THE SCIENTIFIC STATUS OF ECONOMICS AND ECONOMETRIC METHODOLOGY

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Can economics be classified as a science? While many economists consider their approach to be scientific in nature, in this paper Iain Nash disagrees. He explores this enduring question by defining the nature of science and the properties that allow a subject to be labelled as such. He concludes that while particular events may be forecast using econometrics, this is limited by the application of certain assumptions and therefore scientific status cannot be justified.

Introduction

The scientific status of economics is a question that has provoked much controversy since the inception of the subject. However, before the status of economics can be discussed, one must first define 'science', or, more precisely, what values and criterion a subject must possess in order to be 'scientific'.

Science and scientific knowledge is often portrayed in a classical view in which it is totally demarcated from that which it studies. In reality this is not the case, as is shown by the constant revolutions which frequently occur, debunking theories and thus causing a rebase in the subject and its disciplines. Ritchie (1923) comments on how the only constant in science is the scientific method itself and while scientific theories are in a constant state of flux, the process used to create these theories has remained static. Thus, if economics and econometrics are to be classified as scientific, then surely they must use and apply the scientific method in their applications, regardless of any other difference in methodology from the natural sciences.

Another criterion for a subject to be scientific is falsifiabilty. Popper (1959:41) states that "it must be possible for an empirical scientific system to be refuted by experience" meaning that a theory must be capable of being *disproved* through empirical tests in order for them to be considered scientific. Logically then, theories must also be *examinable* in order for them to be proven scientific, otherwise they fall into the realm of idle speculation.

The Scientific Status of Economics

This leads us to the question of whether economics and econometric methodology should be considered a science. Economics, taken independently of econometrics (i.e. classical economics), cannot be considered a science in any real sense of the word. While it may offer interesting and intriguing theories about the nature of the man and the process of exchange, and although these are sometimes correct, classical economic theory fails the scientific method almost entirely; it is not based on empirical data, the hypotheses are not tested and no experiments are carried out. From this, it can be seen that there is little interaction between data and theory as there is no data available to interact with the theory, nor are the limits to economics domain such as the *ceteris paribus* assumption discussed.

Elementary Scientific Method

- Hypothesis Formulation
- Hypothesis Testing
- Deductive and Inductive Logic
- Controlled Experiments
- Repeatability and Replication
- Interaction between Data and theory
- Limits to Science's Domain

Source: Gauch, 2003

An example of this failure is the theory of 'Pareto Efficiency' as discussed by Kenneth Boulding. The theory describes the optimal outcome as one where no further allocations may be reached that makes any one individual better off without making another worse off. He mentions how "from this simple principle a wide range of applications have emerged" (Boulding, 1970:126). However, a simple analysis of the theory shows how it fails the scientific method on a variety of levels. The theory neglects to represent human nature; factors such as malevolence, benevolence, greed and selfishness are ignored. Boulding claims that "anything less descriptive of the human condition can not be imagined" (ibid). This theory is not testable in the scientific sense and hence is not falsifiable, yet it is one of the keystones of modern economics.

Another global assumption in economics is that of *ceteris paribus*. Ceteris paribus means 'all other things being equal' and is widely used in economic methodology as a means of simplifying complex situations in order to permit examination. It allows the economist to study the individual effects of a change in a variable on the overall system and thus draw relevant conclusions. While this initially implies a furthering of scientific method, this is incorrect. C*eteris paribus* has evolved from being a simple analytical tool to a fundamental economic assumption. Economists now use this assumption liberally in the application of theories, ignoring its limitations. For instance, in economics, different variables often interact and cause changes in each other. Thus, economic theories that assume *ceteris paribus* cannot be deemed scientific as they are no longer representative of reality but have become rough approximations of an assumed and simplified reality. For example, in comparative statics, one studies a change in price by holding demand constant. However, we know that price influences demand while simultaneously demand influences price (Brown, 1981). Furthermore, Friedman states that the *ceteris paribus* assumption is invalidated by the passage of time as "the points on a demand curve are alternative possibilities, not temporally ordered combinations" (Friedman, 1966:49).

The value of *ceteris paribus*, however, must not be overlooked as the modern economy is simply too complicated to be studied as a single entity. Eric Beinhocker states that "markets win over command and control, not because of their efficiency at resource allocation in equilibrium, but because of their effectiveness at innovation in disequilibrium" (Wolf, 2007). This demonstrates how economists are forced to introduce simplifications such as *ceteris paribus* in order to return market components to more linear and understandable models. However, economists must recognize that while these 'approximated theories' are quite valid as a study, they are not scientific.

The Scientific Status of Econometric Methodology

This leads us to the question of econometrics as a science and the status of neo-classical (or 'modern') economics. Econometrics was defined as "the advancement of economic theory in its relation to statistics and mathematics" (Econometrica, 1933:1). It should be noted here that the word 'advancement' is not 'replacement'. Econometrics is a tool used to *test* economic theory and not one to develop it. As a result of this, any flaw in the theory will invalidate an econometric analysis even though it may be technically perfect. Hendry generalises this definition when he states that "econometrics commences an analysis of the relationships between

economic variables (such as quantities and prices, incomes and expenditures, etc.) by abstracting the main phenomena of interest and stating theories thereof in mathematical form" (Hendry, 2000:13). From the outset econometrics appears to confer the scientific method onto economics as now, apparently, hypotheses can be tested empirically and also falsified which satisfies the scientific method. In order to validate this argument, a study of econometric methodology and its relation to economic theory must be carried out. Taking the four steps which Koutsoyiannis describes as present in all econometric research, we can immediately see how this method is more scientific in nature than the method of classical economics, as the model is capable of sustaining rigorous testing.

Econometric Methodology

- Formulation of maintained hypothesis
- Testing of maintained hypothesis
- Evaluation of estimates
- Evaluation of model's forecasting validity

Source: Koutsoyiannis, 1973

However, it would still be false to claim that this methodology is inherently scientific in nature. Even with the introduction of econometrics, it is still impossible to carry out controlled, repeatable experiments without introducing assumptions, such as *ceteris paribus*. As shown above, such assumptions nullify the scientific status of the experiment by invalidating the scientific status of the underlying theory.

Leaving aside technical arguments such as the effects of serial correlation, multicollinearity, heteroscedascity, simultaneity and so forth (Gilbert, 1986), which present an array of problems for the modern econometrician but are inherently statistical in nature, more fundamental flaws in the methodology of econometrics exist. For instance Brown states that many economic theories may not be testable with econometrics (Brown, 1981). This indicates a failing in both the economic theory and econometric methodology that prohibits them from being scientific as *all* scientific theories must be examinable and falsifiable.

Conclusion

It can clearly be seen that economics and econometric methodology cannot be classified as 'scientific' as they do not adhere to the scientific method. Although, this is not to say that econometrics is not a useful skill set and that economics will never become a science. Econometrics has shown that, by testing theories using advanced mathematical and statistical techniques, certain events may be forecast. However, these theories are only valid given an array of assumptions and depend on the presence of a number of unique conditions which may never be fully known and thus prevent repeatability. These stochastic errors, combined with the fact that outcomes are only probable to a given level of confidence, places econometrics and hence economics, into a realm which is too imprecise to be deemed 'science' but which is still a valid study. One should also consider that as alchemy led the way for modern chemistry, economics and econometrics do provide an 'approximate' scientific method which could lead to the development of a more rigorous, accurate and overall *scientific* methodology for the study of economics.

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