

Progress on Revising the Consumer Price Index Manual: Chapters 15-23

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Introduction

- A basic constraint on revising the theoretical chapters of the existing Manual is that it should not grow longer!
- Thus some sections will have to be dropped to make room for a new chapter on *Multilateral index number theory and its application to scanner data*.
- It is proposed that this new chapter **replace** the existing Chapter 19: *Price indices using an artificial data set*.
- Since multilateral index number theory draws on both the economic and stochastic approaches, it seems best to place this chapter after all of the basic approaches to index number theory have been discussed.
- Some additional sections of Chapters 15-23 will be dropped as well; these are sections that are not important to the overall Manual

Chapter 15: Basic Index Number Theory

- *Basic index number theory*, Paragraphs 15.1-15.64: to remain as is.
- *Divisia indexes*; Paragraphs 15.65-15.73.
- This material to be dropped from the revised Manual. The rationale for this omission is that the theory of Divisia indexes relies on a continuous time approach to index number theory.
- While this approach leads to some insights, it does not lead to practical advice on how to actually construct an index in discrete time.
- Hence, we propose dropping this material.

Chapter 15: Basic Index Number Theory (continued)

- *Fixed base versus chain indices*; Paragraphs 15.76-15.97.
- This material needs to be revised somewhat.
- The chain drift problem should be introduced here with reference being made to the new Chapter 19, where possible solutions to the problem will be discussed.

- *Appendices 15.1, 15.2 and 15.3 (on relationships between the Laspeyres, Paasche, Lowe and Young indexes)*
- This material to be retained as is.
- Appendix 15.4 (the relationship between the Divisia and economic approaches) to be dropped.

Chapter 16: The Axiomatic and Stochastic Approaches to Index Number Theory

- The *axiomatic approach to index number theory*,
- Paragraphs 16.1-16.73: to remain as is.

- The *stochastic approach to index number theory*, Paragraphs 16.74-16.93:
- Basically, to remain as is with some updating of references to the recent work of Rao and Hajargasht (2015) on this approach.

- The *second axiomatic approach to bilateral price indices*, Paragraphs 16.94-16.129:
- To be dropped. This axiomatic approach is not as compelling as the first axiomatic approach and so in the interests of saving space, we propose to drop this material.

Chapter 16: The Axiomatic and Stochastic Approaches to Index Number Theory (continued)

- The *test properties of the Lowe and Young indexes*, Paragraphs 16.130-16.134:
- To be retained.

- Appendix 16.1: *on the optimality of the Törnqvist Theil index number formula using the second axiomatic approach*:
- To be dropped. This axiomatic approach is not as compelling as the Fisher approach.

Chapter 17: The Economic Approach to Index Number Theory: The Single Household Case

- The *economic approach and exact index number formulae*, Paragraphs 17.1-17.64:
- To remain as is.
- *Annual preferences and monthly prices and the Lowe index as an approximation*, Paragraphs 17.65-17.83:
- To be dropped.
- The problem with this approach is that monthly preferences are the more fundamental concept and if consumers have monthly preferences that differ across months due to strongly seasonal commodities, then annual preferences are not meaningful.

Chapter 17: The Economic Approach to Index Number Theory: The Single Household Case (continued)

- **The problem of seasonal commodities**, Paragraphs 17.84-17.89:
- To be dropped. This material can be covered in the chapter on seasonal commodities.
- The *problem of a zero price increasing to a positive price*, Paragraphs 17.90-17.94:
- This material needs to be expanded somewhat to cover **the new goods problem**. Hicks' (1940) methodological approach to the new goods problem should be covered here, along with and Feenstra's (1994) application of the approach.
- This topic will be revisited in the Chapter on quality adjustment but the Hicks approach does fit in with the economic approach to index number theory.

Chapter 18: The Economic Approach to Index Number Theory: The Many Household Case

- **The material in this Chapter can be retained as is.**

Chapter 19: Price Indices Using an Artificial Data Set

- **It is proposed that this chapter be dropped altogether and be replaced by a new Chapter 20 to be explained below.**
- **Examples of how the various index number formulae work can be given in the chapter on seasonal commodities, using a real Israeli data set on seasonal commodities.**

Chapter 20: Elementary Indexes (New Chapter 19)

- It is proposed that this chapter be moved up to replace the omitted Chapter 19.
- *Basic materials on elementary indexes*, Paragraphs 20.1-20.87: remain as is with small changes when appropriate. These materials would be relabelled as Paragraphs 19.1-19.87.
- *The use of scanner data in constructing elementary aggregates*, Paragraphs 20.88-20.99. This material would be dropped; it will be covered in the new Chapter 21 on Scanner Data.
- *A simple stochastic approach to elementary indices*, Paragraphs 20.100-20.111. This material will be retained as it deals with the bilateral approach to elementary indexes. Multilateral approaches also exist and these extensions will be covered in the new chapter on Multilateral Index Number Theory and Scanner Data.

New Chapter 20: Multilateral Index Number Theory and its Application to Scanner Data

- The **main multilateral index number methods** that have been applied to scanner data in the time series context are covered in Diewert and Fox (2017), which will be presented later.
- The **chain drift problem** which occurs when scanner data are used at the first stage of aggregation was flagged by de Haan and van der Grient (2011).
- The use of multilateral methods in a time series context is due to Balk (1981) and more recently, Ivancic, Diewert and Fox (2011) noted that multilateral methods could be used in order to solve the chain drift problem.
- Other papers that will be covered in this chapter are the Australian Bureau of Statistics (2016), Chessa (2016), de Haan (2008) (2015a) (2015b) and Krsinich (2011) (2016).

Chapter 21: Quality Change and Hedonics

- **This chapter needs to be completely rewritten in the light of recent research; e.g., see de Haan and Krsinich (2014), Krsinich (2013) and de Haan and Diewert (2017).**
- **The paper by de Haan and Diewert (2017) is available as a background document.**

Chapter 22: The Treatment of Seasonal Products

- **This Chapter also needs to be completely rewritten. The Turvey example is out of date.**
- **The work of Diewert, Finkel and Artsev (2009) and Diewert (2014) will be covered.**
- **Israel has made available a new seasonal data set that can be used to illustrate the various treatments of seasonality.**

Chapter 23: Durables and User Costs

- **Most of the material in this chapter can remain in the revised Manual.**
- **Since the Manual was written, quite a bit of research on using sales data to obtain a decomposition of property value into structure and land components has take place.**
- **This research needs to be summarized.**
- **Relevant materials include Koev and Santos Silva (2008), Rambaldi, McAllister, Collins and Fletcher (2010), Diewert and de Haan (2011), Diewert, de Haan and Hendriks (2011) (2015), Diewert and Shimizu (2015) (2016), Eurostat (2015), Burnett-Issacs, Huang and Diewert (2016) and Diewert, Huang and Burnett-Issacs (2017).**

Conclusion

- **We hope to have preliminary drafts of the chapters for Part II of the revised CPI Manual done by the end of September.**
- **We plan to have the final draft done by the end of 2017.**
- **Please send me any comments and suggestions for improving the Manual at:**
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References

- Australian Bureau of Statistics (2016), “Making Greater Use of Transactions Data to Compile the Consumer Price Index”, Information Paper 6401.0.60.003, November 29, Canberra: ABS.
- Balk, B.M. (1981), “A Simple Method for Constructing Price Indices for Seasonal Commodities”, *Statistische Hefte* 22 (1), 1–8.
- Burnett-Issacs, K., N. Huang and W.E. Diewert (2016), “Developing Land and Structure Price Indexes for Ottawa Condominium Apartments”, Discussion Paper 16-09, Vancouver School of Economics, University of British Columbia, Vancouver, B.C., Canada.
- Chessa, A.G. (2016), “A New Methodology for Processing Scanner Data in the Dutch CPI”, *Eurona* 1/2016, 49-69.
- de Haan, J. (2008), “Reducing Drift in Chained Superlative Price Indexes for Highly Disaggregated Data”, paper presented at the EMG Workshop 2008, University of New South Wales, Sydney, Australia, December 10-12.

References

- de Haan, J. (2015a), “A Framework for Large Scale Use of Scanner Data in the Dutch CPI”, Paper presented at the 14th meeting of the Ottawa Group, May 22, Tokyo.
http://www.stat.go.jp/english/info/meetings/og2015/pdf/t6s11p33_pap.pdf
- de Haan, J. (2015b), “Rolling Year Time Dummy Indexes and the Choice of Splicing Method”, Room Document at the 14th meeting of the Ottawa Group, May 22, Tokyo.
<http://www.stat.go.jp/english/info/meetings/og2015/pdf/t1s3room>
- de Haan, J. and W.E. Diewert (eds.) (2011), *Residential Property Price Indices Handbook*, Luxembourg: Eurostat.
http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/methodology/hps/rppi_handbook
- de Haan, J. and W.E. Diewert (2017), “Quality Change, Hedonic Regression and Price Index Construction”, unpublished paper, February 13.
- de Haan, J. and H.A. van der Grient (2011), “Eliminating Chain drift in Price Indexes Based on Scanner Data”, *Journal of Econometrics* 161, 36-46.

References

- de Haan, J. and F. Krsinich (2014), “Scanner Data and the Treatment of Quality Change in Nonrevisable Price Indexes”, *Journal of Business and Economic Statistics* 32:3, 341-358.
- Diewert, W.E. (2014), “An Empirical Illustration of Index Construction using Israeli Data on Vegetables”, Discussion Paper 14-04, Vancouver School of Economics, The University of British Columbia, Vancouver, Canada, V6T 1L4.
- Diewert, W.E., Y. Finkel and Y. Artsev (2009), “Empirical Evidence on the Treatment of Seasonal Products: The Israeli Experience”, pp. 53-78 in *Price and Productivity Measurement: Volume 2: Seasonality*, W.E. Diewert, B.M. Balk, D. Fixler, K.J. Fox and A.O. Nakamura (eds.), Victoria, Canada: Trafford Press.
- Diewert, W.E., J. de Haan and R. Hendriks (2011), “The Decomposition of a House Price Index into Land and Structures Components: A Hedonic Regression Approach”, *The Valuation Journal* 6, 58-106.
- Diewert, W.E., J. de Haan and R. Hendriks (2015), “Hedonic Regressions and the Decomposition of a House Price index into Land and Structure Components”, *Econometric Reviews* 34, 106-126.

References

- Diewert, W.E. and K.J. Fox (2017), “Substitution Bias in Multilateral Methods for CPI Construction using Scanner Data”, Discussion Paper 17-02, Vancouver School of Economics, The University of British Columbia, Vancouver, Canada, V6T 1L4.
- Diewert, W.E., N. Huang and K. Burnett-Issacs (2017), “Alternative Approaches for Resale Housing Price Indexes”, Discussion Paper 17-03, Vancouver School of Economics, The University of British Columbia, Vancouver, Canada, V6T 1L4.
- Diewert, W. E. and C. Shimizu (2015), “Residential Property Price Indexes for Tokyo,” *Macroeconomic Dynamics* 19, 1659-1714.
- Diewert, W. E. and C. Shimizu (2016), “Hedonic Regression Models for Tokyo Condominium Sales,” *Regional Science and Urban Economics* 60, 300-315.
- Eurostat (2015), *Eurostat-OECD Compilation Guide on Land Estimation*, Luxembourg: Publications Office of the European Union.

References

- Feenstra, R.C. (1994), “New Product Varieties and the Measurement of International Prices”, *American Economic Review* 84, 157-177.
- Hicks, J.R. (1940), “The Valuation of the Social Income”, *Economica* 7, 105-140.
- Ivancic, L., W.E. Diewert and K.J. Fox (2011), “Scanner Data, Time Aggregation and the Construction of Price Indexes”, *Journal of Econometrics* 161, 24-35.
- Krsinich, F. (2011), “Price Indexes from Scanner Data: A Comparison of Different Methods”, Paper presented at the twelfth meeting of the Ottawa Group, May 4-6, Wellington, New Zealand.
- Krsinich, F. (2013), “Using the Rolling Year Time Product Dummy Method for Quality Adjustment in the Case of Unobserved Characteristics”, Ottawa Group 2013 Meeting, Copenhagen, Denmark, May 1-3.

References

- Krsinich, F. (2016), “The FEWS Index: Fixed Effects with a Window Splice’ , *Journal of Official Statistics* 32, 375-404.
- Rambaldi, A.N., R.R.J McAllister, K. Collins and C.S. Fletcher (2010), “Separating Land from Structure in Property Prices: A Case Study from Brisbane Australia”, School of Economics, The University of Queensland, St. Lucia, Queensland 4072, Australia.
- Rao, D.S. Prasada and G. Hajargasht (2015), “ Stochastic Approach to Computation of Purchasing Power Parities in the International Comparison Program (ICP) ” , *Journal of Econometrics* 191(2), 414-425.