Land Price Bubbles, Wealth Effect, and Over-investment

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<Abstract>

This Paper analyzes the role of land price bubbles in generating the Asian economic crisis. The idea of the paper is simple: Speculative increase of land prices generates wealth effect in consumption. The wealth effect results in higher sales of products, which induce firms to invest more. Higher income generated from the higher investment in turn leads to much higher consumption, which again accelerates the investment to an even higher level. But this expanding process cannot continue without funding from abroad, since high consumption necessarily means low savings. Therefore current account deficits cause external debt to accumulate. But if an external shock takes place (foreign creditors, for instance, determine it is too risky to lend more) and foreign credit lines get closed, the economy must rely on its own savings for investment. Therefore the drastic fall of investment and income, and the presence of the over-capacity of production may be interpreted as resulting from a sudden shift of the open regime to a closed one. This paper suggests that land/real estate bubbles have significantly contributed to the Asian economic crisis.

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I. Introduction

The recent Asian economic crisis challenges economists with a compelling question: What is the fundamental cause of this sudden crisis? Is there any common factor that makes all the Asian countries vulnerable to an external shock?   It is challenging to explain the cause of the crisis because the macro fundamentals of the troubled countries seemed to be sound until the crisis erupted. The problem of chronic government deficits, which caused the Latin American economic crisis in the 1980s, was absent in the Asian countries. Rather, the governments pursued prudential fiscal policies, and their economies enjoyed high investments, high consumption, and high growth rates of income. For instance, real GDP growth rates of Thailand were 8.6% and 6.6% in 1995 and 1996, respectively. Indonesia's real GDP growth rate was 8.1% in 1995. Korea's growth rates of real GDP were 8.9% in 1995, and 6.8% in 1996. All the economic variables appeared to generate a virtuous circle. Then, all of sudden the Thai, Indonesian, and Korean economies collapsed. What happened in those economies?

Emerging papers emphasize various aspects to explain the fundamental causes of the crisis. Krugman(1998) suggested as a cause of the crisis overinvestment induced by a serious moral hazard. In his model financial intermediaries protected by the governments did not have incentives to take caution in lending money, which resulted in the overinvestment. He also pointed out that the burst of real estate bubbles triggered the insolvency of financial intermediaries, and aggravated the credit pinch. Corsetti *et al*(1998) maintained that appreciation of real exchange rates, current account imbalance, excessive investment, and accumulation of short-term foreign debt along with a moral hazard in lending institutions combined to trigger the crisis. Kim & Lee(1998) presented a model showing that government subsidies lead to over-investment and that high growth economies with the government subsidies are vulnerable to adverse shocks. Wong(1998) constructed a model to show that housing market bubbles produce overproduction of housing, and take a significant role in triggering Thai's economic crisis when the bubbles bust. These papers tried to explain the underlying weakness of the troubled Asian economies.

This paper is another attempt to figure out the cause of the Asian economic crisis. Specifically, the paper will pay attention to the role of land price bubbles in generating the

crisis. As Krugman(1998) suggested, the prominent features of the economies of pre-crisis Asia were the real estate bubbles. Rapid economic growth in the past two or three decades in the region resulted in ever-increasing demand for land and buildings. Thus people got involved in real estate speculation, anticipating further increases in real estate prices in the future. This rampant real estate speculation drove the real estate prices much higher, generating a self-fulfilling prophecy mechanism.

Based on observations, this paper presents a model in which land price bubbles play a key role in building up excessive consumption and investment, and generating a rapid accumulation of external debts, which were the typical features of the pre-crisis Asian economies. The model also shows that the dramatic shrinkage of investment and consumption becomes inevitable once foreign credit lines shut down and that the economy suffers from too much physical capacity of production. The idea of the paper is quite simple. As the price of land increases, people think they have become richer and so they consume more. This results in higher sales of product, which induces firms to invest more. Higher income generated from the higher investment in turn leads to much higher consumption, which again accelerates the investment to an even higher level. But this expanding process cannot continue without funding from abroad. Since high consumption necessarily means low saving, the high investment demand cannot be met by domestic saving. Therefore the gap between investment demand and domestic saving causes the external debt to accumulate. As long as the economy can borrow from abroad macro indicators appear to be sound; high investment, high consumption, and high income. But if an external shock takes place (foreign creditors, for instance, determine it is too risky to lend more) and foreign credit lines get closed, the economy must rely on its own saving for investment. In equilibrium the investment becomes as low as the domestic saving, and income and consumption shrink. The current Asian crisis is interpreted as a temporal shift from the open economy with bubbles to a closed economy.

Literature that pays attention to land in the macro model includes Nichols (1970) and Kiyotaki & Moore (1997). Incorporating land as a productive factor in a neoclassical growth model, Nichols analyzed an equilibrium path of growth and found that the rate of capital accumulation depends negatively on the relative share of rent in national income. Kiyotaki & Moore presented a model where land served as collateral for loans as well. They showed that a

dynamic interaction between credit limit and land price provided a transmission mechanism by which a shock destabilizes the economy as a whole.

II. The basic model

Consider the following small economy with one product which can be consumed or be used as a capital good. C, I, K, Y^s, Y^d stand for consumption, investment, capital stock, supply of, and demand for the good. P and W represent the price of the good and wealth, respectively. L is land size and is normalized as one through out this paper. q is the price of the land, of which growth is assumed to be exogenous. Since we want to highlight the effect of land price bubbles on the real variables such as investment and consumption, we need to treat the inflation of land price as an exogenous variable. In fact Korea's hyper-inflation of land prices in the 70s and 80s cannot be justified by fundamentals(Park & Kwon, 1996). Corsetti *et al*(1998) also argued that the inflation of the real estate prices in the east Asia countries was hardlly explained by the economic fundamentals.

The model consists of six equations and definitions;

$$(1\,)\,C_t = bW_t + cY_t - dP_t$$
$$(2\,)\,I_t = a\,(C_t - C_{t-1}\,)$$
$$(3\,)\,W_t = q_t L + K_t$$
$$(4\,)\,K_t = K_{t-1} + I_t$$
$$(5\,)\,Y_t^{\,d} = C_t + I_t$$
$$(6\,)\,Y_t^{\,s} = AK_{t-1}$$
$$0 < a,\,b,\,c < 1$$

Equation (1) is the consumption function of the economy considered. The first term of the function represents a wealth effect on consumption. In an empirical study using Japanese data Horioka(1996) showed that increasing wealth had a strong influence on consumption. Since wealth consists of land value plus capital stock in our model as in equation (3), the increase of land prices or/and capital stock leads to higher consumption. Park & Kwon(1996), and Horioka(1996) adopted basically the same consumption function as ours to show fast-increasing land prices produced a significant wealth effect. The second and third terms of

the consumption function are traditional. Investment behavior of the economy is described by an acceleration principle in Equation (2). We assume no depreciation of capital, so that all the investment means net investment. Expressions (4) and (5) are definitions of capital stock and demand for the good. The production function is given by Equation (6). The functional form states that one period of time is required for the new investment to be able to produce.

Substituting (1) and (6) into (2), one obtains the desired (planned) level of investment given by (7). In following ΔX_t is defined as $X_t - X_{t-1}$.

$$(7) \quad I_t = \frac{ab\Delta q_t + acAI_{t-1} - ad\Delta P_t}{1 - ab}$$

Expression (7) tells us that the increasing land price leads to more investment through a wealth effect on consumption. The higher price of the good lowers the consumption, and so it decreases the desired investment level. Note that our model assumes investment is a function of the consumption growth. Investment of the last period has a positive effect on the present investment, since one period of time should elapse before a new investment is able to produce and generate income.

Considering (3), (4), and (7) in (1) one obtains the following desired level of consumption.

$$(8) \quad C_t = bq_t + \left\{\frac{ab^2}{1-ab}\right\}\ddot{A}q_t + (cA+b)K_{t-1} + \left\{\frac{abcA}{1-ab}\right\}\ddot{A}K_{t-2} - dP_t - \left\{\frac{abd}{1-ab}\right\}\ddot{A}P_t$$

Expression (8) shows that the more windfall gains from the land and the higher absolute level of the land price, the more consumption will be. Apparently this is due to the wealth effect. This might explain the so called "consumption booms" of the 1980s and early 1990s in the eastern Asian countries when land prices increased rapidly. Expression (8) also shows that the level of and the growth rate of the capital stock of the last period pushes current consumption up. Note that current income is a function of the last period's capital stock. The level of the good's price also checks the desired consumption.

In the following we explore what would be the actual investment and consumption.

Two cases, a closed and an open economy, will be considered.

III. Characterizing equilibrium in a closed economy

From the equilibrium condition, $Y_t^s = Y_t^d$, and considering that Y_t^d is the sum of the desired investment and consumption derived in the previous section, we obtain the following equilibrium price level.

$$(9) \quad P_t = \left\{ \frac{ab(1+b)}{(1+a)d} \right\} \Delta q_t + \left\{ \frac{b(1-ab)}{(1+a)d} \right\} q_t - \left\{ \frac{(1-ab)(A-cA-b)}{(1+a)d} \right\} K_{t-1}$$
$$+ \left\{ \frac{acA(1+b)}{(1+a)d} \right\} \ddot{A} K_{t-2} + \left\{ \frac{a(1+b)}{1+a} \right\} P_{t-1}$$

The good's price is positively related to the capital gains from the land as well as the absolute value of the land price. This is because the wealth effect stimulates higher consumption and demand for the good. We assume that the parameters a, b, and c are relatively small compared to A, and so $(A-cA-b)$ on the third term in the expression (9) is positive. This implies that the more capital stock there was in the last period, the lower the current price of the good will be. The last term of (9) says that with other things being equal, the good's price level persists into the next periods' prices, although the influence gets smaller as time passes since a(1+b)/(1+a)<1 .

Substituting (9) into (7), one obtains equilibrium investment in period t.

$$(10) \quad I_t = -\left\{ \frac{ab}{1+a} \right\} q_{t-1} + \left\{ \frac{acA}{1+a} \right\} I_{t-1} + \left\{ \frac{a(A-cA-b)}{1+a} \right\} K_{t-1} + \left\{ \frac{ad}{1+a} \right\} P_{t-1}$$

An interesting result is that the equilibrium investment level does not depend upon the change of the land price, nor upon the current land price itself. The reason for this result is that the increased demand of consumption and investment induced by the wealth effect of high land price (and/or the capital gains from the change of land price) is exactly offset by the increased good's price, since the supply of the good is fixed during the current period of time. But the

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land price of the last period has a negative effect on the current investment. The acceleration mechanism of investment explains the result; if the land price of the last period is high, the magnitude of the wealth effect on consumption in the last period gets big. This reduces the term of $C_t - C_{t-1}$, which reduces the investment of the present period. The result suggests that land price inflation deters future investment and the accumulation of capital in the long run. Nichols(1970) produced a similar result with a different model.

Expression (10) also says that the investment level of the past period has a positive effect on the current investment. For the investment to be stationary over time, the coefficient on the second term should be less than one. The capital stock of the last period also has a positive effect on current investment since the higher the capital stock of the last period, the higher the income of the present period, and this leads to higher investment through higher consumption[1]. A high price of the good in the last period helps the present investment to increase. This is because the "change" of consumption between two periods becomes bigger (with current consumption given) if the price of the last period is higher. Note that the high price of the good in the last period reduces the consumption during the same period.

The capital stock is expressed by the following equation.

$$(11) \quad K_t = -\left\{\frac{ab}{1+a}\right\}q_{t-1} + \left\{1 + \frac{a(A-b)}{1+a}\right\}K_{t-1} + \left\{\frac{acA}{1+a}\right\}K_{t-2} + \left\{\frac{ad}{1+a}\right\}P_{t-1}$$

The forces that determine the capital stock in the closed economy are the same as those of investment. Therefore the above discussion about the investment applies to the capital stock as well.

Now consider the equilibrium consumption. Expression (12) shows that the current consumption is a function of the last period's land price, not of the current period's. The land price inflation of the current period pushes up the price of the good as shown in (9), and the increased price of the good nullifies the wealth effect of land price inflation by reducing consumption. This is why the current price of land does not affect the current consumption. But

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[1] By assumption b and c are "small" enough relative to A. Thus A-cA-b=(1-c)A-b>0

the land price of the last period has a positive effect on current consumption. Thus the economy with land price bubbles is likely to have a high consumption boom, and this hurts the capital accumulation in the long run.

$$(12) \quad C_t = \left\{\frac{ab}{1+a}\right\}q_{t-1} + \left\{\frac{ab+A}{1+a}\right\}K_{t-1} + \left\{\frac{acA(b-a)}{(1+a)(1-ab)}\right\}K_{t-2} - \left\{\frac{ad(1+2b+ab)}{(1+a)(1-ab)}\right\}P_{t-1}$$

Expression (12) also states that the capital stock of the last period has a positive impact on consumption through the income generated. The direction of the impact of K_{t-2} on the consumption is ambiguous, but the effect of the good's price is unambiguously negative.

The income of the closed economy can be summarized by expression (13).

$$(13) \quad Y_t = -\left\{\frac{abA}{1+a}\right\}q_{t-2} + A\left\{1+\frac{a(A-b)}{1+a}\right\}K_{t-2} - \left\{\frac{acA^2}{1+a}\right\}K_{t-3} + \left\{\frac{adA}{1+a}\right\}P_{t-2}$$

As one can expect from the earlier discussion, expression (13) says that the high land price lowers the equilibrium income in the long run because capital accumulation is deterred by the high land price.

IV. Investment, consumption, and external debt in an open economy

In an open economy the demand for the desired consumption and investment may not be met by the domestic production alone, since the excess demand, if any, can be accommodated by the capital import from abroad. Thus the possibility of debt-financing makes the paths of the macro variables quite different from those of the closed economy.

In the open economy we introduce a new variable, D_t, current account deficit, defined by $D_t = Y_t^d - Y_t^s$. Since there is no financial sector in our model, the excess demand is assumed to be met by import, building up foreign debts. We assume that the purchasing power parity condition for the good's price holds. Denoting the foreign price of the good and the exchange rate by P_t^* and e , respectively, we have $P_t = e + P_t^*$. Here the exchange rate is defined by the price of the one unit of foreign currency measured by the domestic currency. A

fixed exchange rate regime is also assumed. Under this setting, the price of the good, P_t is determined solely by the foreign price, P_t^*, with e given. Considering the desired consumption and investment of section II for the domestic demand, and the production function as domestic supply, one obtains the following expression for the current account deficit.

$$(14) \quad D_t = \left\{ \frac{ab(1+b)}{1-ab} \right\} \Delta q_t + bq_t + \left\{ \frac{c(1+a)A + (1-ab)(b-A)}{1-ab} \right\} K_{t-1} - \left\{ \frac{acA(1+b)}{1-ab} \right\} K_{t-2}$$

$$- d(e + P^*)$$

Expression (14) shows that not only the capital gain from the land price inflation but also the level of the land price itself has positive effects on the deficit. This conforms to the pre-crisis experiences of the troubled Asian countries; property market bubbles with sharply increasing current account deficits, building up the external debts. The effect of the capital stock of the last period on the deficit is negative since we have assumed that the parameters a, b and c are small relative to A^2. It implies that with other things being equal, the more an economy can produce, the less the current account deficit is. The deficit equation also shows that over-valued domestic currency aggravates the current account deficit.

A part of the desired consumption and investment induced by the land price bubbles is accommodated by the deficit. Consider the consumption first. The consumption of the open economy can be written as (15).

$$(15) \quad C_t = \left\{ \frac{b}{1-ab} \right\} q_t - \left\{ \frac{ab^2}{1-ab} \right\} q_{t-1} + \left\{ \frac{cA + b(1-ab)}{1-ab} \right\} K_{t-1} - \left\{ \frac{abcA}{1-ab} \right\} K_{t-2} - de$$

$$- \left\{ \frac{d}{1-ab} \right\} (P_t^* - abP_{t-1}^*)$$

An important point we should notice here is that the absolute level of the land price immediately affects the consumption in a positive way. As seen in (12), the immediate effect of the land price on the consumption does not exist in the closed economy. Even if there is no

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[2] The sign of the coefficient depends upon c(1+a)-(1-a b)(1-b/A) . As mentioned in section 2.2, the assumption that a, b, and c are "relatively small" ensures the coefficient to be negative.

change of the land price (say, $q_t = q_{t-1}$), the impact of the land price of the last period is stronger in the open economy than in the closed economy, since the sum of the first two coefficients in (15), b , is greater than the coefficient ab/(1+a)   in (12). This is because when an excess demand takes place, the shortage of the good is filled with import in the open economy, with no increase of the good's price to check the consumption. Expression (15) also says that the capital stock of the last period and the high valuation of the domestic currency increase consumption in the open economy.

Now let's look at the factors that affect investment. The investment of the open economy is shown in expression (16).

$$(16) \quad I_t = \left\{ \frac{ab}{1-ab} \right\} \Delta q_t + \left\{ \frac{acA}{1-ab} \right\} (K_{t-1} - K_{t-2}) - \left\{ \frac{ad}{1-ab} \right\} (P_t^* - P_{t-1}^*)$$

Thus the land price inflation in the present period leads to more investment. This may explain the investment booms of the pre-crisis era in the eastern Asian economies, when real property bubbles were rampant (Edison *et al*(1998), Krugman(1988)). This   contrasts with the closed economy where the land price inflation hampers the long run capital accumulation. In the open economy, however, increasing land prices stimulate the capital accumulation in the long run.

Since $I_{t-1} = K_{t-1} - K_{t-2}$, expression (16) is a first order difference equation. The solution of the equation given by (17) shows the fundamental forces that drive investment in the open economy.

$$(17) \quad I_t = \left\{ \frac{a}{1-ab} \right\} \sum_{j=0}^{\infty} \left\{ \frac{acA}{1-ab} \right\}^j \left\{ b\Delta q_{t-j} - d\Delta P_{t-j}^* \right\} + k \left\{ \frac{acA}{1-ab} \right\}^t$$

where, k   is an arbitrary constant.

Here acA/(1-ab)   is assumed to be less than one to ensure a stable path of   investment. The solution tells us that the intertemporal equilibrium level of investment in the open economy is determined by the relative land price inflation of the past as opposed to the good's price inflation. Korea experienced quite often the hyper-inflations of land in the 1970s and 1980s. The result of this paper strongly suggests that Korea had built up excessive capital stock during

the land speculation booms. Equation (18) shows that the land price inflation indeed speeds up the capital accumulation.

(18) $\quad K_t = \left\{\dfrac{ab}{1-ab}\right\}\Delta q_t + \left\{1+\dfrac{acA}{1-ab}\right\}K_{t-1} - \left\{\dfrac{acA}{1-ab}\right\}K_{t-2} - \left\{\dfrac{ad}{1-ab}\right\}(P_t^* - P_{t-1}^*)$

V. Land price bubbles and the economic crisis

The impacts of the land price inflation on the macro variables are very different, depending on whether it is open or not. Table 1 summarizes how the level of land price affects the macro variables. The most contrast is found in the effects on investment, capital stock and income. In the closed economy, land price bubbles reduce the investment in the next period. This is because the higher land price stimulates consumption through the wealth effect, and this in turn makes savings fall. In equilibrium the amount of the investment should be the same as that of domestic saving in the closed economy. The reduced investment implies lower production and income in the future.

<table 1> The effect of land price at period t

	investment	capital stock	consumption	income	price of good	external debt
closed economy	(-) at t+1	(-) at t+1	(+) at t+1	(-) at t+2	(+) at t	irrelevant
open economy	(+) at t	(+) at t	(+) at t	(+) at t+1	exogenous	(+) at t

But the effect of the land price hike changes drastically once the economy gets opened. Increasing land prices generate a wealth effect, and so consumption increases. And the increase in consumption accelerates investment. The resulting excess demand for the good is met by the current account deficit, building up the external debt. Therefore, the economy with land price bubbles enjoys high investment, high consumption, and high income levels as long as debt-financing is possible.

What happens when debt-financing is no longer possible? The shutdown of the foreign credit line forces the economy to turn to a closed economy. Suppose that the foreign credit line

shuts down between periods t and t+1, and that land price bubbles prevailed in the past up to period t. Then the investment and capital stock in period t+1 must shrink since the land price of the last period has a negative impact on the variables as shown in table 1. And income is also reduced in period t+2. The magnitudes of the drop in investment and income would be great if the land price inflation was serious in the past periods. Thus our model suggests that the source of the present economic drawbacks in the east Asia countries can be traced to the land/real estate price bubbles.

VI. Summary and concluding remarks

In this paper we explored the role of land price inflation in the Asian economic crisis. The Asian countries suffering from the present crisis had some conspicuous features in common before the crisis hit in 1997: high investment, high consumption, high growth rate of income, and land/real estate price bubbles. It is a natural economic consequence that land prices increase when an economy grows. But the level of and the pace of the inflation of the land prices in these countries were not justified by the fundamentals (Park & Kwon 1996, Krugman 1998). Thus, assuming that the land price inflation is exogenous, we constructed a small country model which combined the wealth effect of land price inflation on consumption with an acceleration mechanism of investment to examine the effect of the land price bubbles.

The comparison of the results from a closed economy with that from an open economy showed that the directions of the impact of the land price inflation on the macro variables, such as investment, capital stock, and income, were very different, depending on whether the economy was open or not. In the open economy the land price bubbles stimulated investment, consumption and production, and increased the current account deficit. In the closed economy, on the other hand, the land price bubbles reduced the investment and income in the near future. Therefore the drastic fall of investment and income, and the presence of the over-capacity of production may be interpreted as resulting from a sudden shift of the open regime to a closed one. This paper suggests that the land/real estate bubbles have significantly contributed to the current Asian economic crisis. A further implication of the paper should be noticed. Levying heavy taxes on the land-holding might reduce the business fluctuations in the open economy,

since the tax effectively keeps the land price bubbles from occurring.

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