## (Supplementary Material) Specifications for Seasonal Adjustment

(i) X12-ARIMA is employed for seasonal adjustment and it allows various specifications such as choice of regressors and selection of ARIMA models. The selection of optimal models is conducted under criteria such as AIC.

(ii) While the specifications for seasonal adjustment are reviewed regularly at the timing the Annual Estimates are incorporated, they may also be revised along with other addition and revision of source statistics.

(iii)The specifications are applied from 1994.1 to 2024.4, and parameter MAXLEAD is set to 8 and parameter MAXBACK to 0 for X12-ARIMA.

**1. Components of GDP (Expenditure Approach)**

| Series | ARIMA Model<br>Top: Nominal Series<br>Bottom: Real Series | Leap Year Effect | Other Regressors | |
|---|---|---|---|---|
| | | | Type | Background |
| Domestic Final Consumption Expenditure of Households | - | - | - | - |
| Durable Goods | ( 1 1 1 )( 0 1 1 )<br>( 0 1 1 )( 1 1 1 ) | × | AO1997.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO1997.2 | |
| | | | RP2008.3<br>-2009.1 | Fluctuation due to the global recession from autumn 2008 |
| | | | AO2014.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO2014.2 | |
| | | | AO2019.3 | Fluctuation due to the consumption tax rate hike |
| | | | AO2019.4 | |
| | | | AO2020.1 | Fluctuation and temporary change due to the COVID-19 |
| | | | AO2020.2 | |
| | | | AO2020.3 | |
| | | | TC2021.3 | |
| Semi-Durable Goods | ( 1 1 0 )( 0 1 1 )<br>( 1 1 0 )( 0 1 1 ) | × | AO1997.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO1997.2 | |
| | | | AO2014.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO2014.2 | |
| | | | AO2019.3 | Fluctuation due to the consumption tax rate hike |
| | | | AO2019.4 | |
| | | | AO2020.2 | Fluctuation and level shift due to the COVID-19 |
| | | | AO2021.3 | |
| | | | LS2022.2 | |
| Non-Durable Goods | ( 1 1 1 )( 1 1 2 )<br>( 1 1 1 )( 2 1 2 ) | ○ | AO1997.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO1997.2 | |
| | | | LS2008.4 | Level shift and temporary change due to the global recession from autumn 2008 |
| | | | TC2009.3 | |
| | | | AO2014.1 | Fluctuation due to the consumption tax rate hike |
| | | | AO2014.2 | |
| | | | AO2019.3 | Fluctuation due to the consumption tax rate hike |
| | | | AO2019.4 | |
| | | | AO2020.2 | Fluctuation due to the COVID-19 |
| | | | AO2020.4 | |
| Services (Excluding Imputed Rent and FISIM) | ( 2 1 2 )( 0 1 1 )<br>( 0 1 2 )( 0 1 1 ) | × | TC2011.1 | Temporary change due to the Great East Japan Earthquake |
| | | | AO2020.1 | Fluctuation, temporary change and level shift due to the COVID-19 |
| | | | TC2020.2 | |
| | | | LS2021.1 | |
| | | | LS2021.4 | |
| | | | LS2022.2 | |
| Services (Imputed Rent) | ( 1 1 1 )( 0 1 1 )<br>( 2 1 1 )( 0 1 1 ) | × | LS2011.2 | Level shift due to the Great East Japan Earthquake |
| Direct Purchases Abroad by Resident Households | ( 0 1 0 )( 2 1 1 )<br>( 0 1 0 )( 2 1 1 ) | × | Nominal series | |
| | | | AO2001.4 | Fluctuation due to the September 11th attacks |
| | | | AO2003.2 | Fluctuation due to the Iraq War |
| | | | LS2006.1 | Level shift due to revision of the BOP |
| | | | AO2020.1 | Fluctuation and level shift due to the COVID-19 |
| | | | LS2020.2 | |
| | | | AO2022.2 | |
| | | | LS2022.3 | |
| | | | LS2023.1 | |
| | | | LS2023.3 | |
| | | | Real series | |
| | | | AO2001.4 | Fluctuation due to the September 11th attacks |
| | | | AO2003.2 | Fluctuation due to the Iraq War |
| | | | LS2006.1 | Level shift due to revision of the BOP |
| | | | AO2020.1 | Fluctuation and level shift due to the COVID-19 |
| | | | LS2020.2 | |
| | | | LS2022.3 | |
| | | | LS2023.1 | |
| | | | LS2023.3 | |

| | | | | |
|---|---|---|---|---|
| Direct Purchases in the Domestic Market by Non-Resident Households | (0 1 0)(2 1 2)<br>(0 1 0)(2 1 2) | × | LS2003.1 | Level shift due to revision of the BOP |
| | | | AO2003.2 | Fluctuation due to the Iraq War |
| | | | LS2006.1 | Level shift due to revision of the BOP |
| | | | TC2011.2 | Temporary change due to the Great East Japan Earthquake |
| | | | LS2020.1 | |
| | | | LS2020.2 | Level shift due to the COVID-19 |
| | | | LS2022.4 | |
| Government Individual Consumption Expenditure | (2 1 2)(0 1 1)<br>(1 1 0)(0 1 1) | × | TC2020.2 | Temporary change and level shift due to the COVID-19 |
| | | | LS2021.2 | |
| Government Collective Consumption Expenditure (Excluding FISIM) | (1 1 2)(0 1 1)<br>(1 1 1)(1 1 1) | × | LS2024.2 | Level shift due to increases in intermediate input and compensation of employees from FY2024 |
| Private Residential Investment | (1 1 2)(0 1 1)<br>(1 1 2)(0 1 1) | × | TC2007.4 | Temporary change due to ammendment of Building Standards Act |
| Private Non-Residential Investment | (0 1 2)(2 1 0)<br>(0 1 2)(2 1 0) | × | n.a. | |
| Public Residential Investment | (1 1 0)(0 1 1)<br>(1 1 0)(0 1 1) | × | n.a. | |
| Public Non-Residential Investment | (1 1 1)(2 1 0)<br>(1 1 1)(2 1 0) | × | n.a. | |
| General Government Gross Fixed Capital Formation | (2 1 1)(1 1 0)<br>(2 1 1)(1 1 0) | × | n.a. | |
| Change in Private Inventories, Materials and Supplies | (1 0 2)(2 0 2)<br>(1 0 2)(2 0 2) | × | AO2008.4 | Fluctuation due to the global recession from autumn 2008 |
| | | | AO2020.2 | Fluctuation due to the COVID-19 |
| Change in Private Inventories, Work-in-Progress | (2 0 1)(1 0 1)<br>(2 0 1)(1 0 1) | × | n.a. | |
| Change in Private Inventories, Finished Goods | (0 0 0)(1 0 1)<br>(0 0 0)(1 0 1) | × | TC2009.1 | Temporary change due to the global recession from autumn 2008 |
| Change in Private Inventories, Wholesale and Retail Trade | (2 0 2)(1 0 1)<br>(2 0 2)(1 0 1) | × | n.a. | |
| Change in Inventories of Public Corporation | (1 0 1)(2 0 1)<br>(1 0 1)(2 0 1) | × | n.a. | |
| Change in Inventories of General Government | (0 0 1)(1 0 0)<br>(0 0 1)(1 0 0) | × | n.a. | |
| Exports of Goods | (1 1 2)(1 1 1)<br>(2 1 2)(0 1 1) | × | LS2008.4 | Level shift and temporary change due to the global recession from autumn 2008 |
| | | | TC2009.1 | |
| | | | AO2011.2 | Fluctuation due to the Great East Japan Earthquake |
| | | | LS2014.1 | Level shift due to revision of the BOP |
| | | | TC2020.2 | Temporary change due to the COVID-19 |
| Exports of Services (Excluding Direct Purchases in the Domestic Market by Non-Resident Households and FISIM) | (1 1 1)(0 1 1)<br>(2 1 1)(0 1 1) | × | LS2014.1 | Level shift due to revision of the BOP |
| Imports of Goods | (0 1 1)(1 1 2)<br>(2 1 2)(2 1 1) | × | Nominal series | |
| | | | AO2008.4 | Fluctuation and level shift due to the global recession from autumn 2008 |
| | | | LS2009.1 | |
| | | | LS2014.1 | Level shift due to revision of the BOP |
| | | | AO2020.2 | Fluctuation due to the COVID-19 |
| | | | AO2020.3 | |
| | | | Real series | |
| | | | LS2009.1 | Level shift due to the global recession from autumn 2008 |
| | | | LS2014.1 | Level shift due to revision of the BOP |
| | | | AO2020.3 | Fluctuation due to the COVID-19 |
| Imports of Services (Excluding Direct Purchases Abroad by Resident Households and FISIM) | (1 1 0)(0 1 1)<br>(1 1 0)(0 1 1) | × | Nominal series | |
| | | | LS2009.1 | Level shift due to the global recession from autumn 2008 |
| | | | LS2014.1 | Level shift due to revision of the BOP |
| | | | AO2022.3 | Fluctuation of the imports of advertisment service |
| | | | Real series | |
| | | | LS2014.1 | Level shift due to revision of the BOP |
| | | | AO2022.3 | Fluctuation of the imports of advertisment service |
| Income from the Rest of the World | (0 1 0)(0 1 1)<br>(0 1 0)(0 1 1) | × | LS1996.1 | Level shift due to revision of the BOP |
| Income to the Rest of the World | (1 1 1)(0 1 1)<br>(1 1 1)(0 1 1) | × | LS1996.1 | Level shift due to revision of the BOP |
| Gross Fixed Capital Formation by Type | - | - | - | - |
| Residential Investment | (1 1 2)(0 1 1)<br>(1 1 2)(0 1 1) | × | TC2007.4 | Temporary change due to ammendment of Building Standards Act |
| Other Buildings and Structures | (1 1 1)(0 1 1)<br>(1 1 1)(0 1 1) | × | n.a. | |
| Transport Equipment | (2 1 2)(2 1 1)<br>(2 1 2)(2 1 1) | × | n.a. | |
| Other Machinery and Equipment etc. | (2 1 0)(1 1 2)<br>(2 1 0)(1 1 2) | × | n.a. | |
| Intellectual Property Products | (1 1 1)(1 1 1)<br>(1 1 1)(1 1 1) | × | n.a. | |

(Note)
Additive models are specified to series of Change in Inventories and multiplicative models to other series

The following series are intermediate in the process of estimation but necessary to be seasonally adjusted.

| Series | ARIMA model | Leap Year Effect | Other Regressors | |
|---|---|---|---|---|
| | | | Type | Background |
| Private Non-Residential Investment: Supply-Side Estimates | ( 2 1 0 )( 0 1 1 ) | × | n.a. | |
| Private Non-Residential Investment: Demand-Side Estimates | ( 1 1 0 )( 1 1 2 ) | × | n.a. | |
| Change in Private Inventories, Materials and Supplies (excluding crude oil and natural gas) | ( 1 0 2 )( 1 0 1 )<br>( 1 0 2 )( 1 0 1 ) | × | AO2008.4 | Fluctuation due to the global recession from autumn 2008 |
| | | | AO2020.2 | Fluctuation due to the COVID-19 |
| Change in Private Inventories, Work-in-Progress (excluding petroleum products) | ( 2 0 1 )( 1 0 1 )<br>( 2 0 1 )( 1 0 1 ) | × | n.a. | |

**2. Compensation of Employees**

| Series | ARIMA model | Leap Year Effect | Other Regressors | |
|---|---|---|---|---|
| | | | Type | Background |
| Wages and Salaries | ( 1 1 2 )( 2 1 2 ) | × | LS2020.2 | Level shift due to the COVID-19 |
| Employer's social contribution | ( 2 1 2 )( 0 1 1 ) | × | n.a. | |

**Sample Code for SPEC File (Example of Nominal Domestic Final Consumption Expenditure of Households (Semi-Durable Goods))**

```
series { start =1994.1
        span  =(1994.1,2026.3)
        modelspan =(1994.1,2026.3)
        period=4
        decimals =3
        precision =3}
transform {  function=log  }
arima {  model =  ( 1 1 0 )( 0 1 1 )  }
forecast {  maxlead = 8
            maxback = 0  }
regression {
user = ( AO1997.1 AO1997.2 AO2014.1 AO2014.2 AO2019.3 AO2019.4 AO2020.2 AO2021.3 LS2022.2 )
file ="xxxxxxxxxxxxxxxxxxxxxxxxx"
}
estimate  { maxiter = 20000 }
x11{  savelog = q
      appendfcst = yes
```

**Regressors applied in the preliminary GDP estimates from January-March 2025**

| Series | Other Regressors |
|---|---|
| Direct Purchases Abroad by Resident Households | AO2025.2 (only real series), AO2025.3 (only real series) |
| Government Collective Consumption Expenditure (Excluding FISIM) | AO2026.2, AO2026.3 (only nominal series) |
| Private Residential Investment | AO2025.3 |
| Change in Private Inventories, Materials and Supplies | AO2025.2 (only nominal series) |
| Change in Private Inventories, Finished Goods | AO2026.1 (only nominal series) |
| Change in Inventories of General Government | AO2026.2 |
| Gross Fixed Capital Formation by Type<br>Residential Investment<br>Intellectual Property Products | <br>AO2025.3<br>AO2026.2 |
| Intermediate series in the process of estimation but necessary to be seasonally adjusted<br>Change in Private Inventories, Materials and Supplies(excluding crude oil and natural gas) | <br>AO2025.2 (only nominal series) |