Reprise and Clarification

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We find Professor Benzing's comment on our application of the Bennett Test in the money-in-the-production-function debate contained in our 1987 paper in this journal a misconceived one since it applies the test to a new and improved data set over the 1959-85 period. As discussed in our paper in this journal and our 1988 I.E.J. paper, the Bennett Test represents a logical and more rigorous extension of existing econometric test procedures and its application in a variety of contexts is likely to help in the process of attempting to empirically falsify economic hypotheses.

A few points need to be addressed with regard to Professor Benzing's update, however. These points pertain to both substantive methodological issues not discussed in detail in our original 1987 paper in this journal as well as with regard to the interpretation of the results in the preceding update.

The first point pertains to the fundamental methodological issue underlying the logic of the alternative test procedure proposed in our 1987 paper. Conventional econometric tests of economic theories of the type used by Sims and Stokes in their seminal 1972 paper are fundamentally inadequate because they are cast in a "confirmationist" mold and suffer from all the logical problems associated with "logical positivism" and the underlying Problem of Induction.1 This involves the enterprise of empirically testing economic theories in a number of significant ways.

The problem is as follows. Due to the existence of the Problem of Induction, whereby there is no general method of providing an inductive proof of the truth of any general statement (theory) on the basis of positive evidence, "confirmations" of economic theories provided by econometric tests cannot be used to argue for the truth of the theory (in this case the original SS hypothesis). The Neyman-Pearson framework of hypothesis testing attempts to circumvent this problem by using empirical data to reject ("falsify") the null hypothesis and thus provide provisional support for the alternative hypothesis. Besides the well-known problems associated with using this framework (see Buse 1961, Cooley and Larkey 1981, Leamer 1983, Mayer 1980, McCloskey 1985 and Swamy et al. 1983), a major problem is that of the Ambiguity of Refutations and difficulties raised by the Duhem-Quine Thesis.2 Since the test of any economic theory involves three levels of assumptions as discussed in our original JKB paper, those of the "core" behavioral assumptions, the "simplifying" assumptions and the "procedural" specifications of a theory being tested respectively, evidence in favor of the null hypothesis cannot be interpreted as evidence in favor of the rejection of the maintained hypothesis since the failure to "confirm" may be due to any one of the assumptions at the other two levels being false rather than at the "core" theory level.3 Since all tests of economic theories are tests of joint hypotheses at the three distinct levels identified, it is not possible to ascertain conclusively the falsity of a behavioral hypothesis. This is the Duhem-Quine Problem. The Problem of the Ambiguity of Refutations arises because in order to falsify a behavioral hypothesis at Part (A) (see JKB, 1987), all possible assumptions at Part (B) and (C) need to be falsified, clearly an impossible task since there are an infinity of such assumptions.

We proposed the Bennett Test as a more rigorous test procedure to attenuate (but not solve) the problems with conventional test procedures. By proposing that counterexamples for a maintained theory be developed and tested using identical assumptions at Part (B) and (C) using identical data, we hoped to provide a procedure that would put the maintained behavioral hypothesis "at stake," since confirmation of the theory as well as its counterexample would provide logical grounds for "rejecting" the maintained hypothesis since the effects of Parts (B) and (C) would be immunized by such a procedure and the logical problems associated with econometric tests would be partially circumvented. Consequently, our adoption of the "GOOD FIT: BAD FIT" terminology of conventional economet-
ric testing was predicated on the econometrician's interest in obtaining 'good' parameter estimates where 'good' was not defined precisely in terms of $\delta^2$. While Professor Benning's footnote 1 is essentially correct in principle, correct use of the Bennett Test implies that the very same procedure and criteria (e.g., $\delta^2 \leq 0.9$, tolerances 2 to 3) and simplifying assumptions (e.g., Cobb-Douglas functional form, exclusion or inclusion of time-trend variable $T$ etc.) be applied in using the test. Professor Benning (herein) references the first section of the JKB Unrestricted Counterexample by comparing $\delta^2$ especially in the light of her own footnote 1.

With regard to the second issue regarding the inclusion/exclusion of the time-trend variable $T$ and of considerations of multicollinearity in the estimates of SS and JJK, while the search for better procedures at the level of Part (C) is hardly novel, this case is essentially dependent from the point of view of the argument of the JKB paper. Since SS had not tested for multicollinearity and the time-trend variable included in their regressions claimed to account for the success of the SS Hypothesis, proper application of the Bennett Test required that the JKB counterexamples be tested with the time-trend variable since defaulting to isolate the actual form of the 'core' hypothesis at Part (A) and instantiate the assumptions at Part (B) and (C). Extensions of the Bennett Test to include tests for multicollinearity at the Permit (C) level may indeed be informative and economically justifiable but not in the context of the original SS paper.

Finally, the notes reported in Professor Benning's paper would seem to raise more doubt regarding the tenability of the SS hypothesis. We agree that the fact that money enters the Cobb-Douglas production function with a significant negative coefficient as pointed out by the author would seem to raise grave doubts about including money in the neoclassical aggregate production function.

In conclusion, it may be pointed out that the Bennett Test Procedure provides a means of attenuating the 'advocacy bias' underlying econometric tests of theories identified by many theoretical econometricians and practitioners (see especially Cooley and Lerey 1981, Felce 1975, Hendry 1980 and Lestran 1983). Its application in the context of the SS hypothesis points towards its usefulness in raising questions regarding the inclusion of real money balances in the aggregate production function as the preceding update by Professor Benning demonstrates.

FOOTNOTES


2. See Ballard (1987, 1982) and Roll for a discussion. The Duhem-Quine Problem arises from the 'modus tollens' of the nature of the theory is false, the hypothesis being falsified to identify what specific assumption is false. For a discussion of the implications of the Duhem-Quine Problem for economic theories see Crox (1982).


4. The comparison of $\delta^2$ when the dependent variable is not the same in problematic as discussed by Kennedy (1985, p. 25, 256) and Mayer (1975). As Kennedy points out, the measure of $\delta^2$ is not of much importance in econometrics even though practitioners act as if it is important.

5. We did discuss the issue of multicollinearity in our 1981 paper but did not pursue the issue in the context of the original SS hypothesis because of the nature of the Bennett Test Procedure. With regard to the estimation of Cobb-Douglas production functions, it is important to note that it is conventional to ignore multicollinearity. As Kennedy (1985, p. 185) notes:

   "The treatment of multicollinearity in a data set does not necessarily mean that the coefficient estimates in which the researcher is interested have unacceptably high variances. The classic example of this is in the estimation of the Cobb-Douglas production function: the inputs capital and labor are highly collinear, but since the least squares estimates are obtained,"

REFERENCES


