Japanese and U.S. Economies as Viewed through New Composite Indexes of Coincident Indicators

Real GDP data published by the Cabinet Office have recently shown moderate, continuous growth despite the occasional ups and downs. However, the composite index of coincident indicators, which is also published by the Cabinet Office, has remained sluggish for the past two years. The discrepancy between real GDP data and the composite index of coincident indicators is attributable to the excessive weight of manufacturing industry-related indicators in the composite index, among other factors. Therefore, we developed new composite indexes of coincident indicators for the Japanese and U.S. economies based on review of the basics of the calculation of GDP data and examined the characteristics of the two economies.

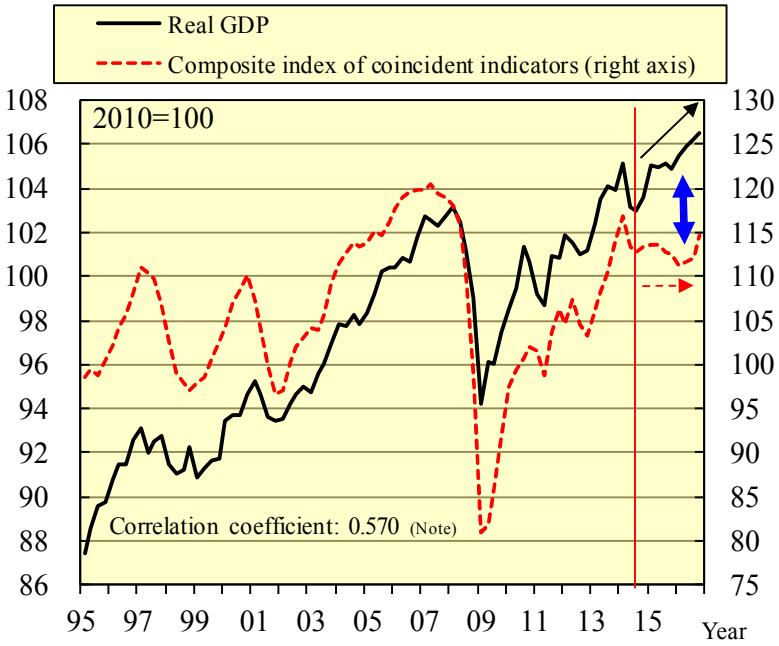
Problems with Japan's Composite Index of Coincident Indicators

The Cabinet Office publishes the composite index of coincident indicators every month as a benchmark for assessing the current state of the Japanese economy. The composite index of coincident indicators represents the aggregation of 10 indicators that are presumed to reflect the current economic conditions. It has been considered to be important as a benchmark that accurately captures the current economic situation from a practical viewpoint, rather than from a theoretical viewpoint. The composite index of coincident indicators has been used in part to complement GDP data, which are prepared on a quarterly basis in accordance with international standards. The composite index provides a snapshot view of changes in the overall state of the economy on a monthly basis. However, over the past two or three years, the discrepancy between GDP data and the composite index of coincident indicators has become too significant to be ignored. Previously, the composite index of coincident indicators and GDP have shown similar patterns of movement. Since around 2015, however, while GDP data have shown a consistent uptrend on the whole, the coincident index has remained flat.

Figure 1 shows the trends in the composite index of coincident indicators and real GDP data expressed as indexes relative to the base of 100 in 2010. Real GDP continued to grow after hitting bottom in the July-September quarter of 2014, recording growth of 3.5% over a period of around two years until the October-December quarter of 2016. However, the composite index of coincident indicators was on a downtrend before rebounding recently.

Why is there such a significant discrepancy between these two sets of data, both of which are supposed to show the overall state of the Japanese economy? The presence of the discrepancy raises doubt about the credibility of the composite index as a gauge of the current state of the economy.

Figure 1 Real GDP and the composite index of coincident indicators



Note: Generally speaking, it is assumed that a correlation coefficient with a value lower than 0.4 indicates the absence of correlation, a correlation coefficient with a value of 0.4 to 0.9 indicates the presence of a weak correlation, and a correlation coefficient with a value higher than 0.9 indicates the presence of a strong correlation.

Source: Cabinet Office

The composite index is calculated by aggregating 10 component indicators, including the industrial production index, the production goods shipment index, the durable consumer goods shipment index and the investment goods shipment index. A composite index, which measures the level as well the direction of change, is regarded as superior to a diffusion index, which measures only the direction of change.

However, if we examine the 10 component indicators of the composite index of coincident indicators one by one, we notice various problems, which are summarized in Figure 2.

The first problem is that the composite index is skewed toward the manufacturing industry: five of the 10 component indicators are manufacturing industry-related ones (Group A in Figure 2). In the past, it was inevitable to rely on manufacturing industry-related indicators because the weight of value created by that industry in the overall economic activity was outstandingly large (55.3% in 1970) and also because there were

not appropriate indicators of value created by the nonmanufacturing industry (tertiary industry). However, the weight of value created by the manufacturing industry has declined to 18.5% (2014). All the same, the government is using few indicators related to the nonmanufacturing industry, which accounts for most of the overall value created by industries, for its economic assessment. Moreover, when the degree of correlation (correlation coefficient) between the five manufacturing industry-related indicators and real GDP data is measured on a quarterly basis, the industrial production index and the production goods index show no correlation with real GDP. There is also only a weak correlation between the durable goods shipment, investment goods shipment and the small and medium-sized enterprise shipment indexes and GDP.

Figure 2 The 10 component indicators of the composite index of coincident indicators and evaluation

	Evaluation	Correlation coefficient	Other problem
A. Five manufacturing industry-related indexes			
Industrial production index	×	0.076	No correlation with real GDP
Production goods shipment index	×	0.293	Same as above
Durable consumer goods shipment index	×	0.385	Weak correlation with real GDP
Investment goods shipment index	×	0.583	Same as above
Small and medium-sized enterprise shipment index (manufacturing)	×	0.438	Same as above
B. Two indicators measured in nominal terms and on a year-on-year basis			
Commercial sales (retail sales)	×	0.028	No correlation with real GDP
Commercial sales (wholesale sales)	×	0.570	Inverse correlation with real GDP
C. Other indicators			
Operating income (all-industry basis)	△	0.873	A fair degree of correlation, but not measured in real terms
Effective ratio of job offers to applicants	○	0.931	Strong correlation with real GDP (Duplication)
Overtime working hours index (total for surveyed industries)	○	0.839	A fair degree of correlation with real GDP (Duplication)

Secondly, while commercial sales data concerning the wholesale and retail industries (Group B in Figure 2) is an important indicator of personal consumption, which accounts for some 60% of GDP, there are several problems, including: (1) nominal sales data, rather than real sales data adjusted for inflation, are used; (2) the data are expressed as a year-on-year change, rather than as an absolute level; and (3) commercial sales are not suitable as a measure of the current state of domestic consumption because imports are included.

New Composite Index for the Japanese Economy

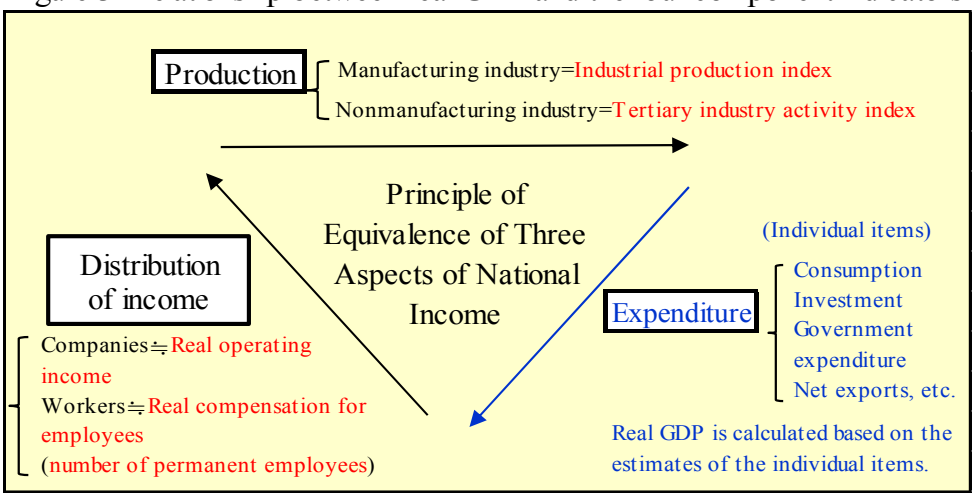
As shown above, there are various problems with the composite index of coincident indicators.

Therefore, we developed a new composite index comprised of the following four indicators based on review of the basics of the calculation of GDP data. The adopted indicators are the industrial production index, the tertiary industry activity index, real operating income (operating income adjusted for inflation) and the number of permanent employees. The four indicators were aggregated through a regression equation based on the least squares method.

These indicators are appropriate because under GDP statistics, (i) the value of production is equivalent to the value of expenditure; (ii) the value of expenditure is equivalent to the value of distributed income; and (iii) the value of distributed income is equivalent to the value of production (this relationship is known as the Principle of Equivalence of Three Aspects of National Income, which is the basis for the calculation of GDP data), as described in Figure 3.

Real GDP is calculated by estimating and aggregating the values of expenditure items, including consumption, investment, governmental spending and net exports (exports minus imports).

Figure 3 Relationship between real GDP and the four component indicators



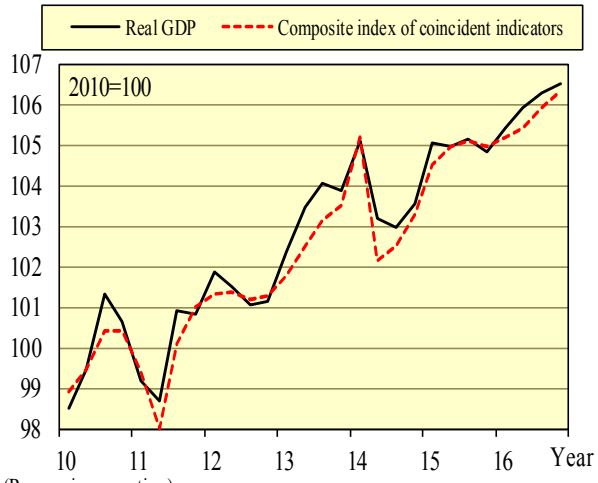
In terms of production, the value of production in GDP data is equivalent to the sum of the value of production by the manufacturing industry and the value of production by the nonmanufacturing industry. In terms of distribution of income, the value of distributed income is equivalent to the sum of the value of real operating income and the value of real wages for employees (which can be substituted by the number of permanent employees).

Consequently, we assume that if the industrial production index and the tertiary industry activity index, which are production-side indicators, and real income operating income and the number of permanent employees, which are distribution-side items, are used in the calculation of the composite index, a composite index that closely tracks GDP can be developed.

As indicated above, the concept of the new composite index is simple and its correlation with real GDP is much stronger that the existing composite index's correlation with real GDP.

Figure 4 shows a comparison between the trends in the new composite index and real GDP. For most of the period covered, the two numbers show almost simultaneous changes and are fairly close to each other in terms of the level. As indicated by the regression equation presented below Figure 4, the impact on real GDP of a 1.0% change in each indicator is a 0.054% change in real GDP concerning the industrial production index, a 0.885% change concerning the tertiary industry activity index, a 0.04% change concerning real operating income and a 0.156% change concerning the number of permanent employees.

Figure 4 Composite index of coincident indicators for the Japanese economy and real GDP (quarterly)



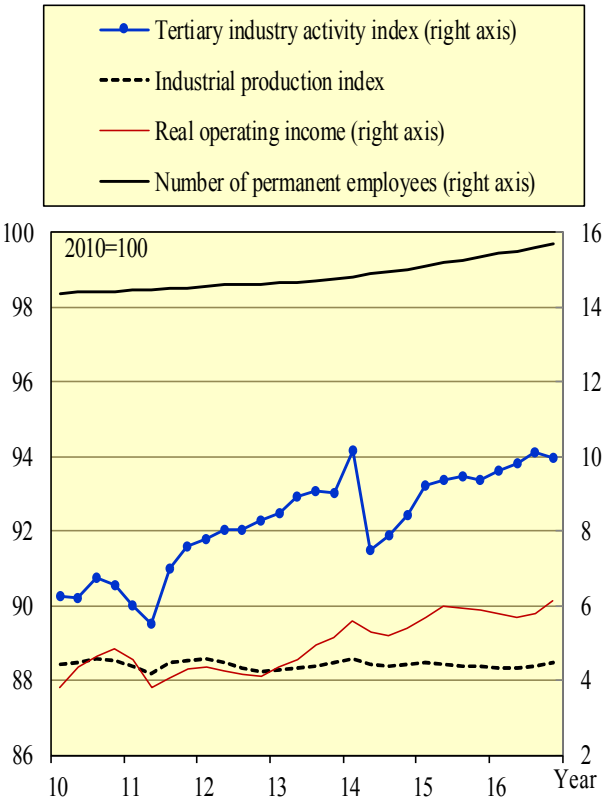
(Regression equation)

Composite index of coincident indicators=Industrial production index x 0.054
(t-value: 1.2)
+ tertiary industry activity index x 0.885 + real operating income x 0.040
(t-value: 9.3) (t-value: 3.0)
+ number of permanent employees – 13.379
(t-value: 1.8) (t-value: 1.2)

Measurement period: from January-March 2010 to October-December 2016;
Coefficient of determination: 0.971; DW: 1.93

Source: Cabinet Office, Ministry of Economy, Trade and Industry, Ministry of Health, Labour and Welfare, Ministry of Finance

Figure 5 Contributions by the components indicators of the composite index of coincident indicators (quarterly)



Source: Cabinet Office, Ministry of Economy, Trade and Industry, Ministry of Health, Labour and Welfare, Ministry of Finance

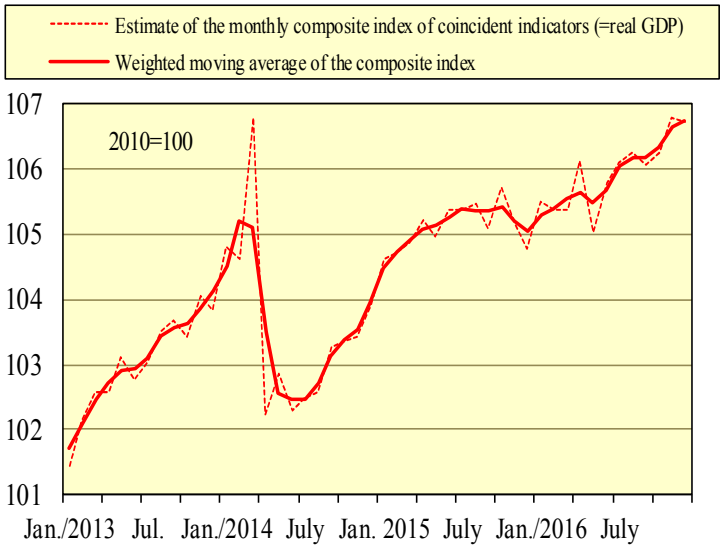
The composite index of coincident indicators has the following three merits.

First, the impact of the four component indicators can be calculated in terms of contribution to the composite index as shown by Figure 5. The component indicator that made the greatest contribution to the recent rise in the composite index is the tertiary industry activity index. Although real operating income and the number of permanent employees have also made similar contributions, the industrial production index's contribution was small.

Sectors that supported the rise in the tertiary industry activity index include healthcare, finance, telecommunications, nursing care, transportation, real estate rental, cargo freight and drug wholesale trade. Activities of hospitals and nursing care businesses have become brisk as a result of the aging of society, and demand has grown for drugs prescribed by healthcare institutions. The spread of the internet has invigorated the telecommunication sector by increasing traffic through websites. That in turn led to an upsurge in goods transportation related to online shopping. The rise in corporate income and the number of permanent employees are also attributable largely to the increased activities in those sectors.

The composite index's second merit is that it can be calculated on a monthly basis if the coefficients developed based on quarterly data for the regression equation (e.g. the coefficient of 0.054 for the industrial production index that is adopted in the equation presented under Figure 4 – page.5) are used because the component indicators are available on a monthly basis. Real GDP data are published on a quarterly basis. If an index that closely tracks real GDP on a monthly basis is developed, it will help to grasp the current state of the economy more accurately. Figure 6 shows a comparison between the trends in the monthly new composite index and its weighted moving average since 2013. Since the beginning of 2015, it is difficult to

Figure 6 Monthly composite index of coincident indicators for the Japanese economy



Note: Weighting of the weighted average: 1 for the value in the previous month, 2 for the value in the current month and 1 for the value in the following month (0 for the month that follows the most recent month)

Source: Cabinet Office, Ministry of Economy, Trade and Industry, Ministry of Health, Labour and Welfare, Ministry of Finance

perceive a clear trend from raw data. However, on a weighted-average basis, we can see that the composite index has continued to rise almost every month since the beginning of 2016.

The third merit is that if a strong correlation can be established between real GDP and the composite index of coincident indicators, confusion over the economic assessment can be cleared up. As mentioned at the beginning of this report, the discrepancy between the composite index of coincident indicators and real GDP data, both of which are published by the Cabinet Office, has become too significant to be ignored. It is unclear which of the two better reflects the actual state of the economy. GDP data are supposed to be the most appropriate indicator of the state of the economy because they comprehensively cover production activities in the whole of the Japanese economy and are calculated based on international standards. However, the Cabinet Office also publishes the composite index of coincident indicators, conducts economic assessment to determine economic peaks and troughs based on the index and publishes the assessment results. The Working Group of Indexes of Business Conditions, which conducts the assessment, includes several noted economists. It would be no wonder if the general public believes that the actual state of the economy can be assessed only on the basis of the composite index of coincident indicators, rather than GDP data, and that experts alone can conduct the assessment.

However, the confusion over the economic assessment will be mostly resolved if it becomes known that the existing composite index does not accurately reflect the state of the economy because the weight of manufacturing industry-related indicators is excessive, although a more accurate composite index can be developed.

New Composite Index for the United States

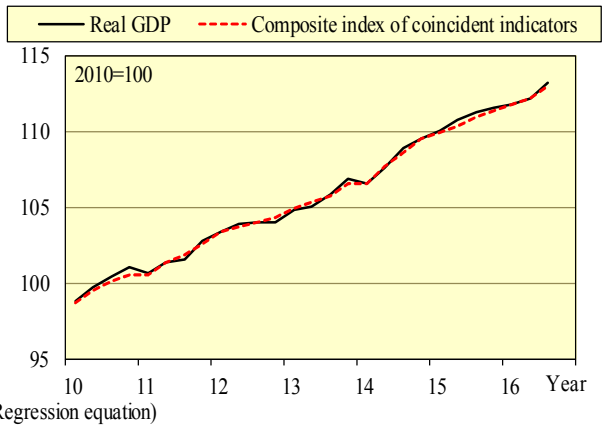
If we can create a new composite index that tracks GDP more closely, then it should follow that it would be possible to develop such an index for other countries in a similar way. So, we created a new composite index of coincidence indicators through the same approach.

Figure 7 shows the trends in the new composite index and real GDP for the U.S. economy. These two numbers show much more similar patterns of movement—their movements all but match each other—than in the case of the Japanese economy. The four component indicators adopted for the new composite index are the industrial production, the personal consumption service index (which is equivalent to the tertiary industry activity index in Japan), real operating income and the number of employees. According

to the regression equation presented below Figure 7, the number of employees makes the greatest contribution. That is because under the U.S. employment system, it is easy to hire and fire employees in accordance with changes in production activity (when companies reduce jobs, they determine the order of dismissal in inverse relation to the length of service. When hiring new employees, they give precedence to people whose work experience is longer. This is known as a seniority system.).

From Figure 8, which shows the contribution by each indicator, it is clear that the number of employees has made the greatest contribution. Real GDP grew by 13.1% from 2010 to the July-September quarter of 2016. The contribution by the number of employees is 8.1%, accounting for around 60% of the growth, It was followed by the contribution of 3.9% made by the personal consumption service index, 0.9% by the industrial production index, and 0.5% by real operating income. In light of the results, it is no wonder that among the economic indicators watched in the U.S. financial market, employment data attract particularly strong attention. The results also suggest that new U.S. President Trump's initiative to invigorate the economy by increasing jobs is an apt policy move.

Figure 7 Composite index of coincident indicators for the U.S. economy and real GDP (quarterly)



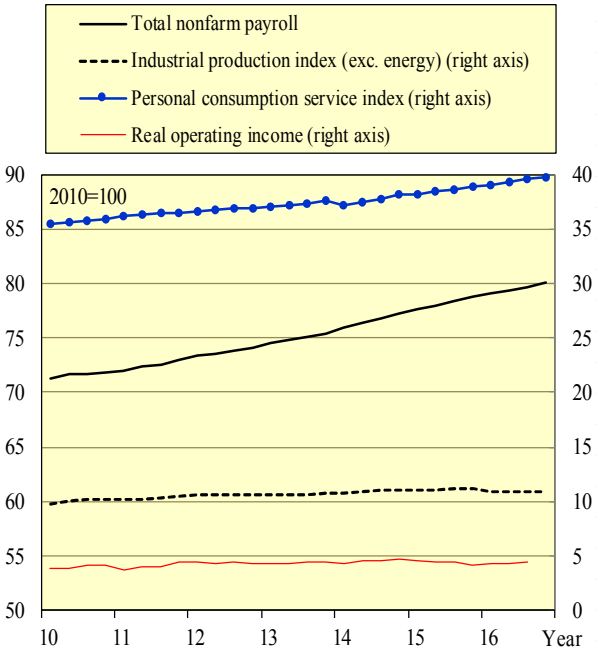
(Regression equation)

Composite index of coincident indicators=Industrial production index x 0.100
(t-value: 2.8)
+ personal consumption service index x 0.357 + real operating income
(t-value: 4.1) (t-value: 3.3)
x 0.040 + total nonfarm payroll x 0.716 – 21.574
(t-value: 8.9) (t-value: 11.3)

Measurement period: From January-March 2010 to July-September 2016;
Coefficient of determination: 0.998; DW: 1.48

Source: U.S. Department of Commerce, U.S. Bureau of Labor Statistics

Figure 8 Contributions by the component indicators of the composite index for the U.S. economy (quarterly)



Source: U.S. Department of Commerce, U.S. Bureau of Labor Statistics

Conclusion

As described above, by using the key four indicators in terms of production and distribution of income, we created new composite indexes of coincident indicators for the Japanese and U.S. economies based on review of the basics of the calculation of GDP data

and examined the characteristics of the two economies as viewed through the new indexes.

Although the same types of indicators are used for the Japanese and U.S. economies, the correlation between the composite index and real GDP is lower for the Japanese economy than for the U.S. economy. If the lower correlation is attributable to a factor related to the composite index, the tertiary industry activity index, which is probably the most volatile of the four component indicators, is most likely to be the cause. Until now, the tertiary industry activity index has not attracted much attention partly because it is difficult to estimate the figure. However, when considering the state of the Japanese economy, it is essential to accurately grasp the state of activity in the tertiary industry. We hope for further refinement of this index. We also hope that this report will serve as a catalyst for revision of the existing composite index, paving the way for more appropriate assessment of the state of the Japanese economy.

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