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Capital Gains, Losses and the Japanese Economy: 1955–2001

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Abstract

Capital gains and losses of land and stocks for 1955-2001 in Japan obtained from the National Accounts data are so large as often surpassing the half of the nominal GDP. By the regression analysis, their direct effects on household consumption, business and residential investment are found all significant. This implies not only that the slowdown of the post-bubble Japanese economy during the 1990s was largely due to the negative impacts of capital losses, but also that its superior performance since the 1960s up to the bubble years had been influenced positively by the still larger capital gains.

Key Word: Changes in the land and stock prices; Capital gains and losses, Japanese aggregate consumption and investment functions.

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Abstract

Capital gains and losses of land and stocks for 1955-2001 in Japan obtained from the National Accounts data are so large as often surpassing the half of the nominal GDP. By the regression analysis, their direct effects on household consumption, business and residential investment are found all significant. This implies not only that the slowdown of the post-bubble Japanese economy during the 1990s was largely due to the negative impacts of capital losses, but also that its superior performance since the 1960s up to the bubble years had been influenced positively by the still larger capital gains.

1 Introduction

Since the bursting the asset price bubble in 1990-91, the Japanese economy has plunged into the long slump of growing at the average annual rate around one percent up to the fiscal year 2001, as contrasted with the renowned “high-growth economy” during the 1960s through the 1980s. To cope with this stagnant economy, the successive Japanese Governments have taken various expansionary policies, such as tax-cuts, increases in the public investment by issuing the government

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bonds and easing the monetary policy variables. However, unlike in the pre-bubble period, the effects of these stimulative policy packages turned out only modest and temporary, so they could not have succeeded in restoring the Japanese economy back to its normal growth track.

As evidenced by the fact that the GDP deflator began falling from 1995 onwards, making the nominal GDP growth rate negative ever since 1998 except only in 2000, the Japanese economy has been beset with stubborn deflationary pressures.

The purpose of this paper is not to discuss about policy measures to solve the current impasse of the Japanese economy, but rather to investigate why and how “the Great Recession” has come into being in the 1990s of Japan from a somewhat long-run perspective. It is well-known that, generally speaking, the GDP growth rate of a country tends to slow down as its economy achieves industrial development and catches up with the advanced economies. In the case of Japan, too, its average growth rate has been declining from 9.1% (1956-73) to 3.9% (1974-90), before reaching the extreme low 1.1% during the post-bubble period (1991-2001). It is no doubt that some compound factors such as the globalization of the economy (i.e., appreciation of yen, and increasing the direct investment abroad), the declining labor force with the population aging, the shortening of the working hours and changes in the work ethos of the youth, etc. have all contributed to this declining the growth trend of Japan, besides the recessionary impacts caused from bursting the asset market bubble of 1990-91. However, this paper intends to take up to the asset price changes, or the land price changes, among others, as the most fundamental factor in explaining the long economic slump of the post-bubble Japan. At the same time, it will give suggestions as to how the post World War II economic growth of Japan had been supported by the steady land price hikes, as its monetary transmission mechanism was often called “the land standard system.”

The remainder of this paper is organized as follows. Section 2 explains the data for changes in the land and stock prices, and their consequent capital gains and losses in Japan for the period of 1955–2001. Section 3 gives specifications of models for estimation. Then, in Section 4 the analyses for the existence of unit root and the estimated results of our models regarding the direct impacts of capital gains and losses on the demand components of GDP are presented. Section 5 concludes with directions for further research.

2 The Asset Market Bubble and Burst

2.1 Asset Price Changes in Japan: 1955-2001

The price indexes of land and stocks, and their growth rates are presented in Figure 1 and 2. In Japan, there exist four kinds of land price data, each of which is surveyed and published by different institutions. Here, we use the one by the Japan Real Estate Institute, because it is available since 1955 in the semi-annual form. Figure 1 shows the two land price indexes, i.e., that of the 6 largest city area, average and of the 6 largest city area, commercial. The stock price index is the average price of the Tokyo Stock Market, 1st section (TOPIX). Both are annualized in calendar year and adjusted to take 100 at the base year of 1968.

Let's focus on stock price changes first. From Figure 1 and 2, we can clearly see that during the 1950s and 1960s it has fluctuated with a moderate upward trend, but around 1970 it began a strong upward movement which lasted for 20 years except temporary dips after the two oil crises (in 1974 and 1982), until hitting its peak of 2160.1 in 1989. In particular the extremely rapid hike during the late 1980s appears abnormal judging from hindsight. While it is generally agreed among Japanese economists that the stock market bubble occurred during the period from 1987 through 1990 ¹, one may argue that the bubble-like bull market had already started in the early 1980s. After bursting the bubble, however, the tide of the market has changed, so the stock price index kept falling with large fluctuations until it reached possibly the bottom in mid-2003 (not shown in Figure 1) which is about the one fourth of the peak value in 1989.

Turning to the two land price indexes, we find that both of them also exhibited a similar steady upward trend until it reached the peak of 1305.0 (for the 6 largest city area, average) and 1507.0 (for the 6 largest city area, commercial) in 1990 ². During the period from 1955 to 1990, they fell only once in 1974 at the time of the first oil crisis. Learning from this steady land price hikes, Japanese people got convinced of "the land myth" implying that the land price in Japan will never

¹See Okina et al. (2001) on this point.

²As regards the lead and lag relationship between the stock price changes and the land price changes, it is clear from Figure 1 that the former having its peak in 1989 leads the latter with its peak in 1990 by one year, which had been confirmed by more rigorous statistical test in studies, such as Ito and Iwaisako (1995) and Kiyotaki and West (1996). However, one needs some care in interpreting the land price index. Besides the fact that the land price index is not the actual transaction price like the stock price, but assessed by the assessor, it is the average of diverse regional price changes across Japan. According to the posted price (Kouji-Kakaku) announced by the National Land Agency (Kokudo-cho) of Japan, the land price of the central commercial area in Tokyo (Toshin San-ku) had its peak in July 1986 and that of the commercial area in Tokyo in July 1987, while that in Osaka hit its peak in January 1990 (see, EPA White Paper (1991) ch.2). Thus, the generally accepted notion that the stock market collapse in 1989 triggered to burst the land price bubble in Japan is not necessarily founded on the firm statistical ground.

drop but just keep on rising. This kind of people's attitude toward land as an asset put a high collateral value on it for the bank financing. Therefore, the Japanese banking system which was supported by the steady increase in land prices had seemingly worked so well as was often called "the land standard system", until the land price bubble burst in 1991.

After the land market collapse, however, the land prices have been falling for 13 consecutive years until even today (in 2003). The fact that the average land price in the 6 largest city area has fallen down to less than 40% (or 20% in the case of commercial area) of its 1990 peak value and still indicates no sign of turning upward has generated the huge bad loans in the Japanese banking sector, putting its financial intermediation mechanism in dysfunction.

There is a growing number of studies on the causes and counter-measures for the Great Recession of the Japanese economy and there the importance of the asset price changes have been emphasized, in particular, with regard to the banking crisis ³. Furthermore, by applying the VAR approach, the critical role of land and stock price changes for financial intermediation by Japanese banks are clearly demonstrated ⁴. However, most studies dealing with the effects of asset price changes in Japan take only their rate of changes into account, without paying due attention to their stock effects, or capital gains and losses.

In examining the impact of the asset price changes on the total Japanese economy, the rate of price changes itself is not the relevant variable to focus. This is because the same rate of price change may give a much different impact on the economy if the stock value of the asset differs. In this connection, one is reminded that the total land asset value is more than three times as large as the total stock market value in Japan. Therefore, if the land price and stock price have changed at the same rate of say, 1%, the impact of the former would be more than three times as large as the latter because of the difference in their stock values. What matters to the economic activity is the capital gains or losses of the assets rather than the rate of asset price changes. Now, we turn our attention to the capital gains and losses of the stock of land and stock market in Japan.

2.2 Capital Gains and Losses: 1955-2001

2.2.1 The Sources of the Data

Annual Report on National Accounts published by Cabinet Office of the Japanese Government gives the calendar-year data for the Reconciliation Accounts of fi-

³For example, see Ogawa and Suzuki (1998), (2000), Ogawa and Kitasaka (2000), Hoshi and Kashyap (2000), Hoshi and Patrick (2000), Mikitani and Posen (2000), and Kuttner and Posen (2001).

⁴See Kwon (1989) and Bayoumi (2001)

nancial assets and non-financial assets for each of 5 sectors (i.e., Non-financial Corporations, Financial Corporations, Households including Private Unincorporated Enterprises, General Government, Private Non-profit Institutions Serving Household). The Reconciliation Accounts in Annual Report based on SNA 93 which covers only the period after 1990, include Revaluation Accounts and Other Changes in Volume of Asset Accounts separately. Namely, this Revaluation Accounts record the annual changes in the asset value due to asset price changes, so from this source we can get data of capital gains and losses for assets such as land and stocks.

However, Annual Report based on SNA 68 which covers 1955-1998 does not have the Revaluation Accounts separate from the Reconciliation Accounts. But by checking the figure in the Other Changes in Volume of Asset Accounts for 1990-2001, they are found very minor for land and stocks, so we decided to use data in the Reconciliation Accounts as an approximation to the one in the Revaluation Accounts for the period 1955 to 1998. Another adjustment of data needs to be mentioned. While the figures in the Reconciliation Accounts are generally recorded in market values, only the values for stocks for the period 1955-69 are reported in book values. Therefore, an estimation of the market value for stocks is needed for the period above. Since the values of Capital Transactions in stocks are given in market values and available for each year in Annual Report, we can estimate the market values of stocks from 1955 to 1969, using the annual average changes of the TOPIX and the stock market value of 1970 ⁵. The adjustment method is shown in Appendix.

Before presenting our figure of capital gains and losses, a reference to some past studies may be made briefly. To our knowledge, there are very few studies dealing with the capital gains or losses in Japan. An important exception is Horioka (1995) and (1996). Horioka (1996) presented the estimates of net capital gains of land and non-land assets for Japanese households during the 1955-93 period. By comparing Horioka's estimate and our data with regard to capital gains of land, quite close coincidence are found, to the extent that the correlation coefficient between the two is 0.954. Horioka (1996) also estimated the impact of capital gains of land and non-land assets on the Japanese households consumption during the 1957-1991, or the pre-and mid-bubble period, and found statistically significant results as expected. But, he did not cover the post-bubble period in his analysis, nor examined the effects of capital gains and losses on the business investment and residential investment behavior.

Okina et al. (2001) also reports the asset price changes and consequent capital

⁵To see if the adjusted values are relevant, we also tested the same adjustment method to estimate the stock market values for the period 1970-85 and found the correlation coefficient between the estimated market values and the actual market values for 1970-85 over 0.992.

gains and losses from land and stocks, and analyses their relationship with the Bank of Japan's monetary policy in the late 1980s, but does not investigate their impacts on demand factors such as consumption and investment.

2.2.2 Capital Gains or Losses vs GDP

Figure 3 presents the capital gains and losses figures for the land and stocks in Japan from 1955 to 2001. To visualize the huge scale of their amounts, their ratios to the nominal GDP instead of their absolute values are graphed. From this Figure, one can be convinced of the much larger impacts expected from the land price changes in comparison with the stock price changes. For instance, capital gains from land price hikes are observed to have risen up to more than 80% of GDP in 1972 and around 45% of it in 1979-1980, before generating capital gains larger than GDP during the bubble year of 1987. The capital gains of stocks are also recorded high in 1972 (36% of GDP) and during the bubble years of 1986 to 1989 (21%~48% of GDP), but not so comparable to that of land. The cumulative sum total of capital gains of land from 1970 through 1990 can be computed as 2,000 trillion yen or approximately 4 times the size of nominal GDP in 2000, as contrasted with that of stocks from 1970 through 1989 being 700 trillion yen.

On the other hand, after the collapse of the asset market bubble in 1990-91, precipitant declines in land and stock prices both began to generate huge capital losses. Here again the capital losses of land are demonstrated much larger in size than those of the stocks. While the ratio of the capital losses of stocks to GDP dropped to -71% in 1991, it soon recovered to null and fluctuated positive and negative alternately during the post-bubble period. In contrast, the same ratio of land, after recording the lowest value -49% in 1992, stayed negative throughout the post-bubble period until the present time of writing this (in 2003). The sum total of capital losses of land from 1971 through 2001 amounted to 1,000 trillion yen in comparison with 500 trillion yen for that of stocks during the period 1990-2001.

In the next two sections, we present the estimation results of our models investigating as to what impacts these capital gains and losses have given to the demand factors, i.e., households consumption, business investment and residential investment in the Japanese economy. But, before doing so, some remarks may be added with regard to the changing size of the asset values of land and stocks in the national balance sheet of Japan.

According to the SNA data, the ratio of the total land asset value to the nominal GDP has become larger than 3.0 in 1972 and since then stayed around 3.3 until early in the 1980s. However, after 1986, it increased rapidly up to the peak value of 5.7 in 1989, and then began declining until it reached 3.1 in 2000. The total stock market value also increased up to almost twice as large as the nominal GDP in 1989, but after the bubble bursting, it dropped below the nominal GDP in 1992

and kept fluctuating more or less horizontally since then. How much further from now the land price will keep on falling is of critical importance for the Japanese economy, a challenging topic which is beyond the scope of this paper.

3 Models for Estimation

3.1 Consumption

The specification of consumption function in this study takes a rather general form as follows:

$$RCh_t = \alpha_0 + \alpha_1 RYhd_t + \alpha_2 RWh_{t-1} + u_t \quad (1)$$

where RCh and $RYhd$ are real per capita final consumption expenditure and real per capita disposable income of households respectively, RWh , the real per capita consumer wealth at the beginning of the period, and u , the error item. All per capita variables are measured by dividing by population in the midyear.

Many empirical works can be found on Japanese consumption behavior⁶. Our methodology is similar to those of Horioka (1995) and Horioka (1996), in which he provided a justification for the use of current income instead of life time income for the consumption function of liquidity-constrained households. Unlike Horioka (1996), however, logarithmic form is not used for the variables in our model.

We nest (1) within a general dynamic regression model, say, adding lagged RCh_t and $RYhd_t$ terms to test this basic specification. As did in Horioka (1995), the values of capital gains or losses are used as proxies for the consumer wealth. We consider two types of capital gains or losses, i.e., real per capita capital gains of land and stocks, for households sector. Thus, the model we estimate has the following form,

$$RCh_t = \alpha_0 + \alpha'_1 RCh_{t-1} + \alpha'_2 RYhd_t + \alpha'_3 RYhd_{t-1} + \alpha'_4 RLh_{t-1}(\text{or } RSh_{t-1}) + u_t \quad (2)$$

where RLh_t is real per capita capital gains or losses of land, and RSh_t , the real per capita capital gains or losses of stocks. As discussed in the next section, the hypotheses $\alpha'_1 = 1$ and $\alpha'_2 = \alpha'_3$ are not rejected with likelihood ratio test. Therefore, instead of using RCh_t in Equation (1), the regression of ΔRCh_t on $\Delta RYhd_t$ and RLh_{t-1} (or RSh_{t-1}), i.e.

$$\Delta RCh_t = \alpha_0 + \alpha''_1 \Delta RYhd_t + \alpha''_2 RLh_{t-1}(\text{or } RSh_{t-1}) + u_t \quad (3)$$

is chosen in our empirical analysis.

⁶See Hayashi (1985), Takenaka and Ogawa (1987), and Ogawa (1990)

3.2 Corporate Investment

The model for corporate investment behavior in this study is Q-type investment function. There is a growing body of literatures on empirical analyses using the so-called Japanese Q-type investment function. The previous studies include Fazzari et al. (1988), Hoshi and Kashyap (1990), Hayashi and Inoue (1991), Hoshi et al. (1991), Blundell et al. (1992), Ogawa and Kitasaka (1998) and Sekine (1999). But they all use the micro firm data. The main objective in this study is to investigate the significance of capital gains and losses on the macro level investment function. Our Q-type model cum capital gains variables is defined as follows,

$$\begin{aligned} \frac{Ie_t}{Ke_{t-1}} = & \beta_0 + \beta_1 \frac{Ie_{t-1}}{Ke_{t-2}} + \beta_2 MQ_t + \beta_3 \frac{CF_t}{Ke_{t-1}} \\ & + \beta_4 \frac{Ln_{t-1}}{Ke_{t-1}} \left(\text{or } \frac{Sn_{t-1}}{Ke_{t-1}} \right) \end{aligned} \quad (4)$$

where Ie_t and Ke_t are investment and capital stock of equipment for private corporate sectors, MQ_t , the marginal Q, Ln_t and Sn_t , the capital gains or losses of land and stocks for non-financial corporations, and CF_t , cash flow. Including firm assets, i.e. the land asset as a collateral in investment functions can be found in Devereux and Schiantarelli (1990) and Blundell et al. (1992) for U.K. firms and Ogawa and Kitasaka (1998) for Japanese industries. In their recent studies, Woo (1999), and Sekine (1999) discussed whether firm financial situations or balance-sheet conditions matter for Japanese firm investment behavior. Unlike many previous studies on the firm level, however, our paper is concerned with the aggregate investment behavior in Japan.

3.3 Residential Investment

We also investigate the impact of capital gains or losses on Japanese residential investment behavior in the private sector. The model used here takes a general form developed by Jorgenson (1963). So-called accelerator model can be specified as,

$$\begin{aligned} \frac{Ir_t}{Kr_{t-1}} = & \gamma_0 + \gamma_1 \frac{Ir_{t-1}}{Kr_{t-2}} + \gamma_2 \Delta \log Y_t \\ & + \gamma_3 \frac{Lh_{t-1} + Ln_{t-1}}{Kr_{t-1}} \left(\text{or } \frac{Sh_{t-1} + Sn_{t-1}}{Kr_{t-1}} \right) \end{aligned} \quad (5)$$

where Ir_t and Kr_t are residential investment and capital stock for the private sector, Y_t , real GDP. This form is consistent with profit maximization subject to constant returns to scale, and constant elasticity of substitution (CES) production

function. We neglect the user cost of capital, and nest the model within a general dynamic regression model.

The sources of all data used for estimation are described in Appendix.

4 Empirical Results

4.1 Analyses for the Existence of Unit Root

First, we examine the existence of unit root in our time series data with augmented Dickey-Fuller tests, where lags lengths are chosen using AIC criterion. The results are presented in Table 1 which includes time-series used in the regressions such as RCh , $RYhd$, RLh , RSh , Ie_t/Ke_{t-1} , Ir_t/Kr_{t-1} , etc.. The Table also includes the test results for some original macro data such as Lh_t and Ln_t (capital gains of land for households and non-financial corporates), Sh_t and Sn_t (capital gains of stock for households and non-financial corporates), Ch_t (real final consumption expenditure of households), Yhd_t (national disposable income of households), Ie_t and Ir_t (equipment and residential investments in the privater sector).

For the time-series used in the regression, RSh_t , Ir_t/Kr_{t-1} , Ln_t/Ke_t , Sn_t/Ke_t , $\Delta \log Y_t$, $(Lh_t + Ln_t)/Kr_{t-1}$, and $(Sh_t + Sn_t)/Kr_{t-1}$ are found to be stationary significantly at 5% or 10% level, while the unit root hypothesis is not rejected on RCh_t , $RYhd_t$, RLh_t , MQ_t , and CF_t/Ke_{t-1} . It is also found that, except for Sh_t , Sn_t and Ln_t , most original macro data are not rejected against the unit root hypothesis.

Perron (1989) carried out tests of the unit root hypothesis with a break in the level or in the slope of the trend function. In his pioneering study, Perron showed how standard tests of the unit root hypothesis against trend stationary alternatives cannot reject the unit root hypothesis if the true data generating mechanism is that of stationary fluctuations around a trend function which contains a one break. His tests rejected the unit root null hypothesis for most of the U.S. macroeconomic data series with a break in the trend occurring at the Great Crash of 1929 or at the 1973 oil-price shock. Since the date of a possible break point in Perron (1989) is fixed a priori, which is not appropriate in many cases, it is desirable to have available tests in which the date of break is treated as endogenous. In this paper, two types of test procedures developed by Zivot and Andrews (1992), and Perron (1997) respectively, are utilized for our data to test the unit root null hypothesis, where the break is determined endogenously. The model used here allows changes both in the level and the slope of the trend function of the series. These test procedures for Zivot and Andrews (1992), and Perron (1997) are described in Appendix.

Table 2 presents the test results for the data series which are not rejected in the

augmented Dickey-Fuller test. The unit root null hypothesis for RLh_t , Ie_t/Ke_{t-1} , CF_t/Ke_{t-1} , MQ_t , Yhd_t , Ie_t and Lh_t is rejected significantly by both of the two procedures, while for RCh_t , and Ch_t , it is rejected at the 5% level by Perron (1997)'s procedure, and for $RYhd_t$ by Zivot and Andrews (1992)'s procedure. These results show that, for the variables which are not rejected in the standard test procedure, the statistics in the model with estimated structural break are all significant against the unit-root hypothesis at least with one test procedure, except for the real residential investment for the private sector (Ir_t). The date of break (T_B), estimated endogenously, indicates that the break for most data series occurs mostly between 1986 and 1989, implying that the bubble economy occurring in the period of 1986-1989 has a substantial influence on Japanese macroeconomic time series.

Since most time series used in our study are not characterized by the presence of a unit root, the cointegration techniques used in some previous studies are neither necessary nor appropriate in the estimations of Japanese consumption and investment functions.

4.2 The Effects of Captial Gains or Losses on the Japanese Economy

4.2.1 Consumption Function

For the regression of Japanese aggregate consumption function of households, the equation (2) was first estimated for the entire sample period (1955-2000) by ordinary least squares. We use likelihood ratio test to the null hypothesis of $\alpha'_1 = 1$ and $\alpha'_2 = -\alpha'_3$. The statistic is estimated as 1.978, which is less than the critical value $\chi^2(2) = 4.61$ at 5% level. Therefore, the equation (3) is employed for the regression. That is, the regressions of ΔRCh on $\Delta RYhd$ and capital gains or losses are carried out. Since the income data are assembled around some basic accounting identities, including consumption, investment, et cetera, the model of aggregated consumption function generally violates the basic assumptions for least squares. The dynamic regressions in our consumption and investment functions also imply correlations between the error term and the right hand side variables. In this case, least squares will be inconsistent once again. For these problems, Generalized Method of Moments (GMM) is also applied in our estimation both for consumption and investment function. We consider the lagged values of Ch , Yhd , Lh , Sh , Ln , Sn and Ie dated $t - 2$, $t - 3$ as instrumental variables. And serial correlations in the error term is assumed as MA(2).

Table 3 shows the estimates obtained from least squares and GMM. There are a few differences between the estimates from the ordinary least squares and the GMM. The values of Durbin-Watson statistics are improved by the GMM. For

the full sample period with the GMM, the coefficient of RLh is estimated as 0.01, and 0.057 for RSh at 1% significant level, implying the positive contributions of capital gains of land and stock to the increase in households consumption, and the latter is larger than that of the former. The GMM estimate for the coefficient of $RLh + RSh$ is 0.012, and closely coincides with the ordinary least squares estimate of Horioka (1995), which is estimated as 0.016 for capital gains in the total households wealth in the period of 1955-1993. Table 3 also shows the results for two subsample periods, i.e. 1955-1990 and 1985-2000. Especially in the period of 1985-2000, the capital gains and losses of land and stocks experienced volatile changes due to the bubble economy and its collapse. Our estimate for capital gains of land and stocks in this period is 0.015, which is more than twice as much as that in the period of 1955-1990. This finding implies that, compared with earlier period, capital gains and losses of land and stocks become increasingly responsible for the changes in the Japanese households consumption during the bubble and the post-bubble period.

4.2.2 Equipment Investment Function

The estimated results for the equipment investment function of the corporate sector are presented in Table 4. There are many empirical studies that estimate the Q-type investment function developed by Hayashi (1982) with Japanese firm level data. More recently, Sekine (1999) and Ogawa (2003) reported their estimation results of the Q-type investment function using a micro panel data or cross-section data during the 1980s and 1990s. In the former study, Tobin's average Q is utilized, and in the latter the marginal Q. Compared with these panel analyses, our results obtained from the ordinary least squares are very similar to those in Ogawa (2003). Coefficient estimates for the marginal Q are negative or not statistically significant, while they are significantly positive for the cash flow term. However, it is not the case for the GMM estimates.

Unlike the coefficient estimates for marginal Q and cash flow, the results for capital gains of land and stock are quite robust. Both in the ordinary least square and the GMM, the estimates for Ln_{t-1}/Ke_{t-1} and Sn_{t-1}/Ke_{t-1} are found all positive, and statistically significant, except the ordinary least square estimates for the subsample period of 1985-2000. The magnitude of coefficient for capital gains of stocks is relatively larger than that of land. And for the period of 1955-1990 and 1985-2000, the coefficients for capital gains are estimated as 0.031 and 0.075 using the GMM. As the results obtained for the consumption function estimation, an increasing impact of capital gains and losses on private equipment investment behavior is also found during the volatile period of 1985-2000.

To investigate the sensitivity of our findings to the choice of specifications for the equipment investment function, we also tested the accelerator model of the

type as discussed in (5), regressing Ie_t/Ke_{t-1} on capital gains of land and stocks. The estimated results are reported in column 5 in Table 4. The coefficients on $(Ln + Sn)_{t-1}/Ke_{t-1}$ term remain conclusively positive and statistically significant. Therefore, we can be reasonably confident that the findings in equipment investment function are not influenced by the choice of models.

4.2.3 Residential Investment Function

Table 5 presents the estimates for residential investment function. In contrast to those findings above from the regression of consumption and equipment investment function, we cannot recognize the significantly positive effects when one year lagged capital gains or losses variables are used in the residential investment function. It is found, however, that the coefficients for the concurrent terms of capital gains or losses, say, Lhn_t/Kr_{t-1} or Shn_t/Kr_{t-1} , turn out positive, and highly significant, if the GMM is used. One explanation for this pattern of capital gains or losses effects may be that investment behavior of residential construction responds more directly and quickly with the change of prices in land or stock assets, compared with households consumption and corporate investment. Evidently, it is necessary to investigate this issue further.

5 Concluding Remarks and Directions for Further Research

5.1 Some Conclusions

In this paper we examined the effects of capital gains or losses of land and stocks on the Japanese economy, especially, on its demand side through households consumption, equipment and residential investment activities of the private sector.

Our data for capital gains or losses are based on the Reconciliation Accounts in the Japanese National Accounts, and covers the period of 1955-2000. We utilize new procedures with an endogenously determined break to test the unit root hypothesis on our time-series data.

Main findings of our study can be stated as follows:

Capital gains of land and stocks generated from steady price increases have been enormous in Japan not only during the bubble years of the late 1980s but ever since the 1950s, as shown by their high ratios to the nominal GDP. However, after the bubble bursting in 1990-91, the Japanese economy has been beset with the huge capital losses due to sudden falls of asset prices.

For most of the macro time-series data, the null hypotheses of unit root are rejected using the test procedures with an endogenously determined break, while

they had not been rejected in the standard unit root test procedures.

When the capital gains or losses variable is taken into account in the regression analysis of households consumption, private business investment and private residential investment in Japan, a significantly positive coefficient is estimated in each case for the sample period of 1955-1990, 1955-2000 and 1985-2000. These results imply that the slowdown of the post-bubble Japanese economy is largely due to the negative impacts on demand components incurred from the large capital losses of the land and stocks. But, at the same time, they also suggest that the superior growth performance of the Japanese economy since the 1960s up to the bubble burst in 1990 had been similarly but positively influenced by the still larger capital gains of the land and stocks.

5.2 Directions for Further Research

So far, this study has focused only on the direct link between the capital gains or losses of the assets and the GDP components, without regard to the mechanism through which the former affects the latter. In the case of households consumption, their link is direct and simple, in the sense that they affect only through the wealth effects of the household because at the macro level the capital gains or losses from land and stocks are supposed to comprise the major part of the yearly changes in the household wealth.

In the case of business investments, however, their link becomes much complicated. First of all, the capital gains or losses accrued to firms may affect directly their investment decisions by changing the position towards the risk premium of the investment project. Secondly, they affect also the amount of bank loans available to firms because in Japan the land asset is often used as a collateral for bank lending, particularly, to small and medium sized firms. But this lending system which worked quite well as far as the capital gains could be expected from land and stocks, had run into deep trouble, seized with the huge amount of bad loans, when the asset prices started falling precipitously. As a result of this, the total amount of loans outstanding by all private banks has been declining until even today since the late 1990s at the annual rate around -5%. How to reduce the bank's burden from the bad loans (which still amounts to around 8% of total loans by all private banks in March, 2003) and to revive the bank's lending activity is of utmost importance for the genuine recovery of the Japanese economy. Therefore, in the further study on the impacts of capital gains or losses in Japan their direct link to the firm's investment decisions as well as the indirect ones through the bank's lending behavior need to be taken into consideration.

Appendix

A.1. Data

The data used in the regressions for the consumption and investment functions cover the period 1955-2000, and are explained below.

Ch: *Final Consumption Expenditure of Households* at constant prices.

Yhd: *National Disposable Income of Households (including Private Unincorporated Enterprises)* at constant prices.

Ie: *Gross Domestic Fixed Capital Formation of Plant and Equipment in the Private Sector* at constant prices.

Ir: *Gross Domestic Fixed Capital Formation of Dwellings in the Private Sector* at constant prices.

Y: *Gross Domestic Product (GDP)* at constant prices.

L: *real Reconciliation Accounts of Land for the nation*.

S: *real Reconciliation Accounts of Shares for the nation*.

Lh: *real Reconciliation Accounts of Land for Households (including Private Unincorporated Enterprises)*.

Ln: *real Reconciliation Accounts of Land for Non-financial Corporations*.

Sh: *real Reconciliation Accounts of Shares for Households (Including Private Unincorporated Enterprises)*.

Sn: *real Reconciliation Accounts of Shares for Non-financial Corporations*.

CF: *real cash-flow, measured as the sum of Entrepreneurial Income of Non-financial Corporations and Consumption of Fixed Capital in the Private Sector both divided by the Deflator of GDP*.

Ke: *fixed capital stock of plant and equipment in the private sector, computed as follows,*

$$Ke_t = Ie_t + (1 - \delta)Ke_{t-1}$$

where $\delta (= 0.0772)$ is the depreciation rate of the fixed capital obtained from Ogawa and Kitasaka (1998)'s physical depreciation rate for the Japanese manufacturing sector. The initial value of the fixed capital, Kp_{1954} , is constructed from the *Non-financial Produced Assets* divided by the *Deflator of Gross Domestic Fixed Capital Formation for Private Plant and Equipment* in 1954.

Kr: *residential fixed capital stock for the private sector, computed in the same way as for Ke using 0.047 as the depreciation rate of residential fixed capital stock (also see Ogawa and Kitasaka (1998)).*

MQ: *marginal Q, constructed as follows,*

$$\text{marginal } Q = \frac{\text{marginal profit of capital/cost of capital}}{\text{deflator of fixed capital formation}}$$

where marginal profit of capital is computed as *Gross Domestic Product* minus *Compensation of Employees* both in the private sector, divided by Ke_{t-1} , and the *Deflator of Gross Domestic Fixed Capital Formation for Private Plant and Equipment* (see Abel and Blanchard (1986, pp255-256)). Following Suzuki (2001), the cost of capital is computed by $(1-\tau) \times r + \delta$, where $\tau = 0.4$ is the corporate tax rate, r , the average contracted interest rate on loans and discounts of domestically licensed banks obtained from Nikkei Economic Electronic Data System (NEEDS), and $\delta = 0.0772$, the physical depreciation rate for the Japanese manufacturing sector.

All data described above in italics are readily accessible from the *Annual Report on National Accounts* (ARNA) published by Cabinet Office of Japanese Government. The real values for L , S , Lh , Ln , Sh , Sn are obtained from the market values divided by the deflator of GDP. S , Sh and Sn in the period of 1955-69, however, are only available in book values. Since the market values of *Capital Transactions* in shares for the nation, households and non-financial corporations are available for each year, we use the following adjustment method to measure market values for S , Sh and Sn during the period of 1955-1970.

In this paper, the values in the *Reconciliation Accounts* are assumed to approximate those in the *Revaluation Accounts*. Therefore, the values in the *Closing Balance Sheet Account* (assets) for each year can be measured as follows,

$$A_t = Ac_t + (1 + g)A_{t-1} \quad (A1.1)$$

where A_t is an asset in the *Closing Balance Sheet Account*, Ac_t , the value of *Capital Transactions*, and $1 + g$, the ratio of the revalued value of A_t to its original value A_{t-1} . For the nation, households or non-financial corporations, A_{1970} of shares are based on market values, and readily available from ARNA. And for g , we consider the growth rates of Average Stock Price Index obtained from Tokyo Stock Market First Section. Thus, A_{t-1} for the previous years can be measured from A_t as follows,

$$A_{t-1} = \frac{A_t - Ac_t}{1 + g} \quad (A1.2)$$

From A_t , A_{t-1} and Ac_t , we can measure the past values of A based on the *Reconciliation Accounts* for the period of 1955-69 for the nation, households and non-financial corporations. The values of *Reconciliation Accounts* for 1999 and 2000, which are not reported based on SNA 68, are also computed in the method discussed above.

A.2 The Unit Root Test with an Endogenously Determined Break

In this paper, we use the procedures developed by Zivot and Andrews (1992), and Perron (1997) to test unit root for all the macro time series in our study. In these approaches, a break both in the level and the slope is allowed, and treated as endogenous, rather than known a priori. The unit-root null hypothesis is based on Model C in Perron (1989), that is,

$$y_t = \mu + \beta t + \delta DU_t + \theta D(T_B)_t + y_{t-1} + \epsilon_t \quad (A2.1)$$

where μ refers to the drift, T_B , the time of break, $DU_t = 1$ if $t > T_B$, 0 otherwise, $D(T_B)_t = 1$ if $t = T_B + 1$, 0 otherwise, and $A(L)\epsilon_t = B(L)v_t$ with $v_t \sim i.i.d.(0, \sigma^2)$.

According to the testing strategy of Zivot and Andrew (1992), the null that the series $\{y_t\}$ is integrated without an exogenous structure break, can be written as,

$$y_t = \mu + y_{t-1} + \epsilon_t \quad (A2.2)$$

With this null hypothesis, the regression equation used to test for a unit root (Equation 3' in Zivot and Andrews (1992)) is,

$$\begin{aligned} y_t = & \mu + \beta t + \delta DU(\lambda)_t + \gamma DT(\lambda)_t^* \\ & + \alpha y_{t-1} + \sum_{j=1}^k c_j \Delta y_{t-j} + v_t \end{aligned}$$

where $DT(\lambda)_t^* = t - T\lambda$ if $t > T\lambda$, 0 otherwise. A plausible estimation scheme is to choose the breakpoint that gives the least favorable result for the null (A2.2) using the standard t statistics, $t_\alpha(\lambda)$, which depends on the location of the break fraction (or breakpoint) $\lambda = T_B/T$. That is, λ is chosen to minimize the one-sided t statistics for testing $\alpha = 1$, when small values of the statistics lead to rejection of the null. Let λ_{inf} denotes such a minimizing value. Then, reject the null of a unit root if

$$\inf_{\lambda \in \Lambda} t_\alpha(\lambda) < \kappa_{inf, \alpha} \quad (A2.3)$$

where $\kappa_{inf, \alpha}$ denotes the size α left-tail critical value from the asymptotic distribution of $\inf_{\lambda \in \Lambda} t_\alpha(\lambda)$, and Λ , a specified closed subset of $(0, 1)$. Zivot and Andrew (1992) provided the percentage points of the asymptotic distribution of $\inf_{\lambda \in \Lambda} t_\alpha(\lambda)$ in their Table 4.

In Perron (1997), two methods to select T_B endogenously were proposed. The first is analogous to Zivot and Andrews (1992)'s approach, and the second is to choose T_B using the minimum of t_γ , the t -statistics on the changes in the slope $DT(\lambda)_t^*$, or the maximum of its absolute value. We apply the latter of the two methods in our unit-root test. This testing strategy is to obtain $t_{\alpha,\gamma} = t_\alpha(\lambda^*)$ where λ^* is,

$$\lambda^* = \operatorname{argmax}_{\lambda \in \Lambda} |t_\gamma(\lambda)| \quad (A2.4)$$

where again different specifications about the choice of k will be analyzed. This procedure needs not any a priori assumption on the sign of the change in slope. Perron (1997) provided the percentage points of the finite sample and asymptotic distributions of $t_{\alpha,\gamma}$ in his Table 1.

The unit root tests are implemented using TSP 4.5 (see the details for code in the web of *TSP International*).

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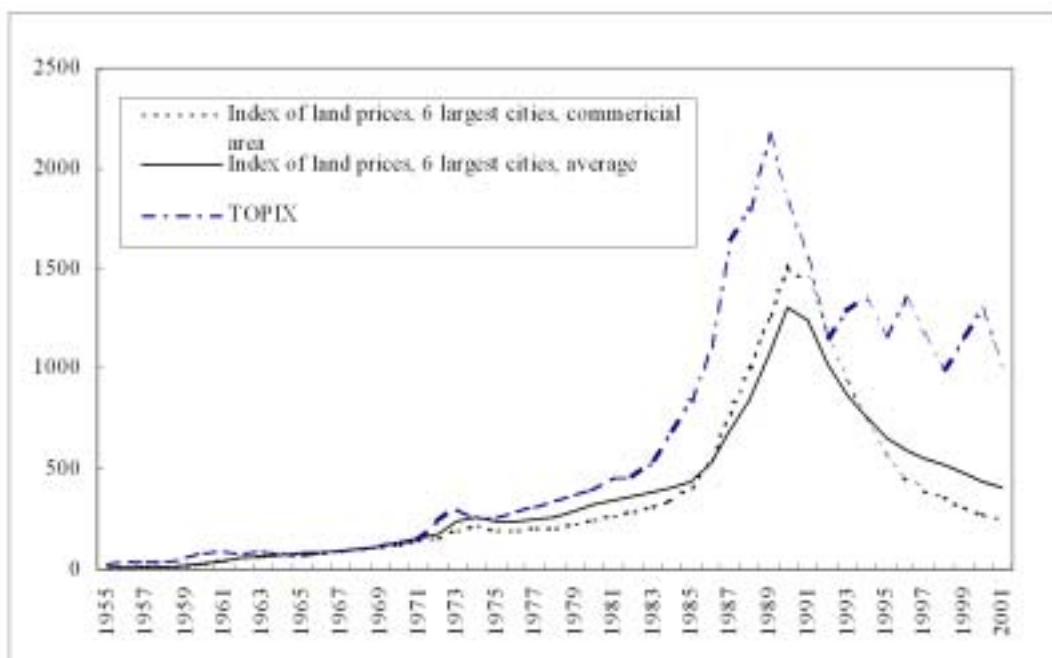


Figure 1: The Index of Land and Stock Prices: 1955-2001 (1968=100)

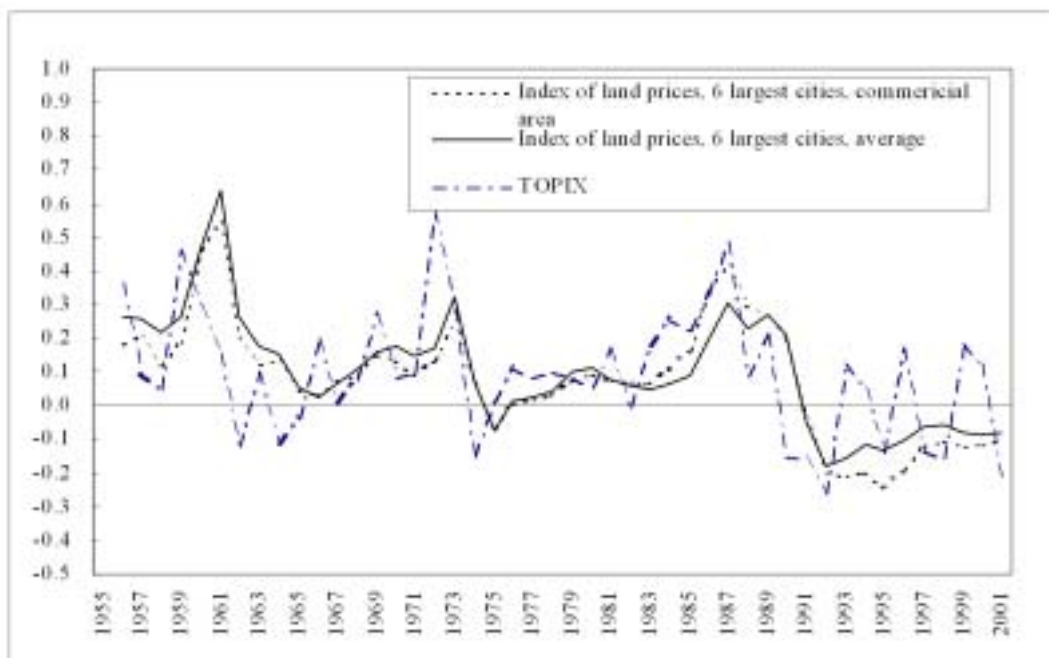


Figure 2: Annual Growth Rates of the Index of Land and Stock Prices

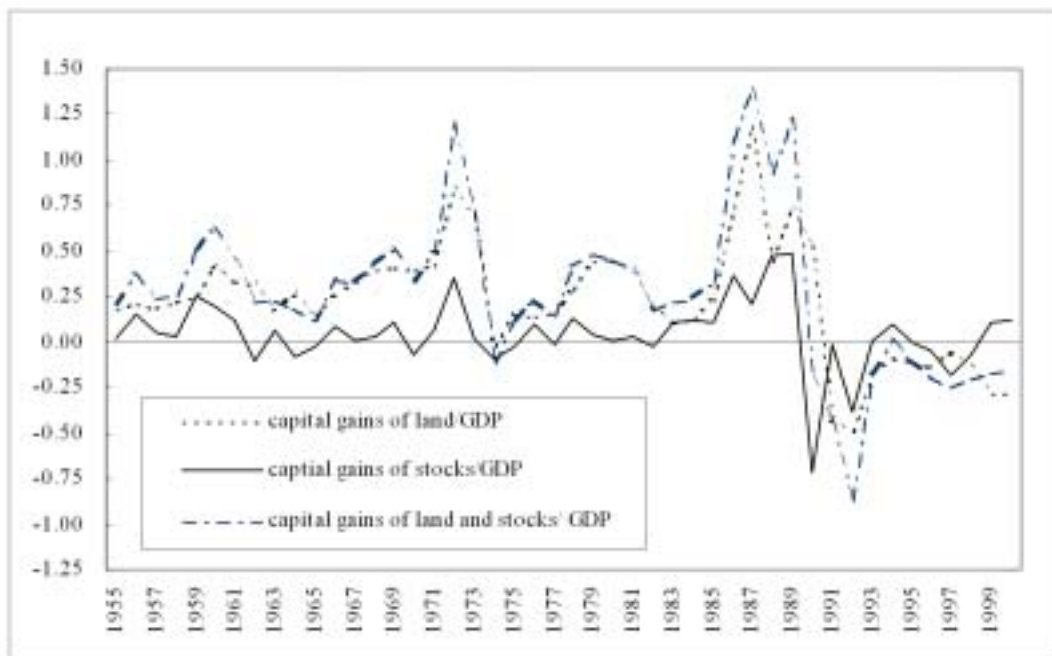


Figure 3: Capital Gains or Losses vs Normal GDP

Table 1. Tests for Unit Root⁽¹⁾ in Dickey-Fuller Test Procedure

Series	t_α	k	Series	t_α	k
Time-series used in the estimation			Original variables		
RCh_t	-1.51	8	Ch_t	-2.64	8
$RYhd_t$	-1.69	3	Yhd_t	-2.31	3
RLh_t	-1.42	5	Ie_t	-1.30	9
RSh_t	-3.76**	2	Ir_t	-1.17	2
Ie_t/Ke_{t-1}	-1.25	10	Lh_t	-1.38	5
Ir_t/Kr_{t-1}	-3.32*	10	Sh_t	-3.77**	2
MQ_t	-0.63	6	Ln_t	-3.32*	10
Ln_t/Ke_t	-3.49**	2	Sn_t	-3.73**	2
Sn_t/Ke_t	-3.24*	2			
CF_t/Ke_{t-1}	-1.05	6			
$\Delta \log Y_t$	-3.20*	2			
$(Lh_t + Ln_t)/Kr_{t-1}$	-3.28*	5			
$(Sh_t + Sn_t)/Kr_{t-1}$	-3.13*	2			
Note: (1) The symbols *, **, and *** denote rejection at the 10%, 5%, and 1% levels respectively.					

Table 2. Tests for Unit Root⁽¹⁾ with a Endogenous Break

Series	Test Procedures	t_α , or $t_{\alpha, \gamma }$	T_B	k
Time-series used in the estimation				
RCh_t	Perron (1997)	-5.017**	1994	14
	Zivot and Andrews (1992)	-4.460	1994	14
$RYhd_t$	Perron (1997)	-3.895	1986	7
	Zivot and Andrews (1992)	-5.306**	1991	7
RLh_t	Perron (1997)	-4.998**	1987	12
	Zivot and Andrews (1992)	-6.582**	1985	3
Ie_t/Ke_{t-1}	Perron (1997)	-5.413***	1975	3
	Zivot and Andrews (1992)	-5.519***	1975	3
CF_t/Ke_{t-1}	Perron (1997)	-6.411***	1980	3
	Zivot and Andrews (1992)	-6.388***	1981	3
MQ_t	Perron (1997)	-5.537***	1982	9
	Zivot and Andrews (1992)	-5.677***	1982	9
Original variables				
Ch_t	Perron (1997)	-4.685**	1988	9
	Zivot and Andrews (1992)	-4.158	1995	6
Yhd_t	Perron (1997)	-4.539**	1987	7
	Zivot and Andrews (1992)	-5.027*	1988	7
Ie_t	Perron (1997)	-4.914**	1988	11
	Zivot and Andrews (1992)	-5.289**	1988	11
Ir_t	Perron (1997)	-3.700	1981	9
	Zivot and Andrews (1992)	-4.784	1985	9
Lh_t	Perron (1997)	-5.584***	1987	12
	Zivot and Andrews (1992)	-5.708*	1988	12

Note: (1) The symbols *, **, and *** denote rejection at the 10%, 5%, and 1% levels respectively.

Table 3. OLS and GMM Estimates of the Households Consumption Function

	OLS					GMM ⁽¹⁾⁽²⁾				
	1	2	3	4	5	1	2	3	4	5
Sample Period:	1955-2000	1955-2000	1955-2000	1955-1990	1985-2000	1955-2000	1955-2000	1955-2000	1955-1990	1985-2000
Dependent Variable: ΔRCh_t										
$\Delta RYhd_t$	0.645 (6.09) ⁽³⁾	0.650 (6.77)	0.625 (6.02)	0.642 (4.56)	0.542 (5.61)	0.485 (5.42)	0.488 (4.18)	0.434 (4.35)	0.605 (5.92)	0.434 (7.62)
RLh_{t-1}	0.008 (1.73)					0.010 (2.82)				
RSh_{t-1}		0.040 (2.81)					0.057 (3.96)			
$(RLh + RSh)_{t-1}$			0.008 (2.24)	0.007 (1.22)	0.012 (4.73)			0.012 (4.66)	0.007 (3.00)	0.015 (13.35)
constant	0.006 (1.09)	0.007 (1.36)	0.007 (1.21)	0.008 (0.98)	0.010 (2.01)	0.013 (2.74)	0.015 (2.84)	0.015 (2.74)	0.010 (1.97)	0.014 (4.71)
R^2	0.579	0.623	0.598	0.481	0.887	0.579	0.623	0.598	0.481	0.887
DW	1.577	1.461	1.569	1.453	2.370	1.707	1.645	1.716	1.489	2.358
Test for overidentifying restrictions						8.244 [0.510] ⁽⁴⁾	7.774 [0.557]	7.771 [0.557]	4.079 [0.906]	3.436 [0.944]

- Note: (1) The instruments used for GMM are as follows, the lagged values of Yhd , Lh , Sh , Ln , Sn and Ie dated $t-2, t-3$.
(2) The error term is considered as in $MA(2)$ process.
(3) The values in () are t-statistics
(4) The values in [] are p-value.

Table 4. OLS and GMM Estimates of the Equipment Investment Function for the Private Sector

	OLS					GMM ^{(1),(2)}				
Sample Period:	1 1955-2000	2 1955-2000	3 1955-1990	4 1985-2000	5 1955-2000	1 1955-2000	2 1955-2000	3 1955-1990	4 1985-2000	5 1955-2000
Dependent Variable: Ie_t/Ke_{t-1}										
Ie_{t-1}/Ke_{t-2}	0.279 (3.89) ⁽³⁾	0.356 (4.71)	0.306 (4.23)	0.766 (5.02)	0.657 (14.49)	0.535 (6.14)	0.724 (7.81)	0.492 (7.51)	0.895 (13.54)	0.707 (26.25)
MQ_t	-0.012 (-1.81)	-0.013 (-2.02)	-0.020 (-2.16)	0.009 (0.77)		-0.009 (-0.99)	0.008 (1.26)	0.027 (1.30)	0.016 (3.16)	
CF_t/Ke_{t-1}	0.413 (4.92)	0.409 (4.74)	0.502 (4.38)	0.182 (1.28)		0.260 (2.68)	0.009 (0.10)	-0.110 (-0.41)	-0.212 (-1.58)	
$\Delta \log Y_t$					(0.53) (6.44)					(0.45) (7.38)
Ln_{t-1}/Ke_{t-1}	0.061 (2.29)					0.063 (3.78)				
Sn_{t-1}/Ke_{t-1}		0.051 (2.02)					0.166 (5.20)			
$(Ln + Sn)_{t-1}/Ke_{t-1}$			0.058 (3.34)	0.019 (0.95)	0.045 (2.72)			0.031 (1.88)	0.075 (2.99)	0.023 (2.25)
constant	0.062 (4.64)	0.059 (4.32)	0.066 (4.40)	-0.036 (-0.73)	0.026 (4.09)	0.046 (2.07)	0.001 (0.04)	-0.010 (-0.34)	-0.017 (-0.63)	0.023 (7.35)
R^2	0.968	0.967	0.968	0.921	0.961	0.968	0.967	0.968	0.921	0.961
DW	0.953	0.985	0.969	1.400	1.448	1.388	1.591	1.151	1.659	1.310
Test for overidentifying restrictions						2.755 [0.431] ⁽⁴⁾	1.802 [0.876]	3.257 [0.660]	2.886 [0.718]	7.603 [0.668]

- Note: (1) The instruments used for GMM are as follows, the lagged values of Ch , Yhd , Lh , Sh , Ln and Sn dated $t-2, t-3$.
(2) The error term is considered as in $MA(4)$ process.
(3) The values in () are t-statistics
(4) The values in [] are p-value.

Table 5. OLS and GMM Estimates of the Residential Investment Function for the Private Sector

	OLS					GMM ^{(1),(2)}				
Sample Period:	1 1955-2000	2 1955-2000	3 1955-2000	4 1955-1990	5 1985-2000	1 1955-2000	2 1955-2000	3 1955-2000	4 1955-1990	5 1985-2000
Dependent variable: Ir_t/Kr_{t-1}										
Id_{t-1}/Kd_{t-2}	0.838 (23.88) ⁽³⁾	0.830 (24.30)	0.835 (23.57)	0.836 (24.41)	0.605 (4.35)	0.837 (50.03)	0.826 (42.23)	0.844 (46.10)	0.831 (41.17)	0.602 (21.88)
$\Delta \log(Y_t)$	0.335 (5.92)	0.278 (4.45)	0.326 (5.80)	0.291 (4.63)	0.207 (2.35)	0.405 (9.75)	0.295 (6.96)	0.291 (7.61)	0.278 (6.34)	0.208 (8.55)
Lhn_t/Kd_{t-1} ⁽⁴⁾		0.004 (1.34)					0.004 (2.43)			
Shn_t/Kd_{t-1}			0.000 (-0.02)					0.009 (3.81)		
$(Lhn + Shn)_{t-1}/Kd_{t-1}$	-0.001 (-0.42)					-0.004 (-2.85)				
$(Lhn + Shn)_t/Kd_{t-1}$				0.002 (0.96)	0.004 (2.11)				0.003 (2.92)	0.004 (6.76)
constant	0.002 (0.69)	0.003 (1.00)	0.003 (0.75)	0.003 (0.84)	0.023 (2.41)	0.001 (0.51)	0.003 (1.45)	0.002 (1.29)	0.003 (1.42)	0.023 (12.50)
R^2	0.980	0.980	0.980	0.980	0.886	0.980	0.980	0.980	0.980	0.886
DW	1.992	1.848	1.960	1.942	1.899	2.011	1.841	2.096	1.894	1.886
Test for overidentifying restrictions						8.149 [0.700] ⁽⁵⁾	7.874 [0.725]	7.346 [0.770]	7.593 [0.749]	3.799 [0.975]

Note: (1) The instruments used for GMM are as follows,
the lagged values of Ch , Yhd , Lh , Sh , Ln and Sn dated $t-2, t-3$.

(2) The error term is considered as in $MA(2)$ process.

(3) The values in () are t-statistics

(4) Lhn denotes $Lh + Ln$, and Shn , $Sh + Sn$.

(5) The values in [] are p-value.