



Did the price of the Internet drop?

SHANE GREENSTEIN
greenstein@kellogg.northwestern.edu

.....No statistic would seem as important to know as the price of the Internet. You might reasonably respond, How can the Internet have a price attached to it? As it turns out, there are many such prices. A particularly interesting one is the consumer price index (CPI) for Internet access, which focuses on the retail price of a household connection.

This price index does not get enough attention because observers confuse future opportunity with recent history. During the first decade of the commercial Internet, access fees were where the money went, because the typical household spent more than three-quarters of its online time at free or advertising-supported sites. Although subscription-based services are growing today, the revenues spent on access fees still swamp subscription services in magnitude. Fees for advertising also are growing and may exceed access revenue in a few more years, but not yet.

One other thing motivates an examination of this index. There is a big debate in the US about whether the broadband market has been organized intelligently. Economic statistics can inform policy debates—that is, if they get interpreted the right way. However, and this is my point in this column, the index is easy to misinterpret. It is worth a close look.

Looking at the numbers

The official price index for Internet access in the CPI started in late 1997. In 1998, the access market generated

\$5.4 billion in access fees. As of 2005, according to the Service Annual Survey, conducted by the US Census, this market is a more than \$36-billion industry, with approximately \$12.2 billion going to dial-up access, \$11.1 billion to cable, \$12 billion to DSL from telephone firms, and \$1.1 billion in wireless access revenues. That growth highlights the importance of deflating revenues properly—that is, is the true growth much larger or much smaller than the changes in nominal growth of revenues?

Table 1 shows the price of Internet access in the United States over the last eight years, normalized to 100 in December 1997. On the Bureau of Labor Statistics Web site, this index carries the misleading official name, "Internet Services and Electronic Information Providers," but if you look up the definitions or speak with a BLS employee, the index is clearly just the price charged for Internet access. The table shows a monthly quote, taken the last month of each year.

The series is not a misprint. The index says the official price index for Internet access in the US went mildly down and up during the five years of dot-com boom and bust, between December 1997 and December 2002. It declined five percent over the next three years, between December 2002 and December 2005—again rather mild for a downturn. Then, just recently, it declined more than 18 percent from its base—that is, $(94.5 - 77.2)/94.2 = .183$.

By the way, that drop continued. It settled at a 23 percent decline in January 2007—that is, $(94.5 - 73.4)/94.5$. Also, if you look closely at the monthly data (not shown in Table 1), you will see that the trend began in the fall of 2006. The timing matters for reasons I will explain in a moment.

To sharpen the focus on the key issue, consider several other closely related categories. During the period from December 1997 to December 2005, official price indices for the US demonstrated the following patterns: computer software and accessories went down 42 percent; personal computers and peripheral equipment went down 88 percent; telephone hardware and calculators and related consumer items went down 55 percent; and wireless telephone services went down 35 percent.

Table 1. US Internet access price index.

Date	Index
12/97	100
12/98	103.3
12/99	96.0
12/00	95.7
12/01	100.3
12/02	99.6
12/03	97.6
12/04	97.2
12/05	94.5
12/06	77.2

Source: <http://data.bls.gov>.

These patterns would lead one to conclude that, until recently, prices declined for everything except the Internet. How can it be that Internet access did not get cheaper, but cell phones did, phone equipment did, PCs did, and software did?

The answer is the point of this column: To understand what has happened, it is essential to properly interpret an important but simple statistic like a price index.

What does a price index do?

Let's be up front about the accuracy of the data: Any errors in this index are not the fault of the person who collects and compiles the data. He is doing exactly what he is supposed to do, making a time series for the Internet that is comparable to any other price series. Data is collected with precisely that in mind.

Specifically, the BLS periodically conducts surveys of consumer expenditure to make sure they know how much households spend on different categories of goods. They also conduct regular surveys of vendors to make sure they get the right prices.

After that, it is just algebra. The final formula is a bit complicated, but the basics behind it are not. The change in the price index is a weighted average of the change in prices paid by households. That is what the index represents, the average price change for the services households actually bought.

This index includes some inevitable measurement error introduced by the lags between changes in consumer behavior and the date of a survey. That could have been a big issue if BLS updated this index as slowly as they do indices for other more stable markets. As it is, they do as much as they can as frequently as they can, which turns this into a small but nontrivial issue.

More to the point, one bigger issue swamps everything else: This index does not fully adjust for quality. The key word is "fully." It does adjust for discrete differences in quality when it leads to different categories of goods—that is, there are distinct price indices for dial-up and broadband connections.

Some of the error is straightforward to recognize although tricky to fix, such as adjusting for upgrades in bandwidth, as from 28K to 56K connectivity, (which largely occurred in 1998 and 1999). Some of it is quite subtle and difficult to fix. For example, the index does not adjust for the improvement in the quality of the many free complements over this time period, such as in the Google search engine or the Yahoo! portal.

The error that is the biggest issue arose in the last five years, however. It occurred when households made the transition from 56K dial-up to broadband speeds of varying qualities and availability. The country went from less than five percent of all households using broadband in the summer of 2000 to approximately 30 percent today (about half of all online households).

That trend resulted in a problem known as *substitution bias*. When a household switches between dial-up and broadband access it alters the market share for the two categories of goods. Though the actual act of switching was motivated by a desire to get more bandwidth for less money, this switch does not get recorded as a fall in price per quality for that user. Most broadband users are simply old dial-up users, not new users, so this error is a big deal.

The error is worse in this case because prices for both old and new goods had not changed much. For example, since the mid 1990s AOL's dial-up service has been \$21.95, plus or minus a couple dollars. The same is true for cable modem service and DSL service: Their price levels have been around \$36 or \$40, plus or minus a couple dollars.

You might reasonably wonder why none of these prices dropped after the emergence of a backbone glut in the US, beginning in 2001. After all, the price for backbone services has declined dramatically. That is a big question, but, alas, I only have so much space! We will have to address it another day.

For now, said succinctly, the BLS constructs a price index for the prices at which goods actually transact. Until

recently, the prices for these services did not change much. Because of substitution bias, the BLS simply did not record the qualitative improvement that most broadband users experienced.

The most recent price drop

What explains the recent big drop in the index? In the fall of 2006, AOL announced a change to its pricing: In response to its loss of customers to broadband, it is moving to advertising-supported service. More precisely, AOL's service goes to about a quarter of the households in the US. When one vendor makes up 25 percent of an index and it announces a 100 percent decline in price, it is tautological that the index must decline by 25 percent.

That is what brought this index down (by 23 percent) just recently. Because the BLS "smooths" the trend downward, it took a few months for the full effect to manifest. This is the most dramatic thing that has happened to this index over several months since the summer of 1999, when AOL attempted to give price breaks to former CompuServe users after AOL merged with CompuServe. (By the way, that price break did not last, so the index went back up.)

That explanation makes it apparent what error remains. Households are switching because the broadband firms completed their build-outs of facilities to more parts of the country, making service available. In addition, some firms have improved the speeds of their networks, inducing users to switch who had been reluctant to do so.

In sum, did the price of the Internet drop? Yes, but this price index records only the price decline going to those who did not switch from dial-up. It is uninformative about the price of the ascending service, broadband. It says nothing about the improvement being experienced by so many households. From this index, there is no way to tell if the gain is big or small.

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