

# TANKAN

(Short-Term Economic Survey of Enterprises in Japan)

## Explanation

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Research and Statistics Department  
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## I. OVERVIEW

### 1. Conducting Body and Purpose

The *Tankan* (Short-Term Economic Survey of Enterprises in Japan) is a statistical survey conducted by the Bank of Japan in accordance with the Statistics Law (Law No. 53 of 2007). It aims to provide an accurate picture of business trends of enterprises in Japan, thereby contributing to the appropriate implementation of monetary policy.

### 2. Coverage

#### (1) *Tankan*

The *Tankan* uses a sample survey framework where sample enterprises are selected from a population in accordance with statistical theory.

The target population of the *Tankan* are private enterprises (excluding "financial institutions" and "business consultants & pure holding companies") in Japan with capital of 20 million yen or more.<sup>1</sup>

The private enterprises which comprise the survey population of the *Tankan* are those in Japan with capital of 20 million yen or more (excluding "financial institutions" and "business consultants & pure holding companies") and are drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications. It should be noted that some industries which may have a weak connection to economic conditions such as "scientific and development research institutes" and "medical and other health services" are excluded from both the target and survey populations.

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<sup>1</sup> A target population is the entire group that forms the focus of a particular measurement. However, there are no exhaustive lists of private enterprises in Japan with capital of 20 million yen or more corresponding to the target population of the *Tankan*. This means, in practice, the target population is a theoretical concept. On the other hand, a survey population is the group that can actually be measured using information obtained in the actual survey.

Sample enterprises are selected from the survey population using stratified sampling to satisfy established criteria such as that of statistical accuracy; for example, the standard error ratio of sales is within the target range (3 percent for manufacturing and 5 percent for nonmanufacturing). The Bank asks newly selected enterprises for their consent to be added to the *Tankan* survey sample in advance. Afterwards, those enterprises which have given consent are added to the sample. The number of sample enterprises and data on statistical accuracy are available in the accompanying release materials for each survey.

## (2) Survey of Financial Institutions

Financial institutions are also surveyed to supplement the *Tankan*.<sup>2</sup>

The target population are private financial institutions in Japan with 10 employees or more.

The private financial institutions which comprise the survey population are those in Japan with 10 employees or more and are drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications.

Sample institutions are selected from the survey population using stratified sampling to satisfy established criteria such as that of statistical accuracy; for example, the standard error ratio of fixed and software investment (excluding land purchasing expenses) for overall financial institutions is 10 percent or less. The Bank asks newly selected institutions for their consent to be added to the survey sample in advance. Afterwards, those institutions which have given consent are added to the sample. The number of sample institutions and data on statistical accuracy are available in the accompanying release materials for each survey.

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<sup>2</sup> The survey on fixed investment of financial institutions was previously conducted to supplement the *Principal Enterprises Tankan* from the November 1989 survey until the December 2003 survey. The Survey of Financial Institutions expanded its coverage and survey items in the March 2004 survey, and has been conducted in order to supplement the *Tankan*.

### (3) Survey of Business Consultants & Pure Holding Companies

Business consultants and pure holding companies are also surveyed to supplement the *Tankan*.

The target population are private enterprises that are "business consultants & pure holding companies" in Japan with capital of 20 million yen or more.

The private enterprises which comprise the survey population are "business consultants & pure holding companies" in Japan with capital of 20 million yen or more and are drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications.

Sample enterprises are selected from the survey population using stratified sampling to satisfy established criteria such as that of statistical accuracy; for example, the sample distributions of sales could be deemed not to deviate from survey population distributions. The Bank asks newly selected enterprises for their consent to be added to the survey sample in advance. Afterwards, those enterprises which have given consent are added to the sample. The number of sample enterprises and data on statistical accuracy are available in the accompanying release materials for each survey.

### (4) Survey on Overseas Business Activities

The Survey on Overseas Business Activities is conducted to supplement the *Tankan*.

The target population are private parent enterprises (excluding "financial institutions") in Japan, with capital of 1 billion yen or more, at the top of a consolidated business group conducting overseas business activities.

The private parent enterprises which comprise the survey population are those in Japan with capital of 1 billion yen or more, at the top of a consolidated business group with sales to overseas external customers or overseas subsidiaries/branches (excluding "financial institutions") and are drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications. It should be noted that some industries which may have a weak connection to economic conditions such as "scientific and

development research institutes" and "medical and other health services" are excluded from both the target and survey populations.

Sample enterprises are selected from the survey population using stratified sampling to satisfy established criteria such as that of statistical accuracy; for example, the standard error ratio of total sales is within the target range (10 percent for both manufacturing and nonmanufacturing). The Bank asks newly selected enterprises for their consent to be added to the survey sample in advance. Afterwards, those enterprises which have given consent are added to the sample. The number of sample enterprises and data on statistical accuracy are available in the accompanying release materials for each survey.

### (5) Revision of Sample Enterprises

In principle, the Bank revises the *Tankan* sample enterprises once every two or three years. Surveys which supplement the *Tankan* (Survey of Financial Institutions, Survey of Business Consultants & Pure Holding Companies and Survey on Overseas Business Activities) are also revised at the same time as the *Tankan*.

Except for these revisions, sample enterprises are basically fixed; however the Bank examines statistical accuracy regularly (once a year in principle) and if necessary, adds new sample enterprises, to prevent the lowering of statistical accuracy caused by a decrease in the number of sample enterprises due to bankruptcies, mergers, and other factors.

## 3. Survey Items

The following items in (1) ~ (3) are surveyed on the basis of non-consolidated accounting. Items in (4) are surveyed on a consolidated basis.

### (1) *Tankan* (4 categories, 26 items)

Judgment survey	Business conditions; domestic supply and demand conditions for products and services; overseas supply and demand conditions for products; inventory level of finished goods and merchandise; wholesalers' inventory level; production capacity; employment
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	conditions; financial position; lending attitude of financial institutions; conditions for CP issuance; change in interest rate on loans; change in output prices; change in input prices
Annual projections	Sales; exports; exchange rates (Yen/U.S. dollar); exchange rates (Yen/Euro); current profits; net income; fixed investment; land purchasing expenses; software investment; R&D investment
Inflation outlook of enterprises	Outlook for output prices; outlook for general prices
Number of new graduates hired	Number of new graduates hired (surveyed in June and December only)

## (2) Survey of Financial Institutions (3 categories, 8 items)

Judgment survey	Business conditions; production capacity; employment conditions
Annual projections	Fixed investment; land purchasing expenses; software investment; R&D investment
Number of new graduates hired	Number of new graduates hired (surveyed in June and December only)

## (3) Survey of Business Consultants & Pure Holding Companies (1 categories, 4 items)

Annual projections	Fixed investment; land purchasing expenses; software investment; R&D investment
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## (4) Survey on Overseas Business Activities (2 categories, 7 items)

Annual projections	Exchange rates (Yen/U.S. dollar); exchange rates (Yen/Euro)
Overseas business activities	Consolidated Sales; overseas sales; consolidated current profits; consolidated fixed investment; overseas fixed investment

## 4. Survey Frequency

The survey is conducted on a quarterly basis, in March, June, September, and December each year.

## 5. Publication

### (1) Release

Each survey result taken in March, June, September, and December is released at the beginning of April, July, October, and mid-December, respectively, over two business days.

The release schedule is available on the Bank's website.

Release Schedule	Release dates for the next four weeks are announced. Updated every Friday.
Outline of Statistics and Statistical Release Schedule	Release dates for the next 12 months are announced. Updated around the end of June and December.

When released data requires correction, corrected data, in principle, is compiled and released as quickly as possible. However, in some cases data would not generally be corrected, for example, where responding enterprises revise their figures after the release.

### (2) Publications

The following materials are available on the Bank's website.

Release Timing	Name	Content
8:50 a.m. on the release day	Summary	Main figures of the survey results
	Outline	Selected figures from the Summary
8:50 a.m. on the following day of release	The Comprehensive Data Set	Detailed figures of the survey results

Long-term time series data of the *Tankan* are available in the "BOJ Time-Series Data Search."

The sample form, guidelines for filling in the form (Japanese only), and an example answer sheet (Japanese only) are available on the Bank's website.



### (3) Release Data Series

#### A. Tankan

The Bank releases the following data series by industry and enterprise size.

Judgment survey	Diffusion index (DI); percentage share of the number of respondents choosing each alternative; number of reporting enterprises
Annual projections	
Sales and other items*1	Year-to-year percent change; revision rate from the previous survey; nominal yen-denominated figures; number of reporting enterprises
Predicted exchange rates*2	Yen per U.S. dollar; Yen per Euro; number of reporting enterprises
Ratio of current profit to sales	Nominal figures; changes from the previous survey
Number of enterprises reporting increase or decrease in profits*3	Nominal figures; number of reporting enterprises
Number of enterprises reporting deficits*3	Nominal figures
Inflation outlook of enterprises	Percentage share of the number of respondents choosing each alternative; number of reporting enterprises; (reference) average of enterprises' inflation outlook
Number of new graduates hired	Year-to-year percent change; revision rate from the previous survey; nominal figures; number of reporting enterprises

\*1 This item corresponds to "domestic sales," "software and fixed investment excluding land purchasing expenses," and "software, R&D, and fixed investment excluding land purchasing expenses" in addition to all items described in 3.(1) excluding "exchange rates."

\*2 This item corresponds to "exchange rates" described in 3.(1).

\*3 Data series are released only for manufacturing, nonmanufacturing, and all industries with regard to industry classification.

#### **Industry classification**

Manufacturing is comprised of 17 industries and nonmanufacturing is comprised of 14 industries based on the Japan Standard Industrial Classification released by the Ministry of Internal Affairs and Communications.

		<i>Tankan</i>	Japan Standard Industrial Classification (code)		
All industries	Manufacturing	Basic materials	Textiles	Manufacture of textile products (11)	
			Lumber & Wood products	Manufacture of lumber and wood products, except furniture (12), Manufacture of furniture and fixtures (13)	
			Pulp & Paper	Manufacture of pulp, paper and paper products (14)	
			Chemicals	Manufacture of chemical and allied products (16)	
			Petroleum & Coal products	Manufacture of petroleum and coal products (17)	
			Ceramics, Stone & Clay	Manufacture of ceramic, stone and clay products (21)	
			Iron & Steel	Manufacture of iron and steel (22)	
			Nonferrous metals	Manufacture of non-ferrous metals and products (23)	
		Processing	Food & Beverages	Manufacture of food (09), Manufacture of beverages, tobacco and feed (10)	
			Processed metals	Manufacture of fabricated metal products (24)	
			General-purpose, Production & Business oriented machinery	General-purpose machinery	Manufacture of general-purpose machinery (25)
				Production machinery	Manufacture of production machinery (26)
				Business oriented machinery	Manufacture of business oriented machinery (27)
			Electrical machinery	Electronic parts, devices and electronic circuits (28), Manufacture of electrical machinery, equipment and supplies (29), Manufacture of information and communication electronics equipment (30)	
	Transportation machinery		Shipbuilding, Heavy machinery & Other transportation machinery	Manufacture of transportation equipment (31) (except Motor vehicles, parts and accessories (311))	
			Motor vehicles	Motor vehicles, parts and accessories (311)	
	Other manufacturing		Printing and allied industries (15), Manufacture of plastic products (18), Manufacture of rubber products (19), Manufacture of leather tanning, leather products and fur skins (20), Miscellaneous manufacturing industries (32)		
	Nonmanufacturing	Construction		Construction work, general including public and private construction work (06), Construction work by specialist contractor, except equipment installation work (07), Equipment installation work (08)	
		Real estate, Goods rental & Leasing	Real estate	Real estate agencies (68), Real estate lessors and managers (69)	
			Goods rental & Leasing	Goods rental and leasing (70)	
		Wholesaling & Retailing	Wholesaling	Wholesale trade, general merchandise (50), Wholesale trade (textile and apparel) (51), Wholesale trade (food and beverages) (52), Wholesale trade (building materials, minerals and metals, etc) (53), Wholesale trade (machinery and equipment) (54), Miscellaneous wholesale trade (55)	
			Retailing	Retail trade, general merchandise (56), Retail trade (woven fabrics, apparel, apparel accessories and notions) (57), Retail trade (food and beverage) (58), Retail trade (machinery and equipment) (59), Miscellaneous retail trade (60), Nonstore retailers (61)	
		Transport & Postal activities		Railway transport (42), Road passenger transport (43), Road freight transport (44), Water transport (45), Air transport (46), Warehousing (47), Services incidental to transport (48), Postal services, including mail delivery (49), Postal services (86)	
		Information communication	Communications	Communications (37)	
			Information services	Information services (39)	
			Other information communication	Broadcasting (38), Services incidental to Internet (40), Video picture information, sound information, character information production and distribution (41)	
		Electric & Gas utilities		Production, transmission and distribution of electricity (33), Production and distribution of gas (34), Heat supply (35)	
Services for businesses		Design services (726), Advertising (73), Technical services, n.e.c.(74) (except Veterinary services (741)), Industrial waste disposal business (882), Automobile maintenance services (89), Machine, etc. repair services (90), Employment and worker dispatching services (91), Miscellaneous business services (92)			
Services for individuals		Laundry, beauty and bath services (78), Miscellaneous living-related and personal services (79), Services for amusement and recreation (80), Specialized training colleges and miscellaneous schools (817), Supplementary tutorial schools (823), Instruction services for arts, culture and technicals (824), Welfare services for the aged and care services (854), Miscellaneous social insurance, social welfare and care services (859)			
Accommodations, Eating & Drinking services		Accommodations (75), Eating and drinking places (76), Food take out and delivery services (77)			
Mining & Quarrying of stone and gravel		Mining and quarrying of stone and gravel (05)			

Note: Each industry is classified according to the small and middle classifications of the Japan Standard Industrial

Classification revised in October 2013.

### ***Enterprise size classification***

Enterprise size is defined by amount of capital, and divided into three categories. Enterprises with capital of 1 billion yen or more are large enterprises, those with capital from 100 million yen to less than 1 billion yen are medium-sized enterprises, and those with capital from 20 million yen to less than 100 million yen are small enterprises.<sup>3</sup>

### **B. Survey of Financial Institutions**

The Bank releases the following data series by sector.

Judgment survey	DI; percentage share of the number of respondents choosing each alternative; number of reporting enterprises
Annual projections*	Year-to-year percent change; revision rate from the previous survey; nominal yen-denominated figures; number of reporting enterprises
Number of new graduates hired	Year-to-year percent change; revision rate from the previous survey; nominal figures; number of reporting enterprises

\* This item corresponds to "software and fixed investment excluding land purchasing expenses," and "software, R&D, and fixed investment excluding land purchasing expenses" in addition to all items described in 3.(2).

### ***Sector classification***

Financial institutions are comprised of five sectors based on the Japan Standard Industrial Classification released by the Ministry of Internal Affairs and Communications.

<i>Tankan</i>	Japan Standard Industrial Classification (code)
Financial institutions	
Banks	Banking (62) (except Central bank (621))
Financial institutions for cooperative organizations	Financial institutions for cooperative organizations (63)
Financial products transaction dealers	Financial products transaction dealers and futures commodity transaction dealers (65)
Insurance companies	Insurance institutions, including insurance agents, brokers and services (67)

<sup>3</sup> Since the March 2004 survey, the amount of capital has been used to define enterprise size instead of the number of employees, as used previously.

Non-deposit money corporations	Non-deposit money corporations, including lending and credit card business (64)
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Note: Each industry is classified according to the small and middle classifications of the Japan Standard Industrial Classification revised in October 2013.

In addition, the Bank releases data on annual projections and number of new graduates hired for "all industries including financial institutions" and "nonmanufacturing including financial institutions," which are calculated as the aggregate amount of the *Tankan* and the Survey of Financial Institutions.

### C. Survey of Business Consultants & Pure Holding Companies

The Bank releases the following data series.

Annual projections*	Year-to-year percent change; revision rate from the previous survey; nominal yen-denominated figures; number of reporting enterprises
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\* This item corresponds to "software and fixed investment excluding land purchasing expenses," and "software, R&D, and fixed investment excluding land purchasing expenses" in addition to all items described in 3.(3).

"Business consultants & pure holding companies" corresponds to the "728 Business consultants and pure holding companies" in the Japan Standard Industrial Classification. In addition, the Bank releases data on annual projections for "all industries including financial institutions and business consultants & pure holding companies" and "nonmanufacturing including financial institutions and business consultants & pure holding companies," which are calculated as the aggregate amount of the *Tankan*, the Survey of Financial Institutions and the Survey of Business Consultants & Pure Holding Companies.

### D. Survey on Overseas Business Activities

The Bank releases the following data series for manufacturing (basic materials and processing, separately) and nonmanufacturing based on the Japan Standard Industrial Classification.

Annual projections*1	Nominal yen-denominated figures; number of reporting enterprises
Overseas business activities*2	Year-to-year percent change; nominal figures; number of reporting enterprises

\*1 This item corresponds to "exchange rates" described in 3.(1).

\*2 This item corresponds to "domestic sales" in the consolidated sales, "domestic fixed investment" in the consolidated fixed investment, "share of overseas sales in total sales," and "share of overseas fixed investment in total fixed investment" in addition to all items described in 3.(4).

## E. Others

The Bank releases the population number and number of sample enterprises as follows.

- The *Tankan*: The population number and number of sample enterprises by industry<sup>4</sup> and enterprise size listed in A. *Tankan*.
- The Survey of Financial Institutions: The population number and number of sample institutions by industry listed in B. Survey of Financial Institutions.
- The Survey of Business Consultants & Pure Holding Companies: The population number and number of sample enterprises in C. Survey of Business Consultants & Pure Holding Companies.
- The Survey on Overseas Business Activities: The population number and number of sample enterprises for manufacturing (basic materials and processing, separately) and nonmanufacturing listed in D. Survey on Overseas Business Activities.

The Bank also releases standard error ratio as follows.

- The *Tankan*: Standard error ratio of sales by industry<sup>6</sup> and enterprise size listed in A. *Tankan*.
- The Survey of Financial Institutions: Standard error ratio of fixed and software investment (excluding land purchasing expenses) for overall financial institutions in the Survey of Financial Institutions.
- The Survey of Business Consultants & Pure Holding Companies: Standard error ratio of fixed and software investment (excluding land purchasing expenses) for business consultants and pure holding companies in the Survey of Business Consultants & Pure Holding Companies.
- The Survey on Overseas Business Activities: The standard error ratio of total sales on a consolidated basis for manufacturing (basic materials and processing, separately) and nonmanufacturing listed in D. Survey on Overseas Business Activities.

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<sup>4</sup> Excluding some industries in the upper class such as basic materials and processing.

## 6. Notes for Users

- (a) To calculate DIs, the percentage share of the number of respondents who chose each alternative is rounded to an integer. This rounding-off is conducted for each release classification DI. Therefore, the degree of change in DIs may sometimes appear inconsistent among release classifications, for example, between all industries, manufacturing, and nonmanufacturing, due to rounding error.
- (b) There are discontinuities in some data series resulting from the following revisions and changes.<sup>5</sup>
- March 2004 revision
    - Judgment survey: before and after March 2004
    - Annual projections: before and after fiscal year 2003
    - Quarterly data: before and after December 2003
  - Changes of the treatment of fixed investment and software investment
    - Annual projections: before and after the September 2010 survey
  - March 2014 revision
    - Conditions for CP issuance: before and after March 2014
  - March 2020 revision<sup>6</sup>
    - Exchange rates: before and after March 2020
- (c) For past explanations and other revisions and changes to the *Tankan*, see the Explanation and Notices of Changes and Corrections, respectively on the Bank's website.

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<sup>5</sup> For further details, see: "Revision of TANKAN in the March 2004 survey –Comparison between the pre- and post-revision in the December 2003 survey," Research and Statistics Department, Bank of Japan, March 8, 2004. "Notice for the *Tankan*," Research and Statistics Department, Bank of Japan, July 1, 2010. "Planned Revision of the *Tankan* Survey – Review of survey items, including the introduction of a survey on *Inflation Outlook of Firms* –," Research and Statistics Department, Bank of Japan, March 22, 2013.

<sup>6</sup> For further details, see: "Planned Revision of the *Tankan*," Research and Statistics Department, Bank of Japan, December 27, 2016 and "Partial Changes to the 'Planned Revision of the *Tankan*'," Research and Statistics Department, Bank of Japan, March 4, 2019.

## II. METHOD

### 1. Data Collection

The survey is conducted using a paper form or an online form.<sup>7,8</sup>

The entire period for collecting responses for each survey is about one month from the day when the paper form or identification code for the online survey is provided to sample enterprises to the release date. For each survey, the Bank sets a deadline to sample enterprises of approximately two weeks after the dispatch of the survey form.

### 2. Survey Content

#### (1) Judgment Survey

For the following 13 items, sample enterprises are asked to choose the response which, according to their judgment, best describes the enterprise's present and future condition from the three options below (excluding seasonal factors). In the case of a "not applicable response," they are asked to reply "9."

The 10 items from "business conditions" to "conditions for CP issuance" survey the level of sample enterprise condition at the time of the survey and in three months' time. On the other hand, the three items from "change in interest rate on loans" to "change in input prices" survey changes in sample enterprise conditions from the three months prior to the time of the survey and then also from the time of the survey to conditions in three months' time.

#### ***Business conditions:***

Judgment of general business conditions of responding enterprises, primarily in light of their profits.

[1.Favorable    2.Not so favorable    3.Unfavorable]

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<sup>7</sup> The online survey began from the March 2011 survey. Since the September 2017 survey, the Government Statistics Sharing System has been used.

<sup>8</sup> Sample enterprises are required to choose to complete either the paper survey or online survey in advance (it can be changed for each survey).

***Domestic supply and demand conditions for products and services:***

Judgment of domestic supply and demand conditions for major products or services in the industry of responding enterprises, taking into account customer trend, order arrival, and movements of goods if necessary. Answers including the judgment of overseas conditions are also acceptable when it is difficult to exclude it.

[1.Excess demand 2.Almost balanced 3.Excess supply]

***Overseas supply and demand conditions for products:***

Judgment of overseas supply and demand conditions for major products in the industry of responding enterprises.

[1.Excess demand 2.Almost balanced 3.Excess supply]

***Inventory level of finished goods and merchandise:***

Judgment of inventory levels of finished goods and merchandise compared with sales of responding enterprises (only for at the time of the survey).

[1.Excessive or somewhat excessive 2.Adequate 3.Insufficient or somewhat insufficient]

***Wholesalers' inventory level:***

Judgment of domestic and foreign wholesalers' inventory levels of major finished goods and merchandise in the industry of responding enterprises (only for at the time of the survey).

[1.Excessive or somewhat excessive 2.Adequate 3.Insufficient or somewhat insufficient]

***Production capacity:***

Judgment of production capacity or business equipment of responding enterprises, excluding temporary factors such as regular maintenance of plant equipment.

[1.Excessive capacity 2.Adequate 3.Insufficient capacity]

***Employment conditions:***

Judgment of the number of employees of responding enterprises.

[1.Excessive employment 2.Adequate 3.Insufficient employment]

***Financial position:***



Judgment of general cash position of responding enterprises, taking into account levels of cash and cash equivalent, lending attitude of financial institutions, and payment and repayment terms (only for at the time of the survey).

[1.Easy 2.Not so tight 3.Tight]

***Lending attitude of financial institutions:***

Judgment of financial institutions' attitude toward lending as perceived by responding enterprises (only for at the time of the survey).

[1.Accommodative 2.Not so severe 3.Severe]

***Conditions for CP issuance:***

Judgment of overall issuance conditions for commercial paper (only for at the time of the survey).

[1.Easy 2.Not so severe 3.Severe]

Responding enterprises for this item are limited to large enterprises with capital of 1 billion yen or more that either issued CP in the past two years or are currently considering CP issuance.<sup>9</sup>

***Change in interest rate on loans:***

Judgment of changes in interest rates on borrowings of responding enterprises

[1. Rise 2.Unchanged 3.Fall]

***Change in output prices:***

Judgment of changes in yen-based selling prices of major products or services provided by responding enterprises.

[1. Rise 2.Unchanged 3.Fall]

***Change in input prices:***

Judgment of changes in yen-based purchase prices of main raw materials (including processing fees for subcontractors) and/or main merchandise paid by responding enterprises.

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<sup>9</sup> The "past two years" means the following:

"from the end of March two years earlier" for the March survey.

"from the end of June two years earlier" for the June survey.

"from the end of September two years earlier" for the September survey.

"from the end of December two years earlier" for the December survey.

[1. Rise 2.Unchanged 3.Fall]

## (2) Annual Projections

For the following 10 items, annual results and forecasts of "fixed investment," "land purchasing expenses," "software investment" and "R&D investment" and semiannual results and forecasts of other items are surveyed in the millions of yen except exchange rates which are in yen per U.S. dollar and yen per Euro.

The *Tankan* surveys figures of each fiscal year six times in total, from the March survey of the previous fiscal year to the June survey of the following fiscal year.

### ***Sales:***

Total of items listed as operating revenue on the income statement, such as sales, business income, and amount of work completed.

### ***Exports:***

Including both direct exports and exports via trading companies (except for the wholesaling industry), but excluding tripartite trade such as exports from a foreign country to another foreign country.

### ***Exchange rates (yen per U.S. dollar):***

Average U.S. dollar-yen exchange rates for actual results and expected rates on which forecasts of sample enterprises' overall businesses are based, if projected by those enterprises.

### ***Exchange rates (yen per Euro):***

Average Euro-yen exchange rates for actual results and expected rates on which forecasts of sample enterprises' overall businesses are based, if projected by those enterprises.

### ***Current profits:***

Current profits listed on the income statement.

### ***Net income:***

Net income after tax deduction listed on the income statement.

### ***Fixed investment:***

Amounts of newly listed tangible fixed assets (including new land purchasing expenses and lease assets), excluding transfers from other accounts to tangible fixed assets and an increase in tangible fixed assets due to mergers and transfers of operations.

***Land purchasing expenses:***

Amounts of new land purchasing expenses (including land developing and preparing) included in "fixed investment," excluding real estate for sale or sale in lots.

***Software investment:***

Amounts of newly listed intangible fixed assets (including lease assets) included in software investment, excluding software recorded as expenses at the time of purchase.

***R&D investment:***

R&D expenses listed on the income statement. Total of R&D expenses included in general and administrative expenses as well as in manufacturing expenses for the period.

### (3) Inflation Outlook of Enterprises

For the following two items, sample enterprises are asked which of multiple price developments is closest to their expectations — excluding the effects of institutional changes such as changes in the consumption tax rate — for 1 year ahead, 3 years ahead, and 5 years ahead.

***Outlook for output prices:***

Expectations for the rate of change in the selling price of a responding enterprise's main domestic products or services relative to the current level. When responding enterprises have difficulty in narrowing down to a single core product or service, they are asked to answer on the basis of the weighted average prices of multiple products and services or their products and services overall. When they have difficulty in narrowing down the domestic price of their main product or service, they are asked to answer on the basis of prices that include overseas prices, excluding the effect of exchange rates to the greatest extent possible.

[Alternatives]

Rate of changes relative to the current level

1. around + 20% or higher (+ 17.5% or higher)
2. around + 15% (+ 12.5% ~ + 17.4%)
3. around + 10% (+ 7.5% ~ + 12.4%)
4. around + 5% (+ 2.5% ~ + 7.4%)
5. around 0% (-2.5% ~ + 2.4%)
6. around -5% (-7.5% ~ -2.6%)
7. around -10% (-12.5% ~ -7.6%)
8. around -15% (-17.5% ~ -12.6%)
9. around -20% or lower (-17.6% or lower)
10. Don't know.

***Outlook for general prices:***

Expectations of year-on-year rate of change in general prices as measured by the Consumer Price Index. For those without specific expectations, responding enterprises are asked to clarify the reason.

[Alternatives]

In annual percent rate changes

11. around + 6% or higher (+ 5.5% or higher)
12. around + 5% (+ 4.5% ~ + 5.4%)
13. around + 4% (+ 3.5% ~ + 4.4%)
14. around + 3% (+ 2.5% ~ + 3.4%)
15. around + 2% (+ 1.5% ~ + 2.4%)
16. around + 1% (+ 0.5% ~ + 1.4%)
17. around 0% (-0.5% ~ + 0.4%)
18. around -1% (-1.5% ~ -0.6%)
19. around -2% (-2.5% ~ -1.6%)
20. around -3% or lower (-2.6% or lower)

\* Without specific expectations

21. Uncertainty over the future outlook is high
22. Not really conscious of inflation fluctuations because they should not influence the strategy of the institution

## 23. Other

### (4) Number of New Graduates Hired (surveyed in June and December only)

For the following item, sample enterprises are asked to provide annual results and forecasts.

The *Tankan* surveys figures of each fiscal year five times in total, from the June survey of the previous fiscal year to the June survey of the following fiscal year.

#### ***Number of new graduates hired:***

The number of new graduates — employees that responding enterprises consider to be new graduates — hired and the planned number to be hired during the surveyed fiscal year.

### (5) Overseas Business Activities

For the following 5 items, sample enterprises are asked to provide annual results and forecasts.

The *Tankan* surveys figures of each fiscal year ten times in total, from the June survey of the previous fiscal year to the June survey of the fiscal year after next.

#### ***Consolidated sales:***

Total of items listed as operating revenue on the income statement, such as sales, business income, and amount of work completed on a consolidated basis.

#### ***Overseas sales:***

Sales to overseas external customers (including export) in "consolidated sales," such as sales to overseas external customers by geographic segment listed in the securities report.

#### ***Consolidated current profits:***

Consolidated current profits listed on the income statement.

#### ***Consolidated fixed investment:***

Amounts of newly listed tangible fixed assets (including new land purchasing expenses and lease assets) on a consolidated basis, excluding transfers from other accounts to

tangible fixed assets and an increase in tangible fixed assets due to mergers and transfers of operations.

***Overseas fixed investment:***

Amounts of newly listed tangible fixed assets located overseas (including new land purchasing expenses and lease assets) on a consolidated basis in "consolidated fixed investment," such as the amounts of newly listed tangible fixed assets of property, plant and equipment located overseas by geographic segment listed in the securities report. These amounts exclude transfers from other accounts to tangible fixed assets and an increase in tangible fixed assets due to mergers and transfers of operations.

### 3. Survey Workflow

The survey workflow is as follows:

(1) Dispatch of survey forms

The Bank's Head Office (Research and Statistics Department) provides a paper form or an identification code for the online survey by mail to all sample enterprises, in principle.

(2) Collection of survey forms

Completed Survey forms are sent back by mail or submitted online to the Bank's Head Office and responses are entered into the Bank's system. After the deadline passes, the Bank calls non-respondents and encourages them to complete and send back forms. Bank staff at the Head Office or branches then go through responses, calling respondents for confirmation where necessary.

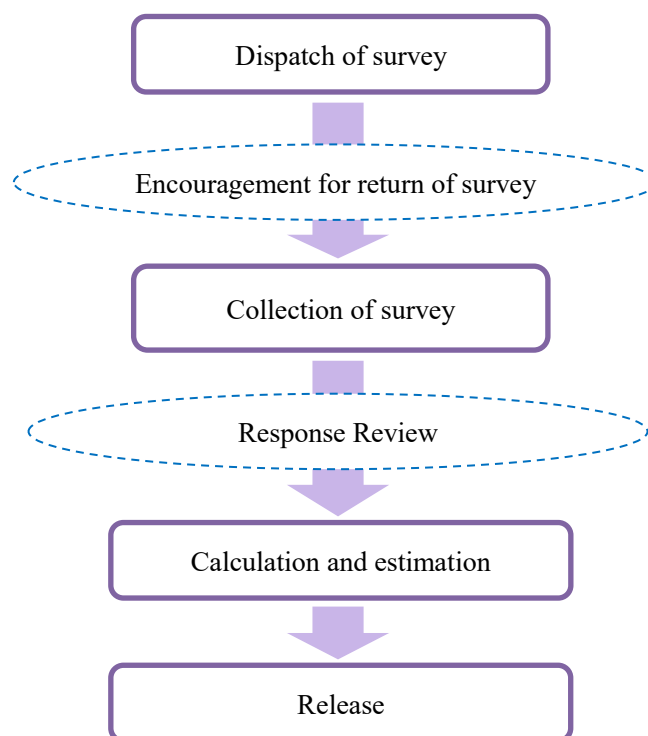
(3) Calculation and estimation

The Bank's Head Office calculates and estimates the survey results of the *Tankan*, the Survey of Financial Institutions, the Survey of Business Consultants & Pure Holding Companies and the Survey on Overseas Business Activities based on the responded figures.

(4) Publication

The Bank's Head Office releases the survey results of the *Tankan*, the Survey of Financial Institutions, the Survey of Business Consultants & Pure Holding Companies and the Survey on Overseas Business Activities.

Flowchart of the *Tankan* Survey (conceptual diagram)



### III. CALCULATION AND ESTIMATION

#### 1. Judgment Survey

Figures from sample enterprise responses are aggregated into the diffusion index (DI) as follows:

$$DI = P_1 - P_3$$

$P_1$  : Percentage share of the number of respondents choosing alternative 1

$P_3$  : Percentage share of the number of respondents choosing alternative 3

For calculating DIs, the percentage share of the number of respondents choosing each alternative is rounded to an integer, then, that of alternative 3 is subtracted from that of alternative 1.

#### Example

In the business conditions survey, when 50 sample enterprises choose "alternative 1 favorable," 120 choose "alternative 2 not so favorable," and 30 choose "alternative 3 unfavorable," the percentage shares of the number of respondents choosing each alternative are 25 percent, 60 percent, and 15 percent respectively.

The "Business Conditions DI" is then calculated as shown below:

$$\text{Business Conditions DI} = 25 (\%) - 15 (\%) = 10 (\% \text{ points})$$

#### 2. Quantitative Survey (Annual Projections, Number of New Graduates Hired and Overseas Business Activities)

The total values of the survey population (population total) for each survey item such as "sales" or "number of new graduates hired," is estimated using figures from sample enterprise responses.<sup>10</sup>

In the *Tankan*, the survey population is divided into homogeneous groups (strata) using three criteria — industry, capital, and sales — in order to select sample enterprises. The

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<sup>10</sup> If there is a release classification by industry and enterprise size where the number of reporting enterprises is only one or two, figures are withheld to avoid estimation of the reporting enterprise's information, in principle.



estimate of the population total is obtained by aggregating the population total in each stratum, which is estimated as follows<sup>11</sup>:

$$e_i = \text{average amount of responding enterprises in stratum } i \times N_i$$

$$e_i = \frac{a_i}{n_i} \times N_i$$

$e_i$  : Estimate of the population total in stratum  $i$

$a_i$  : Simply aggregated amount of responded figures from sample enterprises in stratum  $i$

$n_i$  : Number of responding enterprises in stratum  $i$

$N_i$  : Number of survey population enterprises in stratum  $i$

"Exchange rates" are simple averages of all the enterprises' responded rates. Only the figures from enterprises which have provided answers for both "exports" and "exchange rates" are used to calculate "exchange rates of exporting enterprises."

With respect to release items but not the survey items such as "domestic sales" and "software, R&D, and fixed investment excluding land purchasing expenses," the actual amount is obtained as the sum or the difference of the estimate of the population total of survey items.

Year-to-year percent change and revision rate are calculated using these actual amounts as estimated and calculated above. Specifically, the revision rate is calculated as shown below:

$$\text{Revision rate (\%)} = \frac{Ec - Ep}{Ep} \times 100$$

$Ec$  : Estimate of population total of the current survey

$Ep$  : Estimate of the population total of the previous survey

"Number of enterprises reporting deficits" is the number of enterprises which reported deficits in current profits.

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<sup>11</sup> If there is a stratum where the number of reporting enterprises is zero, the estimate of the population total is complemented by that of a stratum with smaller sales next to the stratum in the same industry and enterprise size with respect to the criterion for stratification.

### 3. Inflation Outlook of Enterprises

Percentage shares of the number of respondents choosing each alternative are calculated. "The average of enterprises' inflation outlook," released as reference data, is the weighted average of responded rates of price change excluding responses of "Don't know" and "Don't have clear views on general prices." The responded rates of price change are based on the following assumptions: for example, "around +15%" and "around +6% or higher" indicate +15% and +6%, respectively.

### 4. Handling of Missing Values

Some sample enterprises do not provide answers causing missing sample data. The missing values are handled as follows.

#### (1) Judgment Survey and Inflation Outlook of Enterprises

If all or part of the figures from sample enterprise responses in each survey item are missing, the enterprise is excluded for calculation and estimation. For example, in the case where a sample enterprise provides only an answer for the present business conditions without providing the future outlook in the judgment survey, both the actual result DI and the forecast DI are calculated excluding the enterprise.

#### (2) Annual Projections, Number of New Graduates Hired and Overseas Business Activities

If all or part of the figures in each survey item from a sample enterprise response are missing, the most recently responded figures from the enterprise are individually substituted for the calculation and estimation in the following imputation methods.<sup>12,13</sup>

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<sup>12</sup> The missing value imputation has been introduced since the March 2004 survey.

<sup>13</sup> For further details, see: Kiyohito Utsunomiya and Katsurako Sonoda, "Methodology for Handling Missing Values In TANKAN," Bank of Japan Working Paper Series, No. 01-11, June 2002.

With respect to "sales," "exports," "current profits," and "net income," figures obtained from the non-responding enterprise for each half of the most recent fiscal year, are used for the imputation: i.e. the figures of the first half and second half of the year are substituted for the first half and second half of the current survey, respectively.

With respect to "fixed investment," "land purchasing expenses," "software investment," "R&D investment," "number of new graduates hired," "consolidated sales," "overseas sales," "consolidated current profits," "consolidated fixed investment," and "overseas fixed investment," the figures obtained from the non-responding enterprise for the whole of the most recent fiscal year, are used for the imputation.

With respect to "exchange rates (yen per U.S. dollar)" and "exchange rates (yen per Euro)," the figures obtained from the non-responding enterprises for the most recent half of fiscal year, are used for the imputation.

## 5. Treatment of Outliers

An outlier is one of the data which significantly deviates from the rest of the data in general. As stated previously, the estimate of the population total is calculated by stratum for the items of annual projections such as "sales" and "exports" in the *Tankan*, using figures from sample enterprise responses. Under the estimation, if a figure from a sample enterprise significantly deviates from the rest of the same stratum and it does not represent the survey population, the estimated values could also significantly deviate from the real values of the survey population. An example of one of the causes of outliers is the stratification of the original sampling which is maintained for several years until the next revision of sample enterprises, by which time the business size or contents of business of sample enterprises could have greatly changed.

With respect to annual projections for "sales," "current profits," "net income," "fixed investment," "software investment," and "R&D investment," a sample data that significantly deviates from the rest of the same stratum beyond a certain criteria is, in principle, treated as an outlier which does not represent the survey population (see

appendix 1 for the method of outlier detection)<sup>14</sup>. Only when a sample data of "sales" and "fixed investment" is detected as an outlier is the method of outlier treatment applied to their sub-items "exports" and "land purchasing expenses" respectively.<sup>15,16</sup>

Specifically, an outlier is regarded as a missing value and the most recent figures regarding the survey item of the corresponding enterprise's response are individually substituted for the calculation and the estimation (see section 4 for the details). Once an outlier is detected, this treatment is continued until the upcoming revision of sample enterprises.

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<sup>14</sup> Similar treatment is also applied to the Survey of Financial Institutions and the Survey of Business Consultants & Pure Holding Companies, which have been conducted in order to supplement the *Tankan*. With respect to "R&D investment", the Bank does not conduct outlier detection for medium-sized and small nonmanufacturing in the *Tankan* nor for the Survey of Financial Institutions (see appendix 1).

<sup>15</sup> For further details, see: Atsushi Ishikawa, Shunsuke Endo, and Tetsuya Shiratori, "Treatment of Outliers in Business Surveys: The Case of Short-term Economic Survey of Enterprises in Japan (Tankan)," Bank of Japan Working Paper Series, No. 10-E-8, September 2010.

<sup>16</sup> The outlier treatment was introduced from the December 2010 survey.

## IV. SAMPLE DESIGN

### 1. Population

The target population of the *Tankan* are private enterprises (excluding financial institutions) in Japan with capital of 20 million yen or more. It should be noted that some industries which may have a weak connection to economic conditions such as "scientific and development research institutes" and "medical and other health services" are excluded from the target population. Comprising approximately 210,000 enterprises (excluding "financial institutions" and "business consultants & pure holding companies") in Japan, the survey population of the *Tankan* is drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications, which provides the most comprehensive information on the target population. As there are non-responding enterprises in the Establishment Frame Database, there are gaps between the target population and the survey population, resulting in coverage error. In an effort to limit the coverage error, enterprises which do not respond to the Establishment Frame Database are added to the *Tankan* survey population to the extent possible.

### 2. Basic Concept of Sample Enterprises

The *Tankan* uses a sample survey framework, which surveys part of a population (sample) and estimates the population parameters using the sample data.

In a sample survey, a higher number of sample enterprises improves statistical accuracy and also increases the total burden on survey respondents. Stratified sampling has been introduced in the *Tankan* to satisfy established criteria for statistical accuracy with a controlled number of sample enterprises. Under this sampling method, the survey population is divided into homogeneous groups (strata) using criteria such as industry and capital, then, each stratum is sampled.

It is desirable that sample enterprises are randomly selected in a sample survey so that the sample closely reflects the features of the population in theory. In this case, however, many enterprises are newly added or excluded from the sample. This leads to a decrease

in the response rate, an increase in respondent errors, and also an increase of the total burden of producing statistics. From this perspective, in the *Tankan*, with the current sample enterprises basically continuing as part of the sample, new sample enterprises are selected by stratum to satisfy the criteria on standard error ratio and sample enterprise distribution as described below. With the *Tankan's* aim of capturing an accurate picture of business trends in Japan in mind and the many sample enterprises who are accustomed to responding to the survey, this method brings about desirable effects such as limiting decreases in response rates and respondent error.

### 3. Criteria for Statistical Accuracy

In the *Tankan* as for any ordinary sample survey, the Bank establishes criteria for statistical accuracy and selects sample enterprises which satisfy them. The Bank sets the following two criteria.

#### (1) Standard Error Ratio

Standard error ratio shows how accurate a survey population mean estimate is. It is calculated by dividing the standard deviation of the sample mean by the survey population mean (see appendix 2 for the details). For example, suppose the sample mean of sales is one million yen and the standard error ratio is three percent, with probability 0.95, the survey population mean of sales will be between 940 thousand yen and 1,060 thousand yen. As this example demonstrates, the confidence interval becomes shorter with the decreased standard error ratio, resulting in improving statistical accuracy.

The population total of quantitative survey items such as "sales" and "fixed investment" are estimated in the *Tankan*. A criterion for statistical accuracy is set for the standard error ratio of certain quantitative survey items. The Bank sets the standard error ratio for sales in consideration of its importance as a survey item.

The dispersion of sales for each industry is spread out over a wide range and, as is well known, that of nonmanufacturing tends to be wider than that of manufacturing. With this in mind, the Bank sets the criteria as three percent or less on the standard error ratio for

manufacturing and as five percent or less for nonmanufacturing respectively in the *Tankan*. These criteria must be satisfied for overall manufacturing and nonmanufacturing as well as for each enterprise size — large, medium-sized, and small enterprises.

In addition, the Bank sets a non-binding target of approximately 10 percent or less for each of the 31 industries by enterprise size.

Criteria for statistical accuracy on standard error ratio of sales

	Large enterprises	Medium-sized enterprises	Small enterprises
Manufacturing	3%	3%	3%
Nonmanufacturing	5%	5%	5%
Each industry (non-binding)	approximately 10%	approximately 10%	approximately 10%

## (2) Sample Enterprise Distribution

In the *Tankan*, as stated previously, the population data is updated upon revision of sample enterprises. After the revision, new sample enterprises are selected with the current sample enterprises basically continuing as part of the sample. This makes it more likely than in random sampling that the sample distribution may become inconsistent with the survey population distribution.

On this point, the Bank sets the following criterion: sample distributions of capital size and sales could be deemed not to deviate from survey population distributions. In particular, each stratum is further subdivided into several subgroups (minimum strata) based on capital and sales (see appendix 3 for the details), then the Bank examines each stratum to check whether there is a statistically significant difference between the population and sample distributions. This difference is tested by the chi-square goodness of fit test (see appendix 4 for the details).

## 4. Sample Design Procedure

The Bank has introduced stratified sampling in the *Tankan* to satisfy established criteria for statistical accuracy with a controlled number of sample enterprises as described in Section 2. This section describes the specific procedure of stratified sampling.

In general, a smaller variance of enterprise sales in each stratum can lower a standard error ratio and satisfy the criteria with a lower number of sample enterprises. This means that if population is further divided to decrease the variance of each stratum, the criteria of standard error ratio can be satisfied with a lower number of sample enterprises.

### (1) Criteria for Stratification

Survey results of the *Tankan* are calculated and released by industry and enterprise size and the criteria of standard error ratio are set for each of these classifications. Consequently, industry and enterprise size are used as criteria for stratification. Sales is also a criterion for stratification as the criterion for statistical accuracy has been set for the standard error ratio of sales.<sup>17</sup>

### (2) Stratification Method

Out of the three criteria for stratification in the sample design of the *Tankan*, industry and enterprise size are determined in advance as follows: the number (31 industries and 3 enterprise sizes) and the boundary line or value for strata are defined based on the Japan Standard Industrial Classification for industry and the amount of capital for enterprise size. As a result, stratification in the sample design of the *Tankan* works to determine the number of strata and the boundary values for 93 strata (31×3) in order to minimize variance of sales of the survey population enterprises.

Taking into account the balance between satisfying the criteria for statistical accuracy and

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<sup>17</sup> Sales was added to the criteria for stratification in the sampling from the March 2018 survey. Number of employees had been previously used as a criterion for stratification due to lack of comprehensive data on sales on the survey population. For more details, refer to "Revision of the Sample Design of the *Tankan* Using the *Economic Census* of Japan," Research and Statistics Department, Bank of Japan, September 23, 2016.



lightening the total burden of producing statistics, since the revision of sample enterprises in 2004, the Bank has divided the survey population into 300 to 400 strata. In fact, there are 384 strata in the sample design since the March 2022 survey. This means that stratification in the *Tankan* works to find boundary values which minimize variance of sales of the survey population enterprises (see appendix 3).

The Bank places the following restriction on finding the boundary values: each stratum has five or more population enterprises. This is because the number of sample enterprises selected from a stratum with less than five population enterprises will inevitably be small, making it impossible to estimate the population total of the corresponding stratum when there are non-responding sample enterprises.

### (3) Selecting Sample Enterprises

In the *Tankan*, sample enterprises are selected for each stratum divided as described above to satisfy the criteria of standard error ratio and sample enterprise distribution as described in section 3. In particular, with the current sample enterprises basically continuing as part of the sample, new enterprises are added and current sample enterprises are excluded from the sample, bearing it in mind to lower the sample size to the extent possible. The Bank places the following restriction on selecting sample enterprises: the sampling ratio of each stratum is maintained at 0.5 percent or more.<sup>18</sup> This method limits disturbance to the estimates due to an idiosyncratic factor of a sample enterprise.

## 5. Sample Design of Survey of Financial Institutions

The Survey of Financial Institutions uses a sample survey framework in the same way as the *Tankan*.

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<sup>18</sup> The Bank eased the restriction on the sampling ratio from one percent or more to 0.5 percent or more for the March 2018 survey because applying the method of outlier treatment has made it easier to control an effect on the estimates caused by some irregular movements in values unique to a sample enterprise.

The target population are defined as private financial institutions in Japan with 10 or more employees. Comprising approximately 2,800 financial institutions in Japan, the survey population is drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications.

Sample institutions are selected from the survey population using stratified sampling for each of the 22 strata, which are formed by dividing the survey population based on sector and the number of employees, in order to satisfy the established criteria for statistical accuracy with current sample institutions basically continuing as part of the sample.

The Bank sets the following two criteria for statistical accuracy: (1) the standard error ratio of fixed and software investment (excluding land purchasing expenses) for overall financial institutions is 10 percent or less; and (2) the sample distribution of number of employees does not deviate from the survey population distribution.

The survey population comprises seven sectors, used as the criterion for stratification, based on the Japan Standard Industrial Classification released by the Ministry of Internal Affairs and Communications as shown below.

Survey of Financial Institutions	Japan Standard Industrial Classification (code)
Financial institutions	
City banks and trust banks	Banking (62) (except Central bank (621))
Member banks of the Regional Banks Association of Japan and the Second Association of Regional Banks	
<i>Shinkin</i> banks, etc.	
Other financial institutions for small businesses	Financial institutions for cooperative organizations (63)
Financial products transaction dealers	Financial products transaction dealers and futures commodity transaction dealers (65)
Insurance companies	Insurance institutions, including insurance agents, brokers and services (67)
Non-deposit money corporations	Non-deposit money corporations, including lending and credit card business (64)

Note: Each industry is classified according to the small and middle classifications of the Japan Standard Industrial Classification revised in October 2013.

As for the number of employees, the other criterion for stratification, the number of strata and the boundary value of each stratum are determined in order to minimize variance of fixed and software investment (excluding land purchasing expenses) of the survey population institutions on condition that each stratum has five or more population institutions.

## 6. Sample Design of Survey of Business Consultants & Pure Holding Companies

The Survey of Business Consultants & Pure Holding Companies uses a sample survey framework in the same way as the *Tankan*.

The target population are private enterprises belonging to "business consultants & pure holding companies" in Japan with 10 employees or more.

Comprising approximately 1,600 enterprises in Japan, the survey population is drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications.

Sample enterprises are selected from the survey population using stratified sampling for each of the 4 strata, which are formed by dividing the survey population based on sales in order to satisfy the established criteria for statistical accuracy with current sample enterprises basically continuing as part of the sample.

The Bank sets the criterion that the sample distribution of sales does not deviate from the survey population distribution for its statistical accuracy.

## 7. Sample Design of Survey on Overseas Business Activities

The Survey on Overseas Business Activities uses a sample survey framework in the same way as the *Tankan*.

The target population are private parent enterprises (excluding "financial institutions") in Japan, with capital of 1 billion yen or more, at the top of a consolidated business group with sales to overseas external customers or overseas subsidiaries/branches.

Comprising approximately 1,600 enterprises in Japan, the survey population is drawn from the Establishment Frame Database of the Ministry of Internal Affairs and Communications.

Sample enterprises are selected from the survey population using stratified sampling for each of the 73 strata, which are formed by dividing the survey population based on sector and total sales, in order to satisfy the established criteria for statistical accuracy with current sample enterprises basically continuing as part of the sample.

The Bank sets the following two criteria for statistical accuracy: (1) the standard error ratio of total sales is within the target range (10 percent for both manufacturing and nonmanufacturing); and (2) the sample distribution of capital and total sales does not deviate from the survey population distribution.

## 8. Sample Maintenance<sup>19</sup>

### (1) Handling of Changes of Sample Enterprises

The Bank examines statistical accuracy — standard error ratios and fitness of the population and sample distributions as described in section 3 — regularly (once a year in principle) to prevent the lowering of statistical accuracy due to a decrease in the number of sample enterprises resulting from bankruptcies, mergers, and other factors. When accuracy is not sufficient to satisfy criteria, the Bank adds new sample enterprises.

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<sup>19</sup> The Bank maintains sample institutions of the Survey of Financial Institutions as well as sample enterprises of the *Tankan*, Survey of Business Consultants & Pure Holding Companies and Survey on Overseas Business Activities.

## (2) Dealing with Mergers and Spin-offs

In general, the Bank takes the following procedures to deal with mergers and spin-offs involving *Tankan* sample enterprises.

### A. Mergers<sup>20</sup>

When the core enterprise is a sample enterprise prior to the merger, the merged enterprise is included in the sample. Specifically, in cases where there is a merger between a sample enterprise and another sample enterprise or a non-sample enterprise with a smaller sales volume, the merged enterprise is included in the sample. On the other hand, when there is a merger between a sample enterprise and a non-sample enterprise with a larger sales volume, the merged enterprise is excluded from the sample.

### B. Spin-offs

Only the core enterprise is included in the sample after the spin-off. However, all enterprises — the core enterprise as well as other spin-offs — are included in the sample when; (1) the core enterprise and other spin-offs are grouped in the same stratum for population estimation and; (2) the impact on the estimate of the population total of sales or fixed investment turns out to be small with the inclusion of these enterprises into the sample.

The Bank has introduced the following two exceptional rules applied when the impact of mergers and spin-offs on the estimate of the population total is above a certain level, such as large-scale mergers and spin-offs in the *Tankan*.

### C. Distribution method

The Bank distributes the responded figures of merged enterprises and spin-off enterprises to the core enterprise prior to the merger or spin-off in the *Tankan*. This means that, in

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<sup>20</sup> The core enterprise corresponds to the enterprise with the largest sales volume in the *Tankan* and the Survey of Business Consultants & Pure Holding Companies, while the core enterprise in the Survey of Financial Institutions is the institution with the largest number of employees. In the Survey on Overseas Business Activities, the core enterprise is defined as the enterprise with the largest total sales.

order to decrease technical fluctuations which do not reflect the actual conditions of the economy, the population total is estimated as if there were no mergers and spin-offs when the impact of mergers and spin-offs on the estimate of the population total is above a certain level.

When there is an impact of approximately one percent or more on the estimate of the population total of sales or fixed investment for the relative category — of the six main categories: two industries (manufacturing and nonmanufacturing) times three enterprise sizes (large, medium-sized, and small enterprises) — to which the enterprise belonged prior to the merger or spin-off, the Bank applies the distribution method.

***In the case of mergers:***

When there is a merger between enterprises A and B creating merged enterprise C, the Bank surveys C and then the responded figure of C is distributed to the figures of A and B. The ratio used in the distribution to A (B) is in principle obtained by dividing the figure of A (B) by the figure of C at the time of the merger.

***In the case of spin-offs:***

When enterprise X is spun off into enterprises A, B, and C, the Bank surveys only the core enterprise (let us assume A) and the responded figure of A is multiplied for calculation of the figure of X. The multiplying factor is in principle the reciprocal of the ratio obtained by dividing the figure of A by the figure of X at the time of the spin-off.

**D. Incorporating spin-off enterprises in the course of time**

A non-core enterprise which was not selected as a sample enterprise at the time of the spin-off may grow and have an impact above a certain level on the estimate of the population total in the *Tankan*. In such a case, the Bank may flexibly incorporate it into the sample enterprise to capture the whole picture of the pre-existing sample enterprise even though some time has passed since the spin-off.

Specifically, the Bank may incorporate a non-core enterprise when its figure of sales or fixed investment has an impact of approximately one percent or more on the estimate of the population total for the relative category — of the six main categories: two industries (manufacturing and nonmanufacturing) times three enterprise sizes (large, medium-sized,

and small enterprises) — to which the enterprise belonged prior to the spin-off. The Bank may incorporate such a spin-off enterprise at the time of regular sample addition (once a year in principle).<sup>21</sup>

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<sup>21</sup> The number of population enterprises is changed exceptionally in this case.

## Method of Outlier Detection

An outlier is one of the data which significantly diverges from the rest of the data. Detailed procedures of the detection of outliers in the *Tankan* are as follows.

(1)  $y_{it}$ , which denotes the degree of influence of values reported from each enterprise on year-on-year rates of change or revision rates for the six main categories<sup>22</sup> — two industries (manufacturing and nonmanufacturing) times three enterprise sizes (large, medium-sized, and small enterprises) —, is calculated as follows:

$$y_{it} = \frac{\text{Degree of change in weighted data}}{\left| \begin{array}{c} \text{Estimate of the population total for one of the six main categories} \\ \text{in the previous fiscal year (or previous survey)} \end{array} \right|} \times 100$$

$$= \frac{w'_i(x_{it} - x_{it-1})}{|M_{jt-1}|} \times 100$$

$x_{it}$  : Value reported from enterprise  $i$  at time  $t$

$x_{it-1}$  : Value reported from enterprise  $i$  at time  $t-1$

$w'_i$  : Adjusted weight of  $x_i^*$

$M_{jt-1}$  : Estimate of the population total for category  $j$  ( $j=1, \dots, 6$ ) at time  $t-1$

\* To accurately measure the degree of change in weighted data, despite the difference in the number of sample enterprises between time  $t$  and  $t-1$ ,  $w'_i$  is computed based on the same number of sample enterprises. For this purpose, when some enterprises provide no response in either of the two surveys (at different points in time), the missing values are substituted by the sample mean in each stratum to which each of these enterprises belongs.

(2) Next,  $z_{it}$ , the indicator of the degree of divergence based on  $y_{it}$ , is calculated as follows:

$$z_{it} = \begin{cases} \frac{y_{it} - d_j^{99}}{D_j} & \text{if } d_j^{99} \leq y_{it} \\ \frac{d_j^1 - y_{it}}{D_j} & \text{if } y_{it} \leq d_j^1 \\ 0 & \text{if } d_j^1 < y_{it} < d_j^{99} \end{cases}$$

If this indicator,  $z_{it}$ , exceeds the threshold value<sup>23</sup>, which is set in advance based on empirical analyses using past data, the reported value is detected as an outlier.

<sup>22</sup> This corresponds to the degree of influence of values reported from each sample on year-on-year rates of change or revision rates for all the samples in the Survey of Financial Institutions and the Survey of Business Consultants & Pure Holding Companies.

<sup>23</sup>  $C$  is set at 50 in the *Tankan*, and 10 in the Survey of Financial Institutions and the Survey of Business Consultants & Pure Holding Companies, respectively. With respect to "R&D investment", the Bank



- $d_j^1$  : One percentile<sup>24</sup> of  $y_{it}$  in category  $j$   
 $d_j^{99}$  : 99 percentile of  $y_{it}$  in category  $j$   
 $D_j$  : Distance between  $d_j^{99}$  and  $d_j^1$  ( $d_j^{99} - d_j^1$ )

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does not conduct outlier detection for medium-sized and small nonmanufacturing in the *Tankan* nor for the Survey of Financial Institutions, given that the ratio of samples whose  $y_{it}$  is zero is high, which makes it difficult to set an appropriate threshold value.

<sup>24</sup> The one percentile is defined as the value below which one percent of observation can be found.

## Standard Error Ratios

Standard error ratios represent the variation of sample means relative to the population mean. Using sales as an example, the formula is shown below.

$$\text{(Standard error ratio)} : = \frac{\text{(Standard deviation of sample mean)}}{\text{(Population mean)}}$$

$$\text{(Standard deviation of sample mean)} : = \sqrt{\sum_{i=1}^L W_i^2 \frac{N_i - n_i}{N_i - 1} \frac{\sigma_i^2}{n_i}}$$

$$\text{(Population mean)} : = \sum_{i=1}^L W_i \bar{Y}_i$$

$N_i$  : Number of population enterprises in stratum  $i$

$n_i$  : Number of sample enterprises in stratum  $i$

$\bar{Y}_i$  : Population mean of sales in stratum  $i$

$\sigma_i^2$  : Population variance of sales in stratum  $i$

$W_i$  : Share of stratum  $i$  in population enterprises classified by industry and size

$L$  : Number of strata in population enterprises classified by industry and size

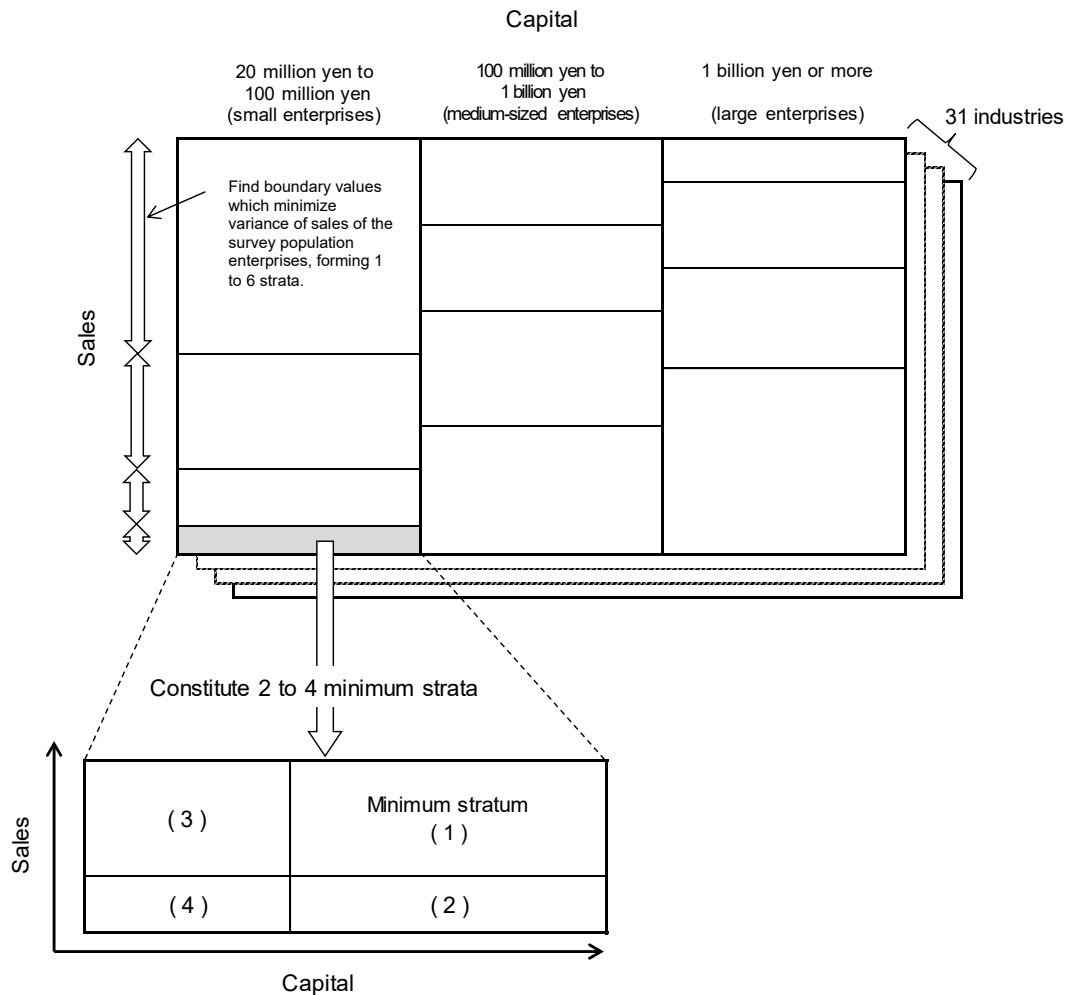
Note: The formula shown above is derived as follows: when selecting a sample of size  $n$  without replacements from a population of size  $N$  (population mean:  $\mu$ , population variance:  $\sigma^2$ ), the sample mean and the sample variance are given by  $\mu$  and  $\frac{N_i - n_i}{N_i - 1} \frac{\sigma_i^2}{n_i}$ , respectively.

## Stratification Method of Sample Design

In the sample design of the *Tankan*, the survey population is divided into 93 strata — 31 industries times 3 enterprise sizes (large, medium-sized, and small enterprises). These are then subdivided into 1 to 6 strata in order to minimize the variance of sales of the survey population enterprises with a goal of 300 to 400 strata as a whole.

Each stratum is further subdivided into 2 to 4 minimum strata based on capital and sales.

The conceptual diagram below shows the stratification method as outlined above.



## Chi-square Goodness of Fit Test

The chi-square goodness of fit test is a statistical method to test whether there is a significant difference between the observed and the expected distributions. Detailed procedures and the diagram of the test in the *Tankan* are as follows.

- (1) Each stratum is subdivided into several subgroups (minimum strata)  $i$ , where  $i = 1, 2, \dots, j$ , based on capital and sales.
- (2) In each minimum stratum, the number of survey population enterprises ( $N_1, N_2, \dots, N_j$ ) and that of sample enterprises ( $n_1, n_2, \dots, n_j$ ) are obtained.
- (3)  $p_i$ , which denotes the ratio of survey population enterprises in each minimum stratum, is calculated as:

$$p_i = \frac{N_i}{N} \quad (N \equiv \sum_{k=1}^j N_k)$$

- (4) If there is no significant difference between the sample and survey population distributions,  $e_i$ , which denotes the number of sample enterprises in each minimum stratum, is expected to be obtained as:

$$e_i = n \cdot p_i \quad (n = \sum_{k=1}^j n_k)$$

The fitness between the two distributions is tested by the chi-square goodness of fit test at 5% significance level, where  $n_i$  is the observed value and  $e_i$  is the expected value.

### [Constitution example of minimum strata]

Survey population		Sample	
(Number of enterprises)		(Number of enterprises)	
1,000	400	20	8
1,600	500	35	11
(Ratio of minimum stratum on stratum)		(Ratio of minimum stratum on stratum)	
0.29	0.11	0.27	0.11
0.46	0.14	0.47	0.15

Testing the difference between the two