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Commercial Bank Exposure and Sensitivity to the Real Estate Market

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***Abstract*. In this study, we assess the balance sheet exposure of commercial banks to the real estate market, and develop a hypothesis on the potential systematic effects of real estate conditions across banks. By applying a seemingly unrelated regression (SUR) model to bank portfolios, we test for the relation between bank values and a real estate market proxy after controlling for general market and interest-rate conditions. We find a positive relationship between monthly bank returns and the real estate index, even after accounting for general market and interest-rate movements. The sensitivity of bank values to the real estate market has increased over time, and the bank-specific sensitivity coefficient is positively related to the bank's balance sheet exposure to real estate.**

Introduction

The relationship between real estate and the banking industry is justifiably the topic of much attention in the real estate literature, but the perspective of that attention largely appears to be focused on how the banking industry shapes and influences real estate market activity. Recent examples of studies based on this perspective include work by Fergus and Goodman (1994) and Peek and Rosengren (1994), each of which examines how reduced credit availability negatively impacts the real estate sector. While considerable evidence is available to indicate the extent to which the banking industry influences real estate, no published studies explicitly consider what impact real estate market conditions may have on the banking industry. The perspective taken in this study is to examine whether real market activity measurably impacts the prices of commercial bank stocks in a manner parallel to how bank lending practices and credit availability impact the real estate sector.

The defaults of various banks that were heavily exposed to real estate loans during the late 1980s, and the early 1990s, prompts the question of whether banks are systematically exposed to real estate conditions. While all bank loans may be susceptible to general market conditions, the default on real estate loans is contingent in part upon an isolated force (the real estate market) that is indirectly linked with general economic conditions. To the extent that bank values are systematically affected by the real estate market, any model of bank returns should directly account for real estate market conditions. Since bank financing of real estate investment has comprised a significant portion of the loan portfolio for many years, there is justification for hypothesizing the presence of real estate effects on commercial bank share prices.

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To the extent that commercial banks take significant equity and creditor positions in real estate, we hypothesize that their stock prices should be influenced by changes in the market value of real estate, unless the factor is already completely captured by the market and interest-rate proxies. Results of this analysis will (1) offer implications for a plausible pricing model for bank stocks, and (2) offer some evidence to bank managers, regulators and investors on whether bank values are systematically influenced by changing real estate values after controlling for general market and interest-rate movements.

Our study is organized as follows. First, we develop the hypotheses for how commercial bank values are related to the market value of real estate. Second, we develop a model that includes a real estate market proxy. Third, we describe the sample to which our model is applied. Fourth, we report the results from testing the bank sensitivity to changing real estate values, and then test the relationship between this sensitivity level and real estate exposure across banks. Finally, we offer relevant implications that can be drawn from our analysis.

Hypothesized Relationship between Real Estate Value and Bank Value

In recent years, much attention has been focused on factors that can systematically cause adverse effects in the banking industry (see Choi, Elyasiani and Kopecky, 1992, for a review). For example, numerous studies use a two-factor asset pricing model to show that stock returns are inversely related to interest rates, beyond the indirect influence captured within the market index. Lynge and Zumwalt (1980), Flannery and James (1984), Booth and Officer (1985), Scott and Peterson (1986), Bae (1990), Yourougou (1990), Saunders and Yourougou (1990), and Akella and Greenbaum (1992) each report a significant negative relationship between interest rates and bank stock returns. The results of these studies suggest that the market's revaluation of banks in response to interest-rate movements accounts for bank exposure to interest-rate risk. In the same way, the market's revaluation of banks in response to changing real estate values should account for bank exposure to real estate.

For bank values to be significantly related to the real estate market, two conditions are necessary: (1) banks must hold significant amounts of real estate, and (2) the real estate holdings must be significantly influenced by general changes in the market value of real estate. The first condition can be verified by a review of bank annual reports. The mean proportion of real estate loans to total assets is disclosed for various bank classifications over recent years in Exhibit 1. The proportion for all banks was 15.70% in 1985 and has increased consistently over time, reaching 24.47% by 1992. The proportion is consistently inversely related to the size classification, regardless of the year. Yet, real estate holdings are even substantial for the money-center banks, reaching 21.83% of total assets by 1992. The second condition regarding the systematic influence of the real estate market overall on real estate holdings by banks is explored below.

Effects on Real Estate Loan and Mortgage Values

While the values of commercial real estate loans and mortgages held by commercial banks are often exposed to interest-rate risk, they are also exposed to default risk. As considered extensively in the mortgage analytics literature, default risk is, at least in part, a function of changes in real estate value. As collateral values decrease, the probability of

Exhibit 1
Proportion of Real Estate Loans to Total Assets for Commercial Banks

	All Banks	Banks with Less than $300 Million in Assets	Banks with $300 Million to $5 Billion in Assets	Banks with More than $5 Billion in Assets Excluding the Ten Largest	Ten Largest Banks
1985	15.70%	20.67%	17.96%	12.50%	11.08%
1986	16.69	21.74	19.56	12.64	12.64
1987	18.69	23.78	22.01	14.93	13.87
1988	20.56	25.68	24.25	17.31	15.37
1989	22.18	27.03	25.91	18.93	17.49
1990	23.51	28.01	26.86	20.17	20.14
1991	24.39	28.82	27.24	21.40	21.21
1992	24.47	29.79	27.37	21.83	19.84

Source: *Federal Reserve Bulletin*, various issues

default increases, which lowers the value of the secured loan. Thus, to the extent that collateral values impact the value of loans and mortgages, the potential loss to the bank as a result of default is inversely related to the market value of real estate.

Effects on Equity Positions in Real Estate

Commercial banks commonly take equity positions in commercial real estate, and are therefore exposed to a peculiar type of market risk that we refer to here as real estate risk. To the extent that most real estate values are systematically driven by general tendencies of the overall real estate market, commercial banks with equity positions in real estate should also be affected by that market. While the real estate market and the stock market are both linked to prospects for economic growth, the two markets do not always move in tandem. Thus, the impact of the real estate market on bank equity positions in real estate may not be completely captured with the stock market index. The value of bank equity positions in real estate should be positively related to changes in the market value of real estate.

Net Effects of Changing Real Estate Values

Based on the arguments just presented, bank values should be positively related to changes in the value of real estate. The degree to which commercial bank values are related to real estate values should be a function of bank exposure to real estate risk, just as sensitivity to an interest-rate factor was sometimes found to be a function of bank exposure to interest-rate risk. We hypothesize that the sensitivity of a commercial bank's value to changes in the market value of real estate is positively related to its degree of real estate exposure.

Model

To test whether bank stock returns are systematically affected by the market value of real estate, the following system of equations is used:

$$R_{c,t}=B_0+B_1R_{m,t}+B_2i_t+B_3RE_t+u_t$$

$$R_{l,t}=\theta_0+\theta_1R_{m,t}+\theta_2i_t+\theta_3RE_t+v_t$$

$$R_{s,t}=\lambda_0+\lambda_1R_{m,t}+\lambda_2i_t+\lambda_3RE_t+w_t\ . \tag{1}$$

where $R_{c,t}$, $R_{l,t}$, and $R_{s,t}$ represent mean monthly returns of money-center, large, and medium, banks respectively, $R_{m,t}$ represents the market return, i_t is the interest-rate index, RE_t is the real estate index, while the B, θ, and λ terms represent coefficients to be estimated, and u, v, and w are error terms. The banks are partitioned into three size categories in the same manner as in Exhibit 1. A subset of small banks in not included because there were no publicly held banks with less than $300 million in assets. Since bank holdings of real estate vary with the size of the bank, the sensitivity of bank returns to changing real estate values (as measured by the coefficients attached to the RE_t variable) may vary across bank size classifications.

The seemingly unrelated regression (SUR) framework is used to estimate the coefficients in the system of equations above. The SUR framework developed by Zellner (1962) has been used by Schipper and Thompson (1983), Binder (1985), and Thompson (1985). More recently, event studies by Smirlock and Kaufold (1987), Allen and Wilhelm (1988), Millon-Cornett and Tehranian (1989), Eyssell and Arshadi (1990), and Madura, Tucker and Zarruk (1992) use the SUR framework to derive estimates of bank share prices to particular regulatory events and to test whether the sensitivity of banks to an event varies across bank portfolios. While our study is distinctly different from these studies, it is analogous in that it attempts to determine whether the estimated coefficients for bank portfolios are significantly different. Our focus is on whether bank sensitivity to the changing real estate values varies across bank classifications.

Proxies are needed for each of the independent variables. The S&P 500 index is used as a proxy to estimate stock market returns, and the National Association of Real Estate Investment Trusts (NAREIT) Equity REIT Index is employed to represent real estate market activity.[1] The REIT Index measures the total return (capital gains plus dividends) on a value-weighted investment in publicly traded equity REITs. Admittedly, the choice of an appropriate proxy to represent real estate market fundamentals is a contentious issue that has not been fully resolved in the literature. Although frequently used, appraisal-based measures of real estate returns do not provide a perfect measure of market activity due to the smoothing problems examined by Geltner (1991) and numerous others. The use of REIT returns is appealing because they represent market transactions, even though REIT prices are a secondary measure of real estate value. Martin and Cook (1991), Giliberto (1990), and McIntosh, Liang and Tompkins (1991) present evidence to support the use of REIT returns as a real estate market proxy. In contrast, Ambrose, Ancel and Griffiths (1992), Liu, Hartzell, Greig and Grissom (1990), Scott (1990), Park, Mullineaux and Chew (1990), Gyourko and Linneman (1988), and others provide evidence that REIT returns are not a perfect proxy for real estate market fundamentals. Ross and Zisler (1991) suggest that a true return index for real estate lies somewhere between the appraisal- and market-based indexes that are currently available. Market efficiency arguments presented by Ennis and Burik (1991) support the use of the NAREIT Equity REIT Index in this study. They conclude that REIT shares are efficiently priced which suggests that REIT shares may provide a better proxy for true real estate returns that do appraisal-based return indexes.

With respect to the interest-rate index, it is appropriate to note that the results of the analysis could be affected by the time horizon used for the interest rate. Booth and Officer used a short-term interest rate while Scott and Peterson used a long-term interest rate. Flannery and James, Bae, Saunders and Yourougou, and Akella and Greenbaum used short-term and long-term interest rates separately. In general, those studies that used short-term and long-term rates find that the overall implications are similar for both horizons. To address this issue, two interest-rate proxies are used: (1) the actual interest rate, using the twenty-year Treasury bond yield, and (2) an estimate for the unanticipated change in the interest rate, derived from an autoregressive process. Unexpected interest-rate changes estimated for long-term Treasury securities are defined as:

$$UI_t = [I_t - E(I_t)] \,, \qquad (2)$$

where I_t represents the actual annualized yield over month t. The unexpected change in the interest rate is estimated by first deriving an expected interest rate based on an autoregressive integrated moving average model (ARIMA). This approach generally follows Bae (1990) and Saunders and Yourougou (1990). The expected rate ($E(I_t)$) is forecast each month based on an analysis of the actual monthly rates over the preceding four yours. The implied ARIMA model is used to forecast the next month's rate. Generally, the *ARIMA (p,d,q)* models were specified with one degree of differencing ($d=1$) and with autoregressive parameters ranging from $p=1$ to $p=3$.

Monthly data were compiled from COMPUSTAT to empirically test the system of equations described in equation (1) over the 1979–1992 period. Because the effects of the changing real estate values on commercial bank returns may be a function of the bank size, we apply our model to three size classifications of banks: money-center banks, large banks (with more than \$5 billion in assets except money-center banks), and medium banks (less than \$5 billion in assets).[2]

The model is orthogonalized by first removing the collinearity between R_m and i. Then the real estate returns are regressed against the orthogonalized two-factor model. The residuals from this regression analysis are used to represent RE_t in the three-factor model specified in equation (1). Thus, the model is designed to test for the influence of changes in the market value of real estate on bank returns that are not already captured by indirect influence through the market and interest-rate variables.

Empirical Results

Bank Sensitivity to Real Estate

Results from applying the SUR framework to the system of three equations are disclosed in Exhibit 2. Results are presented for the model using an unexpected interest rate proxy (Panel a) and for the model using an actual interest-rate proxy (Panel b). Each bank portfolio's returns are positively and significantly related to the market return, regardless of the model used. The returns of each bank portfolio are negatively related to the interest-rate index, but the coefficients are significant only in the unexpected interest-rate model. These results are consistent with those found in previous studies. Our main focus is on the sensitivity of bank values to changing real estate values. The coefficient measuring this sensitivity is positive and significant for each of the three bank portfolios. This coefficient is largest for the portfolio of money-centers in both models. While each real estate coefficient varied with the model used, the real estate coefficient is consistently positive and significant, regardless of the model employed.

To test whether the bank return sensitivity to changing real estate values varied significantly across the three bank portfolios, the following null hypothesis is tested:

$$B_3=\theta=\lambda_3\ . \qquad (3)$$

Exhibit 2
Results of Three-Factor Model

[a] $R_{c.t}=B_0=B_1R_{m,t}=B_2i_t=B_3RE_t=u_t$
$R_{l,t}=\theta_0+\theta_1R_{m,t}\theta_2i_t+\theta_3RE_t+v_t$
$R_{s,t}=\gamma_0+\gamma_1R_{m,t}+\gamma_2i_t+\gamma_3RE_t+w_t$

Group	Intercept	Market Coefficient (t-statistic)	Interest-Rate Coefficient (t-statistic)	Real Estate Coefficient (t-statistic)	Adj. R^2	F-Statistic
Panel a: Unexpected Interest Rates[b]						
Money-Center	.011	.914	−5.027	.517	41%	39.54*
	(2.50)*	(9.20)*	(−4.71)*	(3.44)*		
Large	.014	.847	−5.008	.359	60%	84.34*
	(5.01)*	(13.54)*	(−7.44)*	(3.79)*		
Medium	.014	.678	−2.900	.426	56%	85.36*
	(5.87)*	(12.76)*	(−5.08)*	(5.29)*		
Panel b: Actual Interest Rates[c]						
Money-Center	.023	.977	−.102	.517	41%	39.54*
	(1.08)	(10.13)*	(−.49)	(3.50)*		
Large	.027	.914	−.114	.373	59%	78.16*
	(1.97)**	(14.80)*	(−.85)	(3.86)*		
Medium	.017	.706	−.022	.428	57%	73.49*
	(1.52)	(13.85)*	(−.20)	(5.36)*		

[a] $R_{c,t}$ = mean monthly returns of money-center banks;
$R_{l,t}$ = mean monthly returns of large banks (total assets greater than $5 billion and excluding ten largest money-center banks;
$R_{s,t}$ = mean monthly returns of medium banks (total assets less than $5 billion);
$R_{m,t}$ = monthly market returns (S&P 500 index);
i_t = monthly interest-rate index;
RE_t = monthly real estate index returns.
[b] i_t is defined as the unexpected interest rate in month t (UI_t) where:
UI_t = $[I_t-E(I_t)]$;
I_t = actual annualized twenty-year Treasury bond yield;
$E(I_t)$ = expected rate forecast using an implied ARIMA model based on preceding 48 months.
[c] i_t is defined as the actual interest rate using the twenty-year Treasury bond yield.
*significant at the .05 level
**significant at the .10 level
Source: computed by the Authors

An *F*-test is applied to determine whether the hypotheses of equality of *RE* coefficients across equations are equal. The *F*-statistic is estimated to be 2.17, with a *p*-value of .12. Each pair of *RE* coefficients is also tested for equality. The *F*-statistics for the hypotheses, $\theta_3 = \lambda_3$ and $B_3 = \lambda_3$ are 1.00 (*p*-value=.32) and .52 (*p*-value=.47) respectively. However the *F*-statistic for the hypothesis $B_3 = \theta_3$ is 2.65 (*p*-value=.10). Thus, the sensitivities of money-center versus medium banks to changing real estate values appear to differ, with the sensitivity being greater on average for the money-center banks.

Test of Shifts in Sensitivity to Real Estate

To assess whether the sensitivity of bank portfolio returns to the real estate values and other factors shifted over time, the following system of equations is tested using the SUR methodology:

$$R_{c,t} = \phi + \phi R_{m,t} + \phi_2 i_t + \phi_3 RE_t + \phi_4 D_t R_{m,t} + \phi_5 D_t i_t + \phi_6 D_t RE_t + \mu_t$$

$$R_{l,t} = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 i_t + \gamma_3 RE_t + \gamma_4 D_t R_{m,t} + \gamma_5 D_t i_t + \gamma_6 D_t RE_t + v_t$$

$$R_{m,t} + \Gamma_0 + \Gamma_1 R_{m,t} + \Gamma_2 i_t + \Gamma_3 RE_t + \Gamma_4 D_t R_{m,t} + \Gamma_5 D_t \mathrm{i}_t + \Gamma_6 D_t RE_t + w_t \; . \qquad (4)$$

where D_t is equal to 1.0 from January 1987 forward, and zero otherwise. This year for partitioning the two subperiods was chosen because it reflects the most pronounced increase in bank real estate loans. The mean ratio of real estate loans to total assets for all banks over the 1987–1992 period is 22.30% versus 16.69% in 1986.

The coefficients of the interaction terms $D_t R_{m,t}$, $D_t i_t$, and $D_t RE_t$ indicate the shift in the sensitivity of bank returns to market, interest-rate and real estate movements, respectively. The unexpected interest rate is used to represent i_t. The same orthogonalization procedure described earlier was conducted before testing this model. Our main focus here is on the coefficient for the real estate interaction term. Given increased exposure of banks in aggregate to real estate values over time, we expect that the sensitivity of bank returns to changing real estate values should have increased.

Results of the analysis described above are disclosed in Exhibit 3. The results confirm the significant market and interest-rate effects on bank returns. The real estate coefficients (ϕ_3, γ_3, Γ_3) were positive, but only the coefficient for medium-sized banks was significant. The coefficients measuring shifts in the interest-rate sensitivities is significant for only the medium-sized banks, and neither the market nor the interest-rate shift coefficients are significant for either portfolio. However, the coefficient measuring the shift in the sensitivity to changing real estate values is positive and significant for each bank portfolio. This suggests a more pronounced sensitivity of each bank portfolio to changing real estate values in the post-1987 period compared to earlier years. These results may be attributed to the increased bank exposure (as measured by proportional holdings) to real estate loans over time.

Relationship between Real Estate Sensitivity and Exposure

The sensitivity of each bank's returns to economic factors can be dependent on bank-specific characteristics. For example, Jahankhani and Lynge (1980) find that bank *betas* were cross-sectionally related to their dividend payout ratios, variability of deposits, and

Exhibit 3
Shift in Sensitivity of Bank Returns to Market, Interest Rate, and Real Estate Factors[+]

$$^{a}R_{c,t}=\phi_0+\phi_1 R_{m,t}+\phi_2 i_t+\phi_3 RE_t+\phi_4 D_t R_{m,t}+\phi_5 D_t i_t+\phi_6 D_t RE_t+u_t$$
$$R_{l,t}=\gamma_0+\gamma_1 R_{m,t}+\gamma_2 i_t+\gamma_3 RE_t+\gamma_4 D_t R_{m,t}+\gamma_5 D_t i_t+\gamma_6 D_t RE_t+w_t$$
$$R_{s,t}=\Gamma_0+\Gamma_1 R_{m,t}+\Gamma_2 i_t+\Gamma_3 RE_t+\Gamma_4 D_t R_{m,t}+\Gamma_5 D_t i_t+\Gamma_6 D_t RE_t+v_t$$

Subsample	Intercept (*t*-statistic)	Market Coefficient (*t*-statistic)	Interest-Rate Coefficient (*t*-statistic)	Real Estate Coefficient (*t*-statistic)	Shift in Market Coefficient (*t*-statistic)	Shift in Interest-Rate Coefficient (*t*-statistic)	Shift in in Real Estate Coefficient (*t*-statistic)	Adj. R^2	*F*-Statistic
Money-Center	.013	.855	−5.660	.229	.112	3.313	.867	44%	22.15*
	(2.84)*	(5.98)*	(−4.92)*	(1.28)	(.57)	(1.17)	(2.69)*		
Large	.015	.624	−3.348	.154	.055	2.089	.622	62%	46.43*
	(6.15)*	(8.24)*	(−5.71)*	(1.38)	(.45)	(1.17)	(3.09)*		
Medium	.015	.624	−3.481	.283	.111	3.355	.408	59%	40.34*
	(6.15)*	(8.24)*	(−5.71)*	(2.99)*	(1.07)	(2.23)*	(2.39)*		

[+]using unexpected long-term interest rates as the interest-rate proxy
[a]$R_{c,t}$ = mean monthly returns of money-center banks;
$R_{l,t}$ = mean monthly returns of large banks (total assets greater than $5 billion and excluding ten largest, money-center banks);
$R_{s,t}$ = mean monthly returns of medium banks (total assets less than $5 billion);
$R_{m,t}$ = monthly market returns (S&P 500 index);
i_t = monthly interest-rate index;
RE_t = monthly real estate index returns;
D_t = 1 if month is on or after January 1987, 0 otherwise.
*significant at the .05 level or higher
Source: computed by the Authors

loan to deposit ratios. Flannery and James (1984) find that bank sensitivity to interest rates was cross-sectionally related to the mismatch in asset versus liability durations. However, since the sensitivity of bank returns to real estate values has not been measured in previous research, there is no evidence as to the cross-sectional relationship between bank-specific characteristics and the real estate coefficient. This relationship deserves to be tested, especially given the evidence in this study of a strong sensitivity of bank returns to real estate values. We hypothesize that the sensitivity of a bank's returns to real estate values is related to its exposure to real estate investment and real estate loans.

The sensitivity of each bank's returns to real estate values is measured by applying equation (1) to a system of 125 equations, where each equation represents a different bank. Sensitivity is estimated per bank by the real estate coefficient from applying the SUR method to this system of individual bank equations. The proxy for each bank's exposure to real estate investment is the mean book value of real estate investment in proportion to the book value of total assets over the fourteen-year period assessed. The proxy for each bank's exposure to real estate loans is the mean book value of real estate loans in proportion to total bank capital over the same period. These two real estate exposure variables are separated since their effects on the sensitivity of bank returns to real estate values are not likely to be identical. The cross-sectional relationship between sensitivity to real estate values and real estate exposure is estimated with the four equations specified below:

$$RESENS_j = \alpha_0 + \alpha_1 REEXP_j + e_j \,, \tag{5}$$

$$RESENS_j = \alpha_0 + \alpha_1 REINV_j + \alpha_2 RELOAN_j + y_j \,, \tag{6}$$

$$RESENS_j = \alpha_0 + \alpha_1 REINV_j + u_j \,, \tag{7}$$

$$RESENS_j = \alpha_0 + \alpha_1 RELOAN_j + v_j \,, \tag{8}$$

where

$RESENS_j$ = sensitivity of bank j's returns to real estate values;
$REEXP_j$ = real estate investment and loans divided by the total capital for bank j;
$REINV_j$ = real estate investment divided by the total capital for bank j;
$RELOAN_j$ = real estate loans divided by total capital for bank j;
e_j, y_j, u_j, v_j = error term.

Equation (5) uses a broad definition to measure real estate exposure, while equation (6) partitions exposure into real estate equity investment versus real estate loans provided. By considering the two forms of exposure separately, as in equations (7) and (8), we can determine whether the sensitivity of bank returns to changing real estate values is more pronounced for one form of exposure than another. Weighted least squares analysis is applied to test the models specified above.

Results from applying weighted least squares analysis are disclosed in Exhibit 4. The broad measure of real estate exposure (*REEXP*) is positively and significantly related to the real estate sensitivity (*RESENS*) across banks. When the exposure is partitioned into real investment (*REINV*) versus real estate loans (*RELOAN*), the investment exposure is positively and significantly related to *RESENS*, while the loan proxy is not significant. However, when isolating the effect of each type of exposure on *RESENS* with two

Exhibit 4
Cross-Sectional Relationship between the Sensitivity to Real Estate Values and Exposure to Real Estate

$$^{a}RESENS_j = \alpha_0 + \alpha_1 REEXP_j + e_j$$
$$RESENS_j = \alpha_0 + \alpha_1 REINV_j + \alpha_2 RELOAN_j + y_j$$
$$RESENS_j = \alpha_0 + \alpha_1 REINV_j + u_j$$
$$RESENS_j = \alpha_0 + \alpha_1 RELOAN_j + v_j$$

Model	Intercept (*t*-statistic	*REEXP* (*t*-statistic)	*REINV* (*t*-statistic)	*RELOAN* (*t*-statistic)	Adj. R_2	*F*-Statistic
1	.382	.440			3%	4.34*
	(6.12)*	(2.08)*				
2	.328		2.944	.016	13%	10.06*
	(5.42)*		(3.97)*	(.75)		
3	.461		3.119		13%	19.64*
	(8.61)*		(4.43)*			
4	.388			.042	2%	3.92*
	(6.25)*			(1.98)*		

$^{a}RESENS_j$ = sensitivity of bank *j*'s returns to real estate values;
$REEXP_j$ = real estate investment and real estate loans as a proportion of total assets for bank *j*;
$REINVP_j$ = real estate investment as a proportion of total assets for bank *j*;
$RELOAN_j$ = real estate loans as a proportion of total assets for bank *j*;
*significant at the .05 level or higher.
Source: computed by the Authors

separate single-variable models, each exposure proxy is positive and significant. In general, it appears that the market's revaluation of bank share prices to changing real estate values is conditioned on the bank's degree and type of real estate exposure.

Summary

Given the increasing investment by commercial banks in real estate assets, our objective was to determine whether bank returns are systematically affected by changing real estate values, after accounting for market and interest-rate effects. We document a positive significant relationship between bank returns and changing real estate values, beyond the effects of market and interest-rate movements. Even though real estate values are related to market and interest-rate factors, the influence of changing real estate values on bank returns is not completely captured through use of market and interest-rate proxies. Consistent with the increased bank allocation of funds toward real estate-related assets in recent years, we also find that the sensitivity of bank returns to a real estate index has increased over time. Finally, we test whether the market's revaluation of bank stocks is dependent on the bank-specific degree of exposure to real estate. The results suggest that investors discriminate among banks when rewarding (penalizing) banks in response to increased (reduced) real estate values, based on bank-specific exposure to real estate investment and/or real estate loans.

Our results suggest that bank regulators, managers and investors should closely monitor real estate values when assessing the prospects for specific commercial banks. Regulators may consider closer monitoring of the real estate exposure per bank, just as they monitor bank exposure to interest-rate risk. Bank managers may need to create hedging techniques to immunize their real estate exposure in the same manner that they sometimes use derivative securities to protect their assets from interest-rate risk. Investors should use forecast real estate market values along with general stock market and interest-rate trends when forecasting bank values.

Notes

[1]A second index using all firms in the NAREIT sample provides almost identical results to those reported here.
[2]A complete list of the banks used in this analysis is available upon request to the authors.

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