NBER WORKING PAPER SERIES

OFFICE MARKET VALUES DURING THE PAST DECADE: HOW DISTORTED HAVE APPRAISALS BEEN?

Patric H. Hendershott
Edward J. Kane

Working Paper No. 4128

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 1992

The authors thank David Geltner and participants at the Homer Hoyt May 1992 meeting for their comments. This paper is part of NBER's research program in Corporate Finance. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #4128
July 1992

OFFICE MARKET VALUES DURING THE PAST DECADE: HOW DISTORTED HAVE APPRAISALS BEEN?

ABSTRACT

This paper develops evidence that, in a declining market, appraisal values may lag notably behind analytical measures of the discounted present value of commercial property cash flows. For the period 1982-92, alternative measures of the economic value of constant-quality office buildings are constructed using two benchmark projections designed to bracket expected future vacancy rates and real rents. Until 1992, the time path for both benchmark series lie consistently below that developed from the appraisal-based Russell/NCREIF office market index. This divergence implies that the rate of price appreciation reported by the Russell/NCREIF index is distorted: being slow to register price declines when markets first weaken and then having to overstate the rate of decline once the market begins to bottom out. The distortion may reflect incentives for investment managers and appraisers to smooth potentially temporary price volatility, as well as systematic differences in the character and condition of the properties that tend to trade at different stages of the real estate cycle.

Prof. Patric H. Hendershott
Department of Finance
Ohio State University
Hagerty Hall
Columbus, OH 43210
and NBER

Prof. Edward J. Kane
Department of Finance
Boston College
Fulton Hall
Chestnut Hill, MA 02167
and NBER

OFFICE VALUES DURING THE PAST DECADE: HOW DISTORTED HAVE APPRAISALS BEEN?

Patric H. Hendershott and Edward J. Kane

Throughout most of the last decade, commercial real estate markets have been distressed. The one market with solid data on vacancy rates and real rents is that for office buildings. For this property type, vacancy rates have stood at unprecedented levels since 1984 and real rents have halved relative to 1982. Motel/hotel and shopping center markets have shown parallel signs of distress (Shulman, 1990, etc).

Accounting evidence of falling commercial real estate values appeared first on thrift balance sheets and in FSLIC bailout appropriations. More recently, writedowns have spread to commercial banks and insurance companies. These value declines reflect the substantial overbuilding, fed by what can be described as a "lending frenzy" (Hendershott and Kane, 1992).

One place where value declines have been slow to register is in appraised values. Calculations developed in this paper from the Russell/NCREIF Property Index show two curious features. First, the office market component was higher on a real constant-quality basis at the beginning of 1987 than it had been at the beginning of 1982. Second, the parallel retail component of the index failed to decline until 1990. In part because of the delayed downturn of appraisal-based returns, the deep writedowns of real estate values that began in the mid-1980s have proved something of a surprise to deposit-institution regulators and others.

Our analysis uses data from the office market to assess the accuracy of the real constant-quality Russell/NCREIF indices during the 1980s. This analysis employs a specific valuation model to estimate the ratio of value to replacement cost in the office sector at the beginning of 1992. The model is forward-looking in that it depends primarily on the projected future path

of vacancy rates and the path of real rents these vacancy rates predict. While this paper applies the model only to the national office market, it would be relatively straightforward to extend the analysis to local markets.

To generate a time series of the value/replacement-cost ratio, we shift the valuation date backward a year at a time and repeat the calculation. Nine shifts generate an annual time series covering the beginning of 1982 to the beginning of 1992. Two benchmark series are computed, one based on perfect foresight and another based on the more optimistic assumption that lending would be curtailed enough in the near future to make vacancy rates decline. These series are intended to uncover the trend in fundamental value rather than to track year-to-year movements accurately.

The last step in our analysis develops a comparable ratio from the appreciation component of the Russell/NCREIF office return series. When this index is contrasted with our relatively conservative curtailed-lending series, the index overvalues office real estate by 25 to 35 percent throughout the 1985-90 period. (Using the perfect-foresight benchmark, office buildings were overvalued by 100 percent throughout the 1982-87 period.) Even if the increasing overstatement in the 1983-86 period were interpreted as a so-called "speculative bubble" in which market value temporarily exceeded fundamental value, the failure of the bubble to burst before 1991 implies a clear case of overappraisal.

I. Computing the Ratio of Fundamental Value to Replacement Cost

The Valuation Model

As a first approximation, property value can be defined as replacement cost (RC) less the present value of any expected future below-

equilibrium rental returns (BERI).[1] Dividing both sides of this definition by replacement cost:

$$\frac{V_t}{RC_t} = 1 - \frac{BERI_t}{RC_t}.$$

In this formulation, BERI/RC depends on the net (of depreciation) rate at which replacement cost is expected to appreciate, the rate of discount used, and differences between expected values of both the equilibrium and actual rental rates and the actual and equilibrium vacancy rates.[2] More specifically,

$$\frac{BERI_t}{RC_t} = \sum_{j=1}^{\infty} \frac{[uc - [g_{t+j}\frac{1-v_{t+j}}{1-v^*} - \exp]] * (1+\pi-d)^j}{(1+i)^j},$$

where uc is the equilibrium net (of operating expenses) rental rate on a dollar of property, g is the actual gross rental rate, exp is the operating expense ratio, v* is the equilibrium or natural vacancy rate, v is the actual rate, π-d is the expected net appreciation rate, and i is the nominal rate of

---

[1] Because property value includes land as well as structure, the concept of replacement cost is a little slippery. Movements in real land values will affect the $BERI_t/RC_t$ ratio.

[2] Hendershott, Follain, and Ling (1987) use this model to estimate the impact the 1986 Tax Act had on real estate values.

discount.[3] For simplicity, all future values of uc, exp, v*, π and i have been set equal to their current values.[4]

The model is illustrated graphically in Figure 1. The vertical axis is percent of replacement cost, and the horizontal axis is time going forward from the present. The horizontal line in the graph is the equilibrium gross rent (uc+exp), labelled g_{equil}. The current effective gross rent (actual adjusted for excess vacancies) is labelled g_{eff}. An illustrative time path is drawn along which effective rent returns linearly to its equilibrium value. The present value of the difference between all future equilibrium and actual rents, the triangle indicated by PV, is the ratio BERI/RC. The more rapidly rents are assumed to return to equilibrium, the smaller is the PV triangle BERI/RC and the larger is V/RC.

Once new construction has finally been curtailed, net absorption will be positive. This lets real effective rents and V/RC rise over time. In the figure, as we move the starting date rightward along the horizontal axis, the PV triangle shrinks, BERI/RC declines and V/RC rises. This has several implications. First, effective real rents will rise over time. After a period

---

[3] Hendershott and Kane (1992) use a variant of this formulation to calculate the deadweight economic cost, valued at the end of 1991, of the vacant commercial real estate created in the 1980s. More specifically, the 1991 estimate of cost is computed as:

$$PLV_{91} = \sum_{t=83}^{102} \frac{(v_t - v*)(uc + \exp')_t \, RC_t}{(1+r+d)^{(t-91)}}$$

where exp' is the expense ratio for vacant real estate and r is the real interest rate. The cost is estimated to be $150-$200 billion.

[4] Technically, the zero-coupon rate (plus a risk premium) for each maturity should be used to discount each period's cash flow. When the yield curve is steeply sloped, using different-period discount rates can markedly affect valuation. The user cost will vary over time if zero coupon rates vary or if tax law is expected to change.

in which long-term indexed leases favored investors, long-term indexed leases will now favor renters. Second, a rule that says to sell only properties that are within some small fraction of replacement cost (adjusted for inflation and normal depreciation) will seem to work. Only the relatively good properties (relatively high real effective rents) will sell initially, but eventually all properties will sell. However, waiting for weak properties to rise in value may not earn an equilibrium return.

Real Rent Adjustment

Future gross rental rates are just the current rate compounded at its expected rate of change:

$$g_{t+N} = g_t \prod_{j=1}^{N} (1+\Delta g_{t+j-1}/g_{t+j-2}).$$

The expected rate of change is modelled adaptively as depending positively on the gap between v* and the beginning-period vacancy rate and negatively on the change in the vacancy rate during the previous period:

$$\Delta g_{t+j}/g_{t+j-1} = \lambda(v^*-v_{t+j-1}) - \lambda'(v_{t+j-1}-v_{t+j-2}).$$

Using data for the 1968-90 period,[5] we estimate:

$$\Delta g_t/g_{t-1} = .1067 - .7873\, v_{t-1} - 3.522\, \Delta v_{t-1}, \qquad R^2 = .705.$$
$$(.0592) \quad (.2563) \qquad (0.701)$$

---

[5] Prior to mid-1978, the vacancy rates are simple averages for the downtowns of the largest 34 metropolitan areas; since then they are weighted averages, the weights reflecting square feet of office space. To make the simple and weighted-average series comparable, 1.5 percentage points were subtracted from the simple average series. The real rent series is an effective series computed by Salomon Brothers and described in Wheaton and Torto (1988).

The equation fits reasonably well, as Figure 2 indicates. Slope coefficients differ from zero at the .05 significance level, although the intercept does not. A "natural" vacancy rate is imbedded in the constant term, which is interpretable as the sum of λv^* and an estimation error. Dividing the intercept by the .7873 estimate of λ gives .1355. We view this estimate to be implausibly large (the observed vacancy rate never reached this value during the 1968-84 period and averaged about 8 percent). However, if we lower both the constant and the estimate of λ by their standard errors, the implied natural vacancy rate becomes a more plausible .0475/.531 = .0895.[6] This supports using .09 as the base value in subsequent calculations.

Parameterization and the 1992 Ratio

To parameterize the model, we begin with the Jorgensonian formulation of equilibrium user cost:

$$uc = \frac{(r+d)(1-\tau z)}{1-\tau}.$$

Here, r is the real after-tax interest rate, d is the economic depreciation rate (.025, from Hulten and Wykoff, 1981), τ is the personal income tax rate, and z is the present value of tax depreciation. For the beginning of 1992, we take τ = .3 and r = .06. Under current tax law and with a 10 percent nominal after-tax discount rate, z = .30 so that uc equals .11. The user cost is the gross rental rate less operating expenses. With an operating expense ratio of .055 (one-third the gross rate), the equilibrium gross rent ratio becomes .165.

---

[6] We need to lower both to maintain a reasonable relationship between actual and predicted real rents in the second half of the 1980s (and in the forecasted 1990s). The lower constant term reduces the predicted growth by 5.92 percent; the lower vacancy rate coefficient raises predicted growth by 4.60 percent (.256 times 18%).

The last pieces needed for the calculations are the future path of the vacancy rate and an initial gross rental rate. In the second half of 1991, the vacancy rate was .188. We project this rate to continue through 1992 and then to step down by one percentage point annually to .098 in 2001 and to hold at .09 thereafter. Real office market rents fell 45 percent between 1982 and 1991, lying in 1991 by our calculations at .1059. This is 36 percent below the .165 equilibrium level.

The rental rate adjustment equation we employ is:

$$\Delta g_t/g_{t-1} = .0475 - .531\ v_{t-1} - 3.522\ \Delta v_{t-1} + \alpha(uc - g_{t-1} + exp).$$

The first two coefficients were adjusted downward by a standard error from the statistical estimates to give a more plausible natural vacancy rate; the last term is introduced to ensure that real rents return to their equilibrium level in 2002 when the vacancy rate reaches its natural level (α is discussed below).

With these assumptions and specifications, the V/RC ratio was 0.613 at the beginning of 1992.[7] [8] This result is sensitive both to the speed

---

[7] The calculations do not take into account that longer-term leases are now earning above-market rates of return. On the other hand, the rent adjustment equation has rents rising nearly linearly to the equilibrium level, while they likely would rise slowly (if at all) at first and then rise more rapidly as the equilibrium was approached. These factors obviously work in offsetting directions.

[8] We note that the geographical distribution of office properties in the Russell/NCREIF portfolio may differ significantly from that of all office properties. Because the relevant current vacancy rate could differ significantly from the national rate we employ, this could result in a significantly different V/RC ratio. (For all properties, the Russell/NCREIF portfolio is decidedly less heavily tilted toward the Northeast than a national portfolio and more heavily tilted toward the Pacific.)

at which excess real estate is assumed to be absorbed (i.e., the steepness of the time path moving vacancy rates and the rental rate back to their long-run values) and to the long-run equilibrium rental rate. Holding the vacancy rate at .188 for just two extra years before beginning its .01 annual decline (so that real rents do not return to .165 until two years later) drops today's V/RC ratio to .579. Raising the equilibrium rental rate by .01 reduces the ratio to .574.[9] In contrast, changing the natural vacancy rate by a percentage point, but still projecting a return to equilibrium in 2002, alters V/RC by only .01.

II. Appraisal versus Fundamental Value

Appraisal-based real estate return series have been widely criticized for giving the illusion of far more stable returns than actually exist on real estate investments.[10] Even more important for real estate investors in recent years is whether real estate has been systematically overvalued by investors/appraisers. Certainly the extraordinary vacancy rates and falling real rents observed since the middle 1980s have lowered market values. Our model lets us investigate whether appraisers and/or real estate investment managers lowered their value estimates as rapidly as it was reasonable to do so.

The Calculations

Using our framework and appropriate assumptions, it is easy to construct a time series for the value/replacement-cost ratio for office buildings during the 1982-91 period. Our analysis focuses on two alternative

---

[9] The large reduction occurs because actual rents are so far below equilibrium rents. If the two were initially equal, the value decline would be trivial (Hendershott, Follain and Ling, 1987).

[10] See Geltner (1989) and Ross and Zisler (1991), for example.

sets of benchmark assumptions. First, we compute a "perfect-foresight" series. This series projects observed vacancy rates and real rents through 1991 and employs our model-based forecasted values after that. Second, we calculate a "curtailed-lending" series. This series bases its projections on the (counterfactual) expectation that lending, and thus new construction, would be curtailed shortly after each successive valuation date.

For different starting dates, Table 1 presents a matrix of hypothesized future vacancy rates under the curtailed-lending scenario. Each column states the rates relevant for valuing office buildings at the beginning of the indicated years. Along the diagonal are observed vacancy rates in the previous year. Below the diagonal, projected vacancy rates typically decline slightly in the second year and then fall toward 9 percent by one percentage point annually. An atypical pattern where rates are expected to rise in the second year is specified in 1982 and 1983, when vacancy rates were surging following the steep 1982 recession, and in 1990 and 1991, when the 1991 recession was developing. Values after 1994 (not shown in the table) are presumed to fall by one percentage point per year until reaching 9 percent.

The table also indicates the values of the discount rate (i), user cost (uc), and rental adjustment coefficient (α) used in the different years. For post-1986 values of i, r, and uc, we use the previously discussed 1992 values. The pre-1987 values reflect pretax-reform tax rates and tax depreciation schedules and the higher pre-1986 nominal after-tax interest rates. The .13 user cost is based on $r = .075$, $\tau = .35$, and a present value of tax depreciation (z), using the higher .115 discount rate and 19-year tax life, of

.45.[11] The expected inflation rate is assumed to decline linearly from .07 in 1982 to .04 in 1985 and to remain there in following years. The α's are set at the minimum values needed to bring real rents up to their equilibrium level when the vacancy rate bottoms out at 9 percent.

Our two series (along with an "appraisal-based" series to be discussed momentarily) are plotted in Figure 3. These are "smoother" than price series normally are because we have attempted to capture only broad movements in fundamental value. For example, the annual nominal discount rate was changed only once in the decade and the annual user cost only twice. By construction the two series are equal at the beginning of 1992, but they differ vastly in earlier years. The perfect-foresight series starts at the beginning of 1982 at about 50 cents on the dollar and stays there until the 1990s, when it gradually creeps up to around 60 cents at the beginning of 1992. The curtailed-lending series starts at 1.01, plunges to 0.86 in the next two years, declines gradually to 0.75 over the next five years, and plunges again in 1989 and 1990 to 0.62.

The comparable appraisal-based series for the value/replacement-cost ratio comes from a three-step procedure. First, the appreciation component of the Russell/NCREIF office return series is cumulated to generate a nominal appraised value series. Second, to obtain a real constant-quality measure, this series is divided by the nonresidential structures deflator and then blown up by 2.5 percent per year to allow for depreciation in the replacement-cost denominator.[12] To scale the index

---

[11] To allow for the tax benefits of trading (permitting multiple depreciations), the single depreciation z value was multiplied by 1.16 (see Follain, Hendershott and Ling, 1987).

[12] To the extent that real land prices change significantly, the V/RC series we derive from the Russell/NCREIF data will be too high when real land prices are high and too low when the reverse is true.

comparably to our curtailed-lending series, the Russell/NCREIF series is set equal to 1.0 at the beginning of 1982. We believe that this is more likely to understate than overstate the ratio in as much as the low vacancy rates prevailing at this time could have caused the V/RC ratio to exceed unity.

Comparisons

Huge differences emerge between our benchmark series and the Russell/NCREIF based series. During the 1982-86 period, the curtailed-lending series declines by 22 percent, in contrast to a 5 percent increase shown by the Russell/NCREIF series. At the beginning of 1987, the Russell/NCREIF series overvalued office buildings, on average, by a third. We believe this estimate of the Russell/NCREIF bias in the mid-1980s to be conservative. Using the less optimistic benchmark provided by the perfect-foresight alternative would portray the Russell/NCREIF index as overvaluing office real estate by 100 percent.

Not until the 1987-90 period do the two series finally move similarly, both declining by just over 20 percent; thus the Russell/NCREIF series continued to overvalue properties by about 30 percent. A major correction occurs in the Russell/NCREIF series in 1991: it declines by 17 percent, while our series is unchanged. A further 10 percent correction should be expected, assuming that real estate was being properly priced at the beginning of the period. However, to the extent that real land prices are lower in 1992 than in 1982, ever further downward revision will be necessary to equalize the series.

Evidence in support of a general overstatement of values is given by Miles et al. (1991). They report that office properties sold from the Russell/NCREIF data set during the 1988-90 period generated prices on average 7 percent below their previous appraised value. Further, if one believes, as we do, that Russell/NCREIF pension advisors were more likely to sell properties that were close to their appraised values than those that

were far below, then the sample itself is upward-biased. Values of unsold properties would have been further, possibly much further, below appraised values.

The source of the overvaluation likely varied over time. In the 1983-86 period, when the overvaluation developed, investors may have been willing to pay more than fundamental value for properties. Appraisers, using the comparable sales method, would reasonably produce high valuations. The failure to purge the overvaluation until after 1990 is, however, less understandable. By late 1986, the implications of the widespread excess supply should have been obvious.[13] In its first "Real Estate Market Review" in May 1986, Salomon Brothers emphasized the existence of excess supply and forecast lower effective nominal rents and asset prices.

Data limitations prevent us from estimating value/replacement-cost ratios for other segments of the commercial market and comparing these with other components of the Russell/NCREIF-based series. We are, however, willing to speculate about what such a comparison would show for the retail component. As noted at the outset, on a real constant-quality basis this component did not decline until 1990. The decline so far (1990-91) is only 10 percent. Supposing with David Shulman (1990) and others that this market is in almost as bad shape as the office market, one is led to posit that current overvaluation is in excess of 20 percent.

III. Summary Implications

To track the timing of capital gains and losses that investors accrue

---

[13] In contrast to the actual or "smoothed" Russell/NCREIF series, which changed little in 1987, Fisher, Geltner and Webb (1992) compute a 15 percent drop in their "unsmoothed" total-property Russell/NCREIF index in the first half of 1987.

on untraded real estate, unbiased estimates of periodic price appreciation should be utilized. Our analysis suggests that in the 1982-91 decade the office market component of the Russell/NCREIF Property Index was severely biased, in that the index was slow to register price declines when the speculative bubble burst in 1987. This failure likely reflects biases in business practices: a reluctance of appraisers to change values sharply and incentives that investment managers have to maintain the values upon which their percentage fees are based.

But a simpler phenomenon may also be at work. Under and over adjustment in transactions prices may reflect systematic differences in the character and condition of the properties that actually trade at different stages of the real estate cycle. In particular, early in a real-estate downturn, transactions prices may provide upward-biased estimates of returns on a constant-quality portfolio of commercial properties. At such times, would-be buyers can fill their needs from the stock of prime properties without taking on a subsequent space rehabilitation that is more disadvantageously priced at replacement cost. Only as new construction slows, and prime properties have been successfully reallocated, does the stock of nonprime properties begin to trade in greater proportion and only then will the full value decline be recognized.

Our analysis indicates that techniques for applying market-value accounting to real-estate portfolios must include efforts both to convert appraisal-based indices to transactions-equivalent indices and to adjust transactions-based indices for variation in the quality of the properties actually trading during different accounting periods. In periods of building oversupply, the effect of higher vacancy rates and falling real rents can best be captured by making supplementary use of the cash-flow discounting approach that this paper exemplifies.

References

Fisher, Jeffrey D., David Geltner, and R. Brian Webb, "Historical Value Indices of Commercial Real Estate," mimeo, March 1992.

Follain, James R., Patric H. Hendershott, and David C. Ling, "Understanding the Real Estate Provisions of Tax Reform: Motivation and Impact," National TaxJournal, XL, September 1987.

Geltner, David, "Estimating Real Estate Systematic Risk from Aggregate Level Appraisal-Based Returns," Journal of the American Real Estate & UrbanEconomics Association, 17, Winter 1989.

Hendershott, Patric H., James R. Follain and David C. Ling, "Effects on Real Estate," in Pechman (ed.) TaxReform and the U.S. Economy, The Brookings Institution, 1987.

Hendershott, Patric H. and Edward J. Kane, "Causes and Consequences of the 1980s Commercial Construction Boom," Journal of Applied Corporate Finance, 5, Spring 1992.

Hulten, Charles R. and Frank C. Wykoff, "The Measurement of Economic Depreciation," in Hulten (ed.), Depreciation, Inflation and the Taxation of Income from Capital, The Urban Institute Press, Washington D.C., 1981.

Miles, Mike, David Guilkey, Brian Webb, and Kevin Hunter, "An Empirical Evaluation of the Reliability of Commercial Appraisals, 1978-1990," mimeo, August 20, 1991.

Ross, Stephen and Randell Zisler, "Risk and Return in Real Estate," Journal of Real Estate Finance and Economics, 4, June 1991.

Shulman, David, "Shopping Centers: The Next Office Market?," Salomon Brothers, September 24, 1990.

Wheaton, William C. and Raymond G. Torto, "Vacancy Rates and the Future of Office Market Rents," TheJournal of the American Real Estate & Urban Economics Association, 16, Winter 1988.

Figure 1 : Equilibrium and Effective Real Rents as Determinants of Value/Replacement Cost

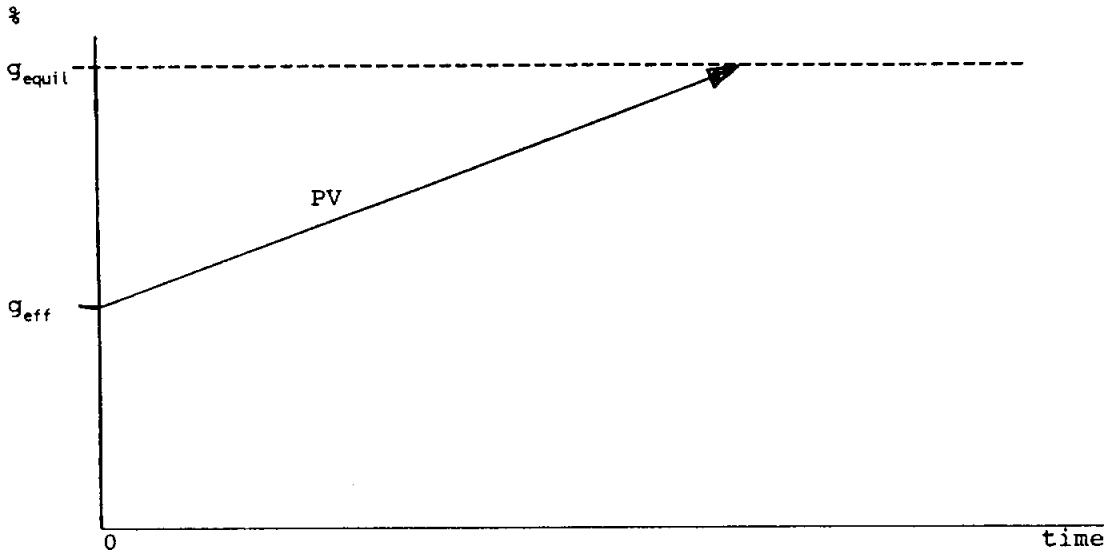

FIGURE 2

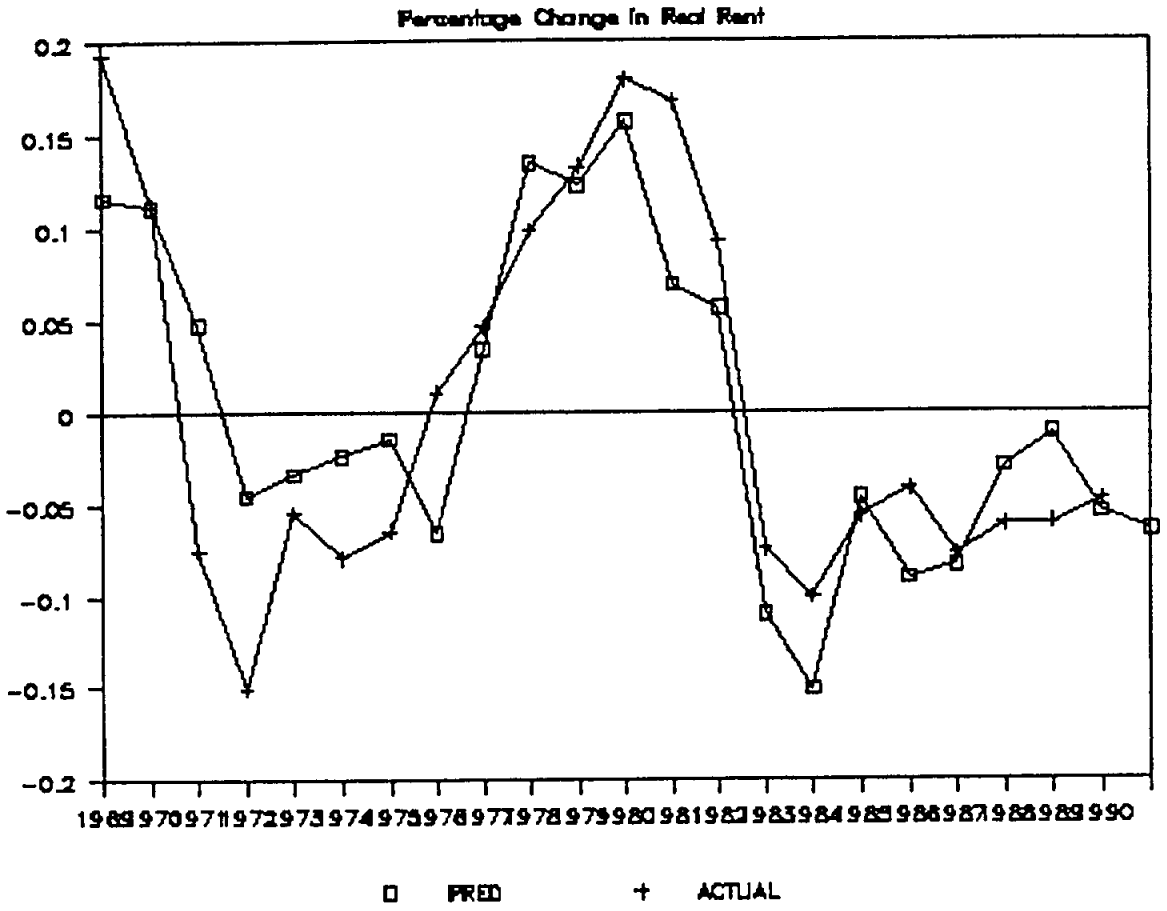
Percentage Change in Real Rent
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
PRED
ACTUAL

FIGURE 3

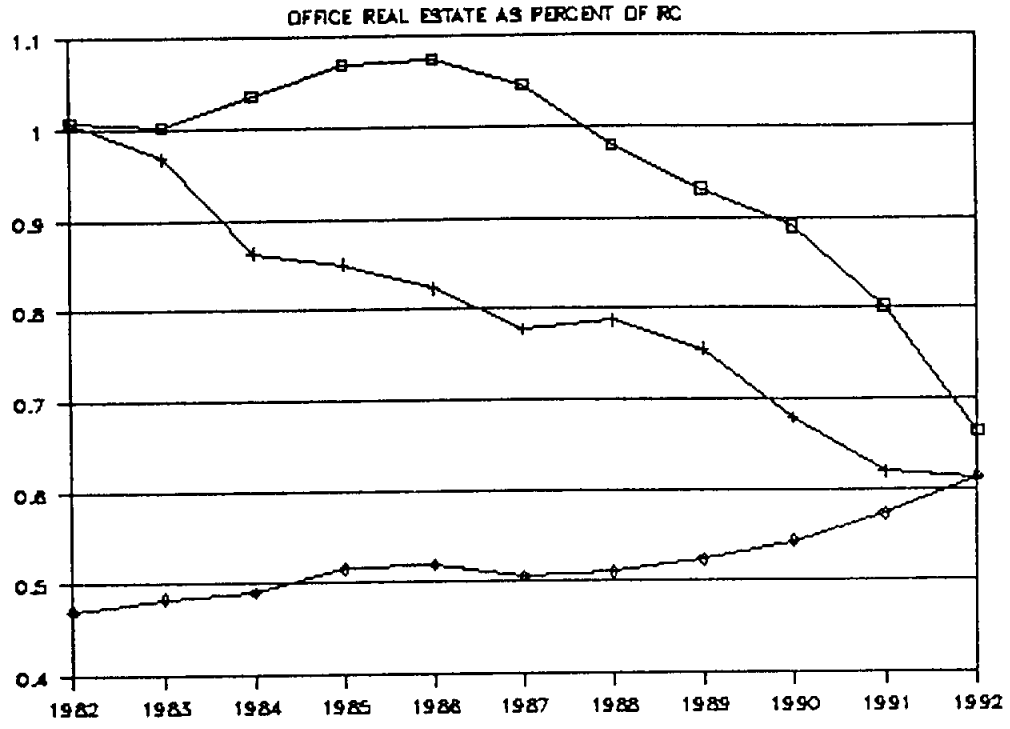
OFFICE REAL ESTATE AS PERCENT OF RC
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
NOREIF
+ CURTAILED-LENDING
◇ PERFECT-FORESIGHT

Table 1. Parameter Assumptions Used in Calculations

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Discount Rate (i)	.115	.115	.115	.115	.10	.10	.10	.10	.10	.10	.10
User Cost (uc)	.13	.13	.13	.13	.107	.11	.11	.11	.11	.11	.11
Rent Adjustment Coefficient	1.0	1.0	.87	.36	.04	.22	.27	.47	.71	.75	.82
1982	.051										
1983	.093	.093									
1984	.10	.11	.135								
1985	.09	.10	.13	.146							
1986		.09	.12	.14	.165						
1987			.11	.13	.16	.179					
1988			.10	.12	.15	.17	.178				
1989			.09	.10	.14	.16	.17	.173			
1990				.09	.13	.15	.16	.17	.179		
1991					.12	.14	.15	.16	.18	.186	
1992					.11	.13	.14	.15	.17	.19	.188
1993					.10	.12	.13	.14	.16	.18	.188
1994					.09	.11	.12	.13	.15	.17	.18

The columns indicate parameters relevant to valuing offices at the beginning of the indicated years. Vacancy rates are lagged values for the year. The diagonal contains observed lagged vacancy rates for the indicated year.