Modern Japan Macroeconomic Database (MJ-MED)

Caption details

1) Macroeconomic indicators (monthly)

1.1) Railway traffic:

The volume of freight transported by the National Rail, seasonally adjusted by the authors of Shibamoto and Shizume (2014) using the X-12 ARIMA method. Source: *Reference Book of Financial Matters* (various issues), Financial Bureau, Ministry of Finance, Japan.

1.2) WPI:

The wholesale price index, seasonally adjusted by the authors of Shibamoto and Shizume (2014) using the X-12 ARIMA method. Source: *Hundred-Year Statistics of Wholesale Price Indexes in Japan* (1987), Research and Statistics Department of the Bank of Japan.

1.3) Futures spread:

The spread between the 1-month and 7-month futures prices of cotton yarn in the Osaka Sanpin Commodity Exchange. Following the notion of Hamilton (1987) that commodity futures prices contain information about market participants' inflation expectations, Shibamoto and Shizume (2014) treated the commodity futures price spread as a representative variable of inflation expectations. Having collected commodity futures price data for cotton yarn, raw cotton, rice, and silk, the study used the cotton yarn data for econometric analysis, and data pertaining to the other commodities to check for robustness of the analysis. The cotton yarn in question was twisted sinistrally and had a weight of one pound per 840 yards. Sources: *Economic Statistics of Japan* (various issues), the Bank of Japan; *Keizai Tokei Nenkan* (Economic Statistics Almanac; various issues), Toyo Keizai Shinpo Sha; *Monthly Report* (various issues), Osaka Sanpin Commodity Exchange.

1.4) Real fiscal balance:

Calculated by subtracting the net liability of the central government at the end of a month from that at the end of previous month and deflating the difference by the WPI. The liability side comprises overall government liabilities, including long-term and short-term government securities and borrowings from the central bank. The asset side comprises government deposits in the central bank. Taken together, the above data represents all the activities of the central government. Sources: *Reference Book of Financial Matters* (various issues), Financial Bureau, Ministry of Finance, Japan; *Hundred-Year Statistics of Wholesale Price Indexes in Japan* (1987), Research and Statistics Department of the Bank of Japan.

1.5) Effective exchange rate:

A weighted average of exchange rates against the US dollar, the British pound-sterling, the French franc, and the Chinese (Shanghai) tael. The weight of Japanese exports to the respective countries and their colonies is used (the 1931 weight is used for January 1920-December 1931, and the 1936 weight is used for January 1932-December 1936). Source: *Reference Book of Financial Matters* (various issues), Financial Bureau, Ministry of Finance, Japan.

1.6) M1:

Bank of Japan note issue, average derived from daily figures, seasonally adjusted by the authors of Shibamoto and Shizume (2014) using the X-12 ARIMA method. Source: *Economic Statistics of Japan* (various issues), the Bank of Japan.

2) JGB yields and their principal components (monthly)

2.1) JGB yields:

Yields to maturity of individual bonds ($r_t$), calculated based on quoted spot prices in the Tokyo Stock Exchange ($P_t$), maturity (n), and incoming cash flows for a bondholder in each period ($CF_j$), using the formula below:

$$P_t = \sum_{j=t}^{n} CF_j \cdot (1 + r_t)^{\frac{j-t}{12}}$$

Source: *Monthly Report* (various issues), the Tokyo Stock Exchange.

2.2) Principal components:

Principal component analysis (PCA) is a technique for "reducing the dimensionality of the dataset, increasing interpretability but at the same time minimizing information loss" (Jolliffe and Cadima 2016). Using PCA, researchers may find new variables that are linear functions of those in the original dataset, which successively maximize variance and are uncorrelated with each other. The formula for calculating the principal component i in time t is:

$$X_{i,t} = \sum_{j=1}^{n} a_i^j \cdot r_t^j$$

where j represents maturity, $X_{i,t}$ is the i'th principal component at period t ($i < j$), $r_t^j$ is the interest rate level for maturity j in period t, and the principal component i is normalized to zero mean and unit variance through the sample period. Six maturities – 1.5, 2.5, 3.5, 4.5, 7.5, and 10 years – are used for j. PCA formulates the coefficient $a_i^j$ to maximize the variance of $X_{i,t}$, a linear sum of interest rate fluctuations for different maturities. After determining the

first principal component, $X_{1,t}$, the second principal component, $X_{2,t}$, is computed so that $X_{2,t}$ is uncorrelated with $X_{1,t}$, and then $X_{3,t}$ is computed so that $X_{3,t}$ is uncorrelated with $X_{1,t}$ and $X_{2,t}$. Using new variables for principal components $X_{i,t}$, movements in the term structure of interest rates can be expressed with fewer variables than in the case of the original data with different maturities.

(References)

Shizume, Masato (2021); *The Japanese Economy During the Great Depression: The Emergence of Macroeconomic Policy in A Small and Open Economy, 1931-1936*, Springer;
Jolliffe, Ian T., and Jorge Cadima (2016); Principal component analysis: a review and recent developments; *Philosophical Transactions of the Royal Society* A, 374.

3) Fiscal indicators and public debts (annual, as % of GNP)

3.1) Government debt at the end of fiscal year:

The sum of government bonds, treasury bills, and borrowings by the central government at the end of fiscal year (end of March of the following year).

Sources: Government bond data is from the Ministry of Finance (1936) for the period through fiscal 1892 and from the Ministry of Finance (various issues) for fiscal 1893 and later. Since the Ministry of Finance (1936) contains only year-end data (end of December), figures through fiscal 1892 are computed according to the linear complementary method, using the formula $(3*D_{t+1}+1*D_{t+1})/4$.

Data pertaining to treasury bills and borrowings is from the Ministry of Finance (1936) for the period through fiscal 1902, and from the Ministry of Finance (various issues) for fiscal 1903 and later. Since the Ministry of Finance (1936) contains only year-end data (end of December), figures through fiscal 1902 are computed according to the linear complementary method, using the formula $(3*D_{t+1}+1*D_{t+1})/4$.

GNP data is from Ohkawa and Shinohara (1979). Calendar-year data has been transformed into fiscal-year data as per the linear complementary method, using the formula $(3*D_{t+1}+1*D_{t+1})/4$.

3.2) Fiscal surplus:

Fiscal surplus is computed by subtracting government debt at the end of a year from that at the end of the previous year.

3.3) Interest payment:

Data is from the Ministry of Finance (1936) for the period through fiscal 1920, and from Ministry of Finance (1954) for 1921 and later.

3.4) Primary surplus:

Primary surplus is calculated by adding interest payment to the fiscal surplus.

(References)

Ministry of Finance (1936). *Meiji-Taisho Zaisei Shi 11: Kokusai1* (The Financial History of the Meiji-Taisho Periods 11: National Debt 1). Tokyo: Zaisei Keizai Gakkai.

Ministry of Finance (1954). *Showa Zaisei Shi 6: Kokusai* (The Financial History of the Showa Period 6: National Debt). Tokyo: Toyo Keizai Shinposha.

Ministry of Finance (various issues). *Kinyu Jiko Sanko Sho* (Reference Book of Financial Matters). Tokyo: Ministry of Finance.

Ohkawa, Kazushi, and Miyohei Shinohara (1979). *Patterns of Japanese Economic Development: A Quantitative Appraisal*. New Haven, CT: Yale University Press.