Capital Structure Decisions in Real Estate Investment

George W. Gau* and Ko Wang**

This study examines the financing decisions of real estate investors and the choice of capital structure when acquiring income-producing properties. Drawing from the literature in finance and real estate, we develop a capital structure model for real estate investment and derive six hypotheses regarding the relationship of the overall loan-to-value ratio chosen by an investor to selected characteristics of the investment. The hypotheses are then tested using financing data from a sample of apartment and commercial transactions over a fifteen-year period in a specific real estate market. The empirical findings strongly support the importance of depreciation deductions, financial distress costs, capital constraints, tax rates, and interest rates as determinants of the capital structure of real estate investors.

During the past three decades few issues in finance have been as extensively researched as the question of what determines the capital structure of a firm. Starting with the seminal work of Modigliani and Miller [14, 15], studies have considered the impact on capital structure of taxes (Miller [13]), bankruptcy costs (Kraus and Litzenberger [11]), agency costs (Jensen and Meckling [10]), and non-debt tax shields (DeAngelo and Masulis [3]). The general consensus of this research seems to be that the firm's optimal capital structure is determined by a trade-off

*Department of Finance, University of Texas at Austin, Austin, Texas 78712;
**Department of Finance, California State University—Fullerton, Fullerton, California 92634.
Date Received: February 8, 1990; Revised: June 21, 1990.
between the tax advantage of debt and various leverage-related costs.¹

Capital structure theory and empirical work are not as well developed for real estate investment. While previous capital structure research has been in terms of corporations, many real estate acquisitions are made through noncorporate ownership forms, a fact that has important implications for capital structure. First, because noncorporate investors pay no corporate income tax and therefore receive no corporate tax shield from interest deductions, debt is more expensive on an after-tax basis for these investors when compared to a corporate borrower.² Second, real estate investors commonly use noncorporate forms because they allow for the pass-through to the individual investor of tax losses generated by a real estate investment. These tax shelter benefits have an effect on the tax shield/leverage cost trade-off associated with debt. Third, by not having access to the equity-raising market for corporate shares, real estate investors may face capital constraints in the noncorporate equity markets and be required to utilize relatively more debt to finance higher-priced acquisitions.³

This study examines the financing decisions of real estate investors when acquiring income-producing properties. A capital structure model for real estate investment is developed and tested using financing data from a sample of apartment and commercial transactions. The next section provides background on real estate financing and how it differs from general corporate finance. The succeeding section presents the capital structure model and derives six hypotheses regarding the relationship of the overall loan-to-value ratio chosen by the investor and

¹Another line of research has considered information asymmetries and market signalling aspects of financing decisions; e.g., Ross [21] and Myers and Majluf [16].

²Howe and Shilling [7] examine the capital structure of real estate investment trusts and argue that there is a tax disadvantage for REITs to using debt financing. Because this noncorporate ownership form pays no corporate tax, it has no tax incentive for issuing debt and REITs are at a disadvantage when competing in debt markets with corporations who have a lower after-tax interest cost.

³Jaffe and Lusht [8] suggest that, despite the tax disincentive with debt, an important explanation for why noncorporate investors may use more debt financing in their capital structures is the combination of the high cost of income properties and capital constraints created by incomplete equity markets. Unable to combine their limited equity with other investors to form large equity pools, these investors require debt to expand their number of investments and create diversified portfolios.
selected characteristics of the investment. The third section discusses the sample data and the empirical tests of the model. The last two sections present the results and conclusions.

REAL ESTATE DEBT AND EQUITY FINANCING

Debt financing in real estate investment is primarily undertaken through the mortgage market. The financing is secured by a specific investment property, although the other assets of the investor may also serve as security for the debt when the borrower gives a personal covenant and the loan is legally specified to have recourse to those assets. The income-generating capability of the property serving as collateral is an important consideration for the mortgage lender. It is common practice for lenders not only to limit the amount they are willing to lend relative to the value of the property (the loan-to-value ratio), but also to place constraints on the level of the mortgage payment relative to the net operating income of the property (the debt coverage ratio).

Because the interest payments on debt are tax-deductible expenses while payments to equity investors cannot be deducted in deriving taxable income, it is generally felt that there is a tax incentive to finance investments with debt instead of equity. For noncorporate investors, however, there is no corporate tax deduction and the tax-deductibility of the interest payments at the level of the individual investor is offset by the interest paid to the debt holders being taxable income. As noted by Miller [13], if the marginal tax rate on interest income from debt is equal to the tax rate on equity income, there is no tax incentive to debt

---

4 If borrowers have better information than lenders concerning the risks and returns of alternative investments, interest rates on debt include risk premiums assessed by lenders to compensate for information asymmetries. Issuing collateralized debt reduces any asymmetries because the debt funds are tied to a specific investment and such debt should carry with it lower borrowing costs. Myers and Majluf [16] have argued that firms with assets that can be used as collateral can be expected to issue comparatively more debt than firms with unsecured debt to take advantage of the lower cost.

5 A common problem in real estate markets is that the observed loan-to-value ratio \(L/V\) in a real estate investment may not be the true ratio of the loan amount to the actual market value of the property. When a property is partially or totally financed by an assumed mortgage or a vendor loan with a below-market interest rate, the transaction price reflects a combination of both the value of the property and the value of the below-market financing. For an analysis of the role of vendor loans in real estate investment markets, see Gau [5].
financing for the noncorporate investor. In terms of real estate investment, there is a tax incentive with debt for noncorporate investors only if the tax rate on real estate equity flows is greater than the rate assessed on the income from mortgage interest.

Given the tax shelter benefits available in real estate investment, it is more likely that the tax charged on the equity returns will be lower than the tax rate on the mortgage interest and there is a tax disincentive for the noncorporate real estate investor to use debt financing. The shelter benefits are created by tax regulations allowing depreciation expenses each year at levels higher than the actual economic decline of the asset’s value. These depreciation deductions reduce the taxes payable on each dollar of cash flow generated by a property and lower the overall taxes paid on real estate equity returns. Various constraints have been placed on these benefits with the one of the more important for capital structure being that corporations investing in real estate and generating tax losses cannot pass through these losses to their shareholders as negative taxable incomes. This constraint historically has encouraged real estate investors to use noncorporate ownership forms, such as partnerships, to take advantage of the pass-through of the tax shelter benefits.

Certain costs associated with financial distress are incurred by the real estate investor using debt. If the property does not generate sufficient income to pay the debt (or the market value of the property falls below the outstanding debt amount), the investor may default and suffer bankruptcy-related costs. These costs are realized by the borrower only in cases where the loan is on a recourse basis and the borrower is personally liable for the

---

6The 1986 Tax Reform Act (TRA) reduces (but does not eliminate) the tax shelter benefits available in real estate investment through depreciation deductions. Under the TRA, depreciation cannot be used by noncorporate investors to create a negative taxable income (except under limited circumstances) and any depreciation claimed during an investor’s holding period that does not reflect an actual decline in asset value is recaptured at the time of sale and taxed as a capital gain. The recapture provision reduces the tax shelter benefits to the equivalent of an interest-free loan in the form of deferred taxes. Gau and Wang [6] provide a discussion of the impact on real estate investment of tax provisions regarding depreciation.

7Besides direct bankruptcy costs, investors defaulting on their mortgages also suffer the loss of future depreciation deductions and the corresponding tax shelter benefits. In addition, independent of default, there are agency costs resulting from debt and from the investor’s interest being represented by delegated managers in cases of real estate investment through partnerships and corporations. The agency costs issues associated with debt financing are discussed in Jensen and Meckling [10] and Masulis [12].
mortgage interest and principal. The higher the expected value of the financial distress costs with recourse loans, the greater the disincentive to debt financing.\(^8\)

With respect to equity financing, the choice of noncorporate investment limits the access of investors to standard capital markets for issuing common stock as a source of equity. Instead of formal stock markets, real estate investors have often relied on informal partnership markets for raising equity funds. These markets can be more costly to generate capital than other markets because of additional information and search costs as well as the agency costs associated with establishing managerial/investor relationships. Real estate investors therefore may face capital constraints in acquiring equity and incur greater capital costs with higher levels of equity investment.

Given these capital constraints we would expect to find a greater incidence of debt among real estate investors who do not have access to stock markets for raising funds and a direct relationship between the extent of debt financing and the price of the property. In 1985 the National Association of Realtors (NAR) reported on a survey of the debt financing used in approximately 900 U.S. income-property transactions closed in that year [17]. These transactions were generally by individual investors and partnerships. The average overall \(L/V\) ratio was 0.66 in the NAR sample. For comparison, the average \(L/V\) ratio of equity REITs traded on U.S. stock exchanges was only 0.38 in 1985.\(^9\) The NAR survey also found that higher priced properties utilized greater debt financing in their capital structures. In that survey the average transaction price of properties financed solely by equity (mean price of $1.4 million) was lower than the average price of properties with some debt financing (mean price of $2.3 million).

\(^8\)Altman [1] has estimated that the direct and indirect costs of bankruptcy for industrial firms is in the range of 12–16% of the firm's value prior to bankruptcy. Quigley and Van Order [20] found that the average default loss with real estate loans is approximately 35% of the outstanding mortgage amount, based on a sample of residential mortgages that originated during the 1976-80 period and defaulted by 1988. A comparison of these empirical findings suggests that the costs of financial distress may be higher with real estate than with other types of investments.

\(^9\)The REIT \(L/V\) is the ratio of the weighted average long-term debt to the total assets for nineteen equity REITs as reported in the COMPUSTAT tapes. Jensen [9] presents data showing that the average debt-to-equity ratio on a market value basis for all U.S. nonfinancial corporations was 0.61 in 1985. This \(D/E\) ratio would be equivalent to a 0.38 \(L/V\) ratio, the same level of debt financing as the equity REITs.
The increasing cost of equity may partially explain an often expressed belief that real estate investors generally try to minimize their equity investment and maximize their debt financing.\textsuperscript{10} By limiting their equity financing, investors can reduce their costs of raising equity funds. With higher levels of debt the reduced costs of acquiring equity may be sufficient to compensate for any added risk premium in the required equity return resulting from the additional financial risk for the investor with debt.\textsuperscript{11} The incremental risk premiums might be especially small and the equity minimization rationale quite significant if mortgage financing could generally be obtained on a nonrecourse basis.

**CAPITAL STRUCTURE MODEL**

To develop a capital structure model for real estate investment, the following are assumed.

1. A real estate investor has an existing portfolio of assets with a given amount of equity capital available for investment. He is considering the financing of a new acquisition whose purchase price is greater than his available equity. Given the property value \(V\) the investor selects the amount of debt \(L\) to maximize the net present value of the equity investment. All loans are assumed to have interest-only payments with no principal amortization during their terms.

2. The cost of debt \(i\) consists of two elements:

\[
i = i^* + \delta L^*, \beta
\]

where \(i^*\) is the market interest rate charged on real estate

\textsuperscript{10}The Pyhrr and Cooper textbook [19] argues for an equity minimization approach to capital structure decisions in real estate investment. It suggests that real estate investors believe that debt financing actually reduces their overall risk because they have less equity committed to the investment and therefore less to lose in cases of financial distress. This approach to capital structure must implicitly assume that any debt is nonrecourse with only the property serving as security for the loan.

\textsuperscript{11}Nesmous and Hill [18] surveyed over 200 real estate professionals from the United States and Canada regarding financial leverage and their required rates of return on equity in real estate investment. That survey found that 71% of the respondents stated that with increases in their loan-to-value ratio in an investment they would either hold constant or lower their required rate of return on equity. Assuming the required return reflected both financial risk and the cost of raising equity, these survey results support the equity minimization rationale.
loans satisfying certain basic minimum debt coverage requirements and maximum $L/V$ levels ($L^*$), and $\Delta(L', \beta)$ is a risk premium assessed by lenders in cases where investors seek amounts of financing above basic risk levels ($L^+ = L - L^*$ with $L^+ > 0$). $\beta = 0$ is a measure of the legal recourse of the lender to the existing net worth of the investor with $\beta = 0$ for non-recourse loans and $\beta = 1$ if unlimited recourse.

3. The required return on equity ($y$) is determined in a competitive market where investors are risk-neutral.\footnote{Under this assumption the required equity return, $y$, is not a function of the level of debt (or the $L/V$ ratio), although the expected financial distress costs are explicitly recognized in the cash flows of the investment. This assumption has been used often in the development of capital structure theory (e.g., Bradley, Jarrell and Kim [2] and Shah and Thakor [22]).}

4. The investor holds his property for two periods. At the end of the first period he receives an after-tax cash flow ($\hat{O}$) from rental operations and at the end of the second period he sells the property and there is an after-tax equity reversion ($\hat{A}$) resulting from the sale.\footnote{It is assumed that the sale of the property takes place before any operating cash flow is realized by the investor in the second period. This assumption simplifies the model development and the presence of a second operating flow would have no implications for the analysis.} Both $\hat{O}$ and $\hat{A}$ are random variables that depend on the underlying net operating income ($\hat{N}$) and the net selling price ($U$), which are uncertain at the time of the investment and have probability density functions of $f(\hat{N})$ and $g(U)$, respectively.

5. The only non-debt tax shelter available to a real estate investor is depreciation ($D$). It is assumed that there is a single tax rate ($\tau$) applied to both the operating and reversion taxable incomes. The extent to which any real estate tax losses can be claimed by an investor is determined by $\alpha$, $0 \leq 1$, and the tax savings rate $r = (1 - \alpha)\tau$.\footnote{The size of $\alpha$ is dependent on tax regulations governing tax sheltering (e.g., passive income rules) as well as the individual tax status of the investor (e.g., whether he has positive taxable income from other sources).}

6. The investor incurs certain fixed costs, $K$, associated with financial distress if he fails to fulfill the debt obligations with a recourse loan. These distress costs would arise if the investor does not pay the first period interest expense or if he fails to repay debt at the end of the second period.

7. Whenever the selected loan amount, together with the investor's available equity endowment, is not sufficient to cover the property's acquisition cost, the investor must raise
additional funds from other real estate investors. Given the less formal nature of the real estate equity market, there is an additional percentage cost to raising equity funds, \( \phi(P) \), that is not recognized in \( y \). This cost is a positive function of the amount of equity \( (P = V - L) \).

With the above assumptions, the investor’s after-tax, operating cash flow depends on the extent to which he can utilize the tax shelter provided by the interest and depreciation deductions.

If \( \bar{N} \leq iL + D \) then \( \bar{O} = (\bar{N} - iL)(1 - t) + Dt \) \( (2) \)

\( iL + D > \bar{N} \geq iL \) \( \bar{O} = (\bar{N} - iL)(1 - r) + Dr \)

\( \bar{N} < iL \) \( \bar{O} = (\bar{N} - iL)(1 - r) + Dr - \beta K \)

The expected value of the investor’s operating cash flow at the end of the first period is:

\[
E(\bar{O}) = [E(\bar{N}) - iL](1 - t) + Dt + \alpha \int_0^{iL + D} [\bar{N} - iL - D] f(\bar{N})d\bar{N} - \beta K \int_0^{iL} f(\bar{N})d\bar{N} \tag{3}
\]

Similarly, the level of the after-tax equity reversion flow at the end of the second period is determined by the relationship of the net selling price of the property to its book value and to the outstanding debt balance on the property.

If \( \bar{U} \geq (V - D) \) then \( \bar{A} = (\bar{U} - L) - [\bar{U} - (V - D)]t \) \( (4) \)

\( (V - D) > \bar{U} \geq L \) \( \bar{A} = (\bar{U} - L) - [\bar{U} - (V - D)]r \)

\( \bar{U} < L \) \( \bar{A} = (\bar{U} - L)\beta - [\bar{U} - (V - D)]r - \beta K \)

The expected value of the investor’s reversion cash flow at the end of the second period is:

\[
E(\bar{A}) = [E(\bar{U}) - L] - [E(\bar{U}) - (V - D)]t - \beta K \int_0^{iL} g(\bar{U})d\bar{U} + \alpha \int_0^{V - D} [\bar{U} - (V - D)]g(\bar{U})d\bar{U} - \int_0^{L} (\bar{U} - L)(1 - \beta)g(\bar{U})d\bar{U} \tag{5}
\]

The net present value of the investor’s equity at a given debt level, \( NPV(L) \), is equal to the expected values of the operating and reversion flows discounted at the investor’s required rate of
return on equity (y) less the original equity investment (P) and
the cost of raising the equity $\phi(P)P$.

$$NPV(L) = E(\bar{O})(1 + y)^{-1} + E(\bar{A})(1 + y)^{-2} - P[1 + \phi(P)]$$  \hspace{1cm} (6)

The investor's capital structure decision consists of selecting $L$
(and therefore the loan-to-value ratio, $L/V$) to maximize the
$NPV$. Substituting equations (1), (3) and (5) into (6) and differentiating
with respect to $L$ yields the first-order condition and the
partial derivative $NPV^* = \delta NPV(L)/\delta L$.

$$NPV^* = -[i + L(\partial \alpha(L^+, \beta)/\partial L)](1 - i)(1 + y)^{-1} - \beta Kg(L)(1 + y)^{-2}$$
$$- [i + L(\partial \alpha(L^-, \beta)/\partial L)]x F(iL + D)(1 + y)^{-1} - (1 + y)^{-2}$$
$$- [i + L(\partial \alpha(L^+, \beta)/\partial L)]\beta Kf(iL)(1 + y)^{-1}$$
$$+ (1 - \beta)G(L)(1 + y)^{-2} + 1 + \phi(P) - P(\partial \phi(P)/\partial L)$$  \hspace{1cm} (7)

where $F(.)$ and $G(.)$ are the cumulative probability density
function of $\bar{N}$ and $\bar{U}$, respectively.

The comparative statics of the model can be shown by
differentiating the optimality condition (7) with respect to each
of the underlying variables relevant to the capital structure
decision. The important exogenous variables are the amount of
the depreciation deduction ($D$), the tax-loss shelter variable ($\alpha$),
the financial distress costs ($K$), the size of the investment ($V$),
the tax rate ($t$), and the market interest rate ($i^*$). These cross partial
derivatives derive hypotheses for empirical testing.

**Hypothesis 1:** The optimal level of debt is inversely related to
the amount of the depreciation deduction available with an
investment.

Differentiating $NPV^*$ with respect to $D$ yields

$$\partial NPV^*/\partial D = -[i + L(\partial \alpha(L^+, \beta)/\partial L)]x f(iL + D)(1 + y)^{-1} < 0$$  \hspace{1cm} (8)

for $\alpha > 0$. So long as there is some limitation on the extent to
which tax losses can be used to shelter the investor's other
income ($\alpha > 0$), the greater the depreciation shield, the lower the
optimal $L/V$ ratio because the interest expense becomes less
valuable as a tax deduction.

**Hypothesis 2:** The optimal level of debt financing is inversely
related to the extent of tax-loss sheltering available to the
investor.

$^{15}$The results of the subsequent analysis of equation (7) will imply that $NPV(L)$
is a strictly concave function and the second-order condition for optimization is
satisfied.
Differentiating (7) with respect to \( \alpha \),
\[
\hat{\partial} NPV^*/\hat{\partial} \alpha = -(i + L(\hat{\partial} \delta (L^+, \beta)/\hat{\partial} L)) t F(iL + D)(1 + y)^{-1} < 0
\] (9)
The basic idea is similar to Hypothesis 1 in that the presence of tax-loss sheltering negates any trade-off between the depreciation and interest deductions.

**Hypothesis 3:** The optimal loan-to-value ratio is inversely related to the costs of financial distress.

Differentiating the optimality condition with respect to \( K \) yields
\[
\hat{\partial} NPV^*/\hat{\partial} K = -[i + L(\hat{\partial} \delta (L^+, \beta)/\hat{\partial} L)] \beta f(iL)(1 + y)^{-1} - \beta g(L)(1 + y)^{-2} < 0
\] (10)
In this model financial distress costs only affect the optimal \( L/V \) ratio if the debt instrument provides the lender with recourse to other assets of the borrower; with \( \beta = 0 \), \( \hat{\partial} NPV^*/\hat{\partial} K = 0 \).

**Hypothesis 4:** The optimal level of debt is directly related to the cost of the property.

Solving for the cross partial with respect to \( V \),
\[
\hat{\partial} NPV^*/\hat{\partial} V = \hat{\partial} \phi(P)/\hat{\partial} V - \hat{\partial} \phi(P)/\hat{\partial} L \left( \hat{\partial} \phi(P)/\hat{\partial} L \right) > 0
\] (11)
Because \( \hat{\partial} \phi(P)/\hat{\partial} V > 0 \), \( \hat{\partial} \phi(P)/\hat{\partial} L < 0 \), and \( \hat{\partial} \phi(P)/\hat{\partial} L \hat{\partial} V = 0 \), this derivative is always positive. The hypothesis represents the capital constraint argument resulting from more costly equity markets in real estate investment.

**Hypothesis 5:** Providing tax-loss sheltering is not completely restricted (\( \alpha < 1 \)), the optimal level of debt financing is directly related to the tax rate.

Differentiating \( NPV^* \) with respect to \( t \),
\[
\hat{\partial} NPV^*/\hat{\partial} t = (1 + y)^{-1}[(i + L(\hat{\partial} \delta (L^+, \beta)/\hat{\partial} L))] - (i + L(\hat{\partial} \delta (L^+, \beta)/\hat{\partial} L)) \alpha F(iL + D)] > 0
\] (12)
Because \( F(iL + D) < 1 \), equation (12) is positive for \( \alpha \neq 1 \). The higher the tax rate, the greater the value of the interest deduction and the higher the optimal \( L/V \) ratio. If an investor cannot create negative taxable incomes (\( \alpha = 1 \)) and the interest and depreciation deductions combined are equal to the projected maximum level of the net operating income \( [F(iL + D) = 1] \), then equation (12) equals 0 and the optimal debt level is unaffected by the tax rate.

Given the corporate income tax, \( t \) will be higher for the corporate as opposed to the noncorporate real estate investor.
Even though a corporation cannot pass through tax losses to its shareholders, its \( \alpha \) may be less than 1 if the corporation has other corporate income that can be sheltered by tax losses on its real estate investment. Alternatively, its net operating income from the property may be greater than its interest and depreciation deductions \([F(iL + D) < 1]\). Under such conditions we would expect, all else held constant, for real estate investments held through corporate ownership to have higher \( L/V \) ratios than noncorporate investments.

**Hypothesis 6:** The optimal \( L/V \) ratio is indirectly related to the level of the market interest rate.

Assuming that \( y \) is independent of \( i^* \), the derivative of (7) with respect to \( i^* \) is

\[
\frac{\partial NPV^*}{\partial i^*} = -(1 + y)^{-1}(1 - t) + \alpha tF(iL + D) + \beta Kf(iL) \\
+ (i + L[\delta \partial L^*, (\beta)/\partial L])(\beta K[\delta f(iL)/\delta i^*]) \\
+ (i + L[\delta \partial L^*, (\beta)/\partial L])(\alpha t f(iL + D))) < 0
\]  

(13)

Higher interest rates raise the cost of debt, reduce the non-debt tax shelter, and increase the probability of incurring financial distress. Therefore, the higher the market interest rate, the lower the optimal loan amount.\(^{16}\) However, if \( y \) and \( i^* \) are interrelated and rising costs of debt cause increases in the investor’s required equity return, the resulting higher costs of equity at least partially offset the impact of an increasing \( i^* \) on the optimal \( L/V \) ratio.

**DATA AND TESTS**

The financing sample considered in this study is based on income-property transactions over the 1971–85 period in Vancouver, Canada. The financing and property data were collected from records of the British Columbia Assessment Authority and the British Columbia Land Title Office. The Assessment Authority is responsible for estimating the market values of all properties in the province for property tax assessment purposes and in performing that task collects information

\(^{16}\)The interest rate also has an effect on the debt coverage relationship commonly required by lenders. The debt coverage ratio (DCR) is equal to the net operating income of the property divided by the debt payment. All else held constant, the higher the interest rate on the debt financing, the higher the debt payment, and lower the amount the investor can borrow under a given DCR. The DCR requirement thus reinforces the inverse relationship between the interest rate and the level of debt financing.
on sales transactions and on the physical/income characteristics of properties. From its database the Assessment Authority provided a list of the sales transactions of Vancouver apartment and commercial properties during the years of 1978 through 1985. A sample of properties was drawn from the list and at the Land Title Office a title search was made of all transactions (titles) of sample properties going back to 1971. The title searches provided information on sales dates, ownership forms, and transaction prices along with complete descriptions (type of debt instrument, mortgage amount, interest rate, etc.) of all debt secured by the properties.

Complete financing information on a total of 1,243 transactions for 760 Vancouver properties is included in this sample. A description of the characteristics of the debt employed in financing these investments is given in Table 1. Combining all debt for each transaction, the mean, overall loan-to-value ratio is 0.687 in the sample. Financing for 5.6% of the transactions is solely through equity with no debt used in the capital structure, and 5.8% of the observations have capital structures containing

### Table 1

**Financing Characteristics**

<table>
<thead>
<tr>
<th>Sample:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Transactions</td>
<td>1,243</td>
</tr>
<tr>
<td>Number of Loans</td>
<td>1,837</td>
</tr>
<tr>
<td>Sample Mean L/V Ratio</td>
<td>0.687</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of Financing: % of Loans (Value-Weighted %)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard First Mortgages</td>
<td>19.9</td>
</tr>
<tr>
<td>Standard Second Mortgages</td>
<td>9.7</td>
</tr>
<tr>
<td>Demand Loans</td>
<td>7.9</td>
</tr>
<tr>
<td>Assumptions</td>
<td>37.7</td>
</tr>
<tr>
<td>Vendor Loans</td>
<td>24.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sources of Financing: % of Loans (Value-Weighted %)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartered Banks</td>
<td>10.1</td>
</tr>
<tr>
<td>Trust and Mortgage Companies</td>
<td>24.0</td>
</tr>
<tr>
<td>Life Insurance Companies</td>
<td>9.7</td>
</tr>
<tr>
<td>Credit Unions</td>
<td>7.8</td>
</tr>
<tr>
<td>Individuals and Non-Financial Corp.</td>
<td>47.7</td>
</tr>
</tbody>
</table>

17Observations consisting of the following types of transactions or financing are excluded from the sample: (1) non-arm's-length transaction or financing (e.g., intrafamily sales or loans); (2) sale resulting from a foreclosure proceeding; (3) transaction where more than one property was being sold, and, (4) loan secured by more than one property or a debenture issued by a corporation and secured by all of the assets of the corporation.
very high levels of debt with overall $L/V$ ratios equal to or
greater than the 0.95 level.

As shown in Table 1, 62.5% of the sample loans are assumed
or vendor mortgages. These forms of creative financing
often have interest costs below the market rates prevailing at the
time of the transaction and the benefits of this cheaper financing
can be capitalized into the transaction prices of the investments.
Such a capitalization would distort the observed $L/V$ relations-
ship if this ratio is measured on the basis of the recorded
transaction price. To eliminate this measurement problem, observa-
tions are deleted from the sample when the interest rate on the
debt is 1% or more below the level of the market rate at the time
of the transaction. Dropped from the sample due to a below-
market interest rate is a total of 484 observations, leaving 759
transactions for the empirical tests.\(^\text{18}\)

The distribution by property type and by year of the trans-
action of the remaining at-market sample is presented in Table 2.
The apartment transactions have capital structures with more
debt than found in the commercial (office, retail, industrial, etc.)
investments. Also, the average $L/V$ ratios tend to be higher for
the transactions during the 1970s than the ones in the first half
of the 1980s. These yearly figures, however, should be viewed
with caution because the run-up in market interest rates during
the 1980s increased below-market financing and caused more
sample observations to be deleted from the analysis during this
later period.

The study gives special attention to the financing arrange-
ments used for the investments with $L/V$ ratios of 0.95 and above.
If the debts in these cases are nonrecourse, the costs of financial
distress may have little impact on the capital structure decision
of these investors. From a careful reading of the titles and loan
documents we found that in every case the loan obligation
required the investors to pledge personal covenants for their
debt; i.e., the lenders had recourse beyond the properties securing
the loans. There is no indication that these investors would not
consider the potential distress costs that would result if they
defaulted on their mortgage obligations.

\(^{18}\)An alternative procedure to dropping the transactions with below-market
interest rates would have been to try to adjust the transaction price to reflect
the value of the below-market financing. However, there has been substantial
controversy in the literature concerning the extent to which these benefits are
capitalized into prices (see Gau [5]). To avoid the possible introduction of
measurement error into the empirical tests, the safest approach to the problem
is to delete the affected observations.
<table>
<thead>
<tr>
<th>Year</th>
<th>Apartment</th>
<th>Office</th>
<th>Retail</th>
<th>Industrial</th>
<th>Mixed(^{b})</th>
<th>Combination(^{b})</th>
<th>Others(^{c})</th>
<th>Total</th>
<th>Percent Corporate</th>
<th>Average (L/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>28</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>37</td>
<td>16.2</td>
<td>0.632</td>
</tr>
<tr>
<td>1972</td>
<td>30</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>37</td>
<td>37.8</td>
<td>0.716</td>
</tr>
<tr>
<td>1973</td>
<td>56</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>77</td>
<td>31.2</td>
<td>0.702</td>
</tr>
<tr>
<td>1974</td>
<td>28</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>42</td>
<td>45.5</td>
<td>0.702</td>
</tr>
<tr>
<td>1975</td>
<td>16</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>24</td>
<td>29.2</td>
<td>0.675</td>
</tr>
<tr>
<td>1976</td>
<td>29</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>41</td>
<td>39.0</td>
<td>0.790</td>
</tr>
<tr>
<td>1977</td>
<td>47</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>60</td>
<td>30.0</td>
<td>0.754</td>
</tr>
<tr>
<td>1978</td>
<td>95</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>117</td>
<td>35.5</td>
<td>0.744</td>
</tr>
<tr>
<td>1979</td>
<td>103</td>
<td>16</td>
<td>30</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>7</td>
<td>69</td>
<td>35.7</td>
<td>0.670</td>
</tr>
<tr>
<td>1980</td>
<td>36</td>
<td>9</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>65</td>
<td>30.8</td>
<td>0.542</td>
</tr>
<tr>
<td>1981</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>57.9</td>
<td>0.548</td>
</tr>
<tr>
<td>1982</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>33.3</td>
<td>0.432</td>
</tr>
<tr>
<td>1983</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>20</td>
<td>60.0</td>
<td>0.522</td>
</tr>
<tr>
<td>1984</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>48.0</td>
<td>0.498</td>
</tr>
<tr>
<td>1985</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>20</td>
<td>60.0</td>
<td>0.501</td>
</tr>
</tbody>
</table>

Total by Property Type

<table>
<thead>
<tr>
<th>Percent Corporate</th>
<th>29.7%</th>
<th>62.7%</th>
<th>39.7%</th>
<th>57.7%</th>
<th>45.7%</th>
<th>43.5%</th>
<th>50.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average (L/V)</td>
<td>0.728</td>
<td>0.507</td>
<td>0.526</td>
<td>0.540</td>
<td>0.582</td>
<td>0.552</td>
<td>0.401</td>
</tr>
</tbody>
</table>

\(^{a}\) Mixed office and retail use
\(^{b}\) Combination of office or retail with residential use
\(^{c}\) Other miscellaneous uses such as hotels and motels
Based on the available sample information, variables are selected to test the hypotheses developed in the previous section. Regression equations are estimated to show the relationship between each of the hypothesized variables and the overall $L/V$ ratio of the real estate investment. The estimated relationships took the following form with the expected signs indicated:

\[
L/V = \Omega (\text{structure age}, 1971 \text{ sale}, \text{property type}, \text{price},
+ \quad + \quad \pm \quad +
\text{corporate ownership, interest rate, price} \times \text{corporate})
\] (14)

For the first hypothesis the age of the structure is used as a proxy for the depreciation deductions. With most real estate investments the proportion of the property value apportioned to the structure versus the land tends to decline with the age of the building, since the existing use of the structure is more likely to represent an underutilization of the site over time. Therefore, when compared to newer structures, older buildings generally have smaller depreciable bases for tax purposes and therefore less depreciation can be claimed with these investments. It is anticipated that the older the structure, the smaller the depreciation per dollar of total investment, and the higher the loan-to-value ratio.

The second hypothesis is represented in equation (14) by a 0-1 variable indicating whether the transaction was in 1971. Canadian tax regulations did not restrict the claiming of tax losses on real estate investments undertaken prior to 1972. However, starting with 1972 acquisitions, limitations are placed on the losses that could be recognized due to depreciation. After this date investors generally are limited to a zero taxable income after claiming interest and depreciation.\(^9\) For sample transactions in 1971, $x=0$ and it is anticipated that these investments have higher debt levels in their capital structure than the 1972-85 transactions where $x>0$.

For the third hypothesis the costs of financial distress should differ across the sample observations depending on the property type and alternative spatial uses.\(^10\) The costs of financial distress are hypothesized to be a function of the potential income and

---
\(^9\) These Canadian limitations are similar to the restrictions on tax-loss sheltering introduced in the 1986 Tax Reform Act in the United States.

\(^10\) Fischer, Heinkele and Zechner [4] also use asset type (in the form of SIC industry codes) as a proxy for bankruptcy costs in their tests of capital structure decisions.
value loss caused by a default on the mortgage and a foreclosure sale of the property. With different market risk levels, each property type should have higher or lower costs of financial distress and therefore different debt levels. Six 0-1 variables are tested representing the seven types of property uses found in the sample with industrial properties as the holdout variable represented by the intercept.

The fourth capital constraint hypothesis is tested with the natural log of the transaction price as an explanatory variable. It is anticipated that the higher the price of the property, the greater is the amount of debt utilized by the investor and the higher is the loan-to-value ratio.

The fifth hypothesis regarding the influence of the tax rate on capital structure is proxied by a 0-1 variable representing the corporate vs. noncorporate ownership form. As discussed earlier, the overall tax rate for a corporate real estate investor will be higher than for a noncorporate investor given the additional burden of the corporate income tax. The interest deduction would have a greater value for the corporate investor, and we would expect these investors to have higher levels of debt in their capital structure. The percentage of sample observations using the corporate ownership form by property type and by the year of the transaction is shown in Table 2.

The market interest rate on real estate debt financing offered by financial intermediaries at the time of the transaction is the variable used for testing the sixth hypothesis. The higher the market rate, the greater the cost of debt, the lower the amount of debt an investor can borrow under a given DCR, and therefore the lower the optimal L/V ratio.

An interaction variable also is tested in the empirical analysis to represent the joint effect on the capital structure of the combination of the transaction price with corporate ownership. With the corporate ownership form investors have access to the equity market for common stock and therefore may have less capital constraints when they invest in higher priced properties and need to use less debt. The interaction term combining these two variable should have an inverse relationship with the L/V ratio in a transaction.

EMPIRICAL RESULTS

The findings of the empirical tests of the capital structure model for real estate investments are presented in Table 3. Run
# Table 3

**Empirical Results**

<table>
<thead>
<tr>
<th>Run</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.0015</td>
<td>0.0010</td>
</tr>
<tr>
<td></td>
<td>(3.6134)**</td>
<td>(3.7497)**</td>
</tr>
<tr>
<td>1971</td>
<td>-0.0781</td>
<td>-0.0683</td>
</tr>
<tr>
<td></td>
<td>(1.3982)**</td>
<td>(1.6960)</td>
</tr>
<tr>
<td>Office</td>
<td>0.0198</td>
<td>0.0776</td>
</tr>
<tr>
<td></td>
<td>(0.3812)</td>
<td>(0.4346)</td>
</tr>
<tr>
<td>Retail</td>
<td>-0.0189</td>
<td>-0.0162</td>
</tr>
<tr>
<td></td>
<td>(0.3670)</td>
<td>(0.396)</td>
</tr>
<tr>
<td>Mixed</td>
<td>0.0289</td>
<td>0.0275</td>
</tr>
<tr>
<td></td>
<td>(0.5167)</td>
<td>(0.4927)</td>
</tr>
<tr>
<td>Apartment</td>
<td>0.1381</td>
<td>0.1387</td>
</tr>
<tr>
<td></td>
<td>(2.9648)**</td>
<td>(2.9796)**</td>
</tr>
<tr>
<td>Combination</td>
<td>-0.0209</td>
<td>-0.0174</td>
</tr>
<tr>
<td></td>
<td>(0.2879)</td>
<td>(0.2401)</td>
</tr>
<tr>
<td>Other</td>
<td>-0.1872</td>
<td>-0.1838</td>
</tr>
<tr>
<td></td>
<td>(2.6780)**</td>
<td>(2.6307)**</td>
</tr>
<tr>
<td>Price (log)</td>
<td>0.0459</td>
<td>0.0614</td>
</tr>
<tr>
<td></td>
<td>(4.2447)**</td>
<td>(4.1432)**</td>
</tr>
<tr>
<td>Corporate</td>
<td>0.0274</td>
<td>0.0407</td>
</tr>
<tr>
<td></td>
<td>(1.5088)</td>
<td>(1.6332)</td>
</tr>
<tr>
<td>Interest Rate</td>
<td>-0.0471</td>
<td>-0.0470</td>
</tr>
<tr>
<td></td>
<td>(7.9039)**</td>
<td>(7.8802)**</td>
</tr>
<tr>
<td>Corporate * Price</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>--</td>
<td>(1.5271)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.4902</td>
<td>0.2942</td>
</tr>
<tr>
<td></td>
<td>0.2041</td>
<td>0.2066</td>
</tr>
<tr>
<td>D.F.</td>
<td>747</td>
<td>746</td>
</tr>
</tbody>
</table>

Absolute value of t-statistic is given in parenthesis.

*significant at the 5% level

**significant at the 1% level

#1 in the table is the regression results without the interaction term, while Run #2 includes this variable. These results generally support the model hypotheses. Other than the 1971 sale variable, the coefficients have the signs anticipated by the model with t-statistics that are significant at the 1% or 5% level in many cases. The R²s indicate that approximately 20% of the variation of the L/V ratios in the sample is explained by the model variables.\(^2\) This level of explained variance is substantial given

\(^2\)Separate stepwise regressions are performed to evaluate the relative contribution of each of the explanatory variables to determining the L/V ratio. These regressions indicate that most of the explained variance in the L/V ratios can be attributed to the interest rate, price, and apartment variables. These three are the most important determinants of the capital structure of the sample investments.
that a major portion of the variation of the $L/V$ ratios in the sample represents risk/return preference decisions of individual investors, decisions that cannot be addressed in the empirical tests without additional information about specific investors.\(^{22}\)

The sign and significance of the age variable indicate that investors with older properties and smaller depreciation deductions tend to have larger proportions of debt in their capital structures. This result supports the first hypothesis.

The coefficient values for the property types generally divide these spatial uses into three groups: (a) apartment; (b) commercial (office, retail, mixed retail and office, combination of office or retail with residential, and industrial); and (c) other miscellaneous uses.\(^{23}\) The results support the third hypothesis regarding the costs of financial distress and show that capital structure decisions are determined by the expected likelihood of incurring these costs. The highest risk group in the sample is the miscellaneous category which contains hotels/motels as well as a diverse collection of non-standard real estate assets (such as a dance hall) and this category has the lowest $L/V$ ratios. During the sample period the apartment category would have the lowest level of investment risk in the Vancouver market and this is reflected in the higher levels of debt financing. Provincial rent controls with rent increases related to inflation existed in Vancouver for most of the 1971–85 period. Even though these controls reduced the expected profitability of apartment investment, they also discouraged new apartment development, which caused very low vacancy rates in the Vancouver multifamily market over the period. The low vacancy levels reduced the risk associated with investing in existing apartment projects.

The coefficient for the transaction price variable indicates that higher priced investments have more debt in their capital structure. This finding confirms the fourth hypothesis that capital constraints in real estate equity markets are affecting capital structure decisions. The coefficient for the corporate ownership variable supports the fifth hypothesis and shows that corporate investors with higher tax rates (facing both corporate

\(^{22}\)These $R^2$ levels are similar to the explanatory power of other capital structure models in tests of the financing of non-real-estate corporations in the finance literature. See Bradley, Jarrell and Kim [2], Fischer, Heinkel and Zechner [4], and Wedig, Sloan, Hassan and Morrissey [23].

\(^{23}\)Tests of the statistical significance of the differences between the regression coefficients show that the apartment coefficient and the miscellaneous coefficient are both significantly different from the coefficients for the remaining commercial property types at the 1% level.
and personal income taxes) have higher $L/V$ ratios in their capital structures. The results for the interaction term in Run #2 with the combined corporate ownership and price variable shows that the corporate ownership form does offer investors access to more formal equity markets with lower fund-raising costs, causing the capital constraints to be less binding and less debt to be used by corporate investors in higher priced properties.

The coefficient for the interest-rate variable supports the sixth hypothesis regarding the effect of the cost of debt on the capital structure decision. The higher the market interest rate, the greater the cost of debt and the more binding is any DCR requirements, the lower the $L/V$ ratio in an investment.

The empirical results do not support the second hypothesis. The sign of the 1971 sale variable shows that, all else held constant, investors used relatively less debt in their capital structures in 1971 when compared to 1972-85, despite the less restricted tax-loss sheltering opportunities. This finding is the opposite of what was expected under the second hypothesis. This result should be viewed with caution since only a small number of transactions with at-market financing in the sample took place in 1971, a total of 37 out of the 759 observations.

CONCLUSION

This study has developed and tested a capital structure model for real estate investment. Six hypotheses concerning the optimal overall loan-to-value ratio in an investment are derived from the model and data from a sample of Vancouver income-property transactions are applied to estimate the relationship between capital structure and a set of variables representing the hypotheses. The empirical results strongly supported five of the six hypotheses. The level of debt financing used in an investment appears to be inversely related to the amount of non-debt tax shields (depreciation) available, to the costs of financial distress, and to the level of the market interest rate. Capital structure decisions in real estate also seem to be affected by capital constraints and the optimal loan-to-value ratio is directly related to the cost of the property. The evidence in these tests did not conform to the model proposition that less restricted tax-loss sheltering expands the use of debt financing by real estate investors.
An earlier version of this paper was presented at the 1988 American Real Estate and Urban Economics Association Meetings in New York and at seminars at the University of Texas (Austin and Arlington), University of Indiana, University of Wisconsin (Milwaukee), California State University (Fullerton), San Diego State University, and the Homer Hoyt Institute. We gratefully acknowledge the helpful comments of seminar participants with particular appreciation to Stuart Gilson, Art Houston, Hans Isakson, Paul Laux, Jane Londerville, Steve Magee, Dan Quan and Peter Rubinstein. We also wish to thank an editor, Pat Hendershott, and two anonymous referees whose careful reviews of an earlier draft led to substantial improvement. The Real Estate Council of British Columbia and the Social Sciences and Humanities Research Council of Canada provided financial support for data collection.

REFERENCES


