

AN EMPIRICAL STUDY ON RELATIONSHIP BETWEEN REAL ESTATE PRICES AND THE VALUE OF FIRMS IN KOREA *

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This paper sets out to investigate the relationship between changes in real estate prices and the value of firms and presents some tentative conclusions based upon its empirical findings.

The main hypothesis is that changes in the value of firms caused by expectations as to increasing real estate prices will be smaller in magnitude than these in the value of their real estate holdings since there will be a loss in the value of the firm occasioned by the perception of future growth opportunities forgone. The secondary hypothesis is that the loss in value caused by growth opportunities forgone will be proportional to the amount of debt financing taken up.

The empirical findings from a yearly cross-sectional test during 1987-91 are that the proportion of a firm's real estate holdings to its total assets had no significant effect on the return on investment in its stocks. However, the higher the debt ratio of the firm, the lower the coefficient of the real estate holdings, implying that the value loss of the growth opportunities forgone becomes larger, as the firm uses more debt. Also these results are not observed in size analysis. Accordingly, a debt effect is regarded to be rather clearer than a size effect in the impact on stock returns of the real estate holdings.

I. INTRODUCTION

During the past few decades, Korea has experienced a continuous and sharp increase in real estate prices. Demand for real estate has sharply increased particularly due to economic development and urbanization. On the other hand, the increase of the real estate supply has been relatively slow, due to the limited availability of land and various regulations. Lower returns on financial instruments

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resulting from financial controls and the underdevelopment of the financial system, have been another cause of the rise in real estate prices. In addition, speculative demand for real estate, fed by expectations of future price rises has increased real estate price to unprecedented levels.

Higher real estate prices are likely to have a malign effect on the national economy and firms for a number of reasons. First, they can cause a slowdown in the production activities of firms, because their production costs increase as the factor price of land rises. Second, the fact that capital gains from real estate investment are greater than normal labor income or normal profits of the firm can sap the work ethic and reduce managerial incentives. Third, a rise in real estate prices can distort wealth distribution among firms and individuals, due to differences in holdings of real estate. Despite these potentially serious effects, however, it is not known to what degree the rise in real estate prices affects firms' management.

This paper examines how significant increases in real estate prices influence investment activity and the value of the firm in Korea. In Korea, it is often said that past increases in real estate prices have resulted in the decline of firms' willingness to invest, thus hindering the development of the economy.

A traditional finance framework based on Nourse & Roulac(1993), who try to link real estate decisions to corporate strategy, is used for theoretical developments and the empirical tests utilize capital market data.

This paper consists of four sections. In section II, the effect of real estate price increase on a firm's value is derived theoretically. And in section III, we undertake empirical tests and report the results. Section IV presents our tentative conclusions.

II. THEORETICAL ANALYSIS OF EFFECTS OF CHANGES IN REAL ESTATE PRICES ON A FIRM'S VALUE

2.1 The case of no debt financing

As in Myers(1973), which examines the determinants of corporate borrowing, let us assume that the market is perfect so that there exist no market imperfections such as corporate taxes or bankruptcy costs. In addition, we assume that the market is complete so that an investor can construct any future income distributions he wants through a portfolio of pure securities.

Under this situation, Myers(1977) considers the case in which a firm at period 0 (current period) holds an investment opportunity which can be invested at period 1(future period). Since the firm has a new growth opportunity to invest in the future regardless of current assets, the total value of the firm consists of the following two values.

$$V = V_A + V_G \quad (1)$$

where V_A = the value of current assets which the firm holds now, and
 V_G = the value of the new investment opportunity of the firm.

For the analysis of the firm's growth opportunities, suppose that the firm decides whether to accept a new investment opportunity, after it knows the realized state at period 1, as in Myers(1977). Also suppose that the same quantity of real estate is needed for the investment opportunity regardless of the realized state.

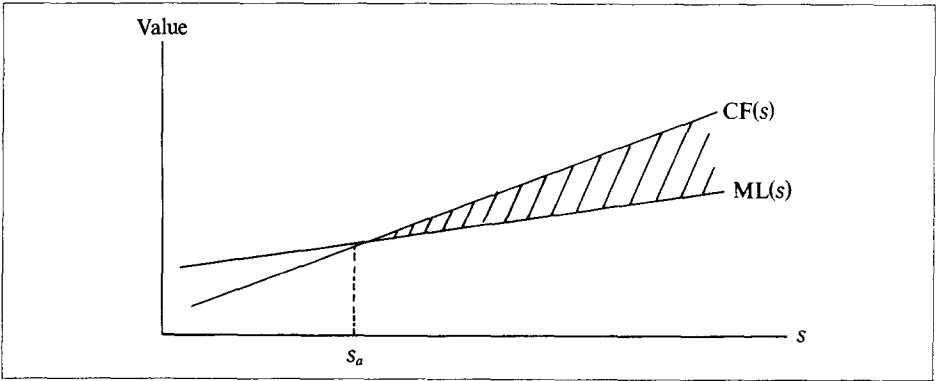
For the project, production factors other than real estate are also needed. Suppose that cash flows of the project, $CF(s,X)$, with the employment of production factors other than real estate in a given state, s , are determined as follows:

$$CF(s, X) = p(s) q(X) - W(s) X \quad (2)$$

where $p(s)$ = unit price of the product in a given state(s),
 X = quantity vector of production factors other than real estate,
 $W(s) = [W_1(s), W_2(s), \dots, W_n(s)]$,
 = price vector of production factors other than real estate in a given state(s), and
 $q(X)$ = production function with the factor input X .

The firm determines quantities of the factor input to maximize $CF(s,X)$ in a given state s . Let $CF(s)$ be the cash flow of the state s under the optimal employment of the factor input. And as in Myers(1977), if the states are arranged along the vertical axis as $CF(s)$ increases, the Figure 1 will be derived. Of course, $CF(s)$ does not have to be a linear function of s as in Figure 1.

[Figure 1] Determination of a firm's investment for growth opportunity under no debt financing



Suppose that the market value of the real estate needed for the project in state s at period 1 under the above premise is $ML(s)$. Also we assume that acquisition of the real estate is financed solely by equity and no additional debt financing is needed.

Then, the firm makes an investment only if cash flow $CF(s)$ exceeds the market value of the real estate, $ML(s)$. Otherwise it would reject the project. This case is shown in Figure 1. For the convenience of analysis, it is assumed that the real estate price in period 1 is a linearly increasing function of state s in Figure 1. This, of course, is not a binding requirement.¹⁾

As shown in Figure 1, the investment period for the firm's growth opportunity begins with state s_a . Therefore the pure value of the investment opportunity except the real estate value invested is represented as a shaded area in the Figure, and the value of the investment opportunity, V_G becomes as follows:

$$V_G = \int_{s_a}^{\infty} y(s) [CF(s) - ML(s)] ds \quad (3)$$

where $y(s)$ = current value of the pure security which pays one dollar at state s and pays none at the other states.

Suppose that the real estate price in state s in period 1 increases by ΔML for any reasons.^{2,3)}

Accordingly the amount needed for the purchase of the same amount of real estate in state s in period 1 increases to $ML(s) + \Delta ML$. Therefore, in this case the acceptance region for the investment opportunity begins with s_b , not s_a in Figure 2. Thus the net value of the firm's investment opportunity except the real estate cost, V_G , becomes as follows:

$$V_G = \int_{s_b}^{\infty} y(s) [CF(s) - (ML(s) + \Delta ML)] ds \quad (4)$$

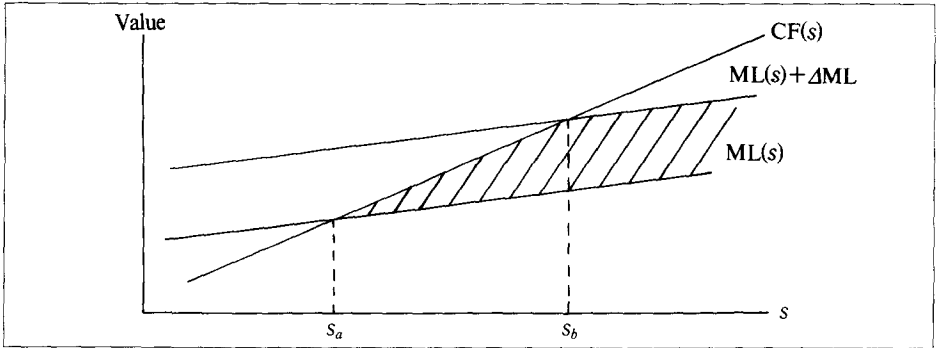
Thus when this value is compared with the value of the growth opportunity before the real estate price increase, the value of the growth opportunity decreases by the following value, ΔVG , as the price of the real estate rises:

¹ If the real estate price in period 1 does not change according to state, s , $ML(s)$ in Figure 1 will be horizontal.

² A more detailed analysis will be provided in section II of the background to real estate price increases.

³ If the size of real estate price increase in period 1 changes according to state, we can assume that the size of increase is $ML(s)$. Also under this assumption, the logic of this paper does not change. This paper assumes for convenience of analysis that the real estate price in period 1 increases by ΔML regardless of state.

[Figure 2] Changes in investment decisions for the firm's growth opportunity due to the real estate price increase under No Debt Financing



$$\Delta V_G = \int_{s_a}^{s_b} \gamma(s) [CF(s) - ML(s)] ds + \int_{s_b}^{\infty} \Delta ML \gamma(s) ds \quad (5)$$

That is, the value of the future investment opportunity of the firm decreases by a shaded area in Figure 2 due to the real estate price increase and thus the value of the firm's growth opportunity decreases by that amount.

However, the above results do not apply for the assets which the firm currently holds. That is, since the price of the assets currently held by the firm is reflected as a sunk cost, the firm's production opportunity will not be changed by even the current change in the asset price.

In order to see this, suppose that a firm has purchased real estate at a price of VL in period 0. Figure 3 represents the determination of a firm's production at this time. If it were not for additional expectations of an increase in price after a firm's purchase of real estate, it would be favorable for the firm to begin with production in period 1 when the future value (in period 1) for VL in period 0, $VL(1+r)$ (r : riskless interest rate), is less than $CF(s)$. Otherwise, it would be favorable⁴⁾ for the firm not to produce. Accordingly when there are no additional expectations of increase in real estate prices, the production period for existing real estate holdings of a firm begins with s_a in the Figure.

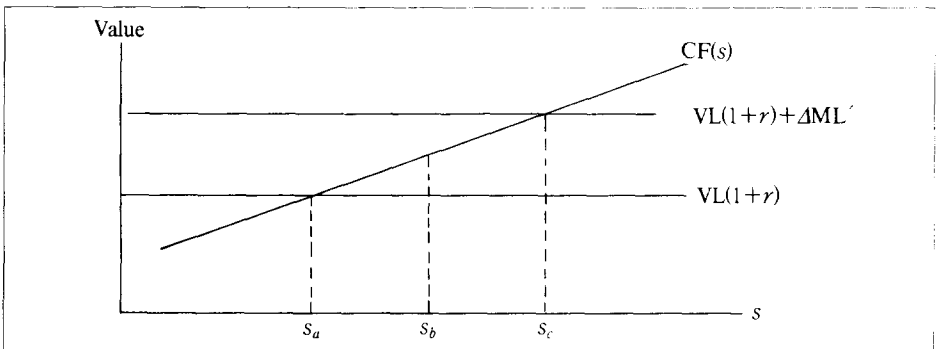
By the way, suppose that the real estate price of a firm is expected to increase by $\Delta ML'$ in period 1 after purchase.⁵⁾

⁴⁾ If present(period 0) real estate investment, VL , is converted into the future(period 1) value of certainty, the value is $VL(1+r)$. The determination of production in period 1 is appraised based on the value in period 1.

⁵⁾ The reason why we assume expected value on real estate price increase in period 1 as $\Delta ML'$ regardless of state is that we analyzed conveniently. Even if it is assumed that an increase in real estate prices is a function of state s , that is, $\Delta ML'(s)$, it does not affect the logic of this paper.

If a firm does not hold real estate at this time, production does not begin at a point such as s_c . However, if a firm has already purchased real estate in period 0, production begins at the point s_c . The reason is that in case production begins with the point s_c , the profit of net investment, $CF(s_c) - VL(1+r)$, which is the production revenue minus acquisition cost, is greater than 0. Also since the real estate price of the firm after its production in period 1 is expected to increase by $\Delta ML'$, the firm acquires capital gain due to the increase in real estate value as well as the profit from production.

[Figure 3] Determination of a firm's production with existing assets held due to the real estate price increase



In the end, this kind of logic holds for all s in $s_a < s < s_b$ in the above Figure. Therefore the value of existing assets held by the firm due to the real estate price increase, V_A is as follows:

$$V_A = \int_{s_a}^{\infty} y(s) [CF(s) - VL(1+r)] ds + (VL + \Delta VL) \quad (6)$$

$$\text{where } \Delta VL = \Delta ML' \int_{s_a}^{\infty} y(s) ds = \frac{\Delta ML'}{1+r}, \text{ and}$$

ΔVL = amount of increase in real estate value now($t=0$)
due to $\Delta ML'$ of real estate price increase in period 1.

If we follow this logic, it is expected to lead to an one to one relationship between increases in the present value of real estate(ΔVL) and those in the value of a firm's existing assets(V_A). That is,

$$\frac{\Delta V_A}{\Delta VL} = 1 \quad (7)$$

Therefore other things being equal, and if capital markets are efficient, the existing value of a firm's assets generally increases by the amount of increase in real estate value. The reason is that even if it is expected that the price of existing real estate held by the firm will increase, this does not affect at all the production opportunity with the existing assets held by the firm. Since capital markets are efficient, V_A changes by the amount of change in V_L if change in real estate value is rapidly and fully reflected in the value of the firm.

Meanwhile, expectations of a real estate price increase (decrease) limit (increase) the growth opportunity of the firm and then decreases (increases) the value of the firm's growth. Accordingly, the amount needed for additional investments in future real estate is inversely related to the growth value. Furthermore, it is expected that the growth value of a firm decreases (increases) according to the increase (decrease) in the existing real estate holdings of a firm as well as increase (decrease) in the additional real estate investment needed for growth opportunity.

That is,

$$\frac{\Delta V_G}{\Delta V_L} < 0 \quad (8)$$

The reason is that it can be expected that $\Delta V_G/\Delta ML$ will be less than 0 according to the logic above. Here if we assume that the amount of real estate holding needed additionally for the future growth opportunity investment is ΔL and additional expected value of price for a unit of real estate in period 1 is ΔP_1 , then ΔML is equal to $\Delta P_1 \cdot \Delta L$.⁶⁾

Also if we assume that the amount of existing real estate holdings of a firm is L , V_L is as follows.

$$\Delta V_L = \Delta ML' \int_{-x}^x y(s) ds = \Delta P_1 L \int_{-x}^x y(s) ds \quad (9)$$

By the way, (8) is decomposed as follows.

$$\frac{\Delta V_G}{\Delta V_L} = \frac{\Delta V_G}{\Delta ML} \cdot \frac{\Delta ML}{\Delta V_L} = \frac{\Delta V_G}{\Delta ML} \cdot \frac{\Delta L}{L} / \int_{-x}^x y(s) ds \quad (10)$$

As long as $\Delta L/L$ in (10) is positive(+), $\Delta V_G/\Delta V_L$ becomes negative(-). Accordingly the growth opportunity value of a firm is inversely related to the value of the existing real estate. Therefore if we integrate (7) and (10), we can derive the

⁶ If the amount of price increase in a unit of real estate in period 1 is dependent on state, the amount of price increase becomes $\Delta P(s)$.

following conclusion.

$$\frac{\Delta V}{\Delta VL} = \frac{\Delta V_A}{\Delta VL} + \frac{\Delta V_G}{\Delta VL} < 1 \quad (11)$$

That is, the change in total value of a firm due to change in the value of existing real estate holdings is less than unity. The reason is that even if the existing asset value of a firm increases by the amount of real estate value increase according to expectations of real estate price increases, these will decrease the growth value of the firm.

We analyze the effect due to change in expectations on real estate price increase in period 1 above. Apart from this, however, there exists an additional reason why a price increase in the existing real estate of the firm is inversely related to its growth opportunity value.

Let us suppose that the price of the firm's real estate holdings has increased by ΔP_0 in period 1. At this time, the value of existing real estate of the firm in period 0, VL , increases by $\Delta P_0 \cdot L$, and then the value of existing asset holding of the firm, V_A , increases by $\Delta P_0 \cdot L$.

However, price increase in a unit of real estate in period 0 gives rise to additional expectations on price increase in future real estate. In order to analyze these effects, we express (10) as follows:

$$\frac{\Delta V_G}{\Delta VL} = \frac{\Delta V_G}{E(\widetilde{\Delta ML})} \cdot \frac{E(\widetilde{\Delta ML})}{\Delta VL} \quad (12)$$

where ΔVL = increase in real estate which a firm holds now(period 0), and

$E(\widetilde{\Delta ML})$ = expected amount of additional real estate investment in period 1(future) for growth opportunity.

(12) modifies (10) for the convenience of the analysis of the following problem. Here ΔML in period 1 is regarded as a stochastic value, not as a certain value. Since the investment opportunity of a firm decreases when the expected amount needed for future real estate investment increases, $\Delta V_G/E(\widetilde{\Delta ML})$ is clearly less than 0. However, total sign of $\Delta V_G/\Delta VL$ is influenced by the size of $E(\widetilde{\Delta ML})/\Delta VL$. Incidentally, $E(\widetilde{\Delta ML})/\Delta VL$ can be expressed as follows:

$$\frac{E(\widetilde{\Delta ML})}{\Delta VL} = \left(\frac{\Delta P_0 + E(\widetilde{\Delta P_1})}{\Delta P_0} \right) \cdot \frac{\Delta L}{L} \quad (13)$$

where ΔP_0 = amount of price increase for a unit of real estate in period 0 (now),

$E(\widetilde{\Delta P_1})$ = expected amount of additional price increase for a unit real estate in period 1(future),

ΔL = amount of real estate needed additionally for growth opportunity in period 1(future), and

L = amount of real estate which a firm holds in period 0 (now).

Here $\Delta L/L$ is positive(+) as long as L is greater than 0. Accordingly, the total sign of $\Delta V_G/\Delta VL$ depends on the sign of the parenthesized bracket.

Here

$$\text{If } E(\widetilde{\Delta P_1})/\Delta P_0 > -1, \text{ then } \frac{\Delta V_G}{\Delta VL} < 0 \quad \text{and,}$$

$$\text{If } E(\widetilde{\Delta P_1})/\Delta P_0 \leq -1, \text{ then } \frac{\Delta V_G}{\Delta VL} \geq 0. \quad (14)$$

However, when we consider the actual price formation process in the Korean real estate market, the ratio $E(\widetilde{\Delta P_1})/\Delta P_0$ is generally expected to be greater than -1 . This is because, under the general assumption that the price formation of the real estate follows a random walk, $E(\widetilde{\Delta P_1})$ is on average approximately 0. In this case the above ratio, $E(\widetilde{\Delta P_1})/\Delta P_0$ is evidently greater than -1 .

In addition to this, price bubbles are believed to be strong in the Korean real estate market. The asset price bubble is dependent on several factors such as a rational bubble, an information bubble and fads. But the reason why a price bubble once formed lasts for a long time is that destabilizing speculation exists in the market.⁷⁾

Then investors expect that the future price will also rise as the current price increases. As a result, an excess demand for an asset lasts so that the asset price increase continues for long periods.

In fact, the above phenomenon is continuously evidenced in the Korean real estate market. In the meantime, if we analyze the background to the real estate price increase in Korea, once real estate prices increase, investors on the street expect that real estate price increases will become larger since the real estate brokers or the press stir them up. Accordingly, the demand for purchase of real estate increases prior to an anticipated rise, and then prices do in fact increase. The price increase again stimulates demand for real estate, producing the vicious circle between price increases and a rise in demand.

It is not still clear how serious the phenomenon of destabilizing speculation is

⁷ Refer to Kyungwhan Kim(1991) concerning factors of price bubble formation and the phenomenon of a destabilizing speculation.

in the Korean real estate market. However, according to Kim's recent study (1991), it is generally estimated that price bubble effects are continuously presented in Korean real estate prices.⁸⁾

If destabilizing speculation dominates Korean real estate prices, the relationship between ΔP_0 and $E(\Delta P_1)$ is expected to be positive. The reason is that the increase in the current price of real estate induces an expectation of an additional future price increase, and then the ratio of $E(\Delta P_1)$ to ΔP_0 is expected to change in the same direction.

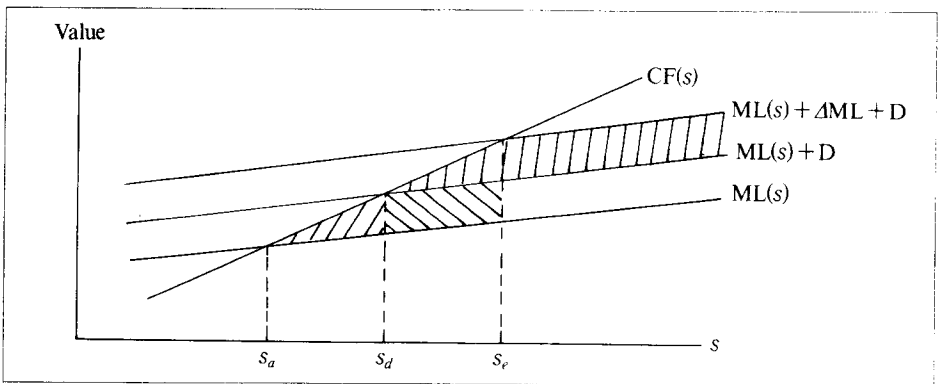
Therefore in view of the realities of Korean real estate markets such as the above, the sign of $\Delta V_G / \Delta V_L$ is generally expected to be negative(-).

2.2 The case with a debt financing

Myers(1977) analyzes a firm's growth opportunity value when debt financing occurs. His analysis shows that if the debt matures after the firm's state is known, then the value of the firm's growth opportunity decreases when the project is financed with debt.

That is, since a firm selects the growth opportunity from the point s_a at the intersection point of the amount of real estate investment, $ML(s)$, in period 1 and the line $CF(s)$ in case of no debt use, the value of a firm's growth opportunity is given as in equation (4) above.

[Figure 4] Changes in investment decisions due to real estate price increases in case of debt financing



⁸ According to Kim's study(1991), it is estimated that price bubbles such as the growing rational bubble are long run features that are continuously included in land prices whether price nominal or real. It was estimated that a rational bubble existed continuously during '82-'90 in nominal land prices and during '85-'90 in real land prices. On the other hand, it is estimated that a price bubble did not exist for real housing prices, but one continuously existed for nominal housing prices during '87-'90.

In contrast, if the firm makes a debt contract to repay the amount D at period 1, the investment for the growth opportunity begins at the point s_d . In this case, the shareholders' value for the growth opportunity VE_G , the debt value VB_G , and the total value for the growth opportunity VD_G are given as follows:

$$\begin{aligned} VE_G &= \int_{s_d}^{\infty} y(s) [CF(s) - \{ML(s) + D\}] ds \\ VB_G &= \int_{s_d}^{\infty} y(s) D ds \\ V_G &= VE_G + VD_G = \int_{s_d}^{\infty} y(s) [CF(s) - ML(s)] ds \end{aligned} \quad (15)$$

Therefore when the firm uses debt, the loss of the growth opportunity is represented by the shaded area with slanted lines in Figure 3, and the value loss for this case is represented as follows:

$$\Delta V_G = \int_{s_d}^{s_d'} y(s) [CF(s) - ML(s)] ds \quad (16)$$

Suppose now that the amount of real estate investment needed for the firm in period 1 is expected to rise by ΔML .⁹

Then, since in this case the investment for the future growth opportunity begins at the point s_e in Figure 3, the net value of the opportunity for the shareholders is given as follows:

$$VE_G = \int_{s_e}^{\infty} y(s) [CF(s) - (ML(s) + \Delta ML + D)] ds \quad (17)$$

Also, the value of the debtholder receiving D at period 1 is given as:

$$VD_G = \int_{s_e}^{\infty} y(s) D ds \quad (18)$$

Thus, the total value of the growth opportunity represented by the sum of the value of the shareholders and that of the debtholders is as follows:

$$V_G = \int_{s_e}^{\infty} y(s) [CF(s) - \{ML(s) + \Delta ML\}] ds \quad (19)$$

When this value is compared with the total value of the debt-use firm for which the expected amount of real estate investment needed is $ML(s)$ only, the amount of real estate investment in period 1 increases by ΔML . Thus it can be

⁹ Also here, even if it is assumed that the amount of real estate investment in period 1 increases by $\Delta ML(s)$, the logic of this paper does not change.

shown that the value of the firm's growth opportunity decreases in total by the following amount:

$$\begin{aligned}\Delta V_G &= \Delta VE_G + \Delta VD_G \\ &= \left\{ \int_{s_d}^{s_e} y(s) [CF(s) - (ML(s) + D)] ds + \Delta ML \int_{s_d}^x y(s) ds \right\} + D \int_{s_d}^{s_e} ds \quad (20)\end{aligned}$$

The first term VE_G on the right-hand side of the equation corresponds to the shaded area with vertical lines in Figure 3. This value loss is equivalent to the value loss of the firm with no debt financing.

When the firm uses debt, however, it loses an additional value represented by the shaded area with horizontal lines in Figure 3. The value of the future growth opportunity when using debt decreases additionally by ΔVD_G , in comparison with that with no debt financing. Therefore, when real estate prices increase, the value decrease for the future growth opportunity becomes larger according to how heavily the firm uses debt financing.

Then, who bears this value loss in the end? Myers(1977) showed that, assuming the rational expectation of debtholders, the shareholders ultimately bear the value loss of the growth opportunity. That is, if debtholders rationally expect that this kind of value loss will occur in advance, they would reflect the loss in the financial contract in terms of interest or the price of the financial claim. Thus the loss is transferred to the shareholders in the end.

According to this argument, the additional value loss, ΔVD_G is expected to be borne ultimately by the shareholders. Also if we assume that all profits and losses due to the real estate price change belongs to the shareholders in the end, the change of the shareholders' value due to the real estate price increase will be adjusted as follows:

$$\frac{\Delta VE}{\Delta VL} = \frac{\Delta VE_A}{\Delta VL} + \frac{\Delta VE_G}{\Delta VL} < 1 \quad (21)$$

where VE = total capital value of a firm,
 VE_A = equity value for assets currently held by the firm, and
 VE_G = equity value for a firm's new investment opportunity.

Since the decrease in the value of the growth opportunity is greater as the debt ratio becomes greater in case of debt-use firm, other things being equal, changes in the equity value due to change in the real estate price, $\Delta VE/\Delta VL$, are expected to become much less than unity as a firm's debt ratio becomes higher.

2.3 Real productivity and the value of the growth opportunity

In the above discussion we did not consider the cause of the real estate price increase. However, depending on what its causes are, the effect on the firm's growth opportunity value may be different. For example, suppose that the marginal productivity per unit of the real estate increases due to some external factors. In this case, other things being equal, the demand for the real estate will increase as the marginal productivity increases. Further, if the supply of its real estate is limited or increases too slowly to meet demand, then its price rises.

However, if the real estate prices's increases are caused by a marginal productivity increase, the value loss of the firm's growth opportunity would not occur. For example, suppose that the production function $q(x)$ changes to $q'(x)$ as in (II-18), as the marginal productivity of the real estate increases.

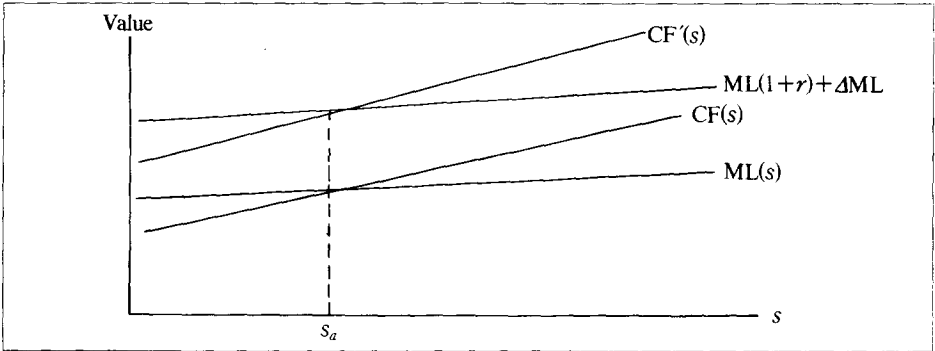
For all s ,

$$\frac{\partial q'(x)}{\partial x_i} > \frac{\partial q(x)}{\partial x_i} \text{ (for all } x_i\text{)}$$
(22)

where $x_i = i^{th}$ production factor

In this case, as the firm's productivity increases, its cash flows also increases. By the way, if expected cash flows in each state along with expectations of real estate price increase both rise as much as the amount of expected increase in real estate price, the value of the firm's growth does not change. That is, suppose that the real estate price rises from $ML(s)$ to $ML(s) + \Delta ML$ and that the firm's cash flow in each state increases from the original $CF(s)$ to $CF'(s)$ as the marginal productivity of the real estate increases. Then, as shown in Figure 4, even though the real estate price rises, the beginning acceptance point of the new investment

[Figure 5] Determination of investment decisions for the firm's growth opportunity due to real estate price increase in case of marginal productivity increase



opportunity is still maintained at s_a . Therefore, the value of the growth opportunity does not change even though the real estate price rises.

The above result offers the basis for the next empirical test. If the main cause of the real estate price increase was due to the productivity increase, the firm's growth opportunity value is not influenced by the real estate price change. If other things are equal and capital markets are efficient so that the change in real estate price is properly reflected in the firm's market value (or equity value), then the firm's market value will change by the same amount as the real estate value change.

On the other hand, if the real estate price increase was due to a bubble price unaccompanied by the firm's real productivity increase or if the real estate price increase exceeds the productivity increase, the value of the firm's growth opportunity will diminish.

III. EMPIRICAL ANALYSIS

3.1 Hypotheses and Model Building

We propose the following hypotheses drawing on the results in section II:

$$\begin{aligned} H_0 : \Delta VE_t / \Delta VL_t &= 1 \\ H_1 : \Delta VE_t / \Delta VL_t &< 1 \end{aligned} \quad (23)$$

where ΔVE_t = incremental value of the firm's equity at t , and
 ΔVL_t = incremental value of the firm's real estate at t .

The null hypothesis is consistent with the hypothesis that expectations of a real estate price increase are caused by the improvement in the real marginal productivity of the real estate.

It was analyzed above in section II that the equity value of a firm would increase by the amount of increase in real estate value, since the value loss of a firm's growth opportunity is not caused even by a real estate price increase in case the marginal productivity of real estate increases. However, the rejection of the null hypothesis can be accepted as evidence supporting the hypothesis that expectations of a real estate price increase are formed by a bubble. If expectations of a real estate price increase are formed by the price bubble with only an accompanying increase in marginal productivity, the expectations constrain the firm's growth opportunity and then it is expected that the amount of equity value rise due to real estate price increase will be less than that of real estate value increase.

However, the above interpretation needs some preconditions. First of all, it

presupposes informational efficiency of capital markets so that all the information about increases and decreases in real estate value are fully and promptly reflected in stock values in capital markets. If capital markets are efficiently responsive to information related to real estate, it is very difficult to judge whether rejection of null hypothesis is caused by informational inefficiency of markets or a real estate price bubble. Thus the above hypothesis is a joint hypothesis along with informational efficiency of markets.

Second, in reality changes in equity value of a firm are influenced by several factors such as financial risks as well as changes in real estate value. Thus incremental value of equity in the hypothesis (23), ΔVE , should be apprehended as an incremental effect rather than this effect. So proper control for factors other than real estate is required.

Third, it is supposed in making the above hypothesis (23) that changes in real estate value do not affect debt value. That is, it is regarded that all the effects due to changes in real estate value are reflected in equity value. If the incremental effect on a firm's value due to changes in real estate value is partly reflected in the debt value, the effect on equity value can differ from this effect, even though there is an one to one linkage running between changes in real estate value and a firm's market value.

In fact, in a situation where loans against real estate collateral are general practice in the case of financial institutions' loans as in Korea, the possibility that changes in real estate value affect debt value is great. However, since the clear effects of this are not known as of now, let us leave this effect out of consideration in this paper.

In order to test the hypothesis (23), both the numerator and the denominator of (23) are divided by VE_{jt-1} . Then we obtain the following null hypothesis for the j^{th} firm.

$$\frac{\Delta VE_{jt}}{VE_{jt-1}} / \frac{\Delta VL_{jt}}{VL_{jt-1}} \cdot \frac{VL_{jt-1}}{VE_{jt-1}} = 1 \quad (24)$$

where VE_{jt-1} = equity value of the firm at t-1, and

VL_{jt-1} = value of the firm's real estate at t-1.

Thus the above equation can be rearranged as follows:

$$R_{jt} = R_{Lt}^j \cdot \frac{VL_{jt-1}}{VE_{jt-1}} \quad (25)$$

where $R_{jt} = \Delta VE_{jt}/VE_{jt-1}$ = return on j^{th} stock at t, and

$R_{Lt} = \Delta VL_{jt}/VL_{jt-1}$ = rate of increase for the j^{th} firm's real estate value at t.

Suppose that rates of the real estate value increase, $R_{L,t}^j$, are equal for all firms denoted as $R_{L,t}$. Further, in order to control the effects other than that of the real estate price change, suppose that the stock return, R_{jt} is basically determined by the following market model:

$$\widetilde{R}_{jt} = \alpha_j + \beta_j \widetilde{R}_{mt} + \widetilde{\varepsilon}_{jt} \quad (26)$$

where α_j = an intercept,

β_j = a regression coefficient of the market portfolio,

\widetilde{R}_{mt} = the market portfolio return, and

$\widetilde{\varepsilon}_{jt}$ = an error term satisfying the Ordinary Least Square estimation conditions.

Then if the two equations above (25) and (26) are joined, the following equation is derived:

$$\widetilde{R}_{jt} = \alpha_{jt} + \beta_j \widetilde{R}_{mt} + R_{L,t} \frac{\widetilde{VL}_{jt1}}{VE_{jt1}} + \widetilde{\varepsilon}_{jt} \quad (27)$$

However, it is impossible to estimate the coefficients using the equation (27) itself. The reason is that time-series data about the real estate ratio needed to estimate the equation III-5 are not available. In order to avoid these problems, the method which Black, Jensen & Scholes(1972) and Fama & McBeth(1973) used in testing the validity of CAPM can be used.¹⁰⁾

That is, in the first step, the coefficient, β_j , is estimated through the equation (26), using time-series data about rates of stock return of each sample firm. And then the coefficients, γ_0 , γ_1 , and γ_2 of the following equation are estimated using cross-sectional data at time t, with β_j estimated in the previous step and the real estate ratio as an independent variable and rates of stock return at time t as a dependent variable.

$$\widetilde{R}_{jt} = \gamma_0 + \gamma_1 \widehat{\beta}_j + \gamma_2 \frac{\widetilde{VL}_{jt1}}{VE_{jt1}} + \widetilde{\varepsilon}_{jt} \quad (28)$$

where $\widehat{\beta}_j$ = beta of firm j estimated through a market model

The coefficient with which we are concerned especially in the equation (28) is

¹⁰ Of course, the method used here is not completely the same as that of Black, Jensen & Scholes (1972) and Fama & McBeth(1973). In particular, they use a method which estimates the coefficients through portfolio construction to improve the efficiency of estimation.

γ_2 . If the argument mentioned above is right, the coefficient, γ_2 , should be equal to R_L under the null hypothesis of the equation (23).

3.2 A single-factor model and a multi-factor model

The equations (27) and (28) in the previous section again raise the question whether basic return generating structure in capital markets is a single-factor model or a multi-factor model and the traditional question about the validity of CAPM.

As known well, the conclusion supporting CAPM generally was made¹¹ according to the results of a test on the validity of CAPM by Black, Jensen & Scholes(1972) and Fama & McBeth(1973) through a model similar to the equation (28).

However, Banz(1981), Reinganum(1981), Keim(1983) and Basu(1983), etc. discovered that the variables such as P/E ratio and firm size other than beta would be important factors explaining asset returns. Also Brennan(1970) and Litzenberger & Ramaswamy (1979) established that dividend returns would be an important factor affecting expected returns on asset if personal income tax existed.

Those studies selected different methods to improve the efficiency of estimation. But the method is basically the same for most studies. That is, first of all, beta is estimated using a market model such as the previous equation (26). And after the portfolio construction based on the estimated beta, a cross-sectional regression for each portfolio in the next period which involves estimated beta and other variables is performed using a model constructed similarly to equation (28).¹²

But the variables other than beta involved in a cross-sectional analysis are different according to the object of study.

From its point of view, equation (28) can be regarded as a model testing a multi-factor characteristic of stock returns. Of course, equation (28) is not a model derived by the equilibrium condition. However, if the coefficient, γ_2 , is discovered to be significant through cross-sectional analysis using equation (28), it provides evidence that CAPM is a misspecified model which does not involve real estate ratio as an important variable of stock return determination. However, if the

¹¹ Their results generally support a zero-beta CAPM rather than the traditional CAPM of Sharpe-Lintner-Mossin.

¹² In most studies, beta re-estimated in the next period, not beta estimated in the portfolio construction period, is used for cross-sectional regression analysis. Also there are several methods for cross-sectional analysis such as OLS method based on the assumption of homoscedastic error term(ex. Fama & McBeth) and GLS method based on the assumption of heteroscedastic error term(ex. Black & Scholes(1974)). Notably, for efficient estimation, Litzenberger & Ramaswamy used GLS and Maximum Likelihood Estimation(MLE) methods, considering errors of a market model and estimation errors of beta, not using the estimation method based on portfolio construction.

coefficient, γ_z , is not different from 0 in a statistical sense, CAPM is judged to be a well-specified model for the real estate ratio.

As is well known, firm-specific factors are not priced by a diversification effect from the viewpoint of portfolio theory. The real estate ratio of a firm corresponds to an unsystematic factor which is not related to a market factor. Accordingly, if CAPM is right, the responsive coefficient, γ_z , for the real estate ratio in the equation (28) will show a value near 0 in a statistical sense. But since many studies suggest the possibility that CAPM is a misspecified model, it is an empirical subject of interest whether real estate holdings ratio of a firm can explain such factors or not.

3.3 The Sample and Test Procedures

The effect of the real estate price change is analysed with the equations (26) and (28). For this analysis, a sample was selected according to the following procedures:

- 1) listed manufacturing firms except wholesale and retailing firms for the period of 1987-1991
- 2) firms for which sixty monthly rates of returns for the past 5 years including the current year were available for the period 1987-1991.

The total number of the sample selected according to the above two rules was 1,319. Then for those firms, book-value of land holdings, paid-in capital, total assets and debt amounts were examined. And using such data, the ratio of the real estate value to equity value of each firm was calculated based on book-value year by year.

The ratio of the real estate value to equity value in (28), (VL_{it} / VE_{it}) should be based on the market value. But as the market values of the real estate of each firm are not observable, the ratios were calculated based on the book-value.¹³⁾

Also, the firm's real estate includes buildings and equipment as well as land. But since the effect of the land price change was the most serious in Korea, only land was included in the analysis.

Using the above data, we take the following procedures:

- 1) Time-series regression analyses are made for the equation (26), using monthly stock returns of each firm as a dependent variable and stock market returns

¹³⁾ A considerable limitation of this paper is that the real estate holdings ratio here is based on book-value, not market-value. However, if the degree of alienation for market-to book-value is almost the same for real estate and equity, the ratio calculated based on book-value can be used as a proxy for the ratio based on market-value. Also if the degree of alienation for book-to market-value for real estate and equity is the same for all firms, the effect of alienation will be involved in the coefficient, r in the equation(28).

as an independent variable for the period 1987-1991. As a result, market parameters α_j and β_j for each firm are estimated. In the regression, monthly return data for sixty months of the past 5 years including the current year are used and returns based on the Korean composite stock price index(KOSPI) are used as the market return.

2) Using the equation (28), a cross-sectional OLS regression analysis is made using all the samples of the firm.¹⁴⁾

In the regression, β_j of each firm estimated in the previous step and the ratio of equity value to book value of real estate holdings are used as independent variables. At this time the value of the previous year from the period of a cross-sectional analysis is used for the ratio of real estate holdings. And yearly returns calculated based on each firm's monthly returns are used as a dependent variable.

3) If we follow the above logic, yearly γ_2 estimated in the equation (28) needs to be compared with the yearly rate of price change for the land realized for the corresponding year. If there is no large difference between γ_2 and the realized yearly land return, then the null hypothesis is accepted. Otherwise the null hypothesis is rejected.

The rates of price increase for land realized during the period 1987-1991 based on land price index by use and by the classification of land categories released by the Ministry of Construction are shown in the following table. As shown in the table, total land prices during the period 1987-1991 in Korea recorded a 21.52% increase on average. Especially during the period 1988-1989, the rate of land price increase was the largest. Average national land prices increased by 31.97% in 1989, showing the largest rate of increase out of the five years analyzed. In the case of land for industrial use, the price increased by 30.34% in 1988, and from the viewpoint of the classification of land category, the price increase of land for industry use was larger than that of land for commercial use. For example, price of land for commercial use during the period 1987-1991 increased by 19.88% on average, while price of land for industrial use increased by 24.13%.

¹⁴ In case of a cross-sectional analysis for the equation (28), the estimation method based on the portfolio construction is, in general, used to improve the efficiency of estimation. Also in order to solve the problems such as measurement errors of beta, or heteroscedasticity of errors, GLS or MLE methods other than OLS are used. In this paper, the GLS and MLE methods suggested by Litzenger & Ramaswamy(1979) as well as the OLS method were used in the estimation. However, according to the estimation results of GLS and MLE, the efficiency was not improved much when compared with OLS estimation results, and since in some cases estimation coefficients were shown to be insignificant, estimation results by OLS method only are suggested.

[Table 1] Rate of price increase by land use and by classification of land category during the period 1987-1991*

		87	88	89	90	91	average
1	national average	14.67	27.33	31.97	20.58	12.78	21.52
	commerce area	14.46	24.77	29.89	20.96	12.22	20.46
	industry area	27.81	27.45	32.36	22.10	15.96	25.14
2	for commercial use	15.10	26.47	24.35	19.50	13.97	19.88
	for industrial use	29.68	30.34	26.62	21.64	15.08	24.13
3	inflation rate**	3.0	7.1	5.7	8.6	9.3	

* Rates of price increase in 1987-1989 are actual values on the basis of the end of 4/4 quarter, and those in 1990-1991 are actual values on the basis of the end of the value of January for the corresponding year.

** Based on consumer price index.

IV. RESULTS

4.1 Cross-sectional results by year

Table 2 shows the cross-sectional results by year. It will be seen from the table that the coefficients of the real estate holdings ratio, γ_2 , are close to zero for the period '88-'90 except for '87 for which the figure is 1.24%.

On the other hand, the coefficient of γ_2 for '91 is significantly negative with 1.93% at a 95% significance level. Notably the response coefficient to beta, γ_1 , is also significantly negative, implying that the specific situation in the '91 stock market are reflected in the coefficients γ_1 and γ_2 . Actually in '91, the Korean stock market was generally bearish. Considering these results, the degree of the effect of stock returns on firms' real estate holdings is generally estimated to be almost zero in the Korean stock market.

When compared with the fact that the rate of national land price increase is on average over 20% for the period '87-'91, the coefficient, γ_2 , is overwhelmingly lower. This result can be interpreted as an evidence to support the null hypothesis that increases in real estate prices are mainly due to price bubbles rather than to marginal productivity increase in real estate in Korea.

That is, the real estate price increase is a factor which increases the stock price by increase in the value of the firm's assets, while also a factor which serves to depress the stock price by reducing the firm's growth opportunity value.

These two effects largely offset each other, leaving precise interpretation of the coefficient, γ_2 , unclear.

[Table 2] Cross-sectional results by year

(unit: %)

year(# of sample)	γ_0 (t)	γ_1 (t)	γ_2 (t)
87 (208)	3.5213*** (4.36)	3.7975*** (5.38)	1.2368 (1.06)
88 (248)	0.5131 (0.97)	4.0133*** (9.34)	-0.7760 (-0.78)
89 (286)	1.6046*** (4.65)	0.3394 (1.09)	-0.2343 (-0.37)
90 (288)	-0.6752** (-2.23)	-0.9807*** (-3.31)	-0.3461 (0.74)
91 (289)	2.6172*** (4.57)	-4.6392*** (-7.97)	-1.9304** (-2.25)

*, **, *** are significant at the 10%, 5% and 1% significance level respectively, and t represents Student t value.

However, the above interpretation seems unreasonable on the following grounds. First of all, it is reasonable that the information about the firm's real estate holdings is interpreted to have a weak effect on the stock returns. In other words, the variable of a firm's real estate holdings in the CAPM framework implies a nonsystematic factor which is not reflected in stock returns. Second, a firm's actual holdings of real estate are not public being its private information so that the actual value can differ from that represented by book-value.

Accordingly, it can be interpreted that stock returns are estimated not responsive to the information about the real estate holdings on financial statements.

On the other hand, as can be seen from Table 2, the coefficients γ_0 and γ_1 are statistically significant. If CAPM holds true, γ_0 should be identical with the riskless rate of return or the rate of return on a zero-beta portfolio. And γ_1 should be identical with the risk premium of the market portfolio.¹⁵⁾

Here this kind of test is omitted. However, the cross-sectional results generally prove that these two variables are important explanatory variables in explaining stock returns in the Korean stock market.

¹⁵ Refer to the papers cited in section 3.2 for further details about this.

4.2 Yearly cross-sectional results by debt ratio

Theoretically, the expectation is that the higher the debt ratio, the lower will be the coefficient γ_2 . Table 3 shows the empirical results in respect of this effect. Table 3 is a summary of the cross-sectional regression results obtained when the samples are classified by the debt ratio every year for the period '87-'91.

The debt ratio used is the ratio of book-value debt to asset-value for the previous year of the cross-sectional analysis period. Theoretically, the degree of the loss of the growth opportunity value depends not on the amount of the existing debt of the firm, but on the amount of the debt taken on for the new investment opportunity. However, since it is difficult to get hold of details of the financing planned for the growth opportunity, it is assumed here that the financing for the opportunity is identical to that represented by the existing capital structure of the firm.¹⁶⁾

In Table 3, γ_2 for the high-debt firm is generally lower than that for the low-debt firm. The size of γ_2 for the high-debt firm in '87 is lower by 3.44% than that for the low-debt firm. In '88, the former is 2.69%, while the latter is -4.26% at a 95% significance level, representing a gap of 6.95%.

Also in '91, the former is 1.86%, while the latter is -3.26% at a 95% significance level, representing a 5.13% gap. Accordingly, for 3 years out of the 5 years analyzed, the former is lower than the latter. For the same 3 years, the size of γ_2 systematically decreases as the debt ratio increases. This result is consistent with the theory that the higher the firm's debt ratio, the larger the loss of the growth opportunity value will be.

Most notably, γ_2 for the high-debt firms is significantly negative in 2 years out of the 5 years, suggesting that for a high-debt firm, the higher the real estate holding, the more the rate of stock returns tends to decrease. Accordingly the empirical result for the analysis by debt ratio supports the theory generally, unlike in the result for the analysis by year.

Only in '89 is γ_2 for a low-debt firm insignificantly negative. On the other hand, γ_2 for a high-debt firm is almost zero and the difference of γ_2 value between a low-debt and a high-debt firm is not significant. So empirical evidence support of the theory is not consistent over all the years.

¹⁶ If the existing capital structure of the firm reflects the optimal capital structure and the financing for the new investment opportunity is raised according to the optimal target value, the capital structure for the growth opportunity will be identical to the existing one.

[Table 3] yearly cross-sectional results and firm size

(unit : %)

year	size	γ_0 (t)	γ_1 (t)	γ_2 (t)
87	small (69)	5.3545*** (3.99)	0.5012*** (0.41)	3.9147*** (1.55)
	middle (69)	0.5276 (0.24)	6.9208*** (3.63)	1.6935 (0.56)
	large (68)	3.0665** (2.23)	4.6410*** (4.40)	0.4736 (0.30)
88	small (82)	0.9590 (1.42)	1.7438*** (2.68)	2.6932 (1.58)
	middle (82)	0.2584 (0.29)	3.9284*** (5.68)	0.1011 (0.06)
	large (84)	1.1963 (0.98)	4.9925*** (5.74)	-4.2621** (-2.32)
89	small (95)	1.5944*** (2.66)	0.6749 (1.33)	-2.8808* (-1.72)
	middle (95)	1.7275*** (2.70)	0.4617 (0.65)	-0.0075 (-0.01)
	large (96)	1.8457*** (3.03)	-0.1257 (-0.25)	0.1980 (0.24)
90	small (95)	-0.2246 (-0.46)	-1.4138*** (-2.96)	0.9235 (0.89)
	middle (96)	-0.3452 (-0.61)	-1.3351** (-2.16)	-0.1220 (-0.14)
	large (97)	-1.7974*** (-3.17)	-0.1135 (-0.23)	1.2189 (1.66)
91	small (96)	1.9025 (1.82)	-4.6593*** (-3.93)	1.8625 (0.85)
	middle (96)	2.3862** (2.21)	-4.0179*** (-3.48)	-2.2283 (-1.65)
	large (97)	3.2228 (3.07)	-5.0846 (-5.72)	-3.2643 (-2.36)

*, **, *** are significant at a 10%, 5% and 1% significance level respectively, and t represents Student t value.

4.3 Yearly cross-sectional results by size

The above cross-sectional results by debt-ratio suggest that the theory is generally consistent with the empirical evidence. Here we analyze the same sample by cross-sectional size. Table 4 represents the results by size. The asset value given by the book value in the previous year for the cross-sectional analysis period is used as the base for a firm's size. As shown in the table, the coefficient γ_2 does not represent a consistent difference by firm size. There is little difference in γ_2 among large, medium and small firms in '89 and '90. And γ_2 for large firms is higher than that for small firm in '87. On the other hand, γ_2 for small firms is higher rather than that for large firm in '88 and '91.

And the size of γ_2 does not change systematically according to the expansion in the size of the firm for all the sample periods in Table 4. γ_2 for large firms is significantly negative at the 95% significance level in '88 but insignificantly negative in '91. However, in '91, γ_2 for medium firms is significantly negative at the 99% significance level, but that for large firms is not. Hence, for this period, γ_2 does not change systematically according to changes in firm size.

These results provide a striking contrast to those by debt ratio above. This suggests that the results by debt ratio are rather clearer than those by size. Also it implies that the effect by debt ratio is unrelated to that by firm size.

V. CONCLUSIONS AND COMMENT

A sharp and continuous increase in the real estate price during the past few decades has enormously changed the economic behaviour of most economic units in Korea. Most of all, it is believed to have greatly influenced firms' investment behavior and firms' value.

The main contribution of this study lies in analyzing the theoretical relationship between the real estate prices and firms' value. As a result of these analyses, it was found that expectations of real estate price increases raise the value of assets currently held by the firm on the one hand. But on the other hand, it is analyzed that the expectations will cause a value loss to the firm by increasing potential investment costs for its future growth opportunities. Therefore, in case expectations of a real estate price increase are caused by a price bubble, the total increase in a firm's value is expected to be lower than the increase in real estate value. However, if expectations of real estate price increase are caused by an increase in marginal productivity, the value loss for growth opportunities of the firm will not occur. Also it is expected that the loss of the growth opportunity value due to expectations of a real estate price increase will be larger for debt-use firm than for zero-debt firms, and for those higher-debt firms where debt is used.

In this paper, these hypotheses are tested empirically, using the rates of stock

[Table 4] Cross-sectional results by debt ratio

(unit: %)

year	debt ratio	γ_0 (t)	γ_1 (t)	γ_2 (t)
87	low (69)	5.7786*** (4.30)	1.7009 (1.54)	0.0682 (0.04)
	middle (69)	3.5699** (0.56)	3.6831*** (2.70)	2.0610 (0.92)
	high (68)	-2.651 (-0.71)	7.2528*** (5.49)	2.1950 (0.83)
88	low (82)	0.7728 (0.91)	3.2985*** (5.12)	0.7544 (0.52)
	middle (82)	1.1200 (1.44)	2.2007*** (3.31)	0.9358 (0.56)
	high (84)	-1.5621 (-1.60)	7.6135*** (9.23)	-3.7545** (-2.1332)
89	low (95)	1.5791*** (2.69)	0.6348 (1.38)	-0.7520 (-0.64)
	middle (95)	0.9088 (1.41)	1.0534 (1.56)	-0.3062 (-0.29)
	high (96)	3.1534*** (4.63)	-1.4197** (-2.27)	-0.5218 (-0.46)
90	low (95)	-0.7251 (-1.39)	-1.0016** (-2.04)	0.8621 (0.98)
	middle (96)	-0.5099 (-0.92)	-0.9101 (-1.52)	-0.4881 (-0.56)
	high (97)	-0.9926* (-1.90)	-0.8397* (-1.74)	0.8521 (1.18)
91	low (96)	0.3618 (0.34)	-3.4894*** (-3.16)	0.1720 (0.09)
	middle (96)	3.2040*** (3.80)	-4.1020*** (-4.17)	-3.6769*** (-3.54)
	high (97)	4.2162*** (4.03)	-6.0065 (-6.05)	-2.0704 (-1.21)

*, **, *** are significant at the 10%, 5% and 1% significance level respectively, and t represents Student t value.

return. First of all, in yearly cross-sectional analysis using yearly rates of stock return as a dependent variable, and the systematic risk(β) of stock returns & the ratio of equity to real estate holding as independent variables, the coefficients for explanatory variables are almost zero. This suggests that the ratio of real estate holdings does not affect rates of stock return in a statistical sense.

However, in case of cross-sectional tests by the firm's debt ratio, the size of the coefficient for the real estate holding variable is generally lower for high-debt firms than for low-debt firms. This result is consistent with the theoretical hypothesis of this paper that the higher the debt ratio, the larger the loss of growth opportunity value. On the other hand, in the case of cross-sectional tests by firm size, there are no systematic changes in the coefficient, unlike in case of results by debt ratio. Accordingly it is estimated that the effect of debt ratio is rather clearer than that of firm size and that firm size has no large effect on the effect by debt ratio.

These results are subject to the following limitations. First of all, the ratio of equity to real estate holding as an independent variable should be based on market-value not book-value in empirical tests. But real estate data based on market-value are not available. Second, in regression analyses, the simple Ordinary Least Square(OLS) method is used so that the coefficient is not likely to be efficient. Third, the theoretical effect of changes in real estate value on debt value is not considered.

REFERENCES

- Banz, R. W., The Relationship between Return and Market Value of Common Stocks, *Journal of Financial Economics* 9, March 1981, 3-18.
- Basu, S., The Relationship between Earnings' Yield, Market Value and Return for NYSE Stocks : Future Evidence, *Journal of Financial Economics* 12, June 1983, 129-156.
- Black, F. and M. Scholes, The Effects of Dividend Yield and Dividend Policy on Common Stock Prices and Returns, *Journal of Financial Economics* 1, May 1974, 1-22.
- _____, M. Jensen and M. Scholes, The Capital Asset Pricing Model: Some Empirical Tests, in *Studies in the Theory of Capital Markets*, (ed.) M. Jensen, New York: Praeger Publishers, Inc., 1972, 79-121.
- Brennan, M. J., Taxes, Market Valuation and Corporation Financial Policy, *National Tax Journal*, December 1970.
- Cheong, K., Is The APT True in Korea?, *Pacific-Basin Capital Markets Research*, Vol. III., July 1992, 267-286.
- _____, A Test of the Multi-Factor Asset Pricing Model in Korea, *Research in International Business and Finance*, Vol. X, April 1993, 199-212.
- Fama, E. F., Efficient Capital Markets: A Review of Theory and Empirical work, *Journal of Finance* 25, May 1970, 383-417.
- _____, and J. MacBeth, Risk, Return and Equilibrium: Empirical Test, *Journal of Political Economy* 71, May-June 1973, 607-636.
- Hartzell, D., J. S. Heckman and M. E. Miles, Real Estate Returns and Inflation, *AREUEA Journal* No. 15, Spring 1987.
- Keim, D. B., Size Related Anomalies and Stock Return Seasonality: Further Evidence, *Journal of Financial Economics* 12, June 1983, 13-32.
- Keiper, J. S., et al, *Theory and Measurement of Rent*, Philadelphia:Chilton co., 1961
- Kim, C. S., Incompleteness of Real Estate Markets and CAPM, *Korean Journal of Financial Management*, Vol. 8-2, Korean Financial Management Association, February 1991.
- Kim, K., Real Estate Speculation and Real Estate Price, *Research Paper* 48-91-03, Korean Economic Institute, March 1991.
- Kim, K., and K. Cheong, A Study on Rational Bubbles- An Empirical Study in Korean Stock Markets, *Korean Journal of Finance*, Vol. 4, Korean Finance Association, October 1991.
- Litzenberger, R. and K. Ramaswamy, The Effect of Personal Taxes, Dividends and Capital Asset Prices: Theory and Empirical Evidence, *Journal of Financial Economics* 7, June 1979, 163-195.
- Myers, S. C., Determinants of Corporate Borrowing, *Journal of Financial Econ-*

- omics, No. 5, 1977, 147-175.
- Nourse, H. O., and S. E. Roulac, Linking Real Estate Decisions to Corporate Strategy, *Journal of Real Estate Research*, July 1993, 475-494.
- Pollock, R. L. and D. C. Shoup, The Effect of Shifting the Property Base Tax from Improvement Value to Land Value: An Empirical Estimation, *Land Economics*, Vol. 53, February 1977, 67-77.
- Reilly, F., R. Marquardt and D. Price, Real Estate as an Inflation Hedge, *Review of Business and Economic Research*, Spring 1977.
- Reinganum, M., Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' 2-2, Yield and Market Value, *Journal of Financial Economics* 9, March 1981, 19-46.
- Shiller, R. J., Speculative Prices and Popular Models, *Journal of Economic Perspectives*, No. 4, Spring 1990, 55-65.
- Titman, S. and A. Warga, Risk and Performance of Real Estate Investment Trusts: A Multiple Index Approach, *AREUEA Journal*, No. 14, Fall 1986.
- Walter, A. A., The Value of Land, in Harold B. Dunkerley ed., *Urban Policy*. New York: Oxford University Press, 1983.
- West, K. D., A Specification Test for Speculative Bubbles, *Quarterly Journal of Economics*, No. 102, 1987, 553-580.
- _____, Bubbles, Fads and Stock Price Volatility Tests: A Partial Evaluation, *Journal of Finance*, No. 43, 1988, 639-656.