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ODOM, ORIS LEON, II
THE PERFORMANCE OF REAL ESTATE INVESTMENT TRUSTS.

THE UNIVERSITY OF OKLAHOMA, D.B.A., 1979

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GRADUATE COLLEGE

THE PERFORMANCE OF REAL ESTATE INVESTMENT TRUSTS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF BUSINESS ADMINISTRATION

BY

ORIS LEON ODOM II

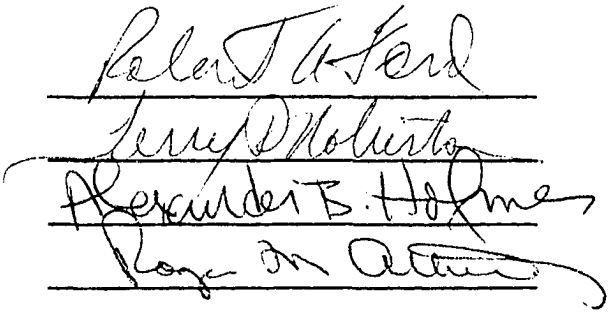
Norman, Oklahoma

1979

THE PERFORMANCE OF REAL ESTATE

INVESTMENT TRUSTS

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ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to Professor Robert Ford, my committee chairman, for his patience and professional guidance during all phases of this endeavor. A special word of thanks is also due Professors Arnold Parr and Terry Robertson for their interest and constructive criticism of this dissertation. I also wish to express my appreciation to the other members of my committee, Professors Roger Atherton and Alexander Holmes, for their assistance regarding this research.

For helping me with some of the necessary computer work, I express my sincere thanks and appreciation to Professors William Green and Jim Bates.

Finally, I am especially grateful to my wife, Cynthia Odom. She not only provided constant quiet support, but also typed the various preliminary drafts and final copy of the dissertation.

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THE PERFORMANCE OF REAL ESTATE INVESTMENT TRUSTS

CHAPTER I

INTRODUCTION

Real Estate Investment Trusts

Real Estate Investment Trusts (REITs) are a relatively new and unfamiliar type of financial intermediary. Enabling tax legislation was passed in 1960 and REITs were formed starting in 1961, the effective date of the law. The REIT industry held $300 million in assets at the end of 1961, its first year in existence; by year-end 1974 the industry's total assets were $21.2 billion. Most of the growth in industry assets from its inception until the end of 1974 occurred during the years 1972, 1973, and 1974. During this three year period industry assets increased $13.1 billion.[1]

Purpose of REITs

The reason special tax legislation was passed allowing the formation of REITs was to provide an investment vehicle

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[1]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book (Washington, D. C.: National Association of Real Estate Investment Trusts, Inc., 1975), 14.

so that the small investor could participate in real estate investments. The small investor for years has been able to participate in security investments through the medium of investment companies, both open-end and closed-end. The investment companies pool the resources of many investors who are too small to acquire a diversified portfolio on their own, and the investor then shares on a pro-rata basis in the total value of the investment company's portfolio. Since 1961 the REITs have had essentially the same tax status as investment companies. The investor is now able to invest in real estate investments such as shopping centers, office buildings, and mortgage loans by buying shares of a REIT whose investment objectives parallel his own. REITs are analogous to closed-end investment companies for people desiring to invest in real estate.

REITs provide their shareholders with securities that represent fractional ownership rights in real estate investments. The investments made by any particular REIT may be in the form of (1) ownership of real property -- an equity trust, (2) ownership of mortgages secured by real property -- a mortgage trust, or (3) a combination of both equity and mortgage investments -- a hybrid trust. The shares of the REITs are traded just like the shares of other closed-end investment companies; some are listed on various exchanges and some are traded over-the-counter.

History of REITs

REITs as they exist today can trace their existence to January 1, 1961, the effective date of the Real Estate Investment Trust Act. The involvement of the business trust form of organization with real estate, however, predates the Act by over 100 years. The state law of Massachusetts did not allow corporate real estate investments, so starting sometime in the mid-nineteenth century the business trust began being used in Massachusetts as the vehicle for real estate investments. The old Massachusetts trust was largely responsible for the early development of cities such as Boston, Detroit, and Chicago.[2] Supreme Court decisions handed down during 1935 that called for all business trusts to be taxed at corporate rates effectively ended business trust investments in real estate.[3] Legislation was quickly passed setting up special tax provisions for trusts investing solely in securities (regulated investment companies), but not until 1955 were serious efforts made to obtain for trusts investing in real estate the same tax treatment that had been given to the regulated investment companies.[4] After several unsuccessful

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[2]H. Cecil Kilpatrick, "Taxation of Real Estate Investment Trusts and Their Shareholders," Taxes 39 (December 1961): 1042.

[3]See for example Morrissey v. Commissioners, 269 U. S. 344 (1935).

[4]David C. Cates and Frank L. Harwell, Jr., "Banks' Big Stake in 'REIT' Field," Bankers Monthly 87 (August 15, 1970): 19.

attempts to pass the needed legislation, the Real Estate Investment Trust Act was passed in 1960, to be effective January 1, 1961.[5]

Prior to 1968 only a handful of REITs existed. Starting in 1968 and continuing into the early 1970s the REIT industry experienced tremendous growth. Total assets for the industry went from zero at the end of 1960 to $900 million at the end of 1967 to $14.2 billion at the end of 1972. Likewise the number of trusts went from zero to 49 to 186 over the same period.[6] By the end of 1972, 34 REITs were listed on the New York Stock Exchange and 36 were listed on the American Stock Exchange. All REITs that were old enough to have at least a full year of dividend paying history posted an over-all return of almost 16 percent during 1972.[7]

Two major factors contributed to the rapid growth of REITs during the early 1970s. First, the traditional sources of construction and development loans, the primary types of loans made by REITs, had been severely restricted during the credit crunch of 1969-1970. Commercial banks were quite stingy in allocating their construction funds, preferring to meet

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[5]E. Norman Bailey, "Real Estate Investment Trusts: An Appraisal," The Appraisal Journal 34 (October 1966): 486-489.

[6]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 11-14.

[7]James E. Lewis. "An Examination of Real Estate Investment Trusts," The Appraisal Journal 41 (July 1973): 350.

the heavy corporate loan demand. The savings and loan associations were likewise unable to participate much in construction lending at this time due to heavy outflows of deposits. The second major factor associated with rapid REIT growth in the early 1970s was the ability of REITs to provide better service to their customers. Borrowers were attracted to REITs not only because the trusts had construction money available, but also because the trusts would generally provide faster processing of the applications than would the more traditional construction lenders.[8]

As previously mentioned, the Real Estate Investment Trust Act was passed in 1960 so that trusts investing in real estate could enjoy the same general tax provisions that apply to regulated investment companies investing solely in securities. Regulated investment companies can be of an open-end or a closed-end capital structure; the former are more numerous and are generally referred to as mutual funds. Although the 1960 Act does not specify the type of capitalization a REIT should have, the Securities and Exchange Commission requires REITs to be closed-end because the nature of their investments is such that they lack the liquidity needed for an open-end structure.[9] Another important difference between REITs and regulated investment companies is the amount of

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[8]Robert E. Brewer, "REITs in Transition," The Appraisal Journal 42 (July 1974): 431.

[9]J. Richard Elliott, Jr., "More Room at the Top," Barron's 42 (February 19, 1962): 5.

leverage used. Open-end investment companies are not levered; closed-end investment companies may be levered provided they borrow no more than one-third of the amount of their shareholders' equity. REITs have commonly levered themselves into having debt-to-equity ratios of four or five.[10]

REITs have certain disadvantages and advantages compared to corporations as a vehicle for public real estate ownership. A trust must receive at least 75 percent of its gross income from rents, mortgage interest, and gains from the sale of real estate.[11] Corporations are relatively free from any restrictions concerning investment and income requirements. In certain instances the corporation may have difficulty avoiding a holding company penalty if too much passive income is earned or preventing treatment as a collapsible corporation if property is not held long enough. REITS are restricted in that they cannot engage in profit-sharing rental arrangements with their tenants, except for fixed percentage leases negotiated at the beginning of the lease. Corporations are unrestricted in their rental income arrangements.[12]

Organizers of REITs are restricted as to how much they may benefit from the trust. The organizers may own shares in the trust, provided that five or fewer beneficiaries do not

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[10]Lewis, 351.

[11]Peter A. Schulkin, "Real Estate Investment Trusts," Financial Analysts Journal 27 (May-June 1971): 33.

[12]Lewis, 357-359.

own more than 50 percent of the trust. Since a REIT cannot manage its own properties, trust organizers frequently own the advisor to the trust instead of shares in the trust itself. Ownership (by the organizers) of the trust's advisor is allowed provided they do not own any shares in the trust. The organizers of a corporation are unrestricted as to the management of their own properties.[13]

Income tax treatment of REITs versus the treatment afforded corporations is the area of greatest advantage to the trust form of real estate ownership. Earnings distributed to the REIT shareholder are not subject to double taxation as are corporate distributions. The qualifying trust which elects to be treated as a REIT merely acts as a conduit for the income. The trust pays no income tax on distributed earnings; only the shareholder pays a tax on the earnings passed through to him. Another advantage the trust possesses is that the income disbributed retains its character as to its eligibility for favorable long-term capital gains tax treatment. Corporate distributions are taxed as ordinary income.[14]

REITs have existed throughout their brief history without any special regulation by governments at either the state or federal level. Certain requirements must of course be met in order to qualify for REIT tax status, but the special tax treatment is elective and the Internal Revenue

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[13]Lewis, 357-359. [14]Lewis, 357-359.

Service does not function in a regulatory capacity for the trusts.[15] The Securities and Exchange Commission is involved with enforcing disclosure provisions relating to new securities offerings and reports to shareholders, but their regulation is no different for REITs than any other industry under their jurisdiction.[16]

Tax Environment of REITs

The Real Estate Investment Trust Act of 1960 added sections 856-858 to the Internal Revenue Code. Essentially the new law gave the same tax treatment to REITs as had previously been available to regulated investment companies, namely exemption from federal income taxation provided certain requirements are met.[17]

The following are the principal requirements necessary for a REIT to receive favored tax status:[18]

1. At least 90 percent of the gross income of the REIT must be derived from dividends, interest, rents, gains on the sale of securities and real property, and refunds of taxes on real property.

2. At least 75 percent of the gross income of the REIT must be derived from rents,

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[15]Sidney I. Roberts, Arthur A. Feder, and Herbert H. Alpert, "Congress Approves Real Estate Investment Trusts; Exacting Rules Made," The Journal of Taxation 13 (October 1960): 197.

[16]Schulkin, "Real Estate Investment Trusts," Financial Analysts Journal, 75.

[17]Kilpatrick, 1044.

[18]See sections 856-857 of the Internal Revenue Code of 1954 for complete details.

mortgage interest, gains from the sale of real estate, dividends from or gains on the sale of shares of other REITs, and refunds of taxes on real property.

3. Less than 30 percent of the gross income of the REIT may be derived from the sale of securities held less than 6 months or real property held less than 4 years.

4. At the end of each quarter 75 percent of the value of the REIT's total assets must consist of real estate (including mortgages), cash, cash items, and government securities.

5. The REIT must be a passive investor rather than an active participant in the operations of its properties. But the active manager of a REIT's properties can own up to 35 percent of its stock.

6. At least 100 persons must own shares, and five or fewer persons cannot own more than 50 percent of the shares during the last half of any tax year.

7. At least 90 percent of the REIT's ordinary income must be distributed to the shareholders within one year after the close of the taxable year.

Considerable confusion as to the correct interpretation of various terms and provisions of the new law abounded during the early months of the life of the Real Estate Investment Trust Act. Uncertainty existed as to what was meant by the term "real property," a phrase that obviously abounds throughout the three sections added to the Code[19] Other problems that were eventually clarified by detailed regulations included the separation of the trust and the independent contractor who was to manage the properties, determination of

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[19]Kilpatrick, 1053.

the correct measure of value to be used in meeting certain percentage requirements, and determination of how to allocate rent receipts between real and personal property.[20]

Although the Real Estate Investment Trust Act does run substantially parallel to sections 851-855 of the Code, those sections dealing with regulated investment companies, the treatment of REITs differs from the treatment of regulated investment companies in four ways. First, a corporation cannot qualify as a REIT. To qualify as a trust, the organization must be either an unincorporated trust or an unincorporated association.[21] Second, a REIT cannot hold property primarily for sale to customers in the ordinary course of its business. A third distinguishing feature of REITs compared to regulated investment companies is that the REIT must hire an independent contractor to handle the actual management of the properties in order to guarantee the passiveness of the trust's income.[22] Fourth, a REIT will lose its favored tax status if as much as 30 percent of its gross income comes from sales of securities held less than six months or from sales of real estate held less than four years. This fourth factor is designed to insure that the trust's income will be passive and primarily related to real

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[20]Paul E. Anderson, "Real Estate Trust Regulations Are Criticized at Hearings," The Journal of Taxation 14 (May 1961): 315.

[21]Roberts, Feder, and Alpert, 194.

[22]Kilpatrick, 1045-1046.

estate.[23] Regulated investment companies have similar but less stringent requirements on income sources.

Types of REITs

REITs are of three basic types -- equity, mortgage, and hybrid. As of December 1974, the end of the period this study covers, 25 percent of REITs were equity trusts, 32 percent were mortgage REITs, and 43 percent were hybrid REITs.[24] The activities of each of these types of REITs will now be covered.

Equity REITs

Virtually all of the REITs formed in the beginning stages of the industry were equity trusts because of general uncertainty as to what the new law meant by requiring REIT investments to be in real property.[25] The trustees of the REITs were certain that outright ownership of real estate fulfilled the Revenue Code requirements. As it became evident that mortgages secured by real property also met the Revenue Code requirements, movement away from the pure equity REIT began. Overall, until the late 1960s most REITs were small trusts involved with owning real property.[26] As of

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[23]Roberts, Feder, and Alpert, 195-196.

[24]This breakdown of REIT type is calculated from information contained in the Membership Directory 12-74 published by the National Association of Real Estate Investment Trusts.

[25]Kilpatrick, 1053.

[26]Peter A. Schulkin, "Real Estate Investment Trusts,"

December 1974, ownership of real property accounted for slightly more than 21 percent of all REIT investments.[27]

Although equity REITs own many different types of properties, the most commonly held are apartment buildings, shopping centers and office buildings. Warehouses, hotels, and motels are also popular REIT holdings.[28] A few trusts specialize in rather unique holdings such as Stadium Realty Trust's equity financing of the stadium for the Boston Patriots Football Club.[29] REITs can acquire ownership of a property in a variety of ways. Existing improved properties may be purchased outright. New properties can be acquired either by contracting for improvements on land the trust already owns or by investing in a joint venture with a developer. A final way that some REITs have acquired ownerhsip property, often only partially improved, is by foreclosure of a mortgage or by taking a deed in lieu of foreclosure.[30]

There are two provisions in the tax law affecting REITs that have particluar significance to equity trusts. First,

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Financial Analyst's Handbook, vol. 2 (ed. Sumner N. Levine; Homewood, Illinois: Dow Jones-Irwin, Inc., 1975), 659.

[27]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 18.

[28]Schulkin, "Real Estate Investment Trusts," Financial Analyst's Handbook, 699.

[29]Schulkin, "Real Estate Investment Trusts," Financial Analysts Journal, 35.

[30]National Association of Real Estate Investment Trusts, Inc., 1975 Fact Book, 18-19.

REITs are prohibited from holding property primarily for sale in the ordinary course of their business.[31] The requirement against acting as a dealer means that REITs cannot build properties and sell them shortly after completion as many real estate investors might. The result is that equity REITs must keep properties in their portfolios for a reasonable time before selling them for prudent portfolio management reasons.[32] The second tax law provision bearing directly upon the operation of equity REITs is the requirement that the trusts use independent contractors to manage the properties owned.[33] The equity REIT is hence forced to play the role of a passive investor or lose its favored tax status.

Mortgage REITs

Almost 79 percent of all REIT investments are comprised of mortgages of various sorts.[34] As of December 1974, there were 55 REITs which invested in nothing except mortgages secured by real estate.[35] The types of mortgage loans held by REITs are shown in Table 1.

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[31] Internal Revenue Code of 1954, Sec. 856 (a)(4)

[32] National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 21.

[33] Internal Revenue Code of 1954, Sec. 865 (d)(3).

[34] National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 18.

[35] This statement is based on information concerning investment objectives of the 173 members of the National Association of Real Estate Investment Trusts contained in the Association's Membership Directory 12-74.

TABLE 1

MORTGAGE LOANS HELD BY REITS
(December 1974)

Type of Mortgage Loan	Percentage of All Mortgages Held by REITs
first mortgage construction	49
first mortgage land	5
first mortgage development	15
first mortgage long-term	12
first mortgage short and intermediate-term (on completed properties)	10
junior	9
	100

SOURCE: National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 26.

As shown in Table 1, construction loans account for almost half of the mortgages held by REITs. Construction loans are obtained by developers to cover the majority of expenses incurred during the construction of a project. The typical developer does not operate with his own funds but rather borrows the money necessary to pay his contractors. A first lien on the land and improvements is given to the lender as security for the loan. REITs make interim construction loans on an assortment of properties, but they have tended to concentrate in residential properties. Table 2 gives a breakdown on the types of construction loans REITs held as of the end of the study period.

TABLE 2

TYPE OF REIT HELD CONSTRUCTION LOANS
(December 1974)

Type of Property	Percentage of All Construction Loans Held by REITs
mobil home parks	1
condominiums	35
single-family homes	8
apartments	22
office buildings	10
shopping centers	8
hotels and motels	7
other commercial	7
industrial	2
	100

SOURCE: National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 27.

First mortgage land loans made up the smallest category of mortgage loans held by REITs at year-end 1974. Most REITs shy away from holding mortgages on unimproved land, preferring instead the greater security of having improved real estate as collateral.

As shown in Table 1, first mortgage development loans were the second largest category of mortgage loans held by REITs during 1974. Development loans are obtained to finance the site improvements needed prior to the commencement of construction. The kinds of site improvements usually encountered are clearing and leveling the land, installing utilities, and building roads. Many of the development loans

that REITs have made involve single-family home tracts which require extensive and expensive development before any construction can take place. REITs usually make development loans on projects for which they intend to also make the construction loans.[36]

The fourth type of mortgage loans held by REITs are the long-term first mortgages. Most permanent REIT financing consists of conventional loans on income producing property, usually apartments. Original loan maturities of 15 to 30 years are common. REITs have been relatively inactive since the early 1970s in providing long-term mortgages because of the unfavorable spread between long-term mortgage rates and the cost of long-term funds for REITs.[37]

First mortgage short-and intermediate-term loans on completed properties accounted for one-tenth of all REIT held mortgages as of the end of 1974. These loans differ from the long-term mortgages in maturity and repayment procedures. Mortgages classified as short-and intermediate-term have maturities of ten years or less and do not require amortization as is usually the case with long-term mortgages. A developer will sometimes make use of short-or intermediate-term financing in one of two possible situations. First, the developer may want to operate the property for a few years to

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[36]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 27-28.

[37]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 28.

prove its worth so that permanent financing can be obtained on the most favorable terms possible, i.e., the developer can likely arrange better financing on a three year old 95 percent leased office building than on a new office building having only half its space leased. The second situation in which a developer might use short-or intermediate-term REIT financing occurs during periods of high long-term mortgage rates. A developer finishing a project at such a time may prefer to finance with a REIT for a few years, oftentimes with the REIT that provided the construction financing, until the long-term rates go down. When the long-term rates do decline the developer will obtain permanent financing and pay off the mortgage held by the REIT.[38]

Table 1 shows that as of the end of 1974 REITs were holding nine percent of all their mortgages in junior liens of one type or another. Because of the very high risk of junior mortgages most trusts are not at all interested in making them, but there are a few REITs which specialize in junior mortgages. One type of junior mortgage loan which REITs make are wraparound mortgages. Wraparound mortgages are used in connection with properties having existing senior mortgages which carry favorable interest rates. The wraparound mortgage is a junior lien covering the entire amount of borrowed money, but only the amount of the junior lien in excess of the previously existing mortgage is actually

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[38] National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 28.

advanced. The lender on the wraparound receives payments on the new, enlarged sum and continues the payments on the previously existing original loan. The main advantage to the borrower of using the wraparound technique is achieving a lower downpayment.[39]

Hybrid REITs

A hybrid REIT invests in both real estate equities and mortgages secured by real estate. Of the 173 member trusts of the National Association of Real Estate Investment Trusts in December 1974, 74 followed investment policies involving both equities and mortgages. In contrast, 44 REITs invested solely in equities and 55 made only mortgage investments.[40] Most of the more recently formed REITs have been of the hybrid variety, sometimes called combination REITs. Operating as a hybrid trust allows flexibility in selecting investments from the variety of equities and mortgages available which differ greatly in attractiveness from time to time.[41]

REIT Advisors

Since tax regulations require REITs to be passive

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[39]Sherman J. Maisel and Stephen E. Roulac, Real Estate Investment and Finance (New York: McGraw-Hill Book Company, 1976), 47-48.

[40]The investment policies followed by the various member REITs were obtained from data in the Association's Membership Directory 12-74.

[41]Schulkin, "Real Estate Investment Trusts," Financial Analyst's Handbook, 694-695.

investors, a trust usually hires an advisor to run the REIT's day-to-day operations concerned with managing the trust's investments. The advisor also frequently seeks new investment opportunities for the trust and presents the proposed investments to the REIT's trustees for a final decision. The trustees of a REIT are elected by the shareholders and generally function much the same as a corporate board of directors. Duties of the REIT's advisor will also likely include liability management for the trust. Liability management for a REIT would involve periodic public offerings and private placements of debt and equity securities and the more frequent management of commercial paper sales and bank borrowings.[42]

Most REITs have been organized by individuals or a group that upon creation of the trust served as advisor to the REIT.[43] The advisor is paid a fee that is based on the invested assets of the REIT. An annual fee of one percent to one and a half percent of invested assets is common; extra incentive compensation may be provided for if the trust exhibits extraordinary performance. Other than receiving a management fee the advisor may collect separate fees for acting as 1) underwriter on REIT security offerings, 2) broker in selling REIT owned properties, 3) insurance agent for REIT owned properties, and 4) appraiser for properties the REIT

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[42]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 7-8.

[43]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 8.

is considering buying or selling or lending money on.[44]

A REIT advisor may own shares in the trust. The tax law does, however, limit the ownership of the trust by the advisor to a maximum of 35 percent if the REIT is to keep its favored tax status.[45] In actuality most advisors do not have major share holdings in their REITs.[46]

REIT advisors have varied backgrounds. Almost 60 percent of all REIT assets as of December 1974 were managed by firms connected with commercial banks, life insurance companies, or real estate related firms such as mortgage companies or real estate brokerage firms. Advisors owned by commercial banks, bank holding companies or bank holding company subsidiaries managed nearly one-third of the industry's $21.2 billion assets at year-end 1974.[47]

Economic Importance

Real estate investment trusts provide professional real estate portfolio management to both large and small investors. REITs provide a vehicle for real estate investment for those lacking the expertise or funds to make real estate investments on their own.[48] Since the shares of most REITs

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[44]Lewis, 354.

[45]Internal Revenue Code of 1954, Sec. 856(d)(3)

[46]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 9.

[47]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 7-8.

[48]Benton E. Gup, Financial Intermediaries: An Introduction (Boston: Houghton Millfin Company, 1976), 204.

are either listed on one of the national stock exchanges or actively traded in the over-the-counter market, REIT investors enjoy a high degree of liquidity. The liquidity afforded REIT shareholders has aided the trusts in growing to a place of economic importance. Since 1961 REITs have provided the real estate sector of the economy with a new source of funds for owning and financing real property. As a result of REIT activities, employment and the construction of a variety of types of properties have increased.[49]

From 1961, the first year of the REIT industry, to 1974, the end of the period of this study, the assets of real estate investment trusts grew from $300 million to $21.2 billion. Most of the growth that resulted in REITs becoming a major financial institution occurred since 1970.[50] The majority of REIT assets are held by relatively large trusts. As of year-end 1974 some 15 percent of the REITs held over 53 percent of the industry's assets.[51] The asset structure will of course vary from trust to trust depending upon the type of REIT and therefore its investment objectives. Table 3 presents the balance sheet for the industry.

The economic impact of REIT investments is felt in

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[49]National Association of Real Estate Investment Trusts, Inc., 1974 REIT Fact Book (Washington, D. C.: National Association of Rerl Estate Investment Trusts, Inc., 1974), 16.

[50]National Association of Real Estate Investment Trusts, Inc., 1974 REIT Fact Book, 14.

[51]National Association of Real Estate Investment Trusts, Inc., 1974 REIT Fact Book, 12.

TABLE 3

REIT INDUSTRY BALANCE SHEET
(Year-end 1974)

Assets	(billions)	Liabilities	(billions)
First Mortgages:			
Land loans	$ .90	Commercial paper	$ .71
Development	2.34	Bank term loans and revolving credits in use	5.78
Construction	7.75	Bank lines in use	5.29
Completed properties:		Senior non-convertible debt	.38
0-10 yr. maturity	1.51	Subordinated non-convertible debt	1.01
10+ yr. maturity	1.95	Convertible debt	.68
Junior Mortgages:		Mortgages on property owned	1.65
Land, development & const.	.39	Other liabilities	.47
Completed properties	1.05	Shareholder's equity	5.20
Loan loss reserves	(.61)		
Land leasebacks	.54		$21.17
Property owned	3.72		
Cash and other assets	1.63		
	$21.17		

SOURCE: National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 37.

varying degrees across the country. Table 4 presents the geographic distribution of REIT investments. As shown in Table 4 over 52 percent of all REIT investments as of December 1974 were in the states of Florida, Texas, California, Georgia, New York, and Virginia. Five of these six states are southern or western states, reflecting the fact that REITs concentrate their investments in the faster growing parts of the country. REITs hold some investments in all 50 states, Washington, D. C., United States Territories, Canada, and other foreign countries, although as Table 4 shows, the investments in some areas are quite minimal.

The economic importance of REITs can be viewed from the perspective of dividends paid to shareholders. REITs paid 474 and 455 quarterly dividends totaling over $464 million and $412 million during the years 1972 and 1974. The greatest amounts were paid by REITs during 1973 when trusts paid 550 quarterly dividends totaling over $599 million in dividends to shareholders. The decline of REIT prosperity was readily reflected with the 1975 results when only 217 quarterly dividend payments totaling less than $139 million were made.[52] The dividends paid by REITs as a percentage of all corporate cash dividends paid during the years 1972 through 1975 are 1.7, 2.0, 1.3, and 0.4.[53]

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[52] "Dividends Paid by REITs," REIT Statistics (January 1976), 6.

[53] REIT dividends as a percentage of all corporate cash dividends were computed based on data found in REIT Statistics and the Federal Reserve Bulletin.

TABLE 4

GEOGRAPHIC DISBURSEMENT OF REIT INVESTMENTS
(December 1974)

Area	Amount (millions)	Percentage of Total REIT Investment
Florida	$ 3,538.4	18.16
Texas	2,042.5	10.48
California	1,929.9	9.90
Georgia	1,115.6	5.72
New York	915.8	4.70
Virginia	702.8	3.61
Maryland	624.7	3.21
Colorado	606.0	3.11
Illinois	592.5	3.04
Ohio	574.7	2.95
Pennsylvania	528.2	2.71
U.S. Territories	476.9	2.45
Louisiana	425.2	2.18
Michigan	420.9	2.16
North Carolina	417.5	2.14
Oklahoma	347.4	1.78
New Jersey	346.8	1.78
Arizona	303.6	1.56
Indiana	276.2	1.42
Massachusetts	274.7	1.41
Tennessee	220.1	1.13
Missouri	211.7	1.09
South Carolina	205.1	1.05
Nevada	202.2	1.04
Washington	185.9	.95
Alabama	176.5	.91
Minnesota	168.6	.87
Washington, D. C.	164.6	.84
Hawaii	153.6	.79
Kentucky	144.2	.74
Iowa	140.8	.72
Mississippi	139.1	.71
Utah	117.2	.60
Wisconsin	109.7	.56
Connecticut	108.8	.56
Kansas	84.3	.43
Oregon	71.1	.36
Delaware	64.2	.33
New Mexico	59.3	.30
Canada	57.5	.29
Arkansas	43.7	.22

TABLE 4 -- Continued

Area	Amount (millions)	Percent of Total REIT Investment
Nebraska	40.0	.21
West Virginia	27.6	.14
New Hampshire	24.1	.12
Idaho	20.8	.11
Foreign (other than Canada)	14.8	.08
Maine	13.1	.07
Alaska	12.4	.06
Vermont	12.4	.06
Rhode Island	11.6	.06
South Dakota	9.4	.05
Wyoming	7.4	.04
North Dakota	3.9	.02
Montana	1.8	.01
	$19,487.7	99.99*

*Does not add to 100 percent due to rounding

SOURCE: National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 5, 42-43.

A final area in which to view the economic significance of REITs is their activity in the primary securities market. During the years 1961 to 1974 inclusive, REITs tapped the capital market 383 times, raising a total of $6.652 billion with a wide variety of offerings. These figures do not reflect 61 private placements which raised $833 million for the trusts nor does the dollar amount include various best efforts offerings, but the amounts raised with best efforts offerings are relatively small.[54] The public offerings of

[54]"Listing of REIT Public Offerings and Private Placements, REIT Statistics (July 1975), 8-14.

REITs over the first 14 years of their existence were 2.6 percent of all publicly offered stocks and bonds during the same period. During 1971, however, when REITs raised a record $1.738 billion through the public sales of their securities they accounted for 4.6 percent of all publicly offered stocks and bonds for the year.[55]

Significance and Objectives of the Study

Recent studies concerning REIT performance have investigated the relationships between various performance measures and one or two independent variables such as leverage or dividend payout ratios.[56] These studies have been deficient primarily in the performance measures selected. The performance measures generally used have been void of any risk dimension. This study seeks to make further application of capital market theory to the study of REIT performance.

The principal objective of this study is to investigate the performance of REITs. One of the main questions to be answered concerns the ability of REITs to diversify their portfolio holdings. Given the legal constraints on assets eligible for REIT ownership, can REITs invest in a real estate

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[55]These calculations are based on data contained in various issues of REIT Statistics and the Federal Reserve Bulletin.

[56]See for example: Charles Henry Wurtzebach, "A Risk-Return Analysis of Real Estate Investment Trusts" (Ph.D. dissertation, University of Illinois, 1975) and David George Shulman, "Leverage, Dividends, and Rates of Return on Equity Real Estate Investment Trusts" (Ph.D. dissertation, University of California, Los Angeles, 1975).

related portfolio and achieve the risk reduction benefits associated with diversification? Diversification will provide risk reduction unless the combined assets are perfectly positively correlated.

A related area of investigation concerns the viability of REITs as an investment medium. Does the performance of REITs justify investor interest? Comparisons of REIT performance to various standards, all on a risk-adjusted basis, will be used as criteria for evaluating the viability of the trusts as an investment medium.

A further question to be studied involves identification of factors significantly affecting REIT performance. From among factors which past research and logic dictate to be important in influencing performance, which will be found significantly influencing the one-parameter, risk-adjusted performance measures? These one-parameter, risk adjusted performance measures derived from the capital asset pricing model are in sharp contradistinction to performance measures used in other studies. It is believed that the use of the aforementioned performance measures and a more complete set of explanatory variables than used in past studies will yield a better understanding of the interrelationships affecting REIT performance.

Hypotheses Tested

Hypotheses were tested in addressing each of the three major areas of this study. The null hypothesis used to examine the

ability of REITs to diversify was that the average correlation coefficient between returns on real estate investments available to REITs is not significantly less than +1.

Various hypotheses were tested to investigate the viability of REITs as an investment medium. First, null hypotheses were tested that no significant differences exist between the average performance of REITs and the market. The one-parameter performance measures of Treynor, Sharpe, and Jensen were used both for the REITs and the market. The second of the approaches used to ascertain the viability of REITs as an investment medium consisted of comparing theoretical and empirical capital market lines (CML). The null hypotheses tested were (1) no significant differences exist between the slopes of the theoretical and empirical CMLs and (2) no significant differences exist between the intercepts of the theoretical and empirical CMLs. The last approach used to examine the viability of REITs involved comparisons between a theoretical security market line (SML) and an empirical SML. The null hypotheses tested were (1) no significant differences exist between the slopes of the theoretical and empirical SMLs and (2) no significant differences exist between the intercepts of the theoretical and empirical SMLs.

In determining factors significantly related to the performance of REITs the null hypotheses tested were that no significant association exists between REIT performance

and the:

1. sponsorship of the trust
2. type of trust
3. size of the trust
4. extent of financial leverage employed
5. quality of the trust's investments, and
6. management fees paid to the trust's advisor

Limitations

This study is restricted because of certain limitations concerning the time periods investigated, the companies and REITs included in the samples, and the variables selected for analysis. The years 1972 and 1974, though important in terms of growth and stock market acceptance for the REIT industry, may not best reflect the structure of REIT performance. The samples used are restrictive in that ultimately they are determined by data availability.

A final limitation concerns the variables used. Performance measures other than the three one-parameter measures used are found in the literature. Though the ones selected have a sound theoretical foundation in the capital asset pricing model, other performance measures are possibly superior. As for the factors chosen as explanatory variables to explain REIT performance, the ones chosen are those which logic and previous research have shown to be important. The possibility remains, however, that factors not investigated could be significant in explaining REIT performance.

Organization of the Study

Chapter II contains four major sections. The first section reviews research that has been conducted on REITs. Next, the capital asset pricing model, which provides the theoretical underpinning for this study, is reviewed. The third part of the chapter reviews various aspects of diversification. The final section of Chapter II reviews performance measurement -- return measures, risk measures, and one-dimensional performance measures.

Details of the samples utilized, sources of data employed, and time periods studied are presented in Chapter III. The one-dimensional performance measures of Treynor, Sharpe, and Jensen that are used throughout much of the study are explained. The particulars of the various tests used to examine the three questions addressed by this study -- Can REITs diversify? Are REITs a viable investment medium? What factors contribute to REIT performance? -- are detailed in the remainder of the chapter.

Chapter IV presents and analyzes the results of the various tests discussed in the preceeding chapter.

The final chapter gives a brief summary of the paper and a statement of the conclusions reached as a result of the study. Recommendations for further study conclude Chapter V.

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature reviewed is divided into four major groupings. First, research conducted on REITs is reviewed. Next, the capital asset pricing model is briefly reviewed since it serves as the basis for the performance measures applied to REITs later in the paper. Third, various aspects of diversification are reviewed. Finally, performance measurement is viewed from the perspectives of return measures, risk measures, and one-dimensional performance measures.

Research Studies

This section of the chapter reviews ten studies that are representative of research conducted on REIT performance. A chronological presentation of the research articles is made in order to highlight the ever increasing sophistication of the research conducted.

Kahn

One of the early research studies on REITs was conducted by Sanford R. Kahn.[1] Although much of his work was descriptive

[1]Sanford R. Kahn, "An Evaluation of the Real Estate

Kahn did seek to provide some measures of REIT performance. Kahn used a sample of 21 trusts in conducting his study. Approximately half of all REITs which had registered security offerings with the SEC as of June 21, 1966 were included in the sample.[2]

Indexing the Dow-Jones Industrial Average (DJIA) at 100 beginning January 1962 and computing his own stock price average for real estate investment trusts, also indexing it at 100 beginning January 1962, Kahn determined that by the end of 1965 the DJIA had greatly outperformed the REIT average. The DJIA ended the period with an index value of almost 140; the computed REIT average ended the period with an index value of almost 98.[3]

In addition to measuring REIT performance by comparing REIT share price movements with the DJIA movements, Kahn made some intra-industry performance measures. Two types of data were examined for some indication of performance variations among REITs. Trusts were found, as of the end of 1965, to have price-earnings ratios ranging from 11 to 31. The more recently formed REITs tended to have the higher price/earning ratios.[4] Dividend yield was also used as a performance measure due to the high payout ratios required for the REITs to retain their favored tax environment. Dividend yields for

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Investment Trust" (Ph.D. dissertation, University of Cincinnati, 1967).

[2]Kahn, 65. [3]Kahn, 67-78. [4]Kahn, 71-72.

1965 ranged from three percent to eight and three-fourth percent, averaging almost six and one-fourth percent.[5]

Performance, as measured in various ways by Kahn, fails to explicitly take risk into account. Kahn's performance measures are all essentially return related. The nearest Kahn gets to discussing performance in risk-return terms is the computation of debt/equity, net income/gross assets, and net income/equity ratios for his sample REITs.[6]

Faulkner

Another work concerning REIT performance was undertaken by Phillip G. Faulkner.[7] Faulkner concentrated on equity return as his performance measure. Equity return was defined as cash flow divided by the equity investment.[8] Faulkner does acknowledge a risk-return philosophy but only illustrates the concept with an example of a subordinated ground lease having a 16 percent return compared to a relatively safe purchase-leaseback arrangement returning 7 percent.[9] Most of Faulkner's paper deals with an examination of various specific REIT investments in apartment complexes, office buildings, and shopping centers. Equity returns are found to average about 10 percent.[10]

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[5]Kahn, 72-73. [6]Kahn, 75-82.

[7]Phillip G. Faulkner, "REITs - Equity Returns in a Fish Bowl," The Appraisal Journal 38 (October 1970): 485-494.

[8]Faulkner, 486. [9]Faulkner, 487. [10]Faulkner, 487-491.

Hines

Mary Alice Hines produced one of the first works to apply any meaningful statistical analysis to the investigation of REIT performance.[11] Hines relied on dividend yield as her performance measure, thus the literature at this time was still one-dimensional in viewing performance. Explicit treatment of risk was missing. Hines did discuss the riskiness of REITs in terms of their holdings of second mortgages and the management fees they incurred, but nothing is found concerning risk in relation to either market return or variability of REIT return.[12]

Superior performance was found by Hines for her sample of mortgage REITs during the years 1970 and 1971. The trusts showed greater price appreciation and larger dividend yields for the period than the stocks on Standard & Poor's 500 Composite Index.[13]

The statistical part of the paper consisted of two uses of regression analysis. First, stepwise regression was used and five variables were found to be highly correlated with dividend yield for the sample REITs: (1) book value to market value, (2) short-term bank loans to total liabilities and net worth, (3) short-term bank loans to total debt, (4) interest expense to interest income, and (5) interest

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[11]Mary Alice Hines, "Risk, Yields, Capitalization, and Management Fees of Mortgage Trusts," The Appraisal Journal 41 (October 1973): 484-503.

[12]Hines, 498-502. [13]Hines, 491-493.

income to total assets.[14] Simple linear regressions were next run between leverage and share price and then between leverage and earnings per share. No significant relationships were found between leverage and either share price or earnings per share. The findings concerning leverage are weakened because the sample used consisted of a mere eight trusts, all that provided the needed data.[15]

Hinson

Dolan Ray Hinson investigated REITs to determine whether the rates of return differ among equity, mortgage, and hybrid trusts. He also addressed the secondary question of whether or not returns earned by REITs differ between trusts sponsored by financial institutions and those with independent sponsors. Hinson's study covered 125 trusts from 1970 through the first quarter of 1973.[16] Three different measures of performance were used: (1) operating net cash flow as a percentage of average total assets, (2) net cash flow as a percentage of average equity, and (3) net profit as a percentage of average equity.[17] All of the performance measures used by Hinson were return oriented and lacking in any specific recognition of risk. Using all three of the

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[14]Hines, 494-495.

[15]Hines, 502-503.

[16]Dolan Ray Hinson, "Comparisons of Performance Among Equity, Combination, and Mortgage Real Estate Investment Trusts" (Ph.D. dissertation, University of South Carolina, 1973), 1-2.

[17]Hinson, 42-43.

above mentioned performance measures, no significant difference in performance among equity, mortgage, and hybrid trust was found.[18] Likewise, Hinson's study detected no significant difference in performance between independent and institutionally affiliated REITs.[19]

Keintz

The efforts of Richard J. Keintz in a study of life insurance company sponsored trusts did not advance the techniques employed to evaluate REIT performance.[20] Keintz compared REIT share prices to the DJIA as an indication of performance. The REITs were found to have outperformed the DJIA during 1970 and 1971 and to have underperformed the DJIA during 1972 and 1973. Further, the trusts sponsored by life insurance companies generally outperformed other REITs.[21]

Elebash

Cross-sectional multiple regression analysis was employed by Clarence C. Elebash in his investigation of the performance of construction and development real estate investment trusts.[22] The study was based on a sample of 36

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[18]Hinson, 74. [19]Hinson, 83.

[20]Richard J. Keintz, "An Analysis of the Impact of Real Estate Investment Trusts Formed by Life Insurance Companies" (Ph.D. dissertation, The University of Wisconsin, 1974).

[21]Keintz, 175-177

[22]Clarence C. Elebash, "Construction and Development Real Estate Investment Trusts and the Influence of Sponsorship" (D.B.A. dissertation, The Florida State University, 1975), 92.

construction and development REITs; the time periods covered were the second and fourth quarters of 1972 and 1973.[23]

Three different performance measures are used as dependent variables in the regression runs: (1) return on capital, (2) the ratio of market price to book value, and (3) the yield on market value. All of the performance measures Elebash used were void of any recognition of risk. They were simply various return measures. The independent variables consisted of five internal financial variables and a dummy variable to represent trust sponsorship. The financial variables were: (1) short-term investments as a percentage of total assets, (2) leverage, (3) return on portfolio, (4) interest expense as a percent of debt, and (5) total assets.[24] Dummy variables were used in classifying the REIT sponsors as commercial banks, mortgage bankers, life insurance companies, or independents.[25] Return on portfolio, leverage, total assets, and sponsorship were found to be significant in explaining REIT performance as measured by Elebash.[26]

Shulman

Equity REITs were the subject of a study by David George Shulman. He studied a split sample of nine trusts from December 31, 1963 to December 31, 1974 and added seven more trusts for investigation from December 31, 1970 to

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[23]Elebash, 73-74. [24]Elebash, 110. [25]Elebash, 90. [26]Elebash, 127.

December 31, 1974.[27] The study uses as performance measures the risk-adjusted performance measures of Treynor and Jensen, computed based upon quarterly returns.[28] Comparisons of performance measures of the equity REITs, a sample of 15 closed-end investment companies, and Standard & Poor's 500 Composite Stock Index indicate that equity REITs fared about the same as closed-end investment companies and performed almost consistently worse than the market as a whole.[29] No statistical tests of significance, however, are conducted by Shulman to verify the comparative performances. Evidence was found that the portfolios of equity REITs were not well diversified.[30] Finally, the risk-adjusted returns of the trusts were not significantly related to either leverage or dividend payout ratio.[31]

Wurtzebach

One of the best efforts to date in using a risk-adjusted measure for REITs has been the research of Charles H. Wurtzebach.[32] Wurtzebach studied 39 trusts from the third quarter 1970 through the fourth quarter 1973. Hypotheses tested were: (1) leverage has a significant impact on REIT return, (2) REIT

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[27]David George Shulman, "Leverage, Dividends and Rates of Return on Equity Real Estate Investment Trusts" (Ph.D. dissertation, University of California, Los Angeles, 1975), 53.

[28]Shulman, 53-59. [29]Shulman, 77-79. [30]Shulman, 71.

[31]Shulman, 104.

[32]Charles H. Wurtzebach, "A Risk-Return Analysis of Real Estate Investment Trusts" (Ph.D. dissertation, University of Illinois at Urbana-Champaign, 1975).

return is cyclical in nature, and (3) risk and return are positively related for REITs.[33]

Wurtzebach used six different return measures. They were: (1) quarterly holding period returns, (2) geometric mean of the quarterly holding period returns, (3) quarterly holding period returns after deducting any return of capital from the total distribution, (4) geometric mean of the quarterly holding period returns after deducting any return of capital from the total distribution, (5) quarterly dividend yields and (6) geometric mean of quarterly dividend yields.[34] Two measures of risk were used, the standard deviation of return and the beta coefficient.[35] Although the exact risk-return relationships varied depending on the risk measure used, no statistically significant relationships were found between risk and return for REIT shareholders. Risk-return relationships were found not altered appreciably by using the various return measures.[36]

A time series multiple regression analysis was employed to determine the functional relationship between return and a group of independent variables consisting of real gross national product, Treasury bill yields, leverage as measured by the debt-to-equity ratio, and standard deviation of return. For the entire sample real gross national product and Treasury

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[33]Wurtzebach, 20-22. [34]Wurtzebach, 49-53.

[35]Wurtzebach, 53-56. [36]Wurtzebach, 98-101.

bill yields were found to be significantly, negatively related to return, thereby supporting the hypothesis that REIT returns are countercyclical in nature. Leverage and standard deviation were not statistically significant in relation to return.[37] Notice that Wurtzebach used return as his dependent variable; like Elebash and others he did not combine risk and return into a single performance measure. Wurtzebach did use one-parameter performance measures derived from the capital asset pricing model, namely Treynor's and Sharpe's performance indexes, to rank the performance of the REITs in his sample. The rankings by the two indexes yielded very similar results. The rankings of trust performance also provided evidence that hybrid trusts outperformed both equity and mortgage trusts and that mortgage trusts outperformed equity trusts.[38]

Valachi

A more recent writing on REIT performance attempts to predict performance in the gross sense of success or failure. Donald J. Valachi used discriminant analysis on a paired sample of fifteen failed and fifteen non-failed REITs to see if financial ratios could be used in predicting trust failure. Failure was defined as entrance into: (1) a bankruptcy proceeding, (2) technical insolvency, or (3) an explicit agreement with creditors to reduce outstanding debt or interest on that debt. Findings of the study indicate that a discriminant function based on financial data drawn primarily from REIT

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[37]Wurtzebach, 109-114. [38]Wurtzebach, 116-117.

annual statements can reliably discriminate failed from non-failed REITs up to two annual reporting periods prior to the failure. Valachi's research effort is consistent with those previously mentioned in avoiding a combination risk and return performance measure.[39]

Cooley

The relationship between the use of debt and the performance of mortgage REITs was the subject of a study by Clyde Jensen Cooley.[40] Cooley examined 37 mortgage REITs from 1971 through 1975. Only those trusts with assets exceeding $10 million were included in the sample.[41] Jensen's one-dimensional performance measure was regressed against debt/equity ratios for the sample trust.[43] The regressions found significant and inverse association between Jensen's performance measure and mortgage REIT's use of debt.[43] Based on average return, with no consideration of the risk component of performance, the sample of 37 mortgage REITs experienced substantially poorer performance than the market, as proxied by the Standard & Poor's 500 Composite Stock

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[39]Donald J. Valachi, "A Discriminant Analysis of Financial Ratios as Predictors of Real Estate Investment Trust Failure," Dissertation Abstracts International-A 37 (Sepbember 1976): 1972.

[40]Clyde Jensen Cooley, "The Impact of Debt on Mortgage Real Estate Investment Trust Shareholder Returns" (Ph.D. dissertation, University of Utah, 1977), 12.

[41]Cooley, 123-124. [42]Cooley, 191. [43]Cooley, 196-199.

Index.[44] The study produced evidence that mortgage REITs do not hold well diversified portfolios.[45] The mortgage trusts studied consistently had negative values for Jensen's performance measure, thus showing that the shareholders were receiving returns lower than the rational investor would expect to earn in an efficient market, given the level of risk incurred.[46]

The Capital Asset Pricing Model

The previously reviewed research studies on REITs have shown that performance has typically been measured by some return surrogate. A basic postulate underlying finance theory is that assets of the same risk level should have the same expected rate of return. An explicit statement of the relationship between risk and return is available from the capital asset pricing model (CAPM). The next three sections of the paper will briefly review the assumptions incurred in the derivation of the model, a statement of the CAPM, and tests conducted on the model.

Assumptions of the CAPM

As with any model, a number of simplifying assumptions are necessary for the development of the CAPM. The assumptions involve certain generalizations concerning investor behavior and conditions existing in the capital markets. The following

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[44]Cooley, 158. [45]Cooley, 137-139.

[46]Cooley, 137-139.

assumptions allow derivation of the CAPM:[47]

(1) All investors are single period expected utility of terminal wealth maximizers who choose among alternative portfolios on the basis of mean and variance (or standard deviation) of return. (Note: representing preferences in terms of mean and standard deviation yields identical results to those obtained in a mean-variance representation.)

(2) All investors can borrow or lend an unlimited amount at an exogenously given risk-free rate of interest and there are no restrictions on short sales of any asset.

(3) All investors have identical subjective estimates of the means, variances, and covariances of return among all assets.

(4) All assets are perfectly divisible and perfectly liquid (i.e., all assets are marketable, and there are no transaction costs).

(5) There are no taxes.

(6) All investors are price takers.

(7) The quantities of all assets are given.

Statement of the CAPM

William F. Sharpe developed the CAPM in his classic article "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk."[48] Sharpe's CAPM relates the

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[47]Michael C. Jensen, "The Foundations and Current State of Capital Market Theory," Studies in the Theory of Capital Markets (ed. Michael C. Jensen; New York: Praeger Publisher, Inc., 1972), 5.

[48]William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," The Journal of Finance 19 (September 1964): 425-442.

expected return on any asset or combination of assets to the riskless rate of return and the expected market return:

$$E(R_i) = R_f + \beta_i\{E(R_m) - R_f\}.$$

The model states that the relationship between return and risk should be linear. Although the CAPM was derived on an ex ante basis, the model is readily converted to an ex post form for use in measuring realized risk-return relationships.[49]

Tests of the CAPM

A model as simple as the CAPM which tries to depict something as complicated as security returns is not likely to be found to be an exact representation of real world happenings. Such is certainly the case with the CAPM. Various tests of the model have been conducted and the consensus is that systematic risk and realized return are positively related, although perhaps not exactly as the CAPM specifies.

Two of the earlier tests of the model were conducted on individual securities. Jacob used both monthly and annual returns for 593 New York Stock Exchange stocks covering two ten year periods from 1946 through 1955 and 1956 through 1965 to test the relationship between realized return and systematic risk. A statistically significant positive relationship was found. The observed relationship was not, however, as strong

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[49]Franco Modigliani and Gerald A. Pogue, "An Introduction to Risk and Return." Financial Analysts Journal 30 (May-June 1974): 77.

as predicted by the CAPM.[50] Miller and Scholes studied 631 stocks from 1954 through 1963 to determine the relationship between realized annual returns and systematic risk. Although the interpretation of results was complicated by multicollinearity among the independent variables, the general observation was that stocks with high systematic risk tend to have high rates of return. This positive relationship is expressed in the CAPM.[51]

The Jacob and Miller and Scholes tests of the model are inefficient. There are two problems with testing the CAPM using individual securities. First, since betas of individual securities are typically measured with some error, some are overestimated and some are underestimated, the measurement errors tend to weaken the relationship between risk and return. Second, much of the variation in security return is random, i.e., unsystematic risk. The CAPM seeks to relate return with systematic risk only.[52]

To alleviate the two problems mentioned, some tests of the model have been conducted using portfolios of securities

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[50]Nancy Jacob, "The Measurement of Systematic Risk for Securities and Portfolios: Some Empirical Results," Journal of Financial and Quantitative Analysis 6 (March 1971): 815-834.

[51]Merton H. Miller and Myron S. Scholes, "Rates of Returns in Relation to Risk: A Re-examination of Some Recent Findings," Studies in the Theory of Capital Markets (ed. Michael C. Jensen; New York: Praeger Publishers, Inc., 1972), 47-78.

[52]Modigliani and Pogue, 80.

rather than individual securities. Black, Jensen, and Scholes grouped all New York Stock Exchange stocks into ten portfolios for each year during a 35 year period from 1931 through 1965. The relationship between monthly return and portfolio beta was computed for the 35 year period and for many subperiods. The work by Black, Jensen, and Scholes provides substantial support for realized return being a linear function of systematic risk, although once again the returns were less than those indicated by the CAPM.[53] Blume and Friend used monthly returns for portfolios covering three time periods during 1955 through 1968 to test the CAPM. They concluded that the linear model is a tenable approximation of the relationship between risk and return for New York Stock Exchange stocks during the period of their study.[54] In their test of the CAPM, Fama and MacBeth included a specific term to test for nonlinearities in the risk-return relationship. Although not exactly as specified by the model, Fama and MacBeth found a linear association between realized portfolio return and systematic risk.[55]

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[53]Fisher Black, Michael C. Jensen, and Myron Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," Studies in the Theory of Capital Markets (ed. Michael C. Jensen: New York: Praeger Publishers, Inc., 1972), 79-121.

[54]Marshall E. Blume and Irwin Friend, "A New Look at the Capital Asset Pricing Model," The Journal of Finance 28 (March 1973: 19-33.

[55]See Modigliani and Pogue page 82 for a brief summary of Eugene F. Fama and James D. MacBeth, "Risk, Return, and Equilibrium: Empirical Tests." Unpublished Working Paper No. 7237, University of Chicago, Graduate School of Business, August, 1972.

Diversification

The fact that investors diversify their investment holdings is a generally observable phenomenon. A reasonable assumption, therefore, is that investors are maximizing their utility when they diversify. As will be discussed, diversification is beneficial in that it almost always reduces the risk of the portfolio. The next two sections discuss naive diversification and Markowitz diversification.

Naive Diversification

Naive diversification can be defined as "not putting all of your eggs in one basket."[56] The benefits of naive diversification come about as a result of averaging out the unsystematic risk components of the individual stocks, leaving only systematic or market risk.[57] No attention is paid to the covariance of returns between securities. The implication of naive diversification is that the investor should own many different securities in order to reduce portfolio risk. Naive diversification often leads to excessive or superfluous diversification which can actually increase portfolio risk rather than reduce it.[58]

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[56]Jack Clark Francis and Stephen H. Archer, Portfolio Analysis (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971), 154.

[57]John Lintner, "Security Prices, Risk, and Maximal Gains from Diversification," The Journal of Finance 20 (December 1965): 589.

[58]Francis and Archer, 164-165.

The question is then raised as to how many securities are needed to achieve the benefits of naive diversification. In a study of firms listed on the New York Stock Exchange, Evans and Archer found the relationship between portfolio risk and the number of randomly selected securities in the portfolio to be as indicated in Figure 1. As shown in Figure 1, a portfolio consisting of as few as 8 securities will have eliminated almost all of the risk that can be eliminated, i.e., -- risk is brought down near the systematic level. The opportunity to reduce the dispersion of portfolio returns by increasing the size of the portfolio is rapidly exhausted.[59]

Markowitz Diversification

In his pioneering work in 1952 Markowitz provides a theoretical justification for diversification.[60] The E-V hypothesis of Markowitz implies avoiding investing in securities with high covariances among themselves in order to reduce the portfolio's risk without sacrificing any of its return.[61] The lower the correlation between expected returns of the securities in the portfolio, the less risky the portfolio will be. Figure 2 graphically depicts the relationship

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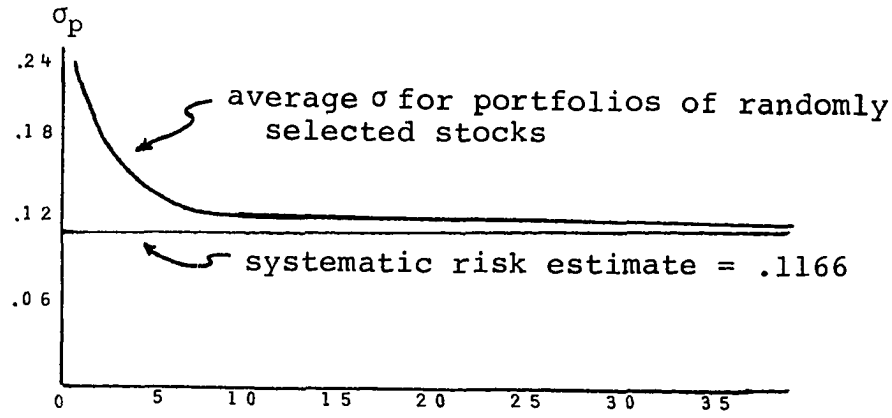
[59]Lawrence Fisher and James H. Lorie, "Some Studies on Variability of Returns on Investments in Common Stocks," Journal of Business 43 (April 1970): 117.

[60]Harry Markowitz, "Portfolio Selection," The Journal of Finance 7 (March 1952): 77.

[61]Markowitz, "Portfolio Selection," 89.

FIGURE 1

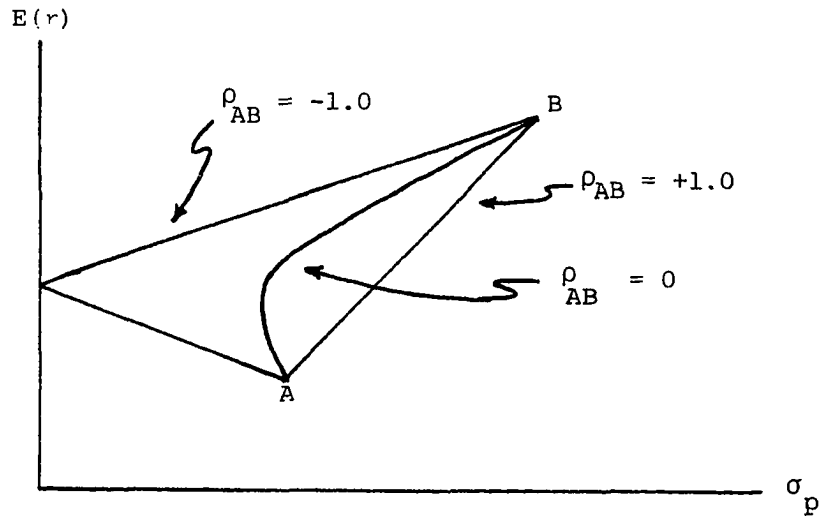
NAIVE DIVERSIFICATION AND RISK REDUCTION



SOURCE: John L. Evans and Stephen H. Archer, "Diversification and the Reduction of Dispersion: An Empirical Analysis," The Journal of Finance 23 (December 1968), 765.

FIGURE 2

THE EFFECTS OF MARKOWITZ DIVERSIFICATION

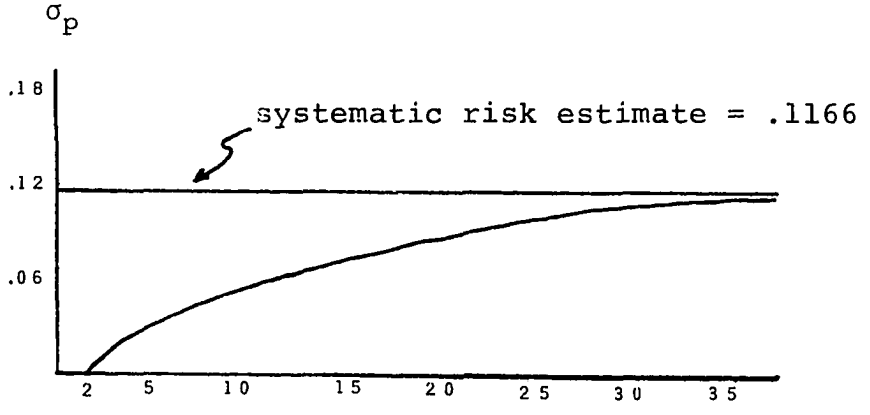


SOURCE: Jack Clark Francis and Stephen H. Archer, Portfolio Analysis (Englewood Cliffs, New Jersey: Prentice-Hall, inc., 1971), 25.

between the correlation of expected return and portfolio risk. As shown in Figure 2, Markowitz diversification allows for the total elimination of risk if the portfolio consists of two perfectly negatively correlated securities. Two such securities are rarely, if ever, found. As additional securities are added to the portfolio it becomes more and more difficult to maintain the low correlations between all possible pair combinations. The result, as shown in Figure 3, is that although Markowitz diversification can reduce portfolio risk below the systematic level, the portfolio risk will approach the systematic level as securities are added to the portfolio because of the scarcity of securities which covary inversely with each other.

FIGURE 3

LIMITS OF MARKOWITZ DIVERSIFICATION



SOURCE: Jack Clark Francis and Stephen H.Archer. Portfolio Analysis (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1971,), 157.

Performance Measurement

Proper measurement of an investment's performance will include two dimensions -- rate of return and risk.[62] The general shortcoming of previous research on REIT performance has been viewing performance only from a return perspective. The next two sections of the paper briefly review various methods available for measuring returns on and risk of security investments. The last section reviews one-parameter performance measures that incorporate return and risk information about the investment.

Rate of Return

A rate of return measure for an investment should reflect the total benefits derived from ownership of the asset over a specified time period. Total benefits obtained from owning a share of common stock during any period consist of capital appreciation or depreciation plus any dividends received during the period. The computation of a proper return measure and the appropriate measure of central tendency for this return measure will now be discussed

Holding-period return

A holding-period return (HPR) can be calculated for any asset. In general terms the HPR is:

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[62]Eugene F. Fama, "Risk and the Evaluation of Pension Fund Portfolio Performance," Modern Developments in Investment Management (ed. James Lorie and Richard Brealey; New York: Preager Publishers, Inc., 1972), 469.

$$r_t = \frac{\text{capital gain or loss + current income resulting from ownership}}{\text{purchase price}}$$

In more specific terms relating to common stock, the HPR formulation would be[63]

$$r_t = \frac{p_{t+1} - p_t + d_t}{p_t}$$

where:

r_t = HPR for the share during period t

p_{t+1} = price for the share at the end of period t

p_t = price of the share at the beginning of period t

d_t = cash dividends received on the share during period t

By combining price change and income yield into a single measure, the HPR formulation ignores any difference between capital gains and dividends. Obviously, for tax reasons, the difference may be of considerable importance for some investors.[64] The HPR is also sensitive to the time period selected. Some would call the above described HPR a holding period yield (HPY) and suggest that a proper HPR would equal HPY + 1.[65] The advantage of using a HPR that

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[63]Jack Clark Francis, Investments: Analysis and Management, 2nd ed. (New York: McGraw-Hill Book Company, 1976), 19-21.

[64]Henry A. Latane´ and Donald L. Tuttle, Security Analysis and Portfolio Management (New York: The Ronald Press Company, 1970), 62-63.

[65]Donald E. Fischer and Ronald J. Jordan, Security Analysis and Portfolio Management (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1975), 90-92.

equals HPY + 1 is in dealing with negative yields. This paper uses the first formulation as its HPR. Negative returns, when encountered, can be handled through proper procedures.

Arithmetic mean of HPRs

Investors sometimes desire to make use of an average of successive HPRs. The arithmetic mean is one method of obtaining a measure of central tendency of HPRs. Cootner favors an arithmetic mean due primarily to downward bias in the geometric mean.[66]

The arithmetic mean of multiperiod HPRs can be, however, very misleading. Suppose a share of stock XYZ is purchased at $100, rises to $200 at the end of the first period, and falls back to $100 at the end of the second period when the share is sold. The returns are 100 percent and negative 50 percent for the first and second periods respectively. The arithmetic mean of the HPRs is 25 percent:

$$\frac{100\% + (-50\%)}{2} = 25\%$$

The share purchased at $100 and sold two periods later at $100 obviously did not earn an average of 25 percent; it clearly earned a zero return.[67]

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[66]Paul H. Cootner, "Stock Market Indexes-Fallacies and Illusions," The Commercial and Financial Chronicle 204 (September 29, 1966): 18-19.

[67]Francis, 683-684.

Geometric mean of HPRs

The geometric mean of successive HPRs provides the true average rate of return over multiple periods. The geometric mean is the average compound rate of return. Computation of the geometric mean is:[68]

$$\bar{r}_g = \{\prod_{t=1}^{n} (1+r_t)\}^{1/n} - 1$$

where $\bar{r}_g$ = geometric mean

r_t = HPR for period t

n = number of holding periods

Using the above example, the geometric mean is found to be zero.

The geometric mean of HPRs is the measure of central tendency used in this paper. The arithmetic mean is only an approximation of the true multiperiod rate of return. As the variance of the HPRs decreases, the approximation becomes closer. Specifically the approximation is:[69]

$$\bar{r} \simeq \{\bar{r}_g^{\,2} + \text{var(HPR)}\}^{1/2}$$

where $\bar{r}$ = arithmetic mean

$\bar{r}_g$ = geometric mean

var (HPR) = variance of PHRs

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[68] Francis, 685.

[69] William E. Young and Robert H. Trent, "Geometric Mean Approximations of Individual Security and Portfolio Performance," Journal of Financial and Quantitative Analysis 4 (June 1969): 184.

Risk

Risk is the factor often left out of performance measurement. As long as the market pays a premium for risk bearing, one should take account of risk in any evaluation of performance. In general, risk is measured by fluctuations of the investment's returns. The more unstable the returns are, the greater is the risk and the less desirable is the investment due to investors' opposition to risk and the accompanying uncertainty. Finance theory usually assumes investors to be risk averse. This section of the paper looks at the division of total risk into systematic and residual components and reviews various risk surrogates.

Systematic and unsystematic risk

Total risk, or total variability of return, of an asset can be split into two components: (1) that part which remains even when the asset is included in a naively selected efficient portfolio and (2) that part which can be eliminated when the asset is included in a naively selected efficient portfolio.[70] The part that remains is called systematic or undiversifiable risk. The part that can be eliminated is called unsystematic, diversifiable, or residual risk. The breakdown of total risk into systematic and unsystematic components was first discussed by Sharpe.[71] Sharpe seeks to show that a

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[70]Fama, "Risk and the Evaluation of Pension Fund Portfolio Performance," 484.

[71]Sharpe, "Capital Asset Prices," 425-442.

consistent relationship exists between expected returns and systematic risk.[72] Using systematic risk as his risk surrogate, Sharpe lays the foundation for the CAPM.

Systematic risk is caused by factors which simultaneously affect the returns of all assets being considered. Changes in the economic, political, and sociological environment can give rise to systematic risk. Unsystematic risk is the part of total risk that is unique to the particular asset. Labor strikes, management errors, inventions, and advertising campaigns are examples of factors that can cause unsystematic risk.[73]

Various risk surrogates

Although the inclusion of risk with return as a proper component of performance measurement is well accepted, there remains the problem of measuring risk. Fortunately there is some evidence that correlations among different measures of variability of return are very high.[74] Various means of risk quantification are now reviewed.

Standard deviation

The standard deviation of HPRs is a very logical and often used risk measure. The popularity of the standard

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[72]Sharpe, "Capital Asset Prices," 436.

[73]Francis, 316-318.

[74]James H. Lorie and Mary T. Hamilton, The Stock Market: Theories and Evidence (Homewood, Illinois: Richard D. Irwin, Inc., 1973), 241.

deviation (or its square, the variance) as a risk measure is no doubt due in large part to its early use by Markowitz.[75] Uncertainty, and hence risk, is greater the more returns fluctuate. Variations of HPRs about their mean are measured by the standard deviation. Standard deviation is a measure of total variability of return, i.e., the standard deviation includes both systematic and unsystematic risk.

A criticism of the standard deviation as a risk measure is that it is statistically inappropriate. Implicit in the use of the standard deviation of expected return as a risk measure is that the future HPRs will be normally distributed.[76] Usually HPRs are assumed to be normally or lognormally distributed. This assumption is justified by the central limit theorem.[77] Fama has found that HPRs do not follow a normal distribution but rather conform to a stable Paretian distribution. A stable Paretian distribution has an infinite variance.[78] The problem of using the standard deviation is obvious if there is an infinite variance. Standard deviation is still considered to be an appropriate risk measure, however, because the distributions of HPRs do not differ greatly from normality.[79]

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[75]Markowitz, "Portfolio Selection," 77-91.

[76]Latane´ and Tuttle, 598.

[77]Eugene F. Fama, "Mandelbrot and the Stable Paretian Hypothesis," Journal of Business 36 (October 1963): 428.

[78]Fama, "Mandlebrot and the Stable Paretian Hypothesis, 425.

[79]Latane´ and Tuttle, 605.

Beta coefficient

The beta coefficient is a risk measure that has received much attention since Sharpe's 1964 introduction of systematic risk. Beta is the measure of systematic risk.[80] Blume has provided a brief summary of the rationale for using the beta coefficient of the CAPM as a risk measure.[81] The CAPM uses beta as the relevant risk measure for any asset or portfolio, efficient or not.[82] Because unsystematic risk can be eliminated through diversification, an investor will only be compensated for the systematic risk he undertakes.[83] Systematic risk is inherent and unavoidable in the market.

A least-squares regression in which an asset's HPRs are the dependent variables and the market's HPRs are the independent variables yields a line called a characteristic line. The slope of an asset's characteristic line is its beta coefficient.[84]

Mean absolute deviation

Like the standard deviation, the mean absolute deviation is a measure of total variability, i.e., total risk. The

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[80]Sharpe, "Capital Asset Prices," 439.

[81]Marshall E. Blume, "On the Assessment of Risk," The Journal of Finance 26 (March 1971): 1-4.

[82]Lorie and Hamilton, 201.

[83]John L. Evans and Stephen H. Archer, "Diversification and the Reduction of Dispersion: An Empirical Analysis," The Journal of Finance 23 (December 1968): 761-767.

[84]Francis, 331.

Bank Administration Institute recommended the use of the mean absolute deviation as a risk measure in a study on measuring the investment performance of pension funds.[85] As a measure of total risk, the mean absolute deviation offers the advantage of being more stable through time and therefore a more reliable estimate of risk than the standard deviation.[86] Another important advantage of the mean absolute deviation is that the measure is less affected by extreme values than the standard deviation.[87]

Modified quadratic mean

While acknowledging the standard deviation as a widely used risk measure in performance measurement, Levy alleges the risk surrogate has three major weaknesses. First, Levy claims the standard deviation measures absolute rather than relative dispersion. Second, the standard deviation is computed using the arithmetic mean as the measure of central tendency; Levy asserts that the geometric mean is the proper measure of central tendency. Third, and the most serious defect of the standard deviation according to Levy, the standard deviation considers all variability of return adverse when in fact the investor only suffers when he experiences

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[85]Fama, "Risk and the Evaluation of Pension Fund Portfolio Performance," 477.

[86]Lorie and Hamilton, 235.

[87]William A. Spurr and Charles P. Bonini, Statistical Analysis for Business Decisions (Homewood, Illinois: Richard D. Irwin, Inc., 1973), 84.

downside variability.[88]

For a risk measure that will be free of the suggested defects of the standard deviation, Levy uses a modification of the quadratic mean of the logarithms of sub-period relatives. The modification suggested is that all logarithms greater than zero are considered zero.[89] By considering all logarithms greater than zero as zero, Levy proposes that he has a risk measure for downside vulnerability rather than total variability.[90]

Semi-variance

Although Markowitz develops his efficient set of portfolios using variance as the risk measure, he also considers semi-variance as a possible risk surrogate.[91] Semi-variance measures variability in one direction, usually from the mean downward.

Markowitz states that an analysis based on semi-variance tends to produce better portfolios than those based on the variance. This advantage is because an analysis based on semi-variance seeks to eliminate low returns whereas an

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[88]Robert A. Levy, "Measurement of Investment Performance," Journal of Financial and Quantitative Analysis 3(March 1968): 43-45.

[89]Levy, "Measurement of Investment Performance," 45-46.

[90]Levy, "Measurement of Investment Performance," 51.

[91]Harry Markowitz, Portfolio Selection (New York: John Wiley & Sons, Inc., 1959), 188.

analysis based on variance seeks to eliminate returns that deviate from the mean on both the high and low sides. Considering advantages of using variance such as its greater convenience and familiarity, Markowitz recommends an analysis based on variance. Use of semi-variance is relegated to use as a secondary risk measure.[93]

One-Dimensional Performance Measures

The evaluation of an asset by the two dimensions of risk and return is not new. Markowitz developed the efficient frontier in risk-return space.[94] Assets on the efficient frontier are preferred to all assets not on the efficient frontier. Without developing the theory farther, however, selection of a preferred asset lying on the efficient frontier is dependent solely on the investor's attitude toward risk. Capital market theory has provided a basis for the combining of risk and return attributes of an asset into one-dimensional performance measures that allow an evaluation of an asset for any investor. Various one-dimensional performance measures found in the literature are now reviewed in chronological order.

Treynor's reward-to-volatility ratio

The first published one-dimensional performance measure

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[93]Markowitz, Portfolio Selection, 193-194

[94]Markowitz, "Portfolio Selection," 82.

was developed by Jack L. Treynor.[95] Treynor's performance measure is

$$T_i = \frac{\bar{r}_i - \bar{r}_f}{b_i}$$

where T_i = Treynor's performance measure for asset i

$\bar{r}_i$ = the average return on asset i

$\bar{r}_f$ = the average risk-free interest rate

b_i = the beta coefficient of asset i

The performance measure is nothing more than a ratio in which the numerator reflects the excess return earned by the asset and the denominator reflects risk of the asset. Excess return is defined as the difference between the average return earned by the asset and the risk-free rate of return. A risky asset is expected to earn an excess return to compensate for added uncertainty undertaken in comparison to the risk-free asset. The denominator of Treynor's performance measure is the beta coefficient of the asset being considered. Thus Treynor views systematic risk as the appropriate risk measure to use in arriving at a one-dimensional performance measure.

Sharpe's reward-to-variability ratio

A year after Treynor's publication of the reward-to-volatility ratio William F. Sharpe presented a very similar

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[95]Jack L. Treynor, "How to Rate Management of Investment Funds," Harvard Business Review 43 (January-February 1965): 63-75.

one-dimensional performance measure that has been called a reward-to-variability ratio.[96] Sharpe's performance measure is

$$S_p = \frac{\bar{r}_p - \bar{r}_f}{\sigma_p}$$

where S_p = Sharpe's performance measure for portfolio p

$\bar{r}_p$ = the average return on portfolio p

$\bar{r}_f$ = the average risk-free interest rate

σ_p = the standard deviation of return on portfolio p

There are two differences between the performance measurement models of Treynor and Sharpe. The first and most obvious difference is found in the risk measurement used. Treynor uses the systematic risk measure of beta; Sharpe used the total risk measure of standard deviation. The difference in risk measurement is the only computational difference between the two measures. The numerators of both performance measures are indicators of excess return as measured by the difference between realized return and a risk-free return proxy.

The second difference between the models is their applicability. Treynor's model is the slope of the security market line and Sharpe's model is the slope of the capital market line. Originating in the security market line, Treynor's performance measure applies to any individual asset or

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[96]William F. Sharpe, "Mutual Fund Performance," Journal of Business 39 (January 1966): 119-138.

portfolio of assets, efficient or not. Sharpe's performance measurement model is more restrictive in its applicability. Since Sharpe's model comes from the capital market line, it is appropriate only for efficiently diversified portfolios.

Levy's performance measure

Robert A. Levy developed a performance measurement model that essentially is a modification of Sharpe's reward-to-variability ratio.[97] For the numerator of his performance measure, which he calls a reward-to-vulnerability ratio, Levy uses the logarithm of the geometric mean of sub-period risk-bearing relatives minus the logarithm of the sub-period risk-free relative. The risk measure Levy uses in the denominator of his model is the modified quadratic mean of the logarithms of the relatives.[98] The modified quadratic mean is defined earlier in this chapter. Levy summarizes his performance measure in this way:

> If the logarithm of the geometric mean of sub-period relatives is used as a measure of return and the modified quadratic mean of the logarithms of sub-period relatives is used as a measure of risk, the regression of return on risk ... will be approximately linear and the slope of the regression line (the reward-to-vulneratility ratio) can serve as an excellent composite measure of performance.[99]

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[97]Levy, "Measurement of Investment Performance," 35-52.

[98]Levy, "Measurement of Investment Performance," 48.

[99]Levy, "Measurement of Investment Performance," 52.

Jensen's total selectivity method

Michael C. Jensen viewed the performance measures of Treynor and Sharpe as reflecting relative performance; Jensen developed a measure of absolute performance.[100] The basic model used is

$$r_{it} - r_{ft} = \alpha_i + b_i(r_{mt} - r_{ft})$$

where r_{it} = the quarterly holding period return on portfolio i

r_{ft} = the average risk-free interest rate during quarter t

α_i = the intercept that measures the forecasting ability of the manager of portfolio i

b_i = a measure of systematic risk for portfolio i

r_{mt} = the holding period return of a market portfolio for quarter t (measured by Standard & Poor's 500 Composite Stock Index)

If the portfolio manager has superior forecasting ability, the intercept, α_i will be positive. Inferior forecasting by the portfolio manager will manifest itself in a negative intercept.[101] It is important to note that Jensen's performance measure, α_i, refers only to the portfolio manager's ability to select assets.[102]

Fama's performance measure

Eugene F. Fama developed an investment performance measure that offers finer breakdowns of performance than are

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[100]Michael C. Jensen, "The Performance of Mutual Funds in the Period 1945-1964," The Journal of Finance 23 (May 1968): 389-416.

[101]Jensen, "Performance of Mutual Funds," 394

[102]Jensen, "Performance of Mutual Funds," 390.

available from the other models reviewed.[103] Fama's basic model is

$$\{r_i - r_f\} = \{r_i - r_x(\beta_i)\} + \{r_x(\beta_i) - r_f\}$$

where r_i = the return on portfolio i

r_f = the risk-free interest rate

$r_x(\beta_i)$ = the return on a portfolio consisting of the risk-free asset and the market portfolio and having risk β_x equal to β_i.

Fama calls the $\{r_i - r_f\}$ term his measure of overall performance. The $\{r_i - r_x(\beta_i)\}$ term is called selectivity and it measures how well portfolio i did relative to a naively selected portfolio with the same level of risk. The $\{r_x(\beta_i) - r_f\}$ term is called risk and it measures the return from the decision to take on positive amounts of risk. The risk term is what is new in Fama's model; the selectivity component, or some variation of it, is what Treynor, Sharpe, and Jensen used as their performance measures.[104] After breaking overall performance into the selectivity and risk components, Fama provides various more detailed subdivisions of both selectivity and risk.[105]

Criticisms of one-dimensional performance measures

The combination of risk and return parameters into

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[103]Eugene F. Fama, "Components of Investment Performance," The Journal of Finance 27 (June 1972): 551-567.

[104]Fama, "Components of Investment Performance," 557.

[105]Fama, "Components of Investment Performance," 557-562.

one-dimensional risk-adjusted performance measures is inherently attractive due to its simplicity and usefulness in comparing performance of investments having different returns and risks.[106] The attractiveness of the one-dimensional performance measures is not, however, without some shortcomings. Several of the criticisms of one-dimensional performance measures are now briefly reviewed.

Friend and Blume found the one-dimensional performance measures of Treynor, Sharpe, and Jensen seemed to yield seriously biased estimates of performance.[107] Of the various assumptions underlying these measures, the one of equal borrowing and lending rates for all investors most clearly causes a bias against risky portfolios.[108] Friend and Blume conclude by stating their preference for using the two traditional parameters of risk and return to measure investment performance instead of the more elegant one-dimensional measures that require an explicit functional relationship between risk and return.[109]

Black, Jensen and Scholes empirically tested the CAPM using both cross-sectional and time series tests.[110] They found results contrary to those expected from the traditional

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[106]Irwin Friend and Marshall Blume, "Measurement of Portfolio Performance Under Uncertainty," American Economic Review 60 (September 1970): 561.

[107]Friend and Blume, 574. [108]Friend and Blume, 569.

[109]Friend and Blume, 574.

[110]Black, Jensen, and Scholes, 81.

form of the CAPM, thereby casting doubt on the one-dimensional performance measures derived from it.[111] Black, Jensen, and Scholes did develop and test a similar model having rate of return a linear function of two factors.[112]

Blume and Friend conducted tests on the CAPM and rejected the model as an explanation of the observed returns on all financial assets because it implies untenable estimates of the rates of return on risk-free assets.[113] Their regression did, however, show linearity between realized return and beta for common stocks. The CAPM, and the one-dimensional performance measures derived from it, may therefore be useful in explaining the risk-return relationship for common stocks but not all financial assets due to segmentations within the markets involved.[114]

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[111]Black, Jensen, and Scholes, 113-114.

[112]Black, Jensen, and Scholes, 115.

[113]Marshall Blume and Irwin Friend, "A New Look at the Capital Asset Pricing Model," The Journal of Finance 28 (March 1973): 30.

[114]Blume and Friend, "A New Look at the Capital Asset Pricing Model," 30-32.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

The objective of this chapter is to explain the design and methodology of the research conducted to investigate the performance of real estate investment trusts. The research design is structured on the theoretical framework of the capital asset pricing model which was reviewed in Chapter II. The importance of the development of a research design based upon a sound theoretical framework cannot be overemphasized, especially when applied to an empirical study.

After explaining the samples used, the sources of data, and the time periods involved in the study, the various performance measures used are presented. The final three major divisions in the chapter detail the procedures used to address the problems (1) can REITs diversify? (2) are REITs a viable investment medium? and (3) can factors significantly affecting REIT performance be identified?

Sources of Data

The financial information used in this study was gathered from published sources. The sources used to obtain the financial data were Moody's Banking and Finance Manual

for the years 1973, 1974, 1975, 1976 and 1977; Moody's Dividend Record for 1972 and 1974; and The Daily Stock Price Record for the New York Stock Exchange, the American Stock Exchange, and the Over-the-Counter Market for 1972 and 1974. For sample REITs whose fiscal years do not correspond to the calendar years under study, the necessary balance sheet and income statement data were obtained by prorating the data for the fiscal years which include the selected calendar years. The type and sponsorship of each REIT was ascertained from the Membership Directory 12-74 and the Handbook of Member Trusts 1974-1975 respectively; these two sources are publications of the National Association of Real Estate Investment Trusts (NAREIT), a trade group.

Samples Used

Two samples were needed to conduct the various investigations within this study. First, a proportional stratified sample of 16 real estate related firms was selected from companies listed on the Primary, Secondary, Tertiary, and Over-the-Counter Industrial Files of Compustat for studying the ability of REITs to diversify.[1] To be eligible for inclusion in this sample the companies must have had available in the aforementioned sources the data necessary to allow the computation of holding period returns for

[1]For details on proportional stratified sampling see Ya-Lun Chou, Statistical Analysis, 2nd ed. (New York: Holt, Reinhard, and Winston, 1975), 396-398.

the years studied. The firms selected to proxy returns available on real estate investment open to REITs come from the following industries: savings and loan associations, real estate land development, subdividing and/or developing, real estate operative builders, and miscellaneous real estate companies. The industries and firms were selected to coincide as closely as possible with the legal constraints under which REITs must operate.[2] The sample of 16 real estate related firms was chosen to yield 120 different pair combinations of representative real estate investments for which correlation coefficients were computed and examined. A large number of combinations was desired in order to have degrees of freedom of sufficiently large size to conduct the desired statistical tests. The 16 companies used to proxy real estate investments are listed by industry in Appendix A.

A second sample was needed to provide data for the remaining areas of concern within the study. This sample consisted of 73 REITs. These 73 REITs represent all REITs for which data were available from the aforementioned sources for the years 1972 and 1974. Although the sample of 73 REITs comprised only 35 percent of all REITs in existance at the end of 1974, the sample REITs held 60 percent of all REIT

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[2]See Section 856 of the Internal Revenue Code of 1954 for details of the restrictions placed on REIT investments.

assets as of year-end 1974.[3] One additional requirement for inclusion in the sample was that the REIT must have paid its initial dividend prior to the beginning of 1972. This final requirement was to remove from the sample those REITs with an insufficient operating history. The sample REITs are listed in Appendix B.

Time Periods

All investigations conducted in this study cover the calendar years 1972 and 1974. The selection of the years 1972 and 1974 and the corresponding decision to use cross-sectional instead of time series analysis are based on the fact that the years represent vastly different periods of growth and success for REITs. During 1972 REITs experienced tremendous growth. Total assets of all REITs increased from $8.1 billion to $14.2 billion, an increase of over 75 percent. The year 1974, however, was a much different growth situation for the industry. Total assets increased from $20.2 billion to $21.2 billion for a nearly stagnant increase of less than 5 percent.[4]

The vast differences between the two years for REITs can also be seen by the public offerings and private placements made by REITs during 1972 and 1974. During 1972 REITs

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[3]These percentages are compiled from the sample and industry data contained in the 1975 REIT Fact Book.

[4]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 14.

raised $1,223.3 million in the capital market, $1,120.3 million in public offerings and $103 million in private placements. Yet during 1974 REITs tapped the capital market for only $23.7 million, $1.5 million in public offerings and $22.2 million in private placements.[5]

The stock market reacted to REIT shares in a very different fashion in 1974 than in 1972. Many REIT shares were near their all-time peak in 1972 and as a whole were popular with investors. By the end of 1974 though, the stock price index computed by the National Association of Real Estate Investment Trusts of all REITs traded on the New York Stock Exchange, American Stock Exchange, and the national OTC market had fallen from its 1972 high of 103.32 reached in November to its 1974 low of 16.87 reached in December, a decline of over 83 percent.[6]

The reasons behind the market's changing evaluation of REITs are reflected by the investment writedowns charged to loan reserves. From 1961 through 1973 all REITs had experienced writedowns of only about $12 million. During 1974 alone, REITs had realized losses of about $70 million.[7]

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[5]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 11.

[6]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 35.

[7]"Investment Writedowns Charged to Loan Reserves," REIT Statistics, September 1975, 3.

Performance Measures

The performance measures used to examine the viability of REITs as an investment medium and those used as dependent variables in the multiple regressions to ascertain factors significantly affecting REIT performance are (1) Treynor's reward-to-volatility ratio, (2) Sharpe's reward-to-variability ratio, and (3) Jensen's total selectivity method. These and other one-dimensional performance measures found in finance literature have been reviewed earlier in this paper. It is not the purpose of this study to show the measures derived by Treynor, Sharpe, and Jensen to be the best performance measures. Rather, the study views the selected performance measures, all derived from the capital asset pricing model, as adequate one-parameter performance measures.

Treynor's Reward-to-Volatility Ratio

Treynor's reward-to-volatility ratio is expressed by the following equation:[8]

$$T_i = \frac{\bar{r}_i - \bar{r}_f}{b_i}$$

where T_i = Treynor's performance measure for asset i

$\bar{r}_i$ = the average return on asset i

$\bar{r}_f$ = the average risk-free interest rate

b_i = the beta coefficient of asset i

The average return on a security is calculated as the

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[8]Treynor, 75.

geometric mean of the quarterly holding-period returns for the year in question. The quarterly holding-period returns are computed using the following formula:[9]

$$r_{it} = \frac{(P_{it+1} - P_{it}) + d_{it}}{P_{it}}$$

where r_{it} = the holding-period return of security i for quarter t

P_{it+1} = the price of security i at the end of quarter t

P_{it} = the price of security i at the beginning of quarter t

d_{it} = the cash dividends paid on security i during quarter t

The average risk-free interest rate is measured as the geometric mean of quarterly market yields of 3-month Treasury bills for the year. The beta coefficient for the security is the slope of its characteristic line, which relates the security's return with the market's return.[10] To compute the beta coefficients for each REIT for 1972 and 1974, the following simple least-squares regression equation is used:[11]

$$r_{it} = a_i + b_i R_{mt} + e_t$$

where r_{it} = the quarterly holding-period of security i

a_i = alpha coefficient of security i

b_i = beta coefficient of security i (measure of systematic risk)

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[9]Francis, 20.

[10]Treynor, 64.

[11]Francis, 328.

R_{mt} = quarterly holding period return of the market (measured by Standard & Poor's 500 Composite Stock Index)

e_t = a random error term having an expected value of zero

In computing beta coefficients a problem arises concerning the length of time available for generating the risk measure. If returns prior to 1972 are used, the sample of 73 REITs would have to be drastically reduced in size because of insufficient data since so many of the trusts were formed in the early 1970s. Extending the period of observations beyond the one year horizon for 1972 and 1974 respectively would not be desirable since evidence suggests calculating beta coefficients separately for bull and bear markets.[12] The only other alternative means available to obtain more observations of returns for use in calculating the beta coefficient would be to use return periods shorter than the quarterly periods. The fact that REITs acquire much of their returns from dividends as opposed to price changes would work against using shorter holding-period returns such as monthly or weekly periods. Using periods shorter than a quarter would result in artifically distorted return data as the quarterly dividends would be reflected only periodically in the holding period returns for the month or week during which the dividend was paid.

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[12]See for example Robert A. Levy, "Beta Coefficients as Predictors of Return," Financial Analysts Journal 30 (January-February 1974): 69 and Arthur E. Gooding and Terence P. O'Malley, "Market Phase and the Stationarity of Beta," Journal of Financial and Quantitative Analysis 12 (December 1977): 854.

No correct or preferred time interval for measuring beta exists. One suggested solution to the problem is to match the base period used for measurement to the investor's time horizon. For example, the use of weekly HPRs over a three month period to calculate beta might be appropriate for the short-term trader but not for the long-term investor. Others favor a very short measurement period regardless of the investor's time horizon. The use of short period for beta calculations would make it easier to detect changing betas. Statistical reliability can be questioned by using either too few observations or too many which may introduce noise. Thus, to summarize, there exists no optimal period for measuring beta.[13] This study uses quarterly HPRs for the years studied for the reasons presented in the preceding paragraph.

Sharpe's Reward-to-Variability Ratio

Sharpe's reward-to-variability ratio is expressed by the following equation:[14]

$$S_i = \frac{\bar{r}_i - \bar{r}_f}{\sigma_i}$$

where S_i = Sharpe's performance measure for asset i

$\bar{r}_i$ = the average return on asset i

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[13]Jerome B. Cohen, Edward D. Zinbarg, and Arthur Zeikel, Investment Analysis and Portfolio Management, 3rd ed. (Homewood, Illinois: Richard D. Irwin, Inc., 1977), 723-724.

[14]Sharpe, "Mutual Fund Performance," 123.

$\bar{r}_f$ = the average risk-free interest rate

σ_i = the standard deviation of quarterly holding-period returns on asset i

Values for $\bar{r}_i$ and $\bar{r}_f$ are the same as used in computing Treynor's performance measure. The standard deviation of quarterly holding-period returns is calculated for each REIT for 1972 and 1974, using the returns received during the respective year.

Jensen's Total Selectivity Method

Jensen's total selectivity method of performance measurement is given by the following equation:[15]

$$r_{it} - \bar{r}_{ft} = \alpha_i + \beta_i(R_{mt} - \bar{r}_{ft}) + e_{it}$$

where r_{it} = the quarterly holding-period return on asset i

$\bar{r}_{ft}$ = the average risk-free interest rate during quarter t

α_i = the intercept that measures the ability of the REIT manager

β_i = a measure of systematic risk

R_{mt} = the holding-period return of a market portfolio for quarter t (measured by Standard & Poor's 500 Composite Stock Index)

e_{it} = a random error term having an expected value of zero

The security's quarterly holding-period return is computed as in the Treynor and Sharpe models. The risk-free interest rate is the average quarterly market yield of 3-month Treasury bills during the quarter. Values for α_i and β_i are determined using simple least-squares regression on the

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[16]Jensen, "The Performance of Mutual Funds," 393.

quarterly data with $\{r_{it} - \bar{r}_{ft}\}$ as the dependent variable and $\{R_{mt} - \bar{r}_{ft}\}$ as the independent variable. Jensen's equation is the SML equation with two changes. First, the risk-free interest rate is subtracted from both sides of the equation to remove the intercept term. Secondly, a new intercept term, α_i, is added. For superior performance α_i will be positive; a negative α_i indicates inferior performance. The intercept, α_i, represents the additional return provided by investing in a managed portfolio rather than the market portfolio. Jensen's performance measure is α_i.

Critique of Performance Measures Used

The three one-parameter performance measures to be used in this study have certain important differences that should be highlighted. Though the Treynor and Sharpe measures are both designed to rank relative performances, the two measures differ in the risk surrogate used. Treynor uses the beta coefficient, a measure of systematic risk, as his risk surrogate. Systematic risk refers to that portion of total variability in return caused by factors affecting the prices of all securities.[16] Sharpe uses the standard deviation of returns as his risk surrogate. Reconciliation of Treynor's and Sharpe's difference on risk measurement is straightforward. Total risk, as measured by the standard deviation of returns, consists of systematic and nonsystematic risk. Nonsystematic risk can be eliminated by

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[16]Fisher and Jordan, 105.

diversification.[17] Therefore, for an efficient portfolio, Treynor's and Sharpe's measures are identical since the only risk that exists for an efficient portfolio is systematic risk.

This study uses Treynor's performance measure because finance theory states that beta is the only relevant risk measure since all other risk can be eliminated by diversification. Sharpe's performance measure is used because the typical REIT investor may react to total variability of return instead of return volatility. Treynor's and Sharpe's models provide one-parameter measures of relative performance. Jensen's model is used in this study because it provides a measure of absolute performance.[18]

None of these performance measures selected for use in this study was developed in relationship to REITs. All three of the performance measures were initially presented to measure mutual fund performance. The techniques developed by Treynor, Sharpe, and Jensen are, however, applicable to any capital asset.

Ability of REITs to Diversify

One of the primary questions addressed by this study is the determination of whether or not REITs can achieve the benefits of risk reduction through Markowitz diversification.

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[17] Lorie and Hamilton, 205.

[18] Jensen, "The Performance of Mutual Funds," 390.

Various authors have shown that the combination of a relatively few assets can significantly reduce the dispersion of the portfolio's returns.[19] This reduction in risk can only take place, however, if the returns on the assets in the portfolio are not perfectly positively correlated. The less strongly correlated the returns of the component assets, the more risk is eliminated. In the extreme, if perfectly negatively correlated assets were found, a portfolio void of all risk could be constructed.[20]

Legal Constraints

The tax law places limitations on the sources of income a REIT may have and still maintain its favored tax status. Section 856(c) of the Internal Revenue Code of 1954 essentially requires that a REIT receive at least 75 percent of its income from rents from real estate, interest on obligations secured by mortgages on real estate, and gains from the sale of real estate or interests in mortgages on real estate. The section further requires that less than 30 percent of a REIT's income can come from the sale of real property held less than four years. The sample discussed earlier of 16 real estate related firms was chosen to

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[19]See for example John L. Evans and Stephen H. Archer, "Diversification and the Reduction of Dispersion: An Empirical Analysis," The Journal of Finance 23 (December 1968): 761-769 and Lawrence Fisher and James J. Lorie, "Some Studies on Variability of Returns on Investments in Common Stocks," Journal of Business 43 (April 1970): 99-134.

[20]Francis and Archer, 23-25.

represent the types of real estate investments available to REITs.

Returns of Representative Real Estate Investments

REITs have the ability to efficiently diversify if they can invest in assets having less than perfectly positively correlated returns. Since the returns on individual real estate investments are not available from standard financial resources, the returns on assets available for inclusion in a REIT's portfolio must be proxied. Quarterly holding-period returns for 1972 and 1974 are computed for each of the 16 real estate firms, thus yielding 120 different pair combinations each year to test the ability of REITs to diversify. These pairs are used as surrogates for possible combinations of investments that a REIT could make.

Due to the small number of data points used to compute the correlation coefficients for the 120 pair combinations during 1972 and 1974, the calculations likely produce some correlation coefficients that are too high and some that are too low. Of concern, however, is not the individual correlation coefficients but their average. The law of large numbers states that the average of the 120 correlation coefficients computed each year ought to be very close to the true mean correlation coefficients.[21]

Tests are conducted to determine if the average

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[21]Chow, 211-212.

correlation coefficient of the surrogate investment is equal to +1. Since the correlation coefficients cannot exceed +1, a one-tailed test of significance is used. If no statistically significant difference exists between the average correlation coefficient of the 120 combinations and +1, then there will be considerable evidence that REITs cannot efficiently diversify. With all of the real estate investments having their returns move together proportionately and in the same direction, as evidenced by a correlation coefficient of +1, combining the assets could only result in a portfolio risk that equals the weighted average of the risk of the components. If the correlation coefficient of the returns of the real estate investments is less than +1, Markowitz efficient diversification is possible.[22] If the average correlation coefficient between returns on real estate investments available to REITs is less than +1, successive tests will be conducted to statistically determine the extent of the correlation among the investments.

Viability of REITs as an Investment Medium

A corollary question addressed by this study is whether or not REITs are a viable investment medium. In essence, if REITs perform as well as or better than capital market theory says they should, they certainly would rightly be considered capable of growing and prospering. If REIT performance is

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[22]Francis and Archer, 23.

less than it should be, the viability of REITs can be seriously doubted. Performance, both for REITs and the standard of comparison, is viewed in a risk-return sense as dictated by the CAPM. Three different ways of examining the viability of REITs as an investment medium are used. The reason for using multiple tests is that there are certain shortcomings in each, so different approaches are used in order to arrive at a consensus.

Comparison of REIT Performance to Market Performance

The first test of the viability of REITs as an investment medium consist of comparing average REIT performance for the 73 sample trusts, as measured by the Treynor, Sharpe, and Jensen one-parameter performance measures, to the market's performance, also measured by the same three risk-adjusted return techniques. The Standard & Poor's 500 Composite Stock Index is used as the market proxy. Two-tailed tests of significance are used to determine if the average REIT performance differs from the market performance. If REITs perform as well as or better than the market, their viability would be supported. Performance by REITs below that of the market would indicate REITs not to be a viable investment medium.

Comparison of Theoretical and Empirical CML

The second test used to ascertain the viability of REITs as an investment medium consists of statistically

comparing the slopes and intercepts of the theoretical and empirical capital market lines (CML). Two-tailed tests of significance are used. The CML represents the risk-return relationship for efficient portfolios.[23] Geometric means of quarterly Treasury bill yields, quarterly holding-period returns on the market, and quarterly holding-period returns on the 73 sample REITs along with the standard deviations of the quarterly returns are used to produce the theoretical and empirical CMLs using simple least-squares regression. Equal slopes indicate REITs have performed as the CAPM predicts. A flatter slope of the empirical CML compared to the theoretical CML indicates inferior performance of REITs as an investment medium. Performance of the REITs as the CML suggests would indicate that the diversification achieved by REITs in constructing their portfolios of real estate investments has resulted in their holding efficient portfolios.[24]

Comparison of Theoretical and Empirical SML

The last of the three tests used to ascertain the viability of REITs as an investment medium consists of statistically comparing the slopes and intercepts of the

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[23]Charles A. D'Ambrosio, Principles of Modern Investments (Chicago: Scientific Research Associates, Inc., 1976) 329.

[24]William F. Sharpe, "Risk Aversion in the Stock Market: Some Empirical Evidence," The Journal of Finance 20 (September 1965): 421-422.

theoretical and empirical security market lines (SML). Two-tailed tests of significance are used. The SML depicts the risk-return relationship for all assets.[25] Geometric means of quarterly Treasury bill yields and market returns, as measured by the holding-period returns on Standard & Poor's 500 Composite Stock Index, are used to generate the theoretical SML. Simple least-squares regression techniques applied to the geometric means of quarterly holding-period returns and computed beta coefficients from the 73 REITs are used to produce the empirical SML. If the empirical SML produced by the REITs is not significantly different from the theoretical SML, the REITs will be shown to have performed as capital market theory would suggest. A slope of the empirical SML significantly greater or less than that of the theoretical SML would be indicative of the superiority or inferiority, respectively, of REITs as an intermediary in the capital market.

Factors Contributing to REIT Performance

The investigation into which of several factors are significant in explaining REIT performance is conducted using cross-sectional multiple regression analysis as the primary quantitative tool. The equations obtained are of the general form:[26]

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[25] D'Ambrosio, 340-341.

[26] M. Dutta, Econometric Methods (Dallas: South-Western Publishing Co., 1975), 46.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + e, \quad n = 1,2,\ldots,N$$

While there are an infinite number of relationships that might be fitted to the collection of data, the method of least squares is particularly appropriate because it:

1. wastes little information
2. generates estimates of parameters which, under certain assumptions, are best linear unbiased estimators (BLUE), and
3. is a robust method

Assumptions of Regression Analysis

Most of the assumptions of regression analysis are stated in terms of the random error term, e. The following are the conventional assumptions of least squares regression:[27]

1. The individual errors or disturbances, e_n, are random variables with finite means, variances, and covariances.
2. Every disturbance, e_n, has zero expected value, irrespective of the value of X_n.
3. The variance of each e_n is the same for all n ($n = 1, \ldots, N$) and independent of X_n.
4. The error terms of different observations are distributed independently of each other.
5. The density function f(e) is normal

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[27]Edward J. Kane, Economic Statistics and Econometrics (New York: Harper & Row, 1968), 355.

6. The independent variable X_n is measured without error and has a finite mean and variance.

A final assumption that is specifically made for multiple regression models is that the number of parameter estimates to be made must be less than or equal to the number of observations.[28] Assumptions 1, 2, 3, 4, and 6 imply the consistency of the parameter estimates. The same assumptions also establish that least square estimators are BLUE. Assumptions 3 and 4 are critical requirements both for consistency and for best linear unbiasedness. Assumption 3 calls for the homoscedasticity of the error term. This means the error term should have a constant variance; when the constant variance assumption is violated, heteroscedasticity exists. Assumption 4 rules out autocorrelation, which exists when the error terms of different observations are not distributed independently of each other, but instead are correlated.[29]

Dependent Variables

The risk-adjusted return measures of Treynor, Sharpe, and Jensen are used as the dependent variables in the multiple regressions. These one-dimensional performance measures have been discussed at length previously in this paper. Various performance measures are used to see if the analysis is sensitive to any particular one.

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[28]Dutta, 43-44

[29]Kane, 356-357.

Independent Variables

The multiple regression procedure used employs six REIT characteristics as independent variables. These are tested for significant association with each of the three performance measures during each of the years studied. Each of the characteristics used as an independent variable is identified below. The discussion of each variable includes how it is measured and why it was selected for inclusion in the study.

REIT advisor. The first independent variable is an indication of trust sponsorship. This qualitative variable is included in the regression via the use of a dummy variable. A REIT is categorized as either commerical bank or non-commercial bank sponsored. The sponsorship is determined from information in the Handbook of Member Trusts 1974-1975.

Sponsorship is limited to the dichotomous classification of commercial bank or non-commercial bank for two reasons. First, REITs sponsored by commercial banks have more than double the assets of REITs sponsored by any other type entity.[30] Secondly, previous research has shown REIT sponsorship to be related to performance. In studying construction and development trusts, Elebash used dummy variables to categorize the trusts as sponsored by mortgage bankers,

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[30]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 7.

commercial banks, life insurance companies, or others.[31] He found REIT sponsorship functionally related to two of his performance measures.[32] This study has condensed the breakdown of sponsorship into just commercial bank or non-commercial bank instead of the four used by Elebash since he found that commercial bank sponsored REITs outperformed other trusts.[33]

Type of REIT. The characteristic of trust type is included in the regression equation via two dummy variables to indicate the type as mortgage, equity, or hybrid. The number of dummy variables used to denote trust type is one less than the number of possible classifications in order to avoid the dummy variable trap.[34] Classification data for trust type are obtained from NAREIT published information.

There are some indications that mortgage REITs suffered the most as the REIT industry faltered.[35] Previous research by Wurtzebach has shown a difference in performance related to the type of trust. He found hybrid REITs had the best performance on a risk-adjusted return basis followed in order by mortgage and equity trusts.[36]

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[31]Elebash, 90. [32]Elebash, 111-112. [33]Elebash, 121.

[34]Dutta, 162.

[35]Priscilla S. Meyer, "Realty Trust Woes," The Wall Street Journal, January 21, 1974, 1.

[36]Wurtzebach, 116-117.

Size of trust. Trust size is the third characteristic used as an independent variable. The year-end total assets of each sample REIT are determined from data found in the appropriate Moody's Banking and Finance Manual. Trust size is included in the regression equation in units of $100,000,000.

Elebash found in his study of construction and development REITs that two of his three performance measures were functionally related to trust size.[37] Better performance is expected from the larger trusts because of their competitive edge in obtaining funds such as in the sale of commercial paper and because of greater investor confidence in large financial institutions.

Trust's financial leverage. Financial leverage, defined as the ratio of total debt to total assets, is the fourth characteristic used as an independent variable. Figures for computing the ratio are obtained from issues of Moody's Banking and Finance Manual. Since leverage is a two-edged sword, increasing returns on net worth when debt funds earn more than they cost and decreasing the returns when debt funds earn less than they cost, a positive relationship with performance is expected in the 1972 period and a negative relationship is expected in the 1974 period.[38]

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[37]Elebash, 127.

[38]See J. Fred Weston and Eugene F. Brigham, Managerial Finance, 5th ed (Hinsdale, Illinois: The Dryden Press, 1975), 587 and "Real Estate Investment Trust Industry," The Value Line Investment Survey (January 4, 1974), 1998.

Using a debt to equity type leverage measure, Elebash has found a significant relationship between performance and leverage for construction and development REITs.[39] Wurtzebach found no significant relationship between REIT shareholder return and leverage. He used debt to equity as his leverage measure.[40] In her study of mortgage REITs Hines found no significant relationship between leverage and share price or leverage and earnings per share.[41] Since past research has been inconclusive regarding the importance of leverage, as measured by the debt to equity ratio, to REIT performance, this study uses debt to total assets in an effort to achieve more definitive results.

Quality of trust's investments. A measure of the quality of a trust's investments is the fifth characteristic used as an independent variable. To measure the quality of the asset holdings, the ratio of net income divided by total assets is computed. Data for the computations are obtained from appropriate issues of Moody's Banking and Finance Manual.

Many REITs have found large portions of their investment portfolios not earning as loans go into default and the trusts increase their loan-loss reserves.[42] The measure

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[39]Elebash, 111. [40]Wurtzebach, 112-116.

[41]Hines, 502-503.

[42]See for example: Priscilla S. Meyer, "Contracting Credit: Lenders are Wounded as Realty Portfolios are Shot Full of Holes," The Wall Street Journal, January 1, 1975, 1; Priscilla S. Meyer, "Falling Out: Real Estate Trust Feud

chosen for use in this study should adequately differentiate between those trusts having high quality investments and those having investments which have ceased to provide a return. Elebash found a similar quality measure, he called his return on portfolio, to be functionally related to performance.[43]

Trust's management expenses. The sixth characteristic used as an independent variable reflects management fees paid to the REIT's advisor. The variable is quantified by dividing the annual management expense for the trust by its total assets. The necessary data are obtained from the appropriate issues of Moody's Banking and Finance Manual.

The advisory fees are negotiated between the trustees and the advisor; oftentimes the fees are structured with an incentive feature based on the earnings performance of the trust.[44] Hines found in her study of mortgage REITs that advisory fees averaged 1.2 percent of total assets.[45] Considering Jensen's finding that mutual funds were on average not able to predict security prices well enough to outperform

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With Advisers Over Their Obligations," The Wall Street Journal, March 13, 1975, 1; "Boston REIT Defaults on Debt of $559.7 Million," The Wall Street Journal, April 2, 1975, 4; and "First Mortgage Has $28 Million Operating Loss," The Wall Street Journal, April 10, 1975, 4.

[43]Elebash, 111.

[44]National Association of Real Estate Investment Trusts, Inc., 1975 REIT Fact Book, 9.

[45]Hines, 500-502.

the market, even when fund returns were measured gross of management expense, it will be interesting to see if REIT advisors can justify their fees by having a strong positive correlation between performance and advisor compensation.[46]

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[46]Jensen, "The Performance of Mutual Funds," 415.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

In this chapter analyses of the data relative to the three areas investigated are presented. First, findings pertaining to the ability of REITs to diversify their portfolio holdings are examined. Next, REIT performance as compared with market standards as established by capital market theory is analyzed. Finally, data are presented and examined to identify factors affecting REIT performance.

Ability of REITs to Diversify

As risky assets are combined to form a portfolio, the risk of the resulting portfolio will be lowered if the correlation between returns for the individual assets is less than perfectly positive. The general expression for the risk of the portfolio is:[1]

$$\sigma_p = \sqrt{\Sigma_i \Sigma_j w_i w_j \rho_{ij} \sigma_i \sigma_j}$$

where σ_p = standard deviation of portfolio return

w_i and w_j = weights invested in assets i and j

ρ_{ij} = correlation coefficient between returns of assets i and j

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[1]William F. Sharpe, Portfolio Theory and Capital Markets (New York: McGraw-Hill Book Company, 1970), 46.

σ_i and σ_j = standard deviation of returns of assets i and j

In the simple case of a two-asset portfolio consisting of assets that are perfectly negatively correlated, there will exist some combination of weights (w_i and w_j) such that the portfolio will have zero risk.[2] Under all conditions, the lower the correlations of returns of assets comprising the portfolio, the lower the portfolio risk.

Correlation coefficients for quarterly HPRs for 1972 and 1974 were computed for all possible pairs of those real estate related firms listed in Appendix A. The quarterly HPRs are presented in Appendix C. A total of 120 correlation coefficients for each year resulted, as shown in Appendix D.

Table 5 presents a summary of testing conducted on the correlation of returns of the real estate firms. Since the correlation coefficient can have values of -1.0 to +1.0, one-tailed tests were conducted starting at a value of +1.0 and stepping down in increments of 0.25 until the null hypothesis could be accepted at a significance level of 0.05. The test statistic used was:[3]

$$T = \frac{\bar{\rho} - \rho_o}{\hat{\sigma}_{\bar{x}}}, \text{ where } \hat{\sigma}_{\bar{x}} = \frac{s}{n-1}$$

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[2] D'Ambrosio, 319-320.

[3] Paul Jedamus, Robert Fame, and Robert Taylor, Statistical Analysis for Businss Decisions (New York: McGraw-Hill Book Company, 1976), 327-328.

TABLE 5

CORRELATION OF RETURNS OF REAL ESTATE RELATED FIRMS

Year	$\bar{\rho}$	ρ_o	Null Hypothesis	T-value	Accept or Reject Null Hypothesis at 0.05 level of significance (one-tailed test)
1972	0.4434	1.00	$\bar{\rho} = \rho_o$	-13.3798	reject
	0.4434	0.75	$\bar{\rho} = \rho_o$	- 7.3702	reject
	0.4434	0.50	$\bar{\rho} = \rho_o$	- 1.3606	accept
1974	0.5630	1.00	$\bar{\rho} = \rho_o$	-10.2342	reject
	0.5630	0.75	$\bar{\rho} = \rho_o$	- 4.3794	reject
	0.5630	0.50	$\bar{\rho} = \rho_o$	1.4754	accept

$\bar{\rho}$ = the average correlation coefficient for the 120 pairs of real estate related firms

ρ_0 = correlation coefficient tested against

$\hat{\sigma}_{\bar{x}}$ = estimate of the standard error of the mean

s = standard deviation of the sample

n = number of observations

Degrees of freedom are n-1.

The null hypothesis of no significant difference between $\bar{\rho}$ and ρ_0 was rejected at ρ_0 values of 1.00 and 0.75 for both years, but could not be rejected at a ρ_0 of 0.50. The implication is therefore that real estate firms do have positively correlated returns, but the returns are not highly correlated. Previous research has shown the average correlation coefficient between stocks to be approximately 0.3549.[4] Table 6 compares the correlation of real estate returns to the correlation found by Elton and Gruber for all stocks. Significant differences at the 0.05 level are found between the mean correlation coefficient for real estate firms and the 0.3549 value computed by Elton and Gruber. The implication is that the real estate firms are more highly correlated than stocks in general.

The real estate related firms produced correlation coefficients from -0.9166 to +0.9935 in 1972, having a mean value of 0.4434 and a standard deviation of 0.4542. For 1974

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[4]Edwin J. Elton and Martin J. Gruber, "Estimating the Dependence Structure of Share Prices - Implications for Portfolio Selection," The Journal of Finance 28 (December 1973): 1221.

TABLE 6

CORRELATION OF RETURNS OF REAL ESTATE RELATED FIRMS COMPARED TO CORRELATION OF ALL STOCK RETURNS

Year	$\bar{\rho}$	ρ_o	Null Hypothesis	T-value	Accept or Reject Null Hypothesis at 0.05 level of significance (one-tailed test)
1972	0.4434	0.3549	$\bar{\rho} = \rho_o$	2.1274	reject
1974	0.5630	0.3549	$\bar{\rho} = \rho_o$	4.8735	reject

the correlation coefficients varied from -0.7450 to +0.9983, with a mean value of 0.5630 and a standard deviation of 0.4662. Returns among real estate related firms appear to be significantly and positively correlated. Since the mean correlations are less than perfect, and in fact high negative correlations of returns exist between some of the real estate firms, the risk reduction benefits available through diversification appear to be available to the holder of a portfolio of real estate investments. Returns of the real estate related firms do seem to be slightly, but significantly, more highly correlated than stocks in general. Despite the ability to diversify away much risk, evidence has been collected by others showing that both equity and mortgage REITs are not well diversified.[5]

REITs As a Viable Investment Medium

The investigation into whether or not REITs serve as a viable investment medium occurred in three stages. First, REIT and market performance were compared using the performance measures of Treynor, Sharpe, and Jensen. These measures are presented in Appendix E. Secondly, REIT performance was examined in the context of the CML. Thirdly, the SML was used to evaluate REIT performance. Each of these approaches to the evaluation of REITs as an investment medium is now presented.

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[5]Shulman, 71 and Cooley, 137-139.

One-Parameter Comparisons of REIT and Market Performance

The one-parameter performance measures of Treynor, Sharpe, and Jensen discussed earlier were used to test REIT performance vis-a-vis market performance. REIT performance is measured as the average value of the one-parameter measures for the 73 sample trusts. Market performance is proxied by the Standard & Poor's 500 Composite Stock Index performance as measured by the same one-parameter measures. Table 7 summarizes the comparisons.

For both years studied, Treynor's measure fails to show any difference between REIT performance and market performance at the 0.10 level of significance, using two-tailed tests. Treynor's measure for 1974 omits Cameron-Brown Investors Group from the sample because its computed beta is so near zero that the resulting value for Treynor's performance measure is large enough to distort the average for all sample trusts from 0.1018 without Cameron-Brown to -1.9317 with the firm. Even if Cameron-Brown were included, the null hypothesis would still be accepted. The test statistic used was:[6]

$$T = \frac{\bar{x} - \mu_0}{\hat{\sigma}_{\bar{x}}}, \text{ where } \hat{\sigma}_{\bar{x}} = \frac{S}{n-1}$$

$\bar{x}$ = average REIT performance measure

μ_0 = market performance measure

$\hat{\sigma}_{\bar{x}}$ = estimate of the standard error of the mean

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[6]Jedamus, Frame, and Taylor, 327-328.

TABLE 7

COMPARISON OF REIT PERFORMANCE TO MARKET PERFORMANCE

Year	Performance Measure	Averate REIT Performance	Market Performance	Null Hypothesis	T-Value	Accept or Reject Null Hypothesis at the 10% level of significance
1972	Treynor	0.0233	0.0344	$\bar{T}_R = T_M$	-0.4022	accept
	Sharpe	0.2888	1.0585	$\bar{S}_R = S_M$	-11.7645	reject
	Jensen	-0.0141	0.0000	$\bar{J}_R = J_M$	-1.8800	reject
1974	Treynor	0.1018	-0.0907	$\bar{T}_R = T_M$	0.5617	accept
	Sharpe	-1.6198	-0.6374	$\bar{S}_R = S_M$	-8.4110	reject
	Jensen	-0.2682	0.0000	$\bar{J}_R = J_M$	-16.8679	reject

S = standard deviation of the sample

n = number of observations

Degrees of freedom are n-1.

The performance measures of Sharpe and Jensen show that REITs performed significantly different than the market at the 0.10 level during 1972 and 1974. The level of significance exceeds 0.001 for the Sharpe measure for both years and for Jensen's measure for 1974.

The preponderance of evidence is suggestive that even during the relatively prosperous year for REITs of 1972 they did not perform as well as the market in general. The inferior performance of REITs found for 1972 and 1974 was also found by Kahn in the 1962-1965 period and by Keintz for 1972.[7] Shulman, using Treynor's and Jensen's performance measures, found equity REITs fared worse than the market from 1964 through 1974.[8] Over the period 1971 through 1975 Cooley found mortgage REITs substantially under-performed the market.[9]

REIT Performance and the CML

The CML relates return to risk, with risk measured as the standard deviation of return. All efficient portfolios, and only efficient portfolios, are expected to plot along the CML. Evidence presented earlier in this chapter suggests that REITs have available as investments assets that are fairly lowly correlated. Thus diversifying their portfolio

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[7]Kahn, 77-78 and Keintz, 175-177.

[8]Shulman, 77. [9]Cooley, 158.

holdings could result in REITs holding efficient portfolios and CML analysis would be appropriate for examining the trusts' performance. REIT performance on or above the theoretical CML would indicate the trusts to be a viable investment medium whereas REIT performance below the theoretical CML would indicate they are not.

Simple least squares regression techniques were used to generate the empirical CMLs. Geometric means of quarterly HPRs and the standard deviation of the quarterly HPRs for the 73 sample REITs were used as the return and risk measures. The data, resulting equations, and residuals for the empirical CMLs are presented in Appendix F. A summary of the regressions is shown in Table 8. As shown in Table 8, the 1972 CML is not significant but the 1974 CML shows a significant relationship between risk and return at the 0.005 level.

TABLE 8

REGRESSION RESULTS FOR EMPIRICAL CML

	1972	1974
intercept	0.0297	-0.1356
slope	0.0305	-0.7361
T-value of slope	0.2364	-3.2375
Prob >|T|	0.8176	0.0035
R^2	0.0008	0.1286
S. E. E.	0.0386	0.1237
F-value	0.0559	10.4813
d. f.	1,71	1,71
Prob >F	0.8176	0.0035

The theoretical CMLs were computed using the geometric means of quarterly HPRs for the Standard & Poor's 500 Stock Index and the standard deviation of those HPRs. The geometric mean of quarterly yields on 3-month Treasury bills was used as the riskless rate of return. The theoretical CMLs computed according to

$$r_p = \bar{r}_f + \left[\frac{\bar{r}_m - \bar{r}_f}{\sigma_m}\right] \sigma_p \text{ are:}$$

$$CML_{72}: \quad r_p = 0.0102 + 1.0585\sigma_p$$

$$CML_{74}: \quad r_p = 0.0196 - 0.6374\sigma_p$$

Figures 4 and 5 are plots of the theoretical and empirical CMLs for 1972 and 1974 respectively. Statistical comparisons of the lines are presented in Table 9. T-values used as tests statistics were computed according to the following formulas:[10]

$$t_{intercept} = \frac{a - \alpha}{s_e\sqrt{\frac{1}{n} + \frac{n \cdot \bar{x}^2}{n(\Sigma x^2) - (\Sigma x)^2}}}$$

$$t_{slope} \quad \frac{b - \beta}{s_e}\sqrt{\frac{n(\Sigma x^2) - (\Sigma x)^2}{n}}$$

where a = sample intercept

α = population intercept

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[10]John E. Freund and Frank J. Williams, Elementary Business Statistics 3rd ed. (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1977), 390-392.

FIGURE 4

THEORETICAL AND EMPIRICAL CAPITAL MARKET LINES FOR 1972

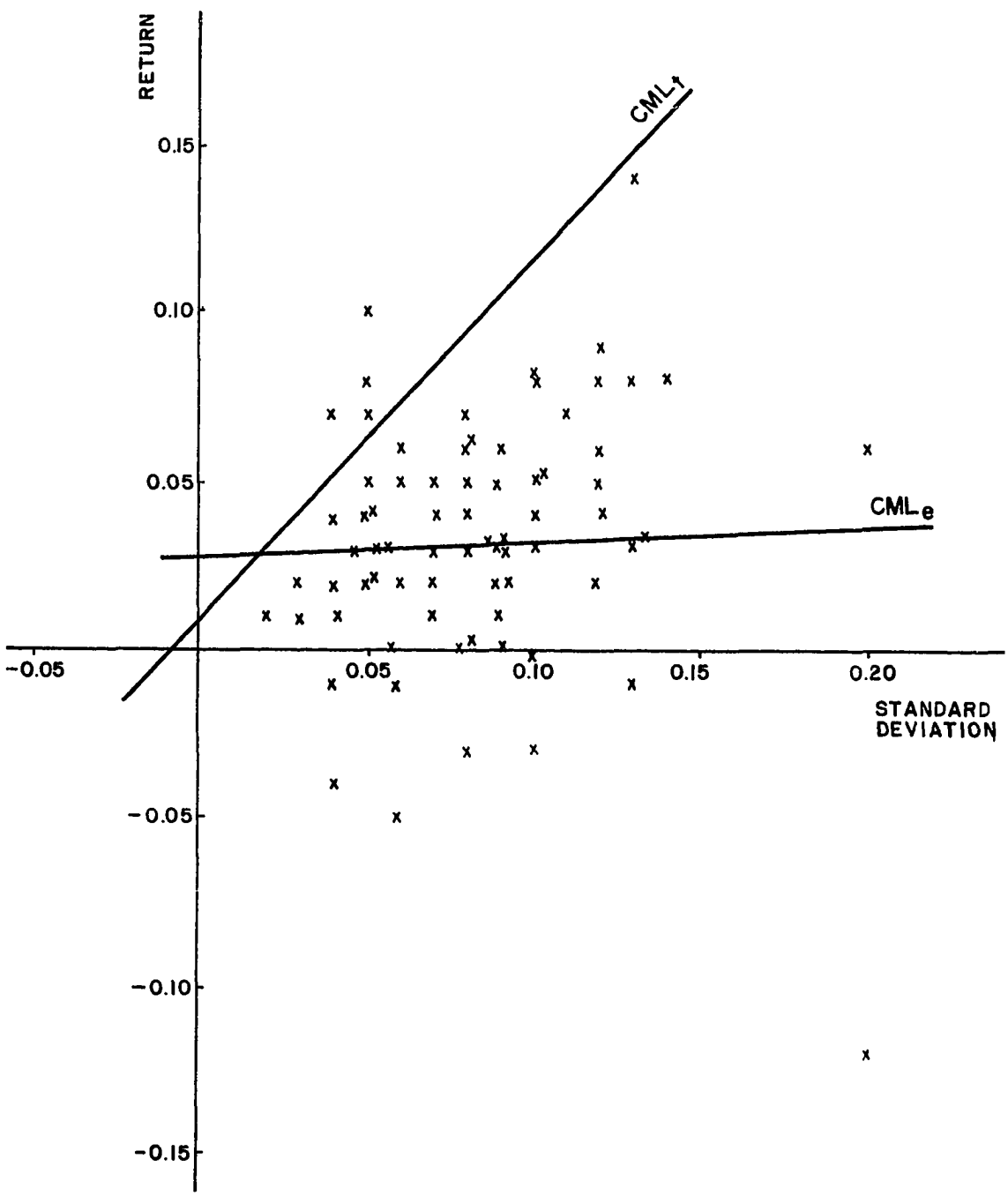


FIGURE 5

THEORETICAL AND EMPIRICAL CAPITAL MARKET LINES FOR 1974

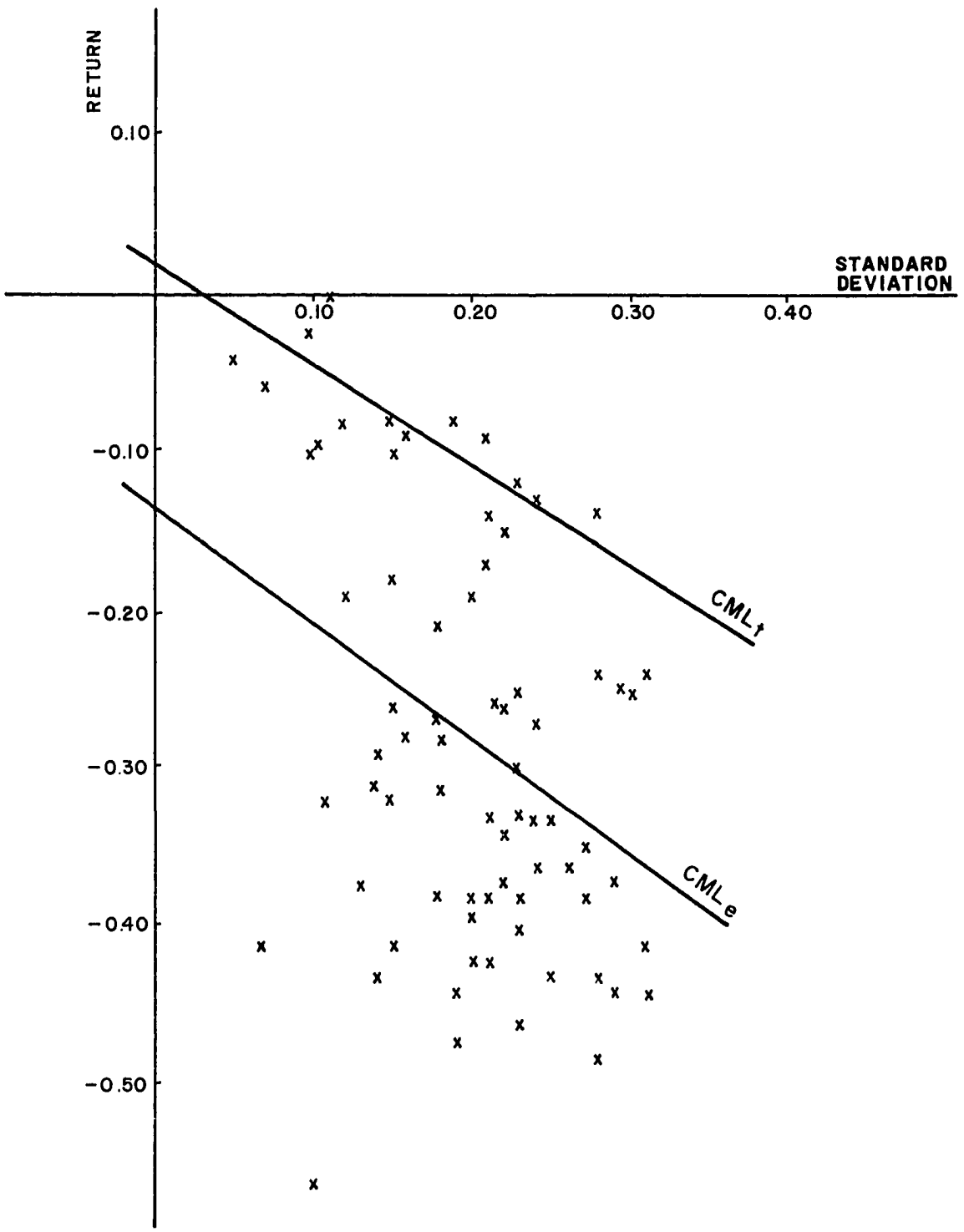


TABLE 9

COMPARISONS OF THEORETICAL AND EMPIRICAL CAPITAL MARKET LINES

Year	Parameter	Theoretical Value	Empirical Value	Null Hypothesis	T-value	Accept or Reject Null Hypothesis at 0.01 level of significance
1972	intercept	0.0102	0.0297	$\alpha = a$	1.6957	accept
	slope	1.0585	0.0305	$\beta = b$	-7.9684	reject
1974	intercept	0.9196	-0.1356	$\alpha = a$	-3.2605	reject
	slope	-0.6374	-0.7361	$\beta = b$	-0.4341	accept

b = sample slope

β = population slope

S_e = standard error of the estimate

n = number of observations

x = risk measure

degrees of freedom are n-2.

As shown in Table 9 the intercept terms of the 1972 theoretical and empirical CMLs are not significantly different at the 0.01 level. The slopes, however, are different at a significance level of 0.01. The intersection of the theoretical and empirical lines for 1972 is at a risk value of 0.0190, meaning that REITs plotting to the right of this risk level were on average receiving a lower return than the theoretical CML would suggest they should for the risk experienced. The mean risk value for the 73 sample REITs is 0.0821 with a standard deviation of 0.0353. None of the sample had a risk value less than 0.0190. In addition, all REITs were experiencing a risk-return tradeoff that was significantly different from and lower than the tradeoff predicted by the slope of the theoretical CML.

Data in Table 9 shows that the 1974 theoretical and empirical CMLs have intercept terms that are significantly different at the 0.01 level. In contrast, the slopes of the lines are not found to be significantly different at the 0.01 level. Since the two lines do not have significantly different slopes the result is two lines roughly parallel to one

another, but at significantly different levels. The theoretical line being the higher of the two.

CML analysis provides evidence that for the years 1972 and 1974 REITs have failed to achieve what capital market theory suggests is the appropriate risk-return relationship. In each of the years the average return realized by the sample trusts was significantly below that suggested by the theoretical CML for risk levels actually encountered. Overall, the preceding analysis clearly discloses that inasmuch as the empirical CML is inferior to the theoretical CML, REITs have not shown themselves to be a viable investment medium.

REIT Performance and the SML

If REITs have proven themselves to be a viable investment medium, they should perform as well as or better than predicted by the security market line. The SML relates return to systematic risk for any asset. Simple linear regression was performed on the geometric means of quarterly HPRs and systematic risk measures of the 73 sample REITs to arrive at an empirical SML for each of the years studied. Appendix G presents the data, resulting equations, and residuals for the empirical SMLs. A summary of these regressions is shown in Table 10. As indicated by the low R^2 values shown in Table 10, the returns of the trusts are not well explained by their levels of systematic risk. Systematic risk and return were not related significantly at the 0.10 level in either year. This finding is in agreement with Wurtzebach's

study which showed no significant relationship between risk and return for REIT shareholders.[11]

TABLE 10

REGRESSION RESULTS FOR EMPIRICAL SML

	1972	1974
intercept	0.0275	-0.2812
slope	0.0041	-0.0113
T value of slope	1.4438	-0.3807
Prob >|T|	0.1404	0.7110
R^2	0.0285	0.0020
S. E. E.	0.0381	0.1324
F value	2.0846	0.1449
d. f.	1,71	1,71
Prob >F	0.1404	0.7110

Of concern is whether or not the empirical SML differs significantly from the theoretical SMLs. The theoretical SMLs were computed using the geometric mean of quarterly yields on 3-month Treasury bills and the geometric mean of quarterly HPRs for the Standard & Poor's 500 Stock Index. The systematic risk for the market portfolio as measured by the Standard & Poor's 500 Stock Index is 1.0 by definition. Theoretical SMLs were found, using the formula

$$r_i = \bar{r}_f + \left[\frac{\bar{r}_m - \bar{r}_f}{\beta_m}\right]\beta_i, \text{ to be:}$$

$$SML_{72}: \quad r_i = 0.0102 + 0.0344\beta_i$$

$$SML_{74}: \quad r_i = 0.0196 - 0.0907\beta_i$$

[11] Wurtzebach, 98-101.

Figures 6 and 7 are plots of the theoretical and empirical SMLs for 1972 and 1974 respectively. Statistical comparisons of the theoretical and empirical SMLs are presented in Table 11. T-values used as tests statistics are computed according to the formulas used with the CML analysis.

The intercepts of the empirical SMLs were significantly different at the 0.01 level from the intercepts of the theoretical SMLs in both 1972 and 1974. The empirically determined intercept in 1972 exceeded the theoretical intercept while the reverse case occurred in 1974. Black, Jensen, and Scholes found that high beta securities tended to have negative intercepts and low beta securities tended to have positive intercepts.[12] Since the average betas for the securities in the sample were 1.1520 and 0.1057 respectively for the years 1972 and 1974, the findings of this study are not in agreement with those mentioned of Black, Jensen, and Scholes. The empirical intercept for 1972 does agree with their findings that the intercept seems to be greater than the risk-free interest rate.[13]

The slopes of the theoretical and empirical SMLs were also found to be different at the 0.01 level of significance for both years studied. The slope of the empirical line was less than the slope of the theoretical line in 1972 and 1974.

Although the empirical SML had a higher intercept than

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[12]Black, Jensen, and Scholes, 81.

[13]Black, Jensen, and Scholes, 82.

FIGURE 6

THEORETICAL AND EMPIRICAL SECURITY MARKET LINES FOR 1972

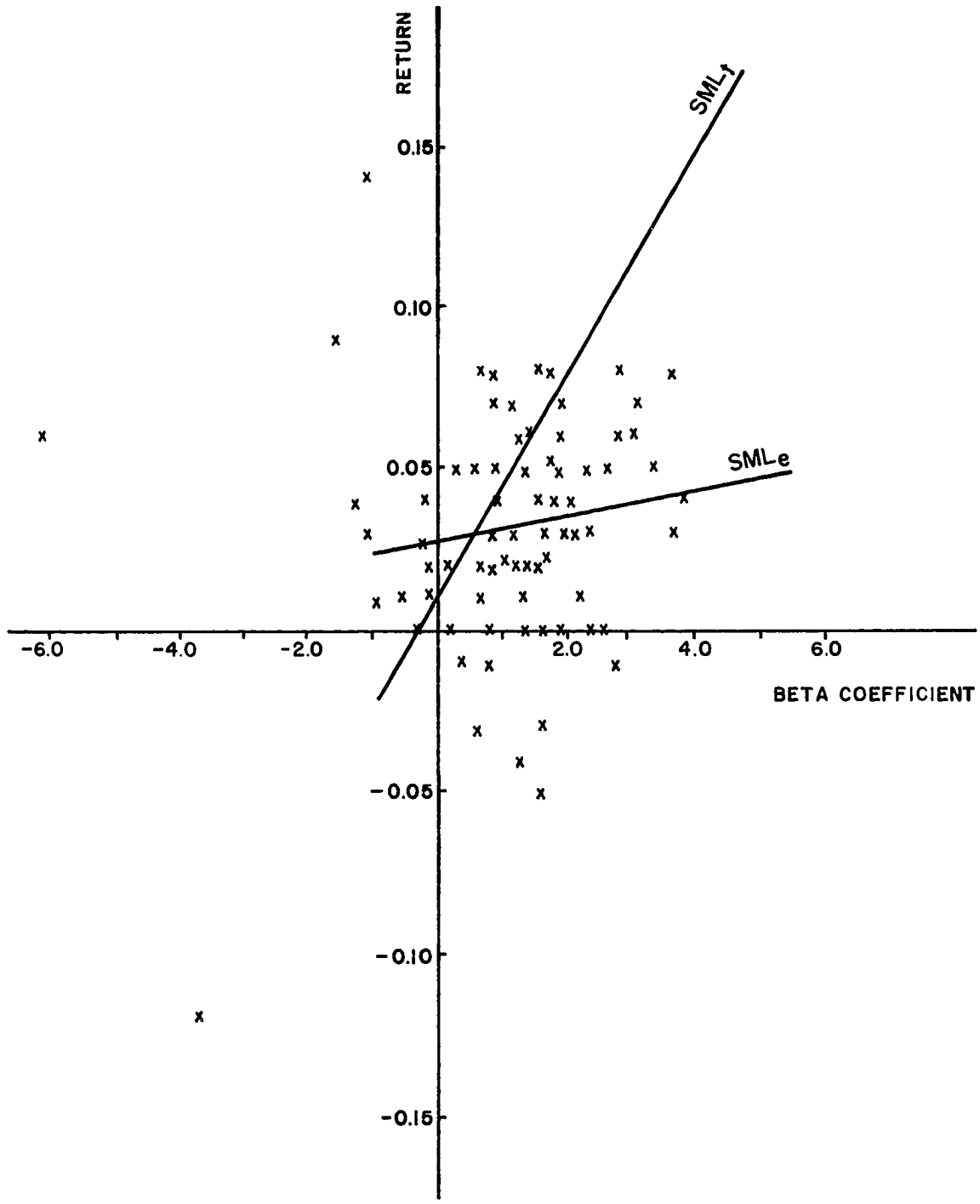


FIGURE 7

THEORETICAL AND EMPIRICAL SECURITY MARKET LINES FOR 1974

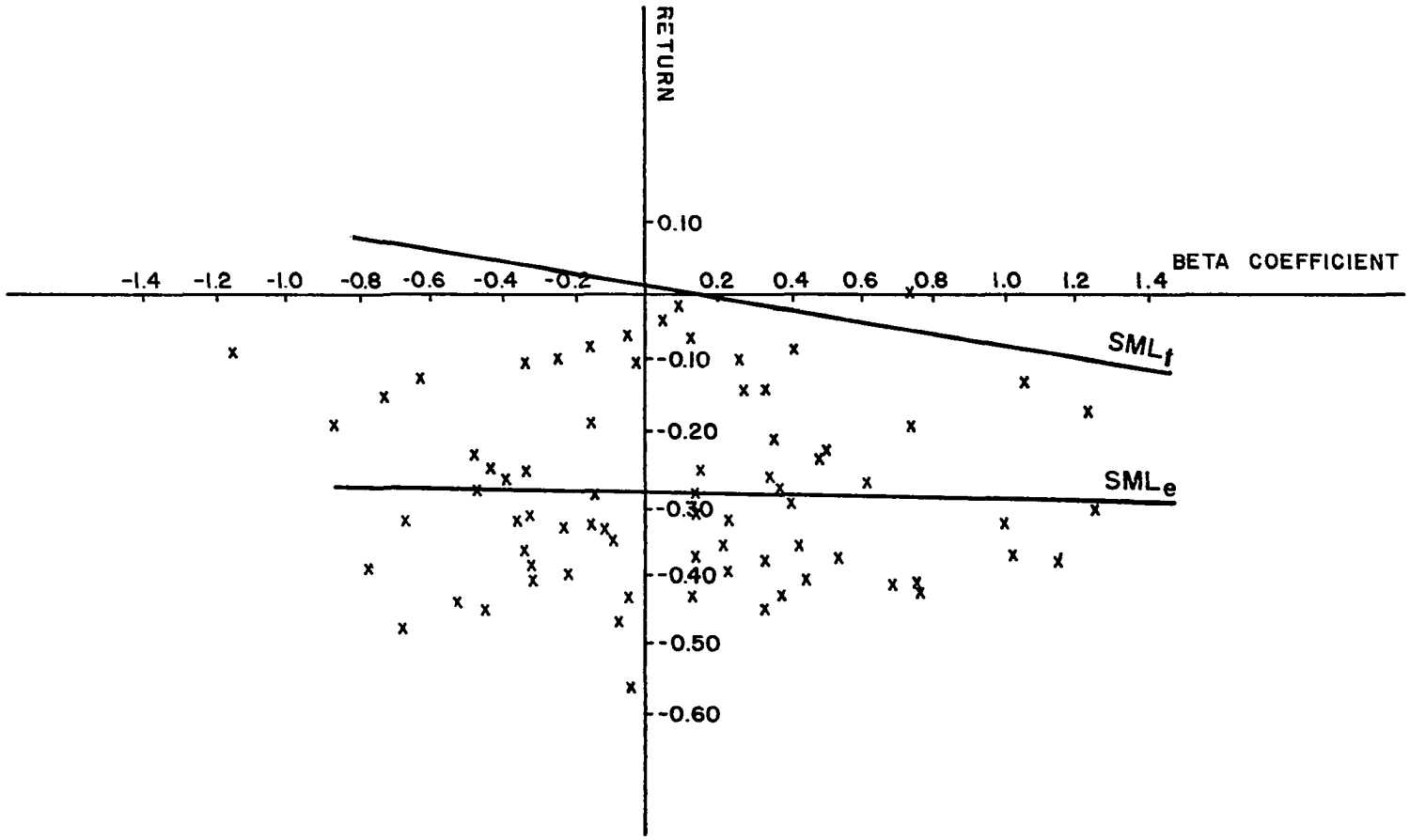


TABLE 11

COMPARISONS OF THEORETICAL AND EMPIRICAL SECURITY MARKET LINES

Year	Parameter	Theoretical Value	Empirical Value	Null Hypothesis	T-value	Accept or Reject Null Hypothesis at 0.01 level of significance
1972	intercept	0.0102	0.0275	$\alpha = a$	3.1455	reject
	slope	0.0344	0.0041	$\beta = b$	-10.6316	reject
1974	intercept	0.0196	-0.2812	$\alpha = a$	-19.0380	reject
	slope	-0.0907	-0.0113	$\beta = b$	2.6662	reject

the theoretical SML during 1972, the risk-return tradeoff of the empirical line, as measured by the slope, was significantly different and lower so that overall during the rising stock market of 1972 the REITs were underperformers. Solving the two 1972 equations simultaneously yields a beta value of 0.57 as the intersection point. This means that in general those REITs having a beta greater than 0.57 performed such that the return achieved per incremental unit of risk undertaken was less than that warranted by the theoretical SML. Since the average beta for sample REITs during 1972 was 1.15, most REITs were performing below the theoretical SML.

REITs performed at a much lower level during the falling stock market of 1974 than the theoretical SML indicates they should. The significantly flatter and negative slope of the empirical line indicates worsening REIT performance vis-a-vis the hypothesized theoretical returns as systematic risk decreases from the intersection point of the two SML lines at a beta value of 3.79. The average beta of sample REITs for 1974 was 0.11. Thus, most REITs did experience poor performance during 1974 as the risk-return tradeoff they experienced was significantly different from that suggested by the theoretical SML.

Capital market theory postulates the SML as the relationship between systematic risk and return for any asset. If REITs have performed as well as or better than theory suggests, the SML should show such performance by having an

empirical risk-return tradeoff, i.e. -- slope of the line, equal to or better than the theoretical risk-return tradeoff. For each year studied, the REITs exhibited a risk-return tradeoff different at a 0.01 level of significance from the theoretical tradeoff. During 1972 the empirical SML shows superior performance compared to the theoretical SML only for those REITs having a beta below 0.57; during 1974 the empirical SML shows superior performance only for those REITs having a beta above 3.79. The statistical comparisons of the SMLs for 1972 and 1974 are strongly suggestive that REITs have not proven themselves to be a viable investment medium.

Blume and Friend have perhaps shed some light on why the empirical risk-return relationships vary so from that which theory leads one to expect. No guarantee exists that high-risk securities will yield high returns in any single period, regardless of how long that period is.[14] The expected returns may be higher, but not the realized returns. Since the results for an investment over any particular time period represent only a single drawing from a probability disbribution, the outcome may not be anywhere near the expected result.[15]

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[14]Marshall E. Blume and Irwin Friend, "Risk Investment Strategy and the Long-Run Rates of Return," The Review of Economics and Statistics 66 (August 1974): 259.

[15]Blume and Friend, "Risk Investment Strategy and the Long-Run Rates of Return," 267.

Factors Affecting REIT Performance

Multiple regression analysis is used to find variables that significantly affect the risk-adjusted performance of REITs. The variables used, both dependent and independent, are listed in Table 12. Appendix H presents the data, resulting equations, and residuals for the multiple regressions.

In all, six regressions were calculated. Regressions were performed using the one-parameter performance measures of Treynor, Sharpe, and Jensen for the years 1972 and 1974. The regression results for Treynor's performance measure are summarized in Table 13, for Sharpe's measure in Table 14, and for Jensen's measure in Table 15.

The next six sections report the findings of how each of the characteristics used as independent variables was related to REIT performance during the two years examined. After testing each of the hypotheses for each of the three dependent variables for each of the two years, a consensus is reached as to the importance of the independent variable in explaining REIT performance. The next section discusses how well the assumptions of regression analysis were adhered to in the multiple regressions conducted. Finally, a section summarizing the importance of the contribution of the factors studied upon REIT performance is presented.

Commercial Bank Sponsorship

Variable CB was found to be significant at the 0.10 level only with Jensen's performance measure during 1972. For

TABLE 12

VARIABLES USED IN MULTIPLE REGRESSION ANALYSES

T_i = one-parameter performance measure of Treynor; equals

$$\frac{\bar{r} - \bar{r}_f}{b_i}$$

S_i = one-parameter performance measure of Sharpe; equals

$$\frac{\bar{r}_p - \bar{r}_f}{\sigma_p}$$

J = one-parameter performance measure of Jensen; equals α_i in the equation

$$r_{it} - \bar{r}_{ft} = \alpha_i + \beta_i(r_{mt} - \bar{r}_{ft})$$

CB = dummy variable indicating REIT sponsorship as a commercial bank or commercial bank holding company; equals 1 if commercial bank is involved, 0 if no commercial bank involvement

Eq = dummy variable indicating REIT invests solely in equity positions in real property; equals 1 if only equity positions are held, 0 if holdings are either mortgages or a combination of mortgages and equities

Hyb = dummy variable indicating REIT invests in both mortgages and equities; equals 1 if investments are both mortgages and equities, 0 if investments are solely either mortgages or equities

TA = total assets of REIT at year-end; measured in units of $100,000,000

Lev = debt ratio as a measure of leverage; equals total debt/total assets

Qual = measure of the quality of the REIT's assets; equals net income/total assets

Exp = measure of the management fees incurred by the REIT; equals management expense/total assets

TABLE 13

REGRESSION RESULTS FOR TREYNOR'S PERFORMANCE MEASURE

$$T = B_0 + B_1CB + B_2Eq + B_3Hyb + B_4TA + B_5Lev + B_6Qual + B_7Exp$$

Independent Variable	1972			1974		
	B Value	T Value	Prob >|T|	B Value	T Value	Prob >|T|
B_0	-0.0355			3.4220		
B_1	0.0163	0.4231	0.6806	3.5241	0.6728	0.5105
B_2	0.0252	0.4008	0.6966	3.3376	0.3779	0.7131
B_3	0.0442	1.2445	0.2073	5.1772	1.0761	0.2806
B_4	0.0074	0.4424	0.6668	0.3681	0.2286	0.8236
B_5	-0.0403	-0.2315	0.8214	-16.3854	-0.9574	0.6588
B_6	0.4576	0.2561	0.8028	-27.1798	-0.6427	0.5298
B_7	0.3518	0.3386	0.7416	131.3444	0.7152	0.5160
R^2	0.0365			0.0399		
F value	0.3522, degrees of freedom are (7,65)			0.3858, degrees of freedom are (7,65)		
Prob >F	0.9317			0.9145		

TABLE 14

REGRESSION RESULTS FOR SHARPE'S PERFORMANCE MEASURE

$$S = B_0 + B_1CB + B_2Eq + B_3Hyb + B_4TA + B_5Lev + B_6Qual + B_7Exp$$

Independent Variable	1972			1974		
	B Value	T Value	Prob >|T|	B Value	T Value	Prob >|T|
B_0	-0.6762			-1.0337		
B_1	-0.0734	-0.5320	0.6040	0.1355	0.5196	0.6125
B_2	-0.4470	-1.9827	0.0455	0.3490	0.7939	0.5643
B_3	0.0397	0.3119	0.7612	0.1946	0.8127	0.5757
B_4	-0.0835	-1.3941	0.1555	-0.0830	-1.0353	0.3007
B_5	1.3499	2.1629	0.0310	-0.7541	-0.8853	0.6183
B_6	4.3861	0.6845	0.5031	4.8635	2.3107	0.0226
B_7	8.1294	2.1819	0.0297	8.2306	0.9005	0.6270
R^2	0.1873			0.2489		
F value	2.1404, degrees of freedom are (7,65)			3.0770, degrees of freedom are (7,65)		
Prob >F	0.0475			0.0089		

TABLE 15

REGRESSION RESULTS FOR JENSEN'S PERFORMANCE MEASURE

$$J = B_0 + B_1 CB + B_2 Eq + B_3 Hyb + B_4 TA + B_5 Lev + B_6 Qual + B_7 Exp$$

Independent Variable	1972			1974		
	B Value	T Value	Prob $>\|T\|$	B Value	T Value	Prob $>\|T\|$
B_0	-0.0193			-0.1600		
B_1	-0.0296	-1.6089	0.1005	-0.0300	-1.2170	0.2182
B_2	0.0415	1.3773	0.1607	0.1056	2.5428	0.0139
B_3	0.0269	1.5808	0.1065	0.0395	1.7449	0.0756
B_4	-0.0091	-1.1321	0.2545	0.0065	0.8576	0.6023
B_5	0.0370	0.4437	0.6659	-0.1558	-1.9366	0.0503
B_6	-0.7277	-0.8504	0.5981	1.1455	5.7611	0.0001
B_7	0.4547	0.9140	0.6347	0.7475	0.8657	0.6070
R^2	0.1913			0.6086		
F Value	2.1967, degrees of freedom are (7,65)			14.4368, degrees of freedom are (7,65)		
Prob $>F$	0.0425			0.000006		

1974 CB was significantly related to Jensen's measure at the 0.22 level. In both instances the relationship was negative. Against the other dependent variables, CB was never more significant than the 0.51 level. The negative relationship between commercial bank sponsorship and REIT performance is counter to the findings of Elebash.[16] Hinson found no relationship between REIT performance and institutional or independent sponsorship.[17]

Although overall not much relationship exists between REIT performance and sponsorship of trusts by commercial banks, the statistical significance that does exist is counter to what might be expected. The evidence here is that during both prosperous and difficult periods the REITs sponsored by commercial banks performed less well than the REITs having non-commercial bank sponsors. The presumed easier access to money markets that the REITs with strong ties to their commerical bank sponsors have seems to not aid the trusts' performance.

Type of REIT

Variables Eq and Hyb combine to test if the type of REIT -- mortgage, equity, or hybrid -- influences performance. For 1972 Eq was negatively, significantly related to Sharpe's measure at the 0.05 level; Eq was positively related to Jensen's performance measure at the 0.16 level of significance. Given that the relationships between Eq and the performance

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[16]Elebash, 127. [17]Hinson, 83.

measures were so mixed for 1972, it seems that there were only slight differences between equity and mortgage REITs, with mortgage REITs having slightly better performance. This finding agrees with Wurtzebach's finding that mortgage REITs outperformed equity REITs during the 1970 to 1973 period.[18] Hinson's study, however, over the same period detected no relationship between performance and REIT type.[19]

During 1974 Eq was positively related to Jensen's measure at the 0.01 level of significance. Thus some evidence is found that equity REITs were better performers than mortgage REITs during the 1974 period of generally poor REIT performance.

In 1972 Hyb was positively related to the Jensen and Treynor performance measures at the 0.10 and 0.20 levels of significance respectively. This indication of hybrid trusts outperforming mortgage trusts corresponds with the findings of Wurtzebach that hybrid trusts outperformed both mortgage and equity REITs during the early 1970s.[20]

The superior performance of hybrid REITs seemed to continue through 1974 as Hyb was positively, significantly related to Jensen's measure at the 0.07 level and Treynor's measure at the 0.28 level. Considerable evidence is found, therefore, that the diversification inherent in the hybrid trusts, compared to those investing solely in mortgages or

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[18]Wurtzebach, 116-117. [19]Hinson, 74.

[20]Wurtzebach, 116-117.

equities, provides consistently superior performance on a risk-adjusted basis.

Total Assets

Variable TA was negatively related to Sharpe's measure at the 0.15 level of significance and Jensen's measure at the 0.25 level of significance during 1972. These negative relationships agree with Elebash's findings that the market accepted a lower yield on trusts with larger total assets during the 1972-1973 period.[21] The negative relationship between TA and performance did not continue during 1974. As total assets were regressed against each of the dependent variables, the coefficients were all positive, but never any more significant than the 0.60 level.

Leverage

During 1972 Lev was positively, significantly related to Sharpe's performance measure at the 0.03 level. This finding is in agreement with Elebash's research on construction and development REITs during 1972-1973.[22] The studies of Hines and Wurtzebach, however, did not find statistically significant relationships between leverage and performance.[23]

The double-edged effect of leverage was illustrated in 1974 as Lev was negatively related to Jensen's performance at the 0.05 level of significance. Of the other two

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[21]Elebash, 127. [22]Elebash, 106.

[23]Hines, 502-503 and Wurtzebach, 109-114.

performance measures, one was negatively and one was positively related to Lev, but neither at a signifncance level above 0.54. The negative relationships should be expected during a period of adverse conditions such as existed for REITs during 1974. Cooley found Jensen's performance measure to be significantly, inversely related to leverage for mortgage REITs from 1971 through 1975.[24] Shulman, however, did not find a significant relationship between Treynor's measure and leverage for equity REITs over the 1964 through 1974 period.[25]

Quality of Assets

Variable Qual never had a level of significance above 0.54 with any of the three performance measure for 1972. During 1974, however, Qual was positively related to Jensen's performance measure at the 0.0001 level of significance. Qual was also positively related to Sharpe's measure at the 0.02 level of significance. The high correlation between Qual and performance during 1974 would seem to indicate the desire on the part of investors to come back to such basics as return on total assets during times of crisis. During the more prosperous period for REITs of 1972, investors were seemingly less interested in such basics.

Management Expense

In 1972 Exp was positively related to Sharpe's performance measure at the 0.03 level of significance. Significance

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[24]Cooley, 191-199. [25]Shulman, 104.

levels between Exp and the other two performance measures were much less, 0.74 and 0.63 for Treynor's and Jensen's measures respectively. For 1974 the relationship between Exp and performance was similar to what it had been in 1972. None of the performance measures were any more significantly related to Exp than the 0.5 level.

Despite various incentive plans common to most management agreements in the REIT industry, not much evidence is found that high compensation of a trust's advisor will be accompanied with high performance. Likewise, low compensation does not appear to be associated with reduced performance.

Meeting the Assumptions of Regression Analysis

The residuals of the multiple regressions were examined to determine how well the assumptions of regression analysis discussed in Chapter III were met. In particular, the possible problem areas of multicollinearity, heteroscedasticity, and autocorrelation were examined.

Multicollinearity will almost always be found to exist. Of concern is not its existence but its severity. This study takes the often used position of arbitrarily setting a maximum correlation coefficient to be tolerated of ±0.8.[26]

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[26]Donald E. Farrar and Robert R. Glauber, "Multicollinearity in Regression Analysis: The Problem Revisited," The Review of Economics and Statistics 49 (February 1976): 98.

The correlation matrices for the independent variables for the two years do not indicate unacceptable levels of multicollinearity. For 1972 the two highest correlation coefficients were -.6850 between Lev and Qual and +.4263 between Eq and Exp. The same general relationships were found in the 1974 data where the highest correlation coefficients of -.4641 and +.4996 were found between Lev and Qual and Eq and Exp respectively.

Examination of the residuals for nonconstance of variance involved plotting the error terms against the estimated dependent variable. This is the method of examination suggested as appropriate for multiple regression models by Neter and Wasserman. None of the plots depicted the trapezoidal pattern expected if the assumptions of homoscedasticity were not met.[27]

Problems of autocorrelation are usually associated with time-series data, but serial correlation cannot be assumed away even in cross-sectional analysis.[28] Durbin-Watson tests were conducted on successive error terms for each of the six multiple regressions. Only for the 1974 run with Jensen's performance measure as the dependent variable did the hypothesis $\rho = 0$ have to be rejected.

All of the assumptions of regression analysis were not met in every case. Since, however, regression analysis is a

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[27]John Neter and William Wasserman, Applied Linear Statistical Models (Homewood, Illinois: Richard D. Irwin, Inc., 1974), 103.

[28]Dutta, 108-114.

robust method of data analysis, the infrequent violations of the assumptions are not deemed sufficient to invalidate the results of the multiple regression investigation into factors affecting REIT performance.

Summary of Factors Affecting REIT Performance

Of the six multiple regressions performed to determine factors significantly affecting REIT performance, four equations were obtained which are significant at the 0.05 level or higher. Statistically significant equations were obtained for both 1972 and 1974 using the performance measures of Sharpe and Jensen. Using Treynor's measure did not provide a satisfactory regression for either year. The reason for Treynor's performance measure yielding insignificant regressions is probably due to computed betas being rather poor risk estimators. Beta coefficients are good at estimating portfolio risk, but do a poorer job at estimating the systematic risk of individual stocks.[29]

Based on a consensus of the regression results, the following evaluations are made of the factors studied:

1. REITs sponsored by commercial banks do not seem to perform much differently from REITs not sponsored by commercial banks.
2. Equity REITs tend to underperform mortgage REITs

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[29]H. Russell Fogler, Analyzing the Stock Market: Statistical Evidence and Methodology (2nd ed.; Columbus, Ohio: Grid, Inc., 1978), 129.

during periods of general prosperity for the trusts and to outperform them during periods of general adversity.

3. Under both favorable and unfavorable conditions hybrid REITs tend to outperform mortgage REITs.
4. The size of a REIT apparently has no bearing on its performance.
5. The use of financial leverage tends to improve REIT performance during periods of general prosperity for the trusts and to deteriorate it during periods of general adversity.
6. The quality of a REIT's investment portfolio appears highly related to the trust's performance, especially during periods of general decline for REITs.
7. Expenses incurred by REITs to compensate their advisors do not seem too importantly related to REIT performance.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

Summary of the Study

The investigation of REIT performance is the principal objective of this study. The research was conducted to answer these specific questions: (1) can REITs diversify? (2) are REITs a viable investment medium? (3) can factors significantly affecting REIT performance be identified?

A sample of 16 real estate related firms was used to ascertain the ability of REITs to diversify. In addition, a sample of 73 trusts was used to study REIT performance for the years of 1972 and 1974. The 73 trusts were all of the REITs for which needed data could be obtained for the years studied. Selection of the years 1972 and 1974 for the study is based on the fact that the years represent vastly different periods of growth and success for REITs. During 1972 total assets of all REITs increased over 75 percent while there was only a 5 percent increase during 1974.

A number of empirical research studies concerning REITs were reviewed. The studies were deficient in that performance was generally gauged only with some return measure.

Performance evaluation was usually void of any risk dimension. This study seeks to more properly evaluate REIT performance by using one-dimensional performance measures derived from the CAPM. These one-dimensional performance measures contain both risk and return attributes of the REITs. Also reviewed were the CAPM, effect of diversification on performance, and performance measurement as viewed from various ways of measuring risk and return and the combination of the two attributes into one-dimensional performance measures founded in the CAPM.

The methodology employed to determine if REITs can diversify was to use the returns on the 16 real estate related firms to proxy the returns available on real estate investments open to REITs. Correlations were then computed on all possible pair combinations of the real estate investments. The lower the correlation coefficient, the greater are the benefits of diversification. To examine the viability of REITs as an investment medium, various tests based on the capital asset pricing model were conducted. Factors significantly affecting REIT performance were investigated by regressing six REIT characteristics against three one-dimensional performance measures derived from the CAPM.

Analysis of the data included simple correlation, T-tests of significance, computing descriptive statistics, analysis of variance, and simple and multiple regression.

Conclusions of the Study

An examination of the data on 73 REITs comprising 60 percent of all REIT assets supports the thesis that REITs have consistently failed to achieve adequate investment performance; i.e., their return is consistently too low for the level of risk encountered. This conclusion was drawn from the following evidence derived in the study:

1. Making use of the SML concept to compare theoretical and empirical SMLs based on the 73 sample REITs reveals that realized REIT performance consistently is less than the SML model predicts. Both the slopes and the intercepts of the theoretical and empirical lines were significantly different for both years. Capital market theory postulates that all assets will exhibit the risk-return relationship shown by the theoretical SML. Performance achieved by REITs has been less than predicted throughout the periods studied.

2. Capital market theory provides another method of examining investment performance -- the CML. The CML depicts the risk-return relationship for efficient portfolios. In addition to its more limited applicability, the CML also differs from the SML in the risk measure used. The CML uses the standard deviation of return as its measure of risk whereas the SML uses the beta coefficient to measure the assets' systematic risk. Comparing theoretical and empirical CMLs in the same way as the SMLs were compared yields

essentially the same results. The REITs consistently realized lower returns than those warranted for the risk involved.

3. Using the one-dimensional performance measures derived from the CAPM by Treynor, Sharpe, and Jensen, average REIT performance was compared to market performance as proxied by Standard & Poor's 500 Composite Stock Index. Comparisons of these risk-adjusted return measures yielded a consensus that REITs performed below and significantly different from the market.

4. In order to ascertain the ability of REITs to hold efficient portfolios, the correlations of returns of 16 real estate related firms were studied. The real estate firms were selected to correspond to those areas from which REITs may legally make their investments; 16 firms were chosen so that the 120 pair combinations they yield would provide a sufficiently large number of degrees of freedom. The average correlation coefficients of returns between the real estate related firms were 0.4358 and 0.5554 for 1972 and 1974 respectively. The correlation of returns on those types of investments open to REITs were found to be higher and significantly different from the average correlation coefficient between stocks of 0.3549 found by Elton and Gruber. Thus, the risk reducing benefits of diversification are more difficult to obtain when making the types of investments REITs are restricted to than when investing in stocks in general.

Addressing the subsidiary question of whether or not factors significantly affecting REIT performance, as indicated by the aforementioned measures of Treynor, Sharpe, and Jensen, could be identified has led to the following conclusions:

1. Hybrid REITs appear to have significantly outperformed mortgage REITs during both periods studied. Thus, even though this study previously found the ability of REITs to diversify somewhat restricted, the diversification the hybrid trusts have achieved has helped them realize better performance than mortgage trusts.

2. Equity REITs have performed countercyclically in comparison to mortgage REITs. Equity REITs performed somewhat poorly during the relatively prosperous year for REITs of 1972. Conversely, equity REITs were found to perform well during 1974, a year of generally poor REIT performance for the trusts.

3. REIT performance was found not to be influenced by whether or not the trust was sponsored by a commercial bank. Slight indications at low levels of significance were found that commercial bank sponsored REITs exhibited worse performance than those REITs sponsored by other interests.

4. The size of a REIT seems to bear no significant relationship to its performance.

5. Management fees paid by REITs have no apparent relationship to their performance.

6. Leverage affects REIT performance as financial theory would predict by magnifying returns and therefore performance measures both positively and negatively as earnings fluctuate. Financial leverage was found positively related to performance during 1972 and negatively related during 1974.

7. The quality of a REIT's investment portfolio, as measured by net income/total assets, was found significantly positively related to performance during 1974. For the more favorable year of 1972, REIT performance was not related to the quality of the trusts' portfolios; investors were evidently content to base their investment decisions on prospective earnings. During 1974, as REITs experienced difficulties, investors became much more interested in earnings currently available.

The implications of this study are found in two areas. First, the study does not lend support to the validity of the CAPM. The relized risk-return tradeoffs of the sample REITs, as indicated by empirical CMLs and SMLs, are significantly different from the tradeoffs predicted by the theoretical CMLs and SMLs. The apparent shortcoming of the CAPM in explaining risk-return relationships may lie in misspecification of the model and/or in problems of measurement. The second area for which this study has implications involves the management of REITs. It would appear that REITs restricting their investments exclusively to either mortgages or equities could achieve better performance by changing to the

hybrid form. The benefits of the hybrid form could be enhanced by management's concerted effort to achieve an efficiently diversified portfolio of real estate investments. This study found correlations of returns on real estate related firms as low as -0.9166 in 1972 and -0.7450 in 1974. With such negatively correlated investments available, REIT managers should be able to construct portfolios with relatively small risk and thus improved performance.

Recommendations for Further Study

The findings of this study reveal the need for additional research in the area of REIT performance.

1. As finance theory produces additional models of the risk-return relationship for assets, the performance measures derived from them should be used to test the stationarity of the results of this study.

2. Alternative methods of calculating risk measures should be used to determine if the results of this study are sensitive to the particular techniques employed.

3. Although the returns on real estate securities seem to be positively correlated at a slightly higher level than stocks in general, additional periods should be checked to see if the higher correlations among real estate securities are a continuing relationship.

4. In investigating those variables having a significant impact upon REIT performance, effort should be made to determine what variables not studied in the current research do effect REIT performance.

5. The Tax Reform Act of 1976 contains several provisions relating to REITs. Possibly the one most likely to affect REIT performance is the provision that REITs may now carry forward a net operating loss for up to eight years. Under prior law a REIT was not allowed the net operating loss deductions. The effect of the Tax Reform Act of 1976 on REITs should be examined.

These unanswered questions indicate that additional research is needed regarding REIT performance. Hopefully, however, the results of this study have filled some of the void in the empirical research concerning REIT performance.

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APPENDIX A

SAMPLE GROUP OF REAL ESTATE RELATED FIRMS

Code	
	Savings and loan associations
1	Financial Federation
2	United Financial of California
	Real estate land development companies
3	Kampgrounds of America
4	Koger Properties
	Subdividers and/or developers
5	Amrep Corporation
6	FPA Corporation
7	Holly Corporation
8	Land Resources
9	Lennar Corporation
10	Punta Gorda Isles Incorporated
11	Shapell Industries
	Real estate operative builders
12	Presley Companies
13	Tishman Realty and Construction
	Miscellaneous real estate companies
14	Canaveral International
15	Rossmoor Corporation
16	Rouse Company

APPENDIX B

SAMPLE REITS

Code	
1	American Century Mortgage Investors
2	American Fletcher Mortgage Investors
3	American Realty Trust
4	Baird & Warner Mortgage and Realty Investors
5	Bankamerica Realty Investors
6	Barnett Mortgage Trust
7	Beneficial Standard Mortgage Investors
8	Cabot, Cabot & Forbes Land Trust
9	Cameron-Brown Investment Group
10	Capital Mortgage Investments
11	Chase Manhattan Mortgage and Realty Trust
12	C. I. Mortgage Group
13	Citinational Development Trust
14	Citizens Mortgage Investment Trust
15	Citizens and Southern Realty Investors
16	Clevetrust Realty Investors
17	Colwell Mortgage Trust
18	Connecticut General Mortgage and Realty Investments
19	Cousins Mortgage and Equity Investments
20	Diversified Mortgage Investors
21	The Equitable Life Mortgage and Realty Investors
22	Fidelco Growth Investors
23	First of Denver Mortgage Investors
24	First Fidelity Investment Trust
25	First Memphis Realty Trust
26	First Mortgage Investors
27	First Pennsylvania Mortgage Trust
28	First Union Real Estate Equity & Mortgage Investments
29	Franklin Realty & Mortgage Trust
30	Fraser Mortgage Investments
31	General Growth Properties
32	Gould Investors Trust
33	Great American Mortgage Investors
34	Guardian Mortgage Investors
35	Gulf Mortgage and Realty Investments
36	Hamilton Investment Trust
37	Heitman Mortgage Investors
38	The Hotel Investors

Code	
39	Hubbard Real Estate Investments
40	Investors Realty Trust
41	Larwin Mortgage Investors
42	Lincoln Mortgage Investors
43	Lomas & Mettleton Mortgage Investors
44	M & T Mortgage Investors
45	Massmutual Mortgage and Realty Investors
46	Midland Mortgage Investors Trust
47	Mortgage Investors of Washington
48	Mortgage Trust of America
49	National Mortgage Fund
50	Northwestern Mutual Life Mortgage and Realty Investors
51	Old Stone Mortgage and Realty Trust
52	Palomar Mortgage Investors
53	Pennsylvania Real Estate Investment Trust
54	PNB Mortgage and Realty Investors
55	Property Capital Trust
56	Real Estate Investment Trust of America
57	Realty Income Trust
58	Realty Refund Trust
59	Republic Mortgage Investors
60	B. F. Saul Real Estate Investment Trust
61	State Mutual Investors
62	Sutro Mortgage Investment Trust
63	Texas First Mortgage REIT
64	Tri-South Mortgage Investors
65	The UMET Trust
66	U. S. Leasing Real Estate Investors
67	U. S. Realty Investments
68	Virginia Real Estate Investment Trust
69	Wachovia Realty Investments
70	Washington Real Estate Investment Trust
71	Wells Fargo Mortgage Investors
72	Western Mortgage Investors
73	Wisconsin Real Estate Investment Trust

APPENDIX C

QUARTERLY HPRs OF REAL ESTATE RELATED FIRMS

Firm	HPR	1972	1974
1	Q1	.3308	.0460
	Q2	.0111	-.1868
	Q3	-.0109	-.1791
	Q4	.0394	.0169
2	Q1	.0633	.1852
	Q2	.1059	-.1500
	Q3	.2151	-.2745
	Q4	-.0273	-.0513
3	Q1	.4545	.1500
	Q2	.0000	-.2400
	Q3	.2360	-.4375
	Q4	.0183	-.1250
4	Q1	.5091	.0328
	Q2	-.4639	-.4194
	Q3	.0519	-.4286
	Q4	-.0550	.0000
5	Q1	.4408	.1786
	Q2	-.2124	-.2813
	Q3	-.3296	-.1304
	Q4	-.1322	-.2222
6	Q1	.5000	.o686
	Q2	-.2037	-.1932
	Q3	.0000	-.4128
	Q4	.0617	-.3333
7	Q1	.5000	.0000
	Q2	-.2500	-.1333
	Q3	-.0833	-.0769
	Q4	-.1667	-.0833

Firm	HPR	1972	1974
8	Q1	.3462	.0000
	Q2	-.0833	-.3750
	Q3	-.2121	-.4000
	Q4	-.3200	-.3333
9	Q1	.0108	.5238
	Q2	-.1099	-.3175
	Q3	-.2954	-.2683
	Q4	-.1617	-.2414
10	Q1	.0658	.1290
	Q2	-.2086	-.0857
	Q3	-.4688	-.3438
	Q4	.0469	-.3182
11	Q1	.1116	.2909
	Q2	-.1738	-.3233
	Q3	-.0340	-.0667
	Q4	-.1259	-.1660
12	Q1	-.0479	.5455
	Q2	-.2938	-.2500
	Q3	-.1290	-.2917
	Q4	.0714	-.2500
13	Q1	.1595	.0493
	Q2	-.0670	-.1973
	Q3	-.1348	-.0911
	Q4	.1898	-.2347
14	Q1	.1875	.0000
	Q2	-.0909	-.3571
	Q3	.0333	-.3750
	Q4	-.3667	-.4000
15	Q1	.3506	.1282
	Q2	-.1852	-.3488
	Q3	-.0116	.7778
	Q4	.5059	-.1522
16	Q1	.0087	-.3731
	Q2	-.1293	-.2439
	Q3	.0971	-.4194
	Q4	-.1422	-.0952

APPENDIX D

CORRELATIONS OF RETURNS OF REAL ESTATE RELATED FIRMS

Combination of Firms	1972	1974
1& 2	-.2972	.8648
1& 3	.8072	.8577
1& 4	.8154	.9983
1& 5	.9935	.6008
1& 6	.9305	.5597
1& 7	.9604	.7320
1& 8	.9137	.7476
1& 9	.8322	.6976
1&10	.6508	.3776
1&11	.8446	.6464
1&12	.3000	.6691
1&13	.6081	.3280
1&14	.6048	.5848
1&15	.4763	-.2188
1&16	.1835	.2981
2& 3	.2445	.9970
2& 4	-.0662	.8568
2& 5	-.3970	.7482
2& 6	-.2635	.8957
2& 7	-.0798	.7485
2& 8	.0026	.9411
2& 9	-.5339	.8909
2&10	-.9166	.7909
2&11	.1215	.7227
2&12	-.6096	.9025
2&13	-.9070	.5562
2&14	.5729	.8565
2&15	-.7550	-.3490
2&16	.7619	.0622
3& 4	.9174	.8540
3& 5	.7355	.6961
3& 6	.8685	.8876
3& 7	.9378	.6953
3& 8	.7963	.9154
3& 9	.3787	.8564
3&10	.1251	.7906
3&11	.9903	.6669

Combination of Firms	1972	1974
3&12	.2020	.8734
3&13	.1735	.4977
3&14	.8536	.8249
3&15	.2398	-.4206
3&16	.7283	.1248
4& 5	.7681	.5562
4& 6	.9621	.5412
4& 7	.9198	.6910
4& 8	.6401	.7209
4& 9	.3674	.6643
4&10	.3620	.3624
4&11	.9619	.6015
4&12	.5737	.6384
4&13	.5802	.2761
4&14	.5759	.5510
4&15	.5993	-.2671
4&16	.5735	.3525
5& 6	.9081	.7888
5& 7	.9240	.9659
5& 8	.8888	.9208
5& 9	.8777	.9627
5&10	.7295	.6773
5&11	.7825	.9901
5&12	.3242	.9382
5&13	.6760	.9522
5&14	.5214	.9403
5&15	.5173	.3297
5&16	.0714	-.5709
6& 7	.9613	.6757
6& 8	.7488	.9370
6& 9	.5996	.9120
6&10	.5759	.9750
6&11	.9255	.7124
6&12	.5582	.9479
6&13	.6386	.7220
6&14	.5318	.9498
6&15	.6541	-.2721
6&16	.3500	-.2577
7& 8	.8885	.8819
7& 9	.6523	.9184
7&10	.4526	.5178
7&11	.9600	.9905
7&12	.3090	.8748
7&13	.4603	.8608
7&14	.7305	.8531
7&15	.4251	.3582
7&16	.4461	-.4303
8& 9	.8083	.9916
8&10	.3924	.8388
8&11	.7781	.8893

Combination of Firms	1972	1974
8&12	-.1077	.9935
8&13	.2718	.8044
8&14	.8117	.9754
8&15	.0780	-.0631
8&16	.2736	-.2770
9&10	.7936	.8125
9&11	.4148	.9346
9&12	.0482	.9951
9&13	.6284	.8725
9&14	.3199	.9856
9&15	.3093	.0620
9&16	-.3301	-.3903
10&11	.2349	.5765
10&12	.5666	.8658
10&13	.9598	.6606
10&14	-.1973	.8854
10&15	.7648	-.3358
10&16	-.5538	-.2867
11&12	.3279	.8974
11&13	.3002	.9224
11&14	.7764	.8902
11&15	.3719	.3911
11&16	.6664	-.5356
12&13	.7749	.8550
12&14	-.3375	.9941
12&15	.9630	-.0113
12&16	-.0312	-.3735
13&14	-.2577	.8898
13&15	.9147	.4685
13&16	-.4286	-.7874
14&15	-.2868	.0300
14&16	.7296	-.4572
15&16	-.1707	-.7450
mean value for year	.4434	.5630

APPENDIX E

PERFORMANCE MEASURES OF SAMPLE REITS AND MARKET

REIT	1972 Treynor	1972 Sharpe	1972 Jensen	1974 Treynor	1974 Sharpe	1974 Jensen
1	-0.0020	-0.0510	-0.0829	0.5218	-2.2642	-0.4468
2	0.0166	0.4907	-0.0466	1.2589	-1.4725	-0.3824
3	0.1501	0.3644	0.0281	-2.5081	-2.9891	-0.3632
4	0.0534	1.1974	0.0238	-0.2838	-1.7464	-0.1413
5	0.0189	0.5034	-0.0339	0.5722	-1.2610	-0.2936
6	0.0087	0.2092	-0.0373	-1.3661	-2.1303	-0.4178
7	-1.0149	0.6973	0.0384	-0.4334	-1.2298	-0.2149
8	0.0098	0.3006	-0.0363	-0.3835	-1.8170	-0.2780
9	0.0038	0.0635	-0.0459	-148.3443	-5.8293	-0.4262
10	-0.0083	-0.1778	-0.0673	1.9031	-1.8780	-0.4129
11	0.0132	0.3039	-0.0526	-0.3410	-1.8815	-0.2726
12	0.0081	0.1857	-0.0563	0.8357	-1.5417	-0.4491
13	-0.0633	-0.2505	-0.0159	6.2474	-1.6091	-0.3369
14	0.0406	0.5194	0.0214	-0.7473	-1.7412	-0.3294
15	0.0064	0.1728	-0.0975	-2.8691	-2.4893	-0.4315
16	0.0267	0.2171	-0.0016	0.5037	-1.3170	-0.3691
17	0.0231	0.5775	-0.0193	-0.6209	-2.1529	-0.3537
18	-0.0541	-0.2953	-0.0260	1.9036	-0.7590	-0.0918
19	0.0241	0.6225	-0.0183	9.6248	-1.7478	-0.4569
20	0.0156	0.3728	-0.0322	9.5579	-1.7902	-0.4151
21	0.0006	-0.0159	0.0349	0.6193	-0.7123	-0.1146
22	0.0166	0.4100	-0.0481	1.9218	-1.8160	-0.3249
23	0.0231	0.6860	-0.0307	-1.8700	-1.4729	-0.3310
24	0.0359	-0.6727	0.0127	0.6285	-0.8945	-0.2598
25	-0.0050	-0.1016	-0.0899	-0.5901	-1.5927	-0.2358

REIT	1972			1974		
	Treynor	Sharpe	Jensen	Treynor	Sharpe	Jensen
26	0.0139	0.1424	-0.0127	0.7142	-2.6222	-0.5205
27	-0.0069	-0.1243	-0.0376	-2.4213	-1.6661	-0.2761
28	0.0101	0.2628	-0.0317	-0.2498	-0.6662	-0.0577
29	-0.0211	-0.4456	-0.0461	-0.1526	-0.9075	-0.0416
30	-0.0238	-0.4758	-0.0848	0.4516	-0.5361	-0.1148
31	-0.0074	0.2244	0.2777	-0.0296	-0.2039	0.0437
32	0.0793	1.6035	0.0405	0.2343	-0.8043	-0.2117
33	0.0196	0.5548	-0.0426	-14.5575	-6.1230	-0.5696
34	0.0104	0.2955	-0.0766	-0.5921	-3.7102	-0.3784
35	0.0416	0.8534	0.0117	-1.3035	-1.9975	-0.3528
36	0.0395	0.8443	0.0110	-0.9073	-1.3661	-0.3173
37	0.0696	0.5969	0.0214	-0.8015	-1.8999	-0.2549
38	-0.0965	0.2139	0.0099	0.3695	-0.8095	-0.1370
39	0.0185	-0.0712	0.0085	8.9640	-1.2753	0.0191
40	-0.0215	0.6435	0.0819	0.2431	-1.0519	-0.2538
41	0.0080	0.2420	-0.0980	1.3290	-2.8973	-0.4390
42	0.0212	0.5689	-0.0218	-0.2792	-1.5458	-0.2199
43	0.0179	0.5000	-0.0562	-0.1387	-0.6208	-0.0368
44	0.0280	0.3825	-0.0024	-1.5192	-1.2038	-0.0582
45	-0.0032	0.0291	0.0298	0.2308	-0.6217	-0.1693
46	0.0661	1.8115	0.0441	1.0532	-2.2378	-0.3543
47	0.0157	0.3226	-0.0390	-1.5178	-1.2038	-0.2350
48	0.3036	-0.1962	-0.0027	-0.5268	-0.8155	-0.1767
49	0.0480	0.7399	0.0099	0.9769	-1.4545	-0.4410
50	0.0206	0.2790	-0.0120	1.3568	-1.3558	-0.1999
51	0.0095	0.2507	-0.0227	-2.8143	-2.2920	-0.3066
52	0.0202	0.2074	-0.0053	-0.9025	-1.3821	-0.3464
53	0.0288	0.7655	-0.0058	-0.4209	-1.1026	-0.0876
54	0.0085	0.2539	-0.0542	-0.3472	-1.3869	-0.2297

REIT	1972			1974		
	Treynor	Sharpe	Jensen	Treynor	Sharpe	Jensen
55	-0.0181	0.2085	0.1130	-0.5538	-0.7538	-0.1125
56	-0.0382	-0.9611	-0.1105	-0.4547	-0.4216	-0.0299
57	-0.0569	-0.3431	-0.0539	0.7101	-1.8431	-0.3012
58	0.0716	1.5332	0.0319	0.0851	-0.5031	-0.1755
59	0.0044	0.1189	-0.0192	-1.1459	-1.5775	-0.3721
60	0.0414	0.0450	0.0010	-0.6532	-1.2893	-0.1863
61	0.0166	0.4019	-0.0318	0.9891	-2.9233	-0.3535
62	-0.0080	-0.1488	-0.0678	1.7965	-2.1135	-0.3080
63	-0.0064	-0.1424	-0.1109	1.0590	-1.5705	-0.3766
64	0.0324	0.6165	0.0010	-1.8631	-2.0117	-0.3714
65	-0.0023	-0.0926	-0.0890	-0.5784	-2.0275	-0.3470
66	-0.0078	-0.1441	-0.0730	-0.5095	-0.5810	-0.1065
67	-0.0408	-1.2481	-0.0907	0.7935	-0.9084	-0.2591
68	-0.1120	0.9766	0.1708	-0.5363	-0.9535	-0.1865
69	0.0091	0.2286	-0.0565	-1.5553	-1.6579	-0.3110
70	0.0316	0.7885	-0.0041	-0.6443	-1.1054	-0.0668
71	0.0133	0.2870	-0.0340	-0.8050	-1.4006	-0.2642
72	0.0874	0.7005	0.0476	1.4435	-1.4501	-0.3390
73	-0.0473	0.6525	0.1345	-0.7746	-1.2587	-0.2302
Market (S&P 500)	0.0344	1.0585	0.0	-0.0907	-0.6374	0.0

APPENDIX F

DATA, RESULTING EQUATIONS, AND RESIDUALS FOR EMPIRICAL CMLs

Data

REIT	1972 Geometric Mean of Quarterly PHR	1972 Std. Deviation of Quarterly HPR	1974 Geometric Mean of Quarterly HPR	1974 Std. Deviation of Quarterly HPR
1	.0058	.0863	-.3841	.1783
2	.0552	.0917	-.3849	.2747
3	.0477	.1029	-.3654	.1288
4	.0739	.0532	-.1891	.1195
5	.0549	.0888	-.2577	.2199
6	.0234	.0631	-.4610	.2256
7	.0443	.0489	-.2737	.2385
8	.0246	.0479	-.3725	.2158
9	.0162	.0945	-.4106	.0738
10	-.0036	.0776	-.4046	.2259
11	.0453	.1155	-.3757	.2101
12	.0273	.0948	-.4352	.2950
13	-.0023	.0499	-.3365	.2213
14	.0824	.1390	-.3847	.2322
15	.0332	.1331	-.4449	.1866
16	.0310	.0958	-.3303	.2656
17	.0549	.0774	-.4155	.2021
18	-.0066	.0569	-.0752	.1249
19	.0572	.0755	-.4780	.2847
20	.0395	.0786	-.4258	.2488
21	.0096	.0378	-.0923	.1571
22	.0603	.1222	-.3098	.1814

REIT	1972 Geometric Mean of Quarterly HPR	1972 Std. Deviation of Quarterly HPR	1974 Geometric Mean of Quarterly HPR	1974 Std. Deviation of Quarterly HPR
23	.0777	.0984	-.3613	.2586
24	-.1240	.1995	-.2508	.3023
25	-.0020	.1201	-.2725	.1834
26	.0227	.0878	-.4697	.1866
27	.0037	.0523	-.2833	.1818
28	.0230	.0487	-.0802	.1498
29	-.0070	.0386	-.1687	.2075
30	-.0261	.0763	-.0918	.2078
31	.0557	.2028	-.0024	.1079
32	.0838	.0459	-.1538	.2156
33	.0694	.1067	-.5627	.0951
34	.0451	.1181	-.4323	.1218
35	.0626	.0614	-.3811	.2006
36	.0780	.0803	-.3748	.2887
37	.0490	.0650	-.2783	.1568
38	.0173	.0332	-.1011	.1491
39	.0046	.0786	-.1050	.0977
40	.0407	.0474	-.1934	.2025
41	.0403	.1244	-.4066	.1471
42	.0486	.0675	-.3330	.2281
43	.0757	.1310	-.1292	.2397
44	.0478	.0983	-.0436	.0525
45	.0123	.0721	-.1229	.2292
46	.1015	.0504	-.3210	.1522
47	.0424	.0998	-.2539	.2272
48	.0051	.0260	-.2363	.3138
49	.0469	.0496	-.4374	.3142
50	.0348	.0879	-.1793	.1467

REIT	1972 Geometric Mean of Quarterly HPR	1972 Std. Deviation of Quarterly HPR	1974 Geometric Mean of Quarterly HPR	1974 Std. Deviation of Quarterly HPR
51	.0193	.0363	-.3077	.1428
52	.0242	.0675	-.4119	.3122
53	.0373	.0354	-.0954	.1043
54	.0281	.0705	-.3328	.2541
55	.0284	.0873	-.1384	.2096
56	-.0491	.0617	-.0226	.1001
57	-.0251	.1029	-.2624	.1530
58	.0726	.0407	-.0779	.1938
59	.0131	.0244	-.4273	.2833
60	.0156	.1201	-.2108	.1787
61	.0393	.0724	-.3157	.1147
62	-.0033	.0907	-.2858	.1445
63	-.0084	.1306	-.3647	.2447
64	.0573	.0764	-.3914	.2043
65	.0046	.0605	-.4151	.2144
66	-.0031	.0923	-.1421	.2783
67	-.0391	.0395	-.2501	.2969
68	.1395	.1324	-.2428	.2752
69	.0305	.0888	-.3322	.2122
70	.0721	.0785	-.0601	.0721
71	.0319	.0756	-.3024	.2299
72	.0771	.0955	-.3293	.2406
73	.0868	.1174	-.2626	.2242

Resulting regression equations for empirical CMLs:

1972: $r_p = 0.0297 + 0.0305\sigma_p$

1974: $r_p = -0.1356 - 0.7361\sigma_p$

Residuals

REIT	1972 Return	1972 Predicted Return	1972 Deviation	1974 Return	1974 Predicted Return	1974 Deviation
1	.0058	.0324	-.0266	-.3841	-.2669	-.1172
2	.0552	.0325	.0227	-.3849	-.3375	-.0474
3	.0477	.0329	.0148	-.3654	-.2304	-.1350
4	.0739	.0314	.0425	-.1891	-.2236	.0345
5	.0549	.0324	.0225	-.2577	-.2975	.0398
6	.0234	.0317	-.0083	-.4610	-.3017	-.1593
7	.0443	.0312	.0131	-.2737	-.3112	.0375
8	.0246	.0312	-.0066	-.3725	-.2945	-.0780
9	.0162	.0326	-.0164	-.4106	-.1899	-.2207
10	-.0036	.0321	-.0357	-.4046	-.3019	-.1027
11	.0453	.0333	.0120	-.3757	-.2903	-.0854
12	.0278	.0326	-.0048	-.4352	-.3528	-.0824
13	-.0023	.0313	-.0336	-.3365	-.2985	-.0380
14	.0824	.0230	.0484	-.3847	-.3065	-.0782
15	.0332	.0338	-.0006	-.4449	-.2730	-.1719
16	.0310	.0327	-.0017	-.3303	-.3311	.0008
17	.0549	.0321	.0228	-.4155	-.2844	-.1311
18	-.0066	.0315	-.0381	-.0752	-.2276	.1524
19	.0572	.0320	.0252	-.4780	-.3452	-.1328
20	.0395	.0321	.0074	-.4258	-.3188	-.1070
21	.0096	.0309	.0213	-.0932	-.2513	.1581
22	.0603	.0335	.0268	-.3098	-.2691	-.0407
23	.0777	.0327	.0450	-.3613	-.3260	-.0353
24	-.1240	.0358	-.1598	-.2508	-.3581	.1073
25	-.0020	.0334	-.0354	-.2725	-.2706	-.0019
26	.0227	.0324	-.0097	-.4697	-.2730	-.1967
27	.0037	.0313	-.0276	-.2833	-.2694	-.0139
28	.0230	.0312	-.0082	-.0802	-.2459	.1657
29	-.0070	.0309	-.0379	-.1687	-.2884	.1197
30	-.0261	.0321	-.0582	-.0918	-.2886	.1968
31	.0557	.0359	.0198	-.0024	-.2150	.2126
32	.0838	.0311	.0527	-.1538	-.2943	.1405
33	.0694	.0330	.0364	-.5627	-.2056	-.3571
34	.0451	.0333	.0118	-.4323	-.2253	-.2070
35	.0626	.0316	.0310	-.3811	-.2833	-.0978
36	.0780	.0322	.0458	-.3748	-.3481	-.0267
37	.0490	.0317	.0173	-.2783	-.2510	-.0273
38	.0173	.0308	-.0135	-.1011	-.2454	.1443
39	.0046	.0321	-.0275	-.1050	-.2075	.1025
40	.0407	.0312	.0095	-.1934	-.2847	.0913
41	.0403	.0335	.0068	-.4066	-.2439	-.1627
42	.0486	.0318	.0168	-.3330	-.3035	-.0295

REIT	1972 Return	1972 Predicted Return	1972 Deviation	1974 Return	1974 Predicted Return	1974 Deviation
43	.0757	.0337	.0420	-.1292	-.3121	.1829
44	.0478	.0327	.0151	-.0436	-.1743	.1307
45	.0123	.0319	-.0196	-.1229	-.3043	.1814
46	.1015	.0313	.0702	-.3210	-.2476	-.0734
47	.0424	.0328	.0096	-.2539	-.3029	.0490
48	.0051	.0305	-.0254	-.2363	-.3666	.1303
49	.0469	.0313	.0156	-.4374	-.3669	-.0705
50	.0348	.0324	.0024	-.1793	-.2436	.0643
51	.0193	.0308	-.0115	-.3077	-.2407	-.0670
52	.0242	.0318	-.0076	-.4119	-.3654	-.0465
53	.0373	.0308	.0065	-.0954	-.2124	.1170
54	.0281	.0319	-.0038	-.3328	-.3227	-.0101
55	.0248	.0324	-.0040	-.1384	-.1899	.1515
56	-.0491	.0316	-.0807	-.0226	-.2093	.1867
57	-.0251	.0329	-.0580	-.2624	-.2482	-.0142
58	.0726	.0310	.0416	-.0779	-.2783	.2004
59	.0131	.0305	-.0174	-.4273	-.3441	-.0832
60	.0156	.0334	-.0178	-.2108	-.2672	.0564
61	.0393	.0319	.0074	-.3157	-.2200	-.0957
62	-.0033	.0325	-.0358	-.2858	-.2420	-.0438
63	-.0084	.0337	-.0421	-.3647	-.3157	-.0490
64	.0573	.0321	.0252	-.3914	-.2860	-.1054
65	.0046	.0316	-.0270	-.4151	-.2934	-.1217
66	-.0031	.0326	-.0357	-.1421	-.3405	.1984
67	-.0391	.0309	-.0700	-.2501	-.3542	.1041
68	.1395	.0338	.1057	-.2428	-.3382	.0954
69	.0305	.0324	-.0019	-.3322	-.2918	-.0404
70	.0721	.0321	.0400	-.0601	-.1887	.1286
71	.0319	.0320	-.0001	-.3024	-.3048	.0024
72	.0771	.0327	.0444	-.3293	-.3127	-.0166
73	.0868	.0333	.0535	-.2626	-.3006	.0380

APPENDIX G

DATA, RESULTING EQUATIONS, AND RESIDUALS FOR EMPIRICAL SMLs

Data

REIT	1972 Geometric Mean of Quarterly HPR	1972 Beta Coefficient	1974 Geometric Mean of Quarterly HPR	1974 Beta Coefficient
1	.0058	2.2551	-.3841	-.7737
2	.0552	2.7073	-.3849	-.3213
3	.0477	.2499	-.3654	.1535
4	.0739	1.1929	-.1891	.7353
5	.0549	2.3645	-.2577	-.4846
6	.0234	1.5229	-.4610	.3518
7	.0443	-0.0336	-.2737	.6195
8	.0246	1.4741	-.3725	1.0224
9	.0162	1.5900	-.4106	.0029
10	-.0036	1.6548	-.4046	-.2229
11	.0453	2.6650	-.3757	1.1590
12	.0278	2.1750	-.4352	-.5442
13	-.0023	.1974	-.3365	-.0570
14	.0824	1.7762	-.3847	.5410
15	.0332	3.6150	-.4449	.1619
16	.0310	.7793	-.3303	-.6946
17	.0549	1.9319	-.4155	.7008
18	-.0066	.3108	-.0752	-.0498
19	.0572	1.9468	-.4780	-.0517
20	.0395	1.8790	-.4258	-.0466
21	.0096	-.9745	-.0923	-.1807
22	.0603	3.0256	-.3098	-.1714

REIT	1972 Geometric Mean of Quarterly HPR	1972 Beta Coefficient	1974 Geometric Mean of Quarterly HPR	1974 Beta Coefficient
23	.0777	2.9191	-.3613	.2037
24	-.1240	-3.7423	-.2508	-.4302
25	-.0020	2.4165	-.2725	.4950
26	.0227	.8970	-.4697	-.6851
27	.0037	.9420	-.2833	.1251
28	.0230	1.2651	-.0802	.3995
29	-.0070	.8144	-.1687	1.2342
30	-.0261	1.5257	-.0918	-.2467
31	.0557	-6.1412	-.0024	.7422
32	.0838	.9278	-.1538	-.7401
33	.0694	3.0254	-.5627	.0400
34	.0451	3.3618	-.4323	.7632
35	.0626	1.2607	-.3811	.3074
36	.0780	1.7170	-.3748	.4347
37	.0490	.5571	-.2783	.3717
38	.0173	-.0736	-.1011	-.3267
39	.0046	-.3032	-.1050	-.0139
40	.0407	-1.4184	-.1934	-.8762
41	.0403	3.7847	-.4066	-.3207
42	.0486	1.8088	-.3-30	1.2627
43	.0757	3.6559	-.1292	1.0731
44	.0478	1.3427	-.0436	.0416
45	.0123	-.6666	-.1229	-.6173
46	.1015	1.3818	-.3210	-.3234
47	.0424	2.0552	-.2539	.1802
48	.0051	-.0168	-.2363	.4858
49	.0469	.7640	-.4374	-.4678
50	.0348	1.1950	-.1793	-.1466

REIT	1972 Geometric Mean of Quarterly HPR	1972 Beta Coefficient	1974 Geometric Mean of Quarterly HPR	1974 Beta Coefficient
51	.0193	.9542	-.3077	.1163
52	.0242	.6938	-.4119	.4781
53	.0373	.9419	-.0954	.2732
54	.0281	2.0978	-.3328	1.0150
55	.0284	-1.0063	-.1384	.2853
56	-.0491	1.5529	-.0226	.0928
57	-.0251	.6202	-.2624	-.3971
58	.0726	.8712	-.0779	-1.1455
59	.0131	.6552	-.4273	.3900
60	.0156	.1305	-.2108	.3527
61	.0393	1.7527	-.3157	-.3390
62	-.0033	1.6818	-.2858	-.1700
63	-.0084	2.9196	-.3647	-.3629
64	.0573	1.4551	-.3914	.2206
65	.0046	2.4840	-.4151	.7516
66	-.0031	1.7019	-.1421	.3174
67	-.0391	1.2070	-.2501	-.3399
68	.1395	-1.1541	-.2428	.4893
69	.0305	2.2384	-.3322	.2262
70	.0721	1.9586	-.0601	.1237
71	.0319	1.6288	-.3024	.4000
72	.0771	.7654	-.3293	-.2417
73	.0868	-1.6179	-.2626	.3643

Resulting regression equations for empirical SMLs:

1972: $r_i = 0.0275 + 0.0041\beta_i$

1974: $r_i = -0.2812 - 0.0113\beta_i$

Residuals

REIT	1972 Return	1972 Predicted Return	1972 Deviation	1974 Return	1974 Predicted Return	1974 Deviation
1	.0058	.0368	-.0310	-.3841	-.2724	-.1117
2	.0552	.0386	.0166	-.3849	-.2776	-.1073
3	.0477	.0285	.0192	-.3654	-.2830	-.0824
4	.0739	.0324	.0415	-.1891	-.2896	.1005
5	.0549	.0372	.0177	-.2577	-.2757	.0180
6	.0234	.0338	-.0104	-.4610	-.2852	-.1758
7	.0443	.0274	.0169	-.2737	-.2882	.0145
8	.0246	.0336	-.0090	-.3725	-.2928	-.0797
9	.0162	.0340	-.0178	-.4106	-.2812	-.1294
10	-.0036	.0343	-.0379	-.4046	-.2787	-.1259
11	.0453	.0385	.0068	-.3757	-.2944	-.0813
12	.0278	.0365	-.0087	-.4352	-.2750	-.1602
13	-.0023	.0283	-.0306	-.3365	-.2806	-.0559
14	.0824	.0248	.0476	-.3847	-.2873	-.0974
15	.0332	.0424	-.0092	-.4449	-.2831	-.1618
16	.0310	.0307	.0003	-.3303	-.2733	-.0570
17	.0549	.0355	.0194	-.4155	-.2892	-.1263
18	-.0066	.0288	-.0354	-.0752	-.2806	.2054
19	.0572	.0355	.0217	-.4780	-.2806	-.1974
20	.0395	.0352	.0043	-.4258	-.2807	-.1451
21	.0096	.0235	-.0139	-.0932	-.2792	.1860
22	.0603	.0399	.0204	-.3098	-.2793	-.0305
23	.0777	.0395	.0382	-.3613	-.2835	-.0778
24	-.1240	.0121	-.1361	-.2508	-.2763	.0255
25	-.0020	.0374	-.0394	-.2725	-.2868	.0143
26	.0227	.0312	-.0085	-.4697	-.2734	-.1963
27	.0037	.0314	-.0277	-.2833	-.2826	-.0007
28	.0230	.0327	-.0097	-.0802	-.2857	.2055
29	-.0070	.0309	-.0379	-.1687	-.2952	.1265
30	-.0261	.0338	-.0599	-.0918	-.2784	.1866
31	.0557	.0023	.0534	-.0024	-.2896	.2872
32	.0838	.0313	.0525	-.1538	-.2728	.1190
33	.0694	.0399	.0295	-.5627	-.2817	-.2810
34	.0451	.0413	.0038	-.4323	-.2899	-.1424
35	.0626	.0327	.0299	-.3811	-.2847	-.0964
36	.0780	.0346	.0434	-.3748	-.2861	-.0887
37	.0490	.0298	.0192	-.2783	-.2854	.0071
38	.0173	.0272	-.0099	-.1011	-.2775	.1764
39	.0046	.0263	-.0217	-.1050	-.2811	.1761
40	.0407	.0217	.0190	-.1934	-.2713	.0779
41	.0403	.0431	-.0028	-.4066	-.2776	-.1290
42	.0486	.0349	.0137	-.3330	-.2955	-.0375

REIT	1972 Return	1972 Predicted Return	1972 Deviation	1974 Return	1974 Predicted Return	1974 Deviation
43	.0757	.0425	.0332	-.1292	-.2934	.1642
44	.0478	.0330	.0148	-.0436	-.2817	.2381
45	.0123	.0248	-.0125	-.1229	-.2742	.1513
46	.1015	.0332	.0683	-.3210	-.2775	-.0435
47	.0424	.0360	.0064	-.2539	-.2833	.0294
48	.0051	.0274	-.0223	-.2363	-.2867	.0504
49	.0469	.0307	.0162	-.4374	-.2759	-.1615
50	.0348	.0324	.0024	-.1793	-.2796	.1003
51	.0193	.0314	-.0121	-.3077	-.2825	-.0252
52	.0242	.0304	-.0062	-.4119	-.2866	-.1253
53	.0373	.0314	.0059	-.0954	-.2843	.1889
54	.0281	.0361	-.0080	-.3328	-.2927	-.0401
55	.0284	.0234	.0050	-.1384	-.2844	.1460
56	-.0491	.0339	-.0830	-.0226	-.2823	.2597
57	-.0251	.0301	-.0552	-.2624	-.2767	.0143
58	.0726	.0311	.0415	-.0779	-.2682	.1903
59	.0131	.0302	-.0171	-.4273	-.2856	-.1417
60	.0156	.0280	-.0124	-.2108	-.2852	.0744
61	.0393	.0347	.0046	-.3157	-.2774	-.0383
62	-.0033	.0344	-.0377	-.2858	-.2793	-.0065
63	-.0084	.0395	-.0479	-.3647	-.2771	-.0876
64	.0573	.0335	.0238	-.3914	-.2837	-.1077
65	.0046	.0377	-.0331	-.4151	-.1897	-.1254
66	-.0031	.0345	-.0376	-.1421	-.2848	.1427
67	-.0391	.0325	-.0716	-.2501	-.2774	.0173
68	.1395	.0228	.1167	-.2428	-.2868	.0440
69	.0305	.0367	-.0062	-.3322	-.2838	-.0484
70	.0721	.0356	.0365	-.0601	-.2826	.2225
71	.0319	.0342	-.0023	-.3024	-.2857	-.0167
72	.0771	.0307	.0464	-.3293	-.3785	-.0508
73	.0868	.0209	.0659	-.2626	-.2853	.0227

APPENDIX H

DATA, RESULTING EQUATIONS, AND RESIDUALS FOR THE MULTIPLE REGRESSIONS

Independent Variables Used in 1972 Multiple Regressions
(values for dependent variables found in Appendix E)

REIT	CB	Eq	Hyb	TA	Lev	Qual	Exp
1	0	0	0	1.6594	.6754	.0326	.0102
2	0	0	0	.8104	.6039	.0425	.0083
3	0	0	1	.4168	.6005	.0502	.0266
4	0	0	1	.5706	.6972	.0278	.0079
5	1	0	1	1.7890	.6322	.0368	.0118
6	1	0	0	1.3296	.7055	.0323	.0094
7	0	0	0	.7857	.7210	.0325	.0094
8	0	1	0	1.1960	.5121	.0482	.0085
9	0	0	0	1.0611	.5613	.0481	.0122
10	0	0	1	1.3165	.7819	.0247	.0082
11	1	0	1	6.5210	.8058	.0315	.0133
12	0	0	0	2.3173	.6594	.0377	.0104
13	1	0	0	.2705	.5868	.0416	.0129
14	1	0	1	.6468	.6994	.0341	.0102
15	1	0	1	2.8009	.7550	.0323	.0088
16	1	0	1	.9714	.5166	.0413	.0078
17	0	0	1	1.1180	.6679	.0381	.0122
18	0	0	1	2.9551	.6248	.0313	.0091
19	0	0	0	1.7480	.6667	.0291	.0092
20	0	0	0	3.1459	.5351	.0624	.0132
21	0	0	1	2.1695	.3854	.0536	.0125
22	0	0	1	.6657	.4188	.0646	.0091
23	1	0	0	.6555	.5641	.0463	.0135
24	0	1	0	.2936	.6393	.0000	.0062
25	1	0	1	.5287	.6036	.0379	.0109
26	0	0	1	4.2011	.7467	.0361	.0084
27	1	0	0	1.2278	.5410	.0443	.0148
28	0	0	1	1.3688	.7543	.0037	.0044
29	0	1	0	.4292	.7639	.0170	.0076
30	0	0	0	.4619	.6179	.0515	.0141
31	0	1	0	1.3677	.8100	.0224	.0334
32	0	0	1	.3578	.7442	.0264	.0582
33	0	0	1	3.0397	.8059	.0367	.0035
34	0	0	0	2.9375	.7791	.0290	.0091

REIT	CB	Eq	Hyb	TA	Lev	Qual	Exp
35	0	0	1	.9983	.5960	.0334	.0089
36	0	0	0	.8831	.6944	.0273	.0083
37	0	0	0	1.2107	.8105	.0248	.0074
38	0	0	1	.6336	.6115	.0400	.0114
39	0	0	1	.9666	.0299	.0633	.0033
40	0	0	1	.5328	.6251	.0260	.0051
41	0	0	0	1.2209	.6677	.0433	.0116
42	0	0	1	.4923	.8001	.0146	.0063
43	0	0	0	2.8805	.6437	.0361	.0125
44	0	0	0	.3467	.6197	.0405	.0085
45	0	0	1	2.1346	.5719	.0409	.0087
46	0	0	1	.9960	.7628	.0300	.0079
47	0	0	1	.6449	.7241	.0291	.0130
48	0	0	1	1.6897	.5884	.0444	.0118
49	1	0	0	.6396	.5412	.0342	.0067
50	0	0	1	1.6330	.4595	.0450	.0098
51	1	0	1	.2986	.7153	.0141	.0049
52	0	0	0	.6411	.6224	.0415	.0075
53	0	1	0	.2549	.4720	.0634	.1424
54	1	0	1	1.0110	.6011	.0430	.0099
55	0	0	1	.6792	.5774	.0510	.0107
56	0	1	0	.4204	.2843	.0518	.0099
57	0	0	1	.6152	.6693	.0348	.0031
58	0	0	1	1.0360	.8151	.0194	.0027
59	0	0	1	.7544	.4816	.0498	.0143
60	0	0	1	2.2489	.6694	.0338	.0050
61	0	0	0	.9529	.4360	.0614	.0108
62	1	0	0	.8337	.5379	.0452	.0095
63	0	0	0	.5045	.6195	.0353	.0089
64	1	0	0	1.2986	.7113	.0336	.0110
65	0	0	1	.9621	.6412	.0407	.0131
66	0	0	1	.4015	.2592	.0438	.0138
67	0	0	1	1.2808	.7895	.0273	.0105
68	0	0	1	.3839	.5881	.0277	.0059
69	1	0	0	1.5103	.5804	.0560	.0128
70	0	1	0	.3323	.5853	.0718	.0121
71	1	0	1	1.8917	.6298	.0397	.0121
72	0	0	0	.1860	.5065	.0397	.0099
73	0	1	0	.5110	.7389	.0212	.0572

Resulting regression equations for 1972:

$$T_i = -0.355 + 0.0163CB_i + 0.0252Eq_i + 0.0442Hyb_i + 0.0074TA_i - 0.0403Lev_i + 0.4576Qual_i + 0.3518Exp_i$$

$$S_i = -0.6762 - 0.0734CB_i - 0.4470Eq_i + 0.0397Hyb_i - 0.0835TA_i + 1.3498Lev_i + 4.3861Qual_i + 8.1294Exp_i$$

$$J_i = -0.0193 - 0.0296CB_i + 0.0415Eq_i + 0.0269Hyb_i - 0.0091TA_i + 0.0370Lev_i - 0.7277Qual_i + 0.4547Exp_i$$

Residuals for Treynor's Performance Measure - 1972

REIT	Treynor's Measure	Predicted Value for Treynor's Measure	Deviation
1	-0.0020	-0.0320	0.0300
2	0.0166	-0.0315	0.0481
3	0.1501	0.0199	0.1302
4	0.0534	0.0003	0.0531
5	0.0189	0.0337	-0.0148
6	0.0087	-0.0198	0.0285
7	-1.0149	-0.0406	-0.9743
8	0.0098	0.0029	0.0069
9	0.0038	-0.0240	0.0278
10	-0.0083	0.0011	-0.0094
11	0.0132	0.0597	-0.0465
12	0.0081	-0.0241	0.0322
13	-0.0633	-0.0173	-0.0460
14	0.0406	0.0207	0.0199
15	0.0064	0.0331	-0.0267
16	0.0267	0.0329	-0.0062
17	0.0231	0.0117	0.0114
18	-0.0541	0.0228	-0.0769
19	0.0241	-0.0329	0.0570
20	0.0156	-0.0006	0.0162
21	0.0006	0.0381	-0.0375
22	0.0166	0.0295	-0.0129
23	0.0231	-0.0112	0.0343
24	0.0359	-0.0317	0.0676
25	-0.0050	0.0257	-0.0307
26	0.0139	0.0291	-0.0152
27	-0.0069	-0.0065	-0.0004
28	0.0101	-0.0084	0.0185
29	-0.0211	-0.0275	0.0064
30	-0.0238	-0.0285	0.0047
31	-0.0074	-0.0109	0.0035
32	0.0793	0.0139	0.0654
33	0.0196	0.0167	0.0029
34	0.0104	-0.0287	0.0391
35	0.0416	0.0104	0.0312
36	0.0395	-0.0416	0.0811
37	0.0696	-0.0453	0.1149
38	-0.0965	0.0110	-0.1075
39	0.0185	0.0447	-0.0262
40	-0.0215	0.0011	-0.0226
41	0.0080	-0.0295	0.0375
42	0.0212	-0.0111	0.0323
43	0.0179	-0.0193	0.0372
44	0.0280	-0.0364	0.0644
45	-0.0032	0.0232	-0.0264
46	0.0661	0.0018	0.0643
47	0.0157	0.0021	0.0136

REIT	Treynor's Measure	Predicted Value for Treynor's Measure	Deviation
48	0.3036	0.0219	0.2817
49	0.0480	-0.0183	0.0663
50	0.0206	0.0262	-0.0056
51	0.0095	0.0065	0.0030
52	0.0202	-0.0342	0.0544
53	0.0288	0.0516	-0.0228
54	0.0085	0.0313	-0.0228
55	-0.0181	0.0175	-0.0356
56	-0.0382	0.0085	-0.0467
57	-0.0569	0.0032	-0.0601
58	0.0716	-0.0067	0.0783
59	0.0044	0.0226	-0.0182
60	0.0414	0.0155	0.0259
61	0.0166	-0.0142	0.0308
62	-0.0080	-0.0107	0.0027
63	-0.0064	-0.0375	0.0311
64	0.0324	-0.0191	0.0515
65	-0.0023	0.0132	-0.0155
66	-0.0078	0.0261	-0.0338
67	-0.0408	0.0025	-0.0433
68	-0.1120	0.0025	-0.1145
69	0.0091	-0.0014	0.0105
70	0.0316	0.0056	0.0260
71	0.0133	0.0359	-0.0226
72	0.0874	-0.0329	0.1203
73	-0.0473	-0.0065	-0.0408

Residuals for Sharpe's Performance Measure - 1972

REIT	Sharpe's Measure	Predicted Value for Sharpe's Measure	Deviation
1	-0.0510	0.3228	-0.3738
2	0.4907	0.3252	0.1655
3	0.3644	0.5757	-0.2113
4	1.1974	0.4431	0.7543
5	0.5034	0.2515	0.2519
6	0.2092	0.3098	-0.1006
7	0.6973	0.4504	0.2469
8	0.3006	-0.2513	0.5519
9	0.0635	0.3030	-0.2395
10	-0.1778	0.4840	-0.6618
11	0.3039	0.0796	0.2243
12	0.1857	0.2703	-0.0846
13	-0.2505	0.3037	-0.5578
14	0.5194	0.4127	0.1067
15	0.1728	0.2886	-0.1158
16	0.2171	0.1509	0.0662
17	0.5775	0.4380	0.1395
18	-0.2953	0.1714	-0.4667
19	0.6225	0.2802	0.3423
20	0.3728	0.1644	0.2084
21	-0.0159	0.0393	-0.0552
22	0.4100	0.2306	0.1794
23	0.6860	0.2700	0.4160
24	-0.6727	-0.2343	-0.4384
25	-0.1016	0.3156	-0.4172
26	0.1424	0.2473	-0.1049
27	-0.1243	0.1928	-0.3171
28	0.2628	0.3194	-0.0566
29	-0.4456	0.0085	-0.4541
30	-0.4758	0.4598	-0.9356
31	0.2244	0.2258	-0.0014
32	1.6035	0.9271	0.6764
33	0.5548	0.3870	0.1678
34	0.2955	0.3314	-0.0359
35	0.8534	0.3035	0.5499
36	0.8443	0.3746	0.4697
37	0.5969	0.4857	0.1112
38	0.2139	0.4042	-0.1903
39	-0.0712	-0.3724	0.3012
40	0.6435	0.3183	0.3252
41	0.2420	0.4074	-0.1654
42	0.5689	0.5177	0.0512
43	0.5000	0.2121	0.2879
44	0.3825	0.3781	0.0044
45	0.0291	0.2074	-0.1783
46	1.8115	0.5058	1.3057
47	0.3226	0.5204	-0.1978

REIT	Sharpe's Measure	Predicted Value for Sharpe's Measure	Deviation
48	-0.1962	0.2073	-0.5035
49	0.7399	0.1320	0.6079
50	0.2799	0.1245	0.1554
51	0.2507	0.3324	-0.0817
52	0.2074	0.3534	-0.1460
53	0.7655	0.9284	-0.1629
54	0.2539	0.2862	-0.0323
55	0.2085	0.3969	-0.1884
56	-0.9611	-0.4668	-0.4943
57	-0.3431	0.3934	-0.7365
58	1.5332	0.4843	1.0489
59	0.1189	0.2853	-0.1664
60	0.0450	0.2682	-0.2232
61	0.4019	0.1899	0.2120
62	-0.1488	0.1824	-0.3312
63	-0.1424	0.3451	-0.4875
64	0.6165	0.3390	0.2775
65	-0.0926	0.4337	-0.5263
66	-0.1441	-0.0158	-0.1283
67	-1.2481	0.5274	-1.7755
68	0.9766	0.2948	0.6818
69	0.2286	0.2575	-0.0189
70	0.7885	0.0524	0.7361
71	0.2870	0.2548	0.0322
72	0.7005	0.2466	0.4539
73	0.6525	0.3895	0.2630

Residuals for Jensen's Performance Measure - 1972

REIT	Jensen's Measure	Predicted Value for Jensen's Measure	Deviation
1	-0.0829	-0.0285	-0.0544
2	-0.0466	-0.0315	-0.0151
3	0.0281	0.0015	0.0266
4	0.0238	0.0115	0.0123
5	-0.0339	-0.0363	0.0024
6	-0.0373	-0.0541	0.0168
7	0.0384	-0.0192	0.0576
8	-0.0363	-0.0010	-0.0353
9	-0.0459	-0.0376	-0.0083
10	-0.0673	0.0103	-0.0776
11	-0.0526	-0.0682	0.0156
12	-0.0568	-0.0386	-0.0182
13	-0.0159	-0.0541	0.0382
14	0.0214	-0.0223	0.0437
15	-0.0975	-0.0390	-0.0585
16	-0.0016	-0.0383	0.0367
17	-0.0193	-0.0001	-0.0192
18	-0.0260	-0.0147	-0.0113
19	-0.0183	-0.0275	0.0092
20	-0.0322	-0.0674	0.0352
21	0.0349	-0.0312	0.0661
22	-0.0481	-0.0259	-0.0222
23	-0.0307	-0.0616	0.0309
24	0.0127	0.0459	-0.0332
25	-0.0899	-0.0272	-0.0627
26	-0.0127	-0.0253	0.0126
27	-0.2376	-0.0656	-0.1720
28	-0.0317	0.0223	-0.0540
29	-0.0461	0.0376	-0.0837
30	-0.0848	-0.0317	-0.0531
31	0.2777	0.0386	0.2391
32	0.0405	0.0391	0.0014
33	-0.0426	-0.0153	-0.0273
34	-0.0766	-0.0341	-0.0425
35	0.0117	0.0003	0.0114
36	0.0110	-0.0177	0.0287
37	0.0214	-0.0150	0.0364
38	0.0099	0.0005	0.0094
39	0.0085	-0.0447	0.0532
40	0.0819	0.0092	0.0727
41	-0.0980	-0.0319	-0.0661
42	-0.0218	0.0249	-0.0467
43	-0.0562	-0.0422	-0.0140
44	-0.0024	-0.0252	0.0228
45	0.0298	-0.0164	0.0462
46	0.0441	0.0085	0.0356
47	-0.0390	0.0132	-0.0522

REIT	Jensen's Measure	Predicted Value for Jensen's Measure	Deviation
48	-0.0027	-0.0129	0.0102
49	0.0099	-0.0566	0.0665
50	-0.0120	-0.0185	0.0065
51	-0.0227	-0.0064	-0.0163
52	-0.0053	-0.0289	0.0236
53	-0.0058	0.0559	-0.0617
54	-0.0542	-0.0358	-0.0184
55	0.1130	-0.0095	0.1225
56	-0.1105	-0.0044	-0.1061
57	-0.0539	0.0028	-0.0567
58	0.0319	0.0154	0.0165
59	-0.0192	-0.0112	-0.0080
60	0.0010	-0.0104	0.0114
61	-0.0318	-0.0516	0.0198
62	-0.0678	-0.0652	-0.0026
63	-0.1109	-0.0226	-0.0883
64	0.0010	-0.0539	0.0549
65	-0.0890	-0.0011	-0.0879
66	-0.0730	-0.0121	-0.0609
67	-0.0907	0.0100	-0.1007
68	0.1708	0.0083	0.1625
69	-0.0565	-0.0761	0.0196
70	-0.0041	-0.0060	0.0019
71	-0.0340	-0.0393	0.0053
72	0.0476	-0.0267	0.0743
73	0.1345	0.0554	0.0791

Independent Variables Used in 1974 Multiple Regressions
(values for dependent variables found in Appendix E)

REIT	CB	Eq	Hyb	TA	Lev	Qual	Exp
1	0	0	0	1.6530	.5883	-.1559	.0150
2	0	0	0	1.2611	.7424	.0030	.0064
3	0	0	1	.5202	.5126	-.0539	.0261
4	0	0	1	.5411	.6344	.0212	.0049
5	1	0	1	2.5857	.7603	-.0063	.0062
6	1	0	0	2.8285	.9274	-.0862	.0052
7	0	0	0	1.0300	.7919	-.0488	.0076
8	0	1	0	2.0917	.7754	-.0410	.0082
9	0	0	0	1.6175	.7614	-.0238	.0000
10	0	0	1	1.8011	.8714	-.0512	.0057
11	1	0	1	8.8792	.9738	-.1045	.0062
12	0	0	0	3.6196	.8220	-.0553	.0031
13	1	0	0	.1912	.5465	-.1010	.0099
14	1	0	1	1.2769	.9261	-.0738	.0009
15	1	0	1	4.5850	.8674	-.0190	.0056
16	1	0	1	1.2989	.7215	-.0509	.0043
17	0	0	1	1.8025	.8369	-.0649	.0029
18	0	0	1	4.3869	.7453	.0198	.0056
19	0	0	0	3.2886	.7466	-.0516	.0051
20	0	0	0	3.6807	.7110	-.0923	.0056
21	0	0	1	3.4512	.5050	.0309	.0068
22	0	0	1	1.3578	.7185	.0146	.0092
23	1	0	0	1.3147	.8308	-.0346	.0047
24	0	1	0	.2881	.6519	.0001	.0089
25	1	0	1	.7191	.7730	-.0443	.0042
26	0	0	1	5.4440	1.0571	-.2695	.0093
27	1	0	0	1.7481	.7105	-.0328	.0091
28	0	0	1	1.6040	.7759	.0194	.0069
29	0	1	0	.5102	.8201	-.0105	.0075
30	0	0	0	.5075	.6558	.0304	.0103
31	0	1	0	2.0913	.8466	.0255	.0495
32	0	0	1	.4330	.8059	.0102	.0650
33	0	0	1	4.5098	.9714	-.1053	.0041
34	0	0	0	4.4656	.9235	-.0733	.0100
35	0	0	1	1.5199	.7665	-.0213	.0038
36	0	0	0	1.0763	.7581	-.0981	.0040
37	0	0	0	2.2916	.8597	.0017	.0015
38	0	0	1	.8677	.6665	.0251	.0204
39	0	0	1	.9420	.0247	.0562	.0032
40	0	0	1	.6386	.7152	.0115	.0044
41	0	0	0	1.7681	.7794	-.0498	.0091
42	0	0	1	.4730	.8666	-.0525	.0046
43	0	0	0	3.7492	.6785	.0288	.0124
44	0	0	0	.4202	.6391	.0374	.0100
45	0	0	1	2.7408	.6651	.0254	.0052
46	0	0	1	1.2565	.8118	-.0331	.0089
47	0	0	1	1.1458	.8059	-.0503	.0079

REIT	CB	Eq	Hyb	TA	Lev	Qual	Exp
48	0	0	1	1.7519	.6150	-.0115	.0060
49	1	0	0	.7703	.9001	-.1948	.0066
50	0	0	1	2.5941	.6445	.0269	.0052
51	1	0	1	.4811	.7912	.0018	.0031
52	0	0	0	.5904	.7458	-.1280	.0038
53	0	1	0	.7255	.7690	.0304	.0653
54	1	0	1	1.5131	.7014	.0165	.0056
55	0	0	1	.7834	.6395	.0340	.0103
56	0	1	0	.4404	.2118	.0563	.0101
57	0	0	1	.9334	.7793	.0153	.0031
58	0	0	1	1.4775	.8702	.0138	.0035
59	0	0	1	.7735	.6608	-.1492	.0167
60	0	0	1	3.4497	.7961	-.0002	.0045
61	0	0	0	1.4411	.7762	-.1320	.0051
62	1	0	0	1.1149	.6558	.0119	.0064
63	0	0	0	.6396	.7699	-.0550	.0050
64	1	0	0	2.1885	.8483	-.0488	.0026
65	0	0	1	1.3975	.7646	-.0332	.0054
66	0	0	1	.8296	.6598	.0108	.0054
67	0	0	1	1.4201	.8288	.0029	.0131
68	0	0	1	.4709	.7143	-.0272	.0170
69	1	0	0	1.7687	.6785	-.0033	.0073
70	0	1	0	.3135	.5139	.0584	.0143
71	1	0	1	2.4532	.7161	.0057	.0058
72	0	0	0	.2944	.7326	-.0209	.0095
73	0	1	0	.4056	.7720	-.0337	.0747

Resulting regression equations for 1974:

$$T_i = 3.4220 + 3.5241CB_i + 3.3376Eq_i + 5.1772Hyb_i + 0.3681TA_i - 16.3854Lev_i - 27.1797Qual + 131.3444Exp_i$$

$$S_i = -1.0337 + 0.1354CB_i + 0.3489Eq_i + 0.1946Hyb_i - 0.0829TA_i - -.7540Lev_i + 4.8635Qual_i + 8.2306Exp_i$$

$$J_i = -0.1600 - 0.0300CB_i + 0.1056Eq_i + 0.0395Hyb_i + 0.0065TA_i - 0.1558Lev_i + 1.1455Qual_i + 0.7475Exp_i$$

Residuals for Treynor's Performance Measure - 1974

REIT	Treynor's Measure	Predicted Value for Treynor's Measure	Deviation
1	0.5218	0.5984	-0.0766
2	1.2589	-7.5193	8.7782
3	-2.5081	5.2845	-7.7926
4	-0.2838	-1.5292	1.2454
5	0.5722	1.6027	-1.0305
6	-1.3661	-4.1828	2.8167
7	-0.4334	-6.8499	6.4165
8	-0.3835	-2.9844	2.6009
9	-148.3448	-7.8116	-140.5332
10	1.9031	-2.8759	4.7790
11	-0.3410	3.0899	-3.4309
12	0.8357	-6.8043	7.6400
13	6.2472	2.1073	4.1401
14	-0.7473	-0.4573	-0.2900
15	-2.8691	0.8500	-3.7191
16	0.5037	2.7238	-2.2201
17	-0.6209	-2.3055	1.6846
18	1.9036	-1.8008	3.7044
19	9.6248	-5.5286	15.1534
20	9.5579	-3.6291	13.1870
21	0.6193	1.6481	-1.0288
22	1.9218	-1.8624	3.7842
23	-1.8700	-4.6253	2.7553
24	0.6285	-2.6498	3.2783
25	-0.5901	1.4777	-2.0678
26	0.7142	1.8284	-1.1142
27	-2.4213	-1.9656	-0.4557
28	-0.2498	-3.1449	2.8951
29	-0.1526	-5.2198	5.0672
30	0.4516	-6.5987	7.0503
31	-0.0196	-0.5341	0.5054
32	0.2343	3.8137	-3.5794
33	-14.5575	-2.2572	-12.3003
34	-0.5921	-6.7606	6.1685
35	-1.3035	-2.3228	1.0193
36	-0.9073	-5.4119	4.5046
37	-0.8015	-9.6703	8.8688
38	0.3695	-0.0051	0.3746
39	8.9640	7.4340	1.5300
40	0.2431	-2.6193	2.8624
41	1.3290	-6.1492	7.4782
42	-0.2792	-3.3952	3.1160
43	-0.1387	-5.4696	5.3309
44	-1.5192	-6.5980	5.0788
45	0.2308	-1.2974	1.5282
46	1.0532	-2.1714	3.2246
47	-1.5178	-1.7793	0.2615

REIT	Treynor's Measure	Predicted Value for Treynor's Measure	Deviation
48	-0.5268	0.2676	-0.7944
49	0.9769	-1.3574	2.3343
50	1.3568	-1.0546	2.4114
51	-2.8143	-0.3056	-2.5087
52	-0.9025	-4.6028	3.7003
53	-0.4209	2.1767	-2.5976
54	-0.3472	1.4745	-1.8217
55	-0.5538	-1.1622	0.6084
56	-0.4547	3.2476	-3.7023
57	0.7101	-3.8351	4.5452
58	0.0851	-5.0310	5.1161
59	-1.1459	4.3050	-5.4509
60	-0.6532	-2.5791	1.9259
61	0.9891	-4.5083	5.4974
62	1.7965	-2.8720	4.6685
63	1.0590	-6.8061	7.8651
64	-1.8631	-4.4803	2.6172
65	-0.5784	-1.8031	1.2247
66	-0.5095	-1.4909	0.9814
67	0.7935	-2.8166	3.6101
68	-0.5363	0.0405	-0.5768
69	-1.5553	-2.4719	0.9166
70	-0.6443	-1.2546	0.6103
71	-0.8050	1.8994	-2.7044
72	1.4435	-6.6578	8.1013
73	-0.7746	4.9867	-5.7613

Residuals for Sharpe's Performance Measure - 1974

REIT	Sharpe's Measure	Predicted Value for Sharpe's Measure	Deviation
1	-2.2642	-2.2492	-0.0250
2	-1.4725	-1.6309	0.1584
3	-2.9891	-1.3161	-1.6730
4	-1.7464	-1.2189	-0.5275
5	-1.2610	-1.4711	0.2101
6	-2.1303	-2.2086	0.0783
7	-1.2298	-1.8911	0.6613
8	-1.8170	-1.5749	-0.2421
9	-5.8293	-1.8578	-3.9715
10	-1.8780	-1.8477	-0.0303
11	-1.8815	-2.6317	0.7502
12	-1.5417	-2.1972	0.6555
13	-1.6091	-1.7360	0.1269
14	-1.7412	-1.8594	0.1182
15	-2.4893	-1.7844	-0.7049
16	-1.3170	-1.5668	0.2498
17	-2.1529	-1.9115	-0.2414
18	-0.7590	-1.6226	0.8636
19	-1.7478	-2.0785	0.3307
20	-1.7902	-2.2780	0.4878
21	-0.7123	-1.2999	0.5876
22	-1.8160	-1.3468	-0.4692
23	-1.4729	-1.7634	0.2905
24	-0.8945	-1.1265	0.2320
25	-1.5927	-1.5271	-0.0656
26	-2.6222	-3.3220	0.6998
27	-1.6661	-1.6637	-0.0024
28	-0.6662	-1.4061	0.7399
29	-0.9075	-1.3348	0.4273
30	-0.5361	-1.3372	0.8011
31	-0.2039	-0.9652	0.7613
32	-0.8043	-0.8981	0.0938
33	-6.1230	-2.4241	-3.6989
34	-3.7102	-2.3747	-1.3355
35	-1.9975	-1.6155	-0.3820
36	-1.3661	-2.1388	0.7727
37	-1.8999	-1.8515	-0.0484
38	-0.8095	-1.1237	0.3142
39	-1.2753	-0.6362	-0.6391
40	-1.0519	-1.3393	0.2874
41	-2.8973	-1.9354	-0.9619
42	-1.5458	-1.7493	0.2035
43	-0.6208	-1.6142	0.9934
44	-1.2038	-1.2864	0.0826
45	-0.6217	-1.4017	0.7800
46	-2.2378	-1.6432	-0.5946
47	-1.2038	-1.7215	0.5177
48	-0.8155	-1.4547	0.6392
49	-1.4545	-2.5340	1.0795

REIT	Sharpe's Measure	Predicted Value for Sharpe's Measure	Deviation
50	-1.3558	-1.3667	0.0109
51	-2.2920	-1.3059	-0.9861
52	-1.3821	-2.2363	0.8542
53	-1.1026	-0.6395	-0.4631
54	-1.3869	-1.2317	-0.1552
55	-0.7538	-1.1362	0.3824
56	-0.4216	-0.5241	0.1025
57	-1.8431	-1.4043	-0.4388
58	-0.5031	-1.5219	1.0188
59	-1.5775	-1.9897	0.4122
60	-1.2893	-1.6895	0.4002
61	-2.9233	-2.3386	-0.5847
62	-2.1135	-1.3747	-0.7388
63	-1.5705	-1.8937	0.3232
64	-2.0117	-1.9354	-0.0763
65	-2.0275	-1.6486	-0.3789
66	-0.5810	-1.3075	0.7275
67	-0.9084	-1.4600	0.5516
68	-0.9535	-1.4092	0.4557
69	-1.6579	-1.5126	-0.1453
70	-1.1054	-0.6966	-0.4088
71	-1.4006	-1.3717	-0.0289
72	-1.4501	-1.3717	0.1839
73	-1.2587	-0.8496	-0.4091

Residuals for Jensen's Performance Measure - 1974

REIT	Jensen's Measure	Predicted Value for Jensen's Measure	Deviation
1	-0.4468	-0.4084	-0.0384
2	-0.3824	-0.2593	-0.1231
3	-0.3632	-0.2393	-0.1239
4	-0.1413	-0.1880	0.0467
5	-0.2936	-0.2548	-0.0388
6	-0.4178	-0.4110	-0.0068
7	-0.2149	-0.3270	0.1121
8	-0.2780	-0.2025	-0.0755
9	-0.4262	-0.2954	-0.1308
10	-0.4129	-0.2991	-0.1138
11	-0.2726	-0.3597	0.0871
12	-0.4491	-0.3257	-0.1234
13	-0.3369	-0.3822	0.0453
14	-0.3294	-0.3704	0.0410
15	-0.4315	-0.2735	-0.1580
16	-0.3691	-0.3097	-0.0594
17	-0.3537	-0.3115	-0.0422
18	-0.0918	-0.1814	0.0896
19	-0.4569	-0.3103	-0.1466
20	-0.4151	-0.3485	-0.0666
21	-0.1146	-0.1364	0.0218
22	-0.3249	-0.2001	-0.1248
23	-0.3310	-0.3471	0.0161
24	-0.2598	-0.1474	-0.1124
25	-0.2358	-0.3139	0.0781
26	-0.5205	-0.5517	0.0312
27	-0.2761	-0.3201	0.0440
28	-0.0577	-0.2037	0.1460
29	-0.0416	-0.1854	0.1438
30	-0.1148	-0.2163	0.1015
31	0.0437	-0.1066	0.1503
32	-0.2117	-0.1831	-0.0286
33	-0.2696	-0.3602	0.0906
34	-0.3784	-0.3514	-0.0270
35	-0.3528	-0.2517	-0.1011
36	-0.3173	-0.3806	0.0633
37	-0.2549	-0.2761	0.0212
38	-0.1370	-0.1748	0.0378
39	0.0191	-0.0515	0.0706
40	-0.2638	-0.2114	-0.0524
41	-0.4390	-0.3203	-0.1187
42	-0.2199	-0.3092	0.0893
43	-0.0368	-0.1992	0.1624
44	-0.0582	-0.2066	0.1484
45	-0.1693	-0.1734	0.0041
46	-0.3543	-0.2702	-0.0841
47	-0.2350	-0.2904	0.0554
48	-0.1767	-0.2137	0.0370
49	-0.4410	-0.5435	0.1025

REIT	Jensen's Measure	Predicted Value for Jensen's Measure	Deviation
50	-0.1999	-0.1695	-0.0304
51	-0.3066	-0.2663	-0.0403
52	-0.3464	-0.4162	0.0698
53	-0.0876	-0.0859	-0.0017
54	-0.2297	-0.2269	-0.0028
55	-0.1125	-0.1685	0.0560
56	-0.0299	-0.0126	-0.0173
57	-0.3012	-0.2161	-0.0851
58	-0.1755	-0.2282	0.0527
59	-0.3721	-0.3769	0.0048
60	-0.1863	-0.2191	0.0328
61	-0.3535	-0.4190	0.0655
62	-0.3080	-0.2665	-0.0415
63	-0.3766	-0.3351	-0.0095
64	-0.3714	-0.3619	-0.0095
65	-0.3470	-0.2646	-0.0824
66	-0.1065	-0.2016	0.0951
67	-0.2591	-0.2274	-0.0317
68	-0.1865	-0.2473	0.0608
69	-0.3110	-0.2826	-0.0284
70	-0.0668	-0.0549	-0.0119
71	-0.2642	-0.2353	-0.0289
72	-0.3390	-0.2891	-0.0499
73	-0.2302	-0.1549	-0.0753