

## STATISTICAL CONSULTING AND THE ECONOMETRICIAN

Olaomi, J. O.  
[jo.olaomi@mail.ui.edu.ng](mailto:jo.olaomi@mail.ui.edu.ng)  
Department of Statistics,  
University of Ibadan, Nigeria.

Statistical consulting is a complex activity that requires technical and non-technical statistical skills. Together, these skills determine the ultimate success of the consultation. This paper makes a case for young econometricians to be taught the act of consulting either while at school and/or as an intern with the older ones. Because graduate students, especially in Nigeria, are given little, if any, preparation for actual consulting, they are prone, particularly in their early years, to commit errors of the third kind: *the error committed by giving the right answer to the wrong problem*. Many of these errors could be avoided if the students were properly trained.

The paper draws the attention of students, administrators, consultants and educators to move more rapidly in filling this wide gap in graduate economics training/curriculum. The paper also looks at the technical and non-technical issues in statistical consulting, in relation to econometrics and proposes remedial measures to having consultants that are measured up to the herculean task of statistical consulting. This is of utmost importance because teaching future applied econometricians requires the teaching of consultation skills since the student must learn to interact with research workers, learn to abstract the econometrical aspects of substantive problems, to provide appropriate technical assistance, and to effectively communicate econometrical results.

**Keywords:** Statistical consulting, Econometrical consulting, Young Econometrician, Errors of the third kind, Economics Curriculum, Consultation skills

## 1. Introduction

Statistics is the scientific application of mathematical principles to the collection, analysis, and presentation of numerical data. Statisticians contribute to scientific inquiry by applying their mathematical and statistical knowledge to the design of surveys and experiments; the collection, processing, and analysis of data; and the interpretation of the results. Statisticians may apply their knowledge of statistical methods to a variety of subject areas, such as economics, biology, engineering, medicine, public health, psychology, marketing, education, and sports. Many economic, social, political, and military decisions cannot be made without statistical techniques.

Econometrics is the branch of economics discipline that brings together economic theory, mathematics, statistics, and computer science with economic data to study economic phenomena with a view to making economic decisions. The primary purpose of econometrics is to give empirical content to economic theory. It is both a separate field of study within economics and a powerful tool that many, if not most, economists and other social scientists use to study particular applied problems.

An Econometrician possesses significant knowledge in the fields of statistics and economics, and utilizes those skills to model the interaction between economic activities. He works with statistical models of financial, economic and revenue systems that are theoretically and empirically valid which others can use as forecasting and estimating tools.

As a result of the many usefulness of econometrics, econometricians are usually saddled with consultancy responsibility in many areas of economics and related fields. This consultation called “econometrical consulting” has a technique and procedure to be carried out to achieve a success. This know-how is not part of the econometrics curriculum in majority, if not all, African universities. A young econometrician is thus left in the ‘cold’ when confronted with the Herculean task of consulting. How to receive clients, how to communicate in non-technical terms, what to charge for a service, and even choosing a correct method in the analysis, become a problem. Because graduate

students in Africa, especially in Nigeria, are given little, if any, preparation for actual consulting, they are prone, particularly in their early years, to commit errors of the third kind: *the error committed by giving the right answer to the wrong problem* (Kimball (1957)). Many of these errors could be avoided if the students were properly trained.

Econometrical consulting may therefore be defined as a process of providing econometrical guidance to researchers/administrators in economics and non-economics subject areas. The aim is to apply econometrical principles and methods to the furtherance of research.

If the discipline of econometrics is to retain its identity between the rapidly growing areas of economics and statistics, the interconnections of econometrics and research in 'user' disciplines like banking, taxation, administration and international finance, must be continually developed. Econometrical consulting may be regarded as at the core of such development, unfortunately, there is dearth of literature in this area, unlike in statistical consulting where there is a myriad of illustrious contributors to statistical science that have been associated with statistical consulting and joint research activity. Statisticians have, of course, long been aware of the importance of statistical consulting as is evidenced by an extensive literature and by sessions on this and related topics at professional meetings. While there are much in the literature about several areas of econometrics research, comparatively little or no attention has been directly addressed to the operation of training econometrical consultants, that of expressly developing their proficiency.

This paper, therefore, makes a case for young econometricians to be taught the art of consulting while at school and/or as an intern with the older ones. The paper draws the attention of students, administrators, consultants and educators to move more rapidly in filling this wide gap in graduate econometrics training. The rest of the paper looks at the nature of statistical consulting in section 2.0, (so as to borrow from it), Section 3 gives the need for teaching econometrical consulting, Section 4 looks at the preparation,

character and educational background of a good consultant, while in section 5, we look at how consulting should be taught and section 6 concluded the paper.

## 2. **The Nature of Statistical Consulting**

Consulting has been described (Cox (1968)) “as a craft, an art, scarcely a science, which cannot be taught but must be learned, acquired, by a process .... akin to progressive apprenticeship under the guidance of a master”. As a result of this perception of statistical computing, students are placed as interns to ‘old’ eminent scholars to learn this act. This has produced many successful statistical consultants without formal, specific, training in consulting. However, an important element is the direct or ‘hands-on’ experience that the future consultant receives. Often this is not part of classroom course content except perhaps with role playing. Marvin Zelen (1969) also noted that one can be a successful researcher in theoretical statistics by giving all one's attention to a narrow topic. Even a person who is not particularly gifted will be able to make contributions by virtue of long-term contact with the same class of problems.

Statistical consulting is a complex activity that requires statistical and non-statistical skills. Together, these skills determine the ultimate success of the consultation. Douglas, et al (1983) contributed on the non-statistical aspects of the initial meeting between statistical consultant and client and presents a model that views consulting sessions as consisting of four parts: (a) identification of relevant aspects of the problem situation, (b) definition of the client's goals, (c) determination of the actions to be taken, (d) discussion of various aspects of the consulting relationship and who will do what when. Each part gives rise to specific issues and requires that the consultant have various nonstatistical skills to deal with these issues. This may be true of econometrical consulting.

The apprenticeship method of learning statistical consulting is really time taken to learn salient facts about statistics and the complementary disciplines. As a result of this Cox (1968) recommended that a course “nicely graduated in terms of complexities and subtleties” can in fact be envisaged to complement the apprenticeship process. He did not assert that such a course would turn out master consultants but he was sustained in the idea by the remark of his teacher, Woodcock, in 1937 that no educational system will

defeat the best student; few systems can help the worst. We may hope, however, that much may be done for those in between.

Statistical consulting as been part of the curriculum of advanced countries' universities for more than two decades now, this has resulted in the production of better statisticians. For instance, the University of North Carolina at Chapel Hill provides a dual training that includes classroom work, but also involves a 'real' practicum. (1 – credit course on the principles of statistical consulting in second year and a classroom oriented 2 – credit course on practice in statistical consulting). This is required of all students and has been part of the curricula of graduate degree programs under the supervision of a faculty member. The student interacts with research workers in the health sciences, learning to abstract the statistical aspects of substantive problems, to provide appropriate technical assistance, and to communicate statistical results. (Bangdiwala, et al. (2002)). Also a graduate course called "Statistical Consulting, Computing, and Data Analysis" at the University of Western Ontario is a professionally (as opposed to academically) oriented course that combines these three aspects of statistical practice. A case study approach is used, along with detailed discussion of a number of current projects. Thus the course has a minimal amount of fixed subject matter. During the year (two terms), each student gradually becomes involved in consulting and with a project requiring substantial data analysis, or statistical computing, or both. (Baskerville (1981)).

### 3. **The need for teaching econometrical consulting**

In developed countries, consulting skills may be acquired on the job, since, in general, the new graduate is expected to work under the supervision of a senior econometrician who may complete his/her training in actual practice. In countries like Nigeria, and by extension, Africa, however, this is not true. There are not enough senior econometricians in the job market, universities are worst hit due to brain drain, and many times the new graduate will be responsible for all econometrical analyses. Unfortunately, formal academic education may not be sufficient to support such responsibilities and some alternative means of providing actual consulting experience is required.

“It is depressing to find how much good biological work is in danger of being wasted through incompetent and misleading analysis of numerical results”. Thus wrote Yates and

Healy (1964). It is equally true today, and of fields other than biology. A lot of research is either unconcluded or rejected by clients/reviewers due to bad econometric analysis and interpretation. Teaching of econometrical consultancy should involve methodological training as well as learning interpersonal and negotiation skills. Lack of these has prevented many potentially useful works not to be published because economic data are insufficiently or incorrectly analyzed with the result that the important and interesting features are not brought out.

Teaching econometrics at the graduate level aims to provide the next generation of professional econometricians with the necessary skills for jobs in academics, government or industry. In all three settings, econometricians are called to be consultants to other researchers, and thus the teaching of consultation skills should be an integral part of any graduate level training. Sprent (1970) suggested seven factors which may reduce the effectiveness of consultancy. One of them is that “there is little or no training in the art of consultancy”. Teaching future applied econometricians requires the teaching of consultation skills since the student must learn to interact with research workers, learn to abstract the econometrical aspects of substantive problems, to provide appropriate technical assistance, and to effectively communicate results.

#### **4. Preparation, character and educational background of a good consultant**

The needs for econometrical consulting services may vary in complexity and creative econometrical methodology input requirements from the routine through the innovative use of known economic theory and methods to the development of newly specialized econometrical methodology. The educational background and competence in the discipline of economics/statistics as well as the necessary personal characteristics required of an effective consulting econometrician may appear too demanding.

Borrowing from Daniel (1969), the preparation, character and the educational background of a good consultant should be:

- a good economics background, which should have been started in undergraduate days; and it should include good training in elementary mathematics (calculus,

analytic geometry, algebra, and standard matrix operations), as well as some statistics and computer science.

- a man's general attitude and manner toward technical people. The more one enjoys cooperative enterprise, the more contentment he gets from being helpful, and the less his need to be dominant, the better consultant he will be. Brashness, arrogance, and superciliousness would lose us many opportunities that client prejudices and limited econometrical competence combined.
- a few years of experience in the study of real data and of real economic interdependence, preferably (but not necessarily) under the supervision of a seasoned econometrician
- a good academic econometrical training .

However, a good consulting econometrician must be familiar with a broad range of methodology, must have a sound knowledge of theory, and must be a capable data analyst. He should also know about the inter-relationships in the economy. It is believed that it is more demanding to be a consulting econometrician than to be simply a researcher in econometrical theory.

It should also be noted that most Ph.D.'s in econometrics are expected to go into econometrical research or into teaching what they have learned; but they may not be considered as the only candidates for consultancies in econometrics. Although its members are hard to locate, a much larger source of potential data analysts and consultants is the group who do not hold advanced degrees in econometrics but who do have the other qualifications.

## 5. **How statistical consulting is taught**

Perusing literatures give an insight on how practitioners have been teaching statistical consulting in their institutions. Expert opinions on different strategies of training are of immediate interest. Such information provides students with some standards to which their own training can be compared and may help guide them through the maze of graduate school courses. In addition to material on consultant training in statistics, the other helping professions, particularly psychology, have substantial literature on the

training of counselors. Although the objectives of various types of helping relationships differ, there are many analogies in the interpersonal domain.

Mention has been made of the apprentice method and formal teaching of consulting in section 2.0. Others are

- employing a scheme called “statistician in residence”, whereby an experienced statistician is brought in from outside the university to occupy a central position in their consultancy services. His explicit duty is to devote half time to the lab to act as senior consultant and mentor to apprentice consultants. Provision of consultancy services by the statistics department to other departments in the university
- providing free consultancy services to other departments in the university.
- requiring students to write proposals or interim reports as well as final reports on all their consulting projects. Periodic oral progress reports, as well as final oral presentations, are also required. Notice of these presentations is sent to professionals.
- reading and discussing a few papers relevant to each topic, and considering how these topics are related, bringing out the consulting part.
- provision of a statistical consulting and cooperative research service in addition to the academic teaching and research programs of a usual university department.

## 6. Conclusion

To alleviate the consulting problems of young econometricians, econometrical consulting should be integrated into the curriculum of the African universities teaching econometrics. It may be taught as a course and/or as an intern with experienced econometricians. Also, as statistical consulting is taught, econometrical consulting could also be taught in like manners or as suggested by more experienced econometricians. If this is achieved, Africa would be able to boast of consultants in econometrics that are measured up to the Herculean task of consulting, and that shall be able to stand, even, in the front, of so called developed nations ‘experts’ .

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