

Method for Estimating the 2025-base Household Consumption Trend Index (CTI micro)

1 Overview of the Household Consumption Trend Index (CTI micro)

The Household Consumption Trend Index (CTI micro) is an index that shows trends in the average amount of household consumption expenditure in Japan. The average monthly consumption expenditure is calculated by combining the monthly results of the Family Income and Expenditure Survey (FIES), the Survey of Household Economy (SHE), and the Expenditure Monitor Survey for One-person Households (EMS). The index is calculated with the monthly average of consumption expenditure in the base year set at 100. The index is calculated monthly for total households, two-or-more-person households, and one-person households. For total households and two-or-more-person households, the indices for workers' households are also calculated. In addition to the indices for the ten major expenditure groups and the sub-expenditure groups, both of which provide breakdowns of consumption expenditure, indices by category of goods and services are also calculated.

Changes in consumption expenditure of total households and two-or-more-person households include the effects of changes in the distributions of the number of household members and the age of the household head. For this reason, we also calculate indices adjusted by the distribution of household, using the household distribution in the base year.

For all of these indices, we also calculate real indices adjusted for price changes using the CPI. Seasonally adjusted series are also calculated for both the nominal and real indices.

The published tables are as follows. Each table contains monthly, quarterly, and annual indices, both nominal and real. For consumption expenditure and the ten major expenditure groups in the original series, nominal and real indices for the fiscal year are also provided.

Table Number	Table of the Household Consumption Trend Index (CTI micro)	Total		Two-or-more-person		One-person	
		Original series	Seasonally adjusted series	Original series	Seasonally adjusted series	Original series	Seasonally adjusted series
1-a-b	Consumption expenditure		○		○	○	○
	Ten Major Expenditure Groups		○		○	○	○
	Category of Goods and Services					○	
1-1-c	Sub-Expenditure Groups	○		○		○	

Adjusted by the Distribution of Household by Number of Household Members and Age Group of Household Head

2-a-b	Consumption expenditure		○		○		
	Ten Major Expenditure Groups						
	Category of Goods and Services						

“a” is 1 for the original series and 2 for the seasonally adjusted series.

“b” is 1 for index and 2 for rate of change.

“c” is 3 for index and 4 for rate of change.

“ ” indicates that both the index and the index for workers' households are provided.

“○” indicates that the index is provided.

In addition, tables showing expenditure of commodities per household are published monthly and annually for reference.

2 Outline of the Estimation Procedure

(1) Adding the sample of EMS to the sample of FIES

Before adding the samples, the weights of EMS are adjusted to account for differences in the survey methods. The EMS sample is then added to the FIES sample to obtain FIES with EMS.

(2) Integration of FIES with EMS and SHE

The weighted averages of expenditures on high-priced goods and services that are purchased infrequently are calculated by group of household attributes in both SHE and FIES with EMS. Those expenditures of FIES with EMS and SHE are combined as a weighted average for each group of the household attributes.

(3) Calculation of the composite expenditure by household attribute

Based on FIES with EMS and (2), we calculate the amount of expenditure by group of household attributes.

(4) Calculation of the amount of expenditure by type of household

We calculate a weighted average of the composite expenditure for each type of household: total households, two-or-more-person households, and one-person households. The weights used in the calculation are the numbers of households by the groups of household attributes in the current month or in the base year.

(5) Calculation of indices (nominal, real), seasonally adjusted series, and trend-cycle estimates ^{*1}

We divide the amount of expenditure obtained in (4) by the monthly average of consumption expenditure in the base year to calculate an index where the monthly average of consumption expenditure in the base year is 100. Using the CPI, the real value is calculated from this index. Based on the indices (nominal and real) except for some indices described in Chapter 4, the seasonally adjusted series are calculated. The trend-cycle estimates are calculated based on the indices (real).

^{*1} Trend-cycle estimates are the indices obtained by removing the irregular components from the input indices (real).

3 Estimation Method

(1) Adding the sample of EMS to the sample of FIES

The EMS is a survey of one-person households under the age of 70. The sample of EMS is selected from monitors who are registered as monitors for a survey conducted by a corporation. Considering that EMS does not use random sampling, we assign weights to the sample of EMS as follows.

First, for each household in the EMS sample, we assign a FIES weight corresponding to its gender and age.

Secondly, the weight for each household in EMS is corrected based on a propensity score.^{*2}

Thirdly, the weights of one-person households under the age of 70 in both surveys are corrected so that the total weight of one-person households under the age of 70 is the same before and after FIES and EMS are

merged. When making that correction, the ratio of the sum of EMS weights to the sum of the weights for one-person households under age 70 in FIES is adjusted to 0.72:0.28, which is the ratio of the inverses of the variances of household consumption expenditure in EMS and FIES.

We acquire FIES with EMS by merging the records of EMS and FIES with those weights corrected above.

*2 The propensity score is estimated as the probability that the sample will be assigned to EMS. By correcting the weight of each EMS household based on the propensity score, we estimate the amount of expenditure that households in the FIES sample would spend if they responded to EMS. (Hoshino (2005), Hoshino (2009))

(2) Integration of FIES with EMS and SHE

For expenditures on high-priced goods and services that are purchased infrequently, we calculate the weighted averages of the current month (m) expenditures by the ten major expenditure groups (i) by the six groups of household members (j) by the six age groups of household heads (k)*³ in FIES with EMS and SHE.

As a result, we obtain expenditures on those goods and services from FIES with EMS ($X_{i,j,k,m}^F$) and SHE ($X_{i,j,k,m}^S$).

The Groups of Household Attributes Used by Integration of FIES with EMS and SHE

			The Six Age Groups of Household Heads					
			Less than 40	Less than 50	Less than 60	Less than 70	Less than 80	80 years & older
The Six Groups of Household Members	One-Person	Men					Merged	
		Women					Merged	
	Two-Persons							
	Three-Persons							
	Four-Persons						Merged	
	Five-or-More-Persons						Merged	

The Groups of Household Attributes Used by Integration of FIES with EMS and SHE for Workers' Households

			The Six Age Groups of Household Heads					
			Less than 40	Less than 50	Less than 60	Less than 70	Less than 80	80 years & older
The Six Groups of Household Members	One-Person	Men					Merged	
		Women					Merged	
	Two-Persons						Merged	
	Three-Persons						Merged	
	Four-Persons						Merged	
	Five-or-More-Persons						Merged	

To calculate the amount of expenditure on high-priced goods and services that are purchased infrequently ($X_{i,j,k,m}^{FS}$), we take a weighted average of the previously calculated expenditures ($X_{i,j,k,m}^F$, $X_{i,j,k,m}^S$) for each group of the ten major expenditure groups (i) and the household attributes (j , k). For the weights, we use the inverses of the variances of FIES with EMS and SHE by the household attributes ($V_{j,k}^{F-1}$, $V_{j,k}^{S-1}$), which are calculated in advance.

$$X_{i,j,k,m}^{FS} = \frac{\frac{1}{V_{j,k}^F} X_{i,j,k,m}^F + \frac{1}{V_{j,k}^S} X_{i,j,k,m}^S}{\frac{1}{V_{j,k}^F} + \frac{1}{V_{j,k}^S}} = \frac{V_{j,k}^S X_{i,j,k,m}^F + V_{j,k}^F X_{i,j,k,m}^S}{V_{j,k}^F + V_{j,k}^S}$$

*3 Adjacent age groups are combined because the sample size of a group can be too small.

(3) Calculation of the composite expenditure by household attribute

We calculate the amount of expenditure for goods and services other than (2) in FIES with EMS by the ten major expenditure groups and the groups of household attributes ($X_{i,j,k,m}^F$).

To obtain the amount of expenditure by the ten major expenditure groups and the groups of household attributes ($X_{i,j,k,m}$), we add up the amounts of expenditure for the items in (2) and for the other items for each of the ten major expenditure groups (i) and the household attributes (j, k).

$$X_{i,j,k,m} = X_{i,j,k,m}^{FS} + X_{i,j,k,m}^F$$

(4) Calculation of the amount of expenditure by type of household

Using the number of households by the household attribute in the current month ($w_{j,k,m}$) as the weight, we take a weighted average of the expenditure by the household attributes ($X_{i,j,k,m}$) to compute the amount of expenditure by the type of household ($X_{h,i,m}$, $X_{h,m}$). The weight is a 12-month backward moving average calculated in advance from the results of the Labour Force Survey.

$$X_{h,i,m} = \frac{\sum_{j,k \in G_h} w_{j,k,m} X_{i,j,k,m}}{\sum_{j,k \in G_h} w_{j,k,m}}$$

$$X_{h,m} = \sum_i X_{h,i,m}$$

G_h : The set of all combinations of the household attributes corresponding to the type of household (h)

Using the monthly average of the number of households in the base year ($\bar{w}_{j,k}$) as the weights, we take a weighted average of the expenditure by the household attributes ($X_{i,j,k,m}$) to calculate the amount of expenditure by the type of household ($X_{h,i,m}^a$, $X_{h,m}^a$), which is adjusted for the distribution of households in the base year.

$$X_{h,i,m}^a = \frac{\sum_{j,k \in G_h} \bar{w}_{j,k} X_{i,j,k,m}}{\sum_{j,k \in G_h} \bar{w}_{j,k}}$$

$$X_{h,m}^a = \sum_i X_{h,i,m}^a$$

$$\bar{w}_{j,k} = \frac{\sum_{m \in \text{base year } 1 \sim 12} w_{j,k,m}}{12}$$

(5) Calculation of indices (nominal, real), seasonally adjusted series, and trend-cycle estimates

We divide the amount of expenditure by the type of household ($X_{h,i,m}$, $X_{h,m}$) by the monthly average of consumption expenditure in the base year ($\bar{X}_h$) to calculate the indices where the monthly average of consumption expenditure in the base year is 100 ($I_{h,i,m}$, $I_{h,m}$).

$$I_{h,i,m} = \frac{X_{h,i,m}}{\bar{X}_h} \times 100$$

$$I_{h,m} = \frac{X_{h,m}}{\bar{X}_h} \times 100$$

$$\bar{X}_h = \frac{\sum_{m \in \text{base year } 1 \sim 12} X_{h,m}}{12}$$

To obtain the indices adjusted by household distribution ($I_{h,i,m}^a$, $I_{h,m}^a$), which are indices using the household distribution in the base year as weights, we replace $X_{h,i,m}$ and $X_{h,m}$ above with $X_{h,i,m}^a$ and $X_{h,m}^a$, while leaving $\bar{X}_h$ unchanged, and then we follow the same procedure used to calculate the indices ($I_{h,i,m}$, $I_{h,m}$).

Using the CPI corresponding to each of the ten major expenditure groups, we deflate the indices. Based on the Census adjustment method (X-12-ARIMA), we calculate the seasonally adjusted series and the trend-cycle estimates^{*4}.

*4 Due to seasonal adjustment, the average of the seasonally adjusted series and the trend-cycle estimates for the base year can differ from 100.

(6) The tables showing the expenditure of commodities for reference

The amount of expenditure shown in the tables for reference is calculated using the same procedure used to calculate the index. However, for the three age groups listed separately in the table for reference by age group of household heads (29 and under, 30-39, and 65 and over), the amount of expenditure is calculated using age group categories that differ from those used in the index calculation. Therefore, the weights listed separately are different from those used to calculate the index, and the "Weight" for these three categories is not shown. The other values shown in the tables for reference, which are from "Weight" to "Rate of owned dwellings," are calculated by using only FIES with EMS ($X_{i,j,k,m}^F$) and not SHE ($X_{i,j,k,m}^S$).

$$X_{h,i,m} = \frac{\sum_{j,k \in G_h} w_{j,k,m} X_{i,j,k,m}^F}{\sum_{j,k \in G_h} w_{j,k,m}}$$

i : From "Weight" to "Rate of owned dwellings"

The change over the year and contributions in the tables for reference are calculated using the amount of expenditure ($X_{h,i,m}$) by household type (h) and by item (i). The consumer price index ($P_{i,m}$) corresponding to each item is used to calculate the real value. The calculation method for each is as follows.

Change over the year (nominal)	$\frac{X_{h,i,m} - X_{h,i,m-12}}{X_{h,i,m-12}} \times 100$
Contribution (nominal)	$\frac{X_{h,i,m} - X_{h,i,m-12}}{X_{h,0,m-12}} \times 100$ ($X_{h,0,m}$ is the composite amount of consumption expenditure in household type h.)
Contribution to the total household (nominal)	$\frac{\frac{\sum_{a \in G_h} w_{a,m}}{\sum_{a \in G_{Total}} w_{a,m}} X_{h,i,m} - \frac{\sum_{a \in G_h} w_{a,m-12}}{\sum_{a \in G_{Total}} w_{a,m-12}} X_{h,i,m-12}}{X_{0,0,m-12}} \times 100$ ($w_{a,m}$ is the weight of household a, $X_{0,0,m}$ is the composite amount of total household consumption expenditure.)
Change over the year (real)	$\frac{X_{h,i,m}/P_{i,m} - X_{h,i,m-12}/P_{i,m-12}}{X_{h,i,m-12}/P_{i,m-12}} \times 100$
Contribution (real)	$\frac{X_{h,i,m}/P_{i,m} - X_{h,i,m-12}/P_{i,m-12}}{X_{h,0,m-12}/P_{0,m-12}} \times 100$ ($P_{0,m}$ is the index value of the CPI "All items, less imputed rent.")
Contribution to the total household (real)	$\frac{\frac{\sum_{a \in G_h} w_{a,m}}{\sum_{a \in G_{Total}} w_{a,m}} X_{h,i,m}/P_{i,m} - \frac{\sum_{a \in G_h} w_{a,m-12}}{\sum_{a \in G_{Total}} w_{a,m-12}} X_{h,i,m-12}/P_{i,m-12}}{X_{0,0,m-12}/P_{0,m-12}} \times 100$

For the table for reference, the monthly and annual results are published as follows.

Table for Reference	Type of Household		
	Total	Two-or-more-person	One-person
Table 1 Expenditures of Commodities per Household by Number of Household Members	○	-	-
Table 2 Expenditures of Commodities per Household by Age Group of Household Heads	○	○	-
Table 3 Expenditures of Commodities per Household by Sex and Age Group	-	-	○
Table 4 Expenditures of Commodities per Household - Change over the year	○	○	○

4 Main points of the 2025-base revision

Beginning with the July 2026 results, the CTI micro is revised to the 2025 base. The revision introduces results by sub-expenditure groups and the real and seasonally adjusted indices for “Other consumption expenditure,” and updates the integration ratios for FIES, EMS, and SHE, along with other changes. The main points of the 2025-base revision are as follows.

Original Series (Year-on-Year Rates of Change)	• The index reference period of the CTI is revised from 2020 to 2025. • The indices by sub-expenditure groups are newly released. • The real indices for “Other consumption expenditure” are newly released^{*5}. • The integration ratios of FIES, EMS and SHE are updated. • The indices before January 2025 are converted into the 2025 base and linked. • The real values are revised due to the CPI revision.
Seasonally Adjusted Series (Month-on-Month Rates of Change)	• The seasonally adjusted indices are revised due to the revision of the original indices. • The seasonally adjusted indices for “Other consumption expenditure” are newly released^{*5}.
Tables for Reference	• The integration procedure of FIES, EMS and SHE is revised.

*5 Results by the sub-expenditure groups and the real indices for “Other consumption expenditure” are available from January 2020.

Note 1. Treatment of past indices

Past indices are prepared or adjusted as follows, depending on the period.

Before December 2014	Concerning consumption expenditure, the 2015-base Household Economy Consumption Index is directly connected to the index below (January 2015 to December 2016). On the other hand, for each of the ten major expenditure groups, the index is converted so that its 2015 average matches the 2015 average of the index below (January 2015 to December 2016). Therefore, for the period prior to December 2014, the sum of the indices for the ten major expenditure groups may not equal the index for consumption expenditure.
January 2015 to December 2016	Index calculated by combining monthly results of FIES and SHE in accordance with the method used to create the CTI micro.
January 2018 to December 2018	For the results from January to December 2018, the index is adjusted for the impact of the change in survey methodology in the FIES in January 2018.
Before December 2019	Since the classification of tuition and other fees paid directly to institutions on behalf of households receiving remittances was revised from “Remittance” to “School fees” beginning with the January 2020 results, linked indices are not compiled for “Other consumption expenditure” under either the goods and services classification or the ten major expenditure groups.

Note 2. Linked indices

For December 2024 and earlier, the 2020-base Household Consumption Trend Index (CTI micro) is converted so that the average for 2025 is 100 and linked to the 2025-base index.

The linked indices up to December 2024 are calculated for each type of household using the following formula.

$$I_{h,m}^{L,2025} = I_{h,m}^{2020} \times \frac{100}{\bar{I}_h^{2020,2025}}$$

$I_{h,m}^{L,2025}$: Linked index on the 2025 base for household type h in month m

$I_{h,m}^{2020}$: Index on the 2020 base for household type h in month m

$\bar{I}_h^{2020,2025}$: Average of the 2020-base consumption expenditure index for household type h in 2025

References

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