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Recent Improvements and Prospects of Price Indexes (1)

Corporate Service Price Index (CSPI): Telecommunications Services

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This is the first paper in a series of studies on price indexes. The papers will take into account the rapid progress in the complexity of Japan's economy and in the diversification of pricing behavior among enterprises. The purpose of this series is to help users deepen their understanding of the characteristics of price indexes and to provide price index compilers and researchers with hints on how to improve price indexes for reflecting actual price developments further accurately. Many more papers, focusing on similar themes, will follow.

Recent Improvements and Prospects of Price Indexes (1)

Corporate Service Price Index (CSPI): Telecommunications Services

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Abstract

The Bank of Japan (BOJ) has issued the Corporate Service Price Index (CSPI) since 1985, providing one of the longest time-series indexes worldwide in the field of corporate services. Service prices are the most problematic areas in capturing actual price trends according to our ample experience in compiling this index. Capturing service prices has attracted many concerns of statistics organizations and users worldwide. Telecommunications services, especially, are an area of focus; they are characterized by rapid growth, by being driven by information technology, and by being advanced by government deregulation.

The purpose of this paper is to show how the index of telecommunications services is compiled in Japan by taking into account these features and to evaluate the actual developments of the index.[1] Remarks on limitations and future concerns are also included.

In this paper, the telecommunications industry of Japan is first explained regarding service providers, types of services, and government regulations to the industry as an explanation of circumstances of service price index compilation. Second, pricing methodology that is adopted for the price survey is mainly mentioned. For accuracy, representative or all prices are adopted as surveyed

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[1] This paper was originally a part of the paper presented to the 16th Voorburg Group on Service Statistics held at Örebro, Sweden in September 2001. The original paper was the joint paper compiled with Mr. Gregory Deuchars, Producer Price Index, U.S. Bureau of Labor Statistics (BLS). Comments on this paper from a wide range of views are welcome.

prices. Discounts are counted as price movements on a real-time basis or on a retroactive basis depending on the timing of receiving data. Third, developments of the price index for more than 15 years are analyzed and evaluated. The downward trends due to strong competition among telecommunications companies as a result of deregulation and to quality improvement of telecommunications services caused by technological innovation can be seen. Overall, the index has succeeded in tracking the actual trend of the prices, reflecting our continuous efforts to catch up with the changes in the telecommunications industry. Fourth, limitations and concerns of current price indexes needing to be solved in the future are discussed, such as in terms of pricing methodology adopted to the current price survey, quality adjustment in replacement of price data, and emerging new types of services not yet covered by the CSPI. The final section concludes with some prospects for the index. We continue to try adopting many new types of services emerging in the telecommunications field to the index and to deepen the study for the improvement of quality adjustment.

1.Introduction

The Corporate Service Price Index (CSPI) is a price index that compiles prices of services traded among corporations. The main purpose of the index is to investigate price movements that sensitively reflect the supply and demand condition of individual services, with a view toward facilitating the analysis of both macro- and micro- economic conditions. The CSPI was released in January 1991 with the index series from January 1985. The base year of the index at the time was 1985. Basically, the base year is revised every five years. The current CSPI is compiled on a 1995 base and consists of eight major groups: 1) finance and insurance, 2) real estate services, 3) transportation, 4) information services, 5) communications and broadcasting, 6) advertising services, 7) leasing and rental, and 8) miscellaneous services. Telecommunications services are in the group of communications and broadcasting and hold about 5 percent relative weights in the current CSPI.[2]

Telecommunications services are one of hardest areas to capture actual price trends; they are characterized by their rapid growth, by being driven by information technology, and

[2] For further explanation of the CSPI, visit the Bank of Japan (BOJ) website (http://www.boj.or.jp/en/index.htm). “Explanation of the 1995 Base Corporate Service Price Index” is available at the FAQ section of the website.

by being advanced by government deregulation. Price movements of the services have a decreasing trend due to quality improvement of the services and to extremely fierce competition among telecommunications companies affected by these features. Concretely, companies always try to improve the quality of their services for providing more attractive services to users than the competitors. The number of the service providers has increased due to the deregulation of entry restriction. Companies have adjusted to the price revision undertaken by competitors very quickly with various ideas along with the deregulation regarding pricing. It has made pricing revision flexible and pricing menu diversified. These quality improvements caused by technological innovation and the fierce competition among companies caused by deregulation have decreased prices.

The purpose of this paper is to show how the index of telecommunications services is compiled in Japan by taking into account these features and to evaluate the actual developments of the index. We also add some remarks on limitations and concerns that need to be addressed in the future.

The rest of this paper consists of following six parts, from Sections 2 through 7.

The structure of the telecommunications industry of Japan is explained in Section 2. Telecommunications is an expanding industry in Japan. Output exceeded 12 trillion-yen during fiscal year 2000. There were 9,349 telecommunications companies in Japan as of March 2001, of which the number has tripled, in the past five years. Details of the telecommunications companies and types of services provided by the companies are further explained in this section.

Government regulation is mentioned in Section 3. The government regulates companies wishing to enter the telecommunications industry by type of business entities under the Telecommunications Business Law. Regarding the revision of price tables, companies need to notify to the government, except for connecting services, which requires prior permission from the government for the revision.

In Section 4, surveyed prices actually used for the CSPI compilation are explained. At first, the category of “item,” which is the lowest index aggregation level of the CSPI consisting of surveyed services, is defined. The definitions of item are made by type of services focusing on a “network” for providing telecommunications services. Then,

surveyed prices are explained by item along with types of services, transaction conditions, and pricing methodology. Especially, pricing methodology adopted for the price survey of telecommunications services is the focus of explanation. Representative services or all services are selected and actual transactions or models are specified for the price survey. For constructing the models, price tables and discount rates are combined. Discounts are reflected in the index by using two pricing methodologies, when the discounts have an impact on price movements. One pricing methodology is "on a real-time basis." Another is "on a retroactive basis." The methodology is selected depending on the timing of receiving data. For the latter case, the index is released reflecting the previous term of discounts at once. Then, the index is periodically recalculated and released after the corresponding term of discount data are obtained.

In Section 5, published data are analyzed and evaluated. The analysis is undertaken by dividing the term into three periods: 1) from 1985 through 1995, 2) from 1996 through around 2000, and 3) from around 2000 to the present. The third period shows the largest declines—an annual average of around 6 percent. There are two significant aspects of the analysis of price movements: 1) strong competition among telecommunications companies as a result of deregulation, and 2) quality improvement of telecommunications services due to technological innovation. Overall, the index has succeeded in tracking the actual trend of prices, reflecting our efforts to catch up with the changes in the telecommunications industry.

In Section 6, limitations and concerns regarding published data are pointed out. Limitations in the chosen pricing methodology and in quality adjustment, along with concerns about emerging new items, are included in this section.

In Section 7 concludes the paper and points out remaining issues of compiling this index that need to be solved in the future.

2. Structure of Industry

The telecommunications industry of Japan has expanded and produced more than 12 trillion yen during fiscal year 2000.[3] The number of companies entering the

[3] This figure is from the "Nikkei Communications 2001. 7. 2 No.345" compiled by Nikkei

telecommunications market to provide services reached 9,349 as of March 2001, or has increased approximately three-fold in the past five years.[4] Details of the telecommunications companies and types of services provided by the companies are as follows.

Telecommunications companies can be divided into two classifications: 1) those belonging to one of the three major groups, and 2) everyone else. In the first group, companies belong to the Nippon Telegraph and Telephone Corporation (NTT) group, the KDDI group, or the Japan Telecom (JT) group. Each group consists of a number of companies by type of service, such as fixed telecommunications services and mobile telecommunications services, or by area of service provided. In the second group, there are pager service companies and other types of telecommunications service companies, such as domestic telephone companies mainly providing fixed local telephone services and thousands of Internet service providers that either organize into small groups of companies or are independent. In addition, the number of emerging companies has recently increased as a result of deregulation regarding entry restrictions. They are generally small in size, but they may succeed in breaking through the existing telecommunications industry and play a role in effecting great change in the industry, because they always try to lower existing service prices and to provide new services at reasonable prices.

Telecommunications services are divided into three categories: fixed telecommunications services, mobile telecommunications services, and services of inter-telecommunications companies. Fixed telecommunications services provide transmission services by using telecommunications networks, mainly constructed of copper and fiber cables, to communicate between fixed-point-of-transmission senders and receivers. Mobile telecommunications services provide transmission services with portable equipment, such as cellular phones. One role of inter-telecommunications service is to supplement the transmission networks of telecommunications companies to provide their own services.

Business Publications, Inc. The figure include output for households, which is beyond the scope of the Corporate Service Price Index (CSPI) compiled by the BOJ.

[4] This figure is from the "2001 WHITE PAPER Information and Communications in Japan" compiled by the Statistics Bureau, Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT).

Fixed telecommunications services are, for example, fixed telephone services, Integrated Services Digital Network (ISDN), leased circuits, and data transmission services. Fixed telephone services and ISDN produced a 5,049 billion-yen output during the fiscal year of 2000.[5] The NTT group holds 84 percent share of the output, the KDDI group holds 9 percent, the JT group holds 5 percent, and other emerging companies hold 2 percent. Leased circuits produced 878 billion yen during the fiscal year of 2000, of which the NTT group holds 74 percent share of the output, the KDDI group holds 8 percent, the JT group holds 5 percent, and other emerging companies hold 13 percent. Data transmission services produced 382 billion yen during the fiscal year of 2000. Fifty-eight percent of that went to the NTT group, versus 26 percent for the KDDI group, 12 percent for the JT group, and 4 percent for the other emerging companies.

Mobile telecommunications services consist of cellular phone services, PHS services, and pager services. Cellular phone services produced 5,617 billion-yen in output during the fiscal year of 2000.[6] This is the first time the sum of output of domestic fixed telephone services and ISDN has been exceeded by that of cellular phone services. The NTT group holds 62 percent share of the output, the KDDI group holds 23 percent, and the JT group holds 15 percent. All cellular phone service companies, which stand by area of providing services, belong to one of the three major groups.

PHS services produced 404 billion-yen in output during the fiscal year of 2000.[7] The KDDI group, the NTT group, and others. The KDDI group holds the largest share of the output.

Pager services are decreasing their shares as other mobile services like cellular phone services and PHS services increase. The NTT group and other independent pager service companies provide the services. The NTT group holds the largest share of the output.

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[5] The figures cited in this paragraph are from the "Nikkei Communications 2001. 7. 2 No.345" compiled by Nikkei Business Publications, Inc. These figures include output for households, which is beyond the scope of the CSPI compiled by the BOJ.

[6] The figures cited in this paragraph are from the "Nikkei Communications 2001. 7. 2 No.345" compiled by Nikkei Business Publications, Inc. These figures include output for households, which is beyond the scope of the CSPI compiled by the BOJ.

[7] The figures cited in this paragraph are from the "Nikkei Communications 2001. 7. 2 No.345" compiled by Nikkei Business Publications, Inc. These figures include output for households, which is beyond the scope of the CSPI compiled by the BOJ.

Services of inter-telecommunications companies are represented by connecting services of networks between telecommunications companies. Telecommunication companies utilize the networks of others to expand their own networks, depending on the transmission of users. Output of the services during the calendar year of 1995 was about 55 billion yen.[8]

3. Government Regulation

The government regulates companies by type of business entities under the Telecommunications Business Law when they enter the telecommunications industry. There are two types of those defined by the facilities they own. Companies that have their own facilities are categorized as a Type I Telecommunication Business. Companies that don't have their own facilities are categorized as a Type II Telecommunication Business.

Companies wishing to enter the telecommunications industry as a Type I Telecommunications Business need to obtain prior permission from the Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT). While companies wishing to start their business categorized as Type II Telecommunications Business need to obtain registration from the MPHPT or report notification to the MPHPT, depending on the type of services that they want to start.

The NTT Law restricts a part of the NTT group—the NTT holding company, Nippon Telegraph and Telephone East Corporation (NTT-East), and Nippon Telegraph and Telephone West Corporation (NTT-West)—regarding their business. For example, areas of providing services and types of them are restricted by the Law.

To revise price tables, telecommunications companies do not need to adhere to government regulation. They can make their own decisions regarding pricing of their providing services. However, they need to report notification to the MPHPT regarding the revision of their price tables. There is an exception regarding connecting services. That is the case of revising access charges, which are paid by telecommunications

[8] The figure cited in this paragraph is the estimated number used for weight calculation of the CSPI. The estimation is based on "1995 Input-Output Table for Japan," compiled by the MPHPT.

companies for usage of the networks of other telecommunications companies. Prior permission from the MPHPT is required.

4. Pricing Methodology

For capturing price movements of telecommunications services, surveyed prices are selected by "item," which is the lowest index aggregation level that is published in the CSPI and is defined by type of services focusing on a "network" for providing telecommunications services. Surveyed prices are specified by types of services, transaction conditions, and pricing methodology.

There are ten items of telecommunications services in the CSPI. For fixed telecommunications services, there are six items: "domestic fixed telephone services," "international fixed telephone services," "Integrated Services Digital Network (ISDN)," "data transmission services," "domestic leased circuits," and "international leased circuits." For mobile telecommunications services, there are three items: "cellular phone services," "Personal Handyphone System (PHS) services," and "pager services." For services of inter-telecommunications companies, there is one item: "access charges." They are classified by type of services defined by telecommunications network, not by industry.[9] For the publication structure of the CSPI and its relationship to the Central Product Classification (CPC) Version 1.0., see Chart 1.[10]

Telecommunications services adopted in the CSPI are defined by focusing on a "network" for providing telecommunications services. "Network" is the key word in compiling indexes of telecommunications services. To define items, to design

[9] The CSPI adopts a classification system based on type of service. In the classification system, outputs of each company are categorized by the type of service. This is different from the industry classification system, in which outputs are categorized by the major output of each company. In the industry classification system, all outputs of each company are counted in one industry, although minor output can be quite different from the output of the industry in which the company is categorized.

Therefore, the item "cellular phone services" in the CSPI, for example, includes cellular phone services only. Even if the providers supply services categorized in other fields, they are not included in the item "cellular phone services."

[10] The Central Product Classification (CPC) is the international classification covering both goods and services defined by type of products not by industry. The CPC Version 1.0 has been approved by the United Nations Statistical Commission in 1997.

classification for the publication, and to choose price data being collected from companies, the structure and function of the "network" is scrutinized.

A "network" of telecommunications services is like a spider's web. Points are connected to other points by various nodes and lines. For example, telecommunication companies, which are categorized as Type I Telecommunication Businesses under the Telecommunications Business Law, have their own facilities. However, they need to supplement their networks by connecting to other networks to provide broader services, according to users' needs. More concretely, to call from a cellular phone to a fixed telephone, the network of the cellular phone and the fixed telephone have to be connected. These connections complicate index compilation and make it difficult to explain each output of telecommunications services. For detailed definitions of items of the CSPI, see Chart 2.

In compiling an index for each item, actual transaction prices or model prices reflecting both average revision rate of price table and discount rate are surveyed. By this method, the main transaction prices of telecommunications services can be traced.

An alternative method would be the average unit price per contract method. However, under this method, changes of quality or quantity may be included in the price movements because many telecommunications services have the charge system consisting of two parts: the base fee and per-call charges. Depending on the distance, length, time of calls, and the type of receivers of counterparts, the quality or quantity of per-call charges for one month will change, while the number of users, who all pay a base fee, will also change. Considering that the various kinds of noises are large enough to distort the quality of data, the average unit price has not been adopted as price data for the CSPI.

A detailed explanation of our method follows.

4-1. Fixed telecommunications services

4-1-1. Domestic fixed telephone services

Domestic fixed telephone services provide voice transmission services from a fixed place of transmission to its receivers by using analog lines between senders and a "group unit center (GC)." GC is the bundling place that transfers the transmission efficiently from

senders to receivers through other GCs. Usually, the line between senders and the GC is made of copper cable. When senders install modems between digital equipment such as personal computers and the line, data transmission on the line-dominating switching system is also available by the fixed telephone services. But the transmission speed is limited to 33.6 kbps (kilobit per second) by the current technology, because the digital data must be converted to analog to transmit by analog lines.

Prices of domestic fixed telephone services consist of base fee and per-call charges. Discounts are included in the price data if they are considered as representative (most popularly transacted) of price movement. All discount plans or representatives are surveyed depending on the impact on the price movements and availability of the data. For the selection of discounts surveyed, various types of discounts plans are fully and carefully examined with the assistance of reporting companies, as each company has various and unique discount plans.

For the base fee, monthly charges are surveyed. The base fee is the charge for giving the right to use fixed telephone services with certain registered numbers for a month.

For the per-call charges, two types of pricing methodology are adopted. The first takes up charges of representative calls per three minutes as price data. They are, for example: a) middle-distance call on weekdays during the daytime, and b) long-distance call on weekdays during the nighttime and on weekends. The second type adopts charges of all calls by reflecting the average revision rate of the price table to the base price level, such as 1,000 yen in January 1995, as price data. In both cases, price changes excluding discounts are reflected in the indexes when the price table is revised. Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies explained below.

For the per-call charges, discounts are included if they are considered as representative price movements of the services. In reflecting discounts to the indexes, “on a real-time basis” and “on a retroactive basis” are adopted. In August 2000, a retroactive index revision to reflect discounts obtained “on a retroactive basis” was undertaken for the first time. The actual effect of the revision is shown in Chart 3.

When it is possible to reflect the price movement due to discounts into the CSPI without delay, they are reflected “on a real-time basis.” An example: under the condition that

calls on weekdays during the daytime, along with a long-term contract discount of 1-2 years, are representative for per-call charges provided by a company:

Regular price for a per-call charge:
100 yen per 3 minutes on weekdays during the daytime (A)
Discount rate for long-term contract
(contracts of 1-2 years) : 5% (B)
Price data for the CSPI : 95 yen = 100 yen ∗ (100% - 5%) (C)

The actual process of compiling and publishing the index is as follows.

Survey the regular price for the service (A) and the accompanying representative discount rate (B). Multiply (A) by (100% - B), and obtain (C). Then put (C) into the CSPI indexes.

When it is impossible to reflect the discounts on a real-time basis because the effect of discount can be captured after the index calculation and its release, such as at the time of calculating the P/L of service providers, they are reflected "on a retroactive basis." An example is as follows:

Regular price for a per-call charge:
100 yen per 3 minutes on weekdays during the daytime (A)
Ex post average discount rates of all the calls
during the survey period: 10% (B)
Price data for the CSPI : 90 yen = 100 yen ∗ (100% - 10%) (C)

The actual process of compiling and publishing the index is as follows.

Survey the regular price for the service (A). Publish the index calculated from the regular price for the time being. After the average discount rates of all the calls during the survey period have been reported by the surveyed companies (B), multiply (A) by (100% - B), and obtain (C). Replace (A) by (C) at the time the discount was actually applied retroactively in the CSPI.

If an average discount rate for the previous period is available, that discount rate is used for the index calculation provisionally $(C)^P$. When the actual discount rate for the surveyed period is reported, $(C)^P$ is replaced by (C).

An experimental case, in which the figures are fictional, to cope with discounts in the CSPI can be seen in Chart 4.

4-1-2. International fixed telephone services

International fixed telephone services provide mainly voice transmission services from fixed places in Japan to other fixed places or to mobile phones overseas.

For tracking prices of international fixed telephone services, per-call charges are surveyed. There are two types of pricing methodology adopted. The first type takes up charges for representative calls per three minutes as price data. They are, for example, a) a call to Korea, Taiwan, United States, United Kingdom, Australia, and African countries on weekdays during the daytime, and b) a call to Taiwan, United States, and United Kingdom on weekdays during the midnight or early in the morning. The second type adopts the charges of all calls by reflecting the average revision rate of the price table to the base price level, such as 1,000 yen in January 1995, as price data. In both cases, price changes excluding discounts are reflected in the indexes when the price table is revised.

Discounts are included if they are considered as representative of price movement. The scheme of reflecting discounts is the same as that of "domestic fixed telephone services." Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies: "on a real-time basis" and "on a retroactive basis." For the effect of retroactive index revision undertaken in October 2000, see Chart 3.

4-1-3. Integrated Services Digital Network (ISDN)

Integrated Services Digital Network (ISDN) provides a digital network that can transmit various types of transmission, such as voice and data, on the line-dominating switching system, and data transmission on the packet switching system. Transmission from a fixed place to receivers is operated by a digital line between senders and the GC. This is different from that of "domestic fixed telephone services." The line is made of copper or fiber cable. When senders adopt copper cable, transmission speed is limited to 144kbps

by the current technology. While when users adopt fiber cable, transmission speed is currently available by 1.5 Mbps (megabit per second).

For tracking prices of ISDN, base fee and per-call charges are surveyed respectively. Discounts are included in the per-call charges for domestic transmission. The scheme of reflecting discounts is the same as that of "domestic fixed telephone services." Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies: "on a real-time basis" and "on a retroactive basis."

For the base fee, monthly charges are surveyed. The base fee is the charge for giving the right to use ISDN with certain registered numbers for a month.

For the per-call charges for domestic transmission, two types of pricing methodology are adopted. The first takes up charges for representative calls per three minutes as price data. They are, for example, a) middle-distance call on weekdays during the daytime, and b) long-distance call on weekdays during the nighttime and on weekends. The second type adopts charges of all calls by reflecting the average revision rate of the price table to the base price level, such as 1,000 yen in January 1995, as price data. In both cases, price changes excluding discounts are reflected in the indexes when the price table is revised.

For the per-call charges for international transmission, calls per three minutes to a) North America, b) United Kingdom, c) Hong Kong, d) Australia, and e) Africa are surveyed.

4-1-4. Data transmission services

Data transmission services provide networks that are settled by various types of transmission methods, such as that of packet switching, and that of the Internet.

For tracking prices of data transmission services, two types of monthly charges are surveyed: a) charges for using the packet switching type of network, and b) charges for accessing the Internet. As for b), two types of charges by different ways of accessing the Internet are surveyed: access by leased circuits, and dial-up. Further, four types of transmission speed for accessing by leased circuits are surveyed: 64 kbps, 128 kbps, 1.5 Mbps, and 6 Mbps.

4-1-5. Domestic leased circuits

Domestic leased circuits provide private transmission lines, which are available only for contracted customers. There are both analog and digital leased circuits. As for the analog type of leased circuits, voice transmission is available. When users adopt modems between digital equipment such as personal computers and the line, data transmission is also available. But the transmission speed is limited to 33.6 kbps, because the digital data must be converted to analog to transmit by analog lines. As for the digital type of leased circuits, the transmission speed is generally faster. There are many types of digital transmission speed. Currently, those of 50 bps through 600 Mbps are available.

For tracking prices of domestic leased circuits, monthly fees for the analog circuits and digital circuits are surveyed. Discounts are included if they are considered as representative of price movement. The scheme of reflecting discounts is the same as that of "domestic fixed telephone services." Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies: "on a real-time basis" and "on a retroactive basis."

For both analog and digital circuits, two types of pricing methodology are adopted. The first type takes up monthly fees for specifying representative services. These services are divided by terms of type of circuit and category of distance for the analog circuits and by terms of transmission speed and category of distance for the digital circuits. The examples of the analog circuits are: a) long-distance for voice transmission, and b) long-distance for voice and data transmission, while those of the digital circuits are: a) short-distance at 64 kbps, and b) long-distance at 1.5 Mbps. The second type adopts monthly fees for representative types of circuits by reflecting the average revision rate of the price table to the base price level, such as 1,000 yen in January 1995, as price data. In both cases, price changes excluding discounts are reflected in the indexes when the price table is revised.

4-1-6. International leased circuits

International leased circuits provide private transmission lines, which are available only for contracted customers, for intermediate transmissions from Japan to foreign countries. There are both analog and digital leased circuits. For analog, voice transmission is available. When users install modems between digital equipment such as personal computers and the line, data transmission is also available. But the transmission speed is

limited to 33.6 kbps, because the digital data must be converted to analog to transmit by analog lines. As for the digital type of leased circuits, transmission speed is generally faster. There are many types of digital transmission speed, from 12.5 bps to 150 Mbps currently.

International leased circuits supplied by Japan's providers must connect with other parts in three ways: 1) from senders to the starting point of international leased circuits provided by Japan's providers, 2) from the end of the circuits provided by Japan's providers, which is the starting point of other international leased circuits supplied by providers abroad, to the end of the circuits supplied by providers abroad, and 3) from the end of the circuits provided by providers abroad to receivers.

For tracking prices of both analog and digital circuits, monthly fees for specifying representative services are surveyed. Examples are voice transmission to the United Kingdom for analog circuits, data transmission at 64 kbps to Hong Kong, at 1.5 Mbps to the United Kingdom, and at 2.0 Mbps to the United States for digital circuits. Price changes excluding discounts are reflected in the indexes when the price table is revised.

Discounts are included if they are considered as representative of price movement. The scheme of reflecting discounts is the same as that of "domestic fixed telephone services." Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies: "on a real-time basis" and "on a retroactive basis."

4-2. Mobile telecommunications services

4-2-1. Cellular phone services

Cellular phone services provide voice transmission services and data transmission services for mobile users. The digital radio telecommunications systems used are personal digital cellular (PDC) and cdmaOne. The frequency bandwidth used for telecommunications is around 800 MHz or 1.5 GHz. The PDC adopts a radio transmission method called "time division multiple access (TDMA)," while cdmaOne adopts "code division multiple access (CDMA)." Data transmission speed is from 9,600 bps to 14.4 kbps for the line-dominated type of switching and from 14.4 kbps to 64 kbps for the packet type.

As for the voice transmission services, phone calls to cellular phones, PHS phones, and

fixed telephones are available.[11] Calls from fixed telephones to cellular phones are also included in the item of "cellular phone services" of the CSPI. Cellular phone companies started offering international telephone services in April 2000 by allowing "roaming," which allows their mobile equipment to be used abroad.

As for the data transmission services, mail between cellular phones, e-mail, and Internet access services are available.

For cellular phone services, base fees and per-call charges are surveyed respectively. Discounts are included if they are considered as representative of price movement. The scheme of reflecting discounts is the same as that of "domestic fixed telephone services." Price changes caused by the discounts are reflected in the index by adopting one of the two pricing methodologies: "on a real-time basis" and "on a retroactive basis." For the effect of retroactive index revision undertaken in October 2000, see Chart 3.

For base fees, monthly charges are surveyed. The base fee is the charge for the right to use cellular phone services with certain registered numbers for a month.

For the per-call charges, charges of all calls by reflecting the average revision rate of the price table to the base price level, such as 1,000 yen in January 1995, are adopted as price data. There are exceptions of data transmission services and international telephone services that are not included in the charges. Price changes excluding discounts are reflected in the indexes when the price table is revised.

4-2-2. Personal Handyphone System (PHS) services

Personal Handyphone System (PHS) services provide voice transmission services and data transmission services for mobile users. Their services are similar to cellular phone services. The PHS services differ from cellular phone services in the sense that PHS uses a radio telecommunications system, which is called the "personal handyphone system," and that the level of frequency bandwidth used for PHS services is around 1.9 GHz. Because of these differences, the quality of voice transmissions is clearer and average data transmission speed, which is between 32 kbps to 64 kbps for the line-dominated type

[11]Phone calls to fixed telephones in foreign countries are included in "international fixed telephone call." For a definition of items adopted in the CSPI, see Chart 2.

of switching, is faster than those of cellular phone services, which is between 9600 bps to 14.4 kbps. On the other hand, PHS has less mobility than the cellular phone. More concretely, it is sometimes impossible for PHS to transmit and to receive in a high-speed moving car or train because of technical limitations in the radio telecommunications system.

As for the voice transmission services, phone calls to PHS phones, cellular phones, and fixed phones are included in the item of "PHS services" of the CSPI. Calls from fixed telephones to PHS phones are also included in that item of the CSPI.

As for data transmission services, mail between PHS phones, e-mail, and Internet access services are available.

For PHS services, base fees and per-call charges are adopted as price data to be collected from companies. They are parallel to those of cellular phone services. For the base fee, monthly charges are surveyed. For the per-call charges, the charges for a representative call for three minutes are surveyed as price data. There are four types of combinations of senders and receivers: 1) from PHS to PHS, 2) from PHS to domestic fixed telephones, 3) from PHS to cellular phones, and 4) from domestic fixed phones to PHS. In each type of combination, representative calls are surveyed. For example, for calls from PHS to PHS, a) calls within the minimum unit of area where the senders are located, on weekdays during the daytime, and b) long-distance calls on weekdays during the daytime are selected as price data. Discounts are not included, because discounts are not dominant in this market at present and their price movements are parallel to regular price movements.

4-2-3. Pager services

Pager services provide data transmission services. Demand for pager services is declining because they are being replaced by growing demands from cellular phone services and PHS services. Pager services remain popular among some business users because the cost is lower than that of cellular phone services and PHS services. Their most advanced radio telecommunications system is FLEX-TD. These services use frequency bandwidth around 280 MHz.

For pager services, monthly charges are adopted as price data.

4-3. Services of inter-telecommunications companies

4-3-1. Access charges

Access charges are the charges to connect to a telecommunications network supplied by major domestic telecommunications companies to other telecommunications companies that have the intention to supplement their telecommunications networks to adjust to customer needs. Charges per three minutes are surveyed.

5. Analysis of "Goodness" of Published Data

The indexes of telecommunications services have been compiled for more than 15 years, starting in January 1985. The indexes generally show a decreasing trend, reflecting the strong competition induced by deregulation and the technological innovation.[12] Because the telecommunications industry can enjoy the merits of economies of scale, they have an incentive to increase their customer bases by competing fiercely and lowering prices. The downward trends can be analyzed by dividing three different periods: from 1985 through 1995, from 1996 through around 2000, and from around 2000 to the present. Each period has different factors that have influenced the downward price trend, but all factors can be classified uniformly as either strong competition among telecommunications companies as a result of deregulation or quality improvement of telecommunications services due to technological innovation. The decreasing trend of the indexes during the first period, from 1985 through 1995, was mainly due to deregulation of entry restrictions. The downward trend during the second period, from 1996 through around 2000, was due to the mixture of further deregulation of entry restrictions, deregulation in the supervision of pricing, and technological innovation. The declining trend of the third period, from around 2000 to the present, was mainly owed to technological innovation and continued competition. The third period shows the largest decline—an annual average of around 6 percent.

5-1. Decreasing trend during the first period—from 1985 through 1995

Until 1985, Japan's telecommunications industry was dominated by only two organizations: the Nippon Telegraph and Telephone Public Corporation and the Kokusai

[12] See Chart 5 for the developments of indexes of telecommunications services. Graphs of the indexes are available.

Denshin Denwa Corporation (KDD). The former was a 100-percent government-owned organization, which had a monopoly on domestic telecommunications services. The latter was a private company regulated by the Kokusai Denshin Denwa (KDD) Law, which had a monopoly on international telecommunications services.[13]

The first step of deregulation was carried out in 1985. Nippon Telegraph and Telephone Public Corporation was privatized and renamed Nippon Telegraph and Telephone Corporation (NTT) by the enforcement of the NTT Law. The entry of new companies, so-called New Common Carriers (NCC), was allowed by the Telecommunication Business Law. This deregulation induced competition between telecommunications companies. Thus the service prices have decreased.

However, even after deregulation, each company was permitted to do business only in one field of telecommunications services, and the number of companies in each field was also regulated.[14] During this deregulation process, the authorities paid special attention to "maintaining a stable supply of telecommunications services," and to "preventing excessive competition among telecommunications companies."

5-2. Downward trend during the second period—from 1996 through around 2000

The second step of deregulation took place in the second half of the 1990s. Cross-market entries such as those between domestic and international telephone services were permitted from 1996 to 1997.[15] Entries of domestic non-telecommunications companies and foreign telecommunications companies were also allowed in 1997 and from 1998 to

[13] The Kokusai Denshin Denwa Corporation (KDD) was founded as a private company in April 1953 by the Kokusai Denshin Denwa (KDD) Law, separated from the Nippon Telegraph and Telephone Public Corporation, which was founded in1952.

[14] Telecommunications services had been partitioned by the Regulations for Enforcement of the Telecommunication Business Law until its revision in January 1996. The partitions included domestic local telephone services, domestic long-distance telephone services, cellular and car phone services, PHS (Personal Handyphone System) services, pager services, international telephone services, and satellite telecommunications services.

[15] In January 1996, the "Manual for Market Entry into Japanese Telecommunications Business," which allows telecommunications companies except for the NTT and KDD to operate in multiple telecommunications fields, was announced by the Ministry of Posts and Telecommunications (MPT), (currently the MPHPT). Furthermore, in June 1997, the NTT Law and the KDD Law were revised. By the revision, NTT was allowed to start international telecommunications services through a subsidiary company, and KDD was allowed to start domestic telecommunications services.

1999 respectively.[16]

This deregulation has intensified price competition, which has led to accelerated price reductions and diversification in the combinations and classifications of services and charge systems.

The pricing of telecommunications services had been regulated, requiring prior permission by the Ministry of Posts and Telecommunications (MPT). In cellular phones, PHS (Personal Handyphone System), and pager services, this regulation was eased in December 1996, shifting from prior permission to notification, due to the revision of the Regulations for Enforcement of the Telecommunication Business Law. As for domestic and international telecommunications services, similar deregulation took place in November 1998 due to the revision of the Telecommunication Business Law.[17] As deregulation regarding pricing has made pricing revision flexible and pricing menu diversified, companies can adjust price revision undertaken by competitors very quickly with various ideas. Competition among telecommunications companies was thus intensified and the related prices plummeted.

Technological innovation in the telecommunications industry has lowered prices by both internal technological innovation and by the intensified competition. For example, with these technological innovations, easy-to-carry terminal machines and lighter and smaller units for cellular phone services were introduced. These innovations have made the demand for cellular phone services soar. The prices have been lowered because such huge demand has lowered cost per unit and intensified price competition in cellular phone services, as cellular phone services companies have scrambled to acquire new customers.

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[16] In May 1997, companies in domestic non-telecommunications industries were allowed to enter the telecommunication field by the revision of the Telecommunication Business Law.

In February 1998, the regulation that set the maximum ratio of foreign capital in Japanese telecommunications companies (one-third at most) was removed, except for NTT and KDD, by the revision of the Telecommunication Business Law and the Radio Law. In November 1998, the regulation on KDD, of which the maximum foreign ownership ratio had been limited to one-fifth, was removed by the abolishment of the KDD Law. Furthermore, in July 1999, NTT was divided according to the revision the NTT Law in June 1997, and the regulation on the NTT Communication Corporation, one of the descendants of NTT, was removed. The maximum foreign ownership ration under regulation for NTT had been limited to one-fifth.

[17] NTT was an exception to the deregulation.

5-3. Declining trend during the third period—from around 2000 up to date

Technological innovation in telecommunications services field has been accelerated recently and many new technologies have been introduced. For example, new services such as ADSL (Asymmetric Digital Subscriber Line) have been introduced to the market, as mentioned in section 6-3. Charges for accessing the Internet have decreased. Quality of voice through mobile phones is improving due to technological innovation in terms of radio telecommunications system, as mentioned in section 6-2-1. Those downward price movements are reflected in the index, although it cannot be said to be sufficient due to the difficulties of quality adjustment.

As for domestic fixed telephone services, the fierce competition for providing new services among carriers to expand their customer bases has continued. This can be seen in the steep decline of the index of that item.

5-4. Overall evaluation

The index has generally succeeded in capturing the dynamic changes in telecommunications service price developments for more than 15 years based on the intensified competition and the rapid changes in technology. This result also shows that the price survey explained in this paper is valid. To catch up with the changes in telecommunications services to improve the accuracy of price index, various efforts are undertaken. For example, new pricing methodology for reflecting discounts to the price movements have been adopted to the 1995 base index, as the telecommunication companies have started to expand their pricing menu by introducing discount plans. In addition, as our effort to appropriately catch up with the changes of telecommunications industry, emerging services; ISDN and PHS services, have been introduced to the index as new items at the time of the index revision from 1990 base to 1995 base, which was released in 1999 with retroactive indexes from January 1995. And both companies collecting prices and surveyed prices have been changed along with emergence or disappearance of them, such as for the item of data transmission services. For example, as the Internet providing services, which are faced with extremely fierce competition due to increase in the number of providers caused by the deregulation of entry restriction and the technological innovation, are categorized in this item, companies collecting prices and surveyed prices are always reviewed. As a result, the number of companies and surveyed prices continue to increase from the beginning of the index.

6. Limitations and Concerns Regarding Published Data

We have done our best to compile accurate index of telecommunications services. However, limitations and concerns of the index still exist, such as regarding pricing methodology currently adopted, treatment of bundling services providing different type of services as a package at one price, quality adjustment for replacing price data, and newly emerging services not yet covered by the CSPI. As telecommunications services especially diversify pricing menu and type of service, and are extremely affected by the rapid changes of technological innovation, it is very important for the index compilers to tackle these limitations and concerns. The followings are the concrete examples of each limitation and concern.

6-1. Limitations in the chosen pricing methodology

6-1-1. Limitation in the survey of per-call charges based on average revision rate

The average revision rate is normally calculated using weights of the nearest term of the revision of the price table. The weights are compiled by sales amount of each service segmented in price table. Each segmentation is divided by the criteria of day (e.g., weekday, weekend), time (e.g., early in the morning, daytime, nighttime, midnight), and distance of call.

Until the 1990 base index, some of companies cooperated with us in reporting the average revision rate calculated by the fixed weights of the base year. As the Laspeyres formula, which is weighted arithmetic mean based on the fixed value-based weights for the base period, is adopted for the index calculation, the fixed-weight average revision rate is ideal for the price survey. We have continued to try to collect the fixed-weight average revision rate during the 1985 base and 1990 base index. However, the weights of each service segmented in price table have rapidly been changed as a result of strong price competitions among companies. Further, partition of services on price table have also been changed rapidly due to price revision with bundling or unbundling services. Through our experiences in compiling index of 1985 base and 1990 base, we have learned that the fixed-weight average revision rate comes not to be able to capture the actual price movements as time passes from the base year of the index. It is necessary to adjust price survey to the rapid changes of telecommunications services. From the 1995 base index, we have decided to discontinue surveying the fixed-weight average revision rate and change them all to the average revision rate calculated by the weights of the

nearest term of the revision of the price table.

However, the price survey by the average revision rate calculated by the weights of the nearest term of the revision of the price table still has a limitation. If new or modified services are introduced on a large scale at the same time of the revision, or if the sales ratio of each segmented service on the price table is greatly changed due to the revision, the bias caused by these factors may be significant.

6-2. Concerns about the accuracy of index movement and other related index movement concerns

6-2-1. Bundling contracts within telecommunications services

Bundled services within telecommunications services are increasing due to accelerated competition among telecommunications companies. It is very difficult for us to capture the prices of each individual service because bundled services often offer various types of discount plans. We are now discussing this matter with the telecommunications companies.

6-2-2. Bundling contracts with services in other fields

Bundled services with other services such as information services through Internet access seem to be increasing. When it becomes impossible to do separate price surveys, we will have to reclassify the index.

6-3. Quality adjustment

6-3-1. Quality improvement in clearness of voice on mobile phones

Due to technological innovation in terms of radio telecommunications systems, the quality of voice through mobile phones, such as cellular phone and PHS phones, is improving, but the price tables are unchanged in response to this improvement. Since we don’t have a good way to solve this problem, we have not yet been able to adjust this quality improvement. If we could reflect this quality improvement into the index, the downward price movement would be greater.

6-3-2. Quality improvement in terms of equipment for PHS services

Due to technological innovation in equipment for PHS services, the numbers of accidental cut-offs of calls in a high-speed car or train are declining. We have not yet been able to adjust this quality improvement, since it is very hard to measure the value of the quality improvement of this type. If we could reflect this quality improvement into the index, the downward price movement would be greater.

6-4. New item bias concerns

Technological innovation occurs very rapidly in the field of telecommunications services and new services are constantly being offered. However, we always try to keep up with the changes caused by the technological innovation for compiling an increasingly accurate price index.

For example, the number of mobile data transmission, such as accessing the Internet and exchanging e-mail by cellular phones and PHS phones, not by personal computers, has soared. The number of data transmission services users by cellular phone exceeded 40 million as of 31 June 2001. We are now studying ways to survey the prices of these mobile data transmission services.

Concern in the near future would be how to treat ADSL (Asymmetric Digital Subscriber Line), a new technology that can change transmission speed by copper cable dramatically. How can we adjust this quality change of copper cable for surveying the item of "domestic fixed telephone services" in the CSPI? Or should we recognize ADSL as a new item of services? We are now studying various adjustment methods. As the sales of ADSL are increasing, we have started to study how the ADSL services should be captured in the CSPI.

7. Conclusion

This paper has explained the price survey of telecommunications services for compiling the CSPI and evaluated the actual index developments with some remarks on the limitations and concerns that need to be solved in the future. For tracking the accuracy of price movements, representative or all prices are adopted as surveyed prices. Discounts are reflected in the price movements on a real-time basis or on a retroactive basis

depending on the timing of receiving data. Indexes are periodically revised to reflect discounts, which are obtained after the index release of corresponding month. Overall, the index has succeeded in tracking the actual trend of the prices by our efforts to catch up with the changes in the telecommunications industry.

So far, the CSPI are compiled with continuous efforts not only on the price survey but also on other things, such as introduction of new items, classification of the index, and weight calculation for the index, for even-more accurate price indexes. We must keep studying and tackling the problems of handling the service price data to keep up with the changes and innovation in telecommunications services. Of course, it is necessary to carefully track the many new services that are emerging in this rapidly changing field. Further, we would like to deepen the study to improve quality adjustment; efforts include developing new ideas regarding quality adjustment and applying the ideas to a new quality adjustment method to introduce to the actual index calculation. There is a room for further discussion—comments from readers are especially welcome. Our ultimate goal—compiling an increasingly accurate index—is more easily achieved by constructive input from a wide array of sources.

(Chart 1)

Publication Structure of CSPI and Its Relationship to the CPC

CSPI classification	CPC Ver.1.0	(Reference) ISIC Rev.3	JSIC	Japan's I-O Tables
Major group / Group / Subgroup / Item				
Communications and broadcasting	---	---	---	---
Communications	---	---	---	---
Postal services	6811	6411	461	7311-011
Letters				
Postcards				
Other postal services				
Domestic and international telecommunications services	8411,8420	6420	4711 4712 472	7312-011,7312-031
Domestic fixed telephone services				
International fixed telephone services				
ISDN (Integrated Services Digital Network)				
Data transmission services				
Domestic leased circuits				
International leased circuits				
Mobile telecommunications services	8412	6420	4713	7312-021
Cellular phone services				
PHS (Personal Handyphone System) services				
Pager services				
Access charges	---	6420	4719	7312-011,7312-021
Access charges				
Broadcasting	---	---	---	---
Cable broadcasting	8411	6420	813	7321-031
Cable broadcasting				

Notes: 1. Shadowed area indicates telecommunications services.
2. "CPC Ver.1.0" stands for Central Product Classification (CPC) Version 1.0.
The numbers are the four-digit code numbers of the class classification in the CPC Ver. 1.0.
3. "ISIC Rev.3" stands for International Standard Industrial Classification of All Economic Activities (ISIC Rev.3).
The numbers are the code numbers of the ISIC Rev 3.
4. "JSIC" stands for latest Japan's Standard Industrial Classification published by the Statistics Bureau, Management and Coordination Agency, Government of Japan, in October 1993.
The numbers are the code numbers of the JSIC.
5. "Japan's I-O Tables" stands for 1995 Japan's Input-Output Tables published by the Statistics Bureau, Management and Coordination Agency, Government of Japan, in March 1999.
The numbers are the row code numbers of basic sector classification in the 1995 I-O Tables.

(Chart 2)

Definition of Telecommunications Service Items in CSPI

---- Except for "data transmission services" and "leased circuits" ----

1. Domestic fixed telephone services

Call from	To
Domestic fixed telephone	Domestic fixed telephone
	Domestic fixed telephone by ISDN
	Cellular phone[1]
	PHS[1]

2. International fixed telephone services

Call from	To
Domestic fixed telephone	fixed telephone overseas
Domestic fixed telephone by ISDN	
Cellular phone	
PHS	
Fixed telephone overseas	Domestic fixed telephone[2]
	Domestic fixed telephone by ISDN[2]

3. ISDN (Integrated Services Digital Network)

Call from	To
Domestic fixed telephone by ISDN	Domestic fixed telephone by ISDN
	Domestic fixed telephone
	Cellular phone[3]
	PHS[3]

Notes: 1. Shadowed services are not included in domestic fixed telephone services.
Calls to cellular phones are included in "cellular phone services."
Calls to PHS are included in "PHS services."
2. Shadowed services are not included in international fixed telephone services because export services are not covered by the CSPI.
They might be included in statistics overseas as imported services.
3. Shadowed services are not included in domestic fixed telephone services, because calls to cellular phones are included in "cellular phone services," and calls to PHS are included in "PHS services."

4. Cellular phone services

Call from	To
Cellular phone	Cellular phone (same company)
	Cellular phone (same group company) [4]
	Cellular phone (different company) [4]
	PHS (same company)
	PHS (same group company)
	PHS (different company)
	Domestic fixed telephone
	Domestic fixed telephone by ISDN
Cellular phone provided by Japanese companies overseas by roaming	Cellular phone (same company or same group company) overseas by roaming[5]
	Cellular phone (same company) in Japan[5]
	Cellular phone (same group company) in Japan[5]
	Fixed telephone overseas[5]
Domestic fixed telephone	Cellular phone
Domestic fixed telephone by ISDN	

5. PHS (Personal Handyphone System) services

Call from	To
PHS	PHS (same company)
	PHS (same group company)
	PHS (different company)
	Cellular phone (same company)
	Cellular phone (same group company)
	Cellular phone (different company)
	Domestic fixed telephone
	Domestic fixed telephone by ISDN
Domestic fixed telephone	PHS
Domestic fixed telephone by ISDN	

6. Pager services

Call from	To
Pager	Pager (same company)
	Pager (same group company)
PHS (same company)	Pager
PHS (same group company)	
PHS (different company)	
Cellular phone (same company)	
Cellular phone (same group company)	
Cellular phone (different company)	
Domestic fixed telephone	
Domestic fixed telephone by ISDN	

Notes: 4. Calls to a cellular phone, prepared by the same group company or a different company, are included in the price data surveyed from the company the caller is using, although the sales are split between the calling company and the receiving company based on an initial agreement called the "credit transfer type connecting rule" described in the reference at the end of this Chart.
This is because the calling company collects the charge, including the charge for the networks owned by the receiving company, based on the agreement.

5. Shadowed services are not yet included in cellular phone services.

7. Access charges

Call from	To
Cellular phone	PHS (same group company) [6]
	PHS (different company) [6]
	Domestic fixed telephone[6]
	Domestic fixed telephone by ISDN[6]
PHS	PHS (same group company) [7]
	PHS (different company) [7]
	Cellular phone (same group company) [7]
	Cellular phone (different company) [7]
	Domestic fixed telephone[7]
	Domestic fixed telephone by ISDN[7]
Domestic fixed telephone	Domestic fixed telephone (same group company) [8]
	Domestic fixed telephone (different company)[8]
	Cellular phone[9]
	PHS[9]
Domestic fixed telephone by ISDN	Cellular phone[10]
	PHS[10]
Domestic fixed telephone	Fixed telephone overseas[11]
Domestic fixed telephone by ISDN	
Cellular phone	
PHS	
Fixed telephone overseas	Domestic fixed telephone[12]
	Domestic fixed telephone by ISDN[12]

Notes: 6. Access charges are paid by cellular phone companies to PHS services companies or domestic fixed telephone services companies.

7. Access charges are paid by PHS services companies to PHS services companies, cellular phone services companies, or domestic fixed telephone services companies.

8. Access charges are paid by domestic fixed telephone services companies (same group company or different company), which provide long-distance call services, to domestic fixed telephone services companies, which provide local call services.

9. Access charges are paid by cellular phone or PHS services companies to domestic fixed telephone services companies.

10. Access charges are paid by cellular phone or PHS services companies to domestic fixed telephone services companies, which provide ISDN services.

11. Access charges are paid by international fixed telephone services companies to domestic fixed telephone services companies, cellular phone services companies, or PHS services companies.

12. Shadowed services are not included in access charges because export services are not covered by the CSPI. They might be included in statistics overseas as imported services.

(Reference) Other connecting related services not included in the CSPI

1. Credit transfer type connection charges

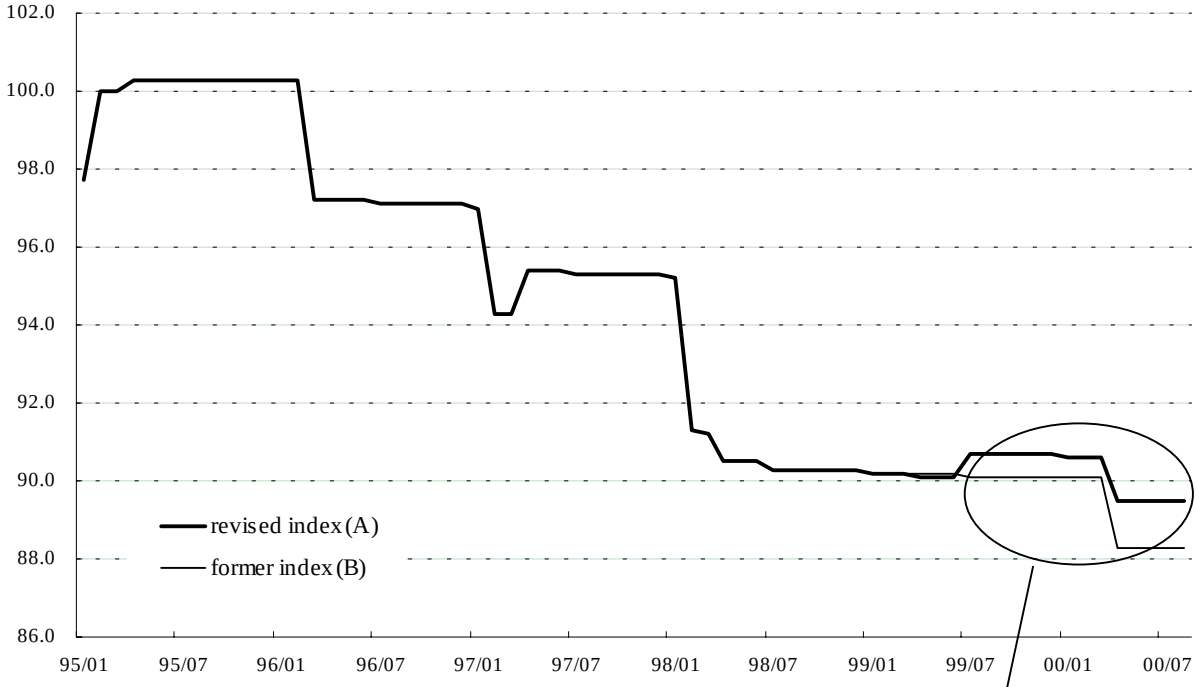
Call from	To
Cellular phone	Cellular phone (same group company)[13]
	Cellular phone (different company) [13]

Notes: 13. There is a point of interface between the calling company and the receiving company, which is the end of the network for each company. Both companies have an agreement to connect their networks for the customers and to charge to the customers. That is the "credit transfer type connection rule." The calling company collects payments from customers, part of the bill for which goes to the receiving companies. Payments are later made by calling companies to receiving companies. The difference between the "charges based on the credit transfer type of connection rule" and the "access charges" is the counting method to the annual report, such as balance sheet, profit and loss statement. The function to connect networks between two companies is the same.

(Chart 3)

Effect of Retroactive Index Revision Undertaken in October 2000

1. Domestic fixed telephone services (1995 average=100)

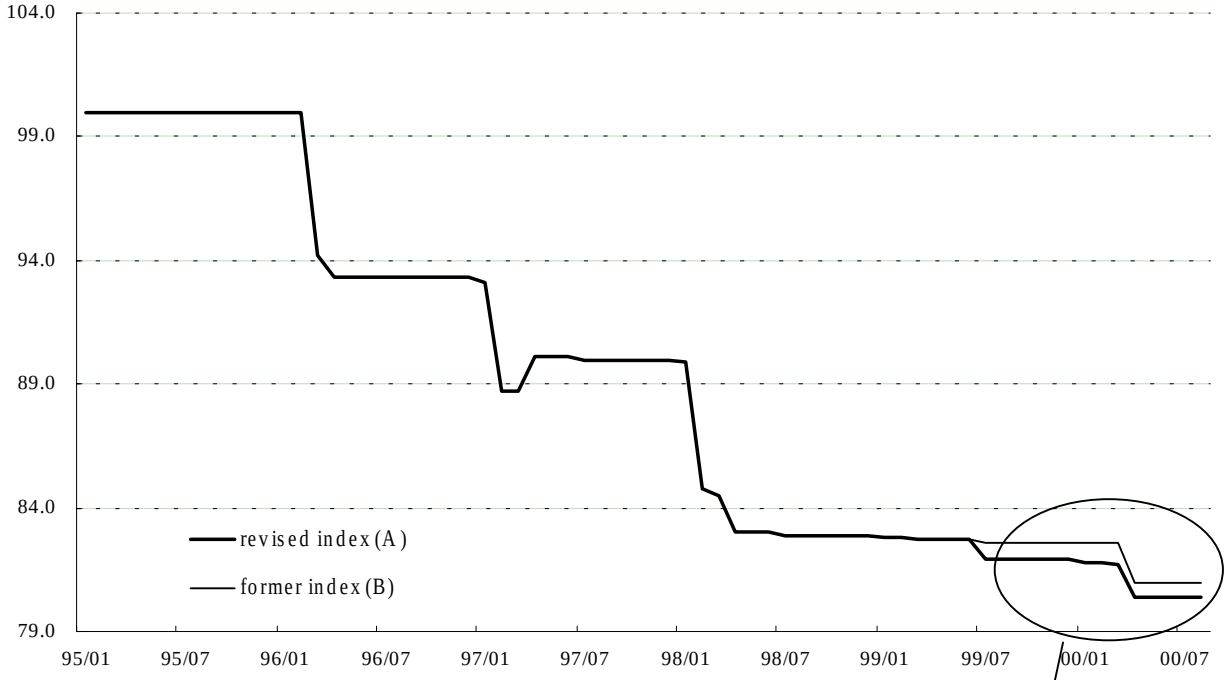


(Reference) Magnification from January 1999 to August 2000

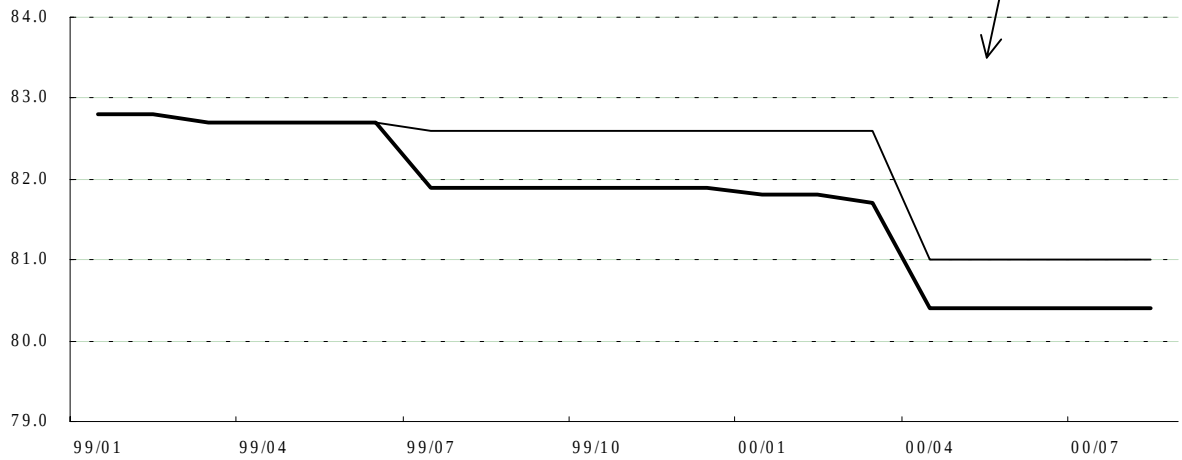
	99/01	2	3	4	5	6	7	8	9	10	12	00/01	2	3	4	5	6	7	8
revised index (A)	90.2	90.2	90.2	90.1	90.1	90.1	90.7	90.7	90.7	90.7	90.7	90.6	90.6	90.6	89.5	89.5	89.5	89.5	89.5
former index (B)	90.2	90.2	90.2	90.2	90.2	90.2	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	88.3	88.3	88.3	88.3	88.3
(A)-(B)	0.0	0.0	0.0	-0.1	-0.1	-0.1	+0.6	+0.6	+0.6	+0.6	+0.6	+0.5	+0.5	+0.5	+1.2	+1.2	+1.2	+1.2	+1.2

2. ISDN (Integrated Services Digital Network)

(1995 average=100)



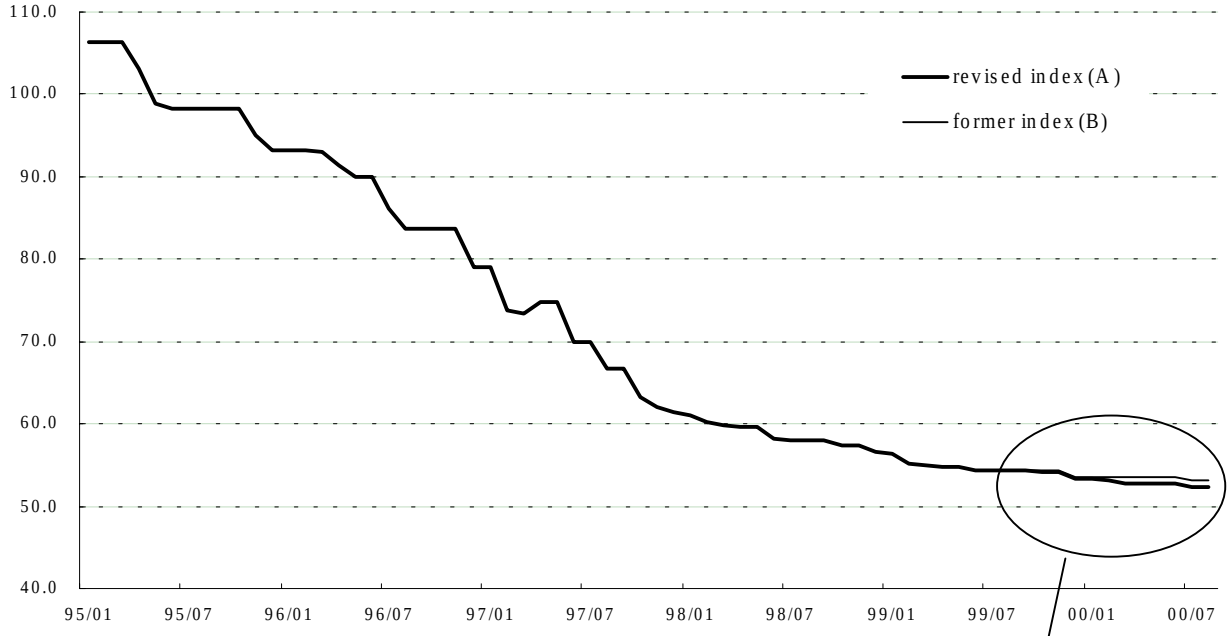
(Reference) Magnification from January 1999 to August 2000



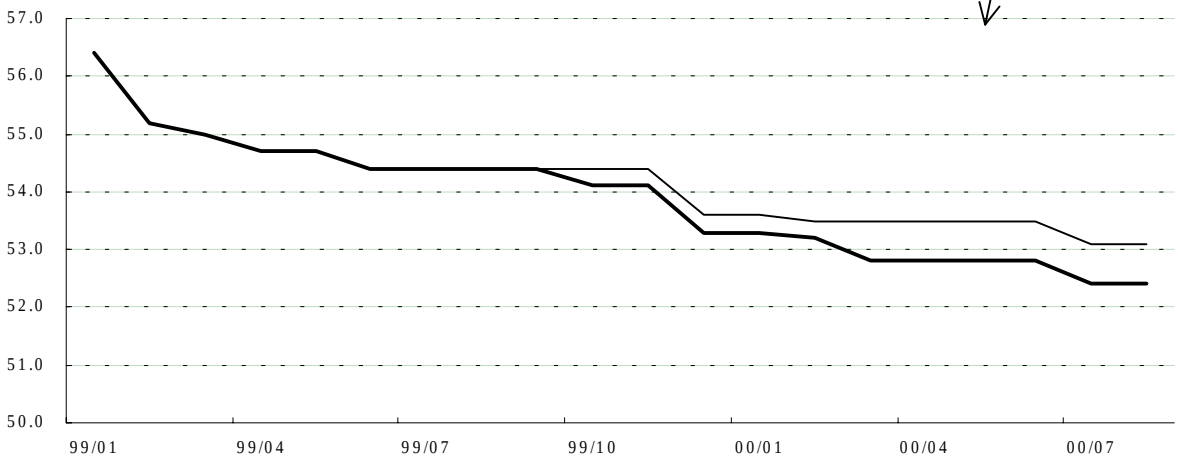
	99/01	2	3	4	5	6	7	8	9	10	12	00/01	2	3	4	5	6	7	8
revised index (A)	82.8	82.8	82.7	82.7	82.7	82.7	81.9	81.9	81.9	81.9	81.9	81.8	81.8	81.7	80.4	80.4	80.4	80.4	80.4
former index (B)	82.8	82.8	82.7	82.7	82.7	82.7	82.6	82.6	82.6	82.6	82.6	82.6	82.6	82.6	81.0	81.0	81.0	81.0	81.0
(A)-(B)	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.9	-0.6	-0.6	-0.6	-0.6	-0.6

3. Cellular phone services

(1995 average=100)



(Reference) Magnification from January 1999 to August 2000



	99/01	2	3	4	5	6	7	8	9	10	12	00/01	2	3	4	5	6	7	8
revised index (A)	56.4	55.2	55.0	54.7	54.7	54.4	54.4	54.4	54.4	54.1	53.3	53.3	53.2	52.8	52.8	52.8	52.8	52.4	52.4
former index (B)	56.4	55.2	55.0	54.7	54.7	54.4	54.4	54.4	54.4	54.4	53.6	53.6	53.5	53.5	53.5	53.5	53.5	53.1	53.1
(A)-(B)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.3	-0.3	-0.7	-0.7	-0.7	-0.7	-0.7	-0.7

4. Other telecommunications services that were revised retroactively

1) International fixed telephone services
2) Domestic leased circuits
3) International leased circuits

Example of Price Data Including Discounts

(Cellular phone services)

Year/month	Base fee			Per-call charges			
	Regular price	Discount rate	Price data for the CSPI	Regular price	Changes in regular price	Discount rate	Price data for the CSPI
	units: yen	units: %	units: yen	units: 1995/Jan.=1,000.00 yen	units: %	units: %	units: yen
1995.01	7,000.00	0.0	7,000.00	1,000.00	---	0.0	1,000.00
1995.02	7,000.00	0.0	7,000.00	1,000.00	---	0.0	1,000.00
1995.03	7,000.00	0.0	7,000.00	1,000.00	---	0.0	1,000.00
1995.04	7,000.00	0.0	7,000.00	1,000.00	---	0.0	1,000.00
1995.05	7,000.00	0.0	7,000.00	1,000.00	---	0.0	1,000.00
1995.06	6,800.00	0.0	6,800.00	1,000.00	---	0.0	1,000.00
1995.07	6,800.00	0.0	6,800.00	1,000.00	---	0.0	1,000.00
1995.08	6,800.00	0.0	6,800.00	850.00	-15.0	0.0	850.00
1995.09	6,800.00	-3.0	6,596.00	850.00	---	0.0	850.00
1995.10	6,800.00	-3.0	6,596.00	850.00	---	0.0	850.00
1995.11	6,800.00	-3.0	6,596.00	850.00	---	0.0	850.00
1995.12	6,800.00	-3.0	6,596.00	850.00	---	0.0	850.00
1996.01	6,000.00	-3.0	5,820.00	850.00	---	0.0	850.00
1996.02	6,000.00	-3.0	5,820.00	850.00	---	-0.1	849.15
1996.03	6,000.00	-3.0	5,820.00	850.00	---	-0.1	849.15
1996.04	6,000.00	-3.0	5,820.00	850.00	---	-0.1	849.15
1996.05	6,000.00	-3.0	5,820.00	850.00	---	-0.1	849.15
1996.06	6,000.00	-3.0	5,820.00	782.00	-8.0	-0.1	781.22
1996.07	6,000.00	-3.0	5,820.00	782.00	---	-0.1	781.22
1996.08	6,000.00	-5.0	5,700.00	782.00	---	-0.1	781.22
1996.09	6,000.00	-5.0	5,700.00	782.00	---	-0.1	781.22
1996.10	6,000.00	-5.0	5,700.00	703.80	-10.0	-0.1	703.10
1996.11	6,000.00	-5.0	5,700.00	703.80	---	-0.1	703.10
1996.12	5,500.00	-5.1	5,219.50	703.80	---	-0.1	703.10
1997.01	5,500.00	-5.1	5,219.50	703.80	---	-0.1	703.10
1997.02	5,500.00	-5.1	5,219.50	612.31	-13.0	-0.3	610.47
1997.03	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.04	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.05	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.06	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.07	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.08	5,500.00	-5.1	5,219.50	612.31	---	-0.3	610.47
1997.09	4,800.00	-5.1	4,555.20	612.31	---	-0.3	610.47
1997.10	4,800.00	-5.1	4,555.20	612.31	---	-0.3	610.47
1997.11	4,800.00	-5.1	4,555.20	612.31	---	-0.3	610.47
1997.12	4,800.00	-5.1	4,555.20	612.31	---	-0.3	610.47
1998.01	4,800.00	-5.1	4,555.20	612.31	---	-0.3	610.47
1998.02	4,800.00	-5.1	4,555.20	520.46	-15.0	-0.5	517.86
1998.03	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.04	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.05	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.06	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.07	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.08	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.09	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.10	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.11	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1998.12	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1999.01	4,800.00	-5.5	4,536.00	520.46	---	-0.5	517.86
1999.02	4,800.00	-5.5	4,536.00	520.46	---	-2.0	510.05
1999.03	4,800.00	-5.5	4,536.00	520.46	---	-2.0	510.05
1999.04	4,800.00	-5.5	4,536.00	520.46	---	-2.0	510.05
1999.05	4,800.00	-5.5	4,536.00	520.46	---	-2.0	510.05
1999.06	4,800.00	-5.5	4,536.00	520.46	---	-2.0	510.05
1999.07	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
1999.08	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
1999.09	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
1999.10	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
1999.11	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
1999.12	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
2000.01	4,800.00	-5.8	4,521.60	520.46	---	-2.0	510.05
2000.02	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.03	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.04	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.05	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.06	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.07	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64
2000.08	4,800.00	-5.8	4,521.60	520.46	---	-4.0	499.64

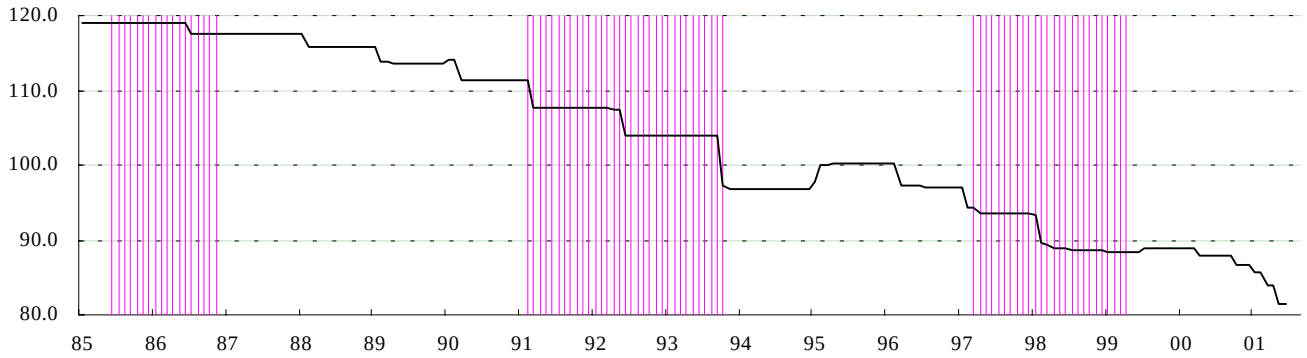
Note: The "changes in regular price" for per-call charges in this example shows the "average revision rate of price table," which is described in the main text, section 4.

(Chart 5)

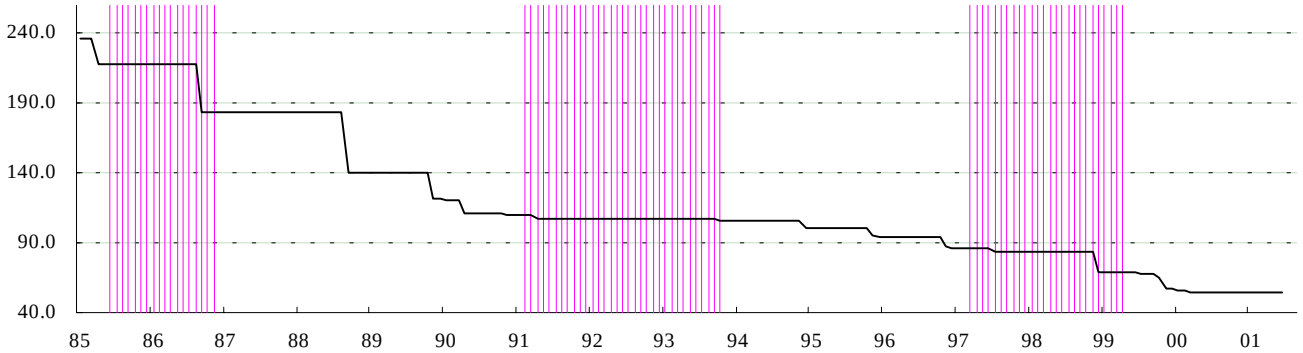
Index Developments of Telecommunications Services

1. Telecommunications services (1995 average=100)

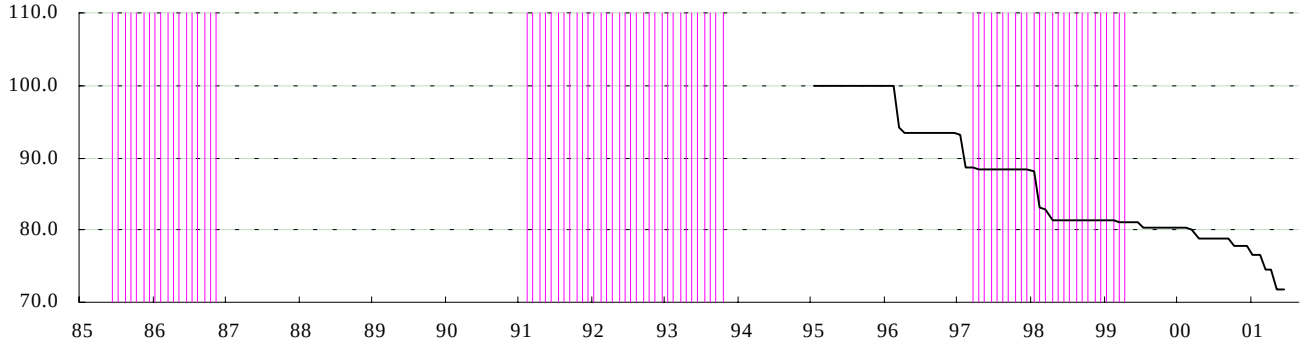
2. Domestic fixed telephone services



3. International fixed telephone services

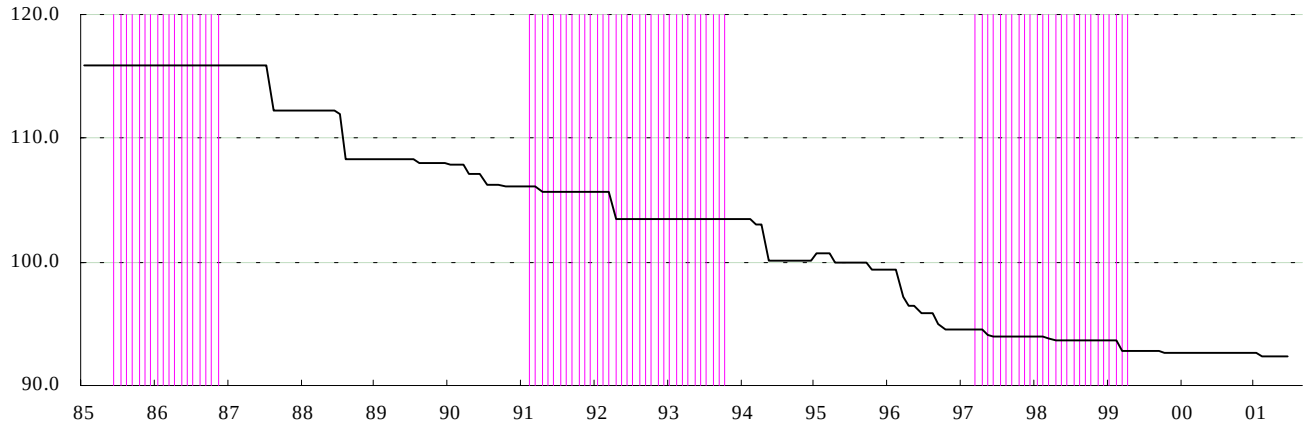


4. ISDN (Integrated Services Digital Network)

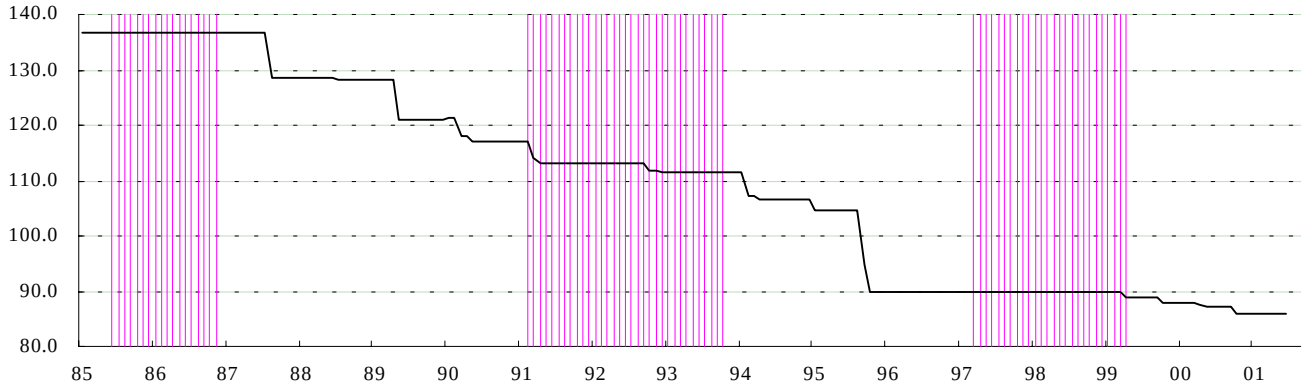


Notes: 1. Shadowed areas indicate recession.
2. Indexes exclude consumption tax from the CSPI, except for tax exemption services: "international fixed telephone services" and "international leased circuits."
3. Indexes of telecommunications services from 1985 through 1989 and those from 1990 through 1994 are a converted index based on 1995 (1995=100) from 1985 based index (1985=100) and 1990 based index (1990=100), respectively.
4. Indexes of "cellular phone services" from 1985 through 1989 are those of "cellular and car phone services" in the 1985 based index.

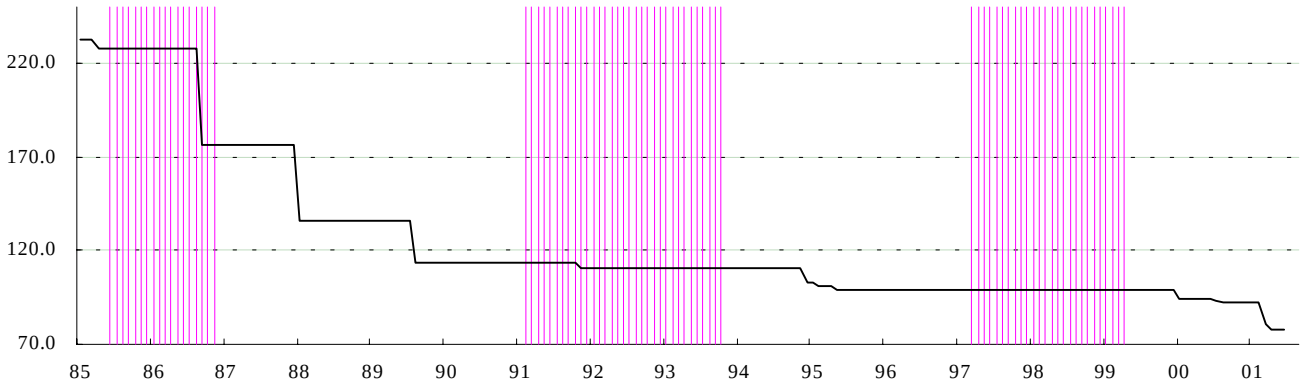
5. Data transmission services (1995 average=100)



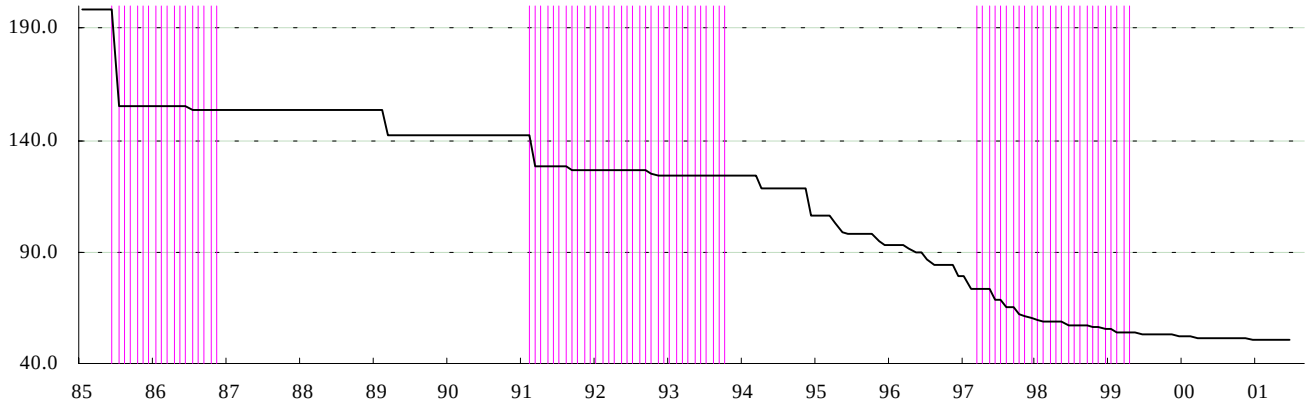
6. Domestic leased circuits



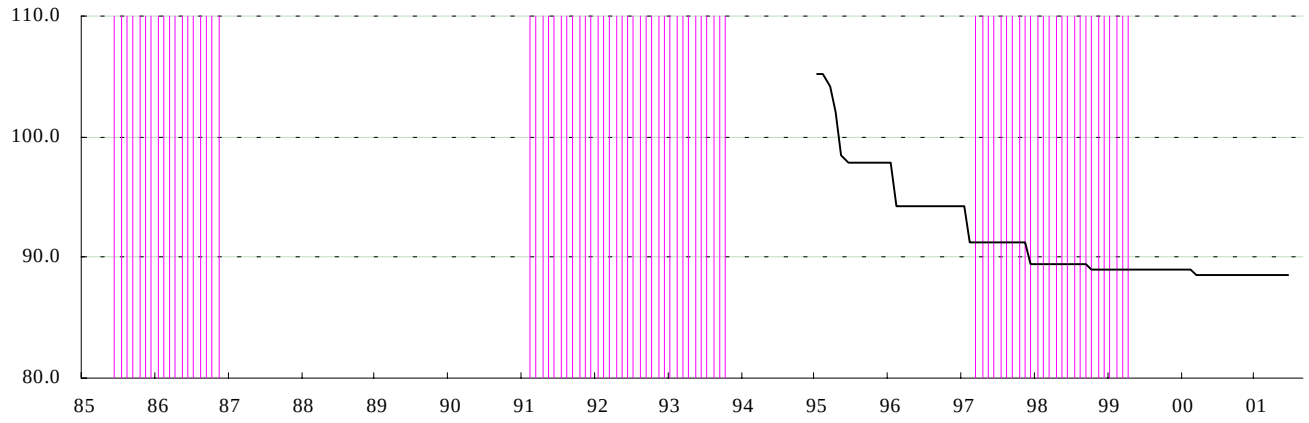
7. International leased circuits



8. Cellular phone services



9. PHS (Personal Handyphone System) services (1995 average=100)



10. Pager services

11. Access charges