THE RISK AND RETURN CHARACTERISTICS OF STOCK MARKET-BASED REAL ESTATE INDEXES AND THEIR RELATION TO APPRAISAL-BASED RETURNS

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ABSTRACT

Despite its importance to our national wealth, real estate remains a relatively unstudied asset. A key reason for this is the perceived limitations of available return data. Most research in the area relies on appraisal-based series such as the Frank Russell Company (FRC) index. This paper suggests that the stock market provides a ready source of transactions-based data. Many real estate researchers are skeptical of stock market data because the studies of real estate investment trusts (REITs) find that their returns are more correlated with the broader stock market than with other known real estate series. A typical conclusion is that traded real estate securities do not accurately reflect real estate values.

We argue that such conclusions are premature. We simulate the returns and risks of portfolios of different types of real estate firms using historical stock prices for the 1962-1988 period. We use the time series of the real estate porfolio returns to estimate the correlation structure of returns among real estate securities, common stocks, long-term Treasury bonds, and inflation. Estimation of factor models documents a particularly strong small stock component to traded real estate stock returns. We also find substantial heterogeneity in return patterns across different types of real estate firms. Finally, we demonstrate that our real estate portfolios are not unrelated to appraisal-based indexes. Lagged values of the real estate portfolio returns can predict returns on the FRC index.

I. INTRODUCTION

Ibbotson and Siegel (1984) estimate that residential and nonresidential real estate constitute about one-half of the value of the (non-human capital) asset base in the United States. They conclude that income-producing properties alone represent one-quarter of our stock of wealth. Despite its importance in our asset base, real estate remains relatively unstudied.

A key reason for this is the perceived limitations of available return data. Due to infrequent trading of properties and the absence of a centralized exchange for transactions, most research has employed appraisal-based return series such as the Frank Russell Company (FRC) index. There is now a large and growing literature detailing the well-known weaknesses of appraisal-based returns and suggesting ways to cleanse the data (e.g., Ross & Zisler (1987a,b) and Geltner (1989)). It is becoming obvious that market-based alternatives are needed in lieu of increasingly complex statistical "fix-ups" of appraisal-based series such as the FRC index. It is the case that pension funds and other investors are increasingly allocating resources to securitized equity investments in real estate in the face of substantial uncertainty about the underlying sources of returns for securitized equity real estate investments.

In this paper we suggest that the stock market provides a ready source of information on transactions-based real estate values. While widely employed by financial economists, these data often are viewed with suspicion by real estate researchers even though there now are numerous traded real estate firms. Equity real estate investment trusts (REITs) are the most studied type

of real estate stock.[1] One typical finding from this literature is that equity REIT returns are far more correlated with the broad stock market than with other known real estate series. This has led many to conclude that traded real estate securities do not accurately reflect real estate values.

We argue that such conclusions are premature. This paper simulates the returns and risks of real estate investment using historical stock prices for the period August 1962 to December 1988. We construct portfolios of real estate stocks, with each portfolio containing stocks comprising a specific real estate category (e.g., owner/operators of buildings, subdividers and developers, general contractors, etc.). These portfolios are diversified across stocks from both the New York and American Stock Exchanges, thereby minimizing firm-specific contributions to risk. Examination of the total return distributions for the different real estate portfolios permits performance comparisons of returns and risks across real estate categories. We also use the time series of real estate portfolio returns to estimate the correlation structure of returns among real estate security portfolios, common stocks, long-term Treasury bonds and unanticipated inflation. In addition to a substantial positive association with the stock market, especially small capitalization stocks, the simple correlations demonstrate that most of our real estate stock portfolios (in excess return form) are also positively

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[1]There has been a wide range of research into REITs. Lee & Kau (1987) study their dividend policies. Allen & Sirmans (1987) investigate REIT performance in takeover settings. More general studies of REIT investment performance date back at least to Smith & Shulman (1976) and Davidson & Palmer (1978). Building upon these efforts have been Patel & Olsen (1984), Kuhle, Walter, & Wurtzebach (1986), Mengden & Hartzell (1986), Titman & Warga (1986), and Kuhle (1987). Chen, Hendershott, & Sanders (1989) and Sagalyn (1989) are the most recent investigations into REIT return behavior with Sagalyn (1989) also providing a good historical overview of these studies.

correlated with the bond market and negatively correlated with unanticipated inflation.

To further characterize the behavior of real estate returns, we report the results of a multifactor regression model that employs stock market, bond market and unexpected inflation variables. This estimation further documents the large small stock market component in traded real estate firm returns. We find substantial heterogeneity in the strength of this component across real estate firms. We show that variation in the small stock index returns alone can explain from 50%–80% of the variance in the different real estate portfolio returns. The estimated small stock betas range from .52 for an equity REIT portfolio to about 1.3 for the contractor and developer portfolios. We argue that the heterogeneity in the strength of the covariance with the market is due partially to the varying degrees with which the cash flows of different types of real estate firms are linked to the more stable cash flows of existing properties. The more dependent are the firm's earnings on the fortunes of existing and leased buildings, the lower the covariance with the stock market. Our results also show a statistically significant positive comovement of most real estate stock portfolio returns with the returns on Treasury bonds (in excess return form). However, this influence is much smaller than that found for the stock market. There is only negligible comovement with unexpected inflation once stock and bond market returns are controlled for.

Finally, we demonstrate that the traded real estate stocks are not completely unrelated to appraisal-based series. It is widely known that the smoothing inherent in such appraisal-based series results in under-estimation of return variance, and that lagged appraisals present problems for the

analysis of the impact of real estate on portfolio decisions. We account for these statistical shortcomings of the appraisal-based series, and find that the returns of the statistically-adjusted series are reliably predicted by lagged values of the returns on our market-based real estate portfolios.

II. DATA

We collect data for real estate-related stocks trading on the New York and American exchanges from the return files of the Center for Research in Security Prices (CRSP). We identify real estate stocks on the CRSP monthly returns file primarily by using four-digit standard industry classification (SIC) codes for five different categories of real estate firms. The first group of firms is made up of general contractors (SIC 1500). This category primarily includes residential builders who build for contract, not on their own account as speculative builders.[2] The second group of firms acts primarily as owners and operators of their own properties (SIC 6510).[3] Returns on firms in this category appear closest in spirit (leverage aside) to the properties tracked by the FRC index. The third group is made up of firms who act as agents and property managers for real estate owners (SIC 6530). Our fourth real estate category contains land subdividers and developers (SIC 6550). If they do own real properties, these firms tend to relinquish

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[2]Our sample does include a small number of speculative builders. Removing them from SIC 1500 does not change any of our results. We also note that major contractors for bridges and other infrastructure such as the Flour Corporation are not part of the group. The government classifies them elsewhere.

[3]SIC 6510 includes a small number of firms labeled as "Lessors of Real Property". Closer examination showed them often to be energy or mining companies with land holdings in the western U.S. Such firms were dropped from the sample.

ownership once the relevant development is finished.[4] Equity REITs comprise the last real estate category we examine. We use Standard and Poor's **Handbook of Real Estate Securities** and various issues of the **REIT Fact Book** published by the National Association of Real Estate Investment Trusts (NAREIT) to guide us in separating the equity REITs from the mortgage and hybrid REITs.[5]

While secondary to our main purposes here, construction of the data base itself constitutes an important contribution because knowledge of the differences in return behavior for different types of real estate firms is scarce. Davidson & Palmer (1978) and Sagalyn (1989) have also analyzed the investment performance of REITs and of other types of real estate firms. Our sample is much larger than that studied by Davidson & Palmer (1978) who focus on homebuilders and equity REITs in the early to mid-1970's. Sagalyn's (1989) sample of non-REIT firms combines homebuilders, developers, and investment companies. As we show below, interesting and useful information can be gleaned by disaggregating the firms. Further, while Sagalyn's sample is composed exclusively of firms that survived over a fifteen year period, our sample includes all real estate firms, including those that were delisted for any reason, thereby avoiding potential survivor bias.

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[4]This SIC code interestingly also contains cemetary subdividers. We drop these firms from our sample.

[5]We do not mean to imply that these groupings encompass all real estate-related firms. Standard and Poor's **Handbook of Real Estate Securities** lists a number of firms in the restaurant and vacation businesses which also own land and structures. Suppliers to the industry such as lumber and wood products firms are also included in the **Handbook**. We focus on our five groups because we can easily identify the firms as primarily in the real estate business. Future work should look at the more peripheral firms which mix real estate with another core business operation.

We compute portfolio returns by combining securities with the same SIC codes into portfolios with equal weights in each month over the period from August 1962 to December 1988. This results in 317 monthly returns for each portfolio. The number of securities in a portfolio varies from month to month. While the number of stocks in a portfolio can be quite small in the early years, the numbers grow through time and remain fairly stable after the middle 1970's. Consequently, findings are reported for the entire 1962-1988 period as well as for two subperiods of approximately equal length, 1962-1974 and 1975-1988.[6]

One objective of this paper is an investigation of the sources of volatility in market-based real estate returns. The existing literature suggests that a variety of factors might impact real estate returns. These include equity market movements, interest rate and term structure movements, and inflation (both expected and unexpected).[7] In the empirical work below, we use both the S&P500 index and a small stock index to represent the broad equity market. The small stock index return is based on the returns of the NYSE-listed firms which are among the smallest 20% in market capitalization. The returns on a portfolio of long-term Treasury bonds less the return on one-month Treasury bills proxy for changes in the term structure. The inflation

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[6]We also investigated return performance over a variety of other subperiods. Those results closely mirror those presented in the text.

[7]For example, see Chen & Tzang (1988) on the covariance of REIT returns with interest rates and inflation. The research departments on Wall Street have long noted the strong positive correlation of traded equity REIT returns with returns on the broader market (e.g., Mengden & Hartzell (1986)). Chan, Hendershott, & Sanders (1989) also postulate the change in industrial production as a potential factor in explaining equity REIT returns, but its impact tends to be small. We find the broader market variable to be much more influential.

variables are derived from monthly CPI data. To create our unanticipated inflation measure, we estimated an ARMA model with monthly CPI data. Experimentation showed that the structure of the process was not stable over time. Consequently, we estimated rolling monthly forecasts with a new ARMA model specified every calendar year. Unexpected inflation is simply the difference between actual inflation and the ARMA forecast.[8] The stock and bond index variables used in section III are from Ibbotson & Sinquefield (1989) for the 1962–1987 period. Updates through 1988 come from Ibbotson & Associates.

III. THE BEHAVIOR OF MARKET-BASED REAL ESTATE RETURNS

III.A. SUMMARY STATISTICS

Summary statistics for the five real estate portfolios and for the bond and stock market indexes are reported in Tables 1A–1C. We also report statistics for an equally-weighted real estate index that combines the returns for the four non-REIT categories. The statistics are based on excess returns defined as total returns less the one-month T-bill return. For the overall period (Table 1A), there is substantial variation in mean excess returns across the four non-REIT real estate firm categories — ranging from 1.18% per month for the general contractors to 0.66% for the owners/operators. All of these categories exhibited higher returns than the REITs (0.45%). The REIT portfolio also has the lowest return standard deviation, but its coefficient

[8] Our forecasts assume knowledge of the entire year's inflation behavior even for months prior to December in that year. We also experimented with permitting knowledge of a future year's inflation behavior because forecasters today may have good knowledge of the near future. Using those forecast results does not change any of our findings.

of variation is comparable to that for the four other real estate-related groups. Note that all the real estate portfolios have higher average excess returns than the Treasury bond index (-0.00%) and the S&P500 index (0.38%). The average excess return of the portfolio of the four non-REIT categories is roughly equivalent that for the small stocks, although the small stocks are considerably less volatile.

The mean excess returns differ considerably in the two subperiods. They are uniformly lower across all assets in the 1962-1974 subperiod (Table 1B), but the differences across assets are similar in both subperiods. Mean excess returns for the real estate index and for the equity REITs are negative in the 1962-1974 period. We caution that it may be difficult to draw inferences about real estate returns from the stock data for this early period due to the small number of real estate stocks in our sample. Real estate equities performed substantially better during the 1975-1988 period (Table 1C). For example, the real estate index experienced higher average returns (1.87% per month) than all the other non-real estate assets. While their return variances are also higher, the real estate portfolios' coefficients of variation are only marginally higher than that for the small stock index and are below that for the S&P500 and the long-term bond index.

III.B. SIMPLE CORRELATION STRUCTURE OF REAL ESTATE STOCK RETURNS

The excess return correlations are reported in the middle panel of Tables 1A-1C. Since the results are qualitatively and quantitatively similar for both subperiods, we focus on the results for the overall period (Table 1A). The correlations among the real estate categories are uniformly high, ranging from 0.64 to 0.94. The equity REIT portfolio return has a marginally lower

correlation with the non-trust portfolios than the non-trust portfolios have among themselves.

The returns on the real estate portfolios are also significantly positively correlated with the returns on the S&P500 index, with correlations ranging from .55 to .64. Note, however, the particularly strong correlations with the small stock index returns. They range from .71 for the equity REITs to .90 for the portfolio of real estate developers. This result is not surprising given the fact that most of the real estate firms are relatively small in terms of market capitalization. Figures 1-5 illustrate this for each of our real estate portfolios. For example, Figure 1 plots the annual capitalization values for the median general contractor firm against the analogous values for the 10%, 20%, and 50% fractiles of the market capitalization distribution for all NYSE and AMEX firms. It is generally the case that the median real estate firm in our sample tends to be smaller than over 60% of the companies with stock trading on the NYSE and AMEX.

The correlations of the real estate stocks with the bond market do differ across time periods. The significantly positive correlations for the full 1962-1988 period (Table 1A) mask generally insigificant results for the early 1962-1974 period (except for equity REITs; see Table 1B). Note also that the correlation of the real estate portfolios' excess returns with the Treasury bond excess returns tends to be lower than the simple correlation between the bond market and the S&P500.

All the real estate groups' returns are negatively related to unanticipated inflation, a finding previously noted by Fama & Schwert (1977). This pattern holds across subperiods, although there appears to be some weakening in this correlation over time for each real estate portfolio except

for the general contractors. These inflation-related correlations are also similar to those reported in Gyourko & Linneman (1988) for the FRC index.

III.C. REAL ESTATE RETURN SPECIFICATIONS

The relatively small market capitalizations of our real estate stocks and their significant correlations with the returns on the small stock index suggest that small stock returns are an important factor in real estate stock returns. The simple correlations in Tables 1A-1C also hint at the importance of other factors, including bond market returns and inflation shocks. We examine the various influences on real estate returns by estimating the following multifactor model

$$R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \beta_2(R_{LB,t} - R_{TB,t}) + \beta_3 UI_t + \epsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is the total monthly return on real estate portfolio i in month t, $R_{TB,t}$ is the monthly return on a Treasury bill with one month remaining to maturity, $R_{ss,t}$ is the total monthly return for the small stock index, $R_{LB,t}$ represents the return on a long-term Treasury bond index, UI_t is the unanticipated inflation rate in month t (see the discussion at the end of section II for details of the variable construction), ϵ_{it} is the standard error term.

Tables 2A-2C report results from the estimation of (1). These tables confirm the importance of the stock market component in traded real estate firm returns. As we discuss below, this factor is the dominant influence on real estate-related stock returns. However, the long bond market component does have a statistically and economically significant impact on most traded

real estate firm returns, especially in the more recent 1975–1988 period. Equity REITs stand out again because they display a strong bond market component only in the earlier years. Equity REITs have to pay out a fixed 95% of their accounting profits. They are known to compete with fixed income investments in yield terms.[9]

Finally, the results from the multifactor models show that excess real estate stock returns are not strongly correlated with unexpected inflation once the broad stock and bond market effects are controlled for. The only exception is for the portfolio of equity REITs which has a significant coefficient over the 1962–1988 and 1962–74 periods. We note that, if the excess return on the S&P500 index is used as the **dependent** variable in (1), the unexpected inflation coefficient is a negative −1.87 and is significant at the .06 level. Thus, most traded real estate firms tend to hedge inflation shocks better than the broad stock market. This is not surprising given the partially inflation-indexed leases on many income-producing properties.[10]

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[9]We also estimated the regressions below with a default-risk premium variable which was measured as the difference in returns between a junk-bond portfolio and the long-term Treasury bond index noted above. Its impact was uniformly insignificant and we do not report those results. Excluding this variable had no material impact on any other coefficients.

[10]Admittedly, our specification does not result from a particular structural model. The multifactor model results are reported because they shed additional light on the nature of real estate stock returns in general. Chan, Hendershott, & Sanders (1989) also estimate a multifactor specification of equity REIT returns with a mimicking portfolio methodology. They postulate five factors (industrial production, expected and unexpected inflation, a risk structure variable, and a term structure variable). Without explicitly including a stock market factor, their R^2s are substanially lower than ours (in the 1980's in particular). We estimate a market model including the small stock index largely because the market component explains a much larger fraction of variance of real estate portfolio returns than do variables such as industrial production. Consistent with Chan, Hendershott, & Sanders (1989), the statistical significance of the bond market and inflation variables increases when we exclude the stock market variable. Both expected and unexpected inflation variables become statistically significant. The R^2

Tables 2A-2C also report the results from estimating the single factor market model,

$$R_{i,t} - R_{TB,t} = \alpha_0 + \beta_1(R_{ss,t} - R_{TB,t}) + \epsilon_{i,t} \qquad (2),$$

where all variables are defined as above.[11]

The relative importance of the small stock component is highlighted by the fact that the R^2's for the simple market model in (2) are only marginally lower than those reported for (1). For the full 1962-1988 time period, the variance in the small stock index alone explains one-half of the variance in traded equity REIT returns and 80% of the variance in contractor and subdivider/developer returns. The R^2's are higher in the 1975-1988 period, but that may only reflect a weaker idiosyncratic influence because of the increased number of stocks in the real estate portfolios.

The substantial variation in the small stock betas across the real estate categories is particularly interesting. Equity REITs, for example, exhibit a much lower comovement with small stocks than do the other real estate firms. F-tests also imply that the excess returns of general contractors and developers/subdividers display stronger comovement with the small stock returns than do the returns of owners and operators of real properties. The relative rankings of small stock betas across real estate groups are largely

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for a regression including only term structure and inflation variables typically is about 0.10.

[11]We also estimated all our specifications using excess returns on the S&P500 instead of the small stock index. Those results are qualitatively the same as for the small stock index. However, the S&P500 index returns explain from 30% to 50% less of the real estate return variance depending upon the category of firm.

unaltered over time.

While the portfolio betas are not unusually large relative to estimates for other industries, they are far larger than estimates reported for appraisal-based real estate indexes such as the FRC index and various commingled real estate funds (see for example Hartzell, Hekman, & Miles (1986) and the references therein). Most authors argue that appraisal smoothing biases downward the variance of those real estate series and artificially lowers the covariance with the market.

While these relatively high estimates of beta probably are largely a reflection of the commonality of movement among common stocks of all types, we believe that some of the comovement of real estate stock returns with the market is indicative of a linkage between real estate fundamentals and the market. Zeckhauser & Silverman (1983) report that roughly one-quarter of corporate value is real estate-related in nature. Thus, we should expect that part of the variance in stock returns in general is related to changes in the value of corporate-owned land and structures. Although some of this real estate-induced variance may be orthogonal to the firms' business risk, some is likely to be correlated with that risk. Long-term expectations of real growth and real interest rates almost certainly affect the capital values of both (non-real estate) firms and real properties in qualitatively similar ways. At the end of a lease, tenants are able to move or to restructure their lease terms and space requirements. Both their willingness to pay a given rent and their demand for space should be influenced by their expectations of future growth as well as their real discount rate. Thus, general property market risk associated with the health of the economy and the derived demand for space by firms should result in some positive correlation of real property

returns with the broader market.[12] Further, the discount rate may also be affected over the cycle in ways that help generate a positive correlation with the stock market. Variance in firm earnings may signal changes in risk which would lead to positive covariance of the building's return with the stock market.

Gyourko & Linneman (1988) maintain that the existence of multi-year leases will vitiate the positive correlation between real estate and the stock market to some extent depending upon factors such as the extent of tenant bankruptcies and the ability to exercise space options. Their basic argument is that rental flows from buildings with good quality tenants should be smoother than tenants' cash flows (not smoothed earnings or dividends) over the business cycle. The reason is that the cost of rental space for tenants is a fixed cost which cannot easily be altered except in the long-run (with the exception of bankruptcy). Even a building with tenants in cyclical industries will have a relatively stable rental income flow as long as the probability of tenant bankruptcy over the cycle is low. As tenant cash flows (and equity prices) vary over the cycle, building rental flows will be much less variable. Bankruptcy on the downside of the cycle and exercise of space options on the upside of the cycle should generate some positive correlation of real property returns with the stock market. In sum, we see no **a priori** reason to expect real property returns to be uncorrelated (or negatively correlated) with stock market returns as has been reported for the FRC index.

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[12]Keim & Stambaugh's (1986) study of stock and bond market returns is part of growing evidence that different asset markets tend to move together due to common underlying factors.

We believe the distinction between real estate-related firm returns and real property returns is key to understanding the different market betas of real estate-related firms. Recall that the general contractors (SIC 1500) and subdividers/developers (SIC 6550) have the highest covariance with the market. By definition, the contractors do not own the underlying property and many developers are highly levered enterprises which build real estate rather than own and manage it. One would expect a pure contractor or a 'for fee' developer which owns no property to have a high stock market beta, particularly if they are highly levered. Their cash flows are likely to be extremely cyclical. Development and building activity is strongly correlated with corporate cash flows because the demand for new space falls when equity prices drop. We suspect that the lower betas for the other three categories of real estate firms are at least partially due to the fact that their cash flows are more closely linked with the flows on existing buildings. Owner-operators and equity REITs actually hold real property in their portfolios. Agent/managers are not owners, but their compensation typically is tied to building rental flows and appraised values.[13]

While we do not argue that the small stock factor is entirely unrelated to real estate fundamentals, it does mask the portion of the total return to

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[13]The markedly lower equity REIT covariance with the market may be due to lower leverage. They own their properties outright while non-REIT owner/operators in SIC 6510 may have levered their purchases. However, equity REITs themselves may be highly levered due to debt issues. Chan, Hendershott, & Sanders (1989) are able to group their equity REIT portfolios into high and low leverage categories and to estimate separate regressions for each group. They find that the highly levered REITs tend to have heightened responses to expected and unexpected unflation, and to changes in the risk and term structures. Clearly, leverage of the firms versus leverage of the real properties should be investigated in future work with micro data at the firm level.

real estate that is unrelated to the broader equity market. The correlation matrices of residuals from the small stock market model in (2) are reported in Tables 3A-3C. These residuals can yield insights into the behavior of real estate stock returns that are purged of market-wide movement. As such, they capture an 'industry' component that may provide useful information regarding differences across types of real estate firms that are hidden by common market movements that dominate the total returns. While (not surprisingly) much smaller than the excess return correlations reported in Tables 1A-1C, most of the residual correlations across real estate categories are still statistically significant. Moreover, these results illustrate that the part of the overall return that is unrelated to the market differs materially across types of real estate firms. In Table 3A, the highest residual correlation across the five individual real estate portfolios is .34. In contrast to the results for the simple excess returns in Tables 1A-1C, the residuals from the single factor model tend not to be correlated with unexpected inflation at the .05 level or better. The correlation with inflation shocks evidenced in Tables 1A-1C is subsumed under the common comovement of the real estate stock returns with the small stock index. Particularly interesting is the negative correlation of the non-REIT real estate index residuals with the returns on the S&P500 index. The correlation is small but significant, especially in the 1975-1988 period. Combined with the insignificant correlation with the bond market, this result suggests that traded real estate equities have presented portfolio diversification opportunities (at least in an **ex post** sense).

IV. THE RELATION BETWEEN MARKET-BASED AND APPRAISAL-BASED REAL ESTATE INDEXES

This section examines the relation between the returns on our real estate portfolios and the appraisal-based FRC index. The appraisal-based return series have become the subject of a large and growing body of research. The results of that research have prompted conlusions that many consider surprising. Specifically, the extremely low (or negative) covariance of the returns of the FRC index with other investment categories prescribes an inordinantly large portfolio allocation toward real estate. For example, Webb & Rubens (1986) calculate allocations toward real estate of up to 80%. Such results have led to extensive work (e.g., Ross & Zisler (1987a,b) and Geltner (1989)) highlighting the weaknesses of appraisal-based indexes and suggesting ways to "fix up" the data.

Nevertheless, the FRC index appears to be a reasonably good guide to changes in the long-run value of pure equity investments in real properties. The index now incorporates data for over 1100 widely diversified properties owned by a broad cross section of major institutional investors.[14] The rental income data are based on actual cash flows, and the appraisals contain no apparent systematic (positive or negative) bias.[15] However, the lags in the appraisal process limit the use of the index for analysis over shorter (e.g., monthly or quarterly) intervals.

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[14]See the Annual Supplement to the **NCREIF Real Estate Performance Report** (1989) for the details.

[15]See Giliberto (1988) and Geltner (1989) for reasons why the potential bias could be positive or negative.

As a practical matter, obtaining the information contained in the periodic updates of the FRC in a more timely manner could be quite valuable. To this end, we examine the relation between our real estate stock portfolio returns and the returns on the FRC index. We computed quarterly returns for the FRC index and for our real estate portfolios. The data cover only the 1978–1988 period since the FRC data are quarterly and return information begins in the last quarter of 1978. Table 4 reports summary statistics for the FRC index, real estate stock portfolios, and the broader stock and bond market indexes used in the previous sections. First, the quarterly returns for the real estate stock portfolios exhibit the same behavior found in the monthly data. Second, the returns on the FRC index are insignificantly (negatively) correlated with the broad stock market indexes as well as the real estate stock portfolios. While the securitized and non-securitized real estate returns appear to have little or no relation to one another, that appearance is misleading. The appraisal process not only smooths the FRC series, it likely causes it to lag changes in property values. Thus, lagged real estate-related stock returns may be correlated with current period FRC returns.

To investigate this possibility, it was necessary to first account for the known strong persistence in the FRC index returns (see Ross & Zisler (1987a,b)). We estimated the following specification

$$R_{FRC,t} = \gamma_0 + \gamma_1 R_{FRC,t-1} + \gamma_2 R_{FRC,t-2} + \gamma_3 Year + \gamma_4 Qtr + \mu_t \quad (3)$$

where $R_{FRC,t}$ is the total return on the FRC index for quarter t, Year is a yearly trend variable with variable values starting at 78 for the year 1978,

Qtr is a vector of dichotomous variables identifying the quarter of the year in which the return is observed (the first quarter is the omitted category), μ_t is the error term, and γ_0-γ_4 are coefficients or coefficient vectors. We found strong quarterly effects in the FRC returns, and a negative yearly time trend. The adjusted R^2 for the specification in (3) is 0.67.[16]

We regress the residuals from (3) on the current and lagged returns of our stock and bond portfolios to investigate whether the market-determined data predict the FRC index movements that are purged of persistence and other time series peculiarities. Table 5 reports results based on estimation of specification (4),

$$\mu_t = b_0 + b_1 R_{i,t} + b_2 R_{i,y(-1)} + u_{i,t} \quad (4)$$

where μ_t is the residual from (3) for quarter t, $R_{i,t}$ is the return for asset category i in quarter t, $R_{i,y(-1)}$ is the compound return for asset category i for the four quarters constituting the year immediately preceding quarter t[17], and u_{it} is the error term.

Consistent with previous research on the raw FRC index returns, contemporaneous stock returns (R_{it}) generally have little explanatory power in (4). In contrast, returns over the previous calendar year ($R_{i,y(-1)}$) have

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[16]Because of our small sample size, we did not experiment with longer lags of the FRC return data. The second lag is included to pick up any longer-term persistence. Equation (3) does yield the highest adjusted R^2 of all the specifications we estimated. We also note that estimation of a specification like (3) with only the yearly trend and the quarterly time controls explains about 60% of the variance in the quarterly returns on the FRC index.

[17]This annual return is 'quarterized' by taking the previous year's return to the one-quarter power.

significant predictive power with respect to current period FRC index returns. This holds for each real estate subcategory except for the general contractors. Of all the real estate categories, the prior-year equity REIT returns display the greatest predictive power. This might be due to the fact that the cash flows underlying REITs are more closely linked to the cash flows and capital values on existing real properties (like those in the FRC index) than is the case for the other categories of traded real estate stocks. Note that the one year lagged returns on the small stock index have the largest regression coefficient, but the explained variance is slightly lower than that for the real estate index and is about one-half that of the equity REIT portfolio. Thus, the explanatory power of equity REITs and the non-trust status real estate stocks does not appear to derive solely from their similarity to other traded small stocks. Nor is this explanatory power a general, market-related phenomenon since the estimated coefficients on the lagged values of the S&P500 and the long-term Treasury bonds are not statistically significant.[18]

V. CONCLUSIONS

There now are numerous real estate-related firms traded on the New York and American exchanges. The equity returns on their stocks provide an important, yet largely unexplored, source of transactions-based data with which to investigate real estate asset returns. This paper has shown that there is a large small stock component to the traded real estate stock

[18]Current bond market (excess) returns are highly significant, however. This partial correlation implies that if the yield curve is flatter, then current FRC index returns are materially lower.

returns. We have argued that this covariance partially reflects real estate fundamentals. Moreover, lagged values of the traded real estate firms' returns are shown to help predict the FRC index returns.

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Table 1A

Summary Statistics: Various Asset Categories
(August 1962 - December 1988; 317 observations)

Asset Category (SIC Code)	Monthly Percentage Excess Return (Std. Dev.)	Correlations[b]									Number of Stocks in Portfolio	
		6510	6530	6550	Equity REITs	Real Estate Index	LTGOV	S&P 500	Small Stocks	Unexpected Inflation	Min (Date)[c]	Max (Date)[c]
(1) General Contractors (1500)	1.18 (10.67)	0.70 (0.00)	0.69 (0.00)	0.83 (0.00)	0.66 (0.00)	0.91 (0.00)	0.22 (0.00)	0.66 (0.00)	0.83 (0.00)	-0.23 (0.00)	2(6212)	25(8803)
(2) Owners-Operators (6510)	0.66 (8.45)		0.69 (0.00)	0.79 (0.00)	0.67 (0.00)	0.88 (0.00)	0.19 (0.00)	0.57 (0.00)	0.77 (0.00)	-0.23 (0.00)	2(6208)	17(8710)
(3) Agents-Managers (6530)	0.99 (9.15)			0.75 (0.00)	0.64 (0.00)	0.87 (0.00)	0.14 (0.01)	0.55 (0.00)	0.76 (0.00)	-0.16 (0.00)	4(6208)	14(8712)
(4) Subdividers-Developers (6550)	0.73 (9.68)				0.72 (0.00)	0.94 (0.00)	0.19 (0.00)	0.64 (0.00)	0.90 (0.00)	-0.19 (0.00)	18(6802)	49(7211)
(5) Equity REITs	0.45 (5.20)					0.75 (0.00)	0.23 (0.00)	0.55 (0.00)	0.71 (0.00)	-0.25 (0.00)	2(6208)	40(8811)
(6) Non-REIT Real Estate Index (1)+(2)+(3)+(4)	0.89 (8.53)						0.21 (0.00)	0.68 (0.00)	0.91 (0.00)	-0.23 (0.00)		
(7) Long-Term Treasury Bond Index (LTGOV)	-0.00 (3.03)							0.32 (0.00)	0.17 (0.00)	-0.19 (0.00)		
(8) S&P 500	0.38 (4.39)								0.78 (0.00)	-0.22 (0.00)		
(9) Small Stock Index	0.90 (6.77)									-0.22 (0.00)		
10) 30-Day Treasury Bills	0.54[a] (0.23)											
(11) Inflation (π-% Δ CPI)	0.44[a] (0.34)											

[a]Raw returns or inflation rate;
[b]Numbers in parentheses convey probability of observing stronger correlation under H_0: $\rho = 0$;
[c]Number is for first date at which minimum or maximum number is observed.

Table 1B

Summary Statistics: Various Asset Categories
(August 1962 - December 1974; 149 Observations)

Asset Category (SIC Code)	Monthly Percentage Excess Return (Std. Dev.)	Correlations[b]									Number of Stocks in Portfolio	
		6510	6530	6550	Equity REITs	Real Estate Index	LTGOV	S&P 500	Small Stocks	Unexpected Inflation	Min (Date)[c]	Max (Date)[c]
(1) General Contractors (1500)	0.06 (10.07)	0.60 (0.00)	0.58 (0.00)	0.76 (0.00)	0.51 (0.00)	0.87 (0.00)	0.10 (0.21)	0.62 (0.00)	0.82 (0.00)	-0.23 (0.00)	2(6212)	13(7304)
(2) Owners-Operators (6510)	-0.49 (7.91)		0.60 (0.00)	0.69 (0.00)	0.48 (0.00)	0.83 (0.00)	0.08 (0.34)	0.55 (0.00)	0.71 (0.00)	-0.29 (0.00)	2(6208)	7(7309)
(3) Agents-Managers (6530)	-0.07 (8.09)			0.65 (0.00)	0.46 (0.00)	0.81 (0.00)	-0.00 (0.99)	0.54 (0.00)	0.71 (0.00)	-0.18 (0.02)	4(6208)	10(7305)
(4) Subdividers-Developers (6550)	-0.33 (9.19)				0.53 (0.00)	0.91 (0.00)	0.13 (0.10)	0.60 (0.00)	0.87 (0.00)	-0.22 (0.01)	18(6802)	49(7211)
(5) Equity REITs	-0.32 (4.91)					0.58 (0.00)	0.19 (0.02)	0.49 (0.00)	0.58 (0.00)	-0.27 (0.00)	2(6208)	14(7308)
(6) Non-REIT Real Estate Index (1)+(2)+(3)+(4)	-0.21 (7.51)						0.09 (0.02)	0.68 (0.00)	0.91 (0.00)	-0.27 (0.00)		
(7) Long-Term Treasury Bond Index (LTGOV)	-0.18 (2.17)							0.25 (0.00)	0.11 (0.17)	0.00 (0.96)		
(8) S&P 500	0.06 (4.06)								0.77 (0.01)	-0.32 (0.00)		
(9) Small Stock Index	0.32 (6.69)									-0.31 (0.00)		
10) 30-Day Treasury Bills	0.41[a] (0.13)											
(11) Inflation (π-% Δ CPI)	0.36[a] (0.31)											

[a]Raw returns or inflation rate;
[b]Numbers in parentheses convey probability of observing stronger correlation under H_0: $\rho = 0$;
[c]Number is for first date at which minimum or maximum number is observed.

Table 1C

Summary Statistics: Various Asset Categories
(January 1975 - December 1988; 168 observations)

Asset Category (SIC Code)	Monthly Percentage Excess Return (Std. Dev.)	Correlations[b]									Number of Stocks in Portfolio	
		6510	6530	6550	Equity REITs	Real Estate Index	LTGOV	S&P 500	Small Stocks	Unexpected Inflation	Min (Date)[c]	Max (Date)[c]
(1) General Contractors (1500)	2.18 (11.12)	0.76 (0.00)	0.76 (0.00)	0.87 (0.00)	0.77 (0.00)	0.93 (0.00)	0.28 (0.00)	0.69 (0.00)	0.84 (0.00)	-0.22 (0.00)	9(7608)	26(8803)
(2) Owners-Operators (6510)	1.69 (8.80)		0.75 (0.00)	0.85 (0.00)	0.81 (0.00)	0.90 (0.00)	0.24 (0.00)	0.59 (0.00)	0.82 (0.00)	-0.16 (0.00)	6(7608)	17(8710)
(3) Agents-Managers (6530)	1.93 (9.93)			0.81 (0.00)	0.76 (0.00)	0.90 (0.00)	0.20 (0.01)	0.55 (0.00)	0.80 (0.00)	-0.13 (0.09)	4(8305)	14(8712)
(4) Subdividers-Developers (6550)	1.67 (10.01)				0.85 (0.00)	0.96 (0.00)	0.22 (0.00)	0.67 (0.00)	0.92 (0.00)	-0.14 (0.06)	28(7608)	45(7501)
(5) Equity REITs	1.14 (5.36)					0.86 (0.00)	0.24 (0.00)	0.59 (0.00)	0.81 (0.00)	-0.20 (0.01)	13(7501)	40(8811)
(6) Non-REIT Real Estate Index (1)+(2)+(3)+(4)	1.87 (9.19)						0.26 (0.00)	0.68 (0.00)	0.92 (0.00)	-0.18 (0.02)		
(7) Long-Term Treasury Bond Index (LTGOV)	0.15 (3.63)							0.35 (0.00)	0.19 (0.00)	-0.26 (0.00)		
(8) S&P 500	0.67 (4.65)								0.79 (0.00)	-0.15 (0.06)		
(9) Small Stock Index	1.42 (6.82)									-0.15 (0.06)		
10) 30-Day Treasury Bills	0.65[a] (0.24)											
(11) Inflation (π-% Δ CPI)	0.50[a] (0.35)											

[a]Raw returns or inflation rate;
[b]Numbers in parentheses convey probability of observing stronger correlation under H_0: $\rho = 0$;
[c]Number is for first date at which minimum or maximum number is observed.

Table 2A

Real Estate-Related Stock Portfolio Excess Return Regressions
(August 1962 - December 1988; n = 317)

$$(1)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \beta_2(R_{LB,t} - R_{TB,t}) + \beta_3 UI_t + \varepsilon_{i,t}$$

$$(2)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \varepsilon_{i,t}$$

Independent Variables	General Contractors (1500)		Owner-Operators (6510)		Agents-Managers (6530)		Subdividers-Developers (6550)		Equity REITs		Non-REIT Real Estate Index	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Intercept (%)	0.04 (0.33)[a]	0.00 (0.34)	-0.17 (0.30)	-0.20 (0.31)	0.06 (0.34)	0.06 (0.33)	-0.42 (0.24)	-0.43 (0.24)	-0.01 (0.20)	-0.04 (0.21)	-0.12 (0.20)	-0.14 (0.20)
Small Stock Excess Returns	1.27 (0.05)	1.31 (0.05)	0.94 (0.05)	0.96 (0.04)	1.03 (0.05)	1.03 (0.05)	1.28 (0.04)	1.28 (0.04)	0.52 (0.04)	0.55 (0.03)	1.13 (0.03)	1.15 (0.03)
Long-Term Bond Excess Returns	0.28 (0.11)		0.15 (0.10)		0.05 (0.11)		0.15 (0.08)		0.17 (0.07)		0.16 (0.07)	
Unexpected Inflation	-1.73 (1.32)		-1.77 (1.20)		0.19 (1.33)		0.64 (0.96)		-1.59 (0.81)		-1.67 (0.79)	
R^2	0.70	0.69	0.60	0.59	0.58	0.58	0.80	0.80	0.52	0.50	0.83	0.83
σ^2_ε	0.0035	0.0035	0.0029	0.0029	0.0035	0.0034	0.0018	0.0018	0.0013	0.0013	0.0012	0.0013
DW	2.09	2.02	2.28	2.26	2.00	2.00	2.09	2.09	2.28	2.21	2.00	1.98
ρ^ε_1	-.04	-.01	-.14	-.13	-.01	-.01	-.05	-.04	-.14	-.10	-.01	.00

[a]Standard errors in parentheses.

Table 2B

Real Estated-Related Stock Portfolio Excess Return Regressions
(August 1962 - December 1974; n = 149)

$$(1)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \beta_2(R_{LB,t} - R_{TB,t}) + \beta_3 UI_t + \varepsilon_{i,t}$$

$$(2)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \varepsilon_{i,t}$$

Independent Variables	General Contractors (1500)		Owner-Operators (6510)		Agents-Managers (6530)		Subdividers-Developers (6550)		Equity REITs		Non-REIT Real Estate Index	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Intercept (%)	-0.37 (0.50)[a]	-0.33 (0.48)	-0.60 (0.47)	-0.76 (-0.46)	-0.50 (0.48)	-0.35 (0.47)	-0.80 (0.39)	-0.72 (0.37)	-0.27 (0.34)	-0.45 (0.33)	-0.57 (0.27)	-0.54 (0.26)
Small Stock Excess Returns	1.24 (0.08)	1.23 (0.07)	0.81 (0.07)	0.84 (0.07)	0.89 (0.07)	0.86 (0.07)	1.21 (0.06)	1.20 (0.06)	0.39 (0.05)	0.43 (0.05)	1.04 (0.04)	1.03 (0.04)
Long-Term Bond Excess Returns	0.05 (0.22)		0.00 (0.21)		-0.32 (0.22)		0.14 (0.17)		0.29 (0.15)		-0.03 (0.12)	
Unexpected Inflation	0.96 (2.29)		-2.97 (2.18)		1.52 (2.21)		1.97 (1.77)		-2.48 (1.54)		0.37 (1.24)	
R^2	0.66	0.66	0.51	0.50	0.52	0.51	0.76	0.76	0.36	0.34	0.83	0.83
σ_ε^2	0.0035	0.0034	0.0031	0.0031	0.032	0.0032	0.0021	0.0020	0.0016	0.0016	0.0010	0.0010
DW	2.27	2.28	2.14	2.10	1.87	1.85	1.90	1.90	2.16	2.11	1.78	1.78
ρ_1^ε	-.14	-.15	-.08	-.05	.04	.06	.04	.04	-.11	-.08	.09	.09

[a]Standard errors in parentheses.

Table 2C

Real Estate-Related Stock Portfolio Excess Return Regressions
(January 1975 - December 1988; n = 168)

$$(1)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t} - R_{TB,t}) + \beta_2(R_{LB,t} - R_{TB,t}) + \beta_3 UI_t + \epsilon_{i,t}$$

$$(2)\quad R_{i,t} - R_{TB,t} = \alpha + \beta_1(R_{ss,t}\ R_{TB,t}) + \epsilon_{i,t}$$

Independent Variables	General Contractors (1500)		Owner-Operators (6510)		Agents-Managers (6530)		Subdividers-Developers (6550)		Equity REITs		Non-REIT Real Estate Index	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Intercept (%)	0.15 (0.47)[a]	0.23 (0.48)	0.17 (0.40)	0.19 (0.40)	0.27 (0.47)	0.28 (0.47)	-0.23 (0.32)	-0.23 (0.32)	0.19 (0.24)	0.23 (0.25)	0.09 (0.29)	0.12 (0.29)
Small Stock Excess Returns	1.32 (0.07)	1.37 (0.07)	1.03 (0.06)	1.05 (0.06)	1.16 (0.07)	1.17 (0.07)	1.33 (0.05)	1.35 (0.05)	0.62 (0.04)	0.64 (0.04)	1.21 (0.04)	1.23 (0.04)
Long-Term Bond Excess Returns	0.31 (0.12)		0.19 (0.11)		0.12 (0.13)		0.12 (0.09)		0.10 (0.07)		0.18 (0.08)	
Unexpected Inflation	-2.85 (1.66)		-0.82 (1.43)		-0.10 (1.69)		0.03 (1.14)		-1.27 (0.88)		-0.93 (1.03)	
R^2	0.73	0.71	0.68	0.67	0.65	0.64	0.84	0.84	0.67	0.66	0.84	0.84
σ_ϵ^2	0.0035	0.0036	0.0026	0.0026	0.0036	0.0035	0.0016	0.0016	0.0010	0.0010	0.0013	0.0014
DW	1.92	1.79	2.32	2.33	2.11	2.11	2.22	2.21	2.08	2.02	2.08	2.04
ρ_1^ϵ	.02	.08	-.21	-.21	-.06	-.06	-.14	-.13	-.09	-.05	(-.08)	(-.05)

[a]Standard errors in parentheses.

Table 3

Correlations of Residuals ($\varepsilon_{i,t}$) From Single-Factor Market Model

$$R_{it} - R_{TB,t} = \alpha_0 + \beta_1(R_{ss,t} - R_{TB,t}) + \varepsilon_{i,t}$$

Dependent Variable (Category i)	6510	6530	6550	Equity REITs	Real Estate Index	LTGOV	S&P 500	Unexpected Inflation
A. August 1962 - December 1988; n = 317								
(1) General Contractors (1500)	0.16 (0.00)	0.16 (0.00)	0.34 (0.00)	0.19 (0.00)	0.65 (0.00)	0.15 (0.01)	0.04 (0.48)	-0.09 (0.09)
(2) Owners-Operators (6510)		0.26 (0.00)	0.34 (0.00)	0.28 (0.00)	0.66 (0.00)	0.10 (0.08)	-0.06 (0.27)	-0.09 (0.09)
(3) Agents-Managers (6530)			0.21 (0.00)	0.22 (0.00)	0.65 (0.04)	0.02 (0.69)	-0.11 (0.04)	0.00 (0.94)
(4) Subdividers-Developers (6550)				0.27 (0.00)	0.66 (0.00)	0.10 (0.08)	-0.20 (0.00)	0.02 (0.71)
(5) Equity REITs					0.36 (0.00)	0.16 (0.01)	-0.01 (0.90)	-0.13 (0.02)
(6) Non-REIT Real Estate Index (1) & (2) & (3) & (4)						0.14 (0.01)	-0.11 (0.04)	-0.07 (0.23)
B. August 1962 - December 1974; n = 149								
(1) General Contractors (1500)	0.06 (0.48)	-0.00 (0.96)	0.19 (0.02)	0.07 (0.38)	0.55 (0.00)	0.02 (0.81)	-0.02 (0.80)	0.03 (0.68)
(2) Owners-Operators (6510)		0.19 (0.02)	0.22 (0.01)	0.11 (0.17)	0.64 (0.00)	-0.00 (0.97)	0.01 (0.88)	-0.11 (0.19)
(3) Agents-Managers (6530)			0.09 (0.30)	0.08 (0.31)	0.56 (0.00)	-0.12 (0.15)	-0.01 (0.91)	0.05 (0.55)
(4) Subdividers-Developers (6550)				0.07 (0.38)	0.58 (0.00)	0.07 (0.39)	-0.22 (0.01)	0.09 (0.27)
(5) Equity REITs					0.15 (0.07)	0.15 (0.06)	0.09 (0.29)	-0.12 (0.15)
(6) Non-REIT Real Estate Index (1) & (2) & (3) & (4)						-0.02 (0.80)	-0.09 (0.30)	0.02 (0.78)
C. January 1975 - December 1988; n = 168								
(1) General Contractors (1500)	0.23 (0.00)	0.27 (0.00)	0.47 (0.00)	0.28 (0.00)	0.72 (0.00)	0.22 (0.00)	0.07 (0.34)	-0.17 (0.02)
(2) Owners-Operators (6510)		0.28 (0.00)	0.43 (0.00)	0.43 (0.00)	0.67 (0.00)	0.14 (0.06)	-0.15 (0.05)	-0.08 (0.32)
(3) Agents-Managers (6530)			0.30 (0.00)	0.31 (0.00)	0.69 (0.00)	0.07 (0.36)	-0.23 (0.00)	-0.02 (0.78)
(4) Subdividers-Developers (6550)				0.47 (0.00)	0.73 (0.00)	0.10 (0.19)	-0.21 (0.01)	-0.02 (0.07)
(5) Equity REITs					0.51 (0.00)	0.15 (0.06)	-0.14 (0.06)	-0.14 (0.06)
(6) Non-REIT Real Estate Index (1) & (2) & (3) & (4)						0.20 (0.01)	-0.17 (0.03)	-0.11 (0.14)

[a]Numbers in parentheses convey probability of observing a strong correlation under H_0: $\rho = 0$.

Table 4

Summary Statistics for Raw Quarterly Returns of Real Estate-Related Stocks, the FRC Index, and Stock and Bond Indexes
1978(1) - 1988(4); n = 44

Asset Category	Quarterly Returns (%)		Correlations									
	Mean	Standard Deviation	1500	6510	6530	6550	Equity REITs	S&P 500	Small Stocks	LT Bonds	T Bills	FRC
Non-REIT Real Estate Index	0.067	0.165	0.91	0.94	0.92	0.96	0.89	0.81	0.93	0.36	-0.07	-0.04
General Contractors (1500)	0.073	0.220		0.79	0.75	0.84	0.80	0.79	0.79	0.46	-0.12	-0.12
Owners & Operators (6510)	0.068	0.149			0.86	0.89	0.87	0.79	0.91	0.31	-0.02	0.03
Agents & Managers (6530)	0.065	0.166				0.87	0.79	0.68	0.88	0.26	0.04	0.01
Subdividers & Developers (6550)	0.064	0.172					0.86	0.76	0.94	0.28	-0.14	-0.05
Equity REITs	0.046	0.083						0.66	0.80	0.49	-0.03	-0.04
S&P 500 Index	0.040	0.082							0.83	0.37	-0.19	-0.13
Small Stock Index	0.051	0.118								0.22	-0.11	-0.09
Long-Term Government Bond Index	0.026	0.080									-0.05	-0.28
T-Bills	0.022	0.007										0.59
FRC Overall	0.030	0.014										

Table 5

OLS Regression of FRC Residual on Stock and Bond Market Returns
Quarterly Observations: 1978 - 1988

$$\mu_t = b_0 + b_1 R_{it} + b_2 R_{i,y(-1)} + \mu_t$$

Independent Variable (R)	b_0	b_1	b_2	Adj. R^2	Dw(ρ)
(1) General Contractors (1500)	-0.0004 (0.0014)	-0.0081 (0.0051)	0.0159 (0.0113)	.06	2.16 (-.09)
(2) Owners & Operators (6510)	-0.0014 (0.0016)	-0.0072 (0.0075)	0.0295 (0.0148)	.07	2.09 (-.06)
(3) Agents & Managers (6530)	-0.0010 (0.0015)	-0.0079 (0.0069)	0.0249 (0.0144)	.06	2.10 (-0.06)
(4) Subdividers & Developers (6550)	-0.0011 (0.0014)	-0.0083 (0.0066)	0.0293 (0.0137)	.11	2.18 (-0.10)
(5) Equity REITs	-0.0021 (0.0019)	-0.0199 (0.0134)	0.0653 (0.0307)	.12	2.10 (-.07)
(6) Non-REIT Real Estate Index (1)+(2)+(3)+(4)	-0.0010 (0.0015)	-0.0093 (0.0068)	0.0264 (0.0139)	.09	2.16 (-.09)
(7) S&P 500	-0.0012 (0.0018)	-0.0082 (0.0145)	0.0420 (0.0307)	.01	2.07 (-.04)
(8) Small Stock Index	-0.0018 (0.0017)	-0.0036 (0.0099)	0.0428 (0.0216)	.06	2.04 (-.04)
(9) LTGOV	0.0014 (0.0012)	-0.0475 (0.0129)	0.0062 (0.0265)	.22	2.08 (-.07)

Figure 1

MARKET CAPITALIZATION VALUES

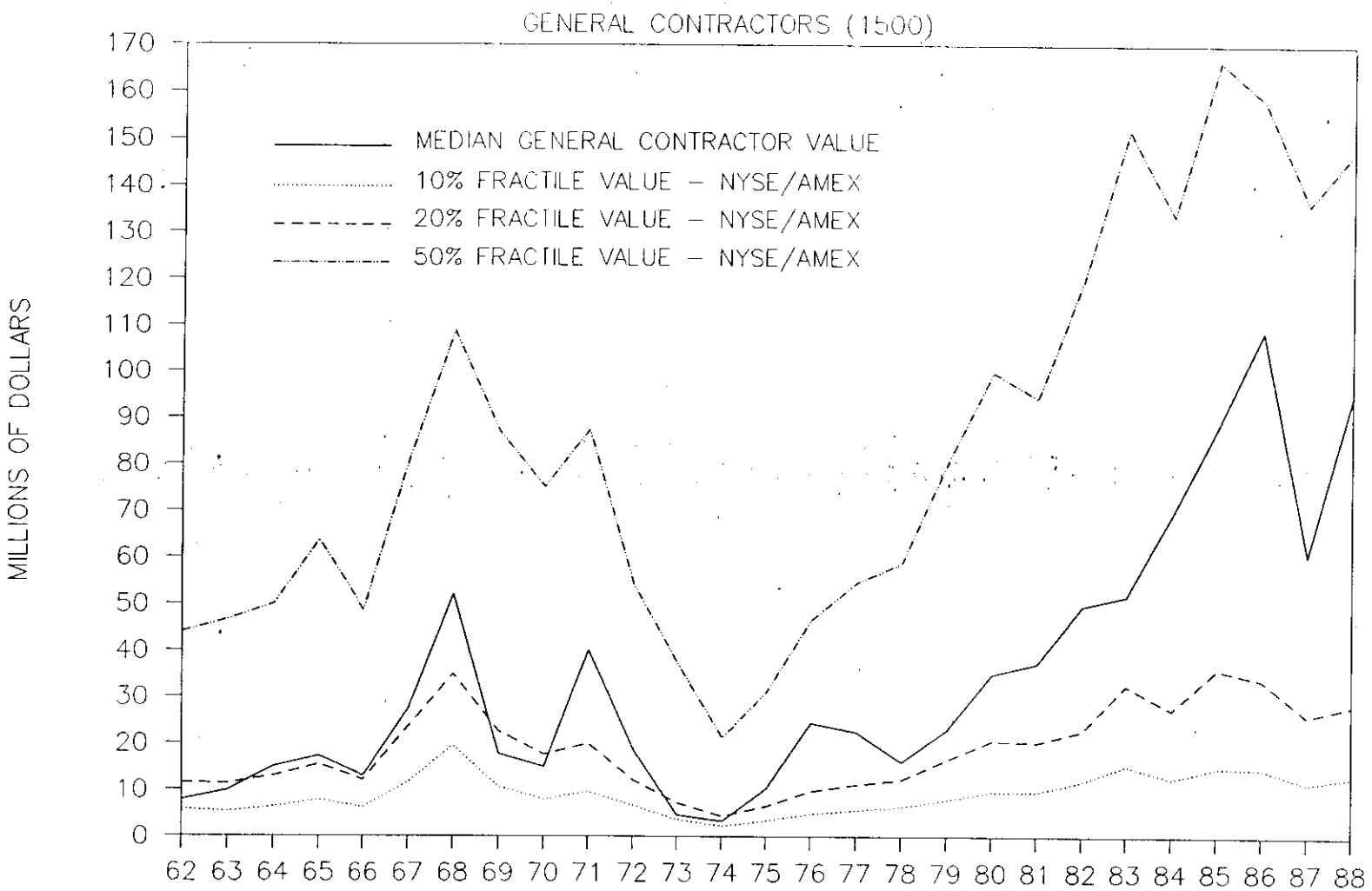

Figure 2

MARKET CAPITALIZATION VALUES

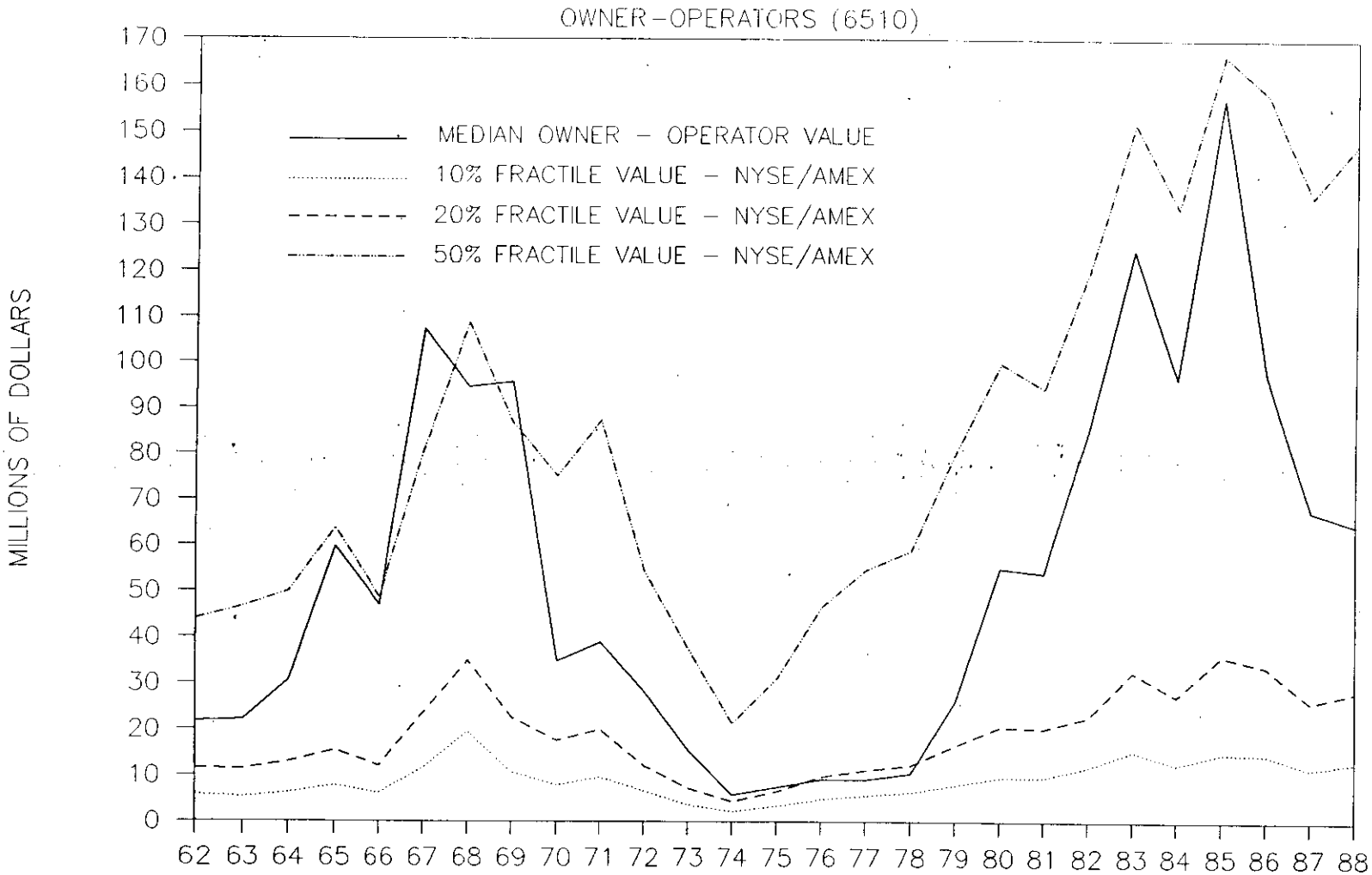

Figure 3

MARKET CAPITALIZATION VALUES

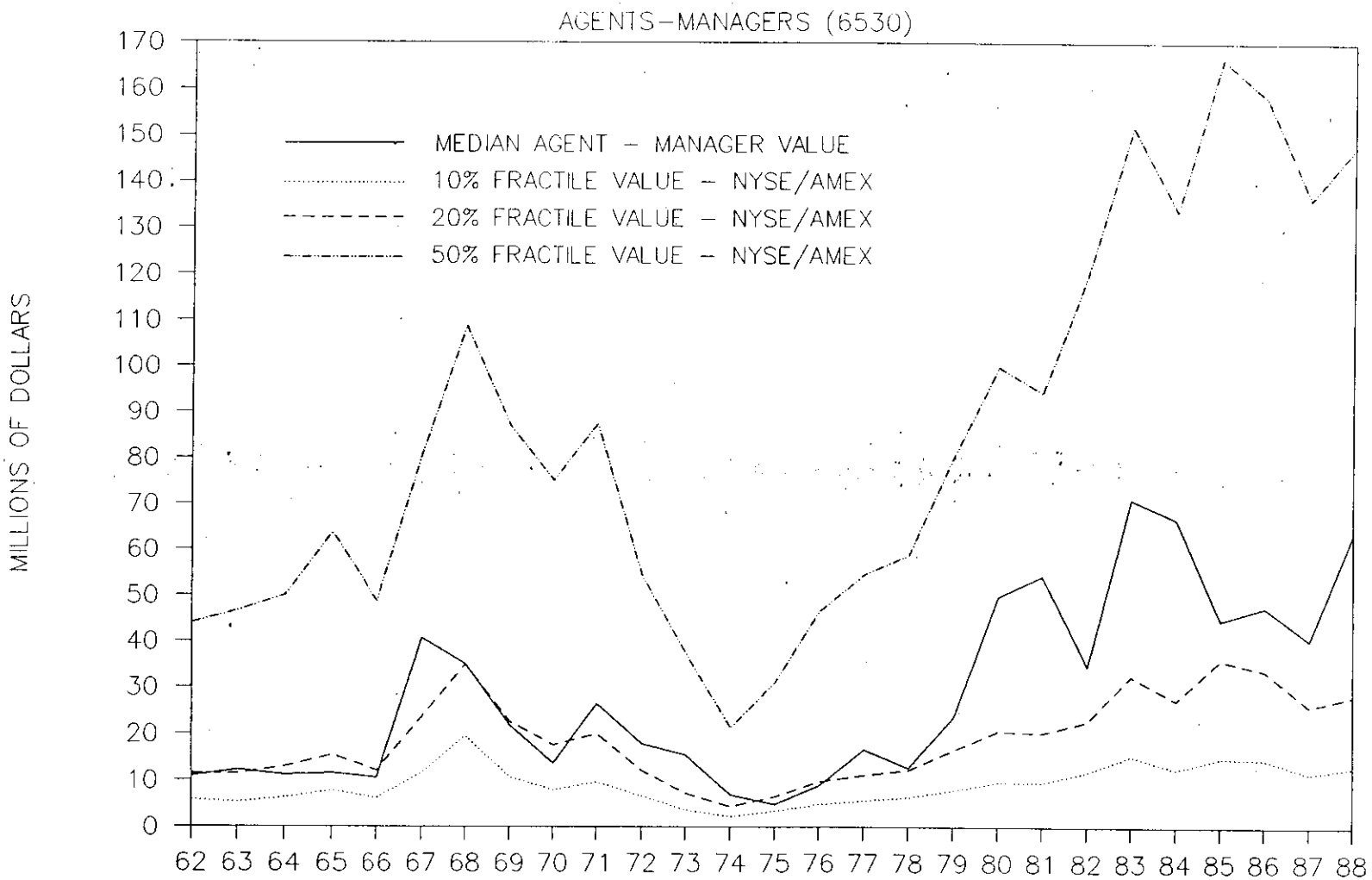

Figure 4

MARKET CAPITALIZATION VALUES

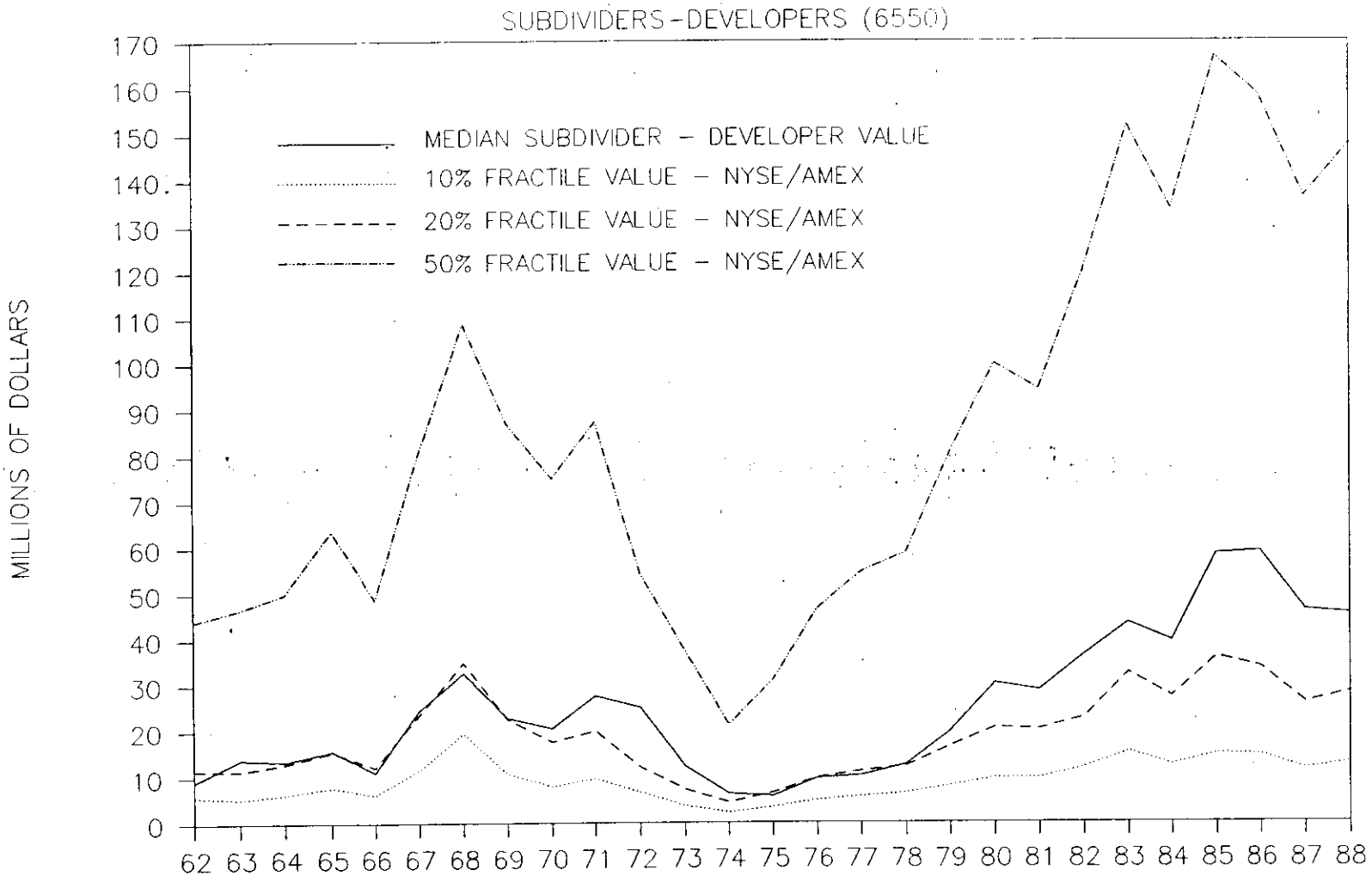

Figure 5

MARKET CAPITALIZATION VALUES