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## VALIDATION OF RISK MODELS: A COMMENT

Nancy E. Bockstael

It must seem surprising to our physical science colleagues that economists, notorious for our preoccupation with models, should be so little concerned with the validation of our modelling constructs. Yet there is no escaping the fact that validation does not hold a very significant place in reports of our modelling research, even when that research is specifically intended for application by decision makers. In fact, the issue of validation in economic modelling, particularly in risk modelling, is replete with ironies. McCarl and Nelson should be commended for taking on the somewhat thankless task of discussing the many, yet relatively unsatisfactory, approaches to validating economic models. I would like to add some structure to their observations by identifying three major themes in their paper and by discussing why each is related to a kind of self-contradiction in validation of economic models. In the end, validation exercises must be pursued if we are to retain our credibility as analysts. However the shortcomings of validation approaches place a greater burden on good economics common sense in the model building stage.

The authors point out the limited attention that has been paid to validation exercises in most economic modelling research, particularly compared to the physical and biological sciences. But this regrettable absence of validation is juxtaposed with our inability to establish an appropriate definition for "validity" in the context of economic models. There is no question that "hard" scientists have historically dedicated more effort and attention to procedures which are associated with the concept of validation. Is validation of their models more straightforward? The world they are attempting to model is every bit as complex and unobservable as ours, and as a consequence their models often require as high a level of abstraction as we must employ. Perhaps the key distinguishing feature is that compared to their world, ours, which depends as it does on the behavior of people, is constantly subject to change. We are trying to hit a moving target. What does it mean to validate a model when the structural relationships upon which it is based are continually changing? Validation which associates predictions in some way with actual outcomes must await the outcomes. However, once we know the actual outcomes, the predictions lose their value. In exchange, we have gained little, since even if the association is convincingly high, it can guarantee no such association between prediction and future outcomes. We can only hope that our models allow for the most likely and most important structural changes. More appropriately we can specifically design them to take these into account; knowing full well that we will occasionally be taken by surprise and occasionally our model predictions will fail miserably.

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The second theme which I wish to highlight is a much more substantive one but also has its share of ironies. Perhaps the key point of the McCarl and Nelson paper is that validation of an economic model only makes sense in the context of the model's intended use. This is a critical point which has ramifications for more than just validation. How many economic models have been generated with no clear motivation for their existence? How often do modellers fail to consider the question, or types of issues, they want ultimately to address when constructing their models?

There is a wide diversity in types of economic models as well as in economic problems which are amenable to modelling. Between the extremes represented by purely structural models and pure forecasting models is a wide range of models with varying emphasis on the elements of testing of structure on the one hand, prediction on the other. Additionally the underlying framework of these models may relate to physical or technological processes or to economic behavior or most frequently to some combination of the two. The diversity in techniques and in problem motivations make it impossible to define uniform criteria for validation - in fact even the aspect of the model or results which should be subject to validation is open to debate.

Once we recognize that a) economic modelling is highly diverse both in its approach, its focus, and its motivation and b) validation of an economic model makes sense only in the context of its intended use, we are faced with two inescapable ironies. The first is that validation must always be subjective, since the criteria by which it is judged will be synonymously defined with the caveats associated with its application. In this light, though, validation could easily degenerate into a type of circular reasoning. Any model could be deemed valid if its intended use could be defined in a restrictive enough manner.

A second irony of this aspect of economic validation is particularly costly to McCarl and Nelson's paper as well as to this comment. The fact that appropriate validation techniques, as well as the meaning of validity itself, can only be determined in a use context suggests that very little can be said, in general terms, about validation of economic models. Both the McCarl and Nelson paper and this comment suffer from the level of generality we try to achieve. The notion of validation in the context of use is the single most important characteristic of validation of economic models, but it's very nature precludes the identification of objective validation standards and uniform tests. Yet without these elements so representative of a "scientific method", it is difficult to see how we shall ever gain the level of credibility that we seek for our modelling exercises.

The third key point of the McCarl and Nelson paper relates to validation of risk models, specifically. The introduction of risk makes an already difficult task formidable. The authors point out that since we often use risk models to predict distributions of outcomes, it is even more difficult to validate these models by comparing predictions with actual outcomes. Clearly an actual outcome which has any non-zero predicted probability of occurring can never invalidate a model. I would argue, however, that this predicament arises in any scientific modelling

of stochastic processes. Economic models incorporating risk encounter an added difficulty, though.

The essence of economics is behavior, and while underlying technological or biological processes are frequently of interest, we rarely have the luxury of stopping there. When we model behavior in an uncertain environment, we observe the outcomes of the uncertain environment and the outcomes of behavior, but this is rarely enough to deduce much about the structure of the underlying behavior. Specifically, we cannot distinguish how people perceive the uncertainty from how they respond to it. Since we have little consensus on the theory of behavior under risk and no a priori notion of the likely degree of risk aversion, we cannot use theory to help us separate subjective risk assessment from risk aversion. In fact, ideally, the modelling exercises should help us discriminate among theories. But since individuals' perceptions of uncertainty and their responses to it are difficult to separate out, the results of validation tests which compare predicted and actual outcomes will be impossible to interpret and the tests will not be able to discriminate among competing theoretical hypotheses.

All this leads us to the conclusion that we cannot promise public decision makers unequivocal validation of our constructs when no completely convincing and uniform means for doing so exist. But to abandon the pursuit of validity is to subject all research, whether well thought out or poorly conceived, to the same level of mistrust. Perhaps we need, more than anything, simply to raise our level of consciousness about the issue. Given the problems which plague the validation of economic models, careful, thoughtful, sensible model building becomes all the more important.