Non-comparable Transactions and Mix-problems

Improved Quality for the Swedish Producer and Import Price Index

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Abstract

When movements in price are measured it is important that the observed transactions are comparable over time regarding price determining characteristics. Price statisticians face transactions that in variable ways change over time. This results in data quality problems. One of these quality problems are problems with non-comparable transactions due to a mix of markets, mix of suppliers, mix of customers, mix of products and alike.

This report aims to give the final results and conclusions from the project *"Non-comparable Transactions"*. The main task of the project has been to identify and find routines that can help handling officers at the Swedish PPI to correct problem-afflicted observations.

In the end routines have been developed for the yearly and monthly cycle of production. A check-list has been implemented as a practical tool for the handling officers when solving problems concerning non-comparable transactions.

Keywords: Non-comparable transactions, mix-problems, mix of products, mix of suppliers, Price indices in Producer and Import stages (PPI), Producer Price Index (PPI), Import Price Index (IMPI) and Export Price Index (EXPI).

1. Introduction

Measuring movements in price from one period to another is complicated because products and transactions changes over time. The wanted price movement is the fluctuation due to pure changes in price, adjusted for different types of noise. Often in reality this is not the case. Other factors than pure changes in prices affects the price movements. Often it is an average price of heterogeneous transactions that is the problem. When average prices are reported the results could be similar to these of unit-value indices[1]. Quality changes are often one factor that is taken care of with different calculation methods. But there are other factors not so easy to discover, these factors and problems are often called mix-problems. Price statisticians need to take care of problems of this kind with other methods then ordinary mathematical methods.

In order to improve the quality of observations within the Swedish Price indices in Producer and Import stages (PPI), the project *"Non-comparable Transactions"* was started. The project aims to identify and attend to problem-afflicted observations. Further, the project was expected to output routines for future identification, correction and documentation of problem observations. The project work was kicked off fall 2006 and was running until the end of December 2008.

This report aims to give the final results of the project. For a start a background and an overview of mix-problems are introduced followed by how the practical work was done. Then routines and check-lists are described and discussed. In the last section the final result and conclusions considering non-comparable transactions are presented.

2. Background

Why do not price statisticians like mix-problems? Because transactions must be comparable over time when you want to measure pure price changes. Please follow this example for an illustration on this topic:

Example 1
The price of a car model A is reported. At point t-1, a price of 250 000 SEK for this specified model is reported. For next period t, the price reported is 270 000 SEK. When contacting the respondent, it becomes clear that the reason for the difference in price depends on differences

[1] A unit value index is a "price" index which measures the change in the average value of units that are not homogeneous and which may therefore be affected by changes in the mix of items as well as by changes in their prices.

in the options for the measured cars. An average price is reported. For period t, better equipped cars (model B) and the same model from the previous time were sold. Suppose a total of 100 cars were sold both period t-1 and period t, then:

	Period t-1	**Period t**
Model	A	A + B
No sold	100	50 + 50
Price of the model, SEK	250000	250000 + 290000
Average price reported, SEK	250000	270000

Hence, no real pure change in price was observed, but rather a problem of mix of specifications or mix of products (cars).

Usually there are big variations between different transactions for a product when there are mixes of markets and customers. Generally Statistics Sweden does not have any information about changes of market structures over time on a detailed product level. Handling officers working with Producer Price Index (PPI) and Import Price Index (IMPI) have to contact establishments and its respondents to investigate mix-problems when they occur.

Historically it has been up to the handling officer to take care of mix-problems without routines, except for a note in the in-house made computer software for documentation.

When the project *"Non-comparable Transactions"* was launched the project was expected to output routines for future identification, correction and documentation of mix-problems. In the routines section of this report some checklists are introduced on different levels.

3. Non-comparable transactions, problem overview

A number of reasons might be the cause behind mix-problems which all deals with non-comparable transactions. These reasons do not have to be mutually exclusive. A number of problems are listed here. There are no definite denominations for specific mix-problems but in the Swedish PPI the following denominations have been used.

- **Mix of Products**. Products might occur in different qualities or with different levels of specification. For example when an average price is reported different levels of quality and/or different specifications afflicts the reported price. In the Swedish PPI there can also be problems with a mix of industrial services.

- **Mix of Customers.** Different customers get different prices for different reasons. For example a big customer often gets lower prices than a small one.
- **Mix of Quantities.** If the quantities sold vary from period to period, the reported price might vary in a wrongful way due to discounts.
- **Mix of order Terms.** Products might be traded under different terms for delivery. Prices for otherwise equal transactions might differ because of this.
- **Mix of Suppliers.** Identical products are delivered by various suppliers at different price levels. This is often a mix-problem when an import price is reported from different markets over time or mix of markets with different characteristics.
- **Mix of Respondents.** When respondents are switched, reported prices may change. This is a usual situation during vacation periods when substitutes report prices. It is also usual when an old respondent quits and a new one do not know what to report. In the Swedish PPI a letter has been sent to the new respondent to inform about the survey and the importance of comparable transactions. However you are never curtain who is responding in reality.

There are other types of mix-problems but they can sort under problems mentioned above.

It is important to notice that some types of variation should be allowed. Of course transactions can vary naturally over time. In some cases it is even tolerable with a mix. An example is that variation due to a change of import countries might be acceptable, as long as the physical and non-physical properties of the product remain unchanged. Import price indices should reflect changes in input prices depending on the fact that imports from low cost markets increases at the expense of higher cost markets. It is assential to catch this change in behaviour among the establishments on an import market when import prices are measured. In some cases this is also present on the export market. Establishments prefer to export to countries where they can get the largest revenue. It can vary from time to time which country it is.

4. Practical work

The practical work with identifying and attending to problems with non-comparable transactions has been going on since fall 2006. The project started out with one person running it on part time basis, but since fall 2007 the project was strengthened with an additional three members from the PPI staff (also part time). During 2008 two

members left the project and in the end of the year there where two part time members working with the project.

In practice most of the work has been to identify and track problem-afflicted observations. In September 2008 there were 120 observations in a documentation file, from 42 establishments. Solutions have been found for 40 to 50 of these observations. The uncertainty in the number of solved cases is due to the fact that many problems were unfortunately not documented in the early stage of the project.

In the end most of the work in the project concerning solving problem-afflicted observations has been concentrated on the following:

- **Desktop investigations.** It has been done by members in the project group but also by other handling officers with support from group members.
- **Company visits.** Throughout 2008 visiting establishments has been a priority. The main topic was not always mix-problems (often the main topic was new commodities) but in the end these problems were always discussed.
- **Development and implementation of routines.** In the next section routines will be presented on several levels.
- **Improved communication.** Improvements, both internal and external, concerning non-comparable transactions have been made by the Swedish PPI. Project members have given attention to the subject and this has lead to important discussions. Now handling officers discuss these problems on a regular basis with project members and with respondents. Among many things a letter has also been produced to inform new respondents about the importance of comparable transactions. Often when respondents have more information about the survey and specific problems they will be more motivated to report prices.

5. Routines

One of the objectives of the project was to develop and establish more explicit routines for identification, correction and documentation of problem-afflicted observations. In the Swedish PPI routines have been developed on an administrative, yearly, monthly and investigating/analysing level. One conclusion from the project was that routines on several levels were the most effective way to identify and solve problem-afflicted observations.

5.1 Routines on an administrative level

In the Swedish PPI three handling officers are working full time with PPI and seven handling officers are working part time in a varying degree. One is product manager, one is validation manager and other administrative duties are on a scheme. All handling officers, except the product manager, are responsible for one or more business sectors. If you are responsible for the calculations for a part of the PPI-survey then you can concentrate on that specific area. In this way knowledge and interest help the handling officer to deal with quality problems.

Routines on an administrative level contain rules and it is important that everybody involved knows about them. For example an education must be held about these routines for new employees. The administrative routines are described below:

A. In the end it is up to the handling officer to solve problem-afflicted transactions in his/her responsible area.

B. Overall for the PPI one handling officer is responsible for mix-problems. In Sweden it is the same handling officer who is responsible for the validation. This is preferable because when data is validated problem-afflicted observations can be discovered.

C. New employees will be educated in how mix-problems are treated in the daily work. It is a shorter education and it can be a part of an introductory education.

D. When new observations are planned, there must be a focus on non-comparable transactions. In the initial phase there are often a lot of contacts with the respondent and hence a great opportunity to solve problems before they even occur.

5.2 Routines on a yearly level

Routines on a yearly level in the Swedish PPI call attention to problems with non-comparable transactions on a regular basis. It is important to update and to repeat how to deal with these kinds of problems. Routines on a yearly level are described below:

A. Every year a longer meeting is held (one day) with the Swedish PPI personnel with mix-problems on the agenda. During this meeting overall methods and routines are discussed and presented. The purpose with this meeting is to give everyone an opportunity to discuss methods and also to give all a chance to come with own proposals on how mix-problems can be solved.

B. At the yearly review of the Swedish PPI all suspicious observations shall be analysed[2]. If the problems are hard to solve or if the observation has low weight then it can be of interest to consider deleting the observation.

5.3 Routines on a monthly level

At the moment, the PPI personnel get together for a validation meeting every month. At the validation meeting mix-problems are now on the agenda. New and unsolved mix-problems are discussed and experiences are shared in the group.

5.4 Routines concerning investigating/analysing

A simple scheme or check-list for capturing and to follow-up non-comparable transactions is to prefer. The meaning of this scheme or checklist is to help investigating officers in their daily work with mix-problems from their desk. It is easy to forget what you should think of when problem-afflicted transactions occur and therefore it is important that the check-list is close to the desktop. A check-list is described below:

A. When a suspicious mix-problem is discovered, then contact the establishment by phone or email. If this is not possible or if the problem is not possible to solve by phone or email consider visiting the establishment. If you need to discuss the problems take contact with the responsible handling officer.

B. When you contact the respondent try to find comparable transactions over time that is representative and typical within the product group on a CN8 level[3]. In exception it is possible to go up on a CN4 level.

C. When observing mixes of products try to find a homogenous product that has same properties or same grade of specification over time. If average prices are reported then be sure that the physical and non-physical characteristics are the same from one time to another

D. When observing mixes of customers try to find a representative and typical customer. This could also be the case when there are mixes of markets within the export and import markets. When there are a mix of markets try to find a representative and typical country.

[2] Every year the Swedish PPI reviews its weights. When January indices are published then there are new weights and also new short term links to December last year.
[3] Combined Nomenclature (CN) is a harmonised classification system for products.

E. Sometimes the best solution is to split the observation into several new observations on customers and markets. This creates a better coverage within the product group on a CN8 level. It also creates a better view of the price determination in that specific industry/company. This method also has disadvantages. In the beginning the new observation has no impact on the index. In the Swedish PPI weights are reviewed in January the following year.

F. If the specific respondent on the establishment is the problem, try to find another contact at the establishment who is willing to deal with the problems. Maybe the new respondent has access to better information?

G. When there are no other possible solutions to the problem try to find another establishment who is willing to report the same kind of transactions. This can only be an option if the old establishment is in the survey with a probability less than 1[4]. This is an exception from the rule because it deviates from the scientific background that the survey is based upon. In this case always contact the responsible handling officer to discuss the method.

H. Always consider if it is worth all the time and cost to solve the specific case. If the observation has a considerable weight then it is always worth the time to solve the problem.

I. It is important to document the work and the investigation. The work should be documented in the in-house made application. In the Swedish PPI the key-word "mix" is used to find suspicious observations in the documentation systems. For that reason it is important to write down the key-word in the text. It is also important to describe the methods that have been used to solve the case.

6. Results and conclusions

The work of tracking and tackling the problems with non-comparable transactions is an ever present process. In the project *"Non-comparable Transactions"* the main purpose has been to identify and find routines that can help handling officers at the Swedish PPI to correct problem-afflicted observations.

[4] In the Swedish PPI the sampling procedure is a stratified PPS (probability proportion to size) design, meaning that sample units are drawn within a stratum (the stratification variable is industry) with probabilities proportional to size. The magnitude of size is based on turnover values.

There are a lot of different kinds of mix-problems involving non-comparable transactions. During the practical work with the project it became clear that a number of reasons might be the cause of mix-problems. These reasons do not have to be mutually exclusive.

In the work with the project it emerges that some types of variation should be allowed. For example it is important to catch changes in behaviour among establishments on an import market. This reflects the price setting on the market. Import price indices should reflect changes in input prices depending on the fact that imports from low cost markets increases often in practice at the expense of higher cost markets. It is important to notice that the physical and non-physical properties of the product should be unchanged from country to country. This is often not easy to catch. Another way to come around this problem is to change the measured price observation from one import market to another more representative, but when?

Most of the work in the project concerning solving non-comparable transactions has been focused on desktop investigations, company visits and on improved communication. It has become clear that good communication with establishments and respondents is the source to success in the work with solving mix-problems. Both internal and external communications have been important. During company visits a lot of misunderstandings concerning non-comparable transactions have been corrected. During the work with the project it appears that company visits is the most effective method to solve these kinds of problems. This method is time consuming and expensive but in the end it is worth it especially when the observation has potential weight.

A clear routine that deals with identification, correction and documentation of problem observations has been developed. It becomes clear that those routines have to be divided into several levels. In the Swedish PPI routines have been introduced now on an administrative, yearly, monthly and investigating/analysing level. On the investigating/analysing level routines are now summarized in a check-list. This check-list helps the handling officer to deal with mix-problems in their daily work. Practical “how to do” tips is the essential part of the list.

In the mentioned checklist, documentation routines have been developed. Today the Swedish PPI has two documentation systems but in the future there will be one. This is to prefer. It is important that the method used to solve the problem is documented. Practical cases help the handling officers in their future work with problems concerning non-comparable transactions, to be a non-problem with comparable transactions.

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