Not to be released before 2 p.m. on Monday, March 2, 2015

March 2, 2015
Research and Statistics Department
Bank of Japan

Regular Revision of the *Tankan* Sample Enterprises

1. Background

The Bank uses a sample survey framework for the *Tankan* (Short-term Economic Survey of Enterprises in Japan), extracting sample enterprises from the population (excluding financial institutions) with capital of at least 20 million yen.

To grasp actual economic conditions accurately, the Bank makes regular revisions to the *Tankan* sample enterprises in line with updates of the population base. Today, the Bank made revisions, after an interval of 5 years, to the sample enterprises that are based on the most updated population (the total number of approximately 210,000 enterprises based on the "*2012 Economic Census for Business Activity*" jointly conducted by the Ministry of Internal Affairs and Communications and by the Ministry of Economy, Trade and Industry). This is the first revision for which the Bank has used the "*Economic Census*[1]" as the population base for the *Tankan* survey.

2. Outline

The sampling design for the March 2015 revision follows the same method as the previous revision in the March 2010 survey. The Bank has decided to continue using current sample enterprises, excluding those that have fallen outside the coverage of the *Tankan* since the previous revision, such as enterprises with capital of less than 20 million yen. New sample enterprises have also been added based on certain criteria related to statistical accuracy and

[1] The "*Economic Census*" aims to provide a comprehensive overview of the actual business activities of establishments and enterprises in Japan and generate information on the population for various statistical surveys of establishments and enterprises. The "*Economic Census*" consists of two surveys: the "*Economic Census for Business Frame*" to identify the basic structure of establishments and enterprises and the "*Economic Census for Business Activity*" to survey the economic activities of establishments and enterprises. The "*Establishment and Enterprise Census*," a previous population base for the *Tankan*, has been integrated into the "*Economic Census*" from 2009.

other measuring factors (see Figure 1 and the attachment for details on sampling design). As a result of the revision, the total number of sample enterprises has increased to 11,126, up from 10,312 enterprises in the December 2014 survey. 254 enterprises have been eliminated and 1,068 newly added[2].

Starting from the March 2015 survey, the Bank will conduct the *Tankan* survey based on these new sample enterprises. The revision of the sample enterprises will induce discontinuity between the figures of the December 2014 survey and those of the March 2015 survey. Therefore, the Bank conducted a preliminary survey in December 2014 to measure the size of such differences caused by the revision. The Bank recalculated the figures for the judgement survey such as "Business Conditions" and the quantitative survey such as "Sales", as well as the survey on "Inflation Outlook of Enterprises" on this preliminary survey basis.

The comparison between the pre- and post-revision figures for the December 2014 survey showed that there were minor differences for both the judgement survey and annual projections in general (Figure 2, Figure 3, and "Data Comparison Between Pre- and Post-revision of the *Tankan* in the December 2014 Survey" released on March 2, 2015, Research and Statistics Department).

3. Release data of the March 2015 Survey (Figures scheduled to be released on April 1 and 2)

As mentioned above, there are two slightly different data sets for the December 2014 survey. The Bank designated the post-revision data as reference figures. For comparison between the December 2014 and March 2015 surveys, the post-revision figures for the December 2014 survey will be adopted.

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[2] The number of sample enterprises may change in the future due to mergers, spin-offs, and other corporate activities. The regular revision of sample financial institutions has also been implemented. The total number of institutions has changed to 196, consisting of 189 current sample enterprises and 7 newly added sample enterprises (Appendix 2).

For convenience, the figures in the December 2014 survey will be cited in the release materials of the March 2015 survey, which are scheduled to be released on April 1 and 2, in the following ways:

<table>
<tr><th colspan="3">Release materials</th><th>Data</th></tr>
<tr><td colspan="3">"Outline"</td><td rowspan="3">The post-revision figures will be cited.</td></tr>
<tr><td rowspan="3">"Summary"</td><td colspan="2">Tables</td></tr>
<tr><td rowspan="2">Graphs</td><td>Long-term Time-series Data</td><td>The pre-revision figures of the December 2014 survey will be connected to the post-revision figures of the March 2015 survey.</td></tr>
<tr><td>Developments of Fixed Investment including Land Purchasing Expenses</td><td>For fiscal year 2014, the pre- and post-revision figures will not be connected directly. Instead, the graphs will present two lines of figures; the pre-revision figures up to the December 2014 survey and the post-revision figures from that survey.</td></tr>
<tr><td colspan="3">"Summary of Inflation Outlook of Enterprises"</td><td>The post-revision figures will be cited.</td></tr>
<tr><td colspan="3">"Figures by Industry"</td><td rowspan="3">The pre-revision figures will be included until the December 2014 survey, and the post-revision figures from the March 2015 survey.</td></tr>
<tr><td colspan="3">"The Comprehensive Data Set"</td></tr>
<tr><td colspan="3">"BOJ Time-Series Data Search"</td></tr>
</table>

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Figure 1

The Number of Population and Sample Enterprises by Industry and Size - March 2015 Survey

Industry	All Enterprises		Large Enterprises		Medium-sized Enterprises		Small Enterprises	
	Population	Sample	Population	Sample	Population	Sample	Population	Sample
All Industries	**212,277**	**11,126**	**4,907**	**2,146**	**20,156**	**3,092**	**187,214**	**5,888**
Manufacturing	**46,759**	**4,517**	**2,099**	**1,098**	**5,779**	**1,193**	**38,881**	**2,226**
Textiles	2,714	253	58	37	223	55	2,433	161
Lumber & Wood products	1,810	139	24	17	121	32	1,665	90
Pulp & Paper	1,360	135	42	28	156	41	1,162	66
Chemicals	2,397	410	317	142	564	87	1,516	181
Petroleum & Coal products	246	114	21	18	28	23	197	73
Ceramics, Stone & Clay	2,927	205	91	45	308	53	2,528	107
Iron & Steel	1,307	238	76	44	233	50	998	144
Nonferrous metals	835	211	71	36	172	55	592	120
Food & Beverages	6,488	430	214	108	747	128	5,527	194
Processed metals	4,669	267	80	42	379	77	4,210	148
General-purpose machinery	1,973	184	87	49	253	51	1,633	84
Production machinery	4,296	302	172	90	419	69	3,705	143
Business oriented machinery	1,402	239	85	47	218	56	1,099	136
Electrical machinery	4,845	585	372	183	857	180	3,616	222
Shipbuilding, Heavy machinery & Other transportation machinery	637	192	37	29	72	46	528	117
Motor vehicles	1,652	284	171	112	288	85	1,193	87
Other manufacturing	7,201	329	181	71	741	105	6,279	153
Nonmanufacturing	**165,518**	**6,609**	**2,808**	**1,048**	**14,377**	**1,899**	**148,333**	**3,662**
Construction	50,797	1,104	252	128	1,414	172	49,131	804
Real estate	17,041	513	342	82	1,848	169	14,851	262
Goods rental & Leasing	1,845	318	66	35	219	112	1,560	171
Wholesaling	30,053	1,138	585	159	3,261	334	26,207	645
Retailing	15,302	713	307	143	1,276	172	13,719	398
Transport & Postal activities	11,993	645	291	134	1,161	210	10,541	301
Communications	343	83	50	18	64	23	229	42
Information services	5,699	279	196	85	1,204	98	4,299	96
Other information communication	3,110	264	234	48	780	108	2,096	108
Electric & Gas utilities	371	173	81	40	182	92	108	41
Services for businesses	13,295	562	127	49	1,210	163	11,958	350
Services for individuals	8,579	454	123	64	1,055	138	7,401	252
Accommodation, Eating & Drinking services	6,717	310	141	54	669	98	5,907	158
Mining & Quarrying of stone and gravel	373	53	13	9	34	10	326	34

(Note 1) Large Enterprises with capital of 1 billion yen or more. Medium-sized Enterprises with capital of 100 million yen or more and less than 1 billion yen. Small Enterprises with capital of 20 million yen or more and less than 100 million yen.

(Note 2) The number of sample enterprises is based on the December 2014 preliminary survey. It may change in the future due to mergers, spin-offs, and other corporate activity.

Figure 2

Comparison Between the Pre- and Post-revision:

Main Results in the Preliminary Survey Conducted on December 2014 Survey

Business Conditions (December 2014 Survey) ("Favorable" minus "Unfavorable," % Points)

		Diffusion Index (Actual)		B - A
		Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	5	6	1
Large Enterprises	Manufacturing	12	12	0
	Nonmanufacturing	16	17	1
Medium-sized Enterprises	Manufacturing	7	7	0
	Nonmanufacturing	7	10	3
Small Enterprises	Manufacturing	1	4	3
	Nonmanufacturing	▲ 1	1	2

Sales (%, % points)

		Year-to-year Percent Change (fiscal 2014)		B - A
		Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	1.4	1.0	▲ 0.4
Large Enterprises	Manufacturing	1.1	1.2	0.1
	Nonmanufacturing	2.5	2.2	▲ 0.3
Medium-sized Enterprises	Manufacturing	1.9	1.6	▲ 0.3
	Nonmanufacturing	0.7	0.6	▲ 0.1
Small Enterprises	Manufacturing	2.1	1.6	▲ 0.5
	Nonmanufacturing	▲ 0.2	▲ 0.9	▲ 0.7

Current Profits (%, % points)

		Year-to-year Percent Change (fiscal 2014)		B - A
		Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	▲ 0.3	▲ 0.4	▲ 0.1
Large Enterprises	Manufacturing	0.4	▲ 0.5	▲ 0.9
	Nonmanufacturing	2.7	3.6	0.9
Medium-sized Enterprises	Manufacturing	▲ 3.3	1.0	4.3
	Nonmanufacturing	▲ 5.8	▲ 5.4	0.4
Small Enterprises	Manufacturing	4.2	3.6	▲ 0.6
	Nonmanufacturing	▲ 6.4	▲ 6.5	▲ 0.1

Fixed Investment including Land Purchasing Expenses (%, % points)

		Year-to-year Percent Change (fiscal 2014)		B - A
		Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	5.5	3.6	▲ 1.9
Large Enterprises	Manufacturing	11.4	11.7	0.3
	Nonmanufacturing	7.6	7.2	▲ 0.4
Medium-sized Enterprises	Manufacturing	19.6	13.4	▲ 6.2
	Nonmanufacturing	▲ 2.6	▲ 5.6	▲ 3.0
Small Enterprises	Manufacturing	7.9	5.5	▲ 2.4
	Nonmanufacturing	▲ 13.2	▲ 17.0	▲ 3.8

Note: The pre-revision figures above are the same as the official data released on December 15, 2014.

Figure 3

Comparison Between the Pre- and Post-revision:

Results of "Inflation Outlook of Enterprises" in the Preliminary Survey

Conducted on December 2014 Survey

Output Prices (%, % points)

			The Average of Enterprises' Inflation Outlook		B - A
			Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	1Year ahead	1.0	1.0	0.0
		3Years ahead	1.7	1.7	0.0
		5Years ahead	2.0	2.1	0.1
Large Enterprises	Manufacturing	1Year ahead	0.3	0.3	0.0
		3Years ahead	0.1	0.1	0.0
		5Years ahead	▲ 0.2	▲ 0.1	0.1
	Nonmanu-facturing	1Year ahead	0.9	0.9	0.0
		3Years ahead	1.5	1.4	▲ 0.1
		5Years ahead	1.7	1.6	▲ 0.1
Small Enterprises	Manufacturing	1Year ahead	1.0	1.0	0.0
		3Years ahead	1.9	1.9	0.0
		5Years ahead	2.2	2.1	▲ 0.1
	Nonmanu-facturing	1Year ahead	1.3	1.3	0.0
		3Years ahead	2.4	2.4	0.0
		5Years ahead	3.1	3.0	▲ 0.1

General Prices (%, % points)

			The Average of Enterprises' Inflation Outlook		B - A
			Pre-revision (A)	Post-revision (B)	
All Enterprises	All Industries	1Year ahead	1.4	1.4	0.0
		3Years ahead	1.6	1.6	0.0
		5Years ahead	1.7	1.7	0.0
Large Enterprises	Manufacturing	1Year ahead	1.1	1.1	0.0
		3Years ahead	1.2	1.2	0.0
		5Years ahead	1.2	1.2	0.0
	Nonmanu-facturing	1Year ahead	1.1	1.1	0.0
		3Years ahead	1.2	1.2	0.0
		5Years ahead	1.2	1.2	0.0
Small Enterprises	Manufacturing	1Year ahead	1.7	1.7	0.0
		3Years ahead	1.8	1.8	0.0
		5Years ahead	1.9	1.9	0.0
	Nonmanu-facturing	1Year ahead	1.6	1.6	0.0
		3Years ahead	1.8	1.8	0.0
		5Years ahead	1.9	1.8	▲ 0.1

Note: The pre-revision figures above are the same as the official data released on December 16, 2014.

Sampling Design[1]

The sampling survey method is adopted for the *Tankan*. Since this method calculates population estimates out of samples, it contains estimation errors or sampling errors. In order to obtain highly accurate statistics, we have to prepare an appropriate sampling design.

The Bank pursues two key goals: One is to achieve high statistical accuracy, and the other to lessen the burden of responding and compiling the *Tankan*.

The sampling design for the March 2015 revision follows the same method as the last revision, that is the revision of sample enterprises in the March 2010 survey. The present revision adopted the "*2012 Economic Census for Business Activity*" as the population enterprises.

1. Setting statistical accuracy targets

For judgement survey items such as "Business Conditions," the Bank simply aggregates the answers received from sample enterprises. As for quantitative items such as "Sales," "Profits," and "Fixed investment," the Bank adopts a different calculating method, as follows. It categorizes the population by strata that have been segmented by "industry," "capital," and "the number of employees." The Bank estimates the overall population aggregate by expanding the answers of sample enterprises. The estimated figure is equivalent to the "population estimate" under the preposition of the unbiasedness of sample sets.

The Bank sets an accuracy target of error range for calculating the population estimate. It sets an error range to the population estimate of "Sales" of sample enterprises. The error ratios, shown in Appendix 1, the relative size of the deviation between the estimated figure

[1] For details on sampling design, refer to "Sample Design and Sample Maintenance of TANKAN" (June 7, 2004, Research and Statistics Department, Bank of Japan).

of the sample survey and the population figure of census for six categories (manufacturing and nonmanufacturing for large-, medium-, and small-sized enterprises) are at less than 3 percent for manufacturing and less than 5 percent[2] for nonmanufacturing[3]. The Bank also sets a nonbinding but target error ratio for 31 industries and for large-, medium-, and small-sized enterprises at almost less than 10 percent.

The error ratios for the six categories as a result of the March 2015 revision are shown in the table below (Appendix 2).

Error Ratio of Sales (Population Estimate)

	Large Enterprises	Medium-sized Enterprises	Small Enterprises
Manufacturing	1.0%	2.7%	2.5%
Nonmanufacturing	3.0%	4.6%	3.9%

2. Dividing the strata and extracting samples from the strata

(Designing the Strata)

It is smart to divide the strata into smaller segments with similar characteristics for achieving the statistical accuracy target. The segmentation contributes to reduce the number of samples.

For this reason, the strata have been divided by "industry," "capital," and "the number of

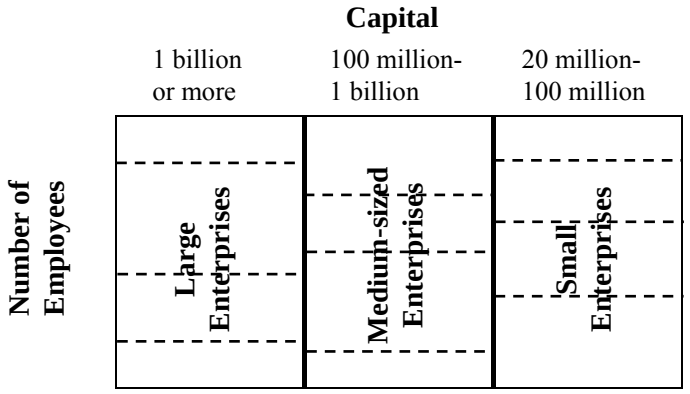
[2] In nonmanufacturing sector, individual enterprises tend to diversify compared to manufacturing, the target accuracy may be set with less strictness.

[3] For financial institutions, the Bank sets the error ratio at less than 10 percent to the population estimate of sample institutions' "Fixed investment," since the *Tankan* does not survey "Sales" for financial institutions.

employees." Every "industry" has three strata for "capital" of sample enterprises with 20 million yen to less than 100 million yen, 100 million yen to less than 1 billion yen, and 1 billion yen or more. Each stratum is divided into two to five smaller strata for "the number of employees" of sample enterprises in order to minimize sample variance.

A total of 391 strata[4] will be adopted in the March 2015 revision.

Design of the Strata



(Note) Each small rectangle, segmented by both the thick and dotted lines, represents a stratum.

(Extracting Samples from Strata)

For each stratum, the Bank decided to continue using the current sample enterprises as a part of the revised sample enterprises for the March 2015 survey, excluding those that have fallen outside the coverage of the *Tankan* since the previous revision, such as enterprises with capital of less than 20 million yen. It also extracted additional enterprises for the appropriate strata by random sampling[5], in order to fulfill the required number for the revised sample enterprises.

[4] No sample enterprise has been extracted from a stratum with less than five population enterprises, since the population estimate for such a stratum may not be calculated if no response is obtained. In any case, there is no such stratum at the 2015 March revision because every stratum is set flexibly compared to the previous revisions.

[5] The Bank maintained almost always the ratio for sample extraction to population enterprises at more than 1 percent to avoid the case in which an unusual change in figures due to one irregular sample disturbs the population estimate.

In strictly theoretical argument, a sample survey should be changed all samples at every revision. However, in practice, it is not feasible to replace a very large number of sample enterprises at once. In addition, maintaining current sample enterprises helps to avoid the decrease in response rate and the increase of unintentional mistakes in the responses.

3. Testing fitness between sample enterprises and population enterprises

Sample enterprises of the *Tankan* may not represent the population enterprises with unbiasedness due to incomplete random sampling. In order to overcome this issue, the Bank tested the fitness of the revised distribution of sample enterprises from the population enterprises for each stratum.

The specific method taken by the Bank for examining the deviation between the sample and population distributions is as follows; the Bank divided each stratum into smaller segments ("minimum strata") by "capital" and by "the number of employees" of the sample enterprises. It then checked the deviation of the distribution of sample enterprises from that of population enterprises by using the Chi-square goodness of fit test (Appendix 1).

1. Definition of error ratio

As shown in the formula below, the error ratio is an index showing the deviation of the sample mean from the population mean.

$$Error\ ratio := \frac{(Standard\ deviation\ of\ Sample\ mean)}{Population\ mean}$$

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

$$Population\ mean := \sum_{i=1}^{L} W_i \ \overline{Y_i}$$

$$\begin{cases} N_i : number\ of\ population\ \ enterprises\ in\ stratum\ i \\ n_i : number\ of\ sample\ enterprises\ in\ stratum\ i \\ \overline{Y_i} : population\ \ mean\ (of\ \ Sales)\ in\ stratum\ i \\ \sigma_i^2 : population\ \ variance\ (of\ \ Sales)\ in\ stratum\ i \\ W_i : ratio\ of\ \ N_i\ to\ number\ of\ \ population\ \ (*) \\ L : number\ of\ \ strata\ \ in\ \ population\ \ (*) \end{cases}$$

2. Chi-square goodness of fit test

Chi-square goodness of fit test is a method that examines the significance of the deviation between two distributions. For the *Tankan*, the Bank compares the distributions of population enterprises and sample enterprises for each stratum, and tests the null hypothesis that states "the population distribution and the sample distribution are identical."

The details of the checking procedure:

(1) Subdivide a stratum into several "minimum strata" $(i = 1, 2, \cdots, j)$ by "capital" and "the number of employees" of sample enterprises.

(2) Calculate the number of population enterprises $(N_1, N_2, \cdots, N_j)$ and sample enterprises $(n_1, n_2, \cdots, n_j)$ for each minimum stratum.

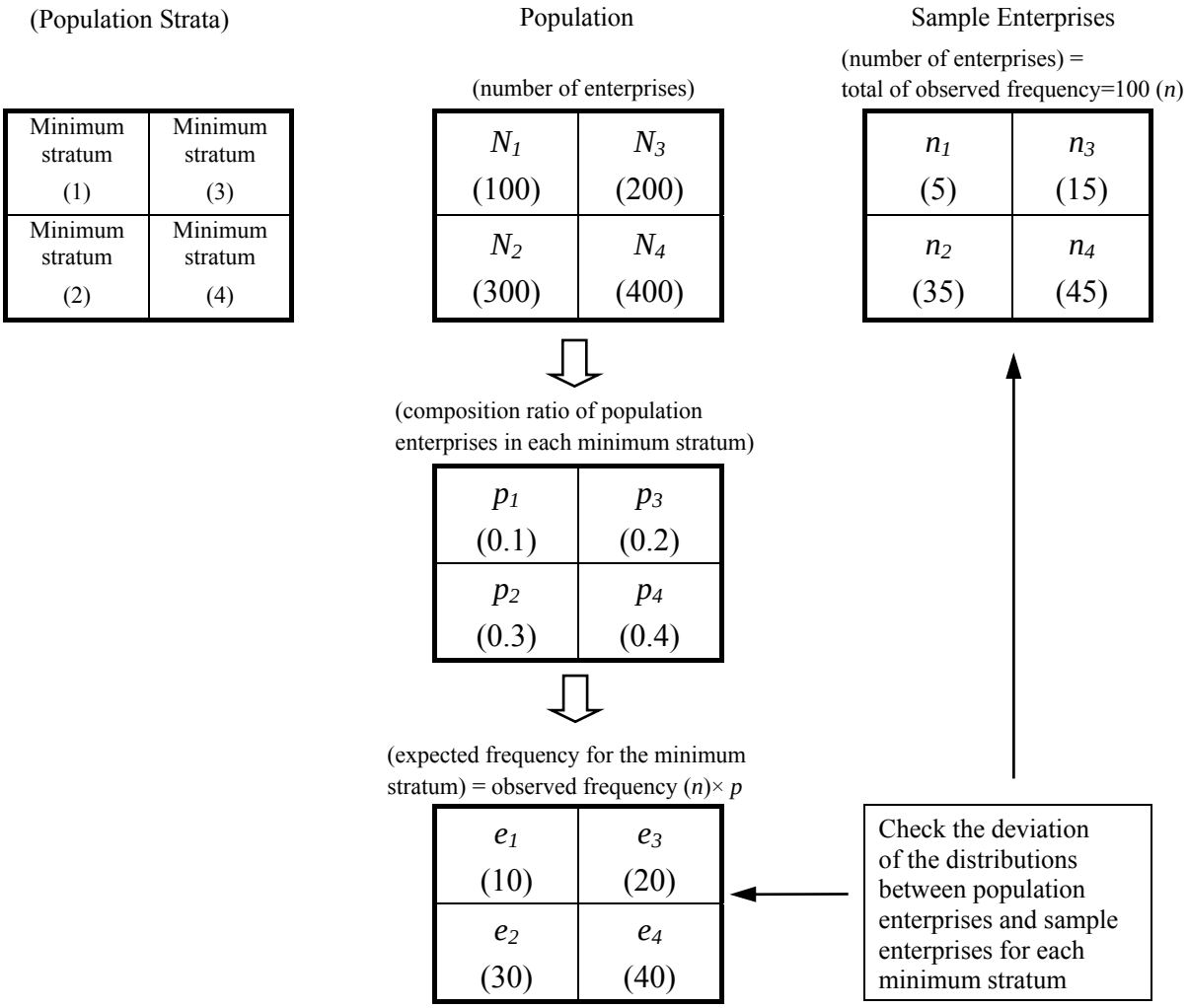
(3) Calculate the composition ratio of population enterprises in each minimum stratum: $(p_i = \frac{N_i}{N}, N \equiv \sum_{k=1}^{j} N_k)$.

(4) According to the null hypothesis, "the population distribution and the sample distribution are identical." If this hypothesis is true, the expected number of sample

enterprises would be $e_i = n \cdot p_i \quad (n = \sum_{k=1}^{j} n_k)$. Here, n_i is the observed frequency for i, and e_i is the expected frequency for the minimum stratum i. The Chi-square goodness of fit test is conducted under the above conditions.

(5) The null hypothesis, that is the population distribution and the sample distribution are identical, is tested by applying the Chi-square goodness of fit test. The upper limit for failure of the test is 5 percent for both side.

Testing the Fitness of the Distributions
(Image diagram, example figures)



Appendix 2

Error Ratio by Industry and Scale

Industry	Large Enterprises	Medium-sized Enterprises	Small Enterprises
Manufacturing	**1.0%**	**2.7%**	**2.5%**
Textiles	2.2%	9.5%	8.9%
Lumber & Wood products	4.9%	9.4%	9.3%
Pulp & Paper	5.8%	9.1%	9.6%
Chemicals	4.4%	8.7%	8.4%
Petroleum & Coal products	3.1%	8.8%	8.7%
Ceramics, Stone & Clay	5.4%	8.3%	9.0%
Iron & Steel	2.3%	9.3%	8.9%
Nonferrous metals	8.4%	9.6%	9.0%
Food & Beverages	5.1%	7.7%	7.9%
Processed metals	3.2%	9.7%	8.3%
General-purpose machinery	2.4%	7.7%	7.3%
Production machinery	4.4%	9.2%	9.2%
Business oriented machinery	2.8%	10.5%	9.2%
Electrical machinery	2.0%	8.1%	9.4%
Shipbuilding, Heavy machinery & Other transportation machinery	1.7%	10.2%	9.2%
Motor vehicles	1.4%	6.9%	7.1%
Other manufacturing	3.5%	10.1%	7.6%
Nonmanufacturing	**3.0%**	**4.6%**	**3.9%**
Construction	2.6%	5.0%	4.1%
Real estate	9.5%	13.4%	14.4%
Goods rental & Leasing	11.1%	11.1%	9.7%
Wholesaling	7.1%	9.5%	9.5%
Retailing	4.4%	9.3%	6.7%
Transport & Postal activities	6.3%	7.2%	8.3%
Communications	7.9%	10.2%	9.2%
Information services	5.3%	8.4%	9.4%
Other information communication	9.1%	7.1%	9.3%
Electric & Gas utilities	1.5%	7.5%	8.2%
Services for businesses	7.2%	9.0%	9.0%
Services for individuals	9.3%	10.3%	10.9%
Accommodations, Eating & Drinking services	8.1%	9.0%	8.8%
Mining & Quarrying of stone and gravel	24.0%	22.5%	18.2%

(Reference) Financial Institutions

Sectors	Population	Sample Enterprises	Error Ratio
Financial Institutions	743	196	**2.4%**
Banks	138	75	—
Shinkin Banks, Other financial institutions for small businesses	275	37	—
Financial products transaction dealers	218	31	—
Insurance companies	94	39	—
Non-deposit money corporations	18	14	—