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January 19, 2013

Mr. Gord Macatee
BC Ferry Commission
RPO Box Hillside
Box 35119
Victoria, BC V8T 5G2

Dear Commissioner. Macatee:

Re: Price Compliance Index Review

InterVISTAS has been retained by British Columbia Ferry Service Inc. (BC Ferries) to conduct a verification of various aspects of BC Ferries' computations of the quarterly price cap compliance index and to provide our assessment directly to the Commission. Specifically, I was asked to verify whether the correct methodology has been applied to the computation of the price cap compliance index in light of several changes as outlined in BC Ferries' letter dated January 10, 2013. A copy of that letter is attached as Annex 1.

In the January 10, 2013 letter, BC Ferries requested InterVISTAS' confirmation that BC Ferries' computations of the price cap compliance index conform to the Direct Paasche Index methodology of Order 11-03 (attached at Annex 2). I was asked to provide the following:

1. A comparison of the computation as at March 31, 2012 of the price cap compliance index for each of the major route group, minor route group and northern route group between the Direct Paasche Index methodology of Order 11-03 and the original Tornqvist Index methodology of Order 05-01, and an assessment as to whether any differences are fundamentally detrimental to the operation of the price cap compliance process and/or to fare payers.
2. A determination as to whether BC Ferries' computations for the price cap compliance index for the quarter ended March 31, 2012 conform with the Direct Paasche Index methodology of Order 11-03, including whether:
 - (a) ferry reservation services have been correctly incorporated as a new output category covered by the price cap;
 - (b) route 3 has been correctly incorporated into the major route group; and
 - (c) the index has been correctly rebased to 100.

InterVISTAS has verified the computations by BC Ferries with respect to the items outlined above, and can confirm the following.

Item 1 involves a comparison of the new Paasche to the previous Tornqvist price compliance index computational method. I note that as of 31 March 2012, the Majors route group had not yet incorporated Route 3. Thus I have undertaken a comparison for the Majors not including Route 3 and separately undertaken a comparison for Route 3. I note that my comparison is for Fiscal Year 2012, quarter 4, the last quarter in Performance Term 2. Our findings are as follows:

- For each of the Majors, Route 3, North and Minors route groups, BC Ferries has correctly computed the Paasche price index as outlined in BC Ferry Commission Order 11-03.
- A comparison of the two methods reveals, as expected, that the difference between the Paasche and Tornqvist methods is relatively small. For the North route group, the difference is roughly 1.5% after a period of 8 years, and for the others is roughly one-half of one percent.
- The small differences are what are expected with the price index drift of the Tornqvist methodology.
- The somewhat higher (but still small) results for the North route group are due to the much greater decrease in traffic on that route group.
- I provide a graphic illustration of the difference between the Tornqvist and Paasche price indexes in Annex 3. This highlights the small differences in the methodologies, even after eight years.

Item 2(a) asks whether ferry reservation services have been correctly incorporated as a new traffic category included in the price index. We reviewed the spreadsheet provided by BC Ferries for Fiscal Year 2012, quarter 4 to assess whether the computation of the quarterly price compliance index conforms to the methodology in BC Ferry Commission Order 11-03, and that it correctly incorporates ferry reservation services as a new traffic category covered by the price cap.

- Our review found that the index number methodology conforms to the Direct Paasche Index methodology of Order 11-03.
- The index number methodology correctly incorporates ferry reservation services as a new traffic category to be covered by the price cap.
- The methodology implemented was similar to the previous changes made to the price compliance spreadsheet when drop trailer services were added to the price cap bundle. The one change was that the latter was implemented for the Tornqvist

price compliance index, whereas the 2012 spreadsheet implements the addition of a new category of traffic using the Direct Paasche Index methodology, approved by the BC Ferry Commission in 2011 (Order 11-03).

Item 2(b) asks whether Route 3 has been correctly incorporated into the major route group. We reviewed the spreadsheet provided by BC Ferries for Fiscal Year 2012, quarter 4. Our findings are:

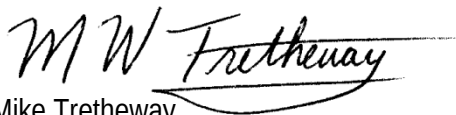
- The methodology used in the calculation of BCFS compliance price index conforms to the Direct Paasche Price Index methodology outlined in Order 11-03;
- The spreadsheet correctly incorporates Route 3 into the Majors route group for the purpose of computing the compliance price index.

Item 2(c) asks whether the Direct Paasche Index has been correctly rebased to 100 in March 2012, which marks the end of Performance Term 2. Rebasing provides a price index series which will show the aggregate changes in BCFS prices for every quarter of PT3 relative to the weighted average prices received by BCFS as of the end of PT2. Our findings are that:

- We have found no errors in the rebasing method. The rebasing of the quarterly price index is correctly done.

InterVISTAS review is not a formal accounting audit. InterVISTAS makes no representations and provides no warranty beyond the confirmation that BC Ferries' computations are consistent with the Direct Paasche Index methodology as outlined above.

Sincerely,



Mike Tretheway
President and Chief Economist
InterVISTAS Consulting Inc.

cc: Mr. Robert P. Clarke, BC Ferry Services
Mr. Sheldon Stollen, BC Ferry Commission

Annex 1: Engagement Letter

January 10, 2013

Dr. Mike Trethaway
Intervistas
1200 West 73rd Avenue, Suite 550
Vancouver, BC V6P 6G5

Dear Dr. Trethaway:

PRICE CAP COMPLIANCE INDEX REVIEW

As you are aware, by Order 11-03, the British Columbia Ferry Commission (Commission) accepted the proposal of British Columbia Ferry Services Inc. (BC Ferries) to replace the methodology of Order 05-01 for calculating the quarterly price cap compliance index, referred to as the Tornqvist Index, with the same methodology used to calculate the quarterly price cap index, referred to as the Direct Paasche Index. This change in methodology was effective April 1, 2010.

Also impacting the price cap compliance index were the following changes effective the quarter ended March 31, 2012, the end of Performance Term Two:

- Arising from amendments to the *Coastal Ferry Act*, reservation fees were incorporated as a new category to be included in the price cap;
- Arising from amendments to the Coastal Ferry Services Contract, route 3 was incorporated into the major route group; and
- Arising from a decision of the Commission, the price cap compliance index was rebased to 100.

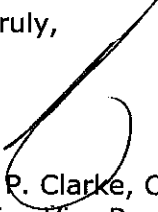
The Commission requires confirmation that BC Ferries' computations for calculating the price cap compliance index have conformed to the Direct Paasche Index methodology of Order 11-03, and also requires an assessment of whether the Direct Paasche Index methodology has performed as originally envisaged by Order 11-03. Specifically, the Commission seeks:

1. A comparison of the computation as at March 31, 2012 of the price cap compliance index for each of the major route group, minor route group and northern route group between the Direct Paasche Index methodology of Order 11-03 and the original Tornqvist Index methodology of Order 05-01, and an assessment as to whether any differences are fundamentally detrimental to the operation of the price cap compliance process and/or to fare payers.
2. A determination as to whether BC Ferries' computations for the price cap compliance index for the quarter ended March 31, 2012 conform with the Direct Paasche Index methodology of Order 11-03, including whether:

- a. ferry reservation services have been correctly incorporated as a new output category covered by the price cap;
- b. route 3 has been correctly incorporated into the major route group; and
- c. the index has been correctly rebased to 100.

BC Ferries requests that you undertake an independent assessment of these matters for the Commission and provide your assessment directly to Mr. Gord Macatee, British Columbia Ferries Commissioner, via email at ferrycommissioner@shaw.ca. Please ensure that we receive a copy of the assessment you provide to Mr. Macatee.

Yours truly,



Robert P. Clarke, CGA
Executive Vice President & Chief Financial Officer

cc: Mr. Gord Macatee, BC Ferry Commission
Mr. Sheldon Stoilen, BC Ferry Commission

Annex 2: BC Ferry Commission Order 11-03



BRITISH COLUMBIA
FERRY COMMISSION

ORDER
NUMBER: 11-03

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IN THE MATTER OF
Section 38 (2) of the *Coastal Ferry Act*, S.B.C. 2003, c. 14
And
Revised Methodology for Determining Weighted Average Fares for
Comparison with Price Caps

BEFORE: Sheldon Stoilen, Deputy BC Ferries Commissioner

O R D E R

WHEREAS:

- A. Section 38(2) of the Act requires the commissioner to determine quarterly whether the average fare charged by a ferry operator is within a price cap for each route group;
- B. BC Ferry Services Inc. (BC Ferries) observed that the existing methodology outlined in Order 05-01 for calculating weighted average fare indices or the Tornquist index method is inconsistent with the methodology used to calculate the price cap indices and has unintentionally produced price index drift due to swings in prices and quantities (i.e. traffic) during 2010/11.
- C. BC Ferries reported that drift was beginning to appear in the quarterly average fare increases in Spring 2011 due to large fuel cost increases and declining traffic as the result of the global recession in 2008 and 2009. This drift was beginning to impact whether or not the company was in compliance and made forecasting the quarterly average fare index more difficult.
- D. BC Ferries proposed replacing the Tornquist index method used to calculate the weighted average fare index with the method used to calculate the quarterly price cap index called the Direct Paasche price index.
- E. BC Ferries proposed that the revised methodology be applied to fiscal 2011 due to the unintentional negative consequence to the company's tariff revenues.

NOW THEREFORE the Deputy Commissioner orders as follows:

- a. BC Ferries shall calculate and compare weighted average fares and price caps quarterly in a manner consistent with the attached Determination for each route group; and
- b. that this revised methodology be adopted retroactive to April 1, 2010 in view of the four-quarter averaging used to calculate the weighted average fares.

DATED at Bowen Island, in the Province of British Columbia, this 22nd day of October 2011 and conveyed verbally to BC Ferries in June 2011.

BY ORDER

A handwritten signature in black ink, reading "S. T. Stoilen". The signature is written in a cursive, flowing style. There is a small, light-colored rectangular mark or stamp directly beneath the signature.

Sheldon Stoilen
Deputy BC Ferries Commissioner

**Revised Methodology
for
Calculation of Average Ferry Fares
for
Comparison with Price Caps**

**Gordon Macatee
BC Ferries Commissioner
July 2011**

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1 Introduction

Purpose of this Document

Under the Coastal Ferry Act, the commissioner is to regulate ferry fares using an approach known as price cap regulation.

The Act states that the commissioner is to:

- 38(a).... review the quarterly reports and annual reports of the ferry operator ... to determine whether...the weighted average of the tariffs charged in relation to the core ferry services applicable to each route group serviced by the ferry operator is within the price cap established for that route group.

Order 05-01 detailed the methods and formats which a ferry operator should use to calculate, compare and report average ferry fares and price caps. The use of these methods and formats permit:

- **the commissioner** to determine whether or not the ferry operator is in compliance with the Act, and whether enforcement actions are called for;
- **ferry customers** to know whether they are being charged fares within the legal limits; and
- **ferry operators** to evaluate alternative service offerings and associated tariffs in order to make maximum use of their pricing freedoms.

The purpose of Order 11-03 is to slightly revise the methodology to calculate average ferry fares. The methodology to determine the price caps remains unchanged.

The motivation for changing the methodology used to calculate average ferry fares was an observation by BC Ferry Services Inc. (“BC Ferries” or the “Company”) is that the existing methodology outlined in Order 05-01 for calculating weighted average fare indexes is inconsistent with the methodology of calculating the price cap indexes and has produced unintentional consequences because of a phenomenon called ‘price index drift.’ Drift is an issue which can emerge in a price index methodology, especially when prices or quantities used for the computations begin to swing. The methodology adopted in Order 05-01 used a modern and often recommended price index computational method, referred to by economists as the Tornquist index method which has the advantage of allowing the weights that are to be applied to the price changes of various categories of ferry traffic to change year to year. This was considered to be desirable as with the commencement in 2004 of regulation of the fares charged by BC

Ferry Services Inc., it was not known whether the relative mix of traffic would change. Allowing weights to change in price index calculations has long been advocated by economists in this field. However, a consequence of the original methodology was that price index drift can emerge. Drift is a known phenomenon that affects a number of price index methodologies and has been written about by a number of statisticians, economists, government agencies and independent organizations such as the Organization for Economic Co-operation and Development (OECD). Drift is generally not an issue when prices and quantities (i.e. traffic) are relatively stable, but can emerge when there are swings in prices or quantities.

With the impact of large fuel cost increases and decline in traffic during the global economic recession of 2008 and 2009, BC Ferries observed to the Commission that drift was beginning to occur in the quarterly average fare index. This drift was beginning to affect the quarterly assessment as to whether or not the Company was in compliance. As well, the emergence of drift was making it more difficult for the Company to forecast its quarterly average fare index, which it needs to do to fine tune its pricing initiatives.

BC Ferries proposed replacing the existing average fare index methodology of Order 05-01 with the same methodology used to calculate the quarterly price cap index referred to as a Direct Paasche Price Index. The Company provided computations illustrating the proposed methodology and which showed the effect of adopting the proposed methodology relative to the existing methodology. These showed that the proposed methodology produced almost exactly the same price index computations as the existing methodology for the years prior to the fuel cost and economic crises that emerged in 2008 and later. Differences between the two methodologies were often less than one one-hundredth of one percent, and always less than one-tenth of one percent. Beginning in 2008, however, the differences increased to roughly three-tenths of one percent. Unintentionally, this penalized the Company by roughly \$2 to \$3 million per annum during this period. The Company also showed that the proposed methodology is simpler, eliminating three of nine steps in the computations. In addition the commissioner has taken note of the observation that the relative revenue shares of the different categories of traffic have been stable since 2004 means that the need for allowing quarterly changes in the weights to be applied to different traffic categories is no longer a major concern. Further, the proposed direct Paasche methodology will allow the weights to be changed every performance term (i.e. every four years).

Accordingly, the commissioner has decided to change the methodology for computing the quarterly price compliance index to reflect the weighted average fares of a ferry operator. The Direct Paasche Price Index methodology is hereby adopted for calculating weighted average fare indexes effective April 1, 2010. At the beginning of each new performance term, the base period (beginning of performance term) prices used in the computations will be reset. BC Ferries' computations and the results of this change will be independently evaluated after one year.

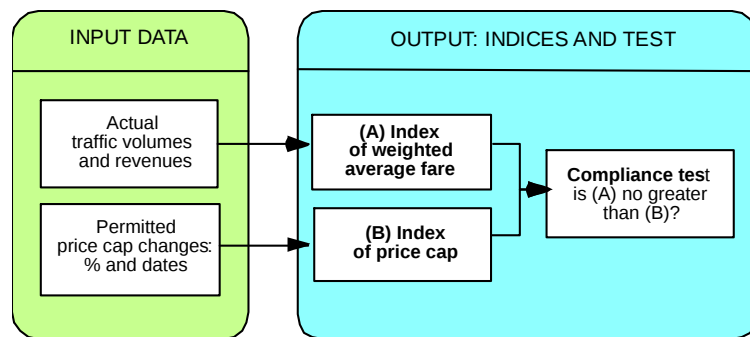
Outline of this document

Order 05-01 described relevant clauses in the Act, defined the technical terminology used in constructing the original price index, detailed the nine-step methodology used to compute the original quarterly price index, and discussed some technical issues that arise in applying the methodology.

This document does not repeat that discussion. This document focuses on the changes from the original nine-step price index methodology to the new six-step methodology. This is followed by a comparison of the results of the original and new methodologies.

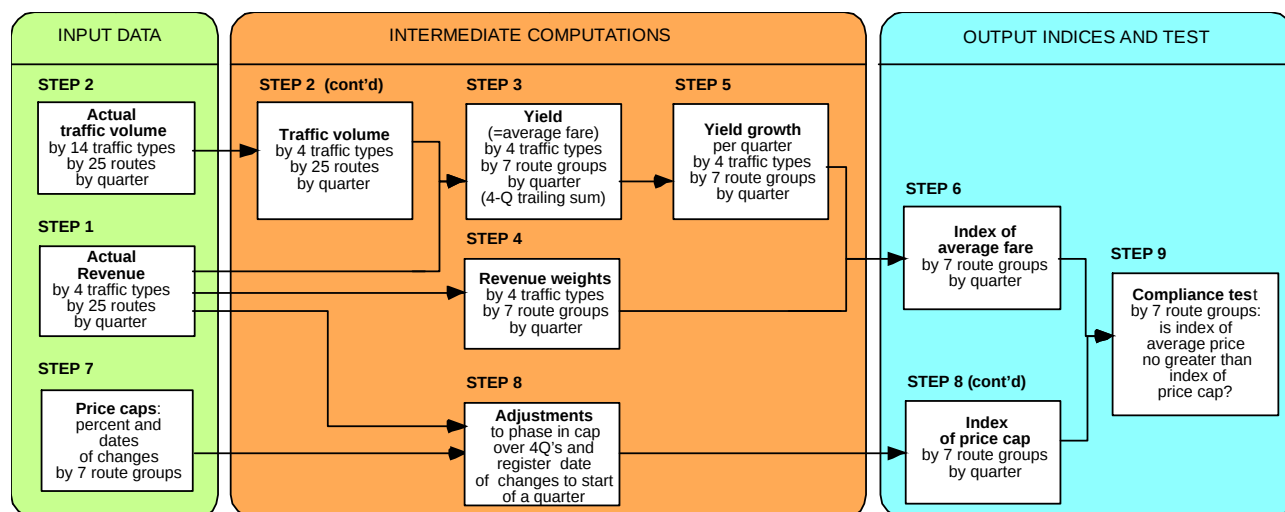
2 Overview of Determining Price Cap Compliance

The diagram below summarizes the approach for measuring and comparing average fares and price caps. It combines actual traffic volumes and revenues to generate an index of average fares actually paid by ferry users, computed at the end of each quarter year. This is compared with an index of the price cap, derived from the permitted percentage changes set by the Commission, also computed quarterly. If the former index does not exceed the latter, the ferry operator is in compliance.



3 Six-Step (Formerly Nine-Step) Calculation

The flow chart below provides an overview of the original nine-step method of Order 05-01. The description of these steps is found in Order 05-01.



The proposed methodology using the Direct Paasche Price Index method requires only six steps. Steps 3, 4 and 5 are no longer needed, simplifying the computation of the price index. To provide continuity with the previous methodology described in Order 05-01, the same numbering of steps is used in this Order. Thus the new methodology consists of steps 1, 2, a modified version of 6, then steps 7, 8 and 9. Only step 6 is different of the remaining six steps.

Step 6 Direct Price Index

This step computes the price index using the direct Paasche methodology, well known to economists. The index is computed by dividing the actual revenues for the actual traffic carried by the revenues that would have been received if the actual traffic carried had been charged the prices which prevailed at the beginning of the current performance

term.¹ The resulting ratio is multiplied by 100. Doing so results in the initial value of the price index at quarter 4 of FY2002/03 as 100. This, by definition, is the value of the index at the start of the first day of the Coastal Ferry Act.

For price cap compliance test purposes the Direct Paasche Price Index is calculated as a rolling four-quarter index. For clarity, Step 6 involves the following computation:

1. for each category of traffic multiply the actual four quarter trailing sum of traffic of each of the ten traffic categories by the 'base year prices' of that traffic category, i.e. by the average revenue per traffic unit that prevailed in FY2008Q1;
2. add up these 'revenues at base year prices;'
3. compute the ratio of the four quarter trailing sum of actual revenues for each of the individual traffic categories to the revenues at base year prices.
4. Multiply this ratio by 100.

The result is the Direct Paasche Price Index.

Step 6a Quantity Index

An index of the total amount of traffic carried (called a quantity index) is not required for price cap regulation within a performance term. However, it was determined in Order 05-01 that it would be a useful measure to have when conducting the price cap reviews to be undertaken by the Commission every four years. Thus the computation of the Direct Price Index in Step 6 is supplemented by an additional calculation of a traffic index. This computation is referred to as Step 6a.

As with the original methodology, the quantity index is simply constructed: divide total revenues by the Price Index and covert the result to an index using 100 as the index for the base quarter.

Step 9 Compliance test

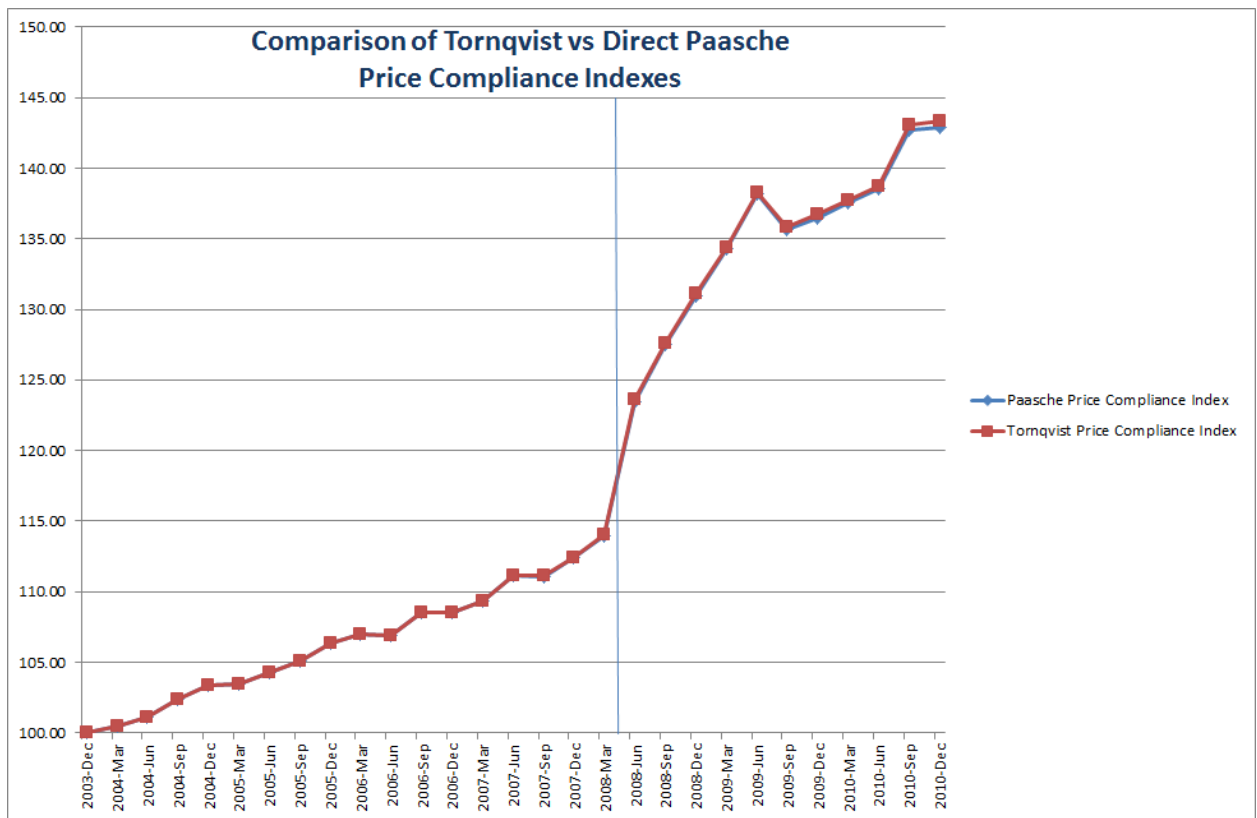
This step is unchanged from Order 05-01, but is repeated here to show how the revised price index is used.

The compliance test (Step 9) compares the average fare index from Step 6 to the price cap index of Step 8. If the latter is greater than or equal to the former, the ferry operator is in compliance.

¹ The Commission will reset the 'base period prices' at the beginning of each four-year performance term. This resetting is recommended by economists. It is similar in concept to the periodic resetting of base period values in the consumer price index computed by Statistics Canada.

4 Comparison of Price Indexes with Previous and New Methodologies

For illustration, the graph below compares the computation of the price index for Route Group 1 with the previous and new methodologies. This diagram computes the index with each methodology back to the quarter ending December 2003. The two indexes are almost identical until 2009. In 2009 and the following period the Direct Paasche Price Index is lower than the original Tornqvist Price Index methodology by a small amount, not exceeding three-tenths of one percent for any of the route groups.



The Company observed a consequence of price index drift. With a price index that is subject to drift, the methodology of Order 05-01 could result in the paradoxical result that if the company raised fares and then returned them to original levels, and if traffic also returned to the original levels at the original fares, then the price index used to assess compliance with the price cap would not return to the original level. This is why the phenomenon is referred to as price index drift. In the volatile conditions that prevailed in 2008 and 2009, the original methodology could result in an erroneous finding that the company was not in compliance with the Commission's price cap. With this order, that possibility has been eliminated.

Annex 3: Comparison of Tornqvist and Paasche Price Indexes

