17th Voorburg Group Meeting
Nantes, France
September 2002

Session 2: Producer Prices for Computer Services

U.S Producer Price Index for
Pre-Packaged Software

Jordan Levine

Producer Price Index
U.S. Bureau of Labor Statistics

I.   The U.S. Producer Price Index for Prepackaged Software

Industry Output

1.   Prepackaged software can be broken out into many different categories of output.

The Producer Price index (PPI) is pricing establishments primarily engaging in the design, development, and production of prepackaged computer software. This industry was earlier defined as shrink-wrapped software. However, it has outgrown this definition and now includes software that is available for download over the internet. Important products of this industry include operating, utility, and applications programs. Establishments in this industry may also provide services such as preparation of software documentation for the user, installation of software for the user, and training the user in the use of the software.

2.   Although there are several ways to breakdown and categorize pre-packaged software, PPI prices:

- Applications software (non-suite, sold separately)
- Applications software (sold as a suite)
- Computer games and other pre-packaged software
- Systems software
- Maintenance, documentation, training, and other software services

3.   It is very important to note that in this industry a consumer is purchasing the rights to use the software. Often this does not mean receiving the software in a package, despite the implications of the title "pre-packaged software." Normally a company or consumer will purchase a license to use the software. In some cases the software is secondary to the services provided, and a company is primarily concerned with purchasing the services where the software simply enhances or aids in these services.

Item Selection

4. Ideally, the first stage of sampling would be performed using revenue for a measure of size. However, the sample for this industry was drawn based on probability proportionate-to-size using employment as a proxy for revenue. The sample for this industry was drawn from three data sources so as to have a truly representative sample. A large sample size from these three sources was needed to ensure the continuity of service lines in which products and services have a short life span due to the rapidly changing technology in both the computer hardware and computer software industries. We used three sources because our administrative frame was lacking some of the major players in the industry.   The two additional frames were used to supplement and refine the sample. The second stage of sampling for item selection was performed using establishment revenue data.

Index Methodology

5. One of the most difficult issues in this index is the pricing of computer games. It is not uncommon for a computer game to be popular for less than a year. Once its popularity fades, the price of the game is substantially reduced. In such instances, PPI asks for a replacement game before the repriced game becomes outdated, and directly compares the price for the new game with the price of the old game.

6. Another difficult problem faced by the PPI, is that certain service lines are dominated by a few very large producers. Because of this concentration and the PPI's pledge to keep data confidential there are certain cell indexes that are unpublishable.

Weights

7. The weights for this industry were taken from the frame that was purchased from a private external source. Once a sample was collected, companies were assigned weights according to

their revenue. When revenue data was not available, revenue was estimated by employment size. This has provided a challenge since the relative revenues and size of firms in this industry change significantly between re-sampling.

Issues in Maintaining Constant Quality

8.   Currently, PPI does not have a hedonic model for prepackaged software that can be used to adjust prices in an attempt to maintain constant quality of the index.   However, in an attempt to reduce new item bias a directed substitution procedure (that captures evolutionary changes to a current product or service that did not exist when the sample was selected) is being conducted. Every reporter is called periodically and is asked the following questions:

   a)   Is the version of the product that PPI is pricing the most recent version?

   b)   How often does your firm come out with a new version?

   c)   What is the life expectancy of your current products?

   d)   Does your firm have any Internet sales?

   - Does that price occur at a list price or an actual transaction price?
   - How much? For all products? Some products?
   - What kind of Products?
   - Do your products sell for the same price over the Internet?
   - Do these prices for Internet sales differ for small retailers versus institutional clients?

   e)   Approximately what market share are you predicting for this new product?

   f)   Can you estimate your research and development costs associated with this new product?

   g)   What is your projected revenue for this product?

   From these questions, PPI is able to use disaggregation to replace outdated products with products that are currently being

sold. This also allows the PPI to anticipate when new releases will become available, and to anticipate changes in the industry.

9. In addition to the directed substitution procedure that is aimed at updating products and services from the current sample of prepackaged software companies, the PPI also plans to augment the sample with software companies that have entered the market with new products. These companies, and their products, would not have had a chance of selection in the original sample for this industry.

10. McKinsey and Company, a consulting firm, wrote a paper for the U.S. Bureau of Economic Analysis which suggested the use of *Function Point Analysis* as a quality adjustment tool for custom software. Unfortunately, as McKinsey points out, this methodology is not applicable to prepackaged software.

11. Another issue concerning quality, is how to treat a software update versus a completely new version.   This is one of the most difficult issues in the pre-packaged software index. If a software product has been simply redesigned to run more smoothly with a new graphical interface and may have a couple of superficial features added, then it is considered an update. If the software provides noticeable new functionality that was not offered in the previous software version, then it is considered a new version. Most companies denote this by using numbers and decimals; for example, 3.0 to 3.1 is usually an update and 3.0 to 4.0 is usually a new version. However, fewer firms are using this numbering practice. Unfortunately, it is not always clear cut. Generally, software updates will not have a price change associated with them, while new versions may be priced differently. With a version update, PPI will do a direct comparison to the old version.   For a completely new version of the software, PPI will perform a link to show no change in price since PPI has no other quality adjustment alternatives.

Price Measurement Challenges[1]

12. Industry researchers have estimated that 80 percent of application suite users are familiar with or employ less than 20

---

[1]The Price Measurement Challenges section was taken from a paper written by Mike Holdway *"Challenges in Producer Price Index Measurement of Selected Service Sector Industries in the New Economy."* August 2002

percent of the available features. This has interesting implications because the researcher is or should be concerned with economically meaningful characteristics that Triplett describes as requiring a "…great deal of technical information, an understanding of what is produced as well as how it is used." If the researcher were to consult producers they would likely recommend a specification that emphasized all the new features that are included with their latest product offering, but users, particularly of application software, may strongly disagree with this emphasis.

13.   The inclusion of software services introduces additional complexity because markets dominated by one or two firms may depart significantly from pricing and product development behavior encountered in more competitive markets. It has been suggested that dominant producers may at times introduce new software features not because they are demanded by consumers, but rather to force smaller competitors to expend scarce resources on features that do not threaten the dominant producers market share. On the other hand, IT managers, particularly at large corporations, appear to be evolving to a more conservative and sophisticated view of the benefits and total lifetime cost of software services. Buying decisions today are more likely to be influenced by support issues and application compatibility for exchanging data both inside and outside the firm. The above factors and others beyond the scope of this paper make more difficult the unbundling of those software features that are reliable or even meaningful determinants of price.

14.   Pricing comparability from period to period may be compromised due to a bewildering array of price determining license terms. Companies may acquire software with licensing provisions that enable upgrades to new versions for a discounted fee that is paid annually. For instance, company A pays $300 per user for version 1 of a general productivity suite that includes word processing, database and spreadsheet components. In addition, the licensing terms require company A to also pay an annual fee of 30 percent ($90) of the initial acquisition cost that entitles company A to obtain version 1.1 and subsequent versions for no additional cost. On the other hand, company B may not wish to incur the testing, deployment and support costs associated with frequent updates of software that already provides the functionality required by company B. Instead company B prefers

to license the productivity suite for $300 with provisions to upgrade to a new version every 4 years for $200 per user. The Gartner Group has estimated that more than 60 percent of the installed base for a major application suite is on a version that is two to three generations (3-4 years or more) removed from the most current version. In this semi-hypothetical, the software producer recently changed licensing terms so that companies with old versions can no longer upgrade for a reduced fee. Instead, they must upgrade to the most recent version and pay annual fees for rights to upgrade to future versions at reduced cost. Gartner estimates that businesses that normally upgrade every 3 years would pay anywhere from 33 to 77 percent more under the new licensing terms and those upgrading every 4 years would pay from 68 to 107 percent more. If a business normally upgrades every two years, they would pay 19 percent less with the new license terms. In the example described, customers that previously upgraded infrequently must now pay an annual fee as part of a maintenance agreement or pay full price for future upgrades. License terms are often modified annually and are not unique to a particular software producer. Because pricing agencies adopt sampling strategies that must be sensitive to resource constraints and reporter burden issues, a price index for the same application software could increase or decline significantly depending on the types of transactions sampled. If recent industry events can be extrapolated, then statistical agencies may find that price effects from changes in license terms may have a significantly larger impact on a prepackaged software index than explicit valuations of quality change.