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Methods of incorporating "discounts" into the price index: the case of telecommunications services in Japan's Corporate Service Price Index (CSPI)[1]

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Abstract

“How do we capture the real price movements?” is the question always raised in compiling price indexes. A particular difficulty we tackled with was the problem arising from “discounts.” This paper presents the current stage of our work on incorporating discounts in the telecommunications field into the Corporate Service Price Index (CSPI).

Section 1 briefly describes the characteristics of the CSPI as an introduction to this paper. Section 2 addresses the recent developments of diversification by deregulation and technological innovation: the “big bang” in the telecommunications industry. The impact on prices of telecommunications services is described. In section 3, the diversification in telecommunications services especially in prices is discussed. Difficulty in specifying sample prices for the CSPI price data is studied. Section 4 discusses the details of the revision of the CSPI. The specific efforts we have made in handling discounts are shown. Methods to incorporate “discounts” into the price data are introduced. Section 5 discusses problems left for future studies. Finally, section 6 concludes this paper.

Introduction

The CSPI is a compilation of price indexes of service transactions for business use. From around the 1970’s, the services industry started to grow quickly in accordance with the change in Japan’s economic and trade structures. As a result, the share of services in Japan’s nominal GDP exceeded 60% in 1985, a 10% point increase in 15 years. This change raised a call for price statistics to reflect the current supply and

demand conditions vividly in the services market, as a counterpart of the Wholesale Price Index (WPI) which focuses on goods traded among corporations (see Table 1). Under such circumstances, the Bank of Japan (BOJ) started to develop the CSPI. In January 1991, the 1985 base CSPI was completed and published with a retroactive index from January 1985.

BOJ is currently revising the CSPI from the 1990 base to the 1995 base, which will be published at the end of this year. This revision is conducted once every five years to incorporate the changes in Japan's economic and trade structures. This will be the second revision, following the revision from the 1985 base to the 1990 base, which was done in December 1994.

The 1995 base CSPI is planned to cover eight major groups of items, corresponding to the 1995 Input-Output Tables (I-O Tables): "Finance and insurance," "Real estate services," "Transportation," "Information services," "Communications and broadcasting," "Advertising services," "Leasing and rental," and "Miscellaneous services."[2] The new index is planned to consist of approximately 3,000 price data on 102 items.[3] The numbers of price data and items are expected to increase by about 200 and 13 respectively from the 1990 base CSPI (see Tables 2, 3).

In the revision for the 1995 base CSPI, telecommunications has been one of the focused fields in reviewing the specifications for the price data. The waves of the "big bang," i.e., deregulations and improvements in technology, have brought about drastic changes to the telecommunications industry. Those changes have diversified the price system and brought about various types of discounts.

[2] The I-O Tables are revised every five years about four and a quarter years after the referenced year. BOJ publishes the revised CSPI as soon as possible after the I-O Tables are published.

[3] "Price data" are the specified sample prices for compiling the price indexes in the CSPI. "Items" are the price indexes at the lowest level in the stratification of the CSPI.

. “Big Bang”: Recent Diversification in the Telecommunications Industry

2.1. Deregulation of entry restrictions[4]

Until 1985, the Japanese telecommunications industry was dominated by only two organizations: “Nippon Telegraph and Telephone Public Corporation” and “Kokusai Denshin Denwa Corporation (KDD).” The former was a 100% government owned organization which monopolistically offered domestic telecommunications services. The latter was a private company regulated by the KDD Law which monopolistically provided international telecommunications services.[5]

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. However, even after the 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.[6] In the deregulation process, the authorities paid special attention to “maintaining the stable supply of telecommunications services,” and to “preventing excessive competition among telecommunications companies”.

The second step of deregulation took place in the second half of the 1990’s. Cross-market entries such as between domestic and international telephone services were opened up from 1996 to 1997. Entries of domestic non-telecommunications companies

[4] For details, see Appendix.

[5] KDD was founded as a private company in April 1953 by the KDD Law, separating from Nippon Telegraph and Telephone Public Corporation.

[6] 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.

and foreign telecommunications companies were also allowed in 1997 and from 1998 to 1999 respectively (see Table 4).

These deregulations have intensified price competition. This has led to accelerated price reductions and diversification in the combinations and classifications of services and charge systems.

2.2. Deregulation in the supervision of pricing: change from prior permission to notification

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 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.[7] Because of these deregulations, competition has been intensified and prices have plummeted.

2.3. Abolition of connection restriction

The regulation restricting connection between different telecommunications services was also abolished, due to the revision of the Regulations for Enforcement of the Telecommunication Business Law. In September 1996, connection between domestic public lines and leased circuits was permitted. In December 1997, similar connection was allowed for international services. This has spurred price competition since it enabled new entries to certain fields.

2.4. Technological innovation

Technological innovation in the telecommunications industry has intensified the

[7] NTT was an exception to the deregulation.

downward price competition as well. For example, With these technological innovations, easy-to-carry terminal machines, and lighter and smaller units, for cellular phone services have been introduced. Because of these innovations, the demand for cellular phone services has soared. This has intensified price competition in cellular phone services, as cellular phone services companies have scrambled to acquire new customers.

Diversification in Pricing: Difficulty in the Specification for Price Data

3.1. Influence of the diversification on the CSPI

As outlined above, telecommunications services have gone through remarkable changes in recent years. With enhanced competition since around 1997, pricing systems have been diversified and many kinds of discounts have been introduced. Today, discounts play a significantly larger role in total tariff reductions than regular price cuts. Moreover, the downward price competition has changed the volume of each service and the combinations of services dramatically. These factors have made the specification for price data more complicated.

Although every effort has been made to keep up with these changes, it has become increasingly difficult for us to cope with them by adjusting the price data under the framework of the 1990 base CSPI. The price data in the CSPI have been getting stale in terms of adequacy. Revisions of rules or introduction of new methodologies for compiling the CSPI have been needed, especially for cellular phone services and domestic and international telephone services.

3.2. Examples of recent changes in price tables

Typical combinations of services and discounts which demand revisions to the former methodology are as follows.

3.2.1. Diversification of charge systems

Recently, more and more types of charge systems are offered with various combinations of basic and additional charges. The basic charges are fixed charges and are on a monthly basis in most cases. The additional charges are toll charges which increase linearly or non-linearly to the amount of consumption. For example, cellular phone services companies offer various charge plans, such as “regular plans” and “night plans.” The basic charges and the additional charges during nighttime for the “night plan” are set at a lower level than under the “regular plan.” However, the additional charges during the daytime for the “night plan” are higher than under the “regular plan.” The “night plan” is economical for users who call mostly at nighttime. This kind of diversification requires special care in selecting the representative samples for the price data.

3.2.2. Volume discounts

A growing variety of volume discounts are being offered as well. Examples are “10% discount for monthly charges exceeding 10,000 yen,” or “10% discount when contracting 10 lines at the same time.” If volume discounts come to prevail in the market, excluding these from the price data will result in a significant bias.

3.2.3. Long-term contract discounts

The long-term contract discount is also becoming popular. Examples are “5% discount after a year of continuous use,” or “3% discount when the contract period exceeds one year.” In order to identify representative prices in these cases, the most prevailing contract periods should be identified.

3.2.4. Packaged services

Various types of discount packages are also being offered. One example is “pay 800 yen

more for the basic charge to get a discount on toll charges." This is a new type of charge system which appeared recently. The difficulty presented by this development is that it is no longer possible to obtain price data for fixed charges and additional charges separately.

3.2.5. Other special discounts

There are still other types of discounts being offered. Examples are "get 50% off toll charges for calls to a specific telephone number with a special basic monthly charge," "get 30% off toll charges for calls made during specific hours of the day (like late at night) by paying a higher monthly basic charge," or "get a certain number of hours of free calls by paying an additional monthly fixed charge." As the charge systems and discount programs have become increasingly diversified, selecting representative samples for price data has become more and more difficult.

Details of the Revision of Price Data

In revising price data, we focused on two things. One was to check and recover the representativeness of the price data. The other was to capture accurate price movements, including discounts.

In this process, we held many discussions with the surveyed companies. Without their advice, we would not have been able to identify actual representative services and price tables in specifying for the adequate price data. Their great understanding and support created the 1995 base CSPI more accurately. We also believe that our attempt to reduce the price reporting burden on them helped very much in gaining their support and maintaining good relations with them.

4.1. General specification for price data

In specifying sample prices for the price data to be indexed, we mainly apply two

methods, depending on the type of price tables offered for each service. This concept has essentially remained unchanged since we began compiling the CSPI.

The price itself is indexed in as price data when a particular type of price dominates in a certain service. In this case, only the representative price is surveyed. For example, the postage for letter less than 25g is selected as price data for "letters."

When a variety of prices are offered for a single service and no single price dominates, all of the contracted prices are incorporated into the price data instead of choosing a representative price. The reason is that, in this case, selecting a representative price is difficult. The movement of the price data is monitored by surveying the average price change for all the services transactions. For example, the train fares for all boarding are incorporated as price data for "railroad passenger transportation" in the CSPI. When price revisions take place, the weighted average rate of price revisions under all contracts is incorporated into the price data.[8]

4.2. Incorporating discounts in the telecommunications field

Since in the telecommunications field for the CSPI has not incorporated discounts into the compilation, we have decided to incorporate discounts from the 1995 base CSPI. In the process of specification for the price data, however, we have met with a problem. We have found that there is a case when we cannot introduce discounts because of the deadline for price data collection for the CSPI compilation.

Traditionally, the CSPI has been compiled on a real time basis. If the prices including discounts can be obtained on a real time basis, we can reflect discounts to the price data

[8] The weighted average discount rate has usually been incorporated into the price data of the CSPI. Theoretically, the CSPI must measure only pure price movements excluding movements due to quality or quantity changes. The change in the average price might include quality or quantity changes as well. In cases when these can be regarded as insignificant, using the average price as price data for the CSPI can be justified.

for the CSPI on a real time basis. But, if the prices including discounts are obtained after a certain time, we cannot incorporate them to the price data for the CSPI.

Hence, we have decided to accept retroactive revisions in order to cope with the discounts which have turned out after a certain time.

Here we describe two cases to incorporate discounts into the CSPI according to the methods mentioned above. The first one is to handle discounts on a real time basis. The second is to handle discounts on a retroactive basis.

4.2.1. Case 1: reflecting discounts "on a real time basis"

In cases when it is possible to reflect the price movement due to discounts into the CSPI on a real time basis, "real time basis method" is adopted. This method is tend to be accepted when we choose a representative price including discounts for the price data for the CSPI, because they are revealed on a real time basis in most cases. An example is as follows:

regular price : 100 yen per 3 min. on weekdays during 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 (see Figure 1).

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

The advantage of this method is that the discounts are incorporated into the index on a real time basis. Whenever there is a price data on a real time basis such as an identifiable representative discount service, this method should be applied because of

this advantage. This method is essentially a variation of the traditional index compilation. Hence, the use of this method can be justified from the viewpoint of maintaining continuity in the method of index compilation.

The disadvantage of this method is that only the representative discount rate can be incorporated into the indexes. If many kinds of discounts are offered for a single service and none of them has a dominant share, this method will create an unnegligible bias.

4.2.2. Case 2: reflecting discounts "on a retroactive basis"

In cases when it is impossible to reflect the discounts on a real time basis, "retroactive basis method" is adopted. This method is tend to be adopted when we choose the weighted average price including discounts for the price data, instead of choosing a representative price including discounts, because it is revealed after a certain time in most cases. An example is as follows:

regular price :
100 yen per 3 min. for all daytime and nighttime contracts (A)
average discount rate : 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 (see Figure 2).

Survey the regular price for the service (A). Publish the index calculated from the regular price for the time being. After the average discount rate of all the calls has been reported by the surveyed companies (B), by multiplying (A) by (100%-B), we get (C). Replace (A) by (C) in the CSPI by revising retroactively.

The advantage of this method is that it makes it possible to incorporate all discount services into the index.

Its disadvantage is that, usually, the discount data can not be obtained in real time. The index must be revised retroactively to reflect the price movement from discounts. In addition, monthly data of discounts are often not available as the surveyed companies calculate their average discount rates only once (or twice) a year in most cases. For the compilation of the CSPI, the same discount rate is employed until the next terms' discount rate is calculated.

Problems for Future Study

There still remain various difficulties in compiling the CSPI. The real world is always changing in telecommunications and related fields. We are trying to work out the solutions one by one to catch up with the changes.

5.1. Difficulty in classifying the prices of services

There are some cases where traditional distinctions among certain telecommunications services have become blurred due to recent technological or commercial developments. This has created difficulty in classifying the surveyed prices of these services into the traditional groups of the CSPI. Examples are as follows.

5.1.1. Domestic and international telecommunications

Satellite cellular phone services started in November 1998. When the charges for satellite cellular phone services are the same no matter where the telephone call is made, it is difficult to distinguish the charges for domestic call from those for international calls. The CSPI will need to adjust to this development.

5.1.2. Voice transmission services and data transmission services

Telephone calls through Internet circuits have become possible. As the only fee is the price of the connection charges to the Internet circuits, the price is lower than that of

regular telephone services. This means that although Internet services are classified as data transmission services a portion of the Internet services has become voice transmission services. Hence, it is difficult to determine the classification of the Internet telephone calls. As the Internet telephone services are increasing, we expect that they should be taken into account in the CSPI in the future. So far, we have an idea to establish a new item category as "Internet telephone services," but we are not sure whether we can survey their prices and weight data apart from data transmissions.

5.1.3. Unification of services in different classifications

Recently, cable television companies began to provide Internet services through their lines. The charge for the Internet services is included in the cable television fee. It is difficult to capture the price of this kind of Internet services since the charge is not divided from that for cable television.

Another similar example is that pager services have begun to distribute news. Newscasting has been generally classified under the item "providing databases" in the category of "Information services." On the other hand, pager services have been classified as "Telecommunications services." In this case, it is hard to decide whether pager services should still be treated as "Telecommunications services" or newly treated as "Information services," unless the charges for newscasting can be identified separately.

5.1.4. Radical changes in the volume of services

PHS (Personal Handyphone System) services started in July 1995. The volume of these services has increased rapidly in just a few years. In 1997, the transaction value was 17 times as much as that in 1995. Pager services started in July 1968. After the volume of services hit a peak in 1995, it slumped more than a half in 1998. Categorization of items for the CSPI is very difficult under such radically changing conditions, because the calculations use the Laspeyres formula, which is revised only every five years.

5.2. Changes in quality

There are some unique difficulties in quality adjustment in the field of telecommunications. The cost corresponding to the quality difference through technological innovation is very difficult to be estimated by the production cost method.[9] For example, even though the quality of ISDN lines doubles in terms of data transmission capability, it is difficult to believe that the price of production also doubles. We continue to seek methods to tackle these types of quality adjustments.

Conclusion

We have incorporated discounts by using two method: “on a real time basis” and “on a retroactive basis” from the 1995 base CSPI. [10] These two methods are effective in the telecommunications field. By incorporating discounts, we will be able to better capture the price movements more accurately than before.

In addition, we will not hesitate to introduce other new methods in the future as well. As we have seen in section 5, the real world is changing rapidly and dramatically. We believe that one of the most important things for compiling the CSPI is to capture accurate price movements of the items. In this view, sticking to the traditional method in compiling the CSPI might be dangerous. The methods should always be inspected and improved in order to keep up with new real world developments.

[9] The production cost method is one of the methods used to specify the price difference corresponding to the quality difference on the assumption that the production cost for the quality change equals the difference in price due to the quality difference.

[10] “Retroactive basis method” has a possibility to expand the usage not only in the field of telecommunications, but also in other fields. For example, it will be useful in cases where price negotiations between the buyer and the supplier are prolonged and the prices are settled ex post facto, which is often the case in office space rental and accounting services in Japan.

Appendix: Recent deregulation of entry restrictions in the telecommunications market in Japan

1. Enabling companies to operate in multiple telecommunications fields

In January 1996, a change of administrative policy was announced by the Ministry of Posts and Telecommunications (MPT) through the publication of "Manual for Market Entry into Japanese Telecommunications Business." Before the policy change, each telecommunications company's business field was fixed. Under the new policy, telecommunications companies, except NTT and KDD, started to expand their business toward other telecommunications fields.[1] For example, some companies which had been doing business in the domestic telephone services market made inroads into international telephone services, and vice versa. The policy change enabled the merger of International Telecom Japan Inc. (ITJ), an international telecommunications company, and Japan Telecom Company, a domestic long-distance telecommunications company, which took place in October 1997. In addition, KDD and Teleway, a domestic long-distance telecommunications company, merged in December 1998.

2. Revision of the NTT Law

In June 1997, the NTT Law was revised. NTT was allowed to start international telecommunications services through a subsidiary company. Before the revision, NTT had been able to offer telecommunications services only within the domestic market.

3. Revision of the KDD Law

In June 1997, the KDD Law was revised. KDD started a domestic long-distance telephone services for corporate customers in July 1997, and in March 1998, KDD expanded its services to individual customers and started offering both international and

[1] The regulation on NTT and KDD were removed in June 1997 by the revision of the NTT Law and the KDD Law (see columns 2 and 3).

domestic discount packages.

4. Deregulation allowing market entry by domestic non-telecommunications companies

In May 1997, the entry restrictions on companies in other industries were also eased by the revision of the Telecommunication Business Law. Sony, a worldwide electronics company, and Sky Perfect TV, a communications satellite (CS) broadcasting company, joined the market in June 1999. PSI Networks, which has been one of the biggest Internet services providers in Japan, was permitted to conduct the telecommunications business in August 1999.

5. Deregulation allowing market entry by foreign companies

In February 1998, a deregulation allowing foreign capitalized companies to enter Japan's telecommunications market was realized by the revision of the Telecommunication Business Law and the Radio Law. Till then, the ratio of foreign ownership of Japanese telecommunications companies had been restricted to a maximum of one-third, but this restriction was removed with the exception of NTT and KDD.[2] In February 1998, WorldCom Japan, a subsidiary of a U.S. company, was permitted for the first time as a 100% foreign capitalized company to provide telecommunications services through their own lines in Japan. In June 1999, Cable and Wireless (C&W), a U.K. telecommunications company, took over International Digital Communications (IDC), which had been one of the international telecommunications companies in Japan.

[2] As for NTT, until the division of July 1999, foreign ownership had been restricted to a maximum of one-fifth. After NTT's division into Nippon Telegraph and Telephone East Corporation (NTT-East), Nippon Telegraph and Telephone West Corporation (NTT-West), and NTT Communications Corporation, the restriction remained only for NTT-East and NTT-West. The regulation on KDD was removed by the abolition of the KDD Law in November 1998. By this abolition, the regulation on the ratio of foreign capital in KDD (one-fifth at most) was removed. At the same time, the method of supervising the international telephone services charges changed from prior permission to notification. This has also intensified the price competition (see column 2.2 in the main text).