HAVE U.S. FINANCIAL INSTITUTIONS' REAL ESTATE INVESTMENTS EXHIBITED "TREND-CHASING" BEHAVIOR?

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Abstract—This paper uses real estate investment data for major groups of U.S. financial institutions—commercial banks, thrifts, and life insurance companies—to evaluate their investment timing performance over the 1970–1989 period. Our major finding is that real estate investments by commercial banks and thrifts have largely been driven by *past* real estate and market returns rather than by future expected returns. This apparent "trend-chasing" investment strategy—of buying high and selling low—offers an explanation for the poor performance of their real estate investments. We argue that imposing market value accounting on such institutions may actually reinforce their "trend-chasing" behavior.

I. Introduction

THE 1980s posed serious profitability and stability problems for U.S. financial institutions—especially in the area of real estate investment. For example, at the end of September 1992, the 50 banks in Salomon Brothers' 50-bank composite reported that 10.3% of their real estate loans were nonperforming.[1] The 1980s are also replete with thrift industry failures in such states as Texas, California, and Florida, where rules concerning real estate investments of state-chartered thrifts were often more liberal than for nationally chartered thrifts (see White (1991)). While real estate investment problems in the life insurance industry have not received as much attention, several insurance company failures and the lingering recession in commercial real estate in some regions suggest that the problem is not over.

This unfolding of bad real estate loan problems for major U.S. financial institutions raises an important empirical question, namely, what business strategy—besides fraud and gross mismanagement—lies behind these problems, and what strategic and regulatory changes need to be made to avoid repeating these problems in the future?

While a number of studies have analyzed the link between moral hazard and excessive risk taking by financial institutions, resulting from mispriced deposit insurance guaranty schemes (see Berlin et al. (1991) for a review), no study has formally sought: (1) to establish the relationship between financial institutions' real estate investments and real estate pricing (returns), and (2) to address the question as to whether the ex post poor performance of such investments has been due to ex post bad luck under excessive risk taking (moral hazard) or to risk taking under ex ante unfavorable odds.

In this paper we use real estate investment data for 1970–1989 for commercial banks, savings and loans, and life insurance companies to address the above issues. These institutions report their positions in real estate assets on a regular and homogeneous basis in such publications as bank call reports and other statistical releases. As such they present a unique laboratory to analyze investment behavior over time and the rationality of such behavior in light of asset pricing theories. Our major finding is that commercial banks' and savings and loans' real estate investments have generally been driven by past real estate or market return performance, and that this "trend-chasing" strategy offers a possible explanation for the poor performance of these institutions' real estate portfolios.

The paper is organized as follows. Section II outlines a framework for real estate asset pricing. In particular we employ a multifactor latent-variable model along the lines of Campbell (1987) and Ferson (1989) to derive time-varying ex ante risk premiums (or expected excess returns) on various real estate investments. We then employ the approximate accounting identity of Campbell (1991) to discuss the relationship between ex post returns and ex ante future expected excess returns on assets such as real estate as well as on the optimal investment strategy for an investor (here a financial institution). This is followed in section III by a description of the data and the empirical methodology. Section IV presents the empirical results, and we discuss our major findings. (1) U.S. commercial banks' and savings and loans' real estate investments have largely been driven by past real estate or market excess returns over the last twenty years. (2) We observe increases in real estate investments at times when ex ante excess returns on real estate may be below their mean levels and declines in real estate investments at times when their ex ante returns may be above their mean levels. (3) We show that this "trend-chasing" strategy offers one explanation for the poor real estate investment performance of a large group of U.S. financial institutions. Here we have tried to distinguish marketwide and real estate–specific investment behavior. We also discuss the role of regulation, and how this may have contributed to financial institutions' poor investment timing. In addition, the implications for proposed regulatory reforms—such as market value accounting—are identified. Section V is a summary and conclusion.

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[1] Salomon Brothers, U.S. Equity Research, Commercial Banks, February 12, 1993.

II. Time-Varying Expected Returns and the Dynamics of Asset Returns

A. *A Simple Model for Real Estate Expected Excess Returns*

To construct proxies for ex ante real estate expected returns, we follow previous studies such as Campbell (1987) and Fama and French (1988) by assuming that the conditional expectations for asset excess returns are linear in several prespecified economic forecasting variables:

$$E_t[e_{i,t+1}] = \sum_{p=1}^{L} \alpha_{ip} X_{pt} \tag{1}$$

where $e_{i,t+1}$ is the continuously compounded return on asset i, held from time t to time $t + 1$, in excess of the risk-free rate. $E_t[e_{i,t+1}]$ is the expected excess return on asset i for time period $t + 1$, conditional on the information set I_t being known to market participants at the end of time t. Equation (1) implies that expected excess returns are time-varying and can be predicted by the economic variables, X_{pt} in the information set. This allows us to use equation (1) to examine the degree to which economic (or "forecasting") variables X_{pt} explain the ex ante time variation in expected excess returns on various real estate assets. We note here that equation (1) can be derived formally from a multifactor arbitrage pricing model, and we can also verify that the expected return given by equation (1) is consistent with equilibrium asset pricing. (See the appendix for a detailed discussion of these points.)

In the next subsection we examine the relationship between ex post excess returns today and future expected excess returns. This relationship is used, along with equation (1), as "building block" in formulating empirical models and tests of the relationship between real estate returns and the real estate investment decisions of financial institutions.

B. *The Campbell (1991) Approximation to the Present-Value Model*

In a world of constant required rates of return, we know that the price of an asset should be equal to the present value of the current and future cash flows on that asset discounted by a constant required rate of return. However, future required rates of return may not be constant if the economic environment and investment opportunity sets are changing.[2] To study the implications of time variation in expected returns on asset valuation, we employ the approximate loglinear present-value relationship of Campbell (1991) to characterize the dynamic relationship between unexpected excess returns in the current period (from t to $t + 1$) and expected excess returns in the future. More formally, when both "dividend" (asset cash flows) and future required returns are uncertain,[3] Campbell (1991) shows that current unexpected excess returns on an asset can be decomposed into the following accounting relationship:

$$\begin{aligned} e_{t+1} - E_t e_{t+1} = {} & (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} \\ & - (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j r_{t+1+j} \\ & - (E_{t+1} - E_t) \sum_{j=1}^{\infty} \rho^j e_{t+1+j} \end{aligned} \tag{2}$$

where E_t is the expectation formed at the end of period t, d_{t+1} is the log of the real dividend (cash flow) paid to investors during period $t + 1$, r_{t+1} is the real interest rate for the time period $t + 1$, Δ denotes a one-period backward difference operator, and $(E_{t+1} - E_t)$ represents a revision of expectations given any new information arriving at time $t + 1$. The (discount rate) parameter ρ is a constant and is constrained to be smaller than 1. A detailed derivation of the identity can be found in Campbell (1991) and Campbell and Ammer (1993). The main point of identity (2), with respect to this paper, is that when the unexpected excess return on an asset is positive, it follows that either the expected future growth in the asset's cash flows must be increasing, expected future real interest rates must be decreasing, or expected future excess returns on the asset must be decreasing. Or some combination of these three effects must occur simultaneously if expectations are internally consistent.

Following Campbell and Ammer (1993), we will use a more compact version of equation (2), written as follows:

$$v_{e,t+1} = \epsilon_{d,t+1} - \epsilon_{r,t+1} - \epsilon_{e,t+1} \tag{3}$$

where $v_{e,t+1}$ is the unexpected component of the asset return e_{t+1}, $\epsilon_{d,t+1}$ represents news about cash flows, $\epsilon_{r,t+1}$ represents news about future real interest rates, and $\epsilon_{e,t+1}$ represents news about future excess returns. Our main objective here is to study the empirical relationship between $v_{e,t+1}$ and $\epsilon_{e,t+1}$, i.e., the relationship between unexpected current returns and future expected returns. The estimation procedure is explained in the appendix.

C. *Variance Ratio Tests*

In addition to analyzing the relationship between real estate unexpected current returns and future expected returns, we utilize a variance ratio test to ascertain whether real estate excess returns display mean-reverting behavior,

[2] The literature on time-varying asset returns is much too large to cite here adequately. A partial list of references might include Bernanke (1990), Campbell (1987), Fama and French (1988), Keim and Stambaugh (1986), and Lo and MacKinlay (1988). Liu and Mei (1993a) have studied this phenomenon in the context of real estate asset returns.

[3] Although the Campbell model is concerned with equity valuation, the valuation decomposition is generalizable to all risky assets. In the case of real estate, the subject of this paper, dividends can be substituted for by cash flows on real estate investment assets.

similar to that found for stocks in general.[4] The variance ratio statistic $V(K)$, which is defined as the ratio of the variance of K-period returns to the variance of one-period returns divided by K, can be calculated directly from the autocorrelations of one-period excess returns by using the fact that

$$V(K) = 1 + 2 \sum_{j=1}^{K-1} \left(1 - \frac{j}{K}\right) \text{Corr}\,(e_t, e_{t-j}). \quad (4)$$

The variance ratio equals 1 for white noise excess returns (i.e., there is no serial correlation in the return series so that $\text{Corr}\,(e_t, e_{t-j}) = 0$); it exceeds 1 when returns are mostly positively autocorrelated and is below 1 when negative autocorrelations dominate.

III. Constructing Real Estate Expected Returns and Investment Variables

A. *Real Estate Returns*

Because of its inherent "lumpiness" as an asset, measuring the returns on real estate assets is not straightforward. Previous studies have generally relied on appraisal-based valuation data such as the quarterly Russell-NCREIF (RN) index. However, appraisal-based series suffer from serious data-smoothing problems since most real estate assets are not appraised on a regular and simultaneous basis.

In a recent study, Gyourko and Keim (1992) found that not only do stock returns on equity real estate investment trusts (REITs) and real estate–related companies act as good proxies for real estate asset returns, but also that these "market-based" series are correlated with the RN index and can predict the returns on the RN index. In addition, Fisher et al. (1991) find that appraisal-based series such as the RN index move very closely with a REITs index after "desmoothing" the appraisal-based series. Mei and Lee (1994) also show that the RN index and equity REIT returns are driven by a common real estate factor. Consequently,, these studies indicate that returns on REITs may serve as good proxies for returns to the underlying real estate assets. In this paper, we use monthly returns on REITs and real estate company stocks as our proxies for real estate asset returns. Specifically, we construct three real estate stock return–based series: an equally weighted return index of equity real estate investment trusts (EREITs), an equally weighted return index of real estate holding companies (owners), and an equally weighted return index of mortgage real estate investment trusts (mortgage). These series consist of all available REITs or real estate companies listed on NYSE, AMEX, and NASDAQ over the sample period. On average there are approximately 50, 15, and 20 REITs or real estate companies, respectively, in the EREITs, owners, and mortgage REIT portfolios each month. Based on the above classifications, three monthly real estate return series are derived from the CRSP (daily) tape.

It is also worth noting that mortgage REITs hold a portfolio of real estate loans and their returns are related to the performance of their underlying mortgage portfolios. From an investment perspective, the "payoff" structure of the real estate loan portfolio of financial institutions is likely to be similar to the mortgage loan asset portfolios underlying mortgage REITs. Thus mortgage REIT returns appear to offer a particularly good proxy to the underlying returns on financial institutions' real estate loan portfolios.

B. *Other Portfolio Returns*

In addition to returns on the three real estate portfolios, monthly returns on the market portfolio and long-term (20-year) U.S. treasury bonds were also derived from the CRSP tapes. The market portfolio comprised a value-weighted index of NYSE and AMEX stocks. The market and bond portfolios are included in the study for two reasons: (1) as control portfolios to examine the relative behavior of real estate asset returns, and (2) to test the cross-sectional equilibrium asset pricing restriction of equation (A.5) in the appendix for a "wide" range of assets.

C. *Estimation of ex ante Risk Premiums*

To obtain the ex ante risk premiums on the three real estate portfolios, a generalized method of moments (GMM) approach, similar to Campbell (1987) and Ferson (1989), is employed to estimate equation (1). The GMM approach is used to adjust for possible heteroskedasticity in regression (1). To ensure that the equilibrium pricing restriction (A.5) holds for a wide range of assets, we use returns on the five asset portfolios discussed above: (1) the market portfolio, (2) the government bond portfolio, (3) the equity REITs portfolio, (4) the owner portfolio, and (5) the mortgage REITs portfolio.

The economic or forecasting variables X_{pt} chosen to estimate equation (1) include those widely used in previous asset pricing studies (see Campbell (1987, 1991), Fama and French (1988), Keim and Stambaugh (1986), and Ferson and Harvey (1991), among others). The variables included are the excess returns on the value-weighted market portfolio, the difference between the 1-month T-bill rate and inflation, the 1-month T-bill rate relative to its past 12-month moving average, and the dividend yield (on an equally weighted market portfolio).[5] While each of these variables has been found to be useful in explaining the time variation in expected returns on regular stocks, the second and third variables may have particular relevance to the expected excess returns on real estate assets.

The difference between the 1-month T-bill rate and the inflation rate proxies for the level of real interest rates.

[4] Campbell (1991) and Lo and MacKinlay (1988) have all used the variance ratio test to document the mean reverting behavior of stock returns.

[5] A constant is also included. A number of other specifications were examined as robustness checks.

Changes in the level of real interest rates can be expected to impact real estate assets in a number of ways. First, the real cost of funds for real estate development finance will increase as real rates rise. Second, changes in real rates impact the discounted present value of cash flows on such investments. Previous studies of real estate portfolios have concluded that higher real interest rates are associated with lower expected real estate excess returns (see Liu and Mei (1993b) and Mei and Saunders (1995), for example). Thus in periods when real interest rates are higher (or lower) than "normal" we might expect a real estate return that is below (above) its historical levels.

The 1-month T-bill rate relative to its past 12 month moving average (the relative bill rate) proxies for *changes* in nominal interest rates in the economy. A high relative bill rate is consistent with a sudden increase in the short-term interest rates in the economy and increased inflationary expectations, which could adversely impact the payoff on financial institutions' commercial real estate assets—especially those assets with relatively fixed nominal rental incomes (see Miles et al. (1991)). Campbell (1991) and Campbell and Ammer (1993) use the relative bill rate in their models to forecast future real and excess returns on bonds and stocks.

The forecasting (economic) variables were derived from a number of sources. Yields on 1-month bills were derived from the Federal Reserve Bulletin and Ibbotson and Associates (1990). The dividend yield variable, defined as the dividend paid during the last 12 months divided by the current market price, was derived using dividend and price information on the CRSP file.

D. *Real Estate Investments*

To measure real estate investments by the nation's financial institutions, we use four seasonally adjusted series: (1) monthly percentage changes in real estate loans at commercial banks, 1/1973–12/1989, (2) monthly percentage changes in mortgages and mortgage-backed securities at FSLIC-insured savings and loan associations, 1/1976–12/1989,[6] (3) monthly percentage changes in mortgage assets at life insurance companies, 1/1971–12/1989, and (4) housing starts, 1/1971–12/1989. These data are obtained from the Citibase data files.

IV. Empirical Results

Table 1 provides summary statistics for the variables used in this study. It provides data on monthly means, standard deviations (SD's), and first-order autocorrelations of actual (ex post) excess returns on five portfolios: (1) the market portfolio, (2) the government bond portfolio, (3) the equity REITs portfolio, (4) the owner portfolio, and (5) the mortgage REITs portfolio.

TABLE 1.—SUMMARY STATISTICS FOR 2/1971–12/1989

Dependent Variables	Mean (%)	SD (%)	ρ_1[a]
Excess return on market portfolio	0.315	4.727	0.051
Excess return on government bond portfolio	0.072	3.265	0.057
Excess return on EREITs portfolio	0.621	4.828	0.120
Excess return on owner portfolio	0.760	8.511	0.129
Excess return on mortgage REITs portfolio	−0.006	6.511	0.013

[a] ρ_2 is the first-order autocorrelation coefficient of the series.

TABLE 2.—CORRELATIONS AMONG EXCESS RETURNS OF DIFFERENT ASSETS[a]

	Market	Bonds	REITs	Owner	Mortgage
Market	1.000	0.316	0.623	0.681	0.440
Bonds		1.000	0.180	0.211	0.283
REITs			1.000	0.843	0.735
Owner				1.000	0.700
Mortgage					1.000

[a] Sample period is 2/1971–12/1989, with 227 observations. Units on excess returns are percentage points per month.

As can be seen, two of the three real estate portfolios had higher excess returns on their portfolios than either the market or the bond portfolio over the entire 1971–1989 sample period. Real estate returns in general also appear to exhibit a higher degree of volatility and first-order autocorrelation than other portfolios.

In Table 2 the correlation among the excess returns of the market, bond, equity REIT, owner, and mortgage REIT portfolios is shown for the whole sample period. As can be seen, all real estate portfolio returns are highly correlated.

Table 3 examines the extent to which the forecasting variables—the excess return on the value-weighted market portfolio, the real interest rate, the relative bill rate, and the dividend yield—explain the time variation in ex ante excess returns on our asset portfolios and, in particular, the ex ante excess returns on real estate assets. (The *t*-statistics have been adjusted for heteroskedasticity.)

The results in table 3 show a degree of predictability of real estate returns, with the lagged market returns, the interest rate variable, the relative bill rate, and the dividend yield exhibiting their expected signs. Specifically, approximately 5.4% of the variation in monthly excess returns on equity REITs (compared to 5.5% for the market index) is accounted for by the four forecasting variables, after adjusting for degrees of freedom. Similar degrees of predictability are exhibited for the owners and mortgage REIT portfolios.

The predictability reported in table 3 is consistent with other studies using similar variables to forecast future expected excess returns on stock and bond portfolios for different sample periods. For example, Campbell (1987) reports an unadjusted R^2 of 11.2% on the value-weighted index predicted by a set of term-structure variables. Fama and French (1988), using a slightly different set of variables, report an unadjusted R^2 of 4% on the value-weighted index,

[6] It should be noted that most mortgage-backed securities are created by direct swaps of mortgages for securities by banks and thrifts with agencies such as FNMA and FHLMC. As such the size of savings and loan mortgage-backed security portfolios reflects the creation of underlying mortgage assets.

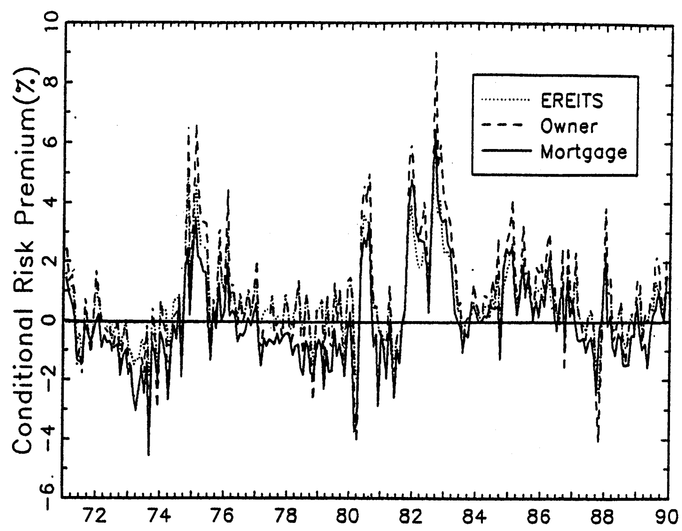
TABLE 3.—CONDITIONED EXPECTED RETURNS ON VARIOUS ASSETS

$$r_{i,t+1} = \text{Constant} + \alpha_1 \text{vwret}_t + \alpha_2 \text{real rate}_t + \alpha_3 \text{rrel}_t + \alpha_4 \text{divyld}_t + \tilde{\epsilon}_i$$

Asset Class	Constant	vwret	Real Rate	rrel	divyld	F-Test	$\bar{R}^2$	DW
Market	−2.118	0.015	0.092	−0.622[a]	0.631	0.00	0.055	1.96
Government bonds	−1.736	−0.079[b]	0.115[a]	−0.065	0.454	0.02	0.028	1.91
EREITs	−2.669	0.151[a]	0.046	−0.454[a]	0.862[a]	0.00	0.054	1.93
Owner	−3.779	0.236[b]	0.143	−0.631[b]	1.160	0.01	0.037	1.91
Mortgage REITs	−3.153	0.066	0.172	−0.667[a]	0.792	0.00	0.044	2.14
χ^2-test of the linear pricing restriction (4): $K = 1$, χ^2-statistic = 37.69 (DF = 25), $P = 0.009$; $K = 2$, χ^2-statistic = 20.60 (DF = 16), $P = 0.056$; $K = 3$, χ^2-statistic = 7.152 (DF = 9), $P = 0.306$								
			Real-Estate-Specific Returns					
Equity REITs	−1.740	0.142[a]	−0.012	−0.058	0.460	0.03	0.018	2.07
Owner	−1.555	0.218[b]	0.029	0.131	0.385	0.10	0.008	2.07
Mortgage REITs	−1.669	0.057	0.116	−0.289	0.408	0.14	0.005	2.29

Notes: Regression of excess returns on each asset class at time $t + 1$ on the excess return on the value-weighted market portfolio vwret, the real interest rate, the relative bill rate rrel, and the dividend yield at time t. The sample period is 2/1971–12/1989. K—number of systematic factors in economy; F-test—joint significance level of all regression variables; P—significance level of χ^2-test of linear pricing restriction (4). Units on 1-month real interest rates, relative bill rate, and dividend yield are percentage per annum.

FIGURE 1.—CONDITIONAL RISK PREMIUMS ON REAL ESTATE ASSETS, 2/1972–12/1989



whereas Ferson (1989) reports an average unadjusted R^2 of less than 1% on the value-weighted index and several bond portfolios.

The time-varying forecasting variables in table 3 along with their estimated regression coefficients α_{ip} can be used to generate expected excess returns $E_t[e_{i,t+1}]$, or conditional risk premiums, for each portfolio (see equation (1)). Figure 1 plots the expected excess return (risk premiums) for various real estate assets over the 2/1971–12/1989 period. Overall, these assets' expected excess returns move closely in tandem. As can be seen, the forecastable risk premiums on some real estate portfolios can be as high as almost 9% for some months. From figure 1 we can see that the conditional expected excess returns on these assets vary over time. They seem to peak just before or after a trough, and to bottom out at or near cycle peaks as defined by the NBER business cycle dates. In other words, investors in real estate appear to demand higher risk premiums during a recession but are willing to accept lower risk premiums when the economy is in an expansionary phase.

In order to confirm that the conditional excess returns for the various real estate asset portfolios, $E_t[e_{i,t+1}]$, given by equation (1), are consistent with equilibrium asset pricing, we also conducted a χ^2-test of the linear pricing restriction (see equation (A.5)) for several specifications of multifactor models. The results are reported at the bottom of table 3. We found that equation (1) is consistent with a three-factor model, but is not consistent with either a one-factor or a two-factor model.[7]

An interesting issue here is whether there is any real estate–specific predictability, since the predictability we observe for real estate assets from table 3 could be completely market driven. To address this issue, we compute real estate–abnormal (or real estate–specific) returns by taking the residuals from the regression of real estate excess returns against market excess returns. We then study the predictability of the abnormal returns. We can see from the bottom panel of table 3 that there exists a real estate–specific (or abnormal) component in real estate portfolio returns which is weakly predictable and not related to aggregate market predictability. The significance levels of joint F-tests of predictability are 3% for equity REITs, 10% for owners, and 14% for mortgages, respectively. As noted above, while the adjusted R^2 are quite small, they are consistent with other studies of predictability, such as Fama and French (1988) and Ferson (1989).[8]

A. *Decomposition of Real Estate Excess Returns*

To achieve a better understanding of what drives real estate excess returns, we decompose excess returns into innovations (news) of cash flows, real interest rates, and future expected returns in equation (3). To estimate these

[7] See Campbell (1987) and Ferson (1989) for details on testing the linear pricing relationship (see A.5) in multifactor models. The χ^2-tests also include excess returns to a real estate builder portfolio. For parsimonious presentation, results about the portfolio are not given in the paper. (They are similar to the three real estate portfolios used in the paper.) They were given in an earlier version of this paper, which is available upon request.

[8] For example, Ferson (1989) reports an average unadjusted R^2 of less than 1% on the value-weighted index and bond portfolios.

innovations, we model excess returns to a real estate portfolio, excess returns to the value-weighted market portfolio, the real interest rate, the 1-month T-bill rate relative to its past 12-month moving average (the relative bill rate), and the dividend yield, according to a K-order VAR process. The estimation of the VAR system is explained in the appendix. We use excess returns on the three real estate portfolios as different proxies for returns to real estate investments. Since the number of parameters in the VAR system increases rapidly with the VAR lag length, and given the capacity of our data sample, we estimated a first- and a second-order VAR process. Since the results for the two specifications are similar, we report results from a parsimonious first-order VAR model.

Table 4 presents a variance decomposition for real estate excess returns. These are normalized by the variance of unexpected excess returns so that the reported numbers add up to 1. We can see that the cash flow innovations $\epsilon_{d,t+1}$ account for a large portion of the return variation in some of the real estate portfolios (e.g., 74% for EREITs and 87% for mortgages). Innovations in future expected returns $\epsilon_{e,t+1}$ also account for a large portion of the return variation in some of the real estate portfolios (e.g., 38% for EREITs). The variation in real interest rates and the covariation of the three components account for the rest of the variation in real estate excess returns.

The last row of table 4 reports the correlation between unexpected excess returns $v_{e,t+1}$ and innovations in future expected excess returns $\epsilon_{e,t+1}$. The correlations are negative for all real estate portfolios, with small standard errors. This negative correlation implies that unexpectedly large excess returns today are associated with smaller future expected excess returns (or a downward revision in future expected excess returns), given no innovations in future cash flows and real interest rates. Thus in the absence of news about future cash flows and real interest rates, an unexpected positive current return on an asset has negative implications for new investors since it implies, via the Campbell–Shiller accounting identity, that lower returns on the asset are to be expected in the future. For a risk-neutral investor (e.g., a profit-maximizing financial institution), the above relationship suggests that the investor should be more inclined to invest in an asset after an unexpected drop in that asset's excess return ($e_{t+1} - E_t e_{t+1}$), since this price drop is consistent with an upward adjustment in future expected rates of return by the market. Likewise, the investor should be less inclined to invest in an asset after an unexpected increase in the asset's excess return because this price increase could be due to a possible downward adjustment of future expected returns on the asset. Or, put more simply, since past excess returns and future expected excess returns on real estate appear to be negatively related, financial institutions should not buy (invest) when unexpected excess returns have been high and not sell (disinvest) when they have been low.

TABLE 4.—VARIANCE DECOMPOSITION FOR EXCESS REAL ESTATE RETURNS

	EREITs	Owner	Mortgage
Var(ϵ_d)	0.740 (0.21)	0.682 (0.26)	0.870 (0.37)
Var(ϵ_r)	0.276 (0.12)	0.093 (0.04)	0.150 (0.06)
Var(ϵ_e)	0.381 (0.27)	0.238 (0.19)	0.313 (0.19)
-2 cov (ϵ_d, ϵ_r)	−0.582 (0.29)	−0.313 (0.16)	−0.378 (0.22)
-2 cov (ϵ_d, ϵ_r)	0.495 (0.21)	0.417 (0.11)	0.192 (0.27)
2 cov (ϵ_r, ϵ_e)	−0.310 (0.28)	−0.116 (0.11)	−0.148 (0.17)
corr (ν_e, ϵ_e)	−0.767 (0.07)	−0.796 (0.07)	−0.599 (0.19)

Notes: ϵ_d, ϵ_r, and ϵ_e represent news about future cash flows, real interest rates, and future expected returns, respectively. Numbers in parentheses are standard errors, calculated from a first-order VAR system. Variances and covariances are normalized by the variance of unexpected excess returns v_e so that the six numbers reported at the top add up to 1. The sample period is 1/1972–12/1989.

FIGURE 2.—IMPLIED VARIANCE RATIOS FOR REAL ESTATE ASSETS

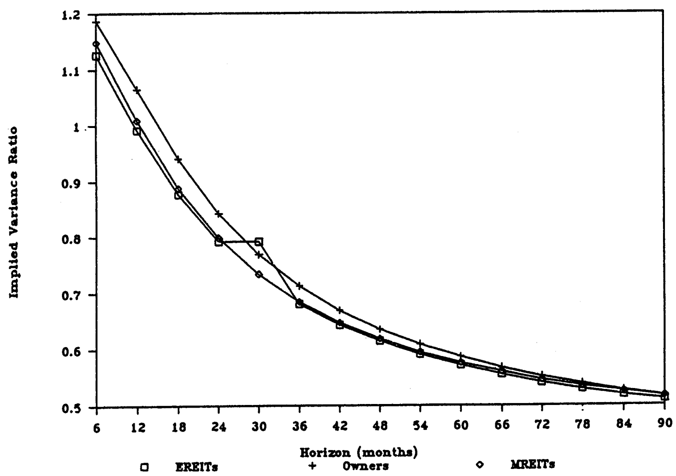


Figure 2 provides a plot of the variance ratio calculations for the three real estate portfolios EREITs, owners, and mortgages, based on the VAR estimates. The variance ratios are calculated at 6-month intervals and go from 6 out to 90 months. Figure 2 reveals that the variance ratios for EREITs and owners are very similar to one another whereas the variance ratios for mortgages are always larger (except for the 6-month horizon). The variance ratios for these portfolios are greater than 1 for the 6-month and 12-month horizons, implying that the autocorrelations for holding periods less than 1 year are predominantly positive. For holding periods greater than 1 year the variance ratios become less than 1 implying that negative autocorrelations dominate for holding periods that are longer than a year. This suggests that mean reversion may exist in real estate excess returns. However, this mean reversion is weaker for mortgages relative to the two other real estate portfolios.[9]

The mean reversion results in figure 2 reinforce our earlier statement about the optimal investment strategy for a risk-neutral investor. If real estate market excess returns display a long-term negative serial correlation, or revert to some mean level of return, then a strategy of investing after a return runup and selling after a return fall will tend to underperform a simple buy-and-hold investment strategy.

[9] We also examine the mean reversion of real estate– abnormal returns, as shown in figure 2. We find strong evidence of mean reversion for real estate–abnormal returns similar to the excess returns shown in figure 2. This result is consistent with the existence of real estate–specific predictability. The result is available from the authors upon request.

TABLE 5.—DETERMINANTS OF REAL ESTATE INVESTMENTS

	Constant	I_{t-1}	$v_{e,t-1}$	$v_{m,t-1}$	$v_{e,t-2}$	$v_{m,t-2}$	Tbill_{t-1}	F_e-Test	F_m-Test	$\bar{R}^2$
Bank I_t (1/1973–12/1989)										
EREITs	3.981[a]	0.766[a]	0.061	0.020	0.121[a]	−0.028	−0.159[a]	0.00	0.72	0.681
Owner	3.947[a]	0.768[a]	0.050	−0.003	0.064[a]	−0.032	−0.157[a]	0.00	0.74	0.681
Mortgage	3.835[a]	0.782[a]	0.037	0.039	0.051	0.019	−0.162[a]	0.17	0.59	0.675
Savings & loans I_t (1/1977–12/1989)										
EREITs	3.187[a]	0.761[a]	0.079	0.105	0.135[b]	0.079	−0.168[b]	0.09	0.10	0.658
Owner	3.338[a]	0.765[a]	0.082	0.056	−0.003	0.160*	−0.184[b]	0.12	0.02	0.656
Mortgage	3.127[a]	0.775[a]	0.031	0.135[b]	0.115[b]	0.086	−0.170	0.11	0.03	0.659
Life insurance I_t (1/1972–12/1989)										
EREITs	1.969[a]	0.617[a]	−0.024	−0.024	0.059	0.088	0.052	0.45	0.22	0.378
Owner	2.009[a]	0.618[a]	−0.014	−0.017	0.000	0.126	0.046	0.88	0.05	0.375
Mortgage	2.010[a]	0.616[a]	0.016	−0.044	0.000	0.126	0.048	0.91	0.04	0.354
Housing status I_t (1/1972–12/1989)										
EREITs	3.264[a]	0.858[a]	0.026	0.148	0.016	0.000	−0.137[a]	0.24	0.74	0.878
Owner	3.260[a]	0.858[a]	0.021	0.003	0.018	−0.011	−0.134[a]	0.03	0.82	0.879
Mortgage	3.272[a]	0.858[a]	0.040[a]	0.007	0.016	0.002	−0.136[a]	0.02	0.91	0.882

Notes: Regression of real estate investment I_t on a constant, lagged real estate investment I_{t-1}, lagged real estate unexpected excess returns $v_{e,t-1}$ and $v_{e,t-2}$, lagged market unexpected excess returns $v_{m,t-1}$ and $v_{m,t-2}$, and lagged interest rate T-bill_{t-1}. Real estate investments I_t by various financial institutions are measured by: (i) the monthly % changes in real estate loans made by all commercial banks, (ii) the monthly % changes in mortgage loans outstanding for FSLIC insured savings and loan associations, (iii) the monthly % changes in total mortgage assets of life insurance companies, and (iv) housing starts. The lagged unexpected return $v_{e,t}$ is defined as $e_{i,t} - E_{t-1}(e_{i,t})$. The lagged market unexpected return $v_{m,t}$ is defined as $e_{m,t} - E_{t-1}(e_{m,t})$. All variables are seasonally adjusted. F_e-test—joint test of the significance of lagged real estate returns; F_m-test—joint test of the significance of lagged market returns.

[a] Significant at the 5% level.

[b] Significant at the 10% level.

B. *What Has Driven Financial Institutions' Real Estate Investment Decisions?*

To find out what has driven financial institutions' real estate investment decisions at the aggregate level, we regress the monthly real estate investments of banks, thrifts, and life insurance companies on their past investments, lagged real estate unexpected excess returns, lagged market unexpected excess returns, and lagged interest rates. In order to determine how many lags we should use in these regressions, we began by using a fairly long lag length, and then performed t-tests to eliminate those lagged variables that were statistically insignificant. The final results are presented in table 5. The top panel of table 5 reports the regression results for commercial banks' real estate investment behavior. The first line reports the regression equation using EREITs as the real estate return proxy. The second and third lines report the regression equations using the owners and mortgages portfolio returns, respectively, as the real estate return proxies.

As can be seen from the top panel of table 5, banks' current real estate investments I_t are positively and significantly related to their one-period lagged real estate investments I_{t-1}, and in two of the three cases they are positively and significantly related to the two lagged real estate unexpected excess returns $v_{e,t-1}$ and $v_{e,t-2}$ (see F_e-test). The relationship between bank real estate investment and the two lagged market excess returns $v_{m,t-1}$ and $v_{m,t-2}$ is mixed in sign and the variables are statistically insignificant (see also F_m-test). The second and third panels of table 5 report similar regressions for our sample of savings and loans and life insurance companies. We find some evidence that the real estate investments of savings and loans have been driven by both past real estate–specific returns and market returns, with the market returns being jointly more significant than real estate returns (see F_e-test and F_m-test). However, while the relationships between investment and past unexpected excess returns are mostly positive, some are statistically insignificant. We also find that the relationships between life insurance companies' investment and lagged real estate and market excess returns are statistically insignificant, with the exception of two joint F_m-tests for market returns. A possible regulatory explanation for the different relative investment sensitivities, across financial institutions, to past returns is discussed later in this section. The goodness of fit ($\bar{R}^2$) for the investment equation is approximately 68% and 65% for commercial banks and thrifts, and approximately 37% for life insurance companies after adjusting for degrees of freedom. In summary, we find evidence that some financial institutions, especially commercial banks, were not just chasing some overall market trend but also a more real estate–specific return trend as well.

C. *Robustness Checks*

To test the possibility that financial institutions' real estate investments were simply passively responding to increases and decreases in overall financial institutions' investments, we also regressed the percentage changes in financial institutions' real estate investment against percentage changes in total investments and past real estate returns for each class of financial institutions. We find that real estate returns are only partly responsive to total investment changes. For example, a 1% increase in total bank investments leads to a 0.44% increase in banks' real estate investments. Moreover, past real estate returns still had a significant effect in determining real estate investments after controlling for total investment changes.[10]

As further confirmation of our results, we performed a similar study on the monthly movement of housing starts.

[10] A complete table of these results is available upon request.

Since housing starts are generally financed by financial institution loans, we should observe similar time-series behavior in housing starts as in the real estate investments of financial institutions. This is confirmed in the bottom panel of table 5. We see that housing starts are positively related to lagged housing starts, positively related to lagged real estate excess returns, and negatively related to interest rates.

To test further the robustness of our results, we performed the same analysis on quarterly real estate investments by financial institutions and quarterly unexpected excess returns on various real estate portfolios, and reestimated our results for tables 1–5 with a different set of forecasting variables. We found that our results are quite robust to different specifications of time intervals, forecasting variables, and VAR lag lengths. Finally we performed our regression using the RN appraisal–based return index instead of real estate equity returns. We found similar positive relationships between lagged unexpected returns and current investments as those shown in table 5.[11]

D. *"Trend-Chasing" Behavior*

Importantly, this positive relationship found between past real estate returns and current commercial banks' (and savings and loans') investments represents a "trend-chasing" investment strategy on behalf of certain financial institution managers. This strategy appears to involve increasing real estate investments after the returns have gone up and reducing real estate investments after the returns have gone down. From Campbell's accounting identity (see equation (2)) and our empirical results in table 4 discussed earlier, this strategy is consistent with some financial institutions' managers increasing real estate investments when future expected excess returns are falling or are low since high unexpected excess returns today imply falling (low) expected excess returns in the future and vice versa. In other words, U.S. financial institutions appear to have increased real estate investments at times when the ex ante future excess returns on real estate were decreasing and to have reduced real estate investments at times when the ex ante future real estate returns were increasing.

This view is further supported by panel A of table 6. We show correlations between financial institutions' real estate investments I_t and their future expected excess returns $E_t[e_{i,t+1}]$ as calculated from equation (1). We can see that these correlations are negative in all cases.

Since financial institutions have been adopting an apparent investment strategy based on past returns for most of the last 20 years, it is perhaps no surprise that they have exhibited mediocre or bad performance on their real estate investment portfolios. A "gambler" is doomed to lose money in the long run if he constantly plays with unfavorable odds. Panel B of table 6 supports this claim by showing that there has been a negative correlation between financial institutions' real estate investments in time period t and their ex post excess returns for time period $t + 1$.[12] We also show in panel C of table 6 that there has been a mostly negative correlation between investments in time t and the average monthly ex post excess returns over the holding period from $t + 1$ to $t + 12$. These results confirm that a poor investment strategy, i.e., a belief that high past excess returns imply high future excess returns, has resulted in poor investment performance.[13] As we pointed out before, consistently gambling with bad odds will sooner or later lead to financial loss.[14]

TABLE 6.—CORRELATIONS BETWEEN REAL ESTATE INVESTMENT AND THEIR RETURNS

	Bank	S & L	Life	Housing Start
A. Increase in Investment I_t and Its ex ante Expected Excess Return $E_t[e_{i,t+1}]$				
EREITs	−0.464	−0.419	−0.108	−0.495
Owner	−0.440	−0.426	−0.114	−0.465
Mortgage	−0.460	−0.395	−0.135	−0.479
B. Investment I_t and Its ex post Excess Return $e_{i,t+1}$				
EREITs	−0.068	−0.055	−0.014	−0.026
Owner	−0.059	−0.049	−0.021	−0.013
Mortgage	−0.078	−0.122	0.017	−0.042
C. Investment I_t and Its Average Monthly ex post Excess Return from $t + 1$ to $t + 12$				
EREITs	−0.083	0.167	0.011	−0.268
Owner	−0.052	0.095	0.003	−0.264
Mortgage	−0.216	−0.201	−0.159	−0.355

Notes: Real estate investments by various financial institutions are measured by (i) the monthly % changes in real estate loans made by all commercial banks, (ii) the monthly % changes in mortgage loans outstanding for FSLIC insured savings and loan associations, (iii) the monthly % changes in total mortgage assets of life insurance companies, and (iv) housing starts. All variables are obtained from the CITI base and seasonally adjusted.

Moreover, it should be noted that our trend-chasing evidence contradicts the moral hazard (mispriced) insurance view since this would argue against finding reductions in real estate investments in bad real estate markets. Specifically, in a moral hazard world, financial institutions would increase their real estate investments in bad real estate markets since they could capture the upside of a recovery and not worry about the downside of a prolonged recession.

E. *Comparison between Performances of Trend-Chasing versus Buy-and-Hold Strategies*

To further gauge the economic significance of the negative correlation between financial institutions' real estate investments and expected future returns, we formed three real estate portfolios based on out-of-sample excess return forecasts and specific investment strategies assumed for

[11] Some of the results are presented in an earlier version of this paper. All of these results are available upon request.

[12] We also calculated the correlation between investment in time t and its ex post future excess returns for time $t + 2$ to $t + 4$. The results are quite similar to those for $t - 1$. They can be obtained from the authors upon request.

[13] Due to a lack of data, we could only study the relationship between investments and their short-term ex post excess returns. It would be interesting to study the relationship between investments and their long-term ex post excess returns (i.e., beyond 1 year).

[14] As a robustness check, we also computed all the correlations in table 6 using real estate–specific returns. We found that similar results hold for real estate–specific returns as well.

TABLE 7.—MEAN PORTFOLIO EXCESS RETURNS BASED ON OUT-OF-SAMPLE PREDICTIONS

Strategy	Long(−)	Buy and Hold	Long(+)	50% Buy and Hold, 50% T-Bill
EREITs	−0.079	0.550	0.629	0.287
	(1.68)	(3.09)	(2.58)	(1.54)
	[−0.48]	[1.84][b]	[2.56][a]	[1.84]
Owner	−0.378	0.653	1.032	0.327
	(3.16)	(5.90)	(4.89)	(2.95)
	[−1.23]	[1.14]	[2.17][a]	[1.14]
Mortgage	−0.392	0.344	0.737	0.172
	(2.35)	(4.06)	(3.21)	(2.03)
	[−1.72][b]	[0.87]	[2.36][a]	[0.87]

Notes: The out-of-sample excess return forecast is based on a 10-year rolling regression using the forecasting variables listed in Table 3. The numbers in parentheses are the standard deviations of the excess returns of the portfolios. The numbers in square brackets are the t-statistics for the test of mean excess return being zero. The long(−) portfolio is formed by taking a long position in the real estate asset whenever the excess return forecast is negative, closing the position and putting the proceeds in treasury bills whenever the excess return forecast is positive. The buy-and-hold portfolio is formed by holding the real estate portfolio. The long(+) portfolio is formed by taking a long position in the real estate asset whenever the excess return forecast is positive, closing the position and putting the proceeds in treasury bills whenever the excess return forecast is negative. The portfolios are formed over the period of 2/1982–12/1989.

[a] Significant at the 5% level.

[b] Significant at the 10% level.

financial institution managers. The out-of-sample excess return forecasts are formed using 10-year rolling regressions with the forecasting variables listed in table 3. For any time period t we estimate equation (1) using data from $t - 1$ to $t - 120$. This regression is then used to form an excess return forecast $E_t[e_{i,t+1}]$, using X_{pt}. The excess return forecasts (expected excess returns) are calculated for the time period of 2/1981–12/1989. Based on the return forecast, we form a passive buy-and-hold portfolio and two active portfolios: a long(−) portfolio and a long(+) portfolio.

Specifically, the buy-and-hold portfolio is formed by holding onto real estate assets over the full 2/1981–12/1989 period. The long(−) portfolio is formed by taking a long position in the real estate asset whenever the excess return forecast is negative, closing the position and putting the proceeds in treasury bills whenever the excess return forecast is positive. The long(+) portfolio is formed by taking a long position in real estate assets whenever the excess return forecast is positive, while closing the position and putting the proceeds in treasury bills whenever the excess return forecast is negative.

Table 7 reports the mean excess returns for the passive buy-and-hold portfolio and the two active portfolio strategies using three different proxies for real estate asset returns. It is interesting to see that not only is the long(−) portfolio easily beaten by the buy-and-hold portfolio, but it also generates negative excess returns during the holding period. By contrast, the long(+) portfolio beats the buy-and-hold portfolio by a significant margin. Although most banks cannot adjust their real estate loan portfolios as easily as buying and selling stocks of real estate companies and REITs (as well as "shorting" real estate), the results tentatively suggest that a financial institution manager could do *better* by following a simple buy-and-hold strategy instead of using the trend-chasing strategy of increasing real estate investments when past excess returns are positive (expected excess returns are negative) and decreasing positions when past excess returns are negative (expected excess returns are positive).[15]

Our study here is consistent with the empirical results of DeBondt and Thaler (1988) and Jegadeesh (1990), who find that a contrarian strategy could earn abnormal excess returns if asset returns follow a mean-reverting process. Here we show that a trend-chasing strategy leads to a poor return performance if asset returns are mean reverting.

F. *Rational Explanation for the Trend-Chasing Strategy*

Although we have shown above that a trend-chasing strategy is inconsistent with profit maximization, the strategy could be rational under certain conditions. First, managers of financial institutions may not be risk neutral—due to human capital or other reasons (see Saunders et al. (1990)). In a world of risk-averse managers, where expected returns and systematic risk are partly related, higher expected future excess returns will imply high future risk exposures to managers. As a result, financial institution managers will rationally reduce their investments in real estate assets when expected future returns are high.

Second, as Franklin and Gordon (1991) have shown, "herding behavior" can be rational if investors have short investment horizons. In the context of our model, buying when real estate prices are high and selling when they are low is consistent with herd-type behavior.

Third, we have assumed explicitly that real estate loans are supply-side determined, using financial institution managers in an analogous fashion to mutual fund managers actively managing a portfolio of assets. Such an approach is consistent with the general condition of credit rationing being present in the market for bank loans (see Berger and Udell (1992)). Indeed, when we examined the investment behavior of more direct real estate investors, such as investments by EREITs and mortgage REITs, we found no clear evidence of trend-chasing behavior. This is at least consistent with the assumption that depository financial institutions' investments are more supply driven rather than demand driven, at least when compared to more direct real estate investments such as REITs.[16]

[15] It is worth noting that although the buy-and-hold strategy offers higher excess returns over the long (−) strategy (e.g., 0.550% versus −0.079% per month for EREITs, 0.653% versus −0.378% per month for owners), it might be argued that it is also more risky (e.g., 3.09% versus 1.68% per month for EREITs, 5.90% versus 3.16% per month for owners). However, a simple "asset allocation" approach of investing 50% in real estate (via buy-and-hold) and 50% in risk-free assets (T-bills) will cut the portfolio risk in half and still allow the investor to enjoy significant positive excess returns. This result is shown in the last column of table 7. As a robustness check, we have formed three trading portfolios as in table 7 using real estate–specific returns. We find that the same results as in table 7 hold for real estate–specific return as well. This implies that chasing the real estate sector trend would also lead to inferior performance relative to the buy-and-hold strategy.

[16] We thank one of the reviewers for suggesting the following test to distinguish the supply-driven versus the demand-driven explanation. Following his or her suggestion, we constructed four time series from the

G. Regulation and the Trend-Chasing Strategy

One partial explanation for the trend-chasing strategy of financial institutions could be the examination procedures by financial institution regulators themselves. In general regulators or examiners will be less aggressive and interventionist if a financial institution has an apparently "strong" current balance sheet. In particular, they are less likely to restrict investments in areas such as real estate if a financial institution's capital or net worth appears to be strong. In such a world, a run up in real estate prices may be perceived as improving a financial institution's net worth position and lead to a relaxation of regulatory constraints on real estate investments.[17] On the other hand, a fall in real estate prices may lead to enhanced perceptions among regulators or examiners that the balance sheet and the financial institution's capital position are weak and lead to a tightening of regulatory constraints on real estate investments. This means relatively easy credit availability (increased real estate investments) during a real estate market boom and a possible credit crunch (decreased real estate investments) during a market fall.

If this is a fair characterization of the regulatory process, then the examination or regulation system may be partly to blame for reinforcing the trend-chasing behavior of financial institution managers. Further, it might be that the stronger the examination or intervention system, the more powerful the trend-chasing strategies of financial institutions. Our results partly support this view in that the relatively more examined or regulated banks show a stronger relationship between investment and past returns than the more weakly regulated life insurance companies. For example, the latter are mostly subject to off-site monitoring at the state level rather than being subject to both on-site and off-site monitoring (at the federal level), as is the case for most large banks.

Our analysis also casts some doubts on the value of using market value accounting systems for financial institutions. Under the stylized bank examination procedures described above, it is easy to see that market value accounting may actually enhance the trend-chasing behavior of financial institutions. This is because under historical cost-accounting systems the book values of real estate investments tend to be below market values after a market boom and above market values after a market fall; while under a market-value accounting system the real estate portfolio will be marked to market and show high actual returns in boom markets and low actual returns in slumps. If regulators (and managers) believe high past returns imply high future returns, they may allow financial institutions to relax further any constraints on their real estate investments. Unfortunately, as we have shown, high returns today often imply low returns tomorrow.

quarterly Compustat database: average investment per REIT for EREITs and mortgage REITs and total real estate investments by REITs and mortgage REITs. The number of companies in the four samples varied over time. On average, there were about 90 companies in the EREITs samples and about 18 companies in the mortgage REITs samples. The sample period covers the period from first quarter 1982: to fourth quarter 1992. Using these investment series, we performed the same regression analysis as that used in table 5. We found that the coefficients on past returns had *mixed* signs, and only one out of 32 coefficients was statistically significant at the 5% level. These results are available from the authors upon request.

[17] Here we are talking about implicit regulation via the examination process rather than the explicit constraints such as maximum amount of funds that can be invested in certain assets as a proportion of bank capital.

V. Summary and Conclusions

In this paper we used commercial bank, savings and loan association, and life insurance company real estate investment data to address the issue of whether their poor performance in recent years has been consistent with a poorly formed investment strategy. We first employed a multifactor latent-variable model to derive the time-varying ex ante (or expected) excess returns on various real estate investment portfolios. We then employed the approximate accounting identity of Campbell (1991) to infer an inverse theoretical relationship between past (ex post) excess returns on risky assets, such as real estate, and future ex ante (or expected) excess returns on those assets. We found that real estate investments made by U.S. commercial banks and savings and loans have largely been driven by ex post real estate returns, and sometimes by ex post market returns as well. This trend-chasing strategy ignored the potential negative correlation between current and past real estate returns and their future expected values. Indeed, we show empirically that such a negative correlation is supported by available data. Tests that compared the performance of this trend-chasing strategy with a simple buy-and-hold strategy were shown to offer an explanation for the poor performance of financial institutions' real estate investments in recent years. We also argue that regulatory behavior may have contributed to this trend-chasing behavior and that the introduction of market-value accounting for financial institutions may actually exacerbate such behavior.

REFERENCES

Berger, A., and G. Udell, "Some Evidence on the Empirical Significance of Credit Rationing," *Journal of Political Economy* 100 (1992), 1047–1077.

Berlin, M., A. Saunders, and G. Udell, "Deposit Insurance Reform: What Are the Issues and What Needs to Be Fixed," *Journal of Banking and Finance* 15 (1991), 735–752.

Bernanke, Ben S., "On the Predictive Power of Interest Rates and Interest Rate Spreads," *New England Economic Review* (Nov.-Dec. 1990), 51–68.

Campbell, John Y., "Stock Returns and the Term Structure," *Journal of Financial Economics* 18 (1987), 373–399.

——— "A Variance Decomposition of Stock Returns," *Economic Journal* 101 (1991), 157–179.

Campbell, John Y., and John Ammer, "What Moves the Stock and Bond Markets? A Variance Decomposition for Long-Term Asset Returns," *Journal of Finance* 48 (1993), 3–37.

Campbell, John Y., and Robert J. Shiller, "The Dividend–Price Ratio and Expectations of Future Dividends and Discount Factors," *Review of Financial Studies* 1 (1988), 195–228.

DeBondt, W., and R. Thaler, "Further Evidence of Investor Overreaction and Stock Market Seasonality," *Journal of Finance* 42 (1988), 557–581.

Fama, Eugene, and Kenneth French, "Dividend Yields and Expected Stock Returns," *Journal of Financial Economics* 22 (1988), 3–25.
Ferson, Wayne, "Changes in Expected Security Returns, Risk, and Level of Interest Rates," *Journal of Finance* 44 (1989), 1191–1217.
Ferson, Wayne, and Campbell Harvey, "The Variation of Economic Risk Premia," *Journal of Political Economy* 99 (1991), 385–415.
Fisher, Jeffery D., R. Brian Webb, and David Geltner, "Historical Value Indices of Commercial Real Estate," University of Indiana, Working Paper (1991).
Franklin, Allen, and Gary Gordon, "Rational Finite Bubbles," NBER Working Paper 3707 (1991).
Gyourko, Joseph, and Donald Keim, "What Does the Stock Market Tell Us about Real Estate Returns?" *AREUEA Journal* 20 (1992), 457–485.
Jegadeesh, N., "Evidence of Predictable Behavior of Security Returns," *Journal of Finance* 45 (1990), 881–898.
Keim, Donald, and Robert Stambaugh, "Predicting Returns in the Stock and Bond Markets," *Journal of Financial Economics* 17 (1986), 357–390.
Liu, Crocker, and Jianping Mei, "Predictability of Returns on Equity REITs and Their Comovement with Other Assets," *Journal of Real Estate Finance and Economics* 5 (1993a), 401–418.
——— "An Analysis of Real Estate Risk Using the Present Value Model," *Journal of Real Estate Finance and Economics* 8 (1993b), 5–20.
Lo, Andrew, and Craig MacKinlay, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test," *Review of Financial Studies* 1 (1988), 41–46.
Mei, Jianping, and Ahyee Lee, "Is There a Real Estate Factor Premium?" *Journal of Real Estate Finance and Economics* 9 (1994), 113–126.
Mei, Jianping, and Anthony Saunders, "Bank Risk and Real Estate: An Asset Pricing Perspective," *Journal of Real Estate Finance and Economics* 10 (1995), 199–224.
Miles, Mike, Brian Webb, and D. Guilkey, "On the Nature of Systematic Risk in Commercial Real Estate," Graduate School of Business, Indiana University, Working Paper 467 (1991).
Saunders, Anthony, Elizabeth Strock, and Nickolaos Travlos, "Ownership Structure, Deregulation, and Bank Risk Taking," *Journal of Finance* 45 (June 1990), 643–654.
White, Larry, *The S&L Debacle: Public Policy Lessons for Bank and Thrift Regulation* (New York: Oxford University Press, 1991).

APPENDIX

To construct proxies for ex ante real estate asset expected excess returns, we assume that asset returns are generated by the following K-factor model:

$$e_{i,t+1} = E_t[e_{i,t+1}] + \sum_{k=1}^{K} \beta_{ik} f_{k,t+1} + \epsilon_{i,t+1} \tag{A.1}$$

where $e_{i,t+1}$ is the excess return on asset i, held from time t to time $t + 1$, in excess of the risk-free rate. $E_t[e_{i,t+1}]$ is the conditional expected excess return on asset i for time period $t + 1$. Under either a no-arbitrage condition or a general equilibrium condition, we should have

$$E_t[e_{i,t+1}] = \sum_{k=1}^{K} \beta_{ik} \lambda_{kt} \tag{A.2}$$

where λ_{kt} is the "market price of risk" for the kth factor at time t. Now suppose that the information set at time t consists of a vector of L $(L > K)$ economic or forecasting variables X_{pt}, $p = 1, \ldots, L$, and that conditional expectations are linear in those variables. Then we can write λ_{kt} as

$$\lambda_{kt} = \sum_{p=1}^{L} \theta_{kp} X_{pt} \tag{A.3}$$

and substituting equation (A.3) into equation (A.2), we have

$$E_t[e_{i,t+1}] = \sum_{k=1}^{L} \beta_{ik} \sum_{p=1}^{L} \theta_{kp} X_{pt} = \sum_{p=1}^{L} \alpha_{ip} X_{pt}. \tag{A.4}$$

This allows us to use equation (A.4) to examine the degree to which economic (or "forecasting") variables X_{pt} explain the ex ante time variation in expected excess returns on various assets. We can see from equation (A.4) that the coefficients α_{ip} are restricted by the following equation:

$$\alpha_{ip} = \sum_{k=1}^{K} \beta_{ik} \theta_{kp} \tag{A.5}$$

where β_{ik} and θ_{kj} are free parameters. See Ferson (1989) for details of the estimation procedure.

To estimate innovations (news) of cash flows, real interest rates, and future expected returns in equation (3), we model excess returns to a real estate portfolio—excess returns to the value-weighted market portfolio, the real interest rate, the 1-month T-bill rate relative to its past 12-month moving average (the relative bill rate), and the dividend yield—according to a K-order VAR process. We define a vector $\mathbf{z}_{t+1}$, which has k elements, the first of which is excess returns e_{t+1} on the asset in question (e.g., the real estate asset), and the second of which is real interest rates. We assume that the vector $\mathbf{z}_{t+1}$ follows the first-order VAR process shown in the equation

$$\mathbf{z}_{t+1} = \mathbf{A}\mathbf{z}_t + \mathbf{w}_{t+1}. \tag{A.6}$$

Higher order VAR models can be stacked into this VAR(1) format in the same manner as discussed in Campbell and Shiller (1988).

In addition to the vector $\mathbf{z}_{t+1}$, we also define a k-element vector $\mathbf{e}_1$, whose elements are all equal to 0, except the first element, which is equal to 1, and another vector $\mathbf{e}_2$, whose elements are all equal to 0, except the second element, which is equal to 1. Using equation (2), we obtain

$$\epsilon_{e,t+1} = \mathbf{e}_1'\rho\mathbf{A}(\mathbf{I} - \rho\mathbf{A})^{-1}\mathbf{w}_{t+1}, \qquad \epsilon_{r,t+1} = \mathbf{e}_2'(\mathbf{I} - \rho\mathbf{A})^{-1}\mathbf{w}_{t+1}. \tag{A.7}$$

In addition, given that the first element of $\mathbf{w}_{t+1}$ is $v_{e,t+1} = \mathbf{e}_1' \mathbf{w}_{t+1}$, equation (3) implies that we can calculate cash flow news as follows:

$$\epsilon_{d,t+1} = [\mathbf{e}_1' + \mathbf{e}_1'\rho\mathbf{A}(\mathbf{I} - \rho\mathbf{A})^{-1} + \mathbf{e}_2'(\mathbf{I} - \rho\mathbf{A})^{-1}]\mathbf{w}_{t+1}. \tag{A.8}$$

We will use equations (A.7) and (A.8) to study the relationship between unexpected excess returns today $v_{e,t+1}$ and expected excess returns in the future $\epsilon_{e,t+1}$ and decompose the variance of unexpected asset returns $v_{e,t+1}$ into the cash flow news $\epsilon_{d,t+1}$, real interest rate news $\epsilon_{r,t+1}$, and future excess return news $\epsilon_{e,t+1}$, and their covariances in section IV. See Campbell and Ammer (1993) for details of the estimation procedure.