Comments by Daniel Melser on,
"Hedonic Price Measurement: the CCC Method"
by Ludwig von Auer.

Paper Presented at the SSHRC Conference in Vancouver, June/July 2004.

A Short Summary of the Paper:

This papers primary aim is to undertake a hedonic analysis of the prices of laser printers in Germany from Jan 1992 – Dec 2003. In the first half of the paper the data set is discussed which consists of 378 observations obtained from a German computer magazine on the prices of laser printers.

One of the conventional approaches to hedonic analysis is to use the time-dummy (or Adjacent Year Regression (AYR)) method for constructing hedonic price indexes. However, the author criticizes this method and pursues an alternative approach. The main contribution of the paper is to suggest an alternative hedonic method, the Continuously Compounding Coefficient (CCC) method, which allows the parameters in the hedonic function to change over time by allowing up to a 3^{rd} order time trend in the estimated coefficients. The CCC method is then applied to the laser printer data set.

Some General Comments:

I enjoyed reading this paper. It is nicely written and involves an interesting topic – that of looking at alternative forms of the hedonic regression equation.

I think that this paper fits into the literature on hedonic price measurement in terms of addressing issues related to the appropriate functional form and flexibility of the hedonic equation. This is an important area of research which interestingly has been neglected in both the theoretical literature on hedonics (Diewert (2001) is an exception) and especially the empirical literature. This is strange given the extensive discussion of flexible functional forms in finding exact and superlative index numbers in index theory.

Some More Specific Comments:

1. This paper presents an interesting new hedonic model, the CCC method, which sits somewhere between the time-dummy method (AYR) and the more general imputations regression method where a separate regression is run each period.

   One of the authors primary reasons for using the CCC method rather than other methods is a concern with the number of parameters to estimate as the data set used was relatively small. Let us then take a brief look at the number of parameters that are required to be estimated under alternative hedonic regression methods. To make the case concrete suppose that we have a panel data set with T (= 10) time periods and K (= 10) quality variables.

(a). The Pooled Time-Dummy method where a single hedonic regression is run over all time periods with the inclusion of time dummy variables.
No. Parameters = K + T – 1
= 10 + 9 = 19

(b). The Time-Dummy Adjacent Year (AYR) method where data is pooled over only adjacent years and a single dummy variable for time is included.
No. Parameters = K*(T – 1)
= 10 * 9 = 90

(c). Using the Imputations method where a hedonic regression is estimated each period.
No. Parameters = K * T
= 10 * 10 = 100

(d). The CCC Method.
No. Parameters = K + n * K, n = order of the time polynomial
= 10 + 3 * 10 = 40, n = 3

Thus it can be seen that the CCC method (d) can bring about a significant reduction in the number of parameters to be estimated compared with estimating a hedonic regression each period (c) or using the AYR method (b). However, it has over double the number of parameters to be estimated in the Pooled Time-Dummy method (a).

An important point to note is that the number of parameters required to be estimated in the CCC method does not depend on T but only on K (and n). This means that for T very large the CCC method will have less parameters to estimate than even the Pooled Time-Dummy method. However, if T is relatively small then the number of parameters to estimate for the CCC method could exceed that for the Imputations method where the hedonic equation is estimated each period.

An alternative approach to the CCC method, which reduces the number of parameters to estimate but increases the flexibility of the Pooled Time-Dummy method, would be to allow structural breaks in the coefficients for a Pooled Time-Dummy model. This would allow some flexibility in not restricting the parameters to necessarily be the same of the entire time span of the panel and would keep the number of parameters to be estimated at a manageable level.

As seen can be seen the CCC method reduces the number of parameters to estimate relative to the AYR method and the Imputations method. This reduction in the number of parameters is very useful for the particular problem the author faced with his data set however such a reduction in the number of parameters may not be essential in the future. It is anticipated that the scanner data “revolution” will mean that a very large number of observations on products sales, prices and

characteristics will be available. This will mean there will essentially be no practical constraints on the number of parameters that can be estimated.

2. I am not entirely convinced that all the criticisms of the time dummy (AYR) method, made on p.5-7, are fair. With regard to objection (1) it is not clear why the AYR method is subject to estimation biases to a greater extent than any other hedonic method from the "omission of relevant variables" or why it is considered "inefficient". It would be useful if these points were further elaborated or dropped. With regard to objection (3) which states that the AYR method does not use the available information efficiently when there are two observations on the same laser printer at different times of the same year. It is not clear to me that the CCC method will do a better job in this regard.

3. The CCC method suggested by the author only allows the parameters on the quality characteristics to change smoothly over time. This is an important feature or basic assumption of the model and it is not completely clear that we would expect parameters always to change in a smooth fashion. It may be the case, for example, that there is a technological break-through, at a point in time, in the ability to produce some characteristic more cheaply. This change will likely lead to a *level shift* or a *jump* in the characteristic price and not a smooth change. Whether technological progress occurs in jumps or more smoothly is not altogether clear but the fact that this model constrains the changes to be smooth is important and may for example lead to price indexes which are in some sense artificially smooth.

4. In the empirical application it would have been useful to see a comparison of various hedonic methods as a way of assessing the CCC method. Particularly it would have been good to compare the Pooled Time-Dummy, AYR and CCC methods (a comparison with the Imputations method would also be very useful though this may not have been possible given the data constraints). In the paper only the results of the CCC method are given. It would be interesting to note whether there were any differences between this method and the others. If there were empirical differences then these could be discussed and perhaps used to strengthen the author's argument that the CCC method is an important hedonic method.

   Another point with regard to the empirical application is that in Figure 3 the CCC results are compared with the 'Official' results which are presumably from the laser printer component of the German CPI. This is an interesting comparison however the data used in the two calculations is likely to be completely different so it may not be surprising that the results are different. Another comparison which is perhaps more important in identifying *bias* is to compare the CCC method applied to the authors data set with an index reflecting the 'Official Methodology' of index construction also applied to the authors data set. I am not sure what procedure is used in the German CPI but this is likely to be some sort of matched model index.

   A final point on the empirical application is that an arithmetic average of the price relatives (a Carli-type formula) is used to derive the price index between the adjacent

periods. The use of this technique is questionable as the Carli formula has in some sense an upward bias (Chp. 20, ILO Manual, 2003). There are a range of alternatives that could be used such as geometric means which do not have this feature.

References:

Diewert, Erwin (2001), "Hedonic Regressions: A Consumer Theory Approach", *Department of Economics Discussion Paper No. 01-12*, University of British Columbia.

ILO Manual (2003), 'Revision of the ILO Manual on the CPI', Electronic Resource Retrieved from, http://www.ilo.org/public/english/bureau/stat/guides/cpi/