1.18	.30	.10	1.56	.86	.07
Percentage write-up method						
10%	1.12	1.02	.10	1.90	1.80	.06
20%	.59	.48	.10	.88	.80	.07
50%	.31	.09	.22	.38	.14	.25
Minimization formula						
Aggregate	.19	.10	.09	.30	.15	.15
Individual	.20	.10	.10	.33	.16	.17
<u>Ranks</u>						
Current market value	8	1	21	9	1	21
Historical cost	21	21	13	21	21	10
I R R - init. at market	14	15	1	13	13	1
Percentage write-up method						
10%	9	12	9	12	14	7
20%	6	8	10	6	10	11
50%	4	3	15	4	3	14
Minimization method						
Aggregate	1	4	7	1	4	12
Individual	2	5	8	2	5	13

from a fixed percentage of the difference between the adjusted book value and the current market value. Parameters of 10%, 20% and 50% have been tested as fixed percentages. For the Minimization Formula Methods the asset value is computed as a variable percentage of the difference between the adjusted book value and the current market value. This percentage applied minimizes both the percentage deviation from market value and the annual change in yield.

The general purposes of these methods are to adjust from the initial cost to market value on a gradual basis. This should result in C_y^2 values that are less for methods in Classification III than for the Current Market Value Method, and should result in C_v^2 values that are less than for the Historical Cost Method.

Since the methods in Classification III are modifications of both the Historical Cost Method and the Current Market Value Method, they will be compared with the Historical Cost Method, the Market Value Method and with each other.

Ranking. As noted in Table 25, with one exception the methods in Classification III rank very high, from first to sixth for both funds. The C^2 values range from .19 to .59 for the AB Fund and from .30 to .88 for the Dow Fund. These values compare with C^2 values of 1.01 and 1.25 for the Current Market Value Method, 2.77 and 5.66 for the Historical Cost Method and 1.18 and 1.56 for median values. The Minimization Methods ranked first and second with very small differences in C^2 values between the methods. The Percentage Write-up Methods ranged from fourth to ninth in ranking for the AB Fund and fourth to twelfth in ranking for the Dow Fund. The 50% Write-up Method ranked fourth for both funds. The 20% Write-up Method ranked sixth for both

funds. The 10% Write-up Method ranked ninth and twelfth respectively.

Closeness to market value. With the exception of the 10% Write-up Method, the methods in Classification III have lower C_v^2 values than the median value. All of the methods demonstrated a significant improvement over the Historical Cost Method. The C_v^2 amounts ranged from .09 to 1.02 for the AB Fund and .14 to 1.84 for the Dow Fund.

The Percentage Write-up Method ranged in ranking of C_v^2 values from third to twelfth for the AB Fund and third to fourteenth for the Dow Fund. As parameter values, the annual percentage write-up, were increased for the values tested, significant improvement in the characteristic of closeness to market values resulted. The 10% Write-up Method had a 1.02 C_v^2 value, with a median annual deviation from market value of 19% for the AB Fund. See Table 26 for a frequency distribution of deviations. The 20% Write-up Method had a .48 C_v^2 value, with a median annual deviation of 11%. The 50% Write-up Method had a .09 C_v^2 value with a median annual deviation of 5%. The 50% Write-up Method was third in ranking of C_v^2 values for both Funds. The 50% Write-up Method provides values very close to market values.

The Minimization Formula Methods ranked fourth and fifth in the ranking of C_v^2 values for both funds. The C_v^2 value, 0.10, for the AB Fund was only slightly higher than the 0.09 for the 50% Write-up Method. The median annual deviation approximated 5% for these methods with a maximum of 14%. The Minimization Formula Methods tested in this study provided values very close to market value.

Stability of yield. The Classification III methods had about average results in ranking for the measure of stability of yield. They ranked from seventh through fifteenth for the AB Fund and seventh

TABLE 26

FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
 III. MODIFICATION BASED UPON BOTH INITIAL COST AND CURRENT MARKET VALUE
 1947 - 1969

Yearly Percentage Deviation From Market Value	A B FUND									
	Percentage Write-up					Minimization Formula				
	10%		20%		50%	Aggregate		Individual		
	No. of Years	Cumu- lative No. of Years	No. of Years	Cumu- lative No. of Years	No. of Years	No. of Years	Cumu- lative No. of Years	No. of Years	Cumu- lative No. of Years	
Over 50%										
40% to 50%										
30% to 40%	4	4								
20% to 30%	6	10	6	6						
10% to 20%	7	17	7	13	2	2	5	3	3	
5% to 10%	2	19	5	18	9	6	11	9	12	
1% to 5%	4	23	3	21	8	11	22	10	22	
0% to 1%	-	23	2	23	4	1	23	1	23	
Median deviation	19%		11%		5%	4%		5%		
Maximum deviation	36%		25%		13%	14%		14%		
1969 deviation	3%		5%		4%	2%		0.3%		

through fourteenth for the Dow Fund. All methods resulted in a significant improvement over the Current Market Value Method. With the exception of the 50% Write-up Method the results for Classification III Methods were comparable with the results for the Historical Cost Method. The 50% Write-up Method had much higher C_y^2 values than the Historical Cost Method.

The Percentage Write-up Method ranged in ranking of C_y^2 values from ninth to fifteenth for the AB Fund and seventh through fourteenth for the Dow Fund. As the parameter value decreased from 50% to 10%, improvement in the characteristic of stability of yield resulted. The 50% Write-up Method had a $.22 C_y^2$ value, with a median annual change in yield of .07 for the AB Fund. See Table 27 for a frequency distribution of annual changes in yield. The 20% Write-up Method had a C_y^2 value of .10 with a median annual change in yield of .05. This is a significant improvement. The difference in C_y^2 values for the Dow Fund was even greater, .25 to .07. However, the improvement between the 20% Write-up Method and the 10% Write-up Method is negligible. Apparently the optimal improvement in stability of yield occurs around the 20% level.

The Minimization Formula Methods ranked seventh and eighth for the AB Fund and twelfth and thirteenth for the Dow Fund. The difference in C_y^2 values for the two funds is not as great as the difference in rankings. The C_y^2 value for the AB Fund was .09 and for the Dow Fund was .15 applying the method on an aggregate basis. The median annual change in yield for the AB Fund was .03 with a maximum of .16. The Minimization Formula tested in this study provided an annual change in yield that did not rank high in relation to other methods.

Evaluation. The Classification III methods rank among the

TABLE 27

FREQUENCY DISTRIBUTION OF FLUCTUATION IN YIELD
 III. MODIFICATION BASED UPON BOTH INITIAL COST AND CURRENT MARKET VALUE

Annual Change in Yield	A B FUND									
	Percentage Write-up					Minimization Formula				
	10%		20%		50%	Aggregate		Individual		
	No. of Years	Cumu- lative No. of Years	No. of Years	Cumu- lative No. of Years	No. of Years	No. of Years	Cumu- lative No. of Years	No. of Years	Cumu- lative No. of Years	
.40 to .50										
.30 to .40					2					
.20 to .30										
.10 to .20	2	2	2	2	3	3	3	3	3	3
.05 to .10	6	8	10	12	12	7	10	7	10	10
.01 to .05	15	23	8	20	4	11	21	12	22	22
.00 to .01	-	23	3	23	2	2	23	1	23	23
Median change	.05		.05		.07	.03		.04		
Maximum change	.19		.17		.21	.16		.13		

highest methods. They rank significantly better than the Historical Cost Method. With the exception of the 10% Write-up Method, they rank significantly better than the Current Market Value Method. The Minimization Formula Methods ranked first and second. With the exception of the 10% Write-up Method, Classification III methods had very high rankings in the measurement of closeness to market value. They had only average rankings in the measurement of stability of yield. All of the methods meet the criteria for theoretical appeal defined in Chapter III. The 50% Write-up Method and the Minimization Formula Methods ranked high, third, fourth and fifth, in closeness to market value. In general all of the methods can be considered as better methods and considered for further analysis.

The 10% Write-up Method was considerably outranked by the other methods in Classification III. The C_v^2 value, the measure of closeness to market value, was considerably higher than for any other method, 1.02 for the AB Fund and 1.84 for the Dow Fund. The method with the next highest C_v^2 values, the 20% Write-up Method, had C_v^2 amounts of .48 and .84 respectively. Since the 10% Write-up Method demonstrated no improvement over the 20% Write-up Method in the measurement of stability of yield, the 10% Write-up Method will be excluded from further consideration as a recommended method. All other methods in Classification III will be included in the extended analysis.

C. SUMMARY

In this chapter each accounting method that was selected for testing has been evaluated. The methods have been evaluated on the basis indicated at the beginning of this chapter. The methods judged

inferior have been discarded from further consideration. Seven methods including the alternative parameters have been selected for further consideration. They are:

II b. Long Range Appreciation Method, 6% appreciation.

III a. Write-up Some Percent Each Year of the Difference between Adjusted Book Value and Market Value, 20% and 50%.

III b. Minimization Formula Methods, applied on both aggregate and individual common stock basis.

V b. Moving Average Market Value Methods, based upon an average of 5 years.

V c. Least Squares Trend Line Method, based upon market values for 5 years.

CHAPTER VII

RESULTS - FINAL EVALUATION OF ACCOUNTING METHODS

The twenty-one accounting methods selected for study have been evaluated against the criteria developed in this study. The major criteria were: closeness to market value, and stability of yield. Fourteen of the methods have been discarded as inferior. The following seven methods have been selected for further analysis:

II b. Long Range Appreciation Method, 6% Appreciation.

III a. Write-up Some Percent Each Year of the Difference between Adjusted Book Value and Market Value, 20% and 50% Write-up.

III b. Minimization Formula Methods, applied on both aggregate and individual common stock basis.

V b. Moving Average Market Value Method, based upon an average of 5 years.

V c. Least Squares Trend Line Method, based upon market values for 5 years.

The methods selected will be compared with each other and with the Historical Cost Method, the Current Market Value Method and the Internal Rate of Return Method, IRR. The Historical Cost Method and the Current Market Value Method will be included in the comparisons because of the current interest in them. The IRR Method will be included because of the theoretical properties of the method. The comparison will include a study of the performance of each method for each

of the factors noted above, a study of the effects upon the ordinal ranking of the methods by changing the weights attributed to each factor and a discussion of other factors that may affect the selection of an accounting method.

A. COMPARISON ON THE BASIS OF EACH FACTOR

Closeness to Market Value

Table 28 is a frequency distribution of the annual deviations from market value for the AB Fund. The accounting methods are arranged across the table by their respective C_v^2 values.

The first four methods listed are:

V c. Trend Line Method.

III a. 50% Write-up Method.

III b. Minimization Formula Methods, aggregate and individual.

These four form a group with relatively good performances in the measures of closeness to market value. The C_v^2 values range from 0.053 to 0.103. The median deviations from market value for the 23 years tested ranged from 4% to 5%. The number and size of the large deviations were the major differences among the methods. The maximum deviations ranged from 9% to 14% and the number of years over 5% ranged from 7 to 12. The Trend Line Method was significantly better in these latter characteristics than the other three methods. This explains the lower C_v^2 value for the Trend Line Method. There appears to be no significant difference in the performance among the other three methods.

The fifth and sixth methods, the Moving Average Method and the 20% Write-up Method, were very close to each other in the measure of closeness to market value but significantly different than the first

TABLE 28
FREQUENCY DISTRIBUTION OF PERCENTAGE DEVIATIONS FROM MARKET VALUE
1947 - 1969

Yearly Percentage Deviation From Market Value	A B FUND - Number of Years									
	Trend Line Method	50% Write-up Method	Minimization Formula Methods		Moving Average Method	20% Write-up Method	Appreci- ation Method	IRR Method	Historical Cost Method	
			Aggregate	Individual						
Over 50%								1	2	
40% to 50%							1	4	5	
30% to 40%							7	6	5	
20% to 30%					4	6	5	4	5	
10% to 20%		2	5	3	7	7	3	5	4	
5% to 10%	7	9	6	9	6	5	5	1	2	
1% to 5%	14	8	11	10	5	3	2	1	-	
Less than 1%	2	4	1	1	1	2	-	1	-	
Median deviation	4%	5%	4%	5%	9%	11%	27%	23%	31%	
Maximum deviation	9%	13%	14%	14%	23%	25%	43%	51%	56%	
1969 deviation	3%	4%	2%	0.3%	2%	5%	7%	-	6%	
C _v ² value	.053	.087	.102	.103	.374	.483	1.564	2.091	2.632	

four methods. The C_v^2 values were 0.374 and 0.483 respectively. The median deviations were 9% and 11% with maximum deviations of 23% and 25%. The Moving Average Method performed slightly better than the 20% Write-up Method and would be preferred of the two if all other factors were equal.

The last three methods listed in Table 28 were:

II b. 6% Appreciation Method.

II a. IRR Method, initialized at market value.

I . Historical Cost Method.

These three methods exhibited a relatively poor performance in the measures of closeness to market value. The C_v^2 values ranged from 1.564 to 2.632. The median annual deviation from market value for the 23 years ranged from 23% to 31%. The maximum deviations ranged from 43% to 56%. If any significant weight is attached to the factor, closeness to market value, these methods do not appear to be desirable methods.

Stability of Yield

Table 29 is a frequency distribution of the annual changes in yield for the AB Fund. The accounting methods are arranged across the table by their respective C_y^2 values.

The first method, the 6% Appreciation Method is in a class by itself with regards to the characteristic, stability of yield. The maximum change in yield for this method over the twenty-three years tested is less than .01. The median change in yield is .003. Considering only this factor, the 6% Appreciation Method is a superior method with almost no change in yield from year to year.

The second method, the Moving Average Method, also appears to

TABLE 29

FREQUENCY DISTRIBUTION OF FLUCTUATIONS IN YIELD
1947 - 1969

Average Change in Yield	Appreci- ation Method	Moving Average Method	A B FUND - Number of Years							Market Value Method
			Minimization Formula		20% Write-up Method	Historical Cost Method		Trend Line Method	50% Write-up Method	
			Aggregate	Individual						
.40 to .50								2		2
.30 to .40										2
.20 to .30							2		1	2
.10 to .20			3	3	2	-			6	3
.05 to .10		7	7	7	10	6			8	12
.01 to .05		12	11	12	8	12			8	4
.00 to .01	23	4	2	1	3	3			-	2
Median change	.003	.025	.03	.04	.05	.03			.06	.07
Maximum change	.008	.07	.16	.13	.17	.24			.22	.21
C _y ² value	.0003	.0388	.0904	.0995	.1026	.1413			.2058	.2220
										1.0121

be in a class by itself with regards to this characteristic. The C_y^2 value, 0.0388 is considerably higher than the value for the 6% Appreciation Method and considerably lower than the next method, the Minimization Formula Method, which has a C_y^2 value of 0.0904. The median annual change in yield is .025 which is slightly better than the next group of methods. The most significant difference between the Moving Average Method and the next group of methods is the maximum annual change in yield of .07 compared with .13 and the tighter cluster of years around the slightly lower median value.

The next four methods are:

III b. The Minimization Formula Methods, individual and aggregate.

III a. 20% Write-up Method.

I . Historical Cost Method.

They form a group with relatively small differences in the C_y^2 values among the methods. The C_y^2 values range from 0.0904 to 0.1413. The median change in yield for the first method, the Minimization Formula Methods and the fourth method, the Historical Cost Method are approximately the same, .03. The maximum change in yield for the Minimization Formula Methods and the third method, the 20% Write-up Method are approximately the same, .16. The Minimization Formula Methods are slightly better than the other two methods and would be preferred if all other factors were equal. While the average change in yield may not be excessive for this group, the maximum change in yield, which ranges from .13 to .24 might be considered an undesirable characteristic for pension funds that attach a significant weight to the factor, stability of yield.

The two methods, Trend Line Method and 50% Write-up Method have significantly higher C_y^2 values than the preceding group of methods. The C_y^2 values are 0.2058 and 0.2220 respectively. The median annual changes in yield are .06 and .07 respectively. These appear to be relatively high annual changes. The maximum changes in yield are .22 and .21 respectively. These maximums are undesirable characteristics. These two methods do not appear to be desirable methods, if any significant weight is attached to the factor, stability of yield. However, for pension funds considering the Current Market Value Method, these methods have demonstrated that they provide yields which are a significant improvement in stability over the Current Market Value Method, which has a C_y^2 value of 1.0121, a median annual change in yield of .13 and a maximum change in yield of .48.

B. COMPARISON OF THE BASIS OF A SENSITIVITY ANALYSIS

The model developed to rank various accounting methods was formulated on a theoretical basis giving effect to the two factors, closeness to market value and stability of yield. As discussed in Chapter IV, the relative weight assigned to the C_v or C_y factor depends upon the relative importance of each factor to each pension fund. This is a matter of individual choice. There are no theoretical grounds for assigning a particular set of weights as being the universal set of correct weights. Therefore, for purposes of this study equal weights have been assigned the factors for the initial evaluation. The effects of varying the weights assigned the factors on the evaluation of the accounting methods will be studied in this section.

Explanation of the Method

An analysis of the sensitivity of the ranking of the accounting methods to the change in weights will be performed in the following manner. The C_v^2 factor, measurement of closeness to market value, has been weighted over the range from 0.01 to 20.0. The evaluation model has been modified and is as follows:

$$C^2 = [\text{weight}] C_v^2 + C_y^2$$

All accounting methods have been ranked in order by the resulting C^2 value for each weight assigned. For the AB Fund the resulting rankings for the accounting methods analyzed in this chapter are displayed in Tables 30 and 31. Table 30 lists each accounting method studied in this chapter as a line item with the respective ranks at each weight listed across the table. Table 31 lists each of the 21 ranks as a line item with the respective accounting methods at each weight listed across the table. The line for the eleventh rank is cited as an example. Accounting method Vc, the Trend Line Method, is listed at the 0.05 weighting. Method IV, the Market Value Method, is listed at the 0.5 weighting. All other methods ranked eleventh are not included in the study in this chapter. The rankings of the accounting methods based upon the individual C_v^2 and C_y^2 have been included in the tables for comparative purposes. C_v^2 is equivalent to a weighting of infinity and C_y^2 is equivalent to a weighting of zero.

Relevant range. As noted in Table 31, there is very little change in the ranking of the accounting methods at the 0.02 weighting and the ranking of the C_y^2 values alone. There is also very little change in ranking at the 10.0 weighting and the ranking of the C_v^2 values alone. Therefore, weightings outside the weights mentioned

TABLE 30

A B FUND

SENSITIVITY ANALYSIS

RANKING OF SELECTED ACCOUNTING METHODS FOR WEIGHTS INDICATED

Method	Weight*														
	C_y^2	0.01	0.02	0.05	0.1	0.2	0.5	1.0	2.0	5.0	10.0	20.0	C_y^2	C_y^2	C_y^2
I Historical cost	13	13	13	15	16	17	21	21	21	21	21	21	21	21	21
IIa I R, initialized at mkt	1	2	2	4	7	10	12	14	15	15	15	15	15	15	15
IIb 6% long range appreciation	2	1	1	2	5	8	9	12	13	13	13	13	13	13	13
IIIa 20% write-up (2)	10	9	9	6	4	4	6	6	7	8	8	8	8	8	8
50% write-up (5)	15	15	15	12	9	6	5	4	4	4	3	3	3	3	3
IIIb Minimization, aggregate (1)	7	7	7	3	2	1	1	1	1	2	4	4	4	4	4
Minimization, individual (2)	8	8	8	5	3	3	2	2	2	3	5	5	5	5	5
IV Current market value	21	21	21	21	20	20	11	8	6	5	2	1	1	1	1
Vb Moving average	4	3	3	1	1	2	3	5	5	6	7	7	7	7	7
Vc Trend line	14	14	14	11	8	5	4	3	3	1	1	2	2	2	2

* $C^2 = (\text{Weight}) C_v^2 + C_y^2$

TABLE 31

SENSITIVITY ANALYSIS - AB FUND
RANKING OF SELECTED ACCOUNTING METHODS FOR THE WEIGHTS INDICATED

Rank	C _v ²	Weight*												Rank
		Relevant Range												
		0.01	0.02	0.05	0.1	0.2	0.5	1.0	2.0	5.0	10.0	20.0	C _v ²	
1	IIa	IIb	IIb	Vb	Vb	IIb1	IIb1	IIb1	IIb1	Vc	Vc	IV	IV	
2	IIb	IIa	IIa	IIb	IIb1	Vb	IIb2	IIb2	IIb2	IIb1	IV	Vc	Vc	
3		Vb	Vb	IIb1	IIb2	IIb2	Vb	Vc	Vc	IIb2	IIa5	IIa5	IIa5	
4	Vb			IIa	IIa2	IIa2	Vc	IIa2	IIa2	IIb1	IIb1	IIb1	IIb1	
5				IIb2	IIb	Vc	IIa5	Vb	Vb	IV	IIb2	IIb2	IIb2	
6				IIa2	IIa2	IIa5	IIa2	IIa	IV	Vb	Vb	Vb	Vb	
7	IIb1	IIb1	IIb1		IIa	IIb		IV	IIa2	IIa2	IIa2	IIa2	IIa2	
8	IIb2	IIb2	IIb2		Vc		IIb			IIa2	IIa2	IIa2	IIa2	
9	IIa2	IIa2	IIa2		IIa5	IIa5	IIb							
10						IIa								
11							IV							
12							IIa	IIb						
13	I	I	I						IIb	IIb	IIb	IIb	IIb	
14	Vc	Vc	Vc					IIa						
15	IIa5	IIa5	IIa5	I					IIa	IIa	IIa	IIa	IIb	
16					I									
17						I								
18														
19														
20					IV	IV								
21	IV	IV	IV	IV			I	I	I	I	I	I	I	

$$*C_v^2 = [\text{Weight}] C_v^2 + C_v^2$$

TABLE 31--Continued

LEGEND

I	Historical Cost
IIa	I R R, Init. at Market
IIb	6% Appreciation
IIIa2	20% Write-up
IIIa5	50% Write-up
IIIb1	Minimization, aggregate
IIIb2	Minimization, individual
IV	Market Value
Vb	Moving Average
Va	Trend Line

above are equivalent to consideration of only one factor. The theory developed in the Chapter II supports the notion that both factors, closeness to market value and stability of yield, are significant factors. Therefore, the relevant range of weighting for the AB Fund in which there is a significant interaction between the two factors would be from 0.05 to 5.0.

Effect of weighting. At the 1.0 weighting, a .05 change in yield is equivalent to at 5% deviation from market value. The basic definition of C_v^2 is equivalent to the squared percentage deviation from market value and the definition of C_y^2 is equivalent to the squared value of the change in yield. Therefore, for the amounts above $[1.0] C_v^2 = [1.0] C_y^2$. Evaluations in the preceding chapter have been made at this weighting. At the 0.05 weighting a .01 change in yield would be rated equivalent to a 4½% deviation from market value and a .05 change in yield would be rated equivalent to a 23% deviation from market value. The formula at the 0.05 weighting for equivalent values is as follows:

$$\begin{aligned} 0.05 C_v^2 &= C_y^2 \\ (0.05)(0.045)^2 &= (.01)^2 \\ .0001 &= .0001 \end{aligned}$$

Similar computations would demonstrate the other equivalent statements made in this section. Selection of rankings at the 0.05 weighting would indicate a very strong preference for a stable yield with only weak consideration of closeness to market value. At the 5.0 weighting a 1% deviation in market value would be rated equivalent to a .022 annual change in yield and a 5% deviation from market value is equivalent to a .11 annual change in yield. Selection of rankings at the 5.0 weighting would indicate a very strong preference for closeness to

market value with only weak consideration of stability of yield.

Evaluation of the Accounting Methods

Within the relevant range, the Moving Average Method ranked first at the 0.05 and 0.1 weightings. The Minimization Formula Method ranked first from the 0.2 weighting to the 2.0 weighting. The Trend Line Method ranked first at the 5.0 weighting. The Minimization Formula Method ranked first over a broad band of weightings and would appear to be the preferred method in the absence of strong preferences for one of the factors.

It is interesting to note in Table 31 that the Current Market Value Method ranks last at the 0.05 weighting and improved its ranking significantly as the weighting of the C_v^2 value increased. However, this method only ranked fifth at the 5.0 weighting. It moved to first at the 20.0 weighting when virtually no consideration was given stability of yield.

The Historical Cost Method is fifteenth at the 0.05 weighting and quickly moves to last at the 0.5 weighting where it resides as the weighting of the C_v^2 factor increases. All methods selected as better methods outranked the Historical Cost Method across the entire relevant range of weighting. None of the methods listed in Table 31 have been affected by the minimum constraint of the historical cost valuation established for many of the methods. Therefore, these are unbiased evaluations.

The IRK Method is second at the 0.01 and 0.02 weightings and is rated fourth at the 0.05 weighting. Its ranking drops rapidly as the weightings of the C_v^2 values are increased and reaches twelfth at

the 0.5 weighting and fifteenth at the 2.0 weighting. Fifteenth is the ranking of the IRR Method based upon the C_v^2 factor alone.

The 6% Appreciation Method ranks very high in stability of yield. This is reflected in its ranking of second at the 0.05 weighting. However, as the weighting of the C_v^2 factor is increased, the ranking of the 6% Appreciation Method drops rapidly. It ranks higher than the IRR Method and closely parallels the IRR Method its movement across Table 31. At the 0.2 weighting the 6% Appreciation Method drops to eighth place and ranks lower than all other methods under consideration.

The 20% Write-up Method ranks lower than the Moving Average Method and Minimization Formula Methods over the entire range of weightings and ranks lower than the Trend Line Method at weights of 0.5 and higher. The 50% Write-up Method ranks lower than the Minimization Formula Methods and the Trend Line Method over the entire relevant range of weights and ranks lower than the Moving Average Method over weights of 0.5 and less.

Based only upon this analysis of rankings over the relevant range of weighting, it would appear that one of the four methods, the Minimization Formula Methods, the Moving Average Method and the Trend Line Method, would be recommended. Both the Moving Average Method and the Minimization Formula Methods, rank fairly high across the entire relevant range. The Trend Line Method does not rank high for C_v^2 values heavily weighted in favor of the measure of stability of yield and would not be as highly rated considering all of the relevant weightings of the factors.

C. COMPARISON BASED UPON UNBIASED WEIGHTS

The relative weighting given each factor by a church pension fund in the selection of accounting methods is based upon the fund's utility preferences for market value and stable yields. Nevertheless for purposes of analysis it would be desirable to provide information concerning a ranking of the methods at an unbiased weight. A unbiased weight will be defined as a weight in which neither factor, closeness to market value or stability of yield, has a greater influence in the ranking of the methods.

No formula has been developed or is known by the researcher to exist to obtain the unbiased weight to be applied to the factors. The method described below will be used to estimate the least biased set of weights applicable to the AB Fund data. The average rank based upon the "C" values of the individual factor will be used as an estimator.

Selection of an Unbiased Weight

The initial evaluation of accounting methods performed in Chapter VI was based upon the assignment of equal weight to the values obtained from each factor in the model. An alternative system of weighting will be utilized in this section. This alternative system of weighting will assign equal weight to the ranking of the accounting methods, where the ranking is based upon values of the individual factors contained in the evaluation model.

The ordinal rankings of the accounting methods based upon the average rank of the individual factors are exhibited in Table 32. To determine the ordinal rankings, the average rank was computed as follows:

TABLE 32
COMPUTATION OF AVERAGE RANK

Accounting Method		AB FUND				
		C _v ²	C _y ²	Ave. Rank (R)	Rank of Ave. Rank	
I a	Historical cost	21	13	17	21	
II a	Long range yield	7%	19	11	15	18
	Long range yield	9%	16	3	9½	10
	I R R, initialized at market		15	1	8	6
II b	Long range appreciation	3%	17	5	11	12
	Long range appreciation	6%	13	2	7½	4
	Long range app, modified	3%	18	6	12	14
II c	Write-up minimum rate	6%	20	12	16	20
III a	Percent adjustment	10%	12	9	10½	11
	Percent adjustment	20%	8	10	9	8
	Percent adjustment	50%	3	15	9	9
III b	Minimization formula, aggregate		4	7	5½	1
	Minimization formula, individual		5	8	6½	3
IV a	Current market value		1	21	11	13
V a	Market value, less a reserve	10%	6	20	13	16
	Market value, less a reserve	20%	11	19	15	17
	Market value, less a reserve	33%	14	18	16	19
	Mkt value, less a res, mod	20%	10	17	8½	7
V b	Moving average	5yr	7	4	5½	2
V c	Trend line	5yr	2	14	8	5
V d	Market value with var adjustment		9	16	12½	15

j = accounting method j

$\bar{R}_j = 1/2 [R_{jcv} + R_{jcy}]$ R_{jcv} = ordinal ranking for accounting method j for the C_v^2 factor

R_{jcy} = ordinal ranking for accounting method j for the C_y^2 factor

The accounting methods were ranked in order by the $\bar{R}_j$ values computed above. If the $\bar{R}_j$ values for different accounting methods were equal, the accounting method with the lowest variance from the $\bar{R}_j$ value was ranked highest. The variance was computed as follows:

$$V_j = [R_{jcv} - \bar{R}_j]^2 + [R_{jcy} - \bar{R}_j]^2$$

If both $\bar{R}$ and V are equal for two accounting methods, the method with the lowest C^2 value was ranked highest. For the AB Fund two pairs of accounting methods required the use of C^2 values to determine a unique rank.

The correlation between the ordinal ranking of average ranks as computed above, and the ordinal ranking of C^2 values at each weighting was calculated. Spearman's Formula for rank correlation was used to compute the correlation coefficient.¹ See Chapter V for description of Spearman's Formula. The resulting correlation coefficients are displayed in Table 33. The weight for the AB Fund with the highest correlation with the average ranks was 0.5. The correlation coefficient at 0.2 was only slightly lower than at 0.5 with coefficients of .84 and .86 respectively. The coefficient at 1.0 was considerably lower with a coefficient of .74. If we assume that equal weight given to the relative ranks of the factors provides a relatively unbiased evaluation, then a weighting of 0.5 provides an unbiased evaluation of the

¹ Spiegel, Problems of Statistics, p. 246.

the accounting methods for the AB Fund.

TABLE 33
CORRELATION COEFFICIENT BETWEEN AVERAGE RANK
AND WEIGHTED C^2 VALUES
AB FUND

	Weight*						
	0.05	0.1	0.2	0.5	1.0	2.0	5.0
Correlation coefficient	.75	.80	.84	.86	.74	.68	.64

$$*C^2 = [\text{Weight}] C_v^2 + C_y^2$$

Ranking at the Unbiased Weight

It is interesting to note that the six methods that ranked the highest on the basis of a weighting of 1.0 applied to each factor are the same six highest methods for both funds when a 0.5 weight is applied to the C_v^2 factor. The relative positions for these six methods does change as the weights are changed to 0.5 and 0.2. The 6% Appreciation Method, not among the six highest, ranked twelfth at the 1.0 weight for the AB Fund, moved to ninth at the 0.5 weight and to eighth at the 0.2 weight. See Table 31 for comparison of ranking of the better methods for the AB Fund across various weightings of the factors in the model. Therefore the selection of methods for further analysis in Chapter VI would not have been affected by conducting the evaluation at the 0.5 or 0.2 weighting. However, the indication that the 0.5 weight should be given added consideration will affect the evaluation in the following section.

D. EVALUATION OF THE METHODS

The evaluation of each accounting method will be summarized. The discussion of each method will include the evaluation in sections A, B, & C above. When the differences in the factors measured in this study are small among accounting methods, then other factors may be important in the final decision by a pension fund in the selection of an accounting method. Other factors include the preference for individual verses aggregate methods, the conceptual simplicity of the method, the ease of implementation, and the flexibility of the method to be modified to achieve the precise performance characteristics desired.

The Minimization Formula Methods

The two Minimization Formula Methods had "C" values that were almost identical. These methods outperformed all other methods. When judged with respect to closeness to market value, as shown in Table 28, they were among the leaders. As indicated in Table 29, the median change in yield .03 and .04 also placed them among the best methods. The major criticism in their performance is that for a small number of years their change in yield was excessive. These methods had 3 years of a total of 23 tested in which the change in yield exceeded .10. The Minimization Formula Methods ranked no lower than fifth across the entire relevant range of weighting and no lower than third across the range from 0.1 to 5.0. The methods were ranked first and second across the range of weights from 0.5 to 2.0 and ranked first and third at the 0.2 weighting. These rankings first to third include the relatively unbiased weights of 0.5 and 0.2. Based upon their consistently

high performance in this study, the Minimization Formula Methods are highly recommended for use and are the top rated of all of the accounting methods. A pension fund's preference for an aggregate or individual method of accounting would determine which of these methods to use.

The Minimization Formula Methods may be difficult to understand for non-mathematically oriented pension fund executives. It is not conceptually simple to the non-sophisticated trustee or executive who does not understand elementary calculus. The formula is rather difficult to test manually because of the extremely large numbers and very small numbers that are generated in the process of computing the annual book values. These complexities may be critical determinants in the selection of an accounting method for many pension funds.

The Minimization Formula can be modified to provide an optimal performance at any desired weighting of the respective factors. Based upon the results obtained in the preceding section, it is suggested that the Minimization Formula Method be modified to optimize its results at the 0.5 weighting. This would result in a performance that would provide greater stability of yield and larger deviations from market value.

Moving Average Market Value Method

The 5 year Moving Average Market Value Method ranked very high in the measurement of stability of yield. As noted in Table 29, it was in a class by itself and was only outranked by the 6% Appreciation Method. The performance of the Moving Average Method in the measurement of closeness to market value was acceptable with a median deviation of 9%, although this deviation is substantially higher than the

Minimization Formula Method and other top performers in this attribute. The Moving Average Method ranked high over the entire relevant range of weighting with a rank of first at the 0.05 and 0.1 weightings, third at the 0.5 weighting and sixth at the 5.0 weighting. The method ranked third and second at the relatively unbiased weights of 0.5 and 0.2. The 5 year Moving Average Method is highly recommended and rated second to the Minimization Formula Methods in order of preference.

The Moving Average Method is an individual method of accounting for common stocks. Pension funds with a preference for aggregate methods would not select this method.

The Moving Average Method can be easily understood. The concept of a moving average is not new to the general public. The computations to test an individual stock are relatively easy. If there is an extensive number of stocks in the portfolio, a computer may be required to utilize this method. The Moving Average Method would be preferred over the Minimization Formula Method where simplicity is a crucial factor in the selection.

The Moving Average Method is closely related to the Trend Line Method. See the discussion of the Trend Line Method for possible modification of the Moving Average Method.

Least Squares Trend Line Method

The Least Squares Trend Line Method ranked very high in the measurement of closeness to market value. See Table 28. This method had a median deviation from market value of 4% and a maximum deviation of 9% over the 23 year period tested. However, the Trend Line Method performed relatively poorly in the measurement of stability of yield

with a median annual change in yield of .06, a maximum change of .22 and almost 1/3 of the years with a change of over .10. The Trend Line Method ranked very high across the portion of the relevant range of weighting from 0.2 and above. It ranked fifth at 0.2, fourth at 0.5, third at 1.0 and first at 5.0. However, the Trend Line Method ranked eleventh and eighth at the 0.05 and 0.1 weightings respectively. Unless a pension fund had a high utility preference for closeness to market value over stability of yield, the Trend Line Method would not be recommended. The Moving Average Method would be strongly recommended in preference to the Trend Line Method.

The Least Squares Trend Line Method is an individual common stock method. This method is conceptually more difficult to understand than the Moving Average Method. In the author's opinion, the Trend Line Method would be understandable to a greater number of non-quantitative people than the Minimization Formula Methods. The computation to test an individual stock is not difficult since the formula reduces to a simple set of equations. A computer would be required to utilize this method for a pension fund portfolio.

The Trend Line Method projects a straight line close to the market value for the last 5 years. The value assigned to the common stock for use in the portfolio is the amount at the point where the line crosses the fifth year. See Chapter III for a detailed description. The Trend Line Method can be modified without additional computations by valuing the common stock at the point where the line crosses the fourth year. This modification would result in a method that would provide a more stable yield than the formula tested in this study, but would have greater fluctuations in yield than the Moving Average Method.

This modified Trend Line Method would have larger deviations from Market Value than the formula tested, but would have smaller deviations than the Moving Average Method. This modified method would be recommended for those funds that have a higher utility preference for closeness to market value than provided by the Moving Average Method, and are willing to sacrifice some stability of yield.

20% Write-up each Year of the Difference between
Adjusted Book Value and Market Value

The performance of the 20% Write-up Method is judged to be average in both factors, closeness to market value and stability of yield. See Tables 28 and 29. The 20% Write-up Method had an 11% median deviation from market value and was slightly worse than the Moving Average Method. The 20% Write-up Method was grouped with the Minimization Formula Methods and the Historical Cost Method in its performance for stability of yield. The median annual change in yield of .05 may be higher than desired. The two years over .10 with a maximum change of .17 are undesirable characteristics. The 20% Write-up Method ranked from fourth to eighth across the relevant range of weighting. This is a relatively consistent performance at a good but not exceptional rank. The method ranked sixth and fourth at the relatively unbiased weights of 0.5 and 0.2 respectively. The 20% Write-up Method ranked lower than the Minimization Formula Methods and the Moving Average Method across the entire weightings. The 20% Write-up Method is rated average. It is an acceptable method but inferior to the three highly recommended methods.

The 20% Write-up Method is an aggregate method of accounting for common stock portfolios. The method is relatively easy to

understand. The computation of the reserve is not difficult. The method can be administered with manual methods of data processing. The Percentage Write-up Methods are presently the most widely used, exclusive of the Historical Cost Method.¹ The 20% parameter is one of the most frequently used. For pension funds preferring aggregate methods, simplicity and manual accounting, the 20% Write-up Method would be recommended.

The 20% Write-up Method is closely related to the 50% Write-up Method. See discussion of the 50% Write-up Method for possible modifications of these methods.

50% Write-up each Year of the Difference between
Adjusted Book Value and Market Value

The 50% Write-up Method ranked very high in the measurement of closeness to market value. See Table 28. The 5% median deviation with a maximum deviation of 13% are bettered by only one method, the Trend Line Method. However, the 50% Write-up Method performed relatively poorly in the measurement of stability of yield with a median annual change in yield of .07, a maximum change of .21 and 5 of 23 years tested over .10. The 50% Write-up Method ranked one place lower than the Trend Line Method at every weighting within the relevant range except at the 5.0 weight. At this weight, the Trend Line Method was first and the 50% Write-up Method was fourth. This method should not be considered for use except by pension funds with a very high utility preference for closeness to market value.

Use of the 20% parameter is recommended over the 50% parameter

¹Kane, Pension Fund Financing, Table 11.

for those pension funds preferring a method with the characteristics of the Percentage Write-up Methods.

The Percentage Write-up Method can be modified to use any desired percentage. Use of a 30% or 40% parameter would be recommended for those pension funds with a higher utility preference for closeness to market value than the performance provided by the 20% Write-up Method.

6% Appreciation Method

The 6% Appreciation Method has virtually no change in yield from year to year. See Table 29. Considering only this factor, the 6% Appreciation Method is the superior method. However, the performance recorded in the measure of closeness to market value was bad. As noted in Table 28, there is a median deviation of 27%, a maximum deviation of 43%, and 16 of 23 years with a deviation in excess of 10%. The 6% Appreciation Method ranked second at the 0.05 weighting and fifth at the 0.1 weighting. As the weightings increase, the 6% Appreciation Method rankings drop, and this method does not rank very high. It ranks ninth and eighth at the 0.5 and 0.2 weightings respectively. One additional factor affecting the evaluation of the 6% Appreciation Method is the 7% deviation from Market Value at December 31, 1969. This deviation is an excess of book value over market value. The 6% Appreciation Method does not utilize market value in the formula. If future market appreciation is less than 6%, the book value could become excessive and be unrealistic over time. Considering its total performance and its theoretical weakness, the 6% Appreciation Method is not recommended.

The 6% Appreciation Method is an aggregate method that is simple to understand and to apply. The parameter represents a prediction of

a portion of the long term earnings, the growth rate of the stock. The method can be modified by changing the parameters. The method can also be modified by putting constraints that insure that book value does not differ from market value by more than a specified amount. Use of constraints increase the fluctuation in yield of the Long Range Appreciation Method. One modification, a 3% appreciation factor, was tested with very poor results. Perhaps the Long Range Appreciation Method, with a more conservative appreciation percentage, 4% to 5%, properly constrained with upper and lower limits, would be appealing to a fund with a high utility preference for stability of yield and little preference for closeness to market value.

E. SUMMARY

Twenty-one accounting methods were selected for testing. Fourteen of the original twenty-one were screened out in Chapter VI as inferior methods. The remaining seven have been evaluated, based upon the criteria established early in this study, and the results of the tests performed to measure the accounting methods against the criteria. The following summarizes the recommendations for these seven methods.

The following methods are highly recommended and rated in the order listed:

- 1 and 2. Two Minimization Formula Methods, equally rated.

3. Moving Average Market Value Method, based upon an average of 5 years.

The following method is considered acceptable but rated much lower than the above methods:

4. 20% Write-up each Year of the Difference between Adjusted Book Value and Market Value.

For those pension funds with high utility preferences for closeness to market value, the following methods are considered acceptable after modification and are rated in the order listed:

5. Least Squares Trend Line Method, based upon market values for 5 years.

6. Percentage Write-up each Year of the Difference between Adjusted Book Value and Market Value, 30% or 40%.

The following method is not recommended:

7. 6% Appreciation Method.

The recommendations are based upon the researcher's evaluation of each method's performance. These judgments are not conclusive. However, the evidence is very persuasive and sufficient to support the recommendations presented.

CHAPTER VIII

SUMMARY, CONCLUSIONS AND IMPLICATIONS

A. SUMMARY

The purpose of this study was to provide a useful answer to the following question. At what amount should the investment in equity securities be carried on the balance sheet in published financial statements for church pension funds? A research methodology was developed to provide a useful solution to this problem. This research methodology is summarized below:

1. Development of the accounting objectives based upon usefulness.
2. Development of specific criteria an accounting method should possess; the specific criteria being based upon the accounting objectives.
3. Development of a mathematical model to measure the effectiveness of accounting methods in meeting the criteria.
4. Testing of alternative accounting methods by use of actual data and by simulation.
5. Use of the model to rate the accounting methods and selection based upon this rating.

The research has been conducted as proposed. The results can be summarized as follows:

1. Accounting objective: equitable allocation of earnings

to participants.

2. Specific criteria: a) closeness to market value.

b) stability of yield

3. Mathematical model: $C^2 = [w] C_v^2 + C_y^2$; where C_v^2 is a measure of closeness to market value, C_y^2 is a measure of stability of yield, and $[w]$ is a weighting factor.

4. Test alternative accounting methods: book values and yields computed for twenty-one selected accounting methods.

5. Rate accounting methods: six acceptable methods ranked in order; the other fifteen methods rated inferior.

Each accounting method specifies a formula for computing the carrying value of the equity securities. The accounting methods recommended will specify the valuation of equity securities which best meet the objectives of church pension funds.

B. RECOMMENDATIONS FOR CHURCH PENSION FUNDS

Historical Cost Method

The study revealed that the Historical Cost Method of accounting for common stocks is the least efficient method to achieve the objectives of church pension funds. It is recommended that the Historical Cost Method of accounting be abandoned by all funds presently using this method.

Current Market Value Method

The study also revealed that the Current Market Value Method of accounting is very inefficient in achieving the objectives of church pension funds and is not an acceptable alternative to the Historical

Cost Method. Any one of the six methods rated acceptable below would be strongly preferred as an alternative to the Current Market Value Method.

Recommended Methods of Accounting

The conclusions of the study regarding recommended accounting methods are detailed in Chapter VII and summarized below.

The following three methods are highly recommended and ranked in the order listed:

1. and 2. Two Minimization Formula Methods, equally ranked.

3. Moving Average Market Value Method, based upon an average of 5 years.

The following method is considered acceptable but ranked much lower than the above methods:

4. 20% Write-up each Year of the Difference between Adjusted Book Value and Market Value.

For those pension funds with high utility preferences for closeness to market value, the following methods are considered acceptable after modification and are ranked in the order listed:

5. Least Squares Trend Line Method, based upon market values for 5 years.

6. Percentage Write-up each Year of the Difference between Adjusted Book Value and Market Value, 30% or 40%.

Proposed Alternative Actions

All church pension funds should re-evaluate their present accounting methods considering the theoretical arguments and empirical results presented in this study. The following alternative actions would be appropriate.

Acceptance. Those pension funds with inadequate resources to conduct their own research may be well advised to adopt the recommendations set forth above. The pension funds should give due consideration to the characteristics of the accounting methods listed below and described in Chapter VII that meet their own situation.

1. Performance for each factor; closeness to market value and stability of yield.
2. Performance over a broad range of relative weighting of the factors; closeness to market value and stability of yield.
3. Performance at the relatively unbiased weighting of the factors; closeness to market value and stability of yield.
4. Accounting on an individual stock or aggregate portfolio basis.
5. Conceptual simplicity.
6. Ease of implementation.
7. Flexibility of the method to be modified to achieve precise performance characteristics desired.

In view of the consistency of results indicated in Chapter V, a minimum of risk would be involved in application of these recommendations to a church pension fund without additional research.

Replication. Those pension funds with adequate resources to conduct their own research would be well advised to replicate this study using their own pension fund data. This replication should reinforce any decision with regards to the adoption of recommendations of this study. Should the results obtained by replication be significantly different than the results of this study, then such results would have to be carefully studied before adoption of an accounting method.

Modification. An alternative course of action for those pension funds that are in a position to replicate this study, would be to apply the methodology with modification to meet the special needs of the pension funds. The methodology would be applied to the pension fund's own data. Modification could include:

1. Testing alternative parameters for the accounting methods recommended in this study. The specific utility preferences of a fund would be the criteria to select alternative parameters.

2. Testing alternative accounting methods not included in the study.

3. Testing of additional factors not included in the study. For example; a three factor model could be used with a factor added to the model for conservatism. Use of the methodology with modification should be preceded by replication of this study. The replication would enable each pension fund to compare their own results with the results of this study.

C. IMPLICATIONS FOR SOCIETY

The study was directed to the needs of church pension funds for the valuation of equity securities. Possible implications beyond the specific purpose of this dissertation will be examined.

Application of the Methodology

The methodology used in this study should be considered for use in the valuation of other assets. The use of this methodology is a logical approach to the selection of accounting methods. It appears to be especially adaptable to specific asset valuation alternatives. The

initial extension of the methodology would be to study accounting methods for valuation of other marketable securities such as bonds. As the accounting profession is studying the possibility of a departure from historical cost accounting, this approach should be considered as a method of study.

Other Uses of the Results

Private pension funds for non-profit organizations. This study was constructed from a theoretical viewpoint and recommendations did not consider specific environmental constraints. Church pension funds are relatively free of governmental regulation and other artificial environmental factors. Therefore, the methods of accounting rated on the basis of theoretical development can be utilized. Results of this study would be equally applicable to all non-insured private pension funds of non-profit organizations that are not subject to state regulatory, Federal income tax, or other Federal regulations.

All private pension funds. Additional research is required to determine the applicability of the results of this research to all non-insured private pension funds. The research should determine the effect of governmental regulation upon the objectives of the pension funds and the effect of any modified objectives upon the criteria for judging accounting methods. Should such research lead to the same criteria used in this study, then the results of this study are applicable to all non-insured private pension funds. In any event the methodology for research is applicable. The results can be utilized with appropriate modification in performing independent research for other types of private pension funds.

Organizations exclusive of pension funds. Future research is also suggested to determine the applicability of the methodology and/or results to marketable security portfolios held by other institutions. Other institutions would include industrial corporations holding investments in marketable securities, or investment companies such as insurance companies or investment trust portfolios. With regard to industrial corporations, separate determinations may be appropriate for investments held as temporary investments for excess cash and long term investments held for other reasons. The research should be directed to defining objectives and conversion of objectives into specific criteria. If at any point in the development of the criteria, the results should converge with the results of this study, then the conclusion and recommendations of this study would also be applicable. For example, the Constant Rate of Return theoretical allocation method defined in Chapter II may be the optimal method to meet a variety of objectives. If the specific objectives for common stock valuation for long term investments of industrial corporations were best met by the Constant Rate of Return theoretical allocation method, then the results of this study could be generalized to include long term investments of industrial corporations.

Donald J. Bevis stated in the lecture series sponsored by Michigan State University that the great problem of the Seventies is bringing the recognition of current values into the financial statements.¹ Perhaps the approach taken in this research study can be of assistance in seeking solutions to this problem.

¹Donald J. Bevis, "Distinguished Accountants Videotape Series, Sidney Davidson and Donald J. Bevis" (East Lansing, Michigan: Michigan State University, Lecture on August 3, 1970).

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APPENDIX

FORMULAS FOR ACCOUNTING METHODS

The formulas for the accounting methods described in Chapter III are presented in this appendix.

Individual Methods of Accounting

The individual methods of accounting are of the form as follows:

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value is the sum of the book values of the individual common stocks by accounting method j

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

Portfolio earnings are the sum of the earnings of the individual common stocks by accounting method j

Aggregate Methods of Accounting

The aggregate methods of accounting are of the form as follows:

$$B_{jt} = (H_t \text{ or } M_t) + V_{jt}$$

Portfolio book value is the portfolio value by the Historical Cost Method or the Current Market Value Method adjusted by a portfolio valuation reserve computed according to the formula for accounting method j

$$E_{jt} = \sum_{i=1}^I E_{ijt} + V_{jt}$$

Portfolio earnings are the sum of the earnings of the individual common stocks by the Historical Cost Method or the Current Market Value Method adjusted by the change in the valuation reserve computed according to the formula for accounting method j

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INDEX OF SYMBOLS

Subscripts

i	=	common stock of company i
j	=	accounting method j
t	=	time t , year, or year end
m	=	month m , date of transaction during the period
$(.sh)$	=	number of shares for transaction $(.)$
$(.ps)$	=	amount per share for transaction $(.)$
$\underline{\cdot}$	=	parameter value to be specified when the accounting method is used

Standard Symbols

$(Bsh)_t, (Bps)_t, B_t$	=	Book value per share, total, at time t
D_t	=	Dividends during time t
E_t	=	Earnings during time t
G_t	=	Gain on sale or increment in value of stock during time t
H_t	=	Book value by the historical cost method at time t
I	=	Number of common stocks i
M_t	=	Market value at time t
$(Psh)_t, (Pps)_t, P_t$	=	Purchases at cost, per share, total during time t
$(Qps)_t, Q_t$	=	Cost of sales, per share, total during time t
$(Ssh)_t, (Sps)_t, S_t$	=	Sales at sales price, per share, total during time t
V_t	=	Valuation reserve for the portfolio at time t
Y_t	=	Portfolio yield during time t
$FPS_t = (P_t - S_t)(m/12)$	=	Average value of transactions during time t

I. HISTORICAL COST METHOD

Computation of Book Value

$$H_t = B_{jt}$$

Portfolio book value by the
Historical Cost Method

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value at time t
equals the sum of the book
value of the individual stocks

$$B_{ijt} = B_{ij(t-1)} + P_{ijt} - Q_{ijt}$$

Book value of stock i at time t
equals the book value at time
(t-1) plus purchases less sales
at cost

$$Q_{ijt} = \sum_{m=1}^M Q_{ijm}$$

Cost of sales for all transactions
for stock i during time t equals
the sum of the individual trans-
actions during time t

$$Q_{ijm} = (Ssh)_{im} \left[\frac{(B_{ij(t-1)} + \sum_{a=1}^m P_{ija})}{(Bsh)_{ij(t-1)} + \sum_{a=1}^m (Psh)_{ija}} \right] \quad a < m \quad \text{Cost of sales for transaction m}$$

$$= (\text{No. of shares}) \times (\text{Cost per share})$$

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

Portfolio earnings during time t
equals the sum of earnings of
the individual stocks

$$E_{ijt} = D_{it} + G_{ijt}$$

Earnings for stock i during time t
equals dividends plus gain on
sale

$$G_{ijt} = S_{it} - Q_{ijt}$$

Gain on sales of stock i during
time t equals sales less cost
of sales as computed above

IIa. LONG RANGE YIELD METHOD

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

Portfolio book value at time t equals book value by the Historical Cost Method plus a valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt}$$

Portfolio valuation reserve at time t equals valuation reserve at time (t-1) plus the change in reserve

$$\Delta V_{jt} = E_{jt} - \sum_{i=1}^I E_{ijt}; \text{ if } V_{jt} > 0$$

Change in the reserve for time t is equal to the portfolio earnings less earnings of the individual stocks by the Historical Cost Method

$$= - V_{j(t-1)}; \text{ Otherwise}$$

Computation of Earnings

$$E_{jt} = \overline{.07} (B_{j(t-1)} + FPS_t); \text{ if } V_{jt} > 0$$

Earnings for time t equal 7% yield on the investment base; provided the total book value is greater than Historical Cost Value

$$= \Delta V_{jt} + \sum_{i=1}^I E_{ijt}; \text{ Otherwise}$$

$$FPS_t = (P_t - S_t) (m/12)$$

Average value of transactions during time t

Alternative Parameter

$$E_{jt} = \overline{.09} (B_{j(t-1)} + FPS_t); \text{ if } V_{jt} > 0$$

Earnings for time t equal 9% yield on the investment base

IIb. LONG RANGE APPRECIATION METHOD

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

Portfolio book value at time t equals book value by the Historical Cost Method plus a valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt}$$

Portfolio valuation reserve at time t equals the valuation reserve at (t-1) plus the change in reserve

$$\Delta V_{jt} = E_{jt} - \sum_{i=1}^I E_{ijt}; \text{ if } V_{jt} \geq 0$$

Change in the valuation reserve for time t is equal to the portfolio earnings less earnings of the individual common stocks valued by the Historical Cost Method

$$= -V_{j(t-1)}; \text{ Otherwise}$$

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I D_{it} + \frac{.03}{.03} (B_{j(t-1)} + FPS_t);$$

Earnings for time t equal dividends plus 3% appreciation on the investment base; provided the total book value is greater than Historical Cost Value

$$\text{if } V_{jt} > 0$$

$$= \Delta V_{jt} + \sum_{i=1}^I E_{ijt}; \text{ Otherwise}$$

Alternative Parameter

$$E_{jt} = \sum_{i=1}^I D_{it} + \frac{.06}{.06} (B_{j(t-1)} + FPS_t);$$

Earnings for time t equal dividends plus 6% appreciation on the investment base

$$\text{if } V_{jt} > 0$$

IIB. LONG RANGE APPRECIATION METHOD - MODIFIED

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

See IIB. for explanation

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt};$$

$$\text{if } B_{jt} < .80 M_t$$

$$\text{and } V_{jt} > 0$$

$$= .80 M_t - H_t ;$$

$$\text{if } B_{jt} > .80 M_t > H_t$$

$$\text{and } V_{jt} > 0$$

$$= 0.0; \text{ Otherwise}$$

Portfolio valuation reserve at time t equals the valuation reserve at (t-1) plus the change in reserve; provided book value is less than 80% of Market Value and greater than Historical Cost Valuation

Portfolio valuation reserve at time t equals the difference between 80% of Market Value and Historical Cost value if book value is greater than 80% of Market Value and Market Value is greater than Historical Cost Value

$$\Delta V_{jt} = E_{jt} - \sum_{i=1}^I E_{ijt};$$

$$\text{if } B_{jt} < .80 M_t$$

$$\text{and } V_{jt} > 0$$

$$= V_{jt} - V_{j(t-1)}; \text{ Otherwise}$$

See IIB. and V_{jt} above for explanationComputation of Earnings

$$E_{jt} = \sum_{i=1}^I D_{it} +$$

$$\frac{.03}{.03} (B_{j(t-1)} + FPS_t) ;$$

$$\text{if } B_{jt} < .80 M_t$$

$$\text{and if } V_{jt} > 0$$

$$= V_{jt} + \sum_{i=1}^I E_{ijt}; \text{ Otherwise}$$

See IIB. and V_{jt} above for explanation

IIc. MINIMUM YIELD METHOD

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

Portfolio book value at time t equals book value by the Historical Cost Method plus a valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt}$$

Portfolio valuation reserve at time t equals the valuation reserve at time (t-1) plus the change in reserve

$$\Delta V_{jt} = E_{jt} - \sum_{i=1}^I E_{ijt}; \text{ if } V_{jt} > 0$$

$$= - V_{j(t-1)}; \text{ Otherwise}$$

Change in the reserve for time t is equal to the portfolio earnings less the earnings of the individual stocks by the Historical Cost Method

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I D_{it}; \text{ if } V_{jt} > 0$$

$$\text{and } Y_{jt} > .06$$

Earnings for time t equal the greater of dividend income or 6% yield on the investment base; provided the total book value is greater than Historical Cost Value

$$= .06 (B_{j(t-1)} + FPS_t);$$

$$\text{if } V_{jt} > 0 \text{ and } Y_{jt} \leq .06$$

$$= \Delta V_{jt} + \sum_{i=1}^I E_{ijt}; \text{ Otherwise}$$

$$FPS_t = (P_t - S_t) (m/12)$$

Average value of transactions during time t

IId. EARNINGS METHOD

Computation of Book Value

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value at time t
equals the sum of the book
value for the individual stocks

$$B_{ijt} = B_{ij(t-1)} + P_{it} + G_{ijt} - S_{it}$$

Book value for stock i at time t
equals the book value at time
(t-1) plus purchases plus gains
less proceeds from sales

$$G_{ijt} = (S_{it} - Q_{ijt}) + (Z_{it} - D_{it})$$

Gain equals; (a) gain on sales for
shares sold and (b) appreciation
recorded for shares owned at the
end of the period

$$Q_{ijt} = \sum_{m=1}^I Q_{ijm}$$

Cost of sales for all transactions
for stock i during time t equals
the sum of the individual trans-
actions at cost

$$Q_{ijm} = (Ssh)_{im} \left[\frac{(B_{ij(t-1)} + \sum_{a=1}^A P_{ia})}{(Bsh)_{ij(t-1)} + \sum_{a=1}^A (Psh)_{ia}} \right]$$

$A < m$ Cost of sales for
transaction m

$$= (\text{No. of shares}) \times (\text{Cost per share})$$

$$Z_{it} =$$

Earnings for corporation (i) appli-
cable to the shares held during
time t. Appreciation equals
($Z_{it} - D_{it}$)

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

Portfolio earnings during time t
equals the sum of the earnings
of the individual stocks

$$E_{ijt} = D_{it} + G_{ijt}$$

Earnings for stocks i during time t
equals the dividends plus gain
as determined above

IIIa. PERCENTAGE WRITE-UP METHOD

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

Portfolio book value at time t equals book value by the Historical Cost Method plus a valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt}$$

Portfolio valuation reserve at time t equals the valuation reserve at time (t-1) plus the change in reserve

$$VX = V_{j(t-1)} - G_{jt}$$

To adjust the valuation reserve at time (t-1) for gains during time t

$$\begin{aligned} \Delta V_{jt} &= \overline{0.1} (M_t - (H_t + VX)); \\ &\quad \text{if } VX > 0.0 \\ &= \overline{0.1} (M_t - H_t); \text{ Otherwise} \end{aligned}$$

Change in valuation reserve equals 10% of the difference between market value and adjusted book value, provided adjusted book value is greater than valuation by the Historical Cost Method

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt} + \Delta V_{jt}$$

Earnings for time t equals earnings for the individual stocks by the Historical Cost Method plus the change in the valuation reserve

Alternative Parameters

$$\begin{aligned} \Delta V_{jt} &= \overline{0.2} (M_t - (H_t + VX)); \\ &\quad \text{if } VX > 0.0 \end{aligned}$$

Change in valuation reserve equals 20% of the difference between market value and adjusted book value

$$\begin{aligned} \Delta V_{jt} &= \overline{0.5} (M_t - (H_t + VX)); \\ &\quad \text{if } VX > 0.0 \end{aligned}$$

Change in valuation reserve equals 50% of the difference between market value and adjusted book value

IIIb. MINIMIZATION FORMULA METHOD - AGGREGATE

Computation of Book Value

$$B_{jt} = H_t + V_{jt}$$

Portfolio book value at time t equals book value by the Historical Cost Method plus a valuation reserve

$$V_{jt} = B_{jt} - H_t$$

Portfolio valuation reserve at time t equals the portfolio book value less portfolio valuation by the Historical Cost Method

$$B_{jt} = K_3 \left[\frac{1}{M_t} - \frac{K_2}{K_1} + \frac{Y_{(t-1)}}{K_1} \right]$$

Book value is a function of the current market value and yield for time (t-1). See the computation on the following page for the development of the formula.

$$K_1 = B_{j(t-1)} + FPS_t$$

$$K_2 = \sum_{i=1}^I (D_{it} + S_{it} - P_{it}) - B_{j(t-1)}$$

$$K_3 = \frac{M_t^2 K_1^2}{M_t^2 + K_1^2}$$

$$\Delta V_{jt} = V_{jt} - V_{j(t-1)}$$

Change in valuation reserve during time t equals the valuation reserve at time t less the valuation reserve at time (t-1)

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt} + \Delta V_{jt}$$

Earnings for time t equals the sum of the earnings for the individual stocks by the Historical Cost Method plus the change in the valuation reserve

COMPUTATION OF THE MINIMIZATION FORMULA

Use of the Mathematical Model

$$C^2 = C_v^2 + C_y^2$$

This is the two factor model
developed in Chapter IV, giving
equal weight to each factor

$$\begin{aligned} \frac{d C^2}{d B_t} &= 2 C_v C'_v + 2 C_y C'_y \\ &= 0.0 \end{aligned}$$

Minimization formula is the derivative of the model, set equal to zero

$$C_v C'_v = - C_y C'_y$$

Formula for Each Factor

$$\begin{aligned} C_v &= \frac{M_t - B_{jt}}{M_t} \\ &= 1 - \frac{B_{jt}}{M_t} \end{aligned}$$

$$C'_v = \frac{-1}{M_t}$$

$$C_y = Y_{jt} - Y_{j(t-1)}$$

$$\begin{aligned} Y_{jt} &= E_{jt} / (B_{j(t-1)} + FPS_t) \\ &= E_{jt} / K_1 \end{aligned}$$

$$\begin{aligned} E_{jt} &= B_{jt} + \sum_{i=1}^I (D_{it} + S_{it} - P_{it}) - B_{j(t-1)} \\ &= B_{jt} + K_2 \end{aligned}$$

$$C_y = [(B_{jt} + K_2) / K_1] - Y_{j(t-1)}$$

$$C'_y = 1 / K_1$$

Substitution into the Formula

$$\left[1 - \frac{B_{jt}}{M_t} \right] \left[\frac{-1}{M_t} \right] = - \left[\frac{B_{jt} + K_2}{K_1} - Y_{j(t-1)} \right] \left[\frac{1}{K_1} \right]$$

Solving for B_{jt}

$$\left[-\frac{1}{M_t} + \frac{B_{jt}}{M_t^2} \right] = - \left[\frac{B_{jt}}{K_1^2} + \frac{K_2}{K_1^2} - \frac{Y_{j(t-1)}}{K_1} \right]$$

$$\frac{B_{jt}}{M_t^2} + \frac{B_{jt}}{K_1^2} = + \left[\frac{1}{M_t} - \frac{K_2}{K_1^2} + \frac{Y_{j(t-1)}}{K_1} \right]$$

$$\frac{B_{jt}(K_1^2 + M_t^2)}{M_t^2 K_1^2} = \left[\frac{1}{M_t} - \frac{K_2}{K_1^2} + \frac{Y_{j(t-1)}}{K_1} \right]$$

$$B_{jt} = K_3 \left[\frac{1}{M_t} - \frac{K_2}{K_1^2} + \frac{Y_{j(t-1)}}{K_1} \right]$$

IV. CURRENT MARKET VALUE METHOD

Computation of Book Value

$$M_t = B_{jt}$$

Portfolio book value by the Current Market Value Method

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value at time t equals the sum of the book value of the individual stocks

$$B_{ijt} = M_{it}$$

Book value of common stock i equals the market value of common stock i

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

Portfolio earnings during time t equals the sum of the earnings of the individual stocks

$$E_{ijt} = D_{it} + G_{ijt}$$

Earnings for stock i during time t equals dividends plus gain

$$\begin{aligned} G_{ijt} &= (B_{ijt} - B_{ij(t-1)}) + (S_{it} - P_{it}) \\ &= (M_{it} - M_{i(t-1)}) + (S_{it} - P_{it}) \end{aligned}$$

Gain for time t equals; (a) Appreciation in the market value of stock i plus (b) sales less purchases

Va. MARKET VALUE, LESS A RESERVE METHOD

Computation of Book Value

$$B_{jt} = M_t + V_{jt}$$

Portfolio book value at time t equals book value by the Market Value Method plus a negative valuation reserve

$$\begin{aligned} V_{jt} &= (- \overline{0.1}) M_t; \text{ if } B_{jt} > H_t \\ &= H_t - M_t; \text{ if } M_t > H_t > B_{jt} \\ &= 0.0; \text{ Otherwise} \end{aligned}$$

Valuation reserve at time t equals 10% of market value at time t; however, not in excess of market value less historical cost value

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt} + \Delta V_{jt}$$

Earnings for time t equals earnings for the individual stocks by the Market Value Method plus the change in the valuation reserve

$$\Delta V_{jt} = V_{jt} - V_{j(t-1)}$$

Change in the portfolio valuation reserve for time t equals the valuation reserve at time t less the valuation reserve at time (t-1)

Alternative Parameters

$$V_{jt} = (- \overline{0.2}) M_t; \text{ if } B_{jt} > H_t$$

Valuation reserve at time t equals 20% of market value at time t

$$V_{jt} = (- \overline{0.33}) M_t; \text{ if } B_{jt} > H_t$$

Valuation reserve at time t equals 33% of market value at time t

Va. MARKET VALUE, LESS A RESERVE METHOD - MODIFIED

Computation of Book Value

$$B_{jt} = M_t + V_{jt}$$

Portfolio book value at time t equals book value by the Market Value Method plus a negative valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt};$$

$$\text{if } V_{jt} > (- \overline{0.2}) M_t$$

$$= (- \overline{0.2}) M_t; \text{ Otherwise}$$

Portfolio valuation reserve at time t equals the valuation reserve at time (t-1) plus the change in the valuation reserve during time t; however the maximum reserve is 20% of Market Value

$$\Delta V_{jt} = (- 0.01) M_t - \sum_{i=1}^I G_{ijt};$$

$$\text{if } V_{jt} > (- 0.2) M_t$$

$$= V_{jt} - V_{j(t-1)}; \text{ Otherwise}$$

The change in the portfolio valuation reserve during time t equals (a) a negative 1% of market value less gain as determined by the Market Value Method; however, the change equals the valuation reserve at time t less the valuation reserve at time (t-1) if the valuation reserve equals 20% of the market value

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt} + \Delta V_{jt}$$

Earnings for time t equals earnings for the individual stocks by the Market Value Method plus the change in the valuation reserve

Vb. MOVING AVERAGE METHOD

Computation of Book Value

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value at time t equals the sum of the book values of the individual common stocks

$$B_{ijt} = (Bsh)_{it} (AVE)_{it}$$

Book value for common stock i at time t equals the average value per share multiplied by the number of shares owned at time t

$$(AVE)_{it} = \left[\sum_{t=T-4}^T (Mps)_{it} \right] / \underline{5} ;$$

if $T-m \geq 4$

Average value per share for common stock i equals the sum of the market value per share for 5 years divided by 5; however, if stock i was purchased within the five year period ending at time T, average value per share is weighted by the purchase price to sufficiently to bring the total periods summed to 5.

$$= \frac{\left[w (Pps)_{im} \right] + \left[\sum_{t=m}^T (Mps)_{it} \right]}{\underline{5}} ;$$

Otherwise

$$m =$$

Year of purchase

$$w = 4 - (T - m); w \geq 1$$

Weighting factor, where T is the current date of valuation and m the year of purchase.

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

Portfolio earnings at time t equals the sum of the earnings of the individual common stocks

$$E_{ijt} = D_{it} + G_{ijt}$$

Earnings for common stock i during time t equals dividends plus gain recorded

$$G_{ijt} = (B_{ijt} - B_{ij(t-1)}) + (S_{it} - P_{it})$$

Gain equals the change in book value plus the excess of the proceeds from sales over the purchases during time t

Vc. TREND LINE METHOD

Computation of Book Value

$$B_{jt} = \sum_{i=1}^I B_{ijt}$$

Portfolio book value at time t equals the sum of the book values of the individual common stocks

$$B_{ijt} = (Bsh)_{it} (Bps)_{ijt}$$

Book value for common stock i at time t equals the number of shares owned at time t multiplied by the book value per share

$$(Bps)_{ijt} = (Alpha)_{it} + \frac{4}{5} (Beta)_{it}$$

Book value per share for common stock i at time t equals an initial computed value plus the rate of change multiplied by the number of time periods after the initial value. For a 5 year linear trend line, 4 time periods after the initial time period, zero

$$(Alpha)_{it} = (AVE)_{it} - \frac{2}{5} (Beta)_{it}$$

The initial computed value is the average value less the annual rate of change multiplied by the mean value of the time periods

$$\frac{2}{5} = \frac{1}{5} \sum_{t=0}^5 t$$

$$(AVE)_{it} =$$

See Method Vb. Moving Average Method, for computation of average value per share for common stock i

$$(Beta)_{it} = \frac{(WAVE)_{it} - \frac{2}{5} (AVE)_{it}}{\frac{10}{5}}$$

Annual rate of change in the market value per share for common stock i by the least squares formula

$$(WAVE)_{it} = \sum_{t=T-4}^T \left[(t - (T-4)) (Mps)_{it} \right]; \text{ if } (T - m) \geq 4$$

$$= \sum_{t=T-4}^m \left[(t - (T-4)) (Pps)_{im} \right] + \sum_{t=m}^T \left[(t - (T-4)) (Mps)_{it} \right]; \text{ Otherwise}$$

$$m =$$

Date of purchase

Computation of Earnings

$$E_{jt} = \sum_{i=1}^I E_{ijt}$$

See Method Vb, Moving Average Method, for computation of earnings

Vd. MARKET VALUE WITH VARIABLE ADJUSTMENT METHOD

Computation of Book Value

$$B_{jt} = M_t + V_{jt}$$

Portfolio book value at time t equals book value by the Market Value Method plus a valuation reserve

$$V_{jt} = V_{j(t-1)} + \Delta V_{jt};$$

if $V_{jt} < 0.0$

$$= 0.0; \text{ Otherwise}$$

Portfolio valuation reserve at time t equals the valuation reserve at time (t-1) plus the change in reserve; however, the total value of the fund cannot exceed market value and the reserve cannot be greater than zero

$$\Delta V_{jt} = E_{jt} - \sum_{i=1}^I E_{ijt}$$

Change in portfolio valuation reserve for time t is equal to the portfolio earnings less earnings of the individual stocks by the Market Value Method

Computation of Earnings

$$E_{jt} =$$

Portfolio earnings are a function of yield, actuarial rate of interest (0.04), and the ratio of the valuation reserve to the market value of the portfolio

$$= \sum_{i=1}^I E_{ijt} - V_{j(t-1)}$$

; if $Y_{jt} \leq .04$ and $V_{jt} = 0$

$$= \frac{0.04}{K_1}$$

; if $Y_{jt} \leq .04$ and $V_{jt} < 0$

$$= \sum_{i=1}^I E_{ijt}$$

; if $.04 \leq Y_{jt} \leq (\text{RATIO} + .04) = \text{FACTOR}$

$$= (\text{FACTOR} + \frac{1}{2}(Y_{jt} - \text{FACTOR}))K_1;$$

if $\text{FACTOR} \leq Y_{jt} \leq (\text{FACTOR} + .10)$

$$= (\text{FACTOR} + \frac{1}{2}(0.10)) K_1$$

; if $Y_{jt} \geq (\text{FACTOR} + .10)$

$$\text{RATIO} = V_{j(t-1)} / M_t$$

$$\text{FACTOR} = 0.04 + \text{RATIO}$$

$$K_1 = B_{j(-1)} + (\text{FPS})_t$$

$$Y_{jt} = \sum_{i=1}^I E_{ijt} / K_1$$

0.04 = Actuarial rate of interest

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