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On the semantic approach to econometric methodology

Steven Cook

Abstract In recent research, Davis (2005) has introduced the semantic conception of theories as a means of studying the differing practices of the Textbook and LSE approaches to econometric modelling. In this paper, Davis' (2005) use of the semantic view is examined, with close attention paid to the stated roles of the semantic notions of 'model dimensions' and 'bridging assumptions'. While comments concerning the latter are of a supportive nature, some concerns are raised in relation to Davis' use of model dimensions.

Keywords: Semantic approach, model dimensions, LSE methodology, Textbook approach
JEL Codes: B41

1 INTRODUCTION

I am grateful to Davis (2005) for his comments on my paper (Cook 2003) and welcome his extension of my research on the Kuhnian analysis of 'Textbook' and 'LSE' approaches to econometric modelling. My attempt to apply Kuhn's framework to the witnessed transition in econometric modelling was very much an exploratory analysis which I thought might possibly prove controversial and attract comment. However, I must confess that I expected any initial response would be of a different form to that presented by Davis (2005). In short, I imagined that the principal criticism would hinge on the issue of whether the subject matter was appropriate for Kuhnian analysis. More precisely, I felt that critics might have argued that whereas Kuhn considered revolutions in the history of science where fundamentally different views clashed, the debate in Cook (2003) was based on a *minor* disagreement between a *limited* number of practitioners concerning the appropriate use of the linear regression model in econometric modelling. As arguments were presented to counter this view in my original paper, I will not repeat them here. However, Davis (2005) did not criticise the subject matter of the Kuhnian analysis in my paper, but rather suggested that the form of analysis applied should be developed or extended.

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The central theme of Davis (2005) is the notion that the application of Kuhnian analysis in isolation can provide a misleading view of econometric methodology, primarily because the objectives of empirical models and the notion of the 'truth' they might hope to approximate are not clear. It is argued that these problems can be overcome via the incorporation of the semantic view of theories associated with Suppe (1989). The introduction of the semantic approach is an interesting development which raises a variety of issues, and I am grateful for this opportunity to comment on a number of them. The comments I intend to make can be grouped under two broad headings. The first set of comments relate to the notion of empirical models having differing dimensions, while the second set arises as a result of the nature and role of bridging assumptions in econometric analysis.

2 THE DIMENSIONS OF MODELS

Davis (2005) notes that under the semantic approach it is recognised that a phenomenal system, or DGP in econometric terminology, will be multi-dimensional. This has long been recognised by those associated with the LSE methodology (see, *inter alia*, Mizon 1984). In contrast, Davis argues that any proposed model can only address a subset of these dimensions. As a result, Model A may be thought to outperform Model B in one or more dimensions, while the reverse may be true in other dimensions. Consequently, any statement concerning the superiority of one model relative to another must be qualified according to the dimension(s) considered. Davis (2005) refers to previous recognition of this issue in the econometrics literature, citing Granger (1990) as an example. This discussion prompts some interesting questions, each of which is addressed in turn below.

Is there further support for the general principle of differing model performance in different dimensions?

An initial question which arises in response to Davis' discussion of the performance of models differing in different dimensions, is whether there is further evidence in support of the general principle. The recent research on economic forecasting shows that such evidence does exist. The results of, *inter alia*, Clements and Hendry (1999) and Hendry and Mizon (2001) show that while causal econometric models might be preferred for economic policy analysis, they can be outperformed by simple time series specifications when employed for forecasting purposes. Using the above terminology, one model would be preferred in the forecasting dimension while another is preferred in the policy dimension. The analysis of Clements (2002) takes this argument a step further, showing that contrary to intuition forecasting performance is not a good guide to the validity of an empirical model. My initial comments are therefore supportive of Davis' arguments

concerning model dimension. However, my next comments are of a more critical nature. A second obvious question to address is whether differing model dimensions have caused the observed divergence in practice under the Textbook and LSE methodologies.

Does the analysis of different dimensions underlie the differences between the specification of models under the Textbook and LSE methodologies?

It is argued by Davis (2005) that much of the difference between the Textbook and LSE methodologies can be explained by their differing objectives. To summarise Davis' arguments, the 'LSE econometrician (*S*)' aims to decompose the observational data into explained and unexplained elements, or alternatively, provide as complete an account as possible of movements in the dependent variable. In contrast, the 'Textbook econometrician (*B*)' is more interested in deriving the relationship between variables or generating accurate estimates of regression coefficients. This outline provided by Davis prompts two immediate questions. The first of these is whether this distinction is as sharp or accurate as Davis suggests. Consider the textbook econometrician *B* interested in a given theory. In addition to attempting to quantify this theory using regression estimates, as suggested by Davis, *B* would surely also wish to explain as much of the variation in the dependent variable as possible to convince others of the worth of the proposed model. This is a generally accepted principle in empirical research, with the explanation of sample behaviour necessary for modelling to be convincing. An investigator would therefore seek, for example, a low value for the estimated equation standard error in an attempt to present persuasive evidence in favour of a model. It can therefore be questioned whether Textbook modellers did not wish to explain observational data. As an example of this, the research of Davidson *et al.* (1978) can be considered. The motivation of Davidson *et al.* (1978) was provided by the poor performance of econometric models of consumers' expenditure. However, this must also have been the prompt for the numerous studies of consumers' expenditure undertaken using the Textbook approach which Davidson *et al.* (1978) sought to examine: if investigators had been content with the properties of existing specifications, the witnessed plethora of models would not have emerged. Similarly, it is incorrect to view econometricians associated with the LSE methodology as having no interest in testing economic theories. It can therefore be argued that the Textbook and LSE methodologies shared a common motivation is this context in the form of providing models which explained a greater degree of the sample variation. Alternatively expressed, the dimensions of the models proposed by the Textbook and LSE modellers were not as distinct as suggested by Davis. This in turn has implications for the suggested incommensurability between models, an issue which is further weakened by the notion of

pseudo-true values which are considered under the encompassing principle (see Gourieroux and Monfort 1995), which allow the estimates obtained from rival models to be compared directly.

Are the suggested dimensions of the Textbook approach appropriate?

A second obvious question that arises as a result of consideration of the dimension of alternative models is whether adoption of the dimensions assigned to the Textbook approach would be valid, irrespective of whether or not they were adopted in practice. The overall tone of Davis arguments is supportive of the Textbook approach. Given that Davis' stated objective of the Textbook approach is to obtain accurate coefficient estimates in simple regression models, it is questionable whether this support is justified. Firstly, Davis argues that if the simple model considered by the Textbook econometrician is found to suffer from serial correlation, it is valid to employ a correction technique, rather than re-specify the model. However, Mizon (1995) has shown mechanical correction for serial correlation to be inappropriate, leading to the generation of inconsistent estimates. Such a finding obviously contrasts to the stated objective of deriving accurate estimates. Second, it is not clear how reliability can be attached to coefficient estimates obtained from simple regression models. This can be illustrated in an empirical context by consideration of Sala-i-Martin's (1997) study of economic growth regressions. Drawing upon the Extreme Bounds Analysis (EBA) of Leamer (1983, 1985), the results of Sala-i-Martin (1997) show how the estimated value of a coefficient can vary as a result of changes in the incorporation of free and doubtful variables in simple models. Indeed, the findings of Sala-i-Martin (1997) show that the sign of an estimate can change according to the specification of a model. These findings illustrate Pyrrho's lemma, which shows that any desired coefficient estimate can be obtained from alternative combinations of variables in model specification. The objective of generating coefficient estimates from simple models is therefore difficult to justify as a result of the lack of confidence which can be placed in them. The alternative approach suggested by the LSE methodology would involve the development of a statistically well-specified model in which hypothesis testing of parameters could be undertaken. It is therefore difficult to support the actions of Textbook modellers on the basis of their models relating to an alternative dimension.

3 BRIDGING ASSUMPTIONS

Davis clearly outlines the alternative bridging assumptions which are required to arrive at an empirical specification of a theory. As noted in Cook (2003), this has been recognised in the econometrics literature and has been the subject of much debate (see, *inter alia*, Boland 1977; Morgan 1988;

Gilbert 1991). However, what was not made sufficiently clear by Cook (2003) is the extent to which this has been noted under the LSE methodology. While it is apparent in Bontemps and Mizon (2003) where the notion of 'local DGP' is discussed, it is raised in Cook and Hendry (1994) in the context of early stages in the reduction process being outside the control of the modeller. The impact of data bridging assumptions also appear in the works of Hendry (1994) and Cook (forthcoming). In these studies the impact of data revision are considered. While the former paper examines the impact of these revisions on individual model performance, the latter considers the comparison of models when the data employed by modellers has altered as a result revisions made to measured variables. In each case, these studies recognise that modellers are faced not with the hypothesised variables underlying a given economic theory, but instead have to employ measured approximations which may be subject to change.

4 CONCLUSION

This paper has considered Davis' application of the semantic conception of theories to econometric methodology. In general, the introduction of the semantic view is to be welcomed as it encourages debate and provides an alternative perspective on the subject matter examined. Rather than present a long list of comments on Davis' work, my response has been restricted to issues relating to the semantic notions of model dimensions and bridging assumptions. While my comments in connection with the latter are in the form of clarifications of my earlier position, the comments made in relation to model dimensions are of a more substantive nature. Recent developments in the analysis of economic forecasting and policy analysis suggest that the ranking of alternative models may differ when considered for alternative purposes or in alternative dimensions. However, Davis' suggestion that differing dimensions underlie the different approach to modelling under the Textbook and LSE methodologies is questionable. Summarising Davis' arguments, Textbook econometricians are purely interested in testing and quantifying economic theories, while LSE econometricians are solely interested in explaining variation in the dependent variable. The interpretation of low equation standard errors and high values of the R^2 were known to Textbook econometricians, and consequently Textbook econometricians were interested in explaining sample information to provide as compelling an argument as possible in support of their models. Similarly, those associated with the LSE methodology are interested in testing economic theories in addition to providing statistically well-specified models of sample information. The proposed different dimensions of models under the rival methodologies, and hence the suggested incommensurability between them, is therefore drawn into question.

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