# Asset Holding and Consumption: Evidence from Japanese Panel Data in the 1990s

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The 1990s crash in Japan's stock and land market should have had adverse effects on household consumption. This paper takes advantage of a panel data from Japanese households to evaluate impacts of the wealth gains or losses on households' spending. We find that stockholders' consumption is responsive to stock market movements while this is not necessarily the case for non-stockholders, suggesting the importance of "direct" wealth effects. Moreover, we observe the MPCs out of stock price and real estate price changes are roughly comparable and estimated to be 0.05 to 0.1 slightly higher than previous estimates using aggregate data.

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## I. Introduction

Most economists agree that Japan's lost decade of the 1990s

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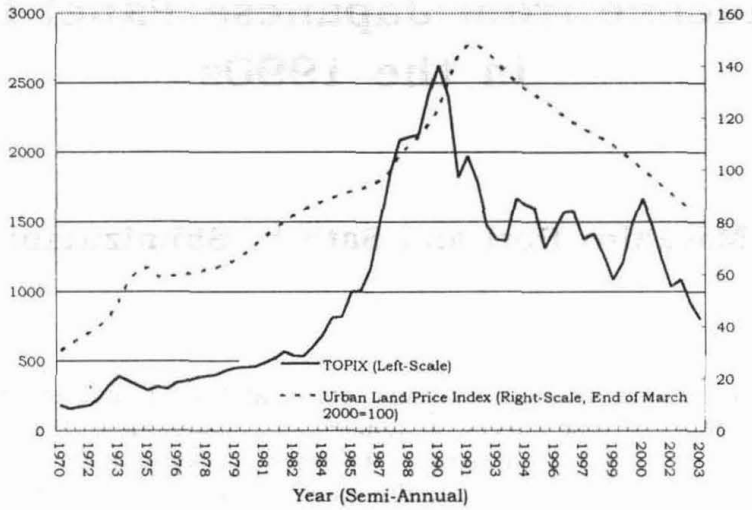


**FIGURE 1**

BUBBLE AND BURST ITS IN JAPAN

started with the collapse of the "Bubble" in asset markets. As its peak at the end of 1989, the Nikkei 225 Stock Average,[1] a representative stock price index in Japan, was at 38,915 yen. By spring of 2003 it had fallen to about 8,000 yen, the same level as that before the Bubble in 1983. Similar crash also can be observed in land prices, which fell by almost half from its peak (Figure 1).[2] Thus, it is natural to consider that these unprecedented crashes in asset prices should have had adverse effects on Japanese household consumption in the 1990s.[3]

However, surprisingly, the channels and magnitude of the asset price effects have not been seriously explored in Japan. Since asset markets still remain stagnant, a quantitative evaluation of the "wealth effect" on Japanese consumption is of interest to both

[1]The Nikkei 225 is a leading price weighted index of 225 top rated Japanese companies listed in the First Section of the Tokyo Stock Exchange.

[2]The nationwide urban land price index compiled by the Japan Real Estate Institute declined by 43% from 1991 to 2003.

[3]Classical block exogeneity tests (Appendix Table) confirm that asset price movements caused real economy in Granger's sense in support of our conjecture.

academics and policy makers, so that it could contribute to explain the stagnant consumption in the decade.

In previous studies on the wealth effect, asset prices have been found to affect consumption through two different channels. The first channel, called the "direct effect," focuses on the fact that a change in asset prices alters the budget constraint on asset holders and thus their consumption. For example, if stock price declines, it makes a stockholder's budget constraint more stringent and thus dampens their spending. This hypothesis is studied in the large literature on the "elasticity of intertemporal rate of substitution (EIS)" or empirical tests of the Consumption CAPM theory. The second channel, called the "indirect effect," focuses on the fact that asset markets predict future prospects of the economy as a whole and therefore affect consumption through anticipation or mental accounting. Under the second channel, even households that do not hold assets may perceive a decline in asset price as a predictor of future income losses and thus shrink their spending.

This study is the first in Japan to consider both channels to evaluate the "wealth gain/loss effects" on Japanese consumption in 1990s, expanding the analysis to the effects of both financial and non-financial assets. Contrary to the previous studies in the 1990s using aggregate data, this study takes advantage of micro-level data from the *Japanese Panel Survey of Consumption* (henceforth, JPSC) conducted by the Institute of Household Economy (Kakei-Keizai-Kenkyu-Sho) in order to obtain precise estimates. The JPSC data set has a unique place in the Japanese household-level data with rich information on households' characteristics and financial status. Initiated in 1993 and surveyed annually, the data can be constructed into an annual panel, which enables us to control for heterogeneity of households to evaluate the capital gain/loss effects.

The main findings of this paper are summarized as follows. First, stockholders' consumption is responsive to stock market movements while this is not the case for non-stockholders, suggesting the importance of "direct" wealth effects. The "indirect" effects are not necessarily observed in our analyses. Second, we compared the marginal propensity to consume (MPC) out of stock price changes and that out of real estate price changes, and found that they are roughly comparable. The MPC out of wealth gains or losses is estimated to be 0.05 to 0.1, slightly higher than estimates reported in previous studies in Japan using aggregate data.

This paper is organized as follows. The next section reviews some previous studies on the effect of capital gains or losses on consumption. The third section describes the data set used in this study. The fourth section presents our empirical results that explore the channels of capital gain/loss to affect on consumption in Japan, and the fifth section estimates the marginal propensity to consume out of wealth gains/losses. The final section concludes.

## II. Literature Review

As discussed above, there are two channels through which asset market developments affect on household consumption: the "direct" effect and the "indirect" effect. Thus we review the previous studies through two different streams in the literature.

The first stream is a large literature of theoretical and empirical studies on the elasticity of intertemporal substitution (EIS). Using aggregate data, Hall (1988) found the EIS is not significantly different from zero. However, more recently, researchers started to take advantage of micro-level data to estimate the elasticity based on the Consumption CAPM. A key finding of those studies based on micro-level data is that consumption of stockholders is more sensitive to market returns than non-stockholders to suggest that the "direct" channel is important.

Mankiw and Zeldes (1991) is a pioneering study that investigates how behavior of stockholders' spending differs from that of non-stockholders. They use annual panel data from the PSID (*Panel Study of Income Dynamics*) to observe that stockholders' spending is more volatile and more sensitive to the excess return of stock market, which contributes to solve the "equity premium puzzle" to some extent. Most of the later studies followed the strategy of Mankiw and Zeldes (1991), and tried to divide the sample into stockholders and non-stockholders to see which type of household is more sensitive to the stock market movements. For example, Vissing-Jorgensen (2002) finds a large and significant difference in estimates of EIS between holders and non-holders and shows that EIS is estimated to be 0.3 to 0.4 for stockholders and 0.8 to 1.0 for bondholders. Attanasio *et al.* (2002) employs U.K. household-level data to report that consumption growth of stockholders is more volatile and more sensitive to excess returns to stocks. On

the contrary, Poterba (2000) argues that the marginal propensity to consume out of stock market wealth is at most 0.05.

In contrast to the first stream that exclusively focuses on the "direct effect" by estimating EIS, the second stream emphasis on the "indirect effect" in their evaluation of wealth effects on consumption. Poterba and Samwick (1995) offer evidence that the direct effect is small. Among the luxury goods they studied, only new car purchase is significantly correlated with stock price movements and this relationship reflects the fact that stock market movements predict consumer demand. Successive studies such as Starr-McCluer (1998) and Otoo (1999) report smaller or little difference in spending between stockholders and non-stockholders. Poterba (2000) argues that the indirect effect is more difficult to quantify than the direct one.

With reference to the opposing view by two streams, *i.e.*, direct *vs.* indirect, Dynan and Maki (2001) proposed a way to empirically evaluate the relative importance of the two channels of the "wealth gain/loss effects" on consumption. They take advantage of household-level data from the *Consumer Expenditure Survey* (CEX), and adopt the Mankiw-Zeldes framework to test the "direct effect" by examining whether there is a difference in the consumption response of stockholders and non-stockholders to the stock prices movements. At the same time, they try to evaluate the "indirect effect" by examining stock prices as a leading indicator of future income. Their findings demonstrate that the direct effect surfaces quickly and stimulates spending for a number of quarters but the indirect effect is not important for consumption growth. They also report that an additional dollar of stock market wealth stimulates consumption by between 5 and 15 cents.

In Japan, Ando *et al.* (1986) is a leading study on consumption wealth effects. They use micro-level cross-section data from the *National Survey of Family Income and Expenditure* and find that the estimated marginal propensity to consume out of asset is estimated to be less than 0.05. More recently, Ogawa and Kitasaka (1998) use prefecture-level data for 1980, 1985 and 1990 to find that wealth effect in financial capital gains/losses is significant but that in real assets movements is ambiguous. The MPC out of liquidity assets (deposits plus securities minus debts) is estimated to be about 0.05. More recently, Institute of Industry (2003) follows the same procedure to estimate the MPCs in 1990s and concludes that

the MPC out of financial assets and real assets is around 0.01.

In this paper, making use of an annual panel data from the JPSC, we basically employ the framework proposed by Dynan and Maki (2001) that dealt with both channels clearly and compared the effects. Since the crash in the 1990s in Japan substantially diminished households' expectation and raised anxiety for future income, our starting hypothesis is that both channels matter in Japan. If we focus only on the estimates of EIS, we might discard the possible indirect channel so that the effect of the asset market crash would be underestimated. Moreover, we will examine not only the wealth effects from stock prices but also those from real estate prices which also experienced a substantial decline in the 1990s. Previous studies mainly focused on stock prices rather than real asset prices probably because real assets are less liquid. However, how real asset is liquid may depend on the types of ownership. We use a rich data set described in the next section to evaluate the consumption effect of real asset prices by type. As far as we know, the JPSC data is the only available data set to be used to calculate the effect of capital gains on consumption at household level in Japan.

## III. Data

The JPSC was initiated by the Institute of Household Economy (Kakei-Keizai-Kenkyu-Syo) in 1993, and tracks the same households every year. The sample is randomly chosen from all over Japan and contains 2,000 households. The survey has very detailed variables related to consumption, income, assets, labor supply and household demographics. At this point, this is the only long-term panel data currently available for Japanese households and the data from 1993 to 1999 is open to researchers outside the Institute.

The first sample of this panel (with 1,500 households) covers both married and unmarried women whose age is between 24 and 34 in 1993. The second sample of 500 households was added in 1997. If there were no omission, the number of observations would be 12,000 $(=1,500\times7+500\times3)$ but the actual number of observations with valid responses is 10,504.

To improve the reliability of our empirical analyses, we remove some observations based on the following criteria. First, we

eliminated 537 households (3,005 observations) with unmarried. This is because Japanese single young women often live on parents' income, but the survey does not contain the information about their parents' consumption. Second, we restrict our analysis to households with wage earners. As noted in the earlier studies on Japanese consumption, income data for self-employed is untraceable and possibly manipulated with their business accounts.[4] Third, we exclude households in which members other than the household head and spouse earn their own income because the existence of other members who have their own source of income may blur the completeness of surveyed households. Forth, we exclude observations if they respond the key items for our analysis, *i.e.*, consumption, income, and asset holdings, improperly. These cuts reduce the sample to 1,164 households (or 3,778 observations).

The summary statistics of the main variables used in our analyses is reported in Table 1. The average household monthly consumption (in September) is 215 thousand yen and the average annual income is 6.1 million yen. The age of head of household is 34.4 on average, relatively young due to the sample design of the JPSC described above. The average family member is about 3.9, and roughly 40% of the heads of household are university graduates. These figures are consistent with those in Table 2, the result of the *National Survey of Family Income and Expenditure* (NSFIE) if we look at the average of the figures in the age ranges of 30-34 and 35-39. Since the NSFIE is a large sample household-level data collected from all over Japan, our sample represents the population and is less biased.

For the purpose of this paper, availability of asset holding information, *i.e.*, the information that can be used to identify assetholders and non-assetholders, is critical. Unfortunately, there is no question that explicitly asks about equity holdings in the

[4]A referee of this journal thoughtfully pointed out that removing unmarried women or self-employed households from the sample makes results biased toward rejecting the indirect effects. However, the elimination is justified by what we explained in the text as well as the fact that it might not be true that unmarried women tend to have steady jobs and thus their income is more affected by stock price movements in Japan, which is especially the case for the sample in the JPSC whose age is young. As regards the self-employed, we tried the estimates in Section IV and V including the self-employed observations but the magnitude and significance of the main variables are not affected.

**TABLE 1**

BASIC STATISTICS BY GROUP WITH DIFFERENT ASSETS

1-1 All Observations

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 3,778 | 21.5 | 20 | 8.8 | 1.3 | 87 |
| Annual Income (Previous Year) | 3,778 | 612.6 | 574 | 274.6 | 50 | 8,200 |
| Age of Household Head | 3,778 | 34.4 | 34 | 5.3 | 22 | 60 |
| Number of Family Member | 3,778 | 3.9 | 4 | 1.3 | 1 | 9 |
| Two-income Family Dummy | 3,778 | 0.2 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 3,778 | 0.4 | 0 | 0.5 | 0 | 1 |
| Security | 3,752 | 37.6 | 0 | 187.2 | 0 | 5,000 |
| Land | 3,527 | 833.7 | 0 | 2,830.8 | 0 | 90,000 |
| House (including Apartment) | 3,380 | 737.1 | 0 | 1410.2 | 0 | 30,000 |

Note: The unit for consumption and annual income is ten thousand and that for assets is thoudand yen.

1-2 Stockholders *vs.* Non-Stockholders

1) Securityholders

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 534 | 24.7 | 23.3 | 9.3 | 7.2 | 70 |
| Annual Income (Previous Year) | 534 | 775.7 | 733.5 | 280.8 | 210 | 2,000 |
| Age of Household Head | 534 | 36.0 | 35 | 5.2 | 24 | 53 |
| Number of Family Member | 534 | 3.9 | 4 | 1.3 | 2 | 8 |
| Two-income Family Dummy | 534 | 0.2 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 534 | 0.7 | 1 | 0.5 | 0 | 1 |
| Security | 508 | 277.7 | 150 | 438.5 | 4 | 5,000 |
| Land | 508 | 1,441.0 | 0 | 3,440.7 | 0 | 30,000 |
| House (including Apartment) | 487 | 1,178.4 | 300 | 2,266.9 | 0 | 30,000 |

2) Non-Securityholders

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 3,244 | 21 | 20 | 8.6 | 1.3 | 87 |
| Annual Income (Previous Year) | 3,244 | 585.8 | 550 | 264.2 | 50 | 8,200 |
| Age of Household Head | 3,244 | 34.1 | 34 | 5.3 | 22 | 60 |
| Number of Family Member | 3,244 | 3.9 | 4 | 1.3 | 1 | 9 |
| Two-income Family Dummy | 3,244 | 0.2 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 3,244 | 0.4 | 0 | 0.5 | 0 | 1 |
| Security | 3,244 | 0 | 0 | 0 | 0 | 0 |
| Land | 3,019 | 731.5 | 0 | 2,702 | 0 | 90,000 |
| House (including Apartment) | 2,893 | 662.8 | 0 | 1,192.4 | 0 | 16,000 |

(Table Continued)

1-3 Real Estate Owner *vs.* Non-Real Estate Owner

1) Detached House Owner

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 1,235 | 20.5 | 20 | 8.7 | 4 | 87 |
| Annual Income (Previous Year) | 1,235 | 638.6 | 596 | 259.7 | 126 | 2,520 |
| Age of Household Head | 1,235 | 35.8 | 36 | 5 | 23 | 56 |
| Number of Family Member | 1,235 | 4.6 | 5 | 1.4 | 2 | 9 |
| Two-income Family Dummy | 1,235 | 0.2 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 1,235 | 0.4 | 0 | 0.5 | 0 | 1 |
| Security | 1,235 | 55.0 | 0 | 268.5 | 0 | 5,000 |
| Land | 984 | 2,988.2 | 2,000 | 4,722.2 | 30 | 90,000 |
| House (including Apartment) | 872 | 1,297.8 | 1,000 | 1,123 | 0 | 10,000 |

2) Condominium Owner

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 405 | 22.3 | 20 | 9.2 | 5 | 75.3 |
| Annual Income (Previous Year) | 405 | 736.5 | 687 | 440.3 | 150 | 8,200 |
| Age of Household Head | 405 | 35.9 | 36 | 4.5 | 25 | 56 |
| Number of Family Member | 405 | 3.6 | 4 | 1 | 1 | 8 |
| Two-income Family Dummy | 405 | 0.2 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 405 | 0.6 | 1 | 0.5 | 0 | 1 |
| Security | 402 | 37.0 | 0 | 138 | 0 | 2,170 |
| Land | 405 | 0.0 | 0 | 0 | 0 | 0 |
| House (including Apartment) | 387 | 2,797.1 | 2,500 | 2,271.1 | 300 | 30,000 |

3) Others

| | Num. Obs | Mean | Medi-an | Std Dev | Mini-mum | Maxi-mum |
|---|---|---|---|---|---|---|
| Household Consumption (September) | 2,138 | 21.9 | 20.4 | 8.8 | 1.3 | 82.5 |
| Annual Income (Previous Year) | 2,138 | 574.2 | 537 | 230.1 | 50 | 4,207 |
| Age of Household Head | 2,138 | 33.3 | 33 | 5.3 | 22 | 60 |
| Number of Family Member | 2,138 | 3.5 | 4 | 1.1 | 1 | 8 |
| Two-income Family Dummy | 2,138 | 0.1 | 0 | 0.4 | 0 | 1 |
| University Graduate Dummy | 2,138 | 0.4 | 0 | 0.5 | 0 | 1 |
| Security | 2,125 | 27.7 | 0 | 128.3 | 0 | 2,150 |
| Land | 2,138 | 0 | 0 | 0 | 0 | 0 |
| House (including Apartment) | 2,121 | 130.7 | 0 | 663.9 | 0 | 10,000 |

**TABLE 2**

RELATED STATISTICS FROM THE *NATIONAL SURVEY OF FAMILY INCOME AND EXPENDITURE* IN 1999

| Workers' Households | All Ages Average | Age Group of Household Head | | | | |
|---|---|---|---|---|---|---|
| | | 25 years, under | 25-29 | 30-34 | 35-39 | 40-44 |
| Number of Tabulate Households | 34,295 | 319 | 1,816 | 3,627 | 4,636 | 5,193 |
| Household Consumption (September-November) | 35.3 | 22.3 | 25.5 | 27.4 | 30.5 | 34.0 |
| Annual Income | 799.2 | 385.3 | 496.4 | 586.0 | 691.2 | 787.2 |
| Age of Household Head | 45.7 | 22.7 | 27.5 | 32.1 | 37.1 | 42.0 |
| Number of Family Member | 3.61 | 2.79 | 2.95 | 3.43 | 3.96 | 4.23 |
| Number of Earners | 1.69 | 1.34 | 1.41 | 1.37 | 1.43 | 1.54 |
| Rate of Owned House | 70.7 | 12.7 | 25.7 | 42.6 | 59.1 | 72.8 |
| Security | 111.0 | 23.7 | 19.9 | 32.3 | 65.5 | 69.8 |

JPSC. In each interview, however, households are asked: "Do you own any securities, such as stocks, bonds, investment trusts, loan trusts?" Respondents who answer "yes" are also asked for the value of all securities, and the total purchase and sales value of any security trade during the past year.

To identify stockholders, we need to set criteria to classify the observations and to assume a certain fraction of securities reflects stock holdings. In our analyses below, we classify households as stockholders if they have security holdings greater than a million yen.[5] Although the mix with other securities, especially with bonds, may cause downward bias in the estimates of the indirect effect, the fact that stock holdings occupies a greater part of total security holdings in Japanese households justifies our criteria.[6]

[5]As in previous studies, we tried other sample splits: i) classify households as stockholder if they have security holdings greater than zero, then ii) if they have security holdings greater than 0.3 million yen, and finally and iii) if they have securities greater than a million yen. Applying the looser dividing lines, *i.e.*, 0 or 0.3 million, decreases the statistical significance of the measured wealth effect on consumption.

[6]According to the *Family Savings Survey 2000* compiled by the Management and Coordination Agency, stock holdings occupies 70 percent of total security holdings (1.15 million yen) by Japanese households with average financial assets (16-8 million yen).

As for real assets (land and real estate), there are questions regarding residential status including detached house, condominium, rented house, house provided by company every year in the JPSC. Respondents who answer they own their detached house are also asked for the market value of land and building respectively.

Based on those criteria, about 42% of all sample households hold some amount of securities; and 32% own their detached house. 11% own a condominium and remaining households are supposed to rent house. The sample size is slightly reduced (to 3,753 or 3,527 observations) if we require the availability of the information of equity and real assets value. The average value of securities held by a household is 376 thousand yen, and that of real assets is 15.7 million yen (8.3 million for land and 7.4 million for house respectively).

If we compare stockholders and non-stockholders based on our million yen criteria (Table 1-2), household consumption and annual income are greater for holders than non-holders as expected. The average age and level of education is also higher for holders. The average value of securities for holders is 2.8 million yen. Stockholders also have larger amount of real assets. The value of land/house for stockholders is about two times higher than those for non-holders.

If we compare different types of house ownership (Table 1-3), annual income and the share of university graduates are higher for condominium owners than other categories, followed by detached house owners. There is no large difference in consumption, but detached house owners have a larger number of family members. The average value of land for detached house owners is 29.9 million yen. The value of house building is 13.0 million for detached house owners, 28.0 million for condominium owners.

## IV. Direct *vs.* Indirect Effects on Consumption by Assetholders and Non-Holders

First, we employ the Dynan and Maki (2001) framework to evaluate the relative importance of the direct and indirect wealth effects on consumption. The idea is to divide the sample by asset ownership and to see the correlation between households' consumption growth and aggregate asset market returns. If we

observe higher correlation for asset holders, we can interpret it as a supportive evidence for direct effects on consumption. If wealth value has no direct effects, the correlation should be no higher for assetholders.

### A. Specification

We run the following regression to see the correlations separately for assetholders and non-assetholders. This specification is based on the standard consumption model employed by Dynan and Maki (2001).

$$\frac{\Delta C_{i,t}}{C_{i,t-1}} = \sum_{j=1}^{2} a_{1i} \frac{\Delta StockIndex_{t-j+1}}{StockIndex_{t-j}} + \sum_{j=1}^{2} a_{2i} \frac{\Delta StockIndex_{t-j+1}}{StockIndex_{t-j}} \times DStockholder_{i,t}$$

$$+ \sum_{j=1}^{2} b_{1i} \frac{\Delta LandIndex_{t-j+1}}{LandIndex_{t-j}} + \sum_{j=1}^{2} b_{2i} \frac{\Delta LandIndex_{t-j+1}}{LandIndex_{t-j}} \times DDetach_{i,t} \quad (1)$$

$$+ \sum_{j=1}^{2} b_{3i} \frac{\Delta LandIndex_{t-j+1}}{LandIndex_{t-j}} \times DCOND_{i,t} + cX_{i,t} + \varepsilon_t$$

The dependent variable is annual growth of real consumption for each household. For our regressions, we construct an annual growth rate of consumption, using the total spending of all household members in September, which is the surveyed month. In other words, we use growth of spending in September as annual change in household consumption.[7] We dropped newly-married observations since a change in marital status surely make our household spending data noisier. We also exclude any observations if the annual consumption growth rate exceeds 100% or falls short of $-50\%$. These adjustments reduce the samples in the following regressions to 685 households (or 1,643 observations).

The first explanatory variable $\Delta StockIndex_{t-j+1}/StockIndex_{t-j}$ is the annual (from September to September) growth of the aggregate real

[7]Kohara (2001) constructed annual growth of household spending in the same way. As she pointed out, there is another way to construct consumption data using change in assets and income flow. However, this way substantially reduces the sample size because the amount of tax payments is often unavailable.

stock value, which is defined as the growth rate of the market price in the 1*st* and 2*nd* sections of the Tokyo Stock Exchange. Similarly, the third variable $\Delta LandIndex_{t-j+1}/LandIndex_{t-j}$ is the annual growth rate of nationwide urban residential land price index, which is regularly published by the Japan Real Estate Institute.

$DStockholder_{i,t}$ is a dummy variable that takes one for stockholder observations (zero for otherwise). Thus, the second terms refer to the interaction between changes in stock value and status of stockholders. If stock value correlates holders' spending more than that for the non-holders' (probably due to the direct wealth effect), this interaction term is to be significantly positive. Similarly, $DDetach_{i,t}$ and $DCOND_{i,t}$ are dummies for detached house owners and condominium owners respectively. Therefore, the fourth terms refer to the interaction between changes in land value and the detached house ownership, and the fifth terms to the interaction between changes in land value and the condominium ownership. If capital gains/losses on land have more of an impact on consumption of a real estate holder than that of a non-holder, these terms would be significantly positive. Following the specification of Dynan and Maki (2001), we include lagged growth in our specification in order to capture wealth effects that probably occur gradually over a period of several years.

Our set of control variables, $X_{i,t}$, includes the growth of real annual income and the log of previous year real income to control for income effects. We also control for head of household age, age-squared, family size and its change, dummy variables corresponding households with loans which takes 1 for households with some loans and 0 for households without any loans, and dummy variables corresponding to educational attainment of head of household. Moreover, we include lagged inter-bank rate to allow for some of aggregate shocks.[8]

### *B. Results*

Table 3 reports the results from estimating some variations of

[8]Similar exercise performed by Dynan and Maki (2001), which is based on quarterly data, uses year dummies to control aggregate shocks but we cannot use year dummies in our regressions due to the annual frequency of our data.

**TABLE 3**

RELATIONSHIP BETWEEN CONSUMPTION GROWTH AND WEALTH CAPITAL GAINS (STOCK AND LAND): ASSETHOLDERS *VS.* NON-ASSETHOLDERS

| Dependent Variable: | Stock Capital Gain | | | Real Estate Capital Gain | | | Stock and Real Estate Capital Gain | | |
|---|---|---|---|---|---|---|---|---|---|
| ⊿Household Consumption/Household Consumption (-1) | Plain OLS | Random Effects | Fixed Effects | Plain OLS | Random Effects | Fixed Effects | Plain OLS | Random Effects | Fixed Effects |
| ⊿Aggregate Market Value/Aggregate Market Value (-1) | -0.050 | -0.051 | -0.122 | | | | 0.045 | 0.058 | 0.050 |
| | [0.073] | [0.064] | [0.372] | | | | [0.053] | [0.039] | [0.138] |
| ⊿Aggregate Market Value (-1)/Aggregate Market Value (-2) | 0.108 | 0.031 | 0.117 | | | | -0.073 | -0.083 | -0.233 |
| | [0.137] | [0.075] | [0.294] | | | | [0.118] | [0.079] | [0.620] |
| ⊿Aggregate Market Value/Aggregate Market Value (-1) | 0.203** | 0.237*** | 0.330** | | | | 0.201** | 0.233*** | 0.331** |
| ×Stock Holding Dummy | [0.098] | [0.088] | [0.136] | | | | [0.098] | [0.088] | [0.137] |
| ⊿Aggregate Market Value (-1)/Aggregate Market Value (-2) | 0.121 | 0.088 | 0.133 | | | | 0.123 | 0.097 | 0.157 |
| ×Stock Holding Dummy | [0.149] | [0.135] | [0.206] | | | | [0.150] | [0.135] | [0.207] |
| ⊿JREI Residential Land Price Index/JREI Residential | | | | 1.101 | 0.555 | 1.523 | 3.133* | 3.413*** | 2.237 |
| Land Price Index (-1) | | | | [1.830] | [1.436] | [6.226] | [1.866] | [1.327] | [8.315] |
| ⊿JREI Residential Land Price Index (-1)/JREI Residential | | | | -0.850 | -0.455 | -1.120 | -1.356* | -1.349** | -2.164 |
| Land Price Index (-2) | | | | [0.952] | [0.562] | [1.868] | [0.813] | [0.686] | [1.952] |
| ⊿JREI Residential Land Price Index/JREI Residential | | | | 0.910 | 0.998 | 0.863 | 0.880 | 0.969 | 0.844 |
| Land Price Index (-1)×Detached House & Land Dummy | | | | [1.152] | [1.073] | [1.942] | [1.152] | [1.070] | [1.939] |
| ⊿JREI Residential Land Price Index (-1)/JREI Residential | | | | 0.102 | 0.455 | 1.215 | 0.124 | 0.461 | 1.253 |
| Land Price Index (-2)×Detached House & Land Dummy | | | | [0.868] | [0.779] | [1.286] | [0.870] | [0.779] | [1.288] |

(Table Continued)

| Dependent Variable: | Stock Capital Gain | | | Real Estate Capital Gain | | | Stock and Real Estate Capital Gain | | |
|---|---|---|---|---|---|---|---|---|---|
| ⊿Household Consumption/Household Consumption (-1) | Plain OLS | Random Effects | Fixed Effects | Plain OLS | Random Effects | Fixed Effects | Plain OLS | Random Effects | Fixed Effects |
| ⊿JREI Residential Land Price Index/JREI Residential Land Price Index (-1)×Condominium Dummy | | | | 2.175 | 2.455* | 2.368 | 2.133 | 2.373* | 2.031 |
| | | | | [1.513] | [1.400] | [2.620] | [1.512] | [1.398] | [2.625] |
| ⊿JREI Residential Land Price Index (-1)/JREI Residential Land Price Index (-2)×Condominium Dummy | | | | -1.448 | -1.458 | -1.582 | -1.428 | -1.445 | -1.655 |
| | | | | [1.244] | [1.106] | [1.826] | [1.244] | [1.104] | [1.823] |
| ⊿Annual Income/Annual Income (-1) | 0.058 | 0.055 | 0.016 | 0.053 | 0.048 | 0.005 | 0.055 | 0.053 | 0.016 |
| | [0.038] | [0.034] | [0.061] | [0.038] | [0.034] | [0.061] | [0.038] | [0.034] | [0.061] |
| ln (Annual Income (-1)/CPI (-1)) | 0.036 | 0.053* | 0.198** | 0.042 | 0.061** | 0.208** | 0.038 | 0.055* | 0.198* |
| | [0.027] | [0.031] | [0.094] | [0.027] | [0.031] | [0.094] | [0.027] | [0.031] | [0.094] |
| Hausman test of $H_0$: RE *vs.* FE: *P*-value | | 0.851 | | | 0.9521 | | | 0.9627 | |
| *F* test of A, B=$A_t$, B: *P*-value | | | 1.000 | | | 1.000 | | | 1.000 |
| Std. error of regression | 0.296 | 0.296 | 0.313 | 0.296 | 0.296 | 0.314 | 0.295704 | 0.295883 | 0.313045 |
| Adjusted *R*-squared | 0.019 | 0.018 | -0.099 | 0.017 | 0.016 | -0.105 | 0.018312 | 0.017875 | -0.1002 |
| # of Observations | 1,643 | 1,643 | 1,643 | 1,643 | 1,643 | 1,643 | 1,643 | 1,643 | 1,643 |

Notes: Standard errors in brackets. Dependent variable is the growth rate of household consumption as defined in the text. Regressions also include age, age squared, family size, change of family size, dummy variables corresponding household with loans, dummy variables for university graduates, and lagged interbank rate.

equation (1). We followed the general procedure of linear regression model for panel data estimation, and compared results from a pooled model (plain OLS), a random effects model, and a fixed effects model. Results of F tests generally support the use of plain OLS and a random effects model, which is preferred to a fixed effects model based on a Hausman specification test.

The first three columns report the results based on our one million yen criteria to identify stock holdings when we include only stock price movements but ignore land price developments. Signs of estimated coefficients on the current and lagged annual growth of the aggregate real stock value are indefinite and insignificant, suggesting current or lagged stock price movements do not affect consumption as a whole. However, the coefficients on the cross terms with the stockholder dummy (the third and fourth row in the table) are positive and significant which indicates that the consumption pattern of stockholders is clearly correlated with contemporaneous stock price movements. Together with the findings on the first two rows, our results support the existence of a direct effect of stock capital gain/loss on consumption.

The fourth to sixth columns show the estimated coefficients when we include land price movements instead of stock price in the regression. The coefficients on the annual growth rate of urban residential land price are also indefinite and not different from zero. The signs of the estimated coefficients for the cross terms with the detached house owner dummy and the condominium owner dummy are positive but not significant. Thus, current or lagged land price movements are not correlated with consumption as a whole, though it has a slightly positive effect on real estate owner's consumption. Therefore, the direct effect observed in the stockholders is weakly observed for the real asset holders with smaller and more insignificant estimates, probably because real assets are more illiquid.

The last three columns in the table report the estimated results of the full specification (1). The full model produces similar coefficient pattern as those of the models in which the effects of stock and real estate price changes are dealt separately probably due to the orthogonality between stock and land price short-run movements. Therefore we conclude that the direct wealth effect on consumption exist at least for stockholders.

As for the indirect channel, our finding that asset prices do not

significantly affect a non-assetholder's consumption in the first to sixth columns might be understood as negative evidence. In addition, if the indirect effect were working substantially, lagged asset prices would positively affect consumption growth since asset prices serve as predictors for future income. However, despite the inference, the coefficients on lagged terms are generally small and often turn to negative. Finally, estimates in Table 3 could reflect indirect wealth effects rather than direct effects if the assets market were a better leading indicator of the future incomes of assetholders than that of non-assetholders. However, the results in Table 4, in which we replace consumption growth with growth in household annual income as the dependent variable,[9] provide no evidence that assetholders' income move together with asset market movements more closely than the income of non-assetholders.[10]

To sum up, we find stockholders' consumption is significantly correlated with stock prices, probably due to direct wealth effects. The direct effects from real estate capital gains/losses are more ambiguous. The indirect effect through the predictive power of asset prices is not necessarily observed. In the next section, we use wealth gains or losses from asset markets in each household to estimate the marginal propensity to consume (MPC) out of capital gains/losses.[11]

## V. Estimates of the MPC out of Wealth Gains/Losses

In this section we estimate the MPC out of capital gains/losses to evaluate the effect of the asset price movements on household consumption. As discussed in the previous section, straightforward expansion of the standard consumption model leads to a simple equation that ties the level of consumption with the level of total

[9]Here, we report fixed effects model results that are preferred by a Hausman test and plain OLS results.

[10]To address the possibility that asset values may predict the future income more than 2 years ahead, we tried more lags of asset values; however, the results were not very much affected.

[11]A referee of this journal pointed out possible alternative interpretations for the finding that stockholders are more responsive to stock price movements. One is the stockholders are more forward looking than nonstockholders who are myopic. The other is stockholders are less liquidity constrainted than nonstockholders who are under constraint.

**TABLE 4**

RELATIONSHIP BETWEEN ASSET PRICE MOVEMENTS AND FUTURE INCOME: ASSETHOLDERS *VS.* NON-ASSETHOLDERS

| ⊿Ann. Income (+1)/Ann. Income | Stock | | Real Estate | | Stock & Real Estate | |
|---|---|---|---|---|---|---|
| | Fixed Effect | Plain OLS | Fixed Effect | Plain OLS | Fixed Effect | Plain OLS |
| ⊿Aggregate Market Value/Aggregate Maket Value (-1) | 0.054 | 5.014 | | | -0.026 | 0.319 |
| | (0.064) | (7.169) | | | (0.075) | (0.262) |
| ⊿Aggregate Market Value (-1)/Aggregate Maket Value (-2) | -0.134 | -1.546 | | | -1.069 | -1.598 |
| | (0.096) | (2.306) | | | (0.762) | (1.208) |
| ⊿Aggregate Market Value/Aggregate Maket Value (-1) | -0.370** | -0.228 | | | -0.358** | -0.249 |
| ×Stock Holding Dummy | (0.161) | (0.310) | | | (0.161) | (0.305) |
| ⊿Aggregate Market Value (-1)/Aggregate Maket Value (-2) | -0.297** | -0.115 | | | -0.297** | -0.079 |
| ×Stock Holding Dummy | (0.139) | (0.265) | | | (0.139) | (0.262) |
| ⊿JREI Urban Land Price Index/JREI Urban Land Price Index (-1) | | | 0.599 | -51.177 | -15.493 | -25.083 |
| | | | (4.499) | (38.967) | (10.691) | (18.651) |
| ⊿JREI Urban Land Price Index (-1)/JREI Urban Land Price Index (-2) | | | 1.029* | 9.247 | -2.699 | -3.661 |
| | | | (0.609) | (6.400) | (2.765) | (3.704) |
| ⊿JREI Urban Land Price Index/JREI Urban Land Price Index (-1) | | | 2.992* | 0.649 | 2.754* | 0.660 |
| ×Independent House & Land Dummy | | | (1.626) | (2.528) | (1.618) | (2.530) |
| ⊿JREI Urban Land Price Index (-1)/JREI Urban Land Price Index (-2) | | | -0.475 | -1.706 | -0.606 | -1.712 |
| ×Independent House & Land Dummy | | | (0.898) | (1.563) | (0.894) | (1.566) |

(Table Continued)

| ⊿Ann. Income (+1)/Ann. Income | Stock | | Real Estate | | Stock & Real Estate | |
|---|---|---|---|---|---|---|
| | Fixed Effect | Plain OLS | Fixed Effect | Plain OLS | Fixed Effect | Plain OLS |
| ⊿JREI Urban Land Price Index/JREI Urban Land Price Index (-1) | | | -1.267 | -0.095 | -1.448 | -0.103 |
| ×Condominium Dummy | | | (1.953) | (3.060) | (1.944) | (3.064) |
| ⊿JREI Urban Land Price Index (-1)/JREI Urban Land Price Index (-2) | | | -1.029 | -8.161* | -0.984 | -8.160** |
| ×Condominium Dummy | | | (1.110) | (2.001) | (1.104) | (2.004) |
| Std. Error of Reg. | 0.147 | 0.386 | 0.148 | 0.380 | 0.147 | 0.380 |
| Adjusted *R*-squared | 0.861 | 0.041 | 0.860 | 0.074 | 0.861 | 0.073 |
| *P*-value: A, B=$A_t$, B (*F* test) | | 0.000 | | 0.000 | | 0.000 |
| *P*-value: Hausman test of $H_0$: RE *vs.* FE (CHISQ test) | 0.000 | | 0.000 | | 0.000 | |
| # of observations | 939 | 939 | 939 | 939 | 939 | 939 |

Notes: Standard errors in parentheses. Dependent variable is the change in household annual income as described in the maintext. Regressions include the same controll varialbes as that is used in the Table 3 regressions.

wealth, *i.e.*, the sum of financial and real wealth and the present discounted value of future income in the form:

$$C_{it} = MPC \times W_{it} \tag{2}$$

Thus, the appropriate specification to estimate MPC out of wealth is a linear regression in levels (rather than logs) as documented in Parker (1999) and Dynan and Maki (2001): a change in wealth, *i.e.*, capital gains/losses is expected to produce a proportional change in the level of consumption. Our strategy is to use cross-sectional variations to estimate equation (2), and obtain the information about the long-run marginal propensity to consume.

### *A. Specification and Data*

We use the following specification to estimate the MPC out of stock and real estate separately.

$$\Delta C_{i,t} = \sum_{j=1}^{2} a_{1j} CgStock_{i,t+1-j} + \sum_{j=1}^{2} a_{2j} CgLand_{i,t+1-j} + \sum_{j=1}^{2} a_{3j} CgApart_{i,t+1-j} + cX_{i,t} + \varepsilon_{i,t} \tag{3}$$

The dependent variable is a change in September consumption by a household from that of previous year. The first explanatory variables, $CgStock_{i,t+1-j}$, are households' capital gains or losses from stock market in current and lagged years. Similarly, the second variables, $CgLand_{i,t+1-i}$, are capital gains/losses from a change in land prices. The third variables, $CgApart_{i,t+1-j}$, are capital gains/losses from a change in house building prices. $X_{i,t}$ represents a vector of control variables.

In the JPSC, households are required to report the current value of securities, land, and housing as of September each year. Thus, a natural strategy is to calculate the change in the value of asset holdings. However, households may liquidate part of their wealth to consume, and this behavior may result in a spurious negative correlation between wealth and consumption changes. Fortunately, the JPSC also includes information about the purchases and sales values in a household's security transactions during the past year. We construct $CgStock_{i,t+1-j}$ by taking the reported changes in security holding value, subtracting reported purchase value, and

adding reported sales value. In the case of real asset capital gains/losses, we can use the changes in the market values reported, since we restricted our observations to the households whose residential status does not change over the year.

There is another source of information in the JPSC that may be used for deriving real asset capital gains/losses. In the survey, respondents owning land and real estate are asked: "How much percent do you think the market value of the land or house of your own has risen/fallen this year?" Theoretically, it is also possible to calculate capital gains or losses by multiplication of previous year market value and this ratio. However, we took our simpler methodology above, since the given ratio is large-meshed with one-tenth increment and results in very coarse estimates. Instead, we used the information to check the consistency or accuracy of the reported market values. Correlation coefficient between the real estate capital gains/losses derived from two different methods was as low as 0.17. We dropped observations if there are inconsistencies among interrelated questions.[12] After this cut, the real estate capital gain/loss observations decrease by 14% (from 2,488 to 2,184) and the correlation increases to 0.89.

*B. Results*

Table 5 shows the MPC estimates of equation (3) using the similar set of control variables as in the earlier empirical exercises.[13] The first and fourth columns report the results of specification only with stock capital gains. Estimated coefficients on the stock capital gain terms in the first column are positive but quite small and insignificant, indicating that a capital gain of a thousand yen over the preceding year raises (annualized) consumption by less than 2 yen. If we take into accounts of lagged effects, it increases to 7 yen in total after two years, though it is still statistically insignificant. The random effects model produces a similar and marginally significant MPC after two years.

Results from the estimation including only real asset capital

[12]We regard the derived data inconsistent if i) the signs of the two estimates are opposite, or ii) a calculated capital gain/loss from one method is more than three times larger than that from the other method.

[13]In those regressions, we replace aggregate shock variables with year dummies.

**TABLE 5**

MARGINAL PROPENSITY TO CONSUME ON CAPITAL GAINS (STOCK AND LAND)

| | Plain OLS | | | Random Effect Model | | |
|---|---|---|---|---|---|---|
| | Stock | Real Estate | Stock & Real Estate | Stock | Real Estate | Stock & Real Estate |
| Capital Gain by Stock (*t*) | 0.015 | | -0.022 | 0.016 | | -0.02 |
| | (0.031) | | (0.042) | (0.030) | | (0.038) |
| Capital Gain by Stock (*t*-1) | 0.057 | | 0.078 | 0.058* | | 0.103* |
| | (0.036) | | (0.059) | (0.034) | | (0.053) |
| Capital Gain by Individual House (*t*) | | 0.077 | 0.106 | | 0.079 | 0.111 |
| | | (0.102) | (0.103) | | (0.092) | (0.092) |
| Capital Gain by Individual House (*t*-1) | | 0.025 | -0.022 | | 0.024 | -0.037 |
| | | (0.033) | (0.047) | | (0.031) | (0.043) |
| Capital Gain by Condominiam (*t*) | | 0.051 | 0.049 | | 0.052 | 0.051 |
| | | (0.045) | (0.044) | | (0.040) | (0.040) |
| Capital Gain by Condominiam (*t*-1) | | -0.004 | -0.006 | | 0.014 | 0.011 |
| | | (0.034) | (0.033) | | (0.031) | (0.031) |

(Table Continued)

| | Plain OLS | | | Random Effect Model | | |
|---|---|---|---|---|---|---|
| | Stock | Real Estate | Stock & Real Estate | Stock | Real Estate | Stock & Real Estate |
| ⊿Ann. Income/Ann. Income (-1) | 0.019<br>(0.028) | 0.025<br>(0.033) | 0.035<br>(0.034) | 0.006<br>(0.025) | 0.002<br>(0.029) | 0.009<br>(0.029) |
| ln (Ann. Income/cpi (-1)) | 15.877<br>(11.929) | 15.244<br>(12.774) | 17.479<br>(12.956) | 21.236<br>(13.626) | 22.326<br>(14.849) | 21.754<br>(14.873) |
| Std. Error of Reg. | 77.891 | 77.837 | 77.054 | 77.798 | 77.847 | 77.125 |
| Adjusted *R*-squared | 0.020 | 0.017 | 0.025 | 0.022 | 0.017 | 0.024 |
| *P*-value: A, B=$A_t$, B (*F* test) | 0.999 | 0.984 | 0.992 | 0.999 | | |
| *P*-value: Hausman test of $H_0$: RE *vs.* FE (CHISQ test) | | | | 649 | 1.000 | 1.000 |
| # of observations | 649 | 580 | 549 | | 580 | 549 |

Notes: Standard errors in parentheses. Dependent variable is the change in household consumption as described in text.

gains in the second and fifth columns convey an insight regarding the difference between detached house owners and condominium owners. The MPCs out of the real asset capital gains for the detached house owner are about 0.1 over two years, and insignificant. On the other hand, the estimated size of the MPC for the condominium owners becomes smaller to be 0.05 over the two-year period. In total, these results for real estates are comparable with those for stock market wealth effect.

The third and sixth columns in Table 5 report the results of the full equation (3). The contemporaneous effects from stock capital gains strangely turns slightly negative, but after adjusting the minor correlation between stock and real estate capital gains, the estimated total MPC after two years increases to 0.08 (OLS) or 0.10 (random effect model), pushed up by positive lagged effects, though the coefficient in the third column is not significant. The total of the MPC out of real estate capital gains for the detached house owners and for the condominium owners are 0.08 and 0.04-0.06 respectively.

To sum up, the marginal propensity to consume—the total change in the level of consumption associated with a 1 yen capital gain after two years—out of wealth gains or losses is estimated to be 0.05 to 0.1 for Japanese households. This estimate coincides with that for US households, *i.e.*, 0.05-0.15, by Dynan and Maki (2001). The MPCs out of capital gains from real assets are estimated to be in the same order with the gains from stock wealth.

## VI. Conclusion

This paper takes advantage of micro-level data from the *Japanese Panel Survey of Consumption* (JPSC) to evaluate the impacts of the wealth gains or losses experienced during the substantial fall in asset prices in the 1990s on households' spending in Japan.

Our empirical findings demonstrate that stockholders' consumption is responsive to aggregate stock market movements while this is not the case for non-stockholders, suggesting that the "direct" effect to alter household's budget constraint is important. Meanwhile, our findings do not support the existence of an "indirect" wealth effect that is supposed to work through the asset

price power to predict future incomes. Distinction between the direct and indirect channels is important, because it gives us a clue as to whether the changes in asset prices are partly causing the economic downturn or just expecting future slowdown. Our supporting evidence for the direct effect suggests that the asset markets (which are possibly in negative Bubble) are partly responsible for the prolonged stagnation in Japan.

This paper also estimates the marginal propensity to consume out of capital gains/losses in various types of assets. Overall, we estimate an MPC of the order of 0.05-0.1, though the MPC may vary among the different sources of capital gains (depending upon the liquidity of each asset). The MPC estimate of this paper is roughly comparable with that of preceding studies in the US, and slightly larger than Ogawa and Kitasaka (1998) estimates on aggregate Japanese data. Yet it is at least of the order of 0.05. According to the Japanese National Accounts, Japanese households lost roughly 35 thousand billion yen in capital losses between 2000 and 2001. This means consumption would have been pushed down by at least 1-2 thousand billion yen per year, roughly 0.3-0.7 percent of total private consumption in 2001.

**APPENDIX TABLE**

*P*-VALUES FOR BLOCK EXOGENEITY (GRANGER CAUSALITY) TESTS ON VARS

| Model | Lags | TOPIX | Residential Land Price Index | Real GDP | Real Households Consumption |
|---|---|---|---|---|---|
| TOPIX and Real GDP | 2 | 0.768 | | 0.486 | |
| | 4 | 0.754 | | 0.081 | |
| TOPIX, Land Price Index, and Real GDP | 2 | 0.864 | 0.189 | 0.111 | |
| | 4 | 0.915 | 0.230 | 0.277 | |
| TOPIX, Land Price Index, Real GDP, and Real Consumption | 2 | 0.932 | 0.240 | 0.034 | 0.131 |
| | 4 | 0.992 | 0.755 | 0.097 | 0.422 |

Note: All VAR models are estimated on annual growth basis using the data from FY 1985 to FY 2003.

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