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A Price Index of Residential Long-distance Telephone Services Based on a Sample of Invoices: Issues

Klaus Kostenbauer

Economist
Statistics Canada
Prices Division
(613) 951-0691
kostkla@statcan.ca

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Introduction to the invoice method

A well-known method for price index construction is 'specification pricing'. After identifying a set of fixed characteristics, statisticians track the price of a product exhibiting these characteristics through time. Should the product become unavailable, a common method is to replace it with one of similar characteristics, and to adjust the price for the difference in quality.

In the case of residential long-distance telephone services, the application of specification pricing uses a sample of invoices collected from the telephone companies during a basket reference period. Each invoice in the sample contains all long-distance telephone services that a consumer purchased, including the destination, the length of the call, and the associated expenditures. In subsequent months, the invoice method depends on the full co-operation of the telephone companies to estimate the cost of each invoice in the sample, applying current prices to the fixed basket base period quantities.[1]

Pricing practices in the Canadian telephone market

Canadian telephone companies frequently offer customers promotional long-distance plans. The term 'plan' is in a way a misnomer. Customers do not buy a specific bundle of services as the terminology sometimes leads one to believe. Instead, a plan in this context provides the same service across consumers, which is access to domestic long-distance calling, they differ only in the way they price discriminate, by offering volume and price discounts.[2]

While some discounts apply at different times of day or in a limited geographic area, for the most part customers always buy the same basic service, which one can define as one minute of domestic long-distance calling. Examples of volume discount options and other forms of price discrimination are: i) a flat charge per month irrespective of usage, ii) a flat cost per minute across Canada coupled with a monthly price ceiling and, iii) a fixed monthly fee plus a low flat cost per minute with or without a price ceiling. Telephone companies frequently introduce and discontinue such volume and price discounts. It is usually up to customers to contact their carrier to be put on a discount plan. Three customers who placed identical calls with the same telephone carrier might therefore receive different invoices.

Theoretical issues with the invoice method

With each introduction of a new plan the invoice method must answer the following question: which consumers would subscribe to the new plan to pay for the invoice of the basket reference period? There is unfortunately no good answer to this question. The problem is that consumers exhibit inertia. They do not always sign on to an optimal plan, one that minimises their expenditures, and if they do, there is an unspecified lag. In an analogous issue, companies also discontinue existing plans. Again it remains

[1] For an authoritative detailed description of the invoice method, the reader should request "Price Indices For Telephone Services – A Technical Discussion Paper" by Bohdan Schultz, Statistics Canada, July 1996.

[2] The restriction of the reasoning to *domestic* long-distance calls is one of convenience. While discount plans for international calls are also frequently distinguishable only in the way they offer volume discounts, they are non-comparable to domestic plans.

unclear how consumers would respond, i.e. which alternative plan they would sign on to. The invoice method leaves unanswered to what extent a price index should reflect theoretical savings (or price increases) to consumers arising from new discount options.

In addition, consumers often switch from one carrier to another to take advantage of a promotional plan. Using the invoice method, the price decrease would not show until the next basket update.

One possible solution to the issues is to simulate the impact of a new discount option on each invoice separately. The approach would consist in assuming that customers adopt the plan that is the most economical for them. One could even assume that customers readily switch among telephone companies to benefit from promotions. While this approach is consistent with economic theory, by appealing to the principle of expenditure minimisation, it is in practice unrealistic. As previously mentioned, many consumers exhibit inertia and do not promptly switch to an optimal plan. To better simulate reality, a speed of adjustment parameter based on the actual penetration rate of the new discount option could be introduced into the model. The penetration rate of a new price discount option would however reflect current, rather than basket, calling patterns. An alternative to using penetration rates would be to simulate opposite assumptions. One model would assume that all consumers immediately take advantage of a new price discount option they would benefit from, while the other model would assume that no one takes advantage of it. A geometric mean of the two resulting estimates of the cost of the basket would yield a more realistic price index than using either of the opposite assumptions.

Implementation issues of the Invoice Method

As stated before, when a Canadian telephone company replaces an existing plan with another, there is usually no material difference in quality between the plans. Therefore, price statisticians cannot use quality adjustment procedures to make the plans comparable. Instead, a more appropriate procedure would track how the new plan affects the average cost per standard unit; i.e. the average amount customers pay for each minute of peak and off-peak domestic long distance calling.

Consider a telephone company that has charged customers 15 cents/minute for all long-distance calls in the past, and from now on charges 15 cents/minute, but with a $30 price ceiling per month. Since the service is measured as one minute of long distance calling, many consumers will increase their airtime, which is akin to a price decrease. In contrast to alternative methodologies (such as unit values), the invoice method will not reflect the price decrease until the next basket update.

Therefore, even if telephone companies agreed to provide a sample of telephone invoices, one could only derive a meaningful index by applying additional features, such as developing an optimisation model (with simulation). While government statisticians could specify the characteristics of the simulation model, it would have to be run by the telephone companies. Since asking the carriers to draw and maintain a sample already places a high burden, the additional burden to run a simulation is out of the question at present.

Conclusion

While the invoice method respects the theory of 'specification pricing', it leaves unanswered important theoretical issues that render its implementation difficult. In addition there are practical difficulties of managing a sample of telephone invoices. These issues and difficulties are a result of the industry's practice to frequently introduce new and popular volume and price discounts. The invoice method is more onerous to apply (in terms of work for the respondents) and may not offer better results in comparison with other simpler and more respondent friendly approaches.