THE INVESTMENT PERFORMANCE OF STATE RETIREMENT FUNDS

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ABSTRACT

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By

Daniel Richard Vellenga

Currently, state retirement systems have over seven and one-half million members and more than sixty billion dollars invested in debt and equity issues. How this money is invested is important to the funding of the pension plans. That is, as investment returns on the pension funds increase, the lower will be the necessary contributions into the fund to provide a given level of benefits; or, for the same level of contributions higher benefits can be paid to the retirees.

This study was designed to measure the investment performance of state retirement funds. It is significant in that it measured the rate of return on these funds by utilizing market values instead of book values. Previous studies and annual reports have generally shown the investment return on the portfolios as the percentage of investment income (dividends and/or interest) to the book value or average book value of the funds. Consequently, in periods of rising markets return is understated and in falling markets overstated.

This study is also significant in that it utilized data from forty state retirement systems from twenty-nine different states. These forty funds held almost 60 percent of the total assets of all state retirement systems. In the past, studies of state pension funds have largely been qualitative in nature and limited to individual states or geographical regions.

The investment analysis used the Dietz formula in calculating the rate of return on the funds over the years 1967 through 1972.[1] The average overall rate of return on the forty funds over the six years was -.24 percent. The highest average overall return was achieved in 1971 with 10.63 percent and the lowest average overall return was experienced in 1970 with a -7.88 percent return.

Further statistical analysis was performed with the following results:

a) There was no statistical significance between the size of the funds and the rate of return earned on the funds.

b) In 1967 there was a significant positive correlation between portfolio turnover and rate of return. In 1969 a significant negative correlation existed between turnover and rate of return. For the remaining four years no significant relationship was found.

c) The degree of liquidity of the funds did not have an appreciable effect upon the rates of return earned on the portfolios.

d) There was a significant positive relationship between the percentage of equity held and portfolio rates of return in three of the six years--1967, 1968 and 1971. In the remaining three years there was no such relationship.

e) No significant relationship between the rate of return and degree of portfolio diversification (measured by the number of issues held) was found.

f) There was a significant difference indicated between rate of return and type of management making the investment decisions. However, further analysis showed no consistent year to year pattern of one type of management outperforming the others.

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[1]P. O. Dietz, Pension Funds: Measuring Investment Performance, The Free Press (Division of the MacMillan Co.), New York, N.Y., 1966, pp. 50-51.

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CHAPTER I

INTRODUCTION

The growth in cash and security holdings of state retirement or pension systems over the past two decades has been dramatic. In 1952 the dollar value of these assets totaled $3.844 billion. As of June 30, 1973, these assets totaled $58.499 billion (see Table I-1).

This fifteen-fold increase in assets held by the state retirement systems is due to a number of factors.

First, the general population growth of the United States led to an increased demand for state government goods and services. As the states hired more employees to provide these goods and services, the dollar contributions to the pension systems likewise increased.

Secondly, the right of a guaranteed education through at least twelve grades coupled with the post World War II baby boom, led to a rapid increase in the numbers of school employees and teachers. Since a large number of school employees and teachers are covered by state pension systems, the contributions toward their pension plans helped swell the dollar value of these pension fund assets.

Table I-1. Cash and security holdings of state retirement systems for selected years (in billions of dollars).

Year	Cash and Security Holdings	Percent Change
1952	$ 3.844	-
1957	8.050	109
1962	15.546	93
1967	27.666	78
1972	51.158	85
1973	58.499	14

Sources: U.S. Bureau of the Census, Employee Retirement Systems of State and Local Governments, Vol. IV, No. 1 of the 1957 Census of Governments.

U.S. Bureau of the Census, Employee Retirement Systems of State and Local Governments, Vol. VI, No. 1 of the 1962 Census of Governments.

U.S. Bureau of the Census, Employee Retirement Systems of State and Local Governments, Vol. 6, No. 2 of the 1967 Census of Governments.

U.S. Bureau of the Census, Employee Retirement Systems of State and Local Governments, Vol. 6, No. 1 of the 1972 Census of Governments.

U.S. Bureau of the Census, Finances of Employee-Retirement Systems of State and Local Governments in 1972-73, March, 1974.

Third, over time, salaries and wages tend to rise in the United States economy. This rise may be due to such factors as seniority, collective bargaining, merit raises or an attempt to keep salaries in line with a rising cost-of-living. The majority of states gear contributions to the pension funds as a percentage of employee earnings. Consequently, as salaries and wages rise in an attempt to keep up with inflation or other reasons, the dollar contributions also increase.

Fourth, through the process of incorporation or merger of systems and centralization of government services many former city and local government employees are now covered by state retirement systems. The states have taken over the financing of these former local systems and have absorbed the financial assets of these smaller units.

Finally, demands for increased retirement benefits by state employees mean that additional contributions must be made by the states and/or employees in order to finance these higher levels of benefit payments.

Table I-1 also shows the interesting fact that for each five-year period between 1952 and 1972 the assets of the retirement systems almost doubled.

Purpose of Study

This study is designed to measure and test the investment performance of state retirement systems.

The rate of return, using market value of fund assets, earned by the retirement systems will be measured. Then the rate of return will be statistically tested to see if various investment strategies have had any significant affect on the rate of return earned on the portfolios of investments.

The rate of return earned on the pension fund assets is important for a number of reasons.

First, an increased rate of return earned on pension assets enables the cost of operating the pension system to decrease from 4 percent to 6 percent for each one-fourth of 1 percent increase in rate of return.[1]

Another way of looking at this is if the yield on the portfolio rises from 4 percent to 6 percent per year on a normal life fund, the long-run costs of the fund will be about 65 percent of what they would have been without the increased yield.[2] This decrease in costs, while maintaining a given level of retirement benefits, enables tax revenues to be used for other government services and programs.

Similarly, if the earnings on the funds rise, increased benefits can be paid to retirees without an

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[1]Joseph J. Melone and Everett T. Allen, Pension Planning, (Homewood, Ill.: Richard D. Irwin, Inc., 1966), p. 233.

[2]Daniel L. Schneid, "On Measuring Pension Fund Performance," Burroughs Clearing House, April, 1971, p. 61.

attendant increase in the cost of operating the retirement system.

Thirdly, as state government expenditures rise at a faster rate than their revenues, the pressure for greater investment return on retirement system assets increases. That is, the government would like the employee retirement system to be self-sustaining so that general tax revenues would not have to be diverted to pay retirement system benefits. However, as the number of retirees increase, the states may find that insufficient financing of the system will necessitate using general tax revenues to pay benefits in the future. Thus, any increase in investment income will tend to reduce the need for utilizing general tax revenues to finance pension payments.

Also, since many of the retirement systems calculate benefits as a percentage of the last few years (or highest salary years if different from the last few years salary in some cases) earnings, there is a normal tendency for benefits to increase over time as salaries rise for merit and/or economic reasons. Therefore, if earnings rise on the pension fund assets, it will enable these increasing benefits to be paid to retirees without too much financial strain on the system.

In addition, the rampant inflation rates being experienced in the United States (with little assurance

that these rates will be controlled in the near future) puts increased pressure upon retirement systems to provide higher benefits. That is, retirees will demand greater pension payments in order to keep up with the rising cost-of-living.[3]

In a recent settlement between the United Steelworkers and the aluminum industry the workers pension payments included a partial cost-of-living escalator. Those who retire will receive periodic pension adjustments of about 65 percent of the increase in the Consumer Price Index.[4]

Various estimates of the added cost to the pension plans for tying benefits in with the Consumer Price Index are:

1. Costs would range from 25 to 50 percent more.
2. Costs would increase from 8 to 10 percent for every 1 percent increase in the cost-of-living.[5]

It will only be a matter of time before this innovation in the private sector will be carried over to the

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[3]"Texas State Employees," Wall Street Journal, May 28, 1974, p. 1, column 5.

[4]"The Price of Aluminum Peace," Business Week, February 9, 1974, p. 44.

[5]"Different Pattern in Pensions," U.S. News & World Report, February 18, 1974, pp. 90-91.

public sector. Once this happens, the costs of public pensions will rise and an increase in the rate of return on the state retirement system assets will help offset some of the increasing costs.

Another recent development which will have long run implications for pension fund financing is zero population growth. Relatively fewer workers in the future contributing toward the pension benefits of a growing number of retirees will put increasing pressure on the funds to earn a greater rate of return if the funds are on a pay-as-you-go basis.

Also, the trend toward early retirement increases the cost of pension plans if benefits are not reduced.[6] With fewer people working a shorter number of years, an additional rate of return on assets would help increase the states ability to pay the greater dollar amount of benefits.

Finally, as state funds attempt to earn a higher rate of return they may accept greater risks in order to obtain the higher return. Investment alternatives which once were not allowed in the portfolio because they were thought to be too risky (for example, common stock) might now be legally acceptable as investment possibilities.

However, in spite of legal restrictions or increased risk acceptance by the portfolio managers, there

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[6] "Why the Big Swing to Early Retirement," U.S. News & World Report, May 13, 1974, p. 59.

is no guarantee as to a higher rate of return on the portfolios. That is, loss in value and/or decrease in the income stream generated by the investment is possible. Those states holding shares of Equity Funding and Penn Central, just to cite a couple of examples, can readily testify to the fact that no return is guaranteed.

Once the rate of return at market value is computed for all the funds in the sample for the years 1967 through 1972, meaningful comparisons among the funds and the market averages are possible. Also, since rate of return on all the funds is calculated in the same way, interfund comparisons can be made.

The major hypothesis to test is that the state retirement systems have not been able to outperform the market in general, as reflected in the Dow Jones Industrial Average or the Standard and Poor's 500 Common Stock Index.

Then statistical tests will be run to determine if the following factors significantly affected the rate of return:

1. Size of the pension fund.
2. Turnover rate of the pension fund.
3. Liquidity of the fund.
4. Type of management of the fund.
5. Percentage of equity investments in the fund.
6. Degree of diversification of the portfolio.

Need for Study

Previous studies of the investment performance of state retirement systems have been incomplete. A majority of the studies have been limited to a qualitative study of the investment aspects of state retirement plans.[7] These studies primarily concentrate on areas such as:

1. The legal restrictions on types of investments in which the states can invest.
2. The aggregate portfolio holdings by class of investment--i.e., Federal Government and Agency bonds, corporate bonds, mortgages, common and preferred stock.
3. The investment objectives of the various funds such as emphasis on liquidity; safety of principal; long-term growth of securities; large current income or as a hedge against inflation.

Furthermore, when these studies do attempt to show a rate of return earned on the assets, it is usually

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[7]For examples see: Bruce Davie, Investment Practices of Public Employee Retirement Systems (Boston: Federal Reserve Bank of Boston, 1959); Elizabeth Deran, State and Local Employee Pension Systems (New York: Tax Foundation, Inc., 1969); W. W. Schmid, Retirement Systems of the American Teacher (New York: Fleet Academic Editions, Inc., 1971); J. R. Tucker, State and Local Pension Funds 1972--Digest of Authorized Investments and Actual Investments (New York: Securities Industry Association, 1972).

expressed as the percentage of dividend and interest income divided by the average book value of the assets of the fund. Unfortunately, these measures do not account for changing values in the assets of the funds as reflected in their market prices--whether it be capital appreciation or depreciation.

Another limitation of previous studies is that they focus only upon single state retirement systems or at best on regions of the United States.[8]

In contrast, this study will be national in scope and should overcome some of the limitations of making general conclusions from regional data.

A further reason for this study is that state retirement fund assets account for almost one-fifth of the total pension fund assets in the United States (see Table I-2).

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[8]For examples see: J. L. Cooper, "Investment Policies of State and Local Pension Funds," The Southern Journal of Business, Vol. 6, No. 2, Athens, Georgia, April, 1971; R. M. Soldofsky and E. V. Zuber, The Investment Policies of the Iowa Public Employees Retirement System (Iowa City, Iowa: Bureau of Business and Economic Research, University of Iowa, 1964); Investment Management Performance of the New York State Teachers Retirement System (Albany, New York: New York State Teachers Retirement Board, January, 1964); Management Survey of the State Teachers Retirement Systems (Sacramento, California: Peat, Marwick, Mitchell and Company, Joint Legislative Retirement Committee, 1967); and Staff Report No. 58, Major State Retirement Systems (Columbus, Ohio: Ohio Legislative Service Commission, 1965).

Table I-2. Dollar value (in billions) of all retirement systems in the United States as of 1972.

Type of Pension Fund	Dollar Holdings	Percent of Total
Private	$ 152	54
State	51	18
Local Government	17	6
Federal Government	60	22
Total	$ 280	100

Source: United States Securities and Exchange Commission, Statistical Series Number 2581 of April 4, 1972.

Data Availability

At the onset of this study the naive assumption was made that since state pension funds are funded by public tax revenues (either in the form of state and/or local government contributions directly to the fund and/or through employee contributions in the form of tax paid salary deductions) there would be no problem in obtaining the security holdings and annual reports of these funds.

However, in collecting the data, several states obviously did not want to provide information regarding their investment holdings. Six states did not bother to respond to the original request for data nor to any of the three follow-up letters. Another thirteen states sent

insufficient or incomplete data which made it impossible to calculate market values of the portfolios for this study.

Typical responses received from those states supplying minimal information are as follows:

> This report does not contain a listing of our securities holdings. . . . We do not attempt to provide a listing of our holdings for anyone.
>
> The information you requested is not filled out. It will take too long to research.
>
> Our annual reports and portfolio lists are not in any way secret. However, we do not have extra copies which can be distributed to interested parties. I shall be glad to discuss our holdings with you if you care to call me on the phone.
>
> We do not have reports available for distribution.
>
> The State of _____does not have back data which would permit an accurate evaluation of its pension performance over the period which you mention.
>
> It is the duty of the state retirement board to
>
> furnish once a year to each member currently making deposits, a statement of his account together with appropriate explanatory material.

The additional paragraphs defined a member precisely--obviously not the researcher.

> You may come to our office and sight the material but may not make any copies of it.

In a couple of extreme cases, members of the system attempted to get detailed data regarding their own pension plan portfolios but were unable to do so.

Furthermore, two state retirement systems were in the process of reorganization or merger so they were

excluded as potential members of the sample to be studied.

On a more positive note, twenty-nine states did provide data on their retirement system portfolios.

Sample Size

The states currently administer about 175 different retirement systems.[9] In order to keep the sample size manageable, only the major retirement systems of each state will be studied.

The major retirement systems of each state are those covering state employees and those covering teachers and/or school employees (in some states non-teaching school employees are covered by the state employees system). There are thirty-three states which have both employee and teacher (or school employee) systems--a total of sixty-six. The remaining seventeen states cover all state employees, including teachers, under one system. Therefore, the sum of the major state retirement systems is eighty-three.

Even though this is only 47 percent (83 out of 175 systems) of the number of state retirement systems, these eighty-three funds account for 93 percent ($54.372 billion) of the $58.499 billion in state pension fund assets.[10]

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[9]U.S. Bureau of the Census, Finances of Employee-Retirement Systems of State and Local Governments in 1972-73, March, 1974, p. 1.

[10]Ibid., pp. 8-21.

Next, of the eighty-three state systems, the combination of six states not supplying information, thirteen states supplying minimal information, and two states in the stage of reorganization means that thirty-two of the major systems are excluded from the study.

Of the remaining fifty-one (83-32) major state systems, only forty could ultimately be examined. This was true because among the twenty-nine states providing data, in eleven cases there were sufficient gaps between years to make continuous analysis of the data across six years impossible. This means that for eleven of the twenty-nine participating states only one of the two state retirement systems can be examined.

However, these forty major retirement system funds left in the sample account for $34.066 billion out of total state pension assets of $58.499 billion--almost 60 percent (see Table I-3).

Table I-3. States included in the sample to be studied.

Arizona	Iowa	North Carolina
Arkansas	Kentucky	Oklahoma
California	Louisiana	Pennsylvania
Colorado	Michigan	Rhode Island
Connecticut	Minnesota	Texas
Florida	Montana	Utah
Georgia	Nevada	Vermont
Idaho	New Jersey	West Virginia
Illinois	New Mexico	Wisconsin
Indiana	New York	

Time Period Covered

Originally, this study was to cover a ten year period. However, in collecting data it soon became apparent that very few states could provide portfolio data on the retirement systems for this length of time. Subsequently, data for fiscal years ending in 1967 through 1972 were collected.

These years were deemed suitable for analysis of the investment performance of the forty state funds for several reasons.

First, this period of time represents both periods of significant growth and decline in the securities markets. The investment performance of the funds can then be measured in both periods of upturn and downturn.

Secondly, many states were legally authorized to invest in equity issues for the first time during this time frame. The purpose of investing in equity issues was to increase the rate of return on the portfolios through capital appreciation of the common stock. The impact upon rate of return of adding stocks to the portfolios will be observed.

Thirdly, as in most cases of financial reporting, there is a time lag between the end of a fiscal year and the time a report for that period is published. In one extreme case there was a four year lag on a consistent basis between the end of the fiscal year and the annual

report. The year 1972 represents the last year for which relatively complete data for the sample could be obtained.

Organization of the Study

Chapter II is a coverage of the investment policies of the state retirement systems. It will include the legal restrictions imposed on the funds; the responsible agent for making investments in the state; the investment objectives of the various funds and the security holdings of the funds. It will show how these factors have changed over the years 1967 through 1972.

Chapter III is devoted to the measurement of the rate of return on each portfolio in the sample for the six years of the study. It includes a comparison of the rate of return earned on the retirement system assets with the market averages.

In Chapter IV an analysis of the rate of return with the specific factors previously mentioned is made. This will indicate if various investment policies and strategies have had any significant affect on the rates of return of the funds.

A summary of the findings of this study is the subject of Chapter V.

CHAPTER II

THE INVESTMENT POLICIES OF STATE RETIREMENT SYSTEMS

A description of the investment policies of the state retirement funds is presented in this chapter.

Dollars to Invest

The forty state retirement funds included in the sample being studied have responsibility for investing billions of dollars. Table II-1 show the dollars invested each year by these funds.

Table II-1. Dollars (in billions at market value) invested by the forty state retirement systems from 1967 to 1972

Year	Dollars Invested	Percent Change From Previous Year
1967	$ 14.428	12
1968	16.144	12
1969	17.645	9
1970	18.634	5.6
1971	23.492	26
1972	26.903	14.5

Source: Annual reports of the forty state retirement systems.

Note the slow down in the rate of growth of the funds in 1969 and 1970. This was due to rising interest

rates during this time period and the corresponding general decrease in stock prices. With depressed stock markets and bond prices on outstanding issues (to reflect the higher yields in the current market) the total market value of the portfolios naturally decrease.

Similarly, in 1971 and 1972 the growth rate of the portfolios accelerated, reflecting lower interest rates in the economy with the attendant rise in stock prices and also outstanding issues of debt to reflect lower current yields.

When going from the depressed base of 1970 to a high period of market activity in 1971, the change is particularly dramatic.

Investment Objectives

The investment objectives of the pension funds are best seen by examining the responses of the fund managers as to what they perceived to be the most important objectives of their particular funds.

In order to accomplish this, the fund directors were asked to indicate for their system the degree of importance of seven given objectives. Ten funds responded specifically to the question of investment objectives and these responses are summarized in Table II-2.

Judging from these limited responses, it appears as if safety of principal is of primary importance. This

Table II-2. Investment objectives of selected state retirement systems by frequency.

Objective	Vital	Very Important	Important	Desirable	Unimportant	Total
1. Liquidity	0	1	6	1	2	10
2. Safety of Principal	4	5	1	0	0	10
3. Long-term growth of securities	3	2	3	2	0	10
4. Large current income	1	0	3	3	3	10
5. Stable income	0	3	5	1	1	10
6. Large monetary gain--either yield and/or capital gains	0	2	5	1	2	10
7. Hedge against inflation	1	2	4	3	0	10

Source: Questionnaire sent to state fund directors.

is not too surprising when one considers that these are publicly contributed funds and therefore, a considerable public trust and fiduciary responsibility exists for the fund managers.

Also of concern, as indicated in Table II-2, are long-term growth of securities, stable income and liquidity. The need for long term growth of securities is looked upon as a hedge against inflation as well as a means of keeping up the ability to pay increasing benefits over time.[11]

Liquidity and stability of income is important so that the fund has sufficient cash flows to meet its requirements. That is, it is able to pay benefits to retirees; lump sum payments to those withdrawing from the system; and administrative expenses in the normal day-to-day operations of the system. Most funds are now in a situation where the cash inflows to the fund exceed the outflows so liquidity is not a problem at this time.

This is further substantiated by the relatively low importance placed on large current income by most of the fund managers who did respond to the questionnaire.

Other objectives of funds as expressed by their directors and not included in the above questionnaire are as follows:

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[11]Barbara A. Patocka, "Public Funds: The Herculean Task is Under Way," Pensions, May/June 1973, Vol. 2, No. 2, pp. 33-34.

1. Increased use of equities as a percentage of the total fund.
2. Increased turnover of the fund to get better investment performance.
3. Increased emphasis on quality growth stocks.[12]

These fund managers seem to agree that increased use of equities in their portfolios coupled with more aggressive management of the assets (higher turnover) will increase the rate of growth of their funds.

A more detailed analysis of the effect of turnover rates and increased use of equities on the rate of return of the portfolios will follow in Chapter IV.

Legal Restrictions

The various state retirement funds are limited as to what types of investments they can participate in by the respective state legislatures.

Statutes abound as to:

1. The type of investment in which the fund can invest--bond, equity, mortgage, savings certificate or real estate.
2. The agency issuing the security to be purchased by the fund--state, local and federal government or corporation.

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[12]"A Report on Ten Other State Pension Funds," The Institutional Investor, February, 1970, pp. 45-47.

3. The quality of the security being procured--measured by national bond and stock rating services.
4. The person, committee or agency having the authority to invest the system funds.

Consequently, the objectives as stated above by fund managers may be tempered by the legal environment in which they must operate.

Some state funds must invest in debt issues only, whereas others may invest up to 100 percent in equity if they so desire. Several states specify the exact percentage of equity funds to total funds that can be utilized. Other state restrictions are not as specific and require only that the investment policy follow the "prudent man rule" or those prescribed for state banks and/or insurance companies. See Appendix A for a detailed listing of the legal restrictions on investments for the major state funds.

Basically all states allow investments in United States Government Securities, United States Government backed securities (such as agency bonds), their own state, local or municipal bonds and high grade corporate bonds. The major legal restrictions by state apply to mortgages, investment funds (mutual funds), corporate preferred and common stock and short term investments such as certificates of deposit, commercial paper and savings shares.

Table II-3, on the following page, shows a summary of the investment restrictions on the major state systems.

All states are authorized to invest in United States Government and U.S. Government backed bonds. Six states limit the purchase of state and local government bonds to only those bonds of their own state. The other forty-four states allow purchases of state and local government issues of any of the United States.

Seventeen states have broadened the investment rules to include Canadian Government and/or Canadian Province Bonds.

All fifty states authorize the funds to invest in corporate bonds with the major provision being that these bonds be rated in the top three ratings by one or two national bond rating services. This is in contrast to 1955 when only ten states authorized the funds to invest in corporate bonds.[13]

Nineteen states allow the funds to invest in railroad equipment trust certificates in addition to corporate bonds.

All but three states authorize investments in mortgages. Most states limit mortgage investments to those

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[13]A. E. Grunewald, "Investment Requirements of State and Local Pension Funds," Municipal Finance Officers Association of the United States and Canada, Special Bulletin 1957A, Chicago, Illinois, January 16, 1957, p. 4.

Table II-3. Investment restrictions on state retirement funds by number of states.

Restriction	Number of States
State and local bond purchases restricted to own state issues only	6
May not invest in mortgages	3
May not invest in common stock	7
May not invest in preferred stock	13
May not invest in mutual funds	12
May invest as prudent man does	12
May invest as savings banks within the state do	7
May invest as domestic life insurance companies do	11
May not invest in Canadian or Canadian Province Bonds	33
May not invest in equipment trust certificates	31
May not invest in real estate	38
May not invest in short term assets such as C.D.'s Commercial paper and Savings Shares	7

Sources: John H. Harper, State and Local Pension Funds 1970, Investment Bankers Association of America, Washington, D.C.

J. Richard Tucker, State and Local Pension Funds 1972, Securities Industry Association, Washington, D.C.

Fund annual reports.

backed by the V.A. and the FHA. On the other hand, only twelve states permit investments in income producing real estate such as apartments, office buildings and shopping centers.

There has been a significant change in equity investments since 1955. In that year only fourteen states authorized their funds to purchase common stocks.[14] Today, forty-three states permit the purchase of common stocks by the funds. However there is a wide range in the amounts of common stock which the various state funds may hold. Most states specify the maximum percentage of equity to total fund assets which may be held at any given time. Table II-4 gives the legal limits on the amount of stock authorized to be held by the funds.

In addition, thirty-seven states authorize investment in preferred stocks provided they have a sound history of dividend payments.

Twelve states allow the funds to purchase shares in investment companies or mutual funds. At one time a couple of states purchased shares of common stock oriented mutual funds in order to obtain equity growth at a time when they were legally unable to buy common stock directly. However, these states now authorize investment in equity and thus the attractiveness of investing in mutual fund shares has been diminished.

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[14] Ibid., p. 4.

Table II-4. Legal limits on the amount of stock which can be held by state funds.

Limit	Number of States
No stock may be held	7
Up to 10% in stock may be held	4
More than 10% but no more than 25% in stock may be held	15
More than 25% but no more than 40% in stock may be held	7
More than 40% but no more than 75% in stock may be held	8
No percentage limit specified	12
Total	53*

*Three states had different restrictions on different type funds.

Sources: John H. Harper, State and Local Pension Funds 1970, Investment Bankers Association of America, Washington, D.C.

J. Richard Tucker, State and Local Pension Funds 1972, Securities Industry Association, Washington, D.C.

Fund annual reports.

Thirty-three states permit investment in short term securities such as certificates of deposit, commercial paper, mutual savings bank shares and savings and loan shares. Many states availed themselves of this opportunity to invest in short-term securities during the credit crunches of 1966 and 1969 when short term interest rates were high and much uncertainty existed as to the future of the stock market.

Other states limit the investment alternatives of the funds to the same investment categories in which domestic life insurance companies and/or savings banks may participate. Twelve states restrict the funds to the same investments as domestic life insurance companies. Another seven states authorize investing in the same alternatives available to savings banks within the state. Of these seven states, three states also authorize investments in what life insurance companies may invest. That is, for these three states it is a situation of investing in the securities authorized for insurance companies and/or savings banks.

Finally, eleven states restrict the funds to investing as a man of prudence would do. This is known as investing according to the Prudent Man Rule.

Investment Holdings

The change in types of portfolio holdings of state retirement systems has been significant over the past

two decades. Table II-5 shows this change over time.

Cash and near cash items have leveled off at 1 percent of total assets since 1964. This indicates that most funds are normally fully invested and not allowing idle assets to accumulate.

Investment in Federal Government Securities has dropped markedly over the twenty year period, from 55 percent of total assets to only 4 percent last year. This is due to the fact that other newly authorized investments, primarily corporate bonds and stocks, were more attractive investment vehicles for the fund managers.

Also, the dollars invested in state and local securities has dropped from 17 percent of total assets in 1954 to a mere 1 percent in 1969 and subsequent years. It is ironic that states have invested in tax-free securities when there is no tax advantage to the states when investing in these securities. The advantage of purchasing tax-exempt securities accrues primarily to individuals in high personal income tax brackets.

Some reasons offered for the funds buying state and local bonds are: political pressure, patriotic appeal at the state/local level and to support the price of existing bonds.[15]

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[15]B. A. Patocka, op. cit., p. 36.

Table II-5. Types of investment holdings for state retirement systems for selected years in billions of dollars.

Year	Type of Holding: Cash and Deposits $	%	Federal Government Securities $	%	State and Local Government Securities $	%	Other Securities $	%	Total $	%
1954	.10	2	2.94	55	.90	17	1.43	26	5.37	100
1964	.15	1	4.78	24	1.15	6	13.65	69	19.73	100
1967	.24	1	4.59	17	.70	2	22.14	80	27.67	100
1968	.25	1	4.13	13	.68	2	26.02	84	31.08	100
1969	.24	1	3.81	11	.56	2	30.61	86	35.22	100
1970	.28	1	3.24	8	.56	1	35.88	90	39.96	100
1971	.34	1	2.95	6	.53	1	41.47	92	45.29	100
1972	.42	1	2.24	4	.68	1	47.81	94	51.15	100
1973	.56	1	2.16	4	.34	1	55.44	94	58.5	100

Sources: U.S. Bureau of the Census, Cash and Investments of Public Employee Funds in 1954.

U.S. Bureau of the Census, Finances of Employee-Retirement Systems of State and Local Governments in: 1964-65, 1965-66, 1967-68, 1968-69, 1969-70, 1970-71, and 1972-73.

U.S. Bureau of the Census, Employee-Retirement Systems of State and Local Governments, Vol. 6, No. 2 of the 1967 Census of Governments.

U.S. Bureau of the Census, Employee-Retirement Systems of State and Local Governments, Vol. 6, No. 1 of the 1972 Census of Governments.

On the other hand, it is readily seen that the majority of new funds have been invested in other securities consisting primarily of corporate bonds, corporate stocks, mortgages and miscellaneous investments such as real estate, mutual funds, certificates of deposit, commercial paper, mutual savings banks shares and savings and loan shares (see Table II-6).

The majority of funds in the "Other Securities" category are invested in corporate bonds. This reflects liberalized investment rules for state pension funds and also an effort by fund managers to obtain a greater return with corporate bonds than could be obtained on government securities. However, as legal categories of investments come to include equity, more funds shifted to stock investments to obtain long-term growth and dividend income to supplement the interest income of the funds. In the last decade corporate stocks increased by more than twelve times as a percentage of the "Other Securities" category of investments.

The effect of the changing portfolio composition on the rate of return will be analyzed more closely in Chapter IV.

Investment Responsibility

The investment responsibility for the funds differs from state to state. In some states the retirement

Table II-6. Analysis of "Other Securities" category for state retirement funds for selected years in billions of dollars.

Year	Corporate Bonds	%	Corporate Stock	%	Mortgages	%	Miscellaneous	%	Total
1964	9.43	69	.92	7	2.53	18	.77	6	13.65
1967	14.32	65	1.91	9	4.26	19	1.65	7	22.14
1968	16.87	65	2.57	10	4.57	17	2.01	8	26.02
1969	19.97	65	3.69	12	4.81	16	2.14	7	30.61
1970	22.68	64	5.13	14	5.81	16	2.26	6	35.88
1971	26.26	63	6.99	17	6.02	15	2.20	5	41.47
1972	29.57	62	9.21	19	6.14	13	2.90	6	47.82
1973	33.90	61	12.06	22	5.96	11	3.53	6	55.45

Sources: U.S. Bureau of the Census, Finances of Employee-Retirement Systems of State and Local Government in: 1964-65, 1967-68, 1968-69, 1969-70, 1970-71 and 1972-73.

U.S. Bureau of the Census, Employee-Retirement Systems of State and Local Governments, Vol. 6, No. 2 of the 1967 Census of Governments.

U.S. Bureau of the Census, Employee-Retirement Systems of State and Local Governments, Vol. 6, No. 1 of the 1972 Census of Governments.

system administration and investment functions are carried out by separate units, whereas in other states the same unit carries out both tasks. Some states have professional investment service while in others it is a function for the State Treasurer or System official(s).

Many of the states utilize the advisory services of professional investment firms in selecting securities. This information serves as an input into the investment decision process, but final authority rests with the person or committee shown in Table II-7.

Two noteworthy exceptions are Oregon and Idaho which have delegated the actual investment function to an outside group.

Oregon uses three investment firms to invest its equity funds. The three firms are evaluated on their performance and those that do well are retained. If a firm does not do well in comparison to the others it can be replaced by a new investment house. In effect, firms compete to be the manager of the equity portion of Oregon's fund.[16]

Idaho has delegated the investment responsibility of its fund to a New York bank and a local bank.

The effect of the type of fund management on the rate of return earned by the fund will also be analyzed in Chapter IV.

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[16]"Oregon Blazed the Pension Trail," The Institutional Investor, February 1970, pp. 41-44.

Table II-7. Investment responsibility for investing state pension fund assets.

Fund investment is the responsibility of: State Board of Administration, Board of Trustees, Retirement Board or Board of Control
Alabama
Arizona (with consultation of investment advisor)
Arkansas
California (delegates authority to fund executive officer)
Colorado
Delaware
Florida
Georgia
Idaho (selects trustee - currently a New York City bank and an Idaho bank)
Indiana
Kansas
Kentucky (appoints an investment committee)
Louisiana
Maine
Mississippi
Maryland
Missouri
Montana
Nevada
New York (with investment counselor who is State Comptroller)
North Carolina
Ohio
Oklahoma
Pennsylvania
Rhode Island
South Carolina
South Dakota (can transfer funds to a funding agent to invest for them - corporate or individual trustee or insurance company)

Table II-7. (continued)

Tennessee
Texas
Virginia
Washington
West Virginia
Wyoming
Fund investment is the responsibility of a State Official
Alaska - Commissioner of Revenue
Connecticut - State Treasurer
Iowa - State Treasurer, after consulting with Advisory Board
Massachusetts - State Treasurer subject to Investment Committee approval
Michigan - Deputy State Treasurer
New Hampshire - State Treasurer
Vermont - State Treasurer
Fund investment is the responsibility of a State Board of Investment (Board usually invests for all the funds of the state)
Illinois
Minnesota
Nebraska
New Jersey - (part of the Treasury Department)
New Mexico
North Dakota
Oregon (turns over part of the fund to professional investor on competitive basis)
Wisconsin

Sources: John H. Harper, State and Local Pension Funds 1970, Investment Bankers Association of America, Washington, D.C.

J. Richard Tucker, State and Local Pension Funds 1972, Securities Industry Association, Washington, D.C.

Fund Annual Reports.

Personal correspondence with fund officials.

Before analyzing the effects of different investment policies and strategies, the rate of return on the funds will be calculated in the next chapter.

Chapter III

RATE OF RETURN

Measuring Performance

The task of measuring the investment performance of the retirement funds presents a dilemma between taking a theoretically sound approach or a practical approach.

There is general agreement that a discounted rate of return technique is appropriate for determining the rate of return on an investment portfolio. However, a distinction is made between the geometric average rate of return (time weighted return) and the internal rate of return (dollar weighted return). The internal rate of return is useful in measuring the overall results of a retirement fund, whereas the time weighted measure is more suitable for measuring the performance of the investment board or trustees. This is true because the trustees or board has no control over the timing of contributions and withdrawals from the fund and therefore should be evaluated only on how they did with the funds given to them. Using an internal rate of return would penalize the managers in that they

would be held responsible for factors over which they have no control.[17]

Furthermore, the time weighted average rate of return requires an evaluation of the portfolio at each time a contribution is made. Obviously, this information is not provided in annual reports and makes it impossible to calculate a geometric average rate of return for this study even if one desired to do so.

Current Techniques

Currently, states do not measure their portfolio returns on comparable bases. That is, there appears to be almost as many techniques for measuring return as there are states. Consequently, a 6 percent rate of return reported for one fund may really be similar to a 4 percent return achieved on a second fund if both were calculated in the same way. Several states only report a rate of return on their investments but offer no explanation of how this return was obtained. This, of course, is quite confusing to the reader who is unfamiliar with these different calculating techniques.

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[17]For a discussion of these issues see: J. Peter Williamson, Investments--New Analytic Techniques, Praeger Publications, New York, 1970, pp. 23-24 and Catherine A. Higgins "Calculating Rate of Return," Pensions, July/August 1973, Vol. 2, No. 3, pp. 82-83.

Examples of the different techniques utilized by states in calculating rate of return are shown in Table III-1 on the following page.

Note that of the twenty-nine states included in the sample, twenty-four mention some type of return in their annual report. However, only three states go on to give the formula utilized in calculating the particular rate of return. Consequently, no meaningful comparison among states can be made utilizing these measures because we would be comparing equals.

Also, all of the return measures are based on book values and therefore ignore any market value increases or decreases. Basically, the dividend and interest income is divided by total assets or average assets on hand at book value for the year. The percentage given as the rate of return on the portfolio is really quite meaningless and should not be taken at face value.

There are two major reasons why states use book value in the annual reports. First of all, the investment portfolios have traditionally been all debt instruments. The investment income was interest only and the bonds were held to maturity so there was no concern about capital appreciation or depreciation. It was standard operating procedure to carry debt issures at par value and if any portfolio included stocks, they were carried at cost value. No explicit

Table III-1. Methods of calculating rate of return on state retirement funds.

Name of Return Measure	Number of States Utilizing This Measure	Formula Given
Average Annual Rate of Return	1	No
Average Return on New Debt Investment	1	No
Average Weighted Yield	2	No
Average Yield	1	No
Effective Interest Rate	2	For 1 of the 2 States only
Net Yield	2	For 1 of the 2 States only
Return on Cost	1	No
Return on New Assets in Excess of Current Liabilities	1	No
Yield	6	For 1 of the 6 States only
Yield on Cost	1	No
Yield to Maturity	1	No
No Yield Given	5	
Totals	24	3 formulas given

Source: Annual Reports of Funds.

recognition of capital gains or losses was generally given in the annual reports.

A second reason for the enchantment with book value by the state funds is that book value was used for actuarial purposes and can readily be carried over into investment reporting. That is, for actuarial purposes capital gains and losses are accounted for only when realized and unrealized gains and losses are ignored.

However, as states began to authorize the funds to invest in equity to achieve higher returns on the portfolios, it became necessary to measure the market values of the portfolios or at least the equity portions. Therefore, beginning in the mid 1960s a few states included the market value of the securities in their annual reports. However, it was not until the late 1960s and early 1970s that several billion dollar funds actually began reporting market values. Other states still have not switched their reporting techniques and continue to only give book values for their portfolio holdings.

In an effort to obtain both better performance measurement and a comparison among funds, some states have begun subscribing to professional investment evaluation services.

As an example, several states have subscribed to the portfolio evaluation services of A. G. Becker Company and a national investment banking firm and also a consultant in the field of measuring investment performance of pension funds. A. G. Becker does not manage the portfolio in these cases; instead it measures the investment performance of funds on a comparable basis. It is important to note that funds are classified such that those with similar size, objectives and restrictions are compared. This precludes comparing fund performance erroneously.

Ohio and Idaho were the first two states subscribing to professional investment measurement service and as of this writing another four states are in the process of joining the service.

The performance results are not publicly reported by the consulting firm. Instead, the state is given its results and a comparison of its fund performance in relation to similar funds. It is up to the discretion of the state fund administration to publish the results in its own annual report.

Rate of Return Measure Used

A practical approach to calculating the rate of return on the state pension assets had to be found. This calculation had to recognize any changes in the market value of the portfolio while at the same time not require

monthly or quarterly data input. The latter was true because only data on an annual basis could be obtained from the funds.

The technique ultimately found which meets the above criteria is the formula developed by Peter O. Dietz:[18]

$$R = \frac{M_2 - M_1 - C}{M_1 + 1/2C} \quad \text{where,}$$

R = rate of return for the year earned on the portfolio,

M_2 = dollar market value of the portfolio at the end of the year,

M_1 = dollar market value of the portfolio at the beginning of the year,

C = net dollar contributions to the fund for the year (net means contributions less payments/ withdrawals).

The Dietz formula assumes that dividend and/or interest income is reinvested when received. This assumption is quite valid for state pension funds since the contributions to the funds exceed the withdrawals and payments so that the funds do not have to rely upon

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[18]Peter O. Dietz, Pension Funds: Measuring Investment Performance, The Free Press (Division of the MacMillan Co.), New York, N.Y., 1966, pp. 50-51.

investment income to meet expenses and pay benefits. That is, the income can realistically be reinvested as it is received. Also, most states limit the rate at which the composition of the portfolios as between debt and equity can be changed. Therefore the assumption of reinvestment of income in the same proportion as the existing portfolio is quite realistic.

Overall Rate of Return

The rate of return on each of the forty funds was calculated for the years 1967 through 1972. Changes in both the market value of equity and debt issues are included in this measure. The ending market value of each year also reflects the reinvested value of dividends and interest received by the funds.

Table III-2 on the following pages shows the overall rate of return on the forty state pension funds included in the sample for each of the years 1967 through 1972. Most of the states are on a fiscal year ending June 30. Therefore, the rate of return is calculated at that date for each fiscal year.

As a risk surrogate the mean absolute deviation (MAD) is used.[19] A higher MAD implies a greater degree

[19]For a discussion of risk measures see: J. C. Francis and S. H. Archer, Portfolio Analysis, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, pp. 212-223.

Table III-2. Overall rate of return in percent on state retirement funds for years 1967 through 1972.

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$	Mean Absolute Deviation (Risk Surrogate)
1	-1.28	.22	-8.37	-11.13	11.62	3.86	-.85	6.08
2	-.34	-7.33	-3.54	-8.74	12.82	4.14	-.50	6.04
3	-1.95	-7.45	-7.39	-14.15	8.02	3.76	-3.19	6.47
4	2.8	-1.76	-6.27	-7.27	4.33	1.60	-1.10	4.01
5	-2.23	-5.44	-5.21	-7.27	9.36	3.83	-1.16	5.17
6	-3.76	-4.86	-6.85	-7.71	4.78	2.72	-2.61	4.24
7	-2.03	-5.10	-7.10	-5.70	6.85	1.21	-1.96	4.00
8	-1.05	-3.55	-28.67	17.54	.11	5.96	-1.61	9.67
9	.14	-6.27	-7.75	-9.39	8.14	9.42	-.95	6.85
10	-2.27	-3.55	-10.44	3.93	-1.20	2.42	-1.85	3.57
11	2.25	5.87	-6.78	-5.38	8.51	6.48	1.83	5.27
12	4.39	-1.92	-5.08	-11.78	18.05	4.90	1.43	7.69
13	9.02	.46	-4.38	-19.45	28.18	9.65	3.91	11.70
14	-.83	.22	-6.79	-10.31	14.63	3.43	.06	6.04
15	-1.34	-4.36	-1.73	-13.79	10.25	15.16	.70	8.00
16	-1.29	-3.77	-7.72	-6.09	6.82	4.03	-1.34	4.52
17	-2.33	-4.55	-6.57	-12.26	26.41	5.01	.95	9.84

Table III-2 (cont'd.)

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$	Mean Absolute Deviation (Risk Surrogate)
18	-1.14	-1.25	-5.79	-14.13	21.60	6.55	.97	8.73
19	2.59	-2.21	-7.88	-10.72	6.98	3.04	-1.37	5.57
20	.02	-4.85	-4.20	-.84	11.45	13.68	2.54	6.68
21	-1.58	-1.32	-8.77	-10.26	9.3	4.24	-1.40	5.47
22	-2.12	1.99	-8.73	-8.52	12.81	5.64	.18	6.64
23	-1.09	-.57	-6.20	-9.15	20.18	5.13	1.38	7.51
24	3.33	-7.20	-7.06	-10.33	7.98	15.66	.40	8.59
25	-1.17	-2.36	-10.22	-8.66	12.04	-1.87	-2.04	5.04
26	-1.27	-1.51	-9.03	-4.64	7.51	1.76	-1.20	3.89
27	-.69	-6.48	-5.23	-11.08	8.52	10.16	-.80	6.80
28	-3.31	2.63	-5.18	-13.20	13.48	7.45	.31	7.54
29	-3.15	-2.82	-4.45	-9.52	14.80	5.79	.11	6.79
30	-.01	-3.03	-6.90	-4.80	5.54	4.64	-.76	4.15
31	-1.22	-6.66	-6.09	-11.16	13.30	9.05	-.46	7.76
32	-.69	-3.11	-4.48	-4.98	6.37	.05	-1.14	3.05
33	-1.00	-3.93	-5.07	-5.96	6.28	1.63	-1.34	3.65

Table III-2 (cont'd.)

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$	Mean Absolute Deviation (Risk Surrogate)
34	-.90	11.42	-2.64	-13.09	11.77	6.48	2.17	7.72
35	.01	-.23	-9.09	-10.05	11.58	7.31	-.08	6.38
36	-2.53	-1.34	-3.55	-6.46	4.68	4.66	-.76	3.62
37	-1.00	-3.82	-4.03	-4.20	7.43	5.99	.06	4.43
38	1.83	-1.85	-8.21	-4.23	10.43	3.33	.22	4.98
39	3.11	-4.04	-3.75	-.91	3.65	3.79	.31	3.21
40	2.00	-2.18	-3.88	-9.39	19.90	1.70	1.36	6.51
$\bar{x}$	-.30	-2.45	-6.78	-7.88	10.63	5.34		

of risk than does a lower MAD. In this sense, risk is the volatility in rate of return over the six-year time span.

Therefore, in analyzing rate of return one must also look at the risk involved in obtaining a given rate of return. Other things being equal, one would select from among two portfolios having the same rate of return, that portfolio with the least MAD. That is, less risk associated with this portfolio for a given return.

From Table III-2 it can be seen that in four of the six years covered by this study there was a negative average rate of return on the forty funds. The overall average rate of return for all the funds for six years was -.24 percent. When using market values, the funds on the average about broke even over the six years. This is in sharp contrast to most annual reports in which the rate of return is calculated on book value. This method cannot help but show a positive rate of return because most states calculate an average rate of return by dividing interest plus dividend income (if any) by the book value (or average book value) of the fund.

However, before being too critical of the performance achieved by these funds and coming to unfounded conclusions, one must keep several things in mind.

First of all, this is a six-year time span which is relatively short when dealing with pension funds. Pension fund managers say that they should be judged over the long run. However, finding agreement as to what constitutes the long run (for example, twenty years or thirty years) is even more difficult.

Secondly, the time period covered excludes much of the growth in the securities markets in the early 1960s. However, since data on this period was not available the study had to begin in fiscal year 1967.

Finally, the market fluctuated wildly during the 1967-1972 time period. Credit crunches in 1966 and 1969 led to depressed market prices for both debt and equity issues. However, at the same time, new debt issues with 8 percent-10 percent coupons looked quite attractive and secure to the fund managers. Thus, in evaluating the rates of return, one should keep in mind what the market was doing. From this perspective, a 5 percent loss in a time period when the market falls 10 percent would not be considered too bad.

Rate of Return Ranges

Table III-2 shows that in 1967 the highest rate of return, 9.02 percent, was earned by fund number thirteen. The lowest rate of return, -3.76 percent, was earned on fund number six. The average rate of return

for all forty funds in 1967 was -.3 percent. Twenty-eight of the forty funds achieved a negative return in 1967.

Fund thirteen was heavily invested in equity issues, whereas fund six was almost 100 percent in debt issues. Fund thirteen selected stocks which appreciated in value, whereas the fund six bonds fell in value as interest rates increased in 1966 with some carryover into 1967.

In 1968, fund thirty-four led with a rate of return of 11.42 percent. The lowest rate of return, -7.54 percent, was earned on fund three. The average loss of the forty funds in fiscal year 1968 was -2.45 percent. Thirty-three of the funds experienced a negative rate of return in 1968.

Again, the high rate of return for fund thirty-four was because it was highly invested in equity (about one-third) and these holdings appreciated in value considerably. On the contrary, fund three was totally invested in debt and its holdings were largely depressed in price.

Fund eight was the largest loser in 1969 with a -28.67 percent rate of return. The least lost was experienced by fund fifteen with a 1.73 percent depreciation in value. All forty funds experienced a loss in 1969 with the average loss of -6.78 percent.

These losses were the result of the credit crunch of 1969 when both stock and debt prices fell as interest rates rose in the United States economy.

The reason for the large 28.67 percent loss on fund eight was that its portfolio consisted of a large number of state and local debt issues as well as low coupon (3-4 percent) older corporate debt issues. The fall in market price of these bonds was quite severe.

In 1970, the high rate of return was 17.54 percent and the lowest return was -19.45 percent. The average rate of return for the fiscal year was -7.88 percent. Thirty-eight of the forty funds experienced a loss as the credit crunch spilled over in 1970.

A turnaround took place in 1971 as all but one fund experienced positive rates of return. The average gain for the forty funds was 10.63 percent with 28.18 percent for fund thirteen the high and -1.20 percent for fund ten the low.

This turnabout was the result of the end of the credit crunch and the attendant fall in interest rates which caused the market price of both debt and equity issues to increase. In going from a low base of 1970 the rise in 1971 was even more dramatic.

In 1972 there was a continuation of the positive gains of 1971 although at a more modest rate.

Again, all but one fund showed a positive rate of return with the average fund achieving a 5.34 percent return. The high return was 15.66 percent and the low was a -1.87 percent earned on fund twenty-five.

Average Compound Rates of Return

Another way to look at the return earned on these state retirement funds is to calculate the average compound rates of return over various time horizons.

Table III-3, on the following pages, shows the compound rates for the funds for two years through six years.

For the two-year period 1967-1968, the average compound rate of loss was -1.4 percent. In the three-year period 1967-1969, the average compound rate of decrease was -3.27 percent.

With the credit crunch of 1969 and 1970 the average compound rate of return for the 1967-1970 period fell to -4.48 percent.

As the market improved in 1971, the average compound rate for the five years 1967 through 1971 for all the funds increased to -1.66 percent.

For the six-year period 1967-1972 the average compound growth rate for all the funds was -.59 percent.

Table III-3. Average compound rates of return in percent earned on state retirement

Fund	1967-1968	1967-1969	1967-1970	1967-1971	1967-1972
1	-.53	-3.22	-5.26	-2.10	-1.13
2	-3.90	-3.78	-5.04	-1.71	-.76
3	-4.74	-5.63	-7.84	-4.86	-3.48
4	.49	-1.81	-3.21	-1.74	-1.19
5	-3.85	-4.30	-5.05	-2.33	-1.33
6	-4.31	-5.17	-5.81	-3.78	-2.73
7	-3.58	-4.74	-4.98	-2.72	-2.08
8	-2.31	-12.03	-5.42	-4.34	-2.70
9	-3.12	-4.69	-5.89	-3.23	-1.23
10	-2.91	-5.49	-3.22	-2.82	-1.96
11	4.04	.30	-1.15	.71	1.65
12	1.19	-.95	-3.77	.24	1.00
13	4.61	1.02	-4.01	1.02	1.03

Table III-3 (cont'd.)

Fund	1967-1968	1967-1969	1967-1970	1967-1971	1967-1972
14	-.31	-2.52	-4.53	-.97	-.25
15	-2.86	-2.49	-5.44	-2.49	.25
16	-2.54	-4.30	-4.75	-2.54	-1.47
17	-3.45	-4.50	-6.50	-.69	.24
18	-1.20	-2.75	-5.73	-.81	.38
19	.16	-2.59	-4.69	-2.46	-1.57
20	-2.45	-3.03	-2.49	.15	2.29
21	-1.45	-3.95	-5.57	-2.77	-1.63
22	-.09	-3.05	-4.45	-1.22	-.11
23	-.83	-2.65	-4.32	.14	.96
24	-2.08	-3.77	-5.45	-2.91	-.03
25	-1.77	-4.67	-5.68	-2.38	-2.29
26	-1.39	-4.01	-4.16	-1.94	-1.33
27	-3.63	-4.17	-5.94	-3.21	-1.10

Table III-3 (cont'd.)

Fund	1967-1968	1967-1969	1967-1970	1967-1971	1967-1972
28	-.38	-2.01	-4.94	-1.51	-.07
29	-2.99	-3.48	-5.02	-1.35	-.20
30	-1.53	-3.35	-3.72	-1.93	-.87
31	-3.98	-4.69	-6.35	-2.71	-.84
32	-1.91	-2.77	-3.33	-1.46	-1.21
33	-2.48	-3.35	-4.01	-2.03	-1.43
34	5.08	2.44	-1.68	.87	1.78
35	-.11	-3.20	-4.96	-1.86	-.39
36	-1.94	-2.48	-3.49	-1.91	-.84
37	-2.42	-2.96	-3.27	-1.22	-.05
38	-.03	-2.83	-3.18	-.60	.04
39	-.53	-1.61	-1.44	-.44	.25
40	-.11	-1.38	-3.45	.82	.97
$\bar{x}$	-1.40	-3.27	-4.48	-1.66	-.59

One can see that over the six-year period of this study the average fund lost ground in that the average compound rate of return was about -.6 percent. This means that even though millions of dollars of interest and dividends were received by the funds, the depreciation in market values of the portfolios was even greater resulting in net losses for the typical fund. However, twelve funds did achieve positive average compound rates of return over the six-year period. These positive rates ranged from .04 percent to 2.29 percent.

Rate of Return on Equity

Another way to analyze performance is to compare the rate of return on the equity section of the portfolios with the market averages as reflected in the Dow Jones Industrial Average (DJIA) and Standard and Poor's 500 (S & P 500).

Table III-4 which follows shows the rate or return on the equity portion of those funds authorized to invest in common stocks and also the market performance as indicated by the market indexes.

In 1967 the average fund earned 3.17 percent on its equity portfolio as compared to 5.81 percent on the S & P 500 and -1.93 percent on the DJIA. The range of return figures was -13.52 percent on fund V to 21.98 percent on fund J. Seven of the twenty-five

Table III-4. Rate of return in percent on equity portion of state retirement funds

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$
A	1.57	3.23	-3.07	-26.64	30.48	3.04	1.44
B	N.A.	-2.97	-11.94	-34.28	39.26	3.90	-1.21
C	N.A.	N.A.	-11.09	-22.94	26.43	2.03	-1.39
D	N.A.	12.00	-1.90	-24.51	42.03	9.57	7.44
E	-9.26	3.79	-5.25	-18.90	25.62	9.98	1.00
F	-4.57	5.15	-4.07	-18.75	26.57	9.62	2.33
G	1.45	-4.36	.01	-20.45	71.12	17.13	10.82
H	1.05	1.26	-11.65	-19.34	96.10	1.56	11.50
I	4.95	17.46	-5.53	-25.42	32.73	12.88	6.18
J	21.98	9.88	-7.93	-22.33	37.55	10.64	8.30
K	8.62	21.94	-3.35	-28.55	42.11	11.72	8.75

Table III-4 (cont'd.)

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$
L	3.44	12.87	-3.03	-27.46	32.63	6.16	4.10
M	N.A.	N.A.	N.A.	N.A.	17.09	6.95	12.02*
N	N.A.	8.91	-3.95	-23.02	33.21	3.51	3.73
O	2.54	6.29	-2.08	-26.00	43.81	14.01	6.43
P	N.A.	12.00	-4.37	-30.71	7.96	4.39	-2.15
Q	1.14	-29.50	-7.09	-21.29	19.54	.03	-6.20
R	3.67	7.93	-14.99	-33.77	33.60	8.17	.77
S	.40	10.04	-1.93	-23.49	34.14	9.92	4.85
T	2.29	8.86	-4.58	-23.25	41.12	10.07	5.75
U	9.13	3.62	-12.67	-31.80	41.93	-9.94	-.05
V	-13.52	10.09	-6.21	-24.98	23.47	4.64	-1.09

*only 2 years.

Table III-4 (cont'd.)

Fund	1967	1968	1969	1970	1971	1972	$\bar{x}$
W	-9.38	5.20	-5.72	-25.94	32.81	2.17	-.14
X	5.16	8.27	-2.17	-28.58	39.81	6.44	4.82
Y	4.62	8.98	-3.18	-24.08	40.48	11.26	6.35
Z	12.42	9.78	-11.07	.53	8.31	12.52	5.42
AA	N.A.	N.A.	N.A.	-26.02	31.16	2.55	2.56**
BB	-4.44	58.31	-2.40	-28.04	27.25	10.74	10.24
CC	17.57	3.99	-4.26	-13.93	19.48	12.57	5.90
DD	-4.30	16.21	-8.91	5.66	6.40	7.63	3.78
EE	9.93	3.88	3.49	-16.97	10.32	8.72	3.33
FF	12.71	5.97	-5.49	-19.85	34.60	2.01	4.99
$\bar{x}$	3.17	8.24	-5.55	-22.75	32.77	6.99	
S&P 500	5.81	9.89	-3.00	-23.71	33.78	8.08	5.14
DJIA	-1.93	4.23	-3.11	-21.15	28.72	5.21	2.00

N.A. - Not Authorized
**Only 3 years.

funds outperformed the S & P 500 (5.81 percent) rate of return.

In 1968, the average fund earned 8.24 percent as compared to 9.89 percent on the S & P 500 and 4.23 percent on the DJIA. The highest return was fund K (21.94 percent) with the low being -29.5 percent on fund Q.

In 1969, the credit crunch took its toll on all but two of the equity portfolios. The average loss was 5.55 percent as compared to about a 3 percent decrease in the market indexes. The greatest loss of 15 percent was experienced by fund R.

In 1970 the market downtown proved to be quite severe with the average fund losing 22.75 percent. This figure was between the market averages of -23.71 percent and -21.15 percent. Only two funds had a positive rate of return for this year.

The year 1971 showed an aboutface as the market rebounded from the 1970 lows. The average rate of return was 32.77 percent which was slightly below the S & P 500 but better than the DJIA figure.

In 1972, the upward trend continued with the average rate of return being about 7 percent. Again this rate was between those of the two market indexes used for this study. Only one fund (U) experienced a loss in 1972.

If the S & P 500 index is used, the average fund outperformed the market measure in only one year--1970. The average fund dropped 22.75 percent while the S & P 500 dropped 23.71 percent.

In using the DJIA as the market measure, the average fund outperformed the market in four years--1967, 1968, 1971 and 1972. In 1969 and 1970 when the stock market dropped the average fund dropped by a larger amount than the market as measured by the DJIA.

Consequently, depending on which market index is used there is some difference as to how well the pension funds did in relation to the general market. If one uses the S & P 500 as an index, the funds did poorer than the market. If one uses the DJIA as a standard, then the funds come out a little better in up markets and poorer in decreasing markets.

Generally speaking, the performance of the stock portfolios fluctuates widely and often large gains (losses) are reversed in subsequent years so that the long term growth is not particularly dramatic. Also, one must consider that in the majority of cases the equity portfolios are a very small portion of the total portfolio. Therefore, even large gains or decreases in the stocks held have relatively little effect on overall portfolio return.

In the next chapter, an analysis of various factors which may affect the rate of return will be performed.

CHAPTER IV

INVESTMENT ANALYSIS

In this chapter the rate of return on the portfolios will be examined with respect to size, turnover, liquidity, equity holdings, diversification and type of management of the funds.

Size of Portfolio

The size of the portfolio could be an important factor on the rate of return earned if one subscribes to the argument that a small fund is more likely to earn a greater rate of return than a larger fund because the fund manager has a greater degree of flexibility in changing his portfolio holdings. If this were true, we would expect a significant inverse relationship between rate of return and the portfolio size.

The size of the portfolios included in this study ranged widely. Table IV-1 shows the average-size fund and the range of sizes for each of the six years studied.

Table IV-1. Fund size ranges and averages in $000's at the end of each fiscal year.

Year	Smallest fund	Largest fund	Average fund
1967	21,900	2,435,960	340,874
1968	30,714	2,687,034	382,145
1969	31,198	2,936,023	419,091
1970	33,371	3,137,605	450,216
1971	44,034	3,949,933	526,575
1972	56,878	4,672,985	642,434

Source: Annual reports.

Similarly, the rate of return earned on the funds can be related to the size of the portfolios as shown in Table IV-2 on the following page.

As seen, Group IV funds had the highest rate of return on the average in years 1967, 1969, 1971 and 1972. Group II funds did best in 1968 and 1970.

On the other hand, Group IV did worst in 1968 and 1970. Group II did worst in 1967 and 1969.

Correlation Between Size and Return

In order to determine if any significant relationship exists between rate of return and fund size, Pearson correlation coefficients were calculated for the six years.

Table IV-2. Ranges and average rates of return in percent earned on funds grouped in quartiles by dollar value.

Quartile		1967	1968	1969	1970	1971	1972
I	H	2.80	-.23	-3.88	-4.64	19.90	7.31
(Ten largest	$\underline{L}$	-3.15	-5.44	-9.09	-10.26	4.33	.05
funds)	$\bar{X}$	-.51	-2.53	-6.32	-7.41	0.50	3.26
II	H	2.59	5.87	-4.20	17.54	26.41	13.68
	$\underline{L}$	-2.33	-6.48	-28.67	-12.26	-1.20	2.42
	$\bar{X}$	-.57	-1.69	-9.37	-4.88	10.31	6.18
III	H	4.39	11.42	-1.73	-.91	20.18	15.16
	$\underline{L}$	-3.76	-6.66	-10.22	-13.79	3.65	-1.87
	$\bar{X}$	-.53	-2.22	-5.74	-8.80	10.44	4.67
IV	H	9.02	2.63	-3.54	-4.20	28.18	15.66
(Ten smallest	$\underline{L}$	-1.95	-7.45	-8.22	-19.45	4.68	3.33
funds)	$\bar{X}$	.41	-3.34	-5.69	-10.43	12.28	6.77

H = highest rate earned in that quartile
$\underline{L}$ = lowest rate earned in that quartile
$\bar{X}$ = average rate earned in that quartile

This was done by ranking the forty funds by dollar value from highest to lowest value by year. Then the rates of return earned on the funds were ranked from high to low for each of the six years. The correlation coefficients calculated are shown in Table IV-3 below.

Table IV-3. Pearson correlation coefficients between size of fund and rate of return.

Year	Pearson correlation coefficient
1967	-.12
1968	-.05
1969	.07
1970	.09
1971	-.10
1972	-.19

In years 1967, 1968, 1971 and 1972 there was a negative correlation between fund size and the rate of return. In 1969 and 1970 there was a slight positive correlation between the two.

However, the Pearson correlation coefficients for all six years, whether positive or negative, are not statistically significant.[20] Consequently, no relationship between size and rate of return existed for this

[20]The cut off for significance levels was greater than .05.

group of state retirement funds over the six year time span.

Turnover

The next factor studied was the portfolio turnover rate. It is assumed that portfolio changes are made to ultimately enhance the rate of return earned on the portfolios. Managers seek to replace lower yielding securities with higher yielding ones as well as select equity issues which will appreciate in value. Thus a higher turnover should result in a higher rate of return.

During this time period several states actively began to switch their portfolio holdings from low coupon debt issues to high coupon debt issues in a process commonly called bond swapping. This was particularly true in 1966-67 and 1969-70 when the credit crunches produced record interest rates on high grade corporate bonds and mortgages. Funds sold their low yielding state, local and corporate bonds and replaced them with new debt bearing coupon rates of 7-9 percent. In doing so, the funds sold their existing low coupon securities at a loss. However, these fund managers felt that the additional gain in interest income over the next ten to twenty years would more than offset the loss in principal incurred

on the old bonds. This process was encouraged by many state legislatures who authorized the loss in principal to be amortized over the future life of the bonds bought to replace the low yielding bonds.

Other states were prohibited from bond swapping in that the accounting regulations for these states required the entire loss in principal to be written off in the year it occurred--not amortized over the future. These states, therefore, had very low turnover rates over the 1967-1972 period.[21]

Insufficient data could be obtained to accurately measure the impact of the bond swapping programs on the overall fund rate of return.

The turnover rates experienced by the state funds over the six years varied considerably. In many cases there was no turnover at all, while in a few extreme cases it was close to 100 percent. Table IV-4 shows the ranges and average turnover rates for the state retirement funds during 1967-72.

The most dramatic examples of turnover which are also documented elsewhere are those for the states

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[21]See Sidney Homer and M. L. Leibowitz, Inside the Yield Book--New Tools for Bond Management Strategy (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972), pp. 100-101.

of Louisiana and Connecticut.[22] In 1968 and 1969 there was more than a one-third turnover in the assets of the Louisiana Teachers' Retirement System. In Connecticut the portfolio turnover rates approached nearly 100 percent as old debt issues were replaced with higher yielding debt issues or by common stock.

Table IV-4. Average turnover rates and ranges in percent for state pension funds.

Year	Highest turnover rate	Lowest turnover rate	Average turnover rate
1967	46	0	5.5
1968	40	0	6
1969	43	0	6.1
1970	45	0	5.2
1971	70	0	7.6
1972	99	0	14.4

Source: Annual reports

Calculating Turnover Rates

In order to calculate the turnover rate of each portfolio the following formula was utilized:

[22]For Louisiana see: T. P. Bleakney, Retirement Systems for Public Employees, Pension Research Council (Homewood, Illinois: Richard D. Irwin, Inc., 1972), p. 141. For Connecticut see: Part I "Axe for the Buttonwood?", Barron's, May 7, 1973, pp. 3 ff., and Part II "Treasurer's Report," Barron's, May 14, 1973, pp. 3 ff.

$$\text{Turnover} = \frac{S}{\frac{V_1 + V_2}{2}} \quad \text{where,}$$

S = sales of securities during the year
V_1 = total value of the fund at the beginning of the fiscal year
V_2 = total value of the fund at the end of the fiscal year

Correlation Between Turnover and Return

Once the turnover rate for each fund was calculated they were ranked from high to low for each year. Similarly, the rate of return on the funds was ranked from highest rate of return to lowest rate of return for each year.

Next a Pearson correlation coefficient was calculated for each year to determine if there was a significant relationship between turnover rates and fund rate of return. The coefficients are shown in Table IV-5 below.

Table IV-5. Pearson correlation coefficients between turnover rates and rate of return.

Year	Pearson correlation coefficient
1967	.64
1968	.08
1969	-.36
1970	.09
1971	.08
1972	.13

The correlation coefficients for 1967 and 1969 are the only significant ones. The 1967, .64 coefficient is significant with a p value of <.001. That is, it is highly significant and says that those funds with the highest turnover had the highest rate of return. However, this result should be tempered by the fact that the one fund with the highest rate of return of all the funds in 1967 also had the highest turnover rate. Therefore, this combination may have unduly influenced the overall rate of return and turnover correlation analysis.

For 1969, the -.36 coefficient is significant with a p value of <.05. This is not as significant as the 1967 coefficient but nevertheless does show a negative relationship between the turnover rates and return earned on the funds.

The remaining coefficients are very slightly positive but not statistically significant in showing any relationship between the turnover rates and return on investment.

These results largely dispel any continued benefits of portfolio turnover. Stronger findings were made in the Institutional Investor Study of the Securities and Exchange Commission in which a negative correlation between turnover and return was established.[23]

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[23]J. A. McQuown, "Technical and Fundamental Analysis and Capital Market Theory," Journal of Bank Research, Spring 1973, p. 11.

Analysis by the A. G. Becker evaluation service shows that on the average, the greater the turnover in recent years, the lower the realized returns for managed portfolios.[24]

In summary, there does not appear to be a definite relationship between turnover rates and rate of return on the average for the forty state retirement funds examined during the 1967-72 time span.

Liquidity

The third variable to examine is the liquidity of the retirement funds. Liquidity will be defined as the percentage of cash, deposits and short-term investments (such as certificates of deposit, Treasury Bills and commercial paper) to total fund value.

Generally speaking, the rate of return on funds with a high percentage of liquidity should be less than those funds with a lower degree of liquidity. There are two major reasons for this. First of all, cash, including checking accounts, receive no return and are in essence idle assets. Secondly, bank deposits and short-term investments normally have a lower yield than other

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[24]William L. Fouse, "Measuring Investment Performance," Investment Systems Division Newsletter, Financial Analysis Department, Wells Fargo Bank, San Francisco, California, N. 11, Oct-Dec 1973, pp. 5-6 (from a paper presented at the 49th National Convention of the Bank Administration Institute, San Francisco, Oct. 28-31, 1973).

investment alternatives because of less risk exposure involved.

Consequently, one would expect a negative correlation coefficient to exist between liquidity percentages and the rates of return on the funds. Those funds with more idle assets or more lower yielding assets naturally produce a lower return than those funds fully invested in higher yielding investments.

The liquidity for each of the funds was determined in each year. The results appear in Table IV-6 below.

Table IV-6. Liquidity, in percent of state retirement funds 1967-72.

Year	Highest liquidity	Lowest liquidity	Average liquidity
1967	28	0	2.5
1968	12	0	1.9
1969	10	0	2.0
1970	9	0	2.5
1971	10	0	3.0
1972	17	0	3.4

Source: Annual reports

The average liquidity ranged from a low of 1.9 percent in 1968 to a high of 3.4 percent in 1972. This shows that in most cases the funds were almost fully

invested. The overall average liquidity for the forty funds over the six year period was 2.5 percent.

One might expect higher percentages in 1966-67 and 1969-70 as uncertainty over the future of the capital markets prevailed and fund managers were reticent to put money into securities--particularly equity issues which were falling in price. However, this tendency may have been negated by the extremely high yields on corporate debt issues and mortgages. Many fund managers deliberately suspended their policy of adding to the stock portfolios and instead purchased high yielding debt issues which in many cases locked in a 7-9 percent rate of return for future years.

In order to measure the relationship between liquidity and rate of return, Pearson correlation coefficients were again calculated for each year.

This was done by ranking the liquidity percentages from high to low for each year. Then the rate of return was ranked from high to low for each of years 1967-72. The correlation coefficients are those in Table IV-7.

The results show no clear relationship between liquidity and rate of return. For three of the six years (1967, 1971 and 1972) there was a positive relationship between the two factors. In the other three years a negative relationship existed. However, for

all six correlation coefficients, there was no statistical significance associated with liquidity and rate of return.

Table IV-7. Pearson correlation coefficients between liquidity and rate of return.

Year	Pearson correlation coefficient
1967	.25
1968	-.09
1969	-.30
1970	-.05
1971	.02
1972	.21

One possible explanation for some of the coefficients being positive rather than negative is that during this period inverted yield curves existed in the money markets from time to time. That is, short-term interest rates were greater than long-term rates. Consequently, if fund managers increased their short-term investments (greater liquidity) during these time periods, the rate of return would be higher rather than lower.

Another explanation for positive coefficients rather than negative ones is that in years 1967, 1971 and 1972 the credit crunches of 1966 and 1969-70 were easing and interest rates in general fell and stock prices rose. Therefore, portfolios appreciated in

market value and in many cases this percentage increase in value more than offset the higher liquidity rates of the funds.

In conclusion, the degree of liquidity of the forty state funds did not appear to have any significant import on the rate of return earned on these funds.

Equity Holdings

As mentioned in Chapter II, many fund managers expressed a strong desire to add to the equity holdings of their portfolios in hopes of achieving a greater rate of return. State legislators were under pressure to authorize state funds to invest in equity or, for those already holding stock, to increase the maximum percentage of equity that such funds could hold.

The release, in 1968, of the famous Lorie and Fisher study of stock prices--"Rates of Return on Investments in Common Stocks"--which showed that the average annual rate of return for all common stocks listed on the New York Stock Exchange from 1926 through 1965 had been 9.3 percent, probably provided a great impetus for the greater interest in equity investment in state funds.[25] Also, the highly attractive growth figures of the stock

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[25]Lawrence Fisher and J. H. Lorie, "Rates of Return on Investments in Common Stock: The Year-by-Year Record, 1926-65," Journal of Business, XLI, No. 3 (July, 1968), pp. 291-316.

market in the late 1950's and early 1960's added credence to the arguments by fund managers that they be authorized to invest more in equity issues.

The fact that these efforts to increase the equity holdings of state retirement funds were successful can be seen in Table IV-8 below.

Table IV-8. Market value in $000's of equity holdings of state retirement funds.

Year	Market value of equity	Number of funds
1966	701,292	22
1967	985,069	27
1968	1,448,928	29
1969	1,891,012	30
1970	2,166,408	31
1971	3,835,700	32
1972	5,484,485	32

Source: Annual reports

The market value of equity holdings of the state funds increased from $701 million to $5,484 million--an eightfold increase--from the end of fiscal year 1966 to the end of fiscal year 1972.

Similarly, the number of funds in the sample holding equity issues grew from 55 percent in 1966 to 80 percent in 1972.

Another way to view this growth is to express the equity holdings as a percentage of the total portfolio value. The equity holdings of the funds grew from an average of 7.5 percent equity per fund in 1967 to an average of 19.7 percent equity per fund in 1972. The overall average percentage of equity held by the funds over the six years was almost 13 percent (see Table IV-9).

Table IV-9. Equity holdings in percent of state retirement systems.

Year	Highest equity percentage	Lowest equity percentage	Average equity percentage
1967	41	0	7.5
1968	46	0	9.3
1969	39	1	11.4
1970	54	0	13.5
1971	63	0	16.3
1972	73	0	19.7

Source: Annual reports

Equity Holdings and Rate of Return

Since the objective of adding to the equity holdings of the portfolios is to increase the overall rate of return, a positive correlation should exist between the percentage of equity holdings and the rate of return obtained by the fund.

Pearson correlation coefficients were again calculated to determine if any such relationship existed. This was done by ranking the portfolios from highest percent of equity to lowest and also by rate of return from highest to lowest. The coefficients can be seen in Table IV-10.

Table IV-10. Pearson correlation coefficients between equity holdings and rate of return.

Year	Pearson correlation coefficient
1967	.54
1968	.67
1969	.16
1970	-.45
1971	.65
1972	.15

In three of the six years there was a significant positive relationship between the two factors. In 1967 (.54), 1968 (.67) and 1971 (.65) the correlation was highly significant with a $p<.001$. For the remaining three years, the coefficients were not statistically significant although a -.45 coefficient in 1970 strongly hints that portfolio losses are the result of large stock market drops. That is, holding equity can work against the fund as well as for it.

The general conclusion that can be made from the above results is that when the stock market in general is rising the earnings potential of the fund rises too. However, when the market falls so does the earnings on the funds and holding equity certainly does not guarantee a higher rate of return on the funds.

To further substantiate the claim that the rate of return on the equity portion of state portfolios is highly related to the market in general, a simple correlation was run by state between its equity return and both the Standard and Poor's 500 (S & P 500) Index and Dow Jones Industrial Average (DJIA) as market barometers. The results of this correlation analysis are summarized in Table IV-11.

Table IV-11. Correlation between rate of return on state fund equity and market averages.

Correlation coefficients	Number of states with DJIA	Number of states with S & P 500
.95 - 1.00	17	11
.85 - .94	6	12
.70 - .84	5	5
Less than .70	4	4

The return on equity for seventeen of the funds was between .95 and 1.00 correlated with the Dow Jones Industrial Average. Six of the funds were in the .85-.94 correlation range with the DJIA.

Similarly, eleven of the funds had equity returns related to the Standard and Poor's 500 Index with correlation coefficients between .95 and 1.00. Twelve funds were in the .85-.94 correlation range with the S & P 500.

A total of twenty-three of the funds had a return on equity of between .85 and 1.00 correlated with both of the market indexes. Likewise, five of the funds were between the .70 and .84 correlation coefficients of both indexes and only four state funds were less than .70 correlated with the DJIA and the S & P 500 Index.

Consequently, one would expect the performance of the equity portion of the state retirement system portfolios in general to closely parallel that of the market averages.

Diversification

The state retirement fund portfolios are composed of a large number of debt issues and where authorized common stock issues. Frequently, state legal restrictions governing these funds limit the ownership of the securities of any one firm to a maximum percentage of the outstanding securities issued by that firm. The intent of these regulations is to ensure that the fund assets are not exposed to undue risk. In other words, the funds should "not have all their eggs in one basket." The primary concern is that if a large share

of the fund assets are invested in a small number of issues, the performance of the fund is too dependent on that particular group of securities. This is especially damaging when these securities all decline in value.

The requirements for diversifying the portfolios as to limits on ownership of any one security or as to between debt and equity issues are designed primarily to protect the funds from significant losses over time. On the other hand, the diversification requirements also tend to limit gains on the upside of a market, but the primary emphasis as far as the legislatures are concerned is to prevent losses which would impair the funds ability to pay benefits to the retirees.

To measure the degree of diversification the number of issues of both common stock and corporate debt was calculated. Table IV-12 summarizes these calculations.

The number of debt issues clearly outweighs the number of equity issues. This is to be expected however, as most funds are limited as to how much in common stock they can hold. The average number of issues of both common stock and debt held by the funds almost doubled over the six year period. This shows that greater diversification of the portfolios, as measured by number of issues, took place over time.

Table IV-12. Diversification by number of issues held by state retirement funds.

Year		Common Stock	Corporate Debt
1967	H	101	718
	L	21	3
	$\bar{X}$	28	183
1968	H	107	872
	L	14	18
	$\bar{X}$	33	177
1969	H	125	1045
	L	13	32
	$\bar{X}$	41	248
1970	H	131	1049
	L	15	44
	$\bar{X}$	47	276
1971	H	137	1069
	L	20	63
	$\bar{X}$	51	299
1972	H	144	1081
	L	27	71
	$\bar{X}$	50	326

H = High
L = Low
$\bar{X}$ = Average

Source: Annual reports

Diversification and Rate of Return

Diversification is said to reduce portfolio loss on the downside and also limit gain on the upside of the market. That is, when the market rises the gain on a highly diversified portfolio will approximate the market gain and the benefit of a few issues which out-perform the market by a wide margin will not have an appreciable effect on overall return. Similarly, on the downside, a large loss incurred on a few issues will not have a noticeable effect on the overall rate of return.

In order to determine if the degree of diversification of the portfolio had any effect on the rate of return, correlation analysis was performed.

Table IV-13 shows the correlation coefficients between rate of return and number of equity issues held in the portfolio.

Table IV-13. Correlation coefficients between rate of return and degree of diversification.

Year	Correlation coefficient
1967	.26
1968	.18
1969	.04
1970	.02
1971	-.01
1972	-.08

The coefficients for all six years are not significant and indicate that no relationship exists between rate of return and diversification for these state funds.

This finding can further be supported by the fact that all of the funds are diversified to such a high degree that little variation in return should be expected. Once the funds hold more than about sixteen randomly selected issues, very little further diversification occurs as more and more securities are added to the portfolio.[26] In effect, most of the portfolios are most likely over diversified and little risk from concentration of issues exists.

Type of Management

The final factor to consider in relation to return on investment is type of management. This is an attempt to determine if one type of portfolio management produces better returns than other management types.

Three different management types are represented by the forty funds in the sample. First of all, two states have delegated the management of the portfolio to a professional investment advisor.

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[26]For examples of studies relating number of issues to degree of diversification see: H. A. Latane and W. E. Young, "Test of Portfolio Building Rules," The Journal of Finance, 24 (September, 1969), pp. 595-612 and Lawrence Fisher and J. H. Lorie, "Some Studies of Variability of Returns on Investments in Common Stocks," Journal of Business, XLIII, No. 2 (April, 1970), p. 117.

Twenty-four states have retained external advisors and even though the states do have final investment responsibility, these advisors basically make the decisions as to what the funds will invest in.

The remaining fourteen states are largely internally administered. They may receive input from investment advisors but the fund personnel actually decide what securities will be purchased. In several cases these states have formed State Investment Boards to handle the portfolios of all the retirement funds in that state.

The rates of return earned by the funds over the six years were studied in relation to the type of management to see if any differences existed.

An analysis of variance was run over the years 1967-72. The analysis showed that there is a significant difference in overall rate of return on the funds over the six years. The F value was 33.11 which is significant with $p<.0005$. This is to be expected though as the return depends on the market conditions from year to year.

The type of management was also found to be significant with $F = 28.51$ and $p<.0005$. The analysis also shows that the interaction between the two (year and management type) is significant with $F = 24.52$ and $p<.0005$.

Even though differences in management were significant, there is no consistent pattern from year to year of any one management type always outperforming the others. This is seen in Table IV-14.

In 1967, 1968, 1971 and 1972 the two funds who delegated their portfolios to outside management did better on the average than the other two types of management. The internally managed funds ranked second in 1967, 1968, 1970 and 1971 and first in 1969. Finally, those funds who relied largely on the recommendations of investment counselors for their portfolio decision-making finished in third place in four of the years and ranked first in 1970 and third in 1971.

At first glance it appears as if the portfolios delegated to outside management did particularly well since they were ranked first in four of the six years. However, the significance of this management type may be due to the fact that the sample size consisted of only two funds and both of these funds were highly invested in equities. The stock market went up in 1967, 1968, 1971 and 1972 which are precisely the years in which this type of management ranked first. Stock portfolios held in the other two management categories may have performed equally as well but the results were averaged down by portfolios in their own group holding high levels of debt instruments.

Table IV-14. Ranking of average rate of return by type of management.

Type of Management	Number of funds	1967	1968	1969	1970	1971	1972
Delegated outside	2	1	1	2	3	1	1
Internal with advisor	24	3	3	3	1	3	2
Internal	14	2	2	1	2	2	3

Furthermore, with the stock market decline of 1969-70, the outside managed portfolios dropped to second and third in the rankings. Thus it appears that the results of the two outside managed were dependent on fluctuations in the market in general rather than any particular type of management. The fact that these managers selected stocks that moved in concert with the market could be viewed as a fortuitous event. After all, had the small sample of two funds been invested in equities which happened to move opposite to the market, the performance would have been ranked poorly.

The following chapter will summarize the findings of this study as well as point out future topics of concern for state retirement system investments.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was designed to measure the investment performance of state retirement funds. It is significant in that it measured the rate of return on state funds by utilizing market values instead of book values. Previous studies and fund annual reports generally showed the investment return on their funds as the percentage of investment income (interest and/or dividends) to book value of the portfolio holdings. These types of calculations do not account for any market fluctuations in the values of the stocks and bonds held by the retirement funds. Consequently, in periods of rising markets, return is understated and in falling markets overstated.

Once the rate of return on each of the portfolios was calculated in a consistent manner, utilizing market values, valid comparisons among funds and analysis of investment performance could be done.

Investment Performance

The investment performance of the funds was calculated for years 1967-1972. These results are summarized in Table V-1 on the following page.

Table V-1. Average overall rates of return and equity rates of return in percent on state retirement funds.

Year	Average overall rate of return	Average return on equity
1967	-.3	3.17
1968	-2.45	8.24
1969	-6.78	-5.55
1970	-7.88	-22.75
1971	10.63	32.77
1972	5.34	6.99

Source: Tables III-2 and III-4.

The average return on the bond portfolios of the funds over the six years was -1.05 percent. This low return was due to the decrease in market prices of outstanding bonds held by the funds as interest rates in general rose during this period of time.

The average return on the equity portfolios of those states authorized to invest in common stock was 3.81 percent over the same six years.

However, since the bond portfolios comprised almost 83 percent of total assets on the average over the six years, the average overall rate of return for the forty funds from 1967-1972 was -.24 percent.

During the six year period the average return on the Standard and Poor's 500 Index was 5.14 percent

and the Dow Jones Industrial Average was 2 percent. Since most of the funds holding stocks have more than the thirty issues comprising the Dow Jones Industrial Average, the Standard & Poor's 500 is probably a better index against which to measure equity performance.[27] If we use the Standard & Poor's 500 average of 5.41 percent over the six years then the average retirement fund performance of 3.81 percent is poorer. For those funds whose equity holdings closely approximate the blue chip composition of the Dow Jones Industrial Average then the Dow's 2 percent return would be the standard of comparison.

In looking at overall rates of return, it is more difficult to evaluate the performance. One can make relative interfund comparisons, or comparisons to the average fund. However, there is difficulty in comparing the performance to a generally accepted market index which measures bond portfolio performance.[28]

The A. G. Becker Company has a study which shows that for 2600 pension funds (including some state funds in the last half of the time period) for the 1962-1972 time period, half failed to achieve a 7.5 percent return

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[27]"The Popular Indexes Don't Tell the Whole Story," Business Week, July 7, 1973, pp. 74-77.

[28]See "Bond Men Seek a Uniform Index," Business Week, September 8, 1973, p. 65.

on their total investments--including fixed income securities. During this same period the Standard & Poor's 500 Index returned 10 percent.

Similarly the A. S. Hansen (an actuarial consultant) Company report for the same 1962-72 time period showed that the equity pension funds managed by thirty of the top banks yielded an average return slightly below the Standard & Poor's 500 Index.[29]

One should exercise caution in making direct comparisons with the state funds in this study and the funds analyzed in the Becker and Hansen reports above.

First of all, the legal restrictions on investment alternatives are different. Secondly, these reports covered ten years instead of six and therefore this study does not reflect the growth of the market in the period of 1962-1966.

Finally, both the Becker and Hansen reports utilize time weighted rates of return as contrasted to the Dietz method for this study. Therefore, direct comparisons of the numbers should not be made.

However, the predominant theme in the Becker and Hansen studies as well as the findings of this study is that it is difficult for a typical pension

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[29]See Dana L. Thomas, "Divide and Multiply--Pension Consultants Like to Spread Assets Around," Barron's, Nov. 5, 1973, p. 7.

fund to consistently out-perform the market averages. This may lead to many state funds reassessing their strategy of trying to out-perform the market and instead be content to invest in unmanaged portfolios. An unmanaged portfolio is one invested in an average such as the Standard & Poor's 500. Instead of trying to out-perform the market, the portfolio returns would duplicate the market. At the same time professional management and advisory fees would be substantially reduced.[30]

Further support for unmanaged portfolios is found in a recent study on the performance of commingled bank managed equity funds during the 1962-1970 time span.[31]

Analysis of Performance

The investment results of the forty state retirement systems studied were analyzed to see if the return was affected by fund size, turnover rate, liquidity, equity holdings, diversification, and type of management.

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[30]See "Unmanaging the Portfolio," Business Week, Nov. 17, 1973, p. 78.

[31]See Edward Malca, Bank-Administered Commingled Pension Funds--Performance and Characteristics 1962-70, Lexington Books (Lexington, Mass.: D. C. Heath & Company, 1973).

The findings are as follows:

1. There was no statistical significance between the size of the fund and the rate of return.

2. In 1967 there was a significant positive correlation between turnover and rate of return. In 1969 a less significant negative correlation existed for the funds. For the remaining four years there was no significant relationship between the two variables. Thus, it appears that turnover of the portfolio does not particularly enhance rate of return.

3. The degree of liquidity of the funds did not have a significant effect upon the rates of return earned on the portfolios.

4. There was a significant positive relationship between the percentage of equity held in three of the six years covered--1967, 1968 and 1971. However, the stock market was rising in these years so it is obvious that return should be better for those funds holding equity issues. However, in the three other years no significant relationship between equity holdings and return existed. This implies that holding equity does not ensure a better rate of return.

5. No significant relationship between the rate of return and portfolio diversification was found. Most of the portfolios are so highly diversified (measured by number of issues held) that it is not a significant factor with respect to rate of return.

6. The effect of type of management of the state funds on the rate of return was analyzed. To do this, the funds were divided into groups on the bases of whether:

a) the management of the fund was delegated to an outside firm,
b) the fund made most of the investment decisions based on the recommendations of investment advisors, or
c) the fund was largely internally administered.

An analysis of variance over the six years between rate of return and type of management showed there was a significant difference between the variables. However, further analysis showed no consistent pattern of the relationship between return and management type from year to year. Also, the small sample size of two for delegated management types may have unduly influenced the analysis of variance.

Availability of Data

The most disappointing aspect of this study was the data form and data availability of state retirement system investments. Of the eighty-three major state systems only forty systems could eventually be analyzed. These forty systems were from twenty-nine different states

and represented almost 60 percent of the assets of the major state retirement funds.

Twenty-one states were not included in the study for various reasons. Six states did not send any information. Another thirteen sent data which was either insufficient or incomplete and subsequently had to be excluded from the study. Two state funds, Kansas and Delaware, were in the process of reorganization and therefore were eliminated from the sample.

In many cases, there was a definite reluctance to provide portfolio information for this study. Many fund administrators gave the impression that this information was somehow secretive in nature. When one considers that the funds are financed with tax revenues it was surprising that fund managers should view their particular portfolios as being privileged information. Rumors of retirement fund mishandling can only be perpetuated in this type of environment.

On the other hand, twenty-nine states did provide data and the fund administrators were extremely cooperative in providing information for this study.

Another problem encountered was that of data format. Many states still carry debt issues at par value and equity issues at book value. This has been standard operating procedure and is largely the result of actuarial reporting where capital gains and losses are not accounted for until actually realized.

This meant that many of the portfolios had to be converted from book to market values before investment performance and analysis could be undertaken. It is encouraging to note that the fund annual reports for more recent years are reporting the market value of securities as well as book values.

Finally, timeliness in reporting for retirement fund should be emphasized. In most cases, the fund annual reports were produced shortly after the end of the fiscal year. However, in a few states, the annual reports were often a year or more late in coming out. In the extreme case, one state fund was consistently four years late in turning out its annual report.

Future Areas of Research

Next some possible future areas of research will be discussed.

The Treasurer of the State of Connecticut has purchased a seat on the PBW Stock Exchange in order to cut the commission costs to the state of trading securities on its pension funds. The Securities and Exchange Commission (SEC) has attempted to halt this action and subsequently the State of Connecticut has instituted a suit against the SEC to enable it to hold its seat on the PBW Exchange. Other states have joined Connecticut in pursuing this issue. If successful, it will be interesting to see if portfolio turnover rates are

affected by states owning seats on the exchange. It will also be interesting to see by how much portfolio trading costs are reduced.[32]

A second issue to examine is whether or not bond swapping (riding the yield curve) is an effective method of improving the rate of return on state retirement system bond portfolios. Currently, a limited number of states authorize their funds to amortize bond losses over the life of the new high coupon bonds purchased to replace the low coupon bonds held in the portfolio. If accounting regulations are changed to allow more states to amortize the loss over time, instead of writing off the entire loss in the year it occurs which effectively prohibits states from bond swapping, the benefits of this process can be tested.

Finally, as many states attempt to get more and more equity issues in their portfolios, there may be funding difficulties for the retirement systems in the future.

The retirement systems have assumed a rate of return for actuarial purposes related to the funding requirements of the pension plan. As funds added equity to their portfolios, anticipating higher rates of return on this common stock, they assumed funding

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[32]"Axe for the Buttonwood?", op. cit., pp. 3 ff.

would be less of a burden. However, as the rates of return on equity over the six years of this study indicate, many of the funds may have overstated their assumptions regarding earnings on their investment portfolios. Furthermore, with the benefits of hindsight one can project significant further losses in the stock market for 1973 and 1974. With little prospect of a quick reversal of the drop in stock prices there may be funding problems for some state retirement programs. That is, overstating the rate of return estimates earned on the equity portfolios, coupled with severe and prolonged market drops may lead to funding difficulties for some state retirement systems. More of current tax revenue may have to be diverted to pay retirees their benefits.

Conclusions

The growth of state retirement funds over the past two decades, even though dramatic, has received very little publicity. The cash and security holdings of these funds have grown from slightly over four billion dollars in 1953 to over sixty billion dollars today. Currently, over seven and one-half million people belong to these retirement systems.

As these funds grow, they become a more significant factor in the money and capital markets of the United States. With sixty billion dollars to invest,

what the fund managers do can have noticeable effects on the value of individual securities or groups of corporate stocks and bonds. These funds have also become significant suppliers of funds in the market for mortgages.

However, as the funds have grown and become an important factor in the money and capital markets, there has been limited reporting of their portfolio holdings and investment performance. Reports showing the rate of return based on market values of the portfolios are even more scarce.

It has been standard operating procedure to merely report the debt issues at par value and the equity holdings at cost. When rate of return is reported, it is generally expressed as the percentage of interest and dividend income to book value or average book value. It ignores any unrealized capital gains or losses which have taken place since the securities were purchased. This may be fine for actuarial reporting but is not for investment reporting. In periods of rising values the returns are understated and in downturns the rate of return is overstated.

Consequently, it is recommended that the state retirement fund administrators do a better job of reporting their investment activities. At a minimum, the reports should include the market value of their security holdings, interest and dividend income, contributions

to the fund, and any realized gains or losses of securities traded during the year. One could use the Texas Teacher Retirement System annual investment report as an example of outstanding public reporting. Also, the states of Arizona, Arkansas, California, Idaho, New Mexico and Wisconsin have fairly complete annual reports. Within the past few years the states of Ohio, Illinois and Montana have begun publishing detailed investment reports. The above mentioned states all include detailed portfolio holdings in the reports.

Unfortunately, other states still view the funds investment activities as being secretive in nature and are hesitant to provide much information about them. It is this type of situation which may eventually lead to forced outside intervention upon the funds. This could be in the form of educational associations, teacher unions or state legislative bodies who may choose to investigate more closely the investment actions of the funds. If one does not think this is a possibility, he need only look at the recent Congressional legislation signed into law on Labor Day 1974 governing private pension plans. It is up to the funds to take the initiative in reporting their investment activities or otherwise requirements will be forced upon them.

Many states have pointed with pride to the growth in assets of their retirement systems. The impression

is given that this growth is often due to the investment performance of the funds.

However, in most cases the growth in the fund size is due to increased levels of contributions rather than any significant investment returns. As the number of state employees grows to meet rising demands for government services there are added contributors. Similarly, as inflation continues, salaries rise too. Since contributions to the funds are based on a percentage of salaries, the contributions cannot help but increase. Therefore, increased inflow from the members and states rather than investment returns has accounted for most of the growth of the pension funds. This is substantiated in this study which shows the overall rate of return on the forty funds from 1967-1972 was -.24 percent.

The fact that the investment return was low for the six year time period covered by this study shows that holding equity issues does not guarantee high rates of return for the funds. Many fund managers were of the opinion that adding equity issues to their portfolios would greatly enhance the rate of return on these funds. Unfortunately, the market downturns of 1966-67 and 1969-70 showed otherwise. This is not said to encourage the discontinuance of equity investments in the portfolios but only to point out that a different investment strategy may be needed.

In the past, formula timing plans and dollar-cost averaging programs were widely used by investors. However, with the sustained growth of the stock market through the 1950s and continuing into the mid 1960s the use of these plans decreased--particularly the formula timing plans. The reason for the abandonment of formula timing plans was that the market moved above the projected levels of the plan users and stayed there. Consequently, it was not thought advisable to continue with the plans.[33]

Only two states in the sample used in this study indicated a dollar-cost averaging plan was being utilized. In both cases this plan was suspended in 1969-70 as high interest rates in the economy made the "guaranteed" 8-10 percent return on high grade corporate bonds an overwhelming choice over riskier equity issues.

However, with the wide market fluctuations during the period of this study, 1967-1972, and with the continued wide fluctuations of the market in 1973 and 1974 coupled with a highly uncertain future outlook for duplicating the high sustained growth of the 1950-1965

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[33]D. H. Bellemore and J. C. Ritchie, Investments Principles/Practices/Analyses (Cincinnati, Ohio: South-Western Publishing Co., 1974), pp. 113-117.

period, formula timing and dollar-cost averaging programs may become useful again.[34]

In order to facilitate these plans though, some states will have to pass legislation authorizing the funds to amortize losses on securities sold at a loss over the future rather than requiring the entire loss to be written off in the year it occurs. This will enable them to effectively manage their bond portfolios as well as their equity portfolios.

One thing is certain, the funds will continue to have larger sums to invest and increasing the returns earned on these funds will ease the funding burden on the retirement plans.

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[34]For a study showing the unique reasons for the sustained growth of the 1950-1965 period see: A. E. Grunewald and Robert C. Klemkosky, "If You Believe Growth is Dead, Try the Formula Timing Plan," MSU Business Topics, Summer 1972 (E. Lansing, Mich.: Michigan State University), pp. 59-65.

APPENDIX

Table A1. Legal restrictions on the investment of state pension funds.

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Alabama	20% at book value	Same as domestic life insurance companies. Includes - mortgages and corporate stock and bonds	Subject to Board of Control approval
Alaska	No percentage limit	Mortgages, S & L shares, corporate stock and bonds	As authorized by Commissioner of Revenue
Arizona	60% at cost - effective 1971	Equipment trust certificates, CD's, mortgages and corporate stock and bonds	Not more than 5% of fund assets in security of one agency or corporation
Arkansas	10% at cost - effective 1968	Corporate securities must be rated within the three highest classifications of at least two standard rating services	Annual purchase of stock limited to dollar amount of investment income for preceeding fiscal year. Not more than 5% of assets in stock of any one firm
California	25% in common stock and 5% in preferred stock. Effective 1972	Same as for savings banks in state	Investment in any one company may not exceed 5% of its common shares, and no investment may exceed 2% of the funds assets

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Colorado	Equity or convertible into equity cannot exceed 30% of the book value of the fund	Prudent man rule - includes mortgages, corporate stock and bonds	
Connecticut	No percentage limit	Prudent man rule	
Delaware	No percentage limit	Discretion of Board	
Florida	No equity allowed	Florida Municipal Bonds only and not more than 50% of fund in corporate bonds	Corporation bonds must be rated A, AA or AAA by at least two national rating services
Georgia	50% at book effective 1969	Same as domestic life insurance companies	Includes mortgages, corporate bonds, preferred and common stock
Hawaii	40% at book	Mortgages, corporate stock and bonds	
Idaho	No percentage limit	Prudent man rule	As necessary by the Retirement Board
Illinois	33-1/3% at book - listed stock only	Equipment trust certificates, S & L shares, corporate stock and bonds	Not more than 1% of total outstanding stock of any one firm nor more than 5% of fund's assets in any one stock

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Indiana	10% for teacher fund. No equity allowed for state employee fund	Not less than 25% of the fund in U.S. Government or agency bonds, S & L shares, corporate stock and bonds, mortgages	Maximum of 10% of total fund at par in any one corporation security
Iowa	10% effective 1967	Same as domestic insurance companies	Maximum of 25% of new money invested in stocks in any one year
Kansas	50%	Same as domestic insurance companies	
Kentucky	25% for teacher fund. No equity allowed for employees fund	Equipment trust certificates, corporate stock and bonds, mortgages	Stock purchases subject to same rules as insurance companies. No more than 6% of total assets in real estate
Louisiana	15% for teacher fund. 50% for employee fund		Maximum of 2% of the investment portfolio in any one issue. Maximum of 10% of investment portfolio in any one company
Maine	No percentage limit	Prudent man rule	

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Maryland	25%	Same as domestic life insurance companies	Dividend paying stocks only
Massachusetts	15% of bank and insurance stocks	Same as savings banks	Maximum of 20% of fund in railroad bonds. Maximum of 25% of fund in telephone bonds. Maximum of 40% of fund in public service bonds
Michigan	25%	Same as domestic life insurance companies	Maximum of 8% of assets in stock per year
Minnesota	45%	Corporate bonds and stocks	Maximum of 5% of total assets can be put into common or preferred stock in any one year. Maximum of 1-1/2% of fund assets in any one corporate stock. Maximum of 5% of voting stock of any one corporation
Mississippi	No equity allowed	Corporate bonds, mortgages	Corporate bonds of A or better rating

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Missouri	No percentage limit	Same as domestic life insurance companies	Includes S & L shares
Montana	No equity allowed	Corporate bonds, mortgages, equipment trust certificates	Within three highest quality grades of rating service
Nebraska	60%	Mortgages, corporate stock and bonds	
Nevada	20%	Mortgages, corporate stock and bonds	Maximum of 1% of total assets in any one company
New Hampshire	No percentage limit	Same as domestic life insurance companies	Includes mortgages, and primary utility and insurance stock and bonds
New Jersey	10% at book for common stock 15% at book for both common and preferred	Same as domestic life insurance companies	Includes equipment trust certificates, mortgages and utility and industrial bonds
New Mexico	No one class of investments can exceed 75% of total of fund	Mortgages, corporate stock and bonds	Maximum of 10% of the voting stock of any one company

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
New York	30%	Same as savings banks. Includes mortgages, corporate stock and bonds	Maximum of 1% of total fund in any one company's stock. Not more than 3% of total issured and outstanding equity of any one corporation
North Carolina	15% for common and preferred stock	Earnings test required for preferred and common stock, corporate bonds	Bonds within the three highest ratings of at least two national rating services. Maximum of 1-1/2% of fund in any one corporation's stock. Maximum of 8% of the total number of shares issued and outstanding by a corporation
North Dakota	No percentage limit	Mortgages, corporate stock and bonds	Bonds rated A or higher by a national rating service
Ohio	35% for common and preferred stock at cost	Mortgages, corporate stock and bonds	Earnings test required for preferred stock

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Oklahoma	25%	Prudent man rule - Public utility bonds	Maximum of 25% of fund in U.S. Government guaranteed first mortgages. Maximum of 50% in highest three classifications of bonds and preferred stocks by recognized rating service. Maximum of 75% in U.S., state and local bonds
Oregon	25% effective 1971	Prudent man rule	Includes mortgages, corporate stock and bonds
Pennsylvania	10% at book not to exceed 50% of the total amount of fund investment in mortgage loans on Penn. real estate and insured by the FHA or VA. Effective 1972	Same as prudent man rule - for corporate bonds and mortgages	Maximum of 2% (book) of total assets of fund may be invested in stock in one year. No more than 2-1/2% of the issued or outstanding stock of any one company
Rhode Island	No percentage limit	Same as savings banks and prudent man rule	Includes RR Equipment trust certificates, corporate stock and bonds, mutual funds

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
South Carolina	No equity allowed	Corporate bonds, S & L shares	Corporate bonds must be within the two highest ratings of at least two nationally recognized rating services. South Carolina corporations must have bond ratings within the three highest classifications of at least two national agencies
South Dakota	50%	Corporate stock and bonds	Nationally registered common and preferred stock subject to SEC control
Tennessee	20% at book value	Same as domestic life insurance companies. Includes corporate stock and bonds	Corporate bonds of A or better rating by two national services. Preferred stock with an A or better rating by one service

Table A1 (cont'd.)

State	Maximum amount of equity funds as a percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Texas	No percentage limit except 33-1/3% for teacher fund if less than $500,000,000 is invested in Government Municipal Securities	Prudent man rule - includes corporate stock and bonds	Not less than 25% of fund at book invested in federal and municipal bonds. Maximum of 1% (book) of fund in stock of any one corporation. Maximum of 5% of the voting stock of any one corporation
Utah	No percentage limit	Corporate stock and bonds and SBA mortgages	Stock and bonds must be within the three highest classifications of at least one rating service
Vermont	35%	Same as domestic life insurance companies and prudent man rule	Maximum of 5% in preferred or guaranteed stock. Corporate debt within four highest ratings by two rating agencies
Virginia	20% at cost for common and preferred stock of a bank or trust company	Same as domestic life insurance companies	

Table A1 (cont'd.)

State	Maximum amount of equity funds as a Percent of total fund	Types of investments authorized other than federal, state and local bonds	Other restrictions on investments
Washington	25% at cost for common, preferred, and open-end investment companies	Corporate stock and bonds, equipment trust certificates, mortgages	Maximum of 5% of common shares outstanding for a corporation. Maximum of 2% at cost of fund for any one stock
West Virginia	No equity allowed	Corporate bonds. Also FHA mortgages	Corporate bonds must be rated AA or better by at least two national rating services
Wisconsin	35%. The variable annuity fund can be invested "primarily" in equity securities	Same as domestic life insurance companies	Includes corporate stock and bonds and mortgages
Wyoming	No equity	Corporate bonds restricted to those approved for a national bank	Corporate bonds cannot exceed 60% (book value) of total retirement fund

Sources: State and Local Pension Funds, 1970, Investment Bankers Association of America, Washington, D.C., 1970; State and Local Pension Funds, 1972, Securities Industry Association, Washington, D.C., 1972; Annual reports of the appropriate states; and Correspondence with fund officials.

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