(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 Top: Nominal Series Bottom: Real Series	Leap Year Effect	Other Regressors	
			Type	Background
Domestic Final Consumption Expenditure of Households	-	-	-	-
Durable Goods	(1 1 1)(0 1 1) (0 1 1)(1 1 1)	×	AO1997.1	Fluctuation due to the consumption tax rate hike
			AO1997.2	
			RP2008.3-2009.1	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) (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) (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) (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) (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) (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	

Series	Model (ARIMA)	Mult/Add	Outlier	Description
Direct Purchases in the Domestic Market by Non-Resident Households	(0 1 0)(2 1 2) (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) (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) (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) (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) (0 1 2)(2 1 0)	×	n.a.	
Public Residential Investment	(1 1 0)(0 1 1) (1 1 0)(0 1 1)	×	n.a.	
Public Non-Residential Investment	(1 1 1)(2 1 0) (1 1 1)(2 1 0)	×	n.a.	
General Government Gross Fixed Capital Formation	(2 1 1)(1 1 0) (2 1 1)(1 1 0)	×	n.a.	
Change in Private Inventories, Materials and Supplies	(1 0 2)(2 0 2) (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) (2 0 1)(1 0 1)	×	n.a.	
Change in Private Inventories, Finished Goods	(0 0 0)(1 0 1) (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) (2 0 2)(1 0 1)	×	n.a.	
Change in Inventories of Public Corporation	(1 0 1)(2 0 1) (1 0 1)(2 0 1)	×	n.a.	
Change in Inventories of General Government	(0 0 1)(1 0 0) (0 0 1)(1 0 0)	×	n.a.	
Exports of Goods	(1 1 2)(1 1 1) (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) (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) (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) (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) (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) (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) (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) (1 1 1)(0 1 1)	×	n.a.	
Transport Equipment	(2 1 2)(2 1 1) (2 1 2)(2 1 1)	×	n.a.	
Other Machinery and Equipment etc.	(2 1 0)(1 1 2) (2 1 0)(1 1 2)	×	n.a.	
Intellectual Property Products	(1 1 1)(1 1 1) (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) (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) (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  =(1994.1,2025.4)
        modelspan =(1994.1,2025.4)
        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 ="xxxxxxxxxxxxxxxxxxxxxxxx"
}
estimate  { maxiter = 20000 }
x11{  savelog = q
      appendfcst = yes
      save = ( d11 d16 )   }
```

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)
Private Residential Investment	AO2025.3
Change in Private Inventories, Materials and Supplies	AO2025.2(only nominal series)
Gross Fixed Capital Formation by Type Residential Investment	AO2025.3
Intermediate series in the process of estimation but necessary to be seasonally adjusted Change in Private Inventories, Materials and Supplies(excluding crude oil and natural gas)	AO2025.2(only nominal series)