

Review of the Prices of Rents and Owner-occupied Houses in Japan

Makoto Shimizu

mshimizu@stat.go.jp

Director, Price Statistics Office
Statistical Survey Department
Statistics Bureau, Japan

Abstract

The shelter service provided by owner-occupied houses is incorporated in the CPI with the imputed rent approach in Japan. For weights, equations are estimated to represent the relationship between rents and other dwelling characteristics for private rented houses with the Housing and Land Survey. For prices, house rents and floor spaces are collected every month in the Retail Price Survey from the demand side, households.

However, it is difficult to catch and survey those of households within a limited period. This issue is serious since actual rents are used as the imputed rents for owner-occupied houses with 13.6% weights.

Methodologies to assemble accurate rent prices through the Retail Price Survey are now reviewed including those to collect rents and pertinent information from the supply side. Methodologies to estimate rents to adjust qualities of rents are also reviewed. Further, the acquisitions approach for owner-occupied houses is compared with the imputed rent approach, based on data accumulated in other institutions.

I Outline of Prices and Rents of the CPI

Characteristics of the CPI in Japan

The Consumer Price Index in Japan is calculated to measure the average price movements of goods and services purchased by households throughout the country, reflecting changes of the cost of purchasing goods and services in a fixed “market basket”. In and after 1955, the base periods are revised every five years, so as to take account of the changes in consumption patterns.

Items are selected in consideration of their relative importance to the total living expenditures, with expenditures more than 0.01% as a standard on the basis of the share of household expenditures on the base year mainly in the Family Income Expenditure Survey (FIES), representing typical price movements in the upper group and feasibility of price data collection, in order to represent the price movements of all the goods and services purchased by households.

For computation of the CPI on the 2000 bases, prices are normal retail prices or service charges at which the items are actually sold at the outlets or establishments, obtained mainly from the Retail Price Survey (RPS) of 598 items in about 30 thousand outlets in 167 municipalities¹. About 250 thousand price quotations including 23 thousand house rents² and total floor spaces are collected every month through the survey. Rents and total floor spaces for rented houses owned by public sectors in all sampled municipalities are also surveyed.

Generally, prices are averaged as a simple arithmetic mean, and ratio of them in the observation period to the base period is calculated as an index for an item for each city or each group of towns and a village every month. The indices are aggregated for those in upper groups and the general with weights for items with the Laspeyres formula.

The weights are also calculated on the basis of household expenditures of the FIES for about eight thousand multi-person households, and are based on consumer expenditures in the base year which has been renewed every five years since 1955.

Outline of rents in the RPS

The Rent Survey Districts are selected following to sampling with varying probabilities from the Enumeration Districts (outside of mountains or deserts) of the Population Census. The total number of the Rent Survey Districts is 1,212 on March 2006. The Districts are shifted every five years, corresponding to those of the Population Census. They were shifted from the 1995 Population Census Districts to the 2000 Population Census Districts in January 2003.

¹ All cities with prefectural governments and designated cities including 23 wards in Tokyo, and other cities, towns and a village which are selected randomly in categories classified by locations, population size or other characteristics.

² Rents do not include public charges for electricity, gas, water, common benefit, car spaces, rights, security or gratitude.

Heads of households residing in the rented houses in the Rent Survey District are designated as price reporters for rents of houses owned by the private sectors, while representatives of competent authorities in each sampled municipality are designated as price reporters for rents of houses owned by the public sector.

From all households in rented houses owned by private sectors in the Rent Survey Districts, the monthly data on the rents and the floor space are collected. The Districts are divided into the first group, the second group and the third group, and reports are collected every three months for each group. The first group is surveyed in January, April, July and October, the second group in February, May, August and November, and the third group in March, June, September and December. Rent per unit area is obtained by dividing total gross rents for all the Districts by total floor spaces rented. As for the Districts not surveyed in that month, the data from the most recent survey month are substituted.³

Most of rents for houses are the same every month if households living there are the same. The changes are likely to happen when households are exchanged or when houses are established or disappeared. Price collectors have to watch the Districts in order to catch such happenings and register them to household lists and maintain them as well as to collect rents every month.

II Outline of Indices for the Owner-occupied Houses

Concept and history

The shelter services provided by owner-occupied houses are incorporated in the index with the imputed rent approach. We consider that an owner-occupied house gets the same service as a rented house with the same condition and try to estimate the price of the service. The services are mainly for households who have lived in the houses for a while, influenced not only by market but also by institutions or regulations concerning houses or housing services, though including those for households who newly began to live in the Districts.

They were included for the first time for the general as a reference on the 1970 bases, and as an official index on the 1985 bases for the purpose of international comparison of the CPI by adjusting costs for housings which vary depending on living style among countries. The methodologies as the followings have been used for their estimations from the start.

Equations for estimation of weights

First, equations are estimated to represent the relationship between rents and other dwelling

³ For example, the second group is surveyed in May, rents surveyed in April for the first group and in March for the third group substituted.

characteristics for private rented houses⁴ with the Housing and Land Survey (HLS)⁵. The formula has been in the followings;

$$\ln r_{ik} = a_i + \sum_j b_{ij} d_{jk} + c_i \ln s_{ik}$$

In this equation, i is one of four area districts (Tokyo, three prefectures around Tokyo, three prefectures including Osaka, and other 40 prefectures)⁶, k is a household, r_{ik} is a rent, d_{jk} are dummy variables representing dwelling characteristics, s_{ik} is a floor space, a_i is a constant, and b_{ij} and c_i are coefficients. The variables and performances on the 2005 basis by area district are shown on Table 1.

Table 1 Estimations of Rents for the Owner-occupied Houses with Variables in 2005

		Tokyo		surrounding area ⁷		Osaka area		others	
		coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
constant		9.33	389.50	9.11	1162.68	9.04	793.89	8.49	1487.69
structure	tenant-house	0.04	4.14	0.02	4.52	-0.06	-13.35	-0.06	-25.65
	non-wooden condominium	0.14	48.41	0.10	55.44	0.25	76.38	0.13	102.60
year of construction	1981-1985	0.12	27.68	0.11	34.68	0.16	39.77	0.13	71.36
	1986-1990	0.18	47.03	0.19	71.14	0.22	60.64	0.23	131.93
	1991-1995	0.22	51.84	0.23	85.32	0.26	67.67	0.29	166.79
	1996-2000	0.22	51.59	0.25	87.71	0.27	75.33	0.33	198.19
	2001-	0.24	41.03	0.27	76.69	0.29	55.80	0.36	169.16
flush toilet		0.24	13.32	0.25	47.58	0.18	25.53	0.25	122.60
regional classification	1	-0.16	-10.94	-0.14	-55.36	-0.18	-33.35	0.05	39.19
	2	-0.28	-20.94	-0.33	-116.82	-0.29	-49.94	0.11	76.13
	3	-0.44	-33.03	-0.50	-84.29	-0.42	-60.26	0.20	123.71
	4	-0.60	-44.99	-0.20	-76.41	-0.69	-38.21	0.05	15.58
	5	-0.77	-49.06	-0.45	-113.95	-1.23	-6.84	0.11	35.20
	6	-	-	-0.17	-69.46	-	-	0.18	59.86
	7	-	-	-0.31	-84.01	-	-	0.23	57.94
	8	-	-	-0.55	-44.56	-	-	-	-
log floor space		0.55	213.74	0.47	286.66	0.46	227.45	0.43	383.49
number of houses		80338		114291		87701		326245	
adj.R ²		0.59		0.57		0.53		0.53	

Coefficients of log floor spaces are from 0.43 to 0.55. This means that, as the larger the floor space is, the lower is the rent per unit according to the economy of the scale, in other words, most of the houses hold least establishments with high costs per space such as bath, toilet, kitchen and space for sleep in order to fulfill least necessities of life while larger houses are apt to add space for amenities with additional lower costs per space.

⁴ Private rented houses with zero rent, with other establishments such as offices or stores or with higher or lower than one percent of rents among all observed households are excluded from analysis.

⁵ The HLS has been implemented two years prior to the base year of the CPI every five years and is the most fundamental statistical survey with the samples of four million households on housing conditions for the purpose of obtaining basic data for various housing policy measures by investigating the actual situations of dwellings and other occupied buildings and the inhabiting households thereof in Japan to clarify the present circumstances and trends for the whole country, major metropolitan areas, and prefectures.

⁶ Area districts had been different on the bases before 1990.

⁷ Three prefectures; Saitama, Chiba and Kanagawa around Tokyo

The data of the HLS are not used as those to variables in this equation directly for the CPI⁸. Instead, the data of the National Survey of Family Income and Expenditure (NSFIE)⁹ are used for the CPI because weights of the CPI are compiled as proportion to the total consumption which is surveyed not by the HLS but by the NSFIE. Since variables are chosen among small number of those related to housing conditions in the NSFIE, adequacies of the equations are not strong.

Adjustments to compile weights

In these ways, data of owner-occupied houses for the 2004 NSFIE are substituted for dwelling characteristics in the equation to estimate the imputed rents for the 2005 bases of the CPI. To be more specific, the price for each household with an owner-occupied house is estimated by applying variables to the equation. The imputed rents are compiled by aggregating these estimated prices corresponding to categories.¹⁰

They include costs to repairs & maintenance and land rent corresponding to items in the FIES. Thus, they are deducted to avoid conceptual duplication and to get weight for the imputed rents of adequate level based on the FIES.

This amount is adjusted to the level for all households in the FIES at the base year by using ratio of living expenditures in the FIES per those in the NSFIE, changing ratio of the CPI for the imputed rents based on the previous bases and ratio of owner-occupied households to all households in the 2003 HLS.

Differences of actual rents and the imputed rents

Further, they are divided into four categories; small wooden houses, medium-sized wooden houses, small non-wooden houses, medium-sized non-wooden houses¹¹ by prefecture according to shares in the HLS.

Distributions of floor space of owner-occupied houses exist in larger space than those of rented houses. Thus, the weight of medium-sized houses is larger for the imputed rents than for actual rents while the weight of small houses is smaller for the imputed rents than for actual rents. In addition, the weight of wooden houses is larger for the imputed rents than for actual rents.

Prices and indexes

⁸ The data of the HLS are used as those to variables of the owner-occupied houses in Japan for the International Comparison Program.

⁹ The NSFIE has been conducted a year prior to the base year of the CPI every five years with about 60 thousand households for the purpose of not only investigating family incomes and expenditures, status of the dwelling house and land owned, major durable goods possessed and the total amount of savings and liabilities, thus identifying overall family budget structure from the point of view of incomes, consumption and assets, but also revealing regional differences of the family budget structure.

¹⁰ The imputed rents are also released as the results of the NSFIE. On the other hand, the imputed rents are not included in the FIES since the imputed rents are estimated once in five years based on the HLS.

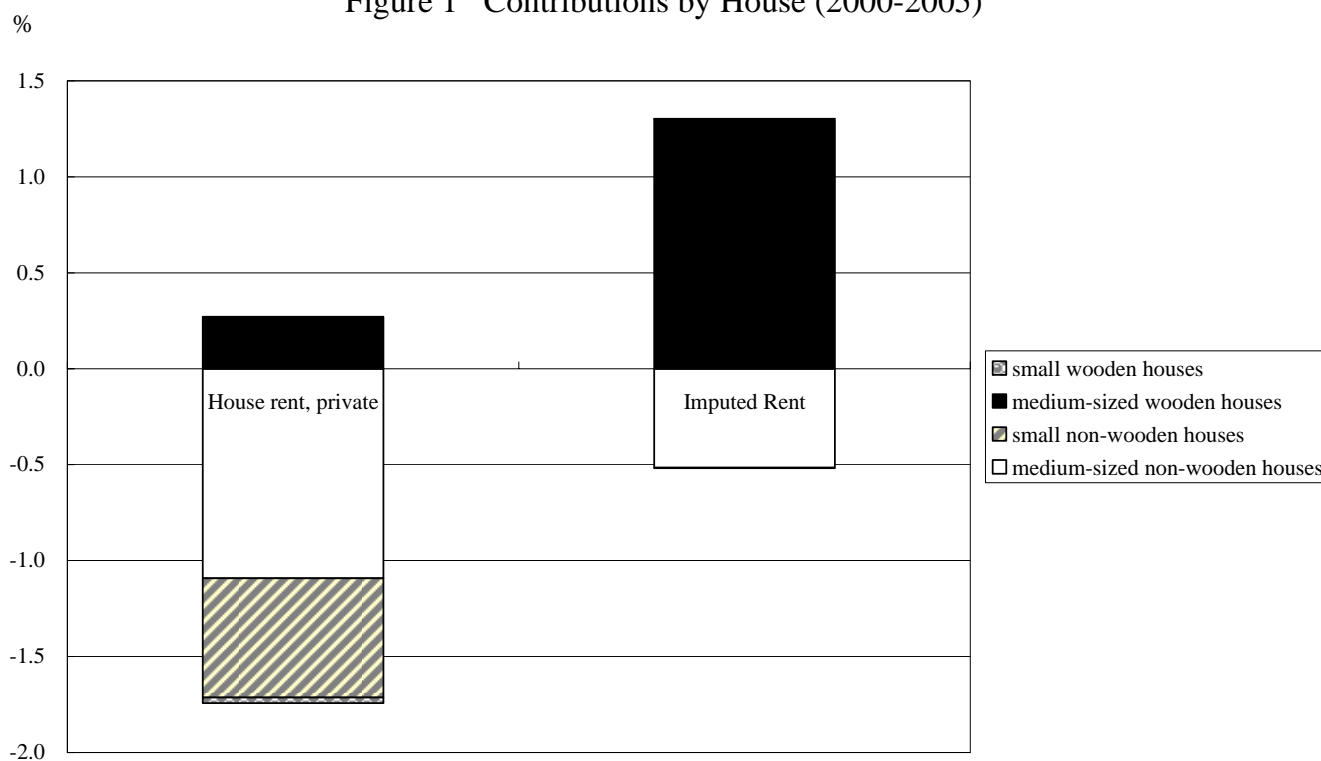
¹¹ On the bases before 2000 small non-wooden houses and medium-sized non-wooden houses had been consolidated as non-wooden houses.

The monthly imputed rents are the same as the rents for rented houses by the above four categories by sampled municipalities or group of them of the RPS. They are divided with the prices on the base year and released as the indices which are also aggregated with the weights by sampled municipalities or group of them into those in larger area or the whole country by the four categories. So, the indices for the imputed rents may be different from the rents for rented houses.

Characteristics of the indices

The rent for medium-sized wooden houses rose while those for small wooden houses, small non-wooden houses and medium-sized non-wooden houses declined from 2000 to 2005. What was more, the larger the share of owner-occupied houses in all houses is, the change of the rent for medium-sized wooden houses is prone to be higher. As a result, because the weight of medium-sized wooden houses is larger for the imputed rents than for actual rents, especially where the share of owner-occupied houses is larger, the imputed rents in total rose during the period. On the other hand, rents for private rented households dropped during the same period. (Figure 1) Because such a comparatively higher level of changes of medium-sized wooden houses has been a long term trend in the CPI, the imputed rents have risen in the annual bases except for 2004 from the start though the actual rents have dropped since 1999 similarly as the general of the CPI.

Figure 1 Contributions by House (2000-2005)



Subjects in future

In order to strengthen adequacies of the equation, the estimates with affluent variables related to construction of the HLS indifferent to the NSFIE will be reviewed, together with methodologies for adjusting difference by time between surveyed date of the HLS and the base year of the CPI, by using the

III Collecting Rents and Related Information from the Supply Side

Issues as to rents in the RPS

Data of house rents and floor spaces are collected every month in the RPS from the demand side, households, who are apt to hesitate to report such private data due to concerns of privacy though they are obliged to do so, based on the Statistics Law. What was worse, the period to survey is so short that any member in households sometimes cannot be asked due to vacancies with work or vacations during the period especially if they are single households or composed of members who work all day long. These issues are serious since rents for private rented houses (with 3% weight) are used as the imputed rents for owner-occupied houses with 13.6% weight in the CPI.

Advantages and disadvantages of using data in the supply side

However, individual information related to real estates such as distances from a station, age of estate, amenities as well as rents and floor spaces can be gained from the supply side, real estate owners. Thus, collecting rents and related information from the supply side are under consideration.

On the other hand, if real estate owners are directly surveyed in the same way as outlets, sampling frame cannot be arranged because they manage real estates beyond regional boundaries. As the results of the RPS and the CPI are released by region, samples for rents have to be categorized by region as well.

Considering these advantages and disadvantages of using data in the supply side, as for households residing in rented houses, the samples selected at the initial stage continues to be households, but their information will be collected through their real estate owners, agents or managers in future.

Activities and planning

On November 2005, the Price Statistics Office asked all of the statistics divisions of prefectures the possibility to collect rents directly from owners or managers of rented houses. Through their responses, it is certified that, in general, owners or managers for households residing in rented houses can be found at ease, and that they can supply better and broader information than households themselves as to their houses. For example, age of estate is not always known by households but by their owners. In the fiscal year 2006, decent issues will be clarified, including rare cases such as when the owner exists far from the household or when the owner cannot be found, through communications with staff at the statistics divisions of prefectures and price collectors.

After arranging practical methodologies to solve those issues, price collectors will ask rents directly to the owners or managers of the sampled rented households in principle. However, they have to visit the sampled households at the initial stage, since price collectors firstly distinguish rented houses and

owner-occupied houses, and describe the address, floor space, and other basic information to the registration if a house is included as rented houses into samples of the RPS, for example, when the Rents Survey Districts are exchanged, when a household moves, or when a household with an owner-occupied house is changed into one with a rented house.

Therefore, the new methodologies will be adopted in the RPS that price collectors visit the households at the initial stage, but that their information are collected by their owners or managers after periods for preparation including tests in operation, that is, since January 2008 when the Rent Survey Districts are shifted from the 2000 Population Census Districts to the 2005 Population Census Districts.

IV Reviewing Adjustment of Quality of Rents

Issues of qualities of rents

Though surveyed rented houses are various, most qualities such as distances from a station, age of estate, amenities have been fixed in almost the same on the whole since all households in the Districts are surveyed. The change of average rents by removals of households, or establishments or disappearances of houses, however, sometimes moves the index of rents for private houses with a large scale, and even influences the index for the general since they are aggregated in those for owner-occupied houses with large weights.

Provisional model

To solve this issue, the provisional model of the rents is formed for a review with variables; floor space, land price, population, rate of population change, population per inhabitable area, and difference of population between day and night by hedonic approach in Tokyo area¹² on March 2005. It is the model for monthly estimation for rents, different from the equation formed once in five years for the imputed rents. The equation of the model is the followings;

$$r_k = a + \sum_i b_i d_{ik} + \sum_j c_j x_{jk} + e s_k$$

In this equation, r_k is a rent, d_{ik} are dummy variables relating to dwelling characteristics, x_{jk} are quantitative variables relating to dwelling characteristics, s_k is a floor space, a is a constant, b_i and c_j , and e are coefficients. The variables and performances on March, June, September and December in 2005 are shown on Table 2. They are selected not only from the RPS but also from other statistics including the Population Census, statistics accumulated following to the System of Social and Demographic Statistics, and so forth. Rent, floor space, detached-houses or not, tenant houses or not, wooden-houses or not and iron-houses or not from the RPS are individual data, vary among households, but other variables from other statistics are the same within surveyed municipalities¹³.

¹² Tokyo area is Tokyo and three prefectures around Tokyo; Saitama, Chiba and Kanagawa. There are so many workers to go to the offices in Tokyo from the houses in the three prefectures that they can be regarded as a united.

¹³ Variables vary among wards in designated cities in principle.

As most of the households stay in the same houses, and their rents are not changed within a short period in particular when the CPI changes with slight ups or downs, the model adopted on March can represent almost the same coefficients and performances on June, September and December. The performances reach the level to estimate theoretical rents and can be used continuously for some months instead of changing variables.

Table 2 Estimations of Rents with Variables in Tokyo Area in 2005

	March		June		September		December	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
constant	-5970.67	-2.84	-4083.80	-1.99	-3966.50	-2.00	-4553.96	-2.29
surveyed in the second month ¹⁴	1377.81	2.68	1652.92	3.24	1326.74	2.64	1469.30	2.89
Chiba prefecture	-1734.60	-2.20	-2043.74	-2.60	-1897.09	-2.45	-1712.77	-2.18
Kanagawa prefecture	3360.79	5.46	2899.39	4.72	2795.21	4.62	2669.90	4.38
23 ward	-9680.60	-6.31	-9839.01	-6.43	-10698.20	-7.05	-10868.78	-7.03
floor space	11.79	74.04	11.48	72.07	11.47	73.21	11.45	72.68
detached-house	-4742.29	-3.86	-4845.70	-3.97	-4540.16	-3.78	-4898.50	-3.99
tenant-house	4204.92	3.08	3539.07	2.53	4363.36	3.17	5231.17	3.75
wooden-house	-5154.93	-2.85	-5356.00	-3.06	-5645.60	-3.36	-5033.72	-2.98
iron-house	7393.56	4.12	6895.05	3.97	6615.78	3.97	7089.85	4.25
land price ¹⁵ on July 1 st 2005	0.10	15.46	0.09	15.39	0.10	15.64	0.10	15.70
population on October 1 st 2005	0.02	10.23	0.02	10.43	0.02	10.74	0.02	10.44
Rate of population change during 2000-2005 (%)	456.06	6.05	467.38	6.28	450.38	6.13	455.76	6.10
population in 2000 per inhabitable area in 2003	0.65	6.05	0.58	5.46	0.61	5.70	0.57	5.33
difference of population between day and night in 2000	0.03	8.00	0.03	7.34	0.03	7.84	0.03	7.40
number of houses	3707		3680		3678		3622	
adj.R ²	0.73		0.73		0.73		0.73	

This model is beneficial for the purpose of adjusting quality of rents, by constructing the relationship with rents and the variables and calculating values of the variables of all data in the month to estimate ideal levels for rents for vacant or newly included houses, for instance, when some sampled households remove into an area outside the Districts, rents for newly established houses are included, or the Districts are exchanged once in five years. It is taken for granted that it should be developed with more detailed data depending on each household in the national level before used in practical situations.

If rents and floor spaces are converted with the logarithmic functions, performances are similar as a whole though adopted variables are a little different. This means that relationships between rents and floor spaces are almost proportional as for Tokyo area in 2005.

¹⁴ As was showed on the Chapter I, all data are composed of those either on two month prior, on one month prior or on the survey month. They are divided with dummy variables.

¹⁵ Based on the Prefectural Land Price Survey by the Ministry of Land Infrastructure and Transport

V Review of the Acquisitions Approach for the Owner-occupied Houses

Characteristics of data in the supply side

There are arguments whether expenses to purchase houses are capital or consumption. As land prices have dropped for almost 15 years¹⁶, the nature as consumption seems to have been strengthened in Japan. Also in the CPI Manual (2004), “Particularly in those countries where rental sectors are relatively small, with limited opportunities for substitution between owner-occupation and renting, it might be argued that the consumption element dominates.” Thus, it is beneficial to review the acquisitions approach, compared with the imputed rent approach for the owner-occupied houses.

Most data in the supply side have not been arranged systematically or statistically, collected aiming at their own purposes, most of which are gaining profits in the market, though they are voluminous. Especially in the website or journals, most of them are the prices of houses to induce consumers to purchase them, and are not purchased in practice or are purchased discounted.

Including construction cost of dwellings

First approach is to aggregate construction costs of dwellings released by the Ministry of Land and Transportation.

Changes of the estimated construction cost of exclusive use for dwellings are similar with those of the imputed rents during 2001 to 2005 except for 2001. (Figure 2)

Then, the estimated construction costs in 2000 are adjusted for owner-occupiers by multiplying ratio of space for owner-occupiers to all newly established houses. If they are substituted for the imputed rents of the 2000 base CPI, the ratio of the costs to the total expenditure is regarded as the weight (5.87%) for the provisional index of the general including the housing prices. The changes in the general would be almost the same between the provisional index and the official CPI. (Figure 3)

This approach followed to the way of thinking in the CPI manual, “Although there is no single agreed technique, one approach is to regard the cost of the land as representing the investment element and the cost of the structure as representing the consumption element.” However, if costs to purchase land are included, the estimation would be proxy for the imputed rents. In practice, the data to purchase land cannot be gained easily. Another factor which should be included is margin, added by sellers, which cannot be estimated easily as well.

Including costs to purchase condominiums

Second approach is to limit the category of houses, for example to condominiums whose data are arranged by the Real Estate Economic Institute Co., LTD. Though purchased condominiums do not

¹⁶ Land price began to rise at the center of Tokyo recently but continues to fall in other dwelling areas.

account for the majority of new dwellings constructed, they may still provide prices for land and margin as well as constructions, and for owner-occupiers exclusively. However, wealth of a condominium is apart from land on the ground and has more to do with getting dwelling services than property, compared with a detached-household. This means that purchasing condominiums is more likely to be considered as consumption than purchasing detached-houses.

If their changes are added on Figure 2, they are lower on 2001, 2002 and 2005 but higher on 2003 and 2004 than those of the imputed rents and the estimated construction costs.

Then, the prices for condominiums in 2000 are substituted for the imputed rent of the 2000 base CPI. The ratio of the prices to the total expenditure is regarded as the weight for the provisional index of the general including the housing prices. If the changes of the provisional index are added on Figure 3, because the weight is only 3.91%, they are almost the same with the official CPI except in 2001 and 2005.

The estimation would be improved if prices for detached-houses are included as well as condominiums, but scrupulously arranged data concerning detached-houses cannot be gained easily at present.

Figure 2 Change over the Previous Year for Housing Prices (per m²)

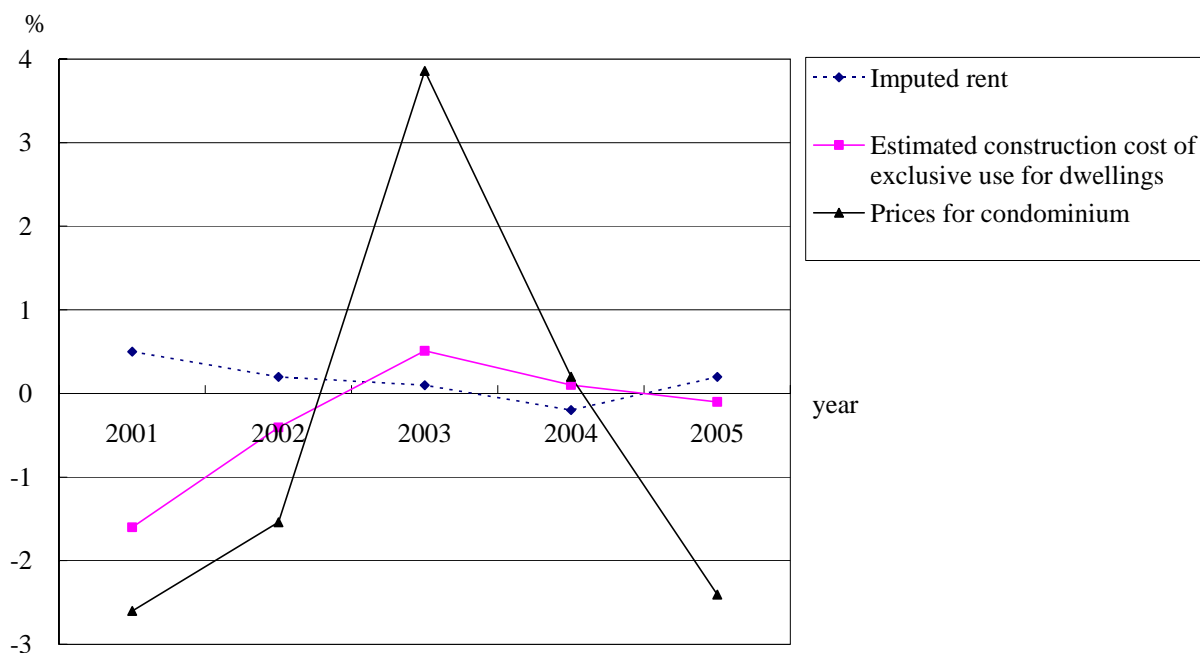
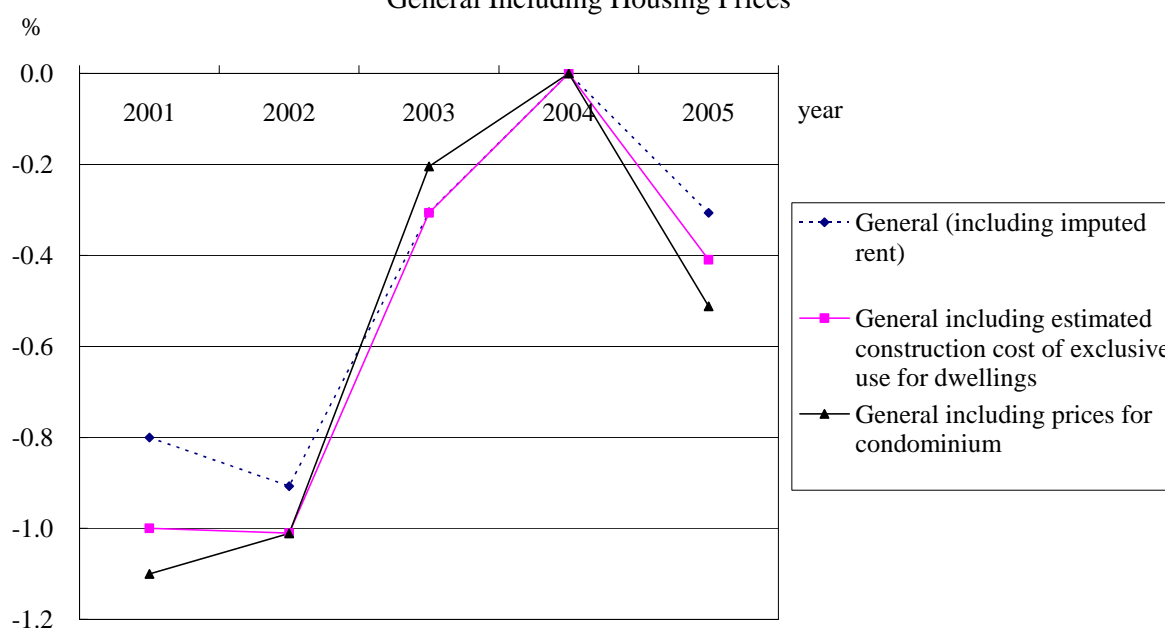


Figure 3 Change over the Previous Year of Provisional Indices for the General Including Housing Prices



Subjects in future

In these ways, the way of estimation for housing costs would not give significant impact on the movement of the general of the CPI. However, more detailed and long-term data should be adopted to improve estimation from now on. We hope that data of housing costs in the supply side would be arranged systematically and statistically so that we can promote the review of the acquisitions approach for owner-occupied houses.

References

ILO/ IMF/ OECD/ Statistical Office of the European Communities/ UN/ The International Bank for Reconstruction and Development/ The World Bank, Consumer Price Index Manual: Theory and Practice, 2004

Construction Research and Statistics Division, Information and Research Department, Policy Bureau, Ministry of Land, Infrastructure and Transport, Annual Report of the Construction Statistics, for the Fiscal Year 2005

Makoto Shimizu, Recent Methodological Developments of the CPI in Japan, Inflation Measures: Too High – Too Low – Internationally Comparable? Paris, 21-22 June 2005, OECD

Real Estate Economic Institute Co., LTD., Market Trend of Condominiums in Japan, 2005 Results, 14 February 2006

<http://www.stat.go.jp>

<http://www.mlti.go.jp>