How to Create Quarterly Fiscal Data on the Japanese Government Sectors

Discussion Paper New Series

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Abstract

The Japanese government sectors have not provided annual long-term data on themselves to the public. Hence, researchers in the Japanese public-finance field have suffered from the small sample-size problem of fiscal data when studying the Japanese government sectors from a time-series viewpoint. In this context, Yoshida (2021), which is my work that was simultaneously implemented with this paper, created quarterly data using public data to overcome this problem for examining the fiscal sustainability of the Japanese government sectors. This paper explains how Yoshida (2021) successfully created the quarterly data of 1970Q2-2020Q1 ("Q" refers to quarter).

Keywords: Quarterly data, Annual data, Japanese government sectors, Fiscal sustainability

JEL Classification Numbers: E01, E69, H69, H79

1. Introduction

The Japanese government sectors have failed to provide annual long-term data on themselves to the public. For example, this feature becomes clearly apparent when compared to the United States (see Bohn, 1998 and 2005). On the other hand, in 1953 the Japanese government started to publicly report a prototype of national accounts, i.e., national income accounts. In 1978, Japan adopted 1968SNA ("SNA" refers to system of national accounts), following the United Nations' lead. Japan successively revised its former system for 1993SNA in 2000 and for 2008SNA in 2016. In this way with SNA, the Japanese government has provided affluent annual and quarterly flow data on such fields as products, income, and outlays: both on the whole of Japanese economy and its subsectors, including the general government (GG). However, the government has failed to sufficiently elucidate quarterly data on the following fields: (1) stock items like assets and liabilities, (2) flow and stock items regarding the Japanese public subsectors, which consist of the central government (CG), the whole of the local governments (WLG), and the whole of the social security funds (WSSF).[1]

Under this circumstance, researchers eventually identified a small sample-size problem on the governments' data when studying public fiscal policies in Japan from a time-series viewpoint. Sakuragawa and Sakuragawa (2020) used a panel data set of 23 OECD countries to estimate Japan's fiscal reaction function (FRF), which reveals how the primary-balance/GDP (gross domestic product) ratio reacts to increments of the government debt/GDP ratio. Due to this small sample-size problem on the governments' data, they assumed that the citizens of advanced countries tend to be politically mature and have

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[1] In this paper, "public sector" denotes GG and "public subsector" denotes each subsector which comprises the GG: the CG, the WLG, and the WSSF. I use "government sector(s)" to target all four governments: the GG, the CG, the WLG, and the WSSF.

identical attitudes toward fiscal policies.[2] Although Yoshida (2019) examined the fiscal sustainability of all the above government sectors using state-space models with the Kalman filter, he just estimated their FRFs with the annual data of FY1970-2017 (FY denotes fiscal year).

Therefore, Yoshida (2021), which is my work that was simultaneously implemented with this paper, tackled the small sample-size problem of the governments' data and successfully created quarterly fiscal data on the Japanese governments using "National Accounts" (NA) (Cabinet Office, Government of Japan) and "White Paper on Local Public Finance" (WPLPF) (Ministry of Internal Affairs and Communications, Government of Japan) data. That is, I prepared a data set whose sample size is large enough to appropriately scrutinize the fiscal policy changes of all the Japanese governments.[3] Due to space limitations, however, Yoshida (2021) omitted a detailed explanation about how to create the quarterly data to this paper, which implements this explanation.

The rest of this paper is organized as follows. Section 2 introduces the data sources and the variables to calculate the quarterly data. Section 3 explains how to create them in detail. Finally, Section 4 shows some notes.

2. Data sources and variables

First, I listed the data sources in Table 1, which indicates all the necessary data from the NAs and WPLPFs. Second, I showed the annual variables utilized in Yoshida (2021) in Panel A in Table 2. Third, the variables with which the quarterly figures of the above variables were

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[2] This assumption seems quite strong.

[3] Doi et al. (2011) also created quarterly data of 1980Q1-2010Q1 on the Japanese governments' fiscal variables to estimate FRFs using a Markov switching model. However, their calculation is different from that of Yoshida (2021) in the following four points, etc.: (1) their targets were only the GG and the CG and WLG sum; (2) the quarterly figures were created differently (Section 3); (3) Yoshida (2021) efficiently used the quarterly data of WPLPF by following Mochida (2015); (4) they used data from the Bank of Japan's Flow of Funds to match the seasonal patterns of the outstanding government-debt series that are estimated quarterly, while Yoshida (2021) directly estimated the outstanding government-debt series quarterly using the estimated net lending/net borrowing figures.

calculated are shown in Panel B in Table 2. The analysis term of Yoshida (2021) is 1970Q2-2020Q1.

3. Creating quarterly figures

3.1 Calculation steps
The following are the steps for calculating the quarterly figures of the necessary variables:

Step 1: The annual figures of the necessary variables are collected and created with the annual NA data (Panel A in Table 2).

Step 2: The ratios to proportionately divide Step 1's annual figures into quarterly ones are estimated with the quarterly data of NAs and WPLPFs.

Step 3: The quarterly figures of the necessary variables are finally estimated with the figures of Steps 1 and 2.

3.2 Details of Step 1
Next, I explain the detailed sequences of the above steps. At Step 1, the figures of all the variables were retroactively updated in the following procedures, which follow those in Yoshida (2019). The subsequent explanations are taken from Section 4.3 of Yoshida (2019): however, this paper replaced FY2017's NA in Yoshida (2019) with FY2019's NA. (1) The FY1980-1993 figures of FY2009's NA were updated using the figures of FY2019's NA to those of the FY2009's NA ratios at FY1994 by the original data item (Panel A in Table 2). (2) The FY1970-1979 figures (FY1969-1979 figures for the asset-related data) of FY1998's NA were updated using the updated figures of FY2009's NA to those of the FY1998's NA ratios at FY1980. (3) In updating the figures of all the public subsectors (the CG, the WLG,

and the WSSF), I adopted the same ratios as the GG in the above terms (1) and (2). Furthermore, since the primary-balance figures from FY1970-1979 do not exist, I estimated them using the following figures and procedures:

Figures: (1-1) financial surplus and deficit; (1-2) payable property income; (1-3) receivable property income; (1-4) average ratio of interest payments to payable property income for FY1980-2009; and (1-5) average ratio of interest receipts to receivable property income for FY1980-2009.

Procedures: (2-1) estimating interest payments and receipts from the above data of Items (1-2) - (1-5); (2-2) adding estimated interest payments to above data of Item (1-1) and subtracting estimated interest receipts from above data of Item (1-1). In addition, when deriving the FY1970-1979 figures of the government expenditures exclusive of interest payments and receipts, the above estimated interest payments and receipts were also utilized.

3.3 Details of Step 2

First, the quarterly figures of the flow variables are initially estimated using the NA and WPLPF data (Table 3). Subsequently, the ratios to proportionately divide Step 1's annual figures of flow variables into quarterly ones are estimated using these quarterly figures.

3.4 Details of Step 3

The quarterly figures of the flow variables are finally estimated by proportionating Step 1's figures with the ratios calculated in Step 2. Subsequently, the quarterly figures of the government debt are estimated using these quarterly figures of the flow variables (Table 3).

4. Notes

Finally, I add the following notes about estimating the quarterly figures:

(1) I standardized all the data amounts with the quarterly GDP deflator (2015 calendar year = 100).

(2) The trend levels of the government expenditures and the GDP are computed using the Hodrick-Prescott (HP) filter.

(3) All the quarterly figures of the variables were seasonally adjusted using X12-ARIMA.

(4) See Table A1 of Yoshida (2021) for descriptive statistics of the created data.

[Table 1 about here]

[Table 2 about here]

[Table 3 about here]

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Tables

Table 1 Data List

Data Sources

Source	Note
A: Annual Data	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019
B: Data to Calculate Quarterly Figures	
General government	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019
Social security funds	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019
Local governments	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019
White Paper on Local Public Finance	Issues for FY1970-2019
Central government	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019
GDP, GDP deflator	
National Accounts (Cabinet office, Japan)	Issues for FY1998, FY2009, and FY2019

Source: Table 4 in Yoshida (2021).

Table 2 Variable List

Panel A: Annual Data

Variable	Utilized Original Data	Derivation
Primary Balance	a. Primary balance	
	b. Financial surplus and deficit	
	c. Interest payments	
	d. Interest receipts	
Net Debt Outstanding	a. Financial assets	$b - a$
	b Financial liabilities	
Government Expenditure (exclusive of net interest payments)	a. Government expenditures	$a - (b - c)$
	b. Interest payments	
	c. Interest receipts	
Net Grant	a. Intergovernmental fiscal transfers, receivable	$a - b$
	b. Intergovernmental fiscal transfers, payable	
GDP	a. GDP	
GDP Deflator	a. GDP deflator	

Note: "Government expenditure" includes net land-purchase cost. See Table 3 for the details of this variable.

Panel B: Variables to Calculate Quarterly Figures

General government	Social security funds
Gross fixed capital formation	Property income, receivable
Consumption of fixed capital	Property income, payable
Changes in inventories	Social contributions, receivable
Purchases of land, net	Other current transfers, receivable
Saving, net	Social benefits other than social transfers in kind, payable
Capital transfers, receivable	Other current transfers, payable
Capital transfers, payable	Final consumption expenditure
Interest, payable	Capital transfers, receivable
Interest, receivable	Capital transfers, payable
Current transfers within general government, payable	Gross fixed capital formation
Current transfers within general government, receivable	Consumption of fixed capital
Local governments	Changes in inventories
Debt service (*)	Purchases of land, net
Reserves (*)	Interest, payable
Local government loans (*)	Interest, receivable
Transfers from other accounts (*)	Current transfers within general government, payable
Total expenditure (*)	Current transfers within general government, receivable
Interest, payable	**Central government**
Interest, receivable	Using the above governments' figures
Current transfers within general government, payable	**GDP related**
Current transfers within general government, receivable	GDP & GDP deflator

Notes: 1. Variables with (*) are from "White Paper on Local Public Finance."

2. All other variables are from "National Accounts."

Source: Table 5 in Yoshida (2021)

Table 3 Details of Steps 2 and 3

Panel A: General government (GG)

No.	Variable	Note subcategory		Necessary quarterly figure	Estimated?	Estimation procedure	Data source NA	Flow or Stock
1	Primary balance: s		sc1	Gross fixed capital formation			Gross domestic product (at current price)	Flow
			sc2	(less) Consumption of fixed capital	Yes	Annual data/4	Capital and financial accounts classified by institutional sectors: general government	Flow
			sc3	Changes in inventories			Gross domestic product (at current price)	Flow
			sc4	Purchases of land, net	Yes	Annual data/4	Capital and financial accounts classified by institutional sectors: general government	Flow
			sc5	Net lending(+)/net borrowing(-)	Yes	sc7+(sc8-sc9)+sc2-(sc1+sc3+sc4)		Flow
			sc6	s (primary balance)	Yes	sc5+(sc10-sc11)		
		Here,"s" indicates not "primary-balance/GDP ratio" but "primary balance level."						
			sc7	Saving, net			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc8	Capital transfers, receivable	Yes	Annual data/4	Capital and financial accounts classified by institutional sectors: general government	Flow
			sc9	(less) Capital transfers, payable	Yes	Annual data/4	Capital and financial accounts classified by institutional sectors: general government	Flow
		For s						
			sc10	Interest, payable			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc11	Interest, receivable			Income and outlay accounts classified by institutional sectors: general government	Flow
		The figures of "FISIM unadjusted" are adopted since FY1964. "FY" indicates "fiscal year."						
	* Annual s						Account classified by the subsectors of general government	Flow
2	Total expenditure: g		sc1	g (total expenditure)	Yes	Sum of from sc2 through sc9		Flow
	exclusive interest payment		sc2	Subsidies, payable			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc3	Property income, payable			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc4	Social benefits other than social transfers in kind, payable			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc5	Other current transfers, payable			Income and outlay accounts classified by institutional sectors: general government	Flow
			sc6	Final consumption expenditure			Gross domestic product (at current price)	Flow
			sc7	Gross fixed capital formation			Gross domestic product (at current price)	Flow
			sc8	Changes in inventries			Gross domestic product (at current price)	Flow
			sc9	Purchases of land, net	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
	* Annual g	Annual g consists of the following: the same items of the above sc2-sc9 and rent.					Account classified by the subsectors of general government	Flow
3	Grant, payable		sc1	Current transfers within GG, payable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
	Grant, receivable		sc2	Current transfers within GG, receivable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		"GG" indicates "general government."						
4	Government debt: d		sc1	Liabilities		Annual data	Closing stocks of assets and liabilities classified by the sub-sectors of general government	Stock
			sc2	Financial assets		Annual data	Closing stocks of assets and liabilities classified by the sub-sectors of general government	Stock
			sc3	d: net finacial liabilities	Yes	(sc1-sc2)+Σ[quartely estimated sc5 of "No. 1"]+ adjusted term		Stock
		Here,"d" indicates not "government-debt/GDP ratio" but "government debt level."						
		Here, sc5's figures are ones finally estimated at Step 3.						
						Adjusted term		
						{[(sc1-sc2)-(sc1(-1)-sc2(-1))]+ Σ[quartely estimated sc5 of "No. 1"]}*(1/4)		
		Here,"sc1(-1)" indicates the previous year's sc1: so does "sc2(-1)."						
		Here,"Σ" means to sum the figures of sc5 from the 1st quarter through the 4th quarter.						

Panel B: Social Security Funds (WSSF)

No.	Variable	Note subcategory	Necessary quarterly figure	Estimated?	Estimation procedure	Data source NA	Flow or Stock
1	Primary balance: s	sc1	Property income, receivable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc2	Property income, payable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc3	Social contributions, receivable			Income and outlay accounts classified by institutional sectors: general government	Flow
		sc4	Other current transfers, receivable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc5	Social benefits other than social transfers in kind, payable	Yes	(Annual GG' figure) *(Annual WSSF's figure/annual GG's)	Income and outlay accounts classified by institutional sectors: general government & Account classified by the subsectors of general government	Flow
	"GG" and "WSSF" indicate "general government" and "whole of social security funds," respectively.					Account classified by the subsectors of general government	Flow
		sc6	Other current transfers, payable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc7	Final consumption expenditure	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc8	Capital transfers, receivable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc9	(less) Capital transfers, payable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc10	Gross fixed capital formation	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc11	(less) Consumption of fixed capital	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc12	Changes in inventories	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc13	Purchases of land, net	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc14	Net lending(+)/net borrowing(-)	Yes	sc1+sc3+sc4+sc8+sc9+sc11-(sc2+sc5+sc6+sc7+sc10+sc12+sc13)		Flow
		sc15	s (primary balance)	Yes	sc14+(sm16-sc17)		Flow
	For s						
		sc16	Interest, payable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
		sc17	Interest, receivable	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
	The figures of "FISIM unadjusted" are adopted since FY1964.						
	* Annual s					Account classified by the subsectors of general government	
2	Total expenditure: g exclusive interest payment	sc1	g (total expenditure)	Yes	Annual data/4	Account classified by the subsectors of general government	Flow
	* Annual g	Annual g consists of the following: the same items of the above sc2-sc7 in No.2 of Panel A and rent.				Account classified by the subsectors of general government	Flow
3	Grant, payable	Same as No.3 of Panel A.					Flow
	Grant, receivable						Flow
4	Government debt: d	Same as No.4 of Panel A.					Stock

Panel C: Local governments (WLG)

No.	Variable	Note subcategory	Necessary quarterly figure	Estimated?	Estimation procedure	Data source WPLPF	NA	Flow or Stock
1	Primary balance: s	sc1	Debt service	Yes	Using "annual data" & cash flows ratios (since 1970)	Settled expenditures by characteristic & cash flows (since: FY1970)		Flow
		Using the ratios on "Local government loans" in the previous year.						
		sc2	Reserves	Yes	Using "annual data" & cash flows ratios (average of 2009-2019)	Settled expenditures by characteristic & cash flows (since: FY2009)		Flow
		sc3	Local government loans	Yes	Using "annual data" & cash flows ratios (since 1970)	Settled expenditures by characteristic & cash flows (since: FY1970)		Flow
		sc4	Transfers from other accounts	Yes	Using "annual data" & cash flows ratios (average of 2009-2019)	Settled expenditures by characteristic & cash flows (since: FY2009)		Flow
		sc5	Net lending(+)/net borrowing(-)	Yes	sc6-(sc7-sc8)			Flow
		sc6	s (primary balance)	Yes	(sc1+sc2)-(sc3+sc4)			Flow
		For s						
		sc7	Interest, payable	Yes	Using "annual data" & cash flows ratios (since 1970)	Cash flows (since:1970)	Account classified by the subsectors of general government	Flow
		Using the ratios on "Local government loans" in the previous year.						
		sc8	Interest, receivable	Yes	annual data/4		Account classified by the subsectors of general government	Flow
		The figures of "FISIM unadjusted" are adopted since FY1964.						
2	Total expenditure: g exclusive interest payment	sc1	g (total expenditure)	Yes	Using "annual data" & cash flows ratios (since 1970)	Settled expenditures by characteristic & cash flows (since: FY1962)	Account classified by the subsectors of general government	Flow
	* Annual g	Annual g consists of the following: the same items of the above sc1-sc9 in No.2 of Panel A and rent.						
3	Grant, payable	sc1	Current transfers within GG, payable	Yes	Using "annual data" & cash flows ratios (since 1970)	Cash flows (since:1970)	Account classified by the subsectors of general government	Flow
	Grant, receivable	sc2	Current transfers within GG, receivable	Yes	Using "annual data" & cash flows ratios (since 1970)	Cash flows (since:1970)	Account classified by the subsectors of general government	Flow
4	Government debt: d	Same as No.4 of Panel A.						Stock

Panel D: Central government

No.	Variable	Note	subcategory	Necessary quarterly figure	Estimated?	Estimation procedure	Data source	Flow or Stock
1	Primary balance: s		sc1	Net lending(+)/net borrowing(-)	Yes	GG's figure-WSSF's figure-WLG's figure	Figures finally estimated at Step 3	Flow
			sc2	s (primary balance)	Yes	GG's figure-WSSF's figure-WLG's figure	Figures finally estimated at Step 3	Flow
2	Total expenditure: g exclusive interest payment		sc1	g (total expenditure)	Yes	GG's figure-WSSF's figure-WLG's figure	Figures finally estimated at Step 3	Flow
3	Grant, payable		sc1	Current transfers within GG, payable	Yes	GG's figure-WSSF's figure-WLG's figure	Figures finally estimated at Step 3	Flow
	Grant, receivable		sc2	Current transfers within GG, receivable	Yes	GG's figure-WSSF's figure-WLG's figure	Figures finally estimated at Step 3	Flow
4	Government debt: d	Same as No.4 of Panel A.						Stock