The Political Methodologist

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Contents

Notes From the Editor

We are extremely fortunate to have a contribution from Harold F. Gosnell in this issue. Professor Gosnell was kind enough to recount some of his illustrious career, during which modern political methodology first emerged. Anyone who has reservations about "newfangled" statistical techniques should be referred to this article, which begins with his experiences in graduate school over *seven* decades ago.

This issue also begins a series of articles on the status of political methodology in other parts of the world, featuring Yun-han Chu's report on Taiwan. In future issues, you can expect reports on political methodology in Australia, the Netherlands, Britain, and many other countries. The interest scholars all over the world have in political methodology should be encouraging to us all.

In this issue, also look for a book review, recommended readings, a review of methodology in political science graduate programs, announcements of free computer software, and various other points of interest. The final item features a preview of the political methodology program for this Summer's American Political Science Meeting in San Francisco.

Alas, this is my last issue as editor of *The Political Methodologist.* I have enjoyed the experience and recommend it as a pleasant way to keep in touch with a large and interesting cross-section of the discipline. I am also delighted to announce that beginning with the next issue Professor Charles Franklin of Washington University has agreed to take over as editor.

Please send contributions to Charles Franklin, Department of Political Science, Washington University, St. Louis, Missouri 63130 (BITnet: c38871cf@wuvmd). We prefer submissions in TEX or LATEX formats on MS-DOS diskettes, but most other electronic formats will do. Subscriptions to the *The Political Methodologist* are free to members of APSA's Political Methodology Section and $15.00/year to others. *Gary King, Harvard University.* TPM

The Marriage of Math and Young Poli Sci: Some Early Uses of Quantitative Methods *Harold F. Gosnell*[1]

When I came to the University of Chicago as a graduate student in 1919, the Department of Political Science, under Professor Charles E. Merriam, was on the verge of enormous expansion and revitalization. Professor Merriam turned his full energies to building up the department, promoting research, and founding the Social Science Research Committee to finance such research. One of the secrets of his success in promoting research was his skill in obtaining funds for the University from men of wealth and their foundations, including the Julius Rosenwald and Rockefeller foundations. Had such funds not been available for some of my early research projects, they would have been far more arduous, if not impossible, for a young man trying to apply scientific, quantitative methods to the study of political behavior.

Non-Voting

After the April 1923 mayoralty election in Chicago, Professor Merriam proposed that he and I (by then an instructor) make a joint study of nonvoting in that election. (He may have chosen me for this project partly because of my background and interest in math, psychology, sociology and statistics.) Little more than half of those eligible bothered to vote. This situation, we thought, needed investigation. Why so few? Were the voters dissatisfied with the electoral process? Among what kinds of people was political apathy most widespread? What could be done to stimulate voting? Would a high voter turnout mean greater acceptance of the political order?

To answer some of these questions, we proposed a sample survey, by conducting personal interviews with nonvoters. But how should we select the sample? Arthur L. Bowley had done some systematic sampling in England in 1913, but his methods were not introduced in the United States until the 1930s. We endeavored to secure a representative sample by examining the social characteristics of the Chicago population, as shown in the Census. We wanted our sample to reflect the sex, age, race, economic and social composition of the city. Data regarding adult citizens were obtained by special tabulation from the Census Bureau. By comparing the Census race and age characteristics with the 5,310 persons interviewed, we determined that our sample turned out to be fairly representative.

The next step was to decide how to conduct the interviews. Should we use a free answer or a set questionnaire? We decided to pretest a questionnaire, but leave space for free answers.

We then had to train graduate students to do the interviewing. We worked out a detailed set of instructions on how to find nonvoters and how to approach them. The five graduate students we hired did an excellent job.

This was before the day of computers, so the 5,000-odd answered questionnaires had to be coded, and the information transferred to punch cards for (what was then considered) rapid sorting and counting of the results. The University then had no card sorting machines, but I arranged with the Comptroller's Office of the City of Chicago to use their machines after hours. The operator agreed to run our cards through on his own time (for one dollar an hour).

We found twice as many female nonvoters as male. The analysis showed that, for both sexes, old age or youth, newness to the city and unfamiliarity with local affairs were associated with nonvoting. Many of the woman nonvoters were foreign-born, with foreign language habits. When asked their reasons for not voting, two-fifths stated general indifference and inertia, one quarter illness or absence, one eighth legal or administrative failures (such as not being registered), and one sixth mentioned disbelief in women's voting or disgust with politics.

After I presented a draft of the results, Professor Merriam revised the first chapter of our study, "Methods of Inquiry". The University's Social Science Research Committee approved, and made funds available for, its publication. The University of Chicago Press published it under our joint authorship in 1924, as the book entitled Non-Voting.

In their book *The Development of Political Science from Burgess to Behaviorism*, Albert Somit and Joseph Tanenhaus wrote, "...the significance of this book would be hard to overestimate. The problem itself was one about which little of a systematic character was known, and the study provided a means of introducing a bevy of young graduate students to field research. More to the immediate point...it was based on a survey rather than aggregate data. Although the sampling methods used would not pass muster today, they were quite sophisticated for their time. Interviewers were trained for their assignments, the schedules were carefully structured, and Hollerith cards and counter-sorters were used in data processing. With *Non-Voting* the Chicago department took a giant step towards establishing itself as the national center for the scientific study of politics." (Sounds a bit strong, but we did have the heady feeling that we might be breaking new ground.)

Getting Out the Vote

Though the nonvoting study gave us much satisfaction, it failed to answer the question of how to spur people to vote. This is one of the key questions I attempted to explore in the next study, whose results were published as *Getting Out the Vote*.

To do this, our research team needed a new approach.

[1] with editorial assistance from my son, John S. Gosnell.

Appendix C of the Non-Voting book, "Suggestions as to Procedures in Future Studies of Non-Voting", recommended a complete canvass of all citizens in selected election districts, so a control groups could be established in each.

Starting with that basic idea, the experimental design of the Getting Out the Vote study was further elaborated in consultation with a group of social psychologists, who suggested introducing controlled stimuli. To the experimental group, we would send notices urging them to vote and explaining the details of the process, but the control group would get no such notices. The difference between the voting response of the two groups would indicate whether the stimuli had any influence.

The study was based on the actual behavior of some 6,000 citizens from twelve selected Chicago districts, in two elections: the Presidential election of November 4, 1924, and the aldermanic election of February 3, 1925. We endeavored to make a complete canvass of all adult citizens in these districts. The Local Community Research Committee of the University of Chicago made funds available for this study. I again hired five graduate students, who did an excellent job in collecting and processing the data. As in the *Non-Voting* study, the Comptroller's Office furnished valuable aid in counting and tabulating the results.

The twelve districts, eight of which were voting precincts, were selected from parts of Chicago that differed in economic status and national origins. The nonpartisan mailing to the experimental groups took the form of information notices in English, Polish, Czech, and Italian, before the first day of registration; and a second notice with a cartoon before the final day of registration. We sent no notices to the control groups. A post-election survey of the citizens in the experimental group showed that most of them received the notices. If a larger proportion of the experimental group registered and voted than of the control, it was presumed that the stimuli had some effect. A comparison of results obtained on the last day of registration and those obtained on the first day showed the effects to be about the same. In both cases, the difference between the experimental and the control groups was 9 per cent. This is evidence that the notices contributed to the result.

Regarding this study, Professor George E. G. Catlin, in *Methods in Social Science*, stated: It may be concluded that experiment in the fields of politics and sociology is possible. The term "experiment" is here used in its strict scientific sense, as a process from which confident deductions can be drawn about measurable changes and uniformities.... The needs of obtaining such scientific results in the social field are well indicated by the careful precautions taken and by the methods of random sampling and of control groups adopted in the present investigation by Gosnell. It has the high merit of being precisely, a scientific social experiment."

Correlation and Factorial Analysis

Anyone who examines the elaborate tables of correlation and factorial analyses of voting behavior in my 1935 piece in the *American Political Science Review*, "An Analysis of the 1932 Presidential Vote in Chicago", and in my book *Machine Politics: Chicago Model*, might wonder how one man could do all those calculations. With no computers, he couldn't. Once again, the U of C's Social Science Research Committee came through with the funds for overhead and research assistants, without whose help those studies would have had to have dragged on interminably, been scaled way down, or abandoned altogether.

For statistical guidance, I looked to Professor William F. Ogburn of the Sociology Department, who had made some studies of voting behavior; to Professor Henry Schultz of the Economics Department, who had devised excellent procedures for calculating coefficients of correlation; to Professor L.L. Thurstone of the Psychology Department, who presented the technique of factorial analysis in his book, *The Vectors of Mind: Multiple-Factor Analysis for the Isolation of Primary Traits*; and to M. Ezekiel's book, *Methods of Correlation Analysis*.

To use these techniques effectively, the correlation matrix on which they are based must include a sufficient number of study units. To establish a matrix for Chicago, it was decided to divide the city into 147 units, based on political and community lines. The local communities were defined by the United States Census, and the political lines by the ward boundaries. I selected the following variables for making up the matrix: Percent for Smith (1928), for Lewis (1930), for Roosevelt (1932, 1936), for Igoe (1934), women voters (1930, 1932), for the bond issue (1930), for prohibition repeal (1930), foreign-born adults (1930), Catholic (1930), median rental (in $ not %, 1930), owning home (1930), 18 or older, completed 10th grade (1934), more than one family per home (1934), and on relief (1934).

The next step was to calculate the interrelationships between all these variables. This was done by calculating the product moment coefficients of correlation for all possible combinations. It was found that the political variables were closely related to many of the other variables. This close correlation raised a number of questions. Were not some of these variables measuring the same thing? Do the coefficients tend to group themselves in clusters? What is the net effect upon an independent variable when the influence of other variables is kept constant? The statistical device of partial correlation was useful in answering some of these questions. Its use determined that a number of the variables were indeed measuring the same characteristic.

Since the calculations involved in partial correlation become increasingly complicated as new variables are added, it was decided to select five independent variables for the analysis of a key dependent variable. This process made it possible to determine which of the independent variables was most important. The most important variable in our study was previous voting behavior.

I also presented the correlation matrix in another way, by going through what is called multiple factor analysis. One purpose of multiple-factor analysis is to determine how many general and independent factors must be postulated in order to account for a correlation matrix. In the two cited studies, the results of multiple factor analysis indicated that four independent factors were needed, although we started with a possible sixteen.

In this article, we have discussed our early attempts to use quantitative methods to examine political behavior: data collection by interviewing a selected sample of persons whose characteristics we wished to study; working out an experimental study of voting behavior in response to controlled stimuli; and analyzing variables we assumed to be related to voting behavior by using correlational and multiple-factor analysis methods. TPM

Political Methodology in Taiwan

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Political methodologists in Taiwan are a rare species but far from endangered. On the contrary, with more and more young faculty members joining the ranks, the methodology field is growing strong. As compared to its meager start about two decades ago, one might conclude that the methodology field in 1990 has finally come of age. In its formative years, the field was pioneered by Professors Yuan Song-shi, Hu Fu and Lu Ya-li at National Taiwan University and Yih Chun-Po and Wei Yung at National Chengchi University. All of them received advanced training in the U.S. and witnessed the scientific movement in American political science run its full course during the 1960s. They returned to the island in the late 1960s and early 1970s and became self-appointed evangelists of logical-positivism and the behavioralist paradigm. They should be credited for turning Karl Popper, May Brobeck, Carl Hempel, Ernest Nagel, Heinz Eulau and David Easton into household names among political science students. With their endeavors, the field soon established its distinctive identity in the political science community. Methodological courses were added to existing department programs, and almost every political science department adopted at least one methodological course as part of its requirements for undergraduate majors by the mid-1970s.

Nowadays, students at large political science departments can choose from a variety of methodological courses. For example, at National Chengchi University, the department offers several graduate-level seminars on special topics, such as research design, survey research methodology, and advanced statistics for social science, etc. At National Taiwan University—which has undergraduate programs in political theory, international relations and public administration—research methods courses are designed especially for their respective type of inquiry. At the graduate level students in seminars on quantitative methods for political science are taught an array of the most frequently used multivariate models, namely the regression model, the log-linear model, and other related models such as logit and probit. All political science departments, including the smaller ones at some private institutions such as Soochow University and Tunghai University, offered at least two methodological courses—political methodology and introductory applied statistics.

In terms of teaching and research facilities, political methodologists in Taiwan have few complaints nowadays. They can take the full advantage of living in the unofficial world capital of the PC-compatible. Local computer makers in Taiwan constantly turn out new models based on the state-of-art technology and sell them around the world. Under fierce competition, the local price of made-in-Taiwan PCs can even beat the mail-order houses along the infamous 47th street in New York. Most political science departments are either equipped with their own microcomputer laboratory or share one with other social science departments, something unthinkable just ten years ago. Also, I hesitate to admit that due to loose enforcement of intellectual property rights, application-specific programs are readily available. Many popular statistical programs are customized so that they can be run in the Chinese DOS environment. Thus, virtually every political methodologist that I talked to incorporates computer-aided exercises in his or her course design. For example, in my undergraduate statistics class, the students are trained to run their homework using both SST and SPSS-PC. Some of them achieve a high level of computer literacy even before college.

Most universities are equipped with their own mainframes and all get easy and virtually free access to the computing facilities at the Academic Computing Center of the Ministry of Education, which is the power house that provides the main data-processing support for the research activities of the social science faculties of all universities within the radius of Taipei's metropolitan area. The center provides dial-up connection, supports many popular statistical packages, including SPSSX, BMDP, TSP, SAS and SHAZAM, and is connected with major international electronic mail networks such as Bitnet and Arpanet. The centralization of computing resources is less due to any statist legacy than to the advantages of economies of scale.

As of today, the number of political methodologists is still very small. No official count is available, but I put the number of those who would claim methodology as one of their fields of specialization at around fifteen, and as a consequence they all know each other. Nevertheless, for an island with only three bona fide political science departments awarding doctoral degrees and a 200-member professional association, this is no small number. On the other hand, the size of this core group is still too small to provide the critical mass for fruitful collegial interactions. Thus, political methodologists in Taiwan are forced to reach out across national borders and/or disciplinary boundaries. Currently, there is no separate section on political methodology under the Chinese Political Science Association. Instead of forming their own professional circle, political scientists with strong quantitative inclinations oftentimes join other like-minded social scientists to take part in the professional activities organized by the Chinese Statistics Association (CSA). As a matter of fact, political scientists have been quite active at the CSA annual meetings and many CSA-sponsored workshops. Political scientists with strong philosophical inclinations, on the other hand, collaborate with theorists in related fields. In some cases, political methodologists are induced to take advantage of interdisciplinary interaction by design. For example, political scientists may meet hermeneutic theorists at the Sun-Yet Sun Institute for Social Sciences and Philosophy at Academic Sinica (Taiwan's National Science Academy), which houses political scientists, economists, sociologists, and social theorists all under one roof. At the Institute, seminars on methodological issues typically draw audiences of diverse academic backgrounds.

It is difficult to measure the progress of the field in qualitative terms. It is fair to say that in the last decade the average level of methodological proficiency (narrowly defined) among faculty under 40 has risen substantially. Ten years ago, few political science departments offered courses on research design, survey research, formal modeling and advanced quantitative methods. However, advancement in research methods and quantitative skills has not been matched by progress in other areas of a broadly conceived methodological field, in particular in the areas of philosophy of social science and sociology of knowledge. One might wonder if this indicates that methodology has entered the stage of "normal science"? Few methodologists in Taiwan cover post-Kuhnian philosophy of science, as exemplified by the works of Imre Lakatos, Paul Feyerabend, Larry Laudan, and Richard Bernstein, in its full spectrum, to say nothing of the new philosophy of science—scientific realism. The works of Anthony Giddens, Rom Harre, and Roy Bhaskar are only about to make inroads into the syllabi of graduate seminars. Furthermore, as neo-Marxist teaching gains popularity in many Taiwanese universities due to the relaxation of government restrictions, it is hard to tell if today's political methodologists are prepared to meet future intellectual challenges from their own graduate students. TPM

Review of Gill, Murray, and Wright's *Practical Optimization*,

Henry E. Brady, University of Chicago

Philip E. Gill; Walter Murray; and Margaret H. Wright. 1981. *Practical Optimization*, Academic Press.

Suppose you were blindfolded, transported somewhere in some large unknown country, and required to find the top of the highest mountain. Further suppose that the only information you were allowed to have were the coordinates and elevation of the point where you were currently located, and each move to a new location cost you some significant amount of money or time. Do you think you could find the highest mountain under these circumstances?

Every time we use some non-linear estimation method, we are trying to find the top of the highest mountain (or the bottom of the deepest valley) in just this way: we are not allowed to just look around, and we must rely upon nothing more than our current location and height. Despite the difficulty of this task, many social scientists are now taking complicated nonlinear techniques for granted—partly because numerical routines are often nearly invisible to the practicing researcher who uses SAS, SPSS, SST, RATS, LISREL, or even GAUSS. This seems very dangerous to me because we are often no better off than the blindfolded man. We should probably become much more skeptical about the results from these software packages.

Gill, Murray, and Wright's *Practical Optimization* provides the perfect required reading for those social scientists who have been lulled into passively accepting the output from standard software packages which solve non-linear numerical optimization problems. *Practical Optimization* provides detailed descriptions of all of the standard optimization methods—complete with understandable discussions of the mathematics and illustrations of how the methods can be applied. Probably of most value, however, to the practicing researcher are Chapters 7 and 8 on "Modelling" and "Practicalities." For those who are unwilling to work through the rest of the book, some parts of these two chapters will necessarily be obscure, but they are still worth reading because they are relevant to those who took for granted the results printed out by their software packages.

It is worth remembering, for example, that in its early versions, LISREL often printed out extremely unreliable standard errors because it relied solely upon variable metric methods which are constitutionally incapable of providing reliable standard errors in fewer iterations than the number of free parameters. This kind of knowledge seems essential for anyone using existing software packages.

Exhortations, however, may not be enough to get the typical social science methodologist to read a book on computational methods. There are, after all, many books we should read which we never do. Consequently, I shall make my argument for this book by providing my own summary of its contents. I hope at least some readers will find the issues important enough to read *Practical Optimization*.

Univariate Maximization—Let us return to the hapless blind person left in a foreign country to find the top of the highest mountain. This person's problem would be considerably simplified if he or she were told that the highest mountain were either directly North or South of his current location and within, say, ten miles. This situation is like a statistical problem whose solution involves the maximization of some function of one parameter which is known to lie within some interval. The function could be, for example, a likelihood function for the location parameter of some observations.

In this case, the blind person and the researcher both have a one-dimensional closed interval along which they must search. Given any kind of continuity in the topography—a reasonable assumption with mountains but not necessarily with the type of complex functions that we sometimes try to maximize—the obvious procedure is to employ a structured search which chooses points along the interval and looks for places where the terrain seems higher than other places. The blind wanderer might then assume that he or she would be more likely to find the highest point near high points than near low points.

Unfortunately, while continuity insures that the highest point is near many other high points, it does not imply that any particular high point is near the highest point. The basic problem is that there may be many local maxima, but there is only one global maximum. There are many tall mountains, but only one Mt. Everest. Something more than continuity, namely convexity of the terrain, is required before the blind person can be sure that going towards a higher point gets him or her nearer the highest point.

The difficulty of distinguishing between local and global maxima is probably the biggest problem in all non-linear optimization methods because many, if not most, of the functions that we maximize are not convex, and they have more than one maximum. Moreover, almost the entire research effort of those who study the theoretical properties of optimization methods has been focussed on dealing with the performance of methods when the maximized function is known to be convex, or equivalently, when it is already known that the researcher has a starting value which is in a convex neighborhood of the maximum. Unfortunately, we rarely know that we are in such a neighborhood.

What can be done in this situation? One way to deal with this problem is to try numerous starting values and to choose the maximum of all the maxima that are produced from these starting values. This is a reasonable method although it is a great deal like choosing random starting places on the globe, finding the nearest tall mountain, and then assuming that the highest of all these high mountains is the tallest on Earth. A somewhat better procedure is to require that all the starting values lead to the same maximum. If the same maximum is found in all cases then we assume that it is probably the global maximum. However, what is one to do when there is no single maximum? Moreover, how can one be sure that some other, higher, maximum has not been overlooked?

Part of the difficulty with these approaches is that there is no way to be sure that one has chosen starting values that are anywhere near the true solution. One approach to this problem is to start by linearizing the non-linear problem itself or by linearizing the non-linear estimator. This could be done through a Taylor series expansion or some other standard method. With a linear problem or estimator, a true maximum can usually be found in a finite number of steps. If the non-linear problem is sufficiently well-behaved so that the linear approximation is a good one, then the solution to the linear problem can be used as a starting value for the non-linear one. Personally, this is my preferred solution, and it is one reason why I am skeptical of those who believe that modern computing methods make it unnecessary to develop linear computational methods such as the linear probability model, two stage least squares, and so forth.

Maximum likelihood itself is a seductive statistical framework, and modern computers do seduce us into believing that we can go directly to highly non-linear maximum likelihood methods. However, I believe that we should all be distrustful of numerical methods which can only promise local maxima, and I prefer to start my estimation of a complicated non-linear model by obtaining the results for a version which can be estimated by linear methods. These results can then be used as a check on the non-linear results. This requires more work, but it provides an important check on one's results.

Let us now return to the blind person, and let us assume that he or she knows, or at least is fearless about assuming, that the terrain is convex so that there is only one maximum. In this case, there are a number of economical search strategies along one dimension such as the bisection method and Fibonnaci search. More generally, there is a well-developed theory for finding a maximum, and it can be found to any pre-determined degree of accuracy within a finite number of steps.

Multivariate Maximization—Multivariate maximization is required when there is more than one parameter to be estimated. Each parameter adds another dimension to the space that must be searched. Multivariate estimation is the rule in most social science research, and not surprisingly, it creates difficulties which go far beyond the univariate case. The most fundamental problem is the possibility that the maximum lies in an infinity of possible directions as well as at an infinity of possible distances from the starting point. Even if the terrain is convex, the blind man or woman must determine both the direction and distance of the highest point. This can be done in two different ways.

The first and most labor intensive way is direct methods such as grid search. This amounts to making a map of the whole terrain. The blind person simply divides the territory into a grid of squares, and then records the elevation at one point in the territory. At the end of this procedure, the square with the highest elevation is considered the maximum. This always works if the topography is not too crazy and if the grid is fine enough, but it is very costly—partly because the technique must deal with the "curse of dimensionality" which requires that if the number of elevation measurements that must be made for a one-dimensional problem is n, then the number for t dimensions is (n^t).

The second way is to use "local" information to make a decision about what direction to go, and to then maximize the function along this direction. Methods of this sort are called "gradient" methods because they rely upon the gradient, local curvature, or, in the language of calculus, the slope or derivative of the terrain. For the blind person, this approach amounts to taking small steps, one for each dimension, around his or her current position and noting the slope of the ground. In one gradient method, he or she then chooses to "step" in the direction of steepest ascent—in that direction in which the ground goes up the most. This method requires undertaking $(t+1)$ elevation measurements for each step, and then some more measurements to find the maximum along this step. The maximum along this direction is found by the univariate methods described above.

This gradient approach works remarkably well in many situations, but it tends to require many small steps. The basic problem is that the steepest path up a mountain is not necessarily the most direct path. One solution for the blind man is to obtain even more information by checking out not only the slope of the ground, but also the rate at which it is sloping. This "second derivative" information indicates whether or not a sharp incline is increasing or decreasing as one moves up it. Obviously, everything else equal, it would be better to follow a path whose slope is increasing as one moves up rather than one whose slope is decreasing. This information can be very valuable, but it is also very costly because obtaining it can involve as many as (t^2+1) measurements of elevation for each step.

Because it is costly to compute these second derivatives, a set of techniques, called variable metric or quasi-Newton methods, have been developed which improve upon an approximation of these second derivatives at each step. The initial approximation is usually just a guess, and the methods slowly build up a better version of the second derivatives under the assumption that these derivatives do not change much from step to step. The most prominent of these methods are the algorithms of Broyden-Fletcher-Goldfarb-Shanno (BFGS) and Davidon-Fletcher-Powell (DFP). These algorithms have been widely used, especially in problems with large numbers of parameters or many dimensions. For example, one of the great contributions of the early LISREL programs developed by Karl Joreskog was the use of these methods to estimate models that could not be estimated in any other way. These techniques typically converge faster than pure gradient methods, and they have the extra advantage of providing a measure of the curvature of the function at its maximum. This information is closely related to the standard errors of the parameter estimates.

There are other ways to approximate the second derivatives. The Gauss-Newton and Berndt-Hall-Hausman-Hall (BHHH) algorithms make use of a special property of the outer product of the first derivatives for each observation to compute an approximation to the second derivatives. These methods require more calculations than the variable metric techniques, but they seem to yield a better approximation more quickly.

Finally, for some problems, it makes sense to go ahead and calculate the second derivatives directly. This is very costly, but the Newton method which uses these derivatives usually takes a very small number of steps to reach the maximum.

These methods vary in terms of the amount of information obtained and used at each step. The simple grid search obtains the least information. Only the value of the function is computed at each iteration, and this information is not used as the basis for the next step. The Newton method obtains the most information by computing the value of the function, the values of the first derivatives, and the values of the second derivatives. Moreover, this information is used as the basis for going on to the next step. In between these two extremes are the simple gradient, variable metric, Gauss-Newton, and BHHH methods. The gradient methods obtain values of the function and of the first derivatives, and they use all of this information to go on to the next step. The variable metric, Gauss-Newton, and BHHH methods obtain the value of the function, the first derivatives, and approximations to the second derivatives of varying quality. (We have left out the "EM" algorithm which has become enormously popular for many problems in the last decade. This method has many strengths, and it deserves consideration by any practicing methodologist. However, it is quite different from the others described here so that we omit it from our discussion.)

By ranking these methods according to the amount of information obtained and used at each iteration, we obtain a useful dimension for characterizing the other properties of these methods. First, as one goes from grid search to the Newton method, the number of steps required to find a *local* maximum decreases because more information is obtained at each step, but the amount of computation per step increases dramatically—especially when there are many parameters to be estimated. For small problems of ten to twenty parameters, the Newton technique makes a great deal of sense. As the number of parameters increases, something like the BHHH or variable metric methods become more and more reasonable. Second, these methods can be rated according to the amount of structure they require for the function that is being maximized. The grid search requires virtually no structure whereas the variable metric, BHHH, Gauss-Newton, and Newton method require that the first and the second derivatives exist. Third, the methods differ in the likelihood that they will find a global maximum. In this case, the grid search is always a surer bet than the other methods.

Final Practicalities—What method should the practitioner use? The best answer is that one should read Gill, Murray, and Wright. A second best answer is to consider the approach used by the programmers of GAUSS for maximum likelihood problems. They suggest starting most problems with a BHHH step which obtains reasonably good approximations to the second derivatives at a fairly modest cost compared to a Newton step. Then, they suggest using a variable metric method until convergence is achieved. This does a good job of updating the already fairly good second derivatives without costing too much. Once convergence is achieved, they suggest using a second BHHH step or a Newton iteration to obtain top-notch estimates of the second derivatives. This insures that standard errors based upon these estimates are reliable.

This is a good recipe. It has served me well when I have used GAUSS. However, the user should be careful. This method will not necessarily work for maximization problems that are not based upon maximum likelihood because it uses a special property of the outer product of each gradient term for each independent observation of the likelihood function. In short, the user must understand both the statistical estimation method that he or she is using, and the properties of the computational method.

One of the dangers of user-friendly software for social scientists has always been the low level of knowledge that most of us bring to it. I think that problem is even worse with the new non-linear (including most maximum likelihood) methods of their inherent complexity. Gill, Murray, and Wright might be the starting place for those who want to increase their knowledge about computational methods and to avoid some of the pitfalls that might befall us. TPM

Recommended Readings

George Marcus, Williams College

We often think of political methodology as defined by statistical analysis. While this is certainly a crucial component of political methodology it by no means covers all of the essential topics in the social sciences. Perhaps one person more than any other has been at the forefront of extending social science methodology beyond the issues of statistics. Donald T. Campbell, now at the School of Social Relations at Lehigh University, has written extensively on and made seminal contributions to social science methodology. Among the best reviews of his work is can be found in two volumes that are essential reading for any political methodologist. They are:

Marilyn B. Brewer and Barry E. Collins. 1981. *Scientific Inquiry and the Social Sciences: A Volume in Honor of Donald T. Campbell*, Jossey Bass.

E. Samuel Overman. 1988. *Methodology and Epistemology for Social Science: Selected Papers*, University of Chicago Press.

The first is a collection of essays by a number of contributors that review the main body of Campbell's work with a concluding essay by Donald Camphell. The second is a collection of some of the more important essays of Donald T. Campbell. Both are highly recommended. TPM

Recommended Readings

Gary King, Harvard University

I frequently give this annotated bibliography to graduate students who wish a sampling of readings in quantitative topics in political methodology.

Preliminaries

Hanushek, Eric A. and John E. Jackson. 1977. *Statistical Methods for Social Scientists.* New York: Academic Press. A classic that you've probably already read; covers everything from linear models through simultaneous equations, and logit and probit.

Achen, Christopher H. 1986. *Statistical Analysis of Quasi-Experiments.* University of California Press. Fabulous intuitive introduction to linear models with selection bias.

King, Gary. 1989. *Unifying Political Methodology: The Likelihood Theory of Statistical Inference.* New York: Cambridge University Press.

Probability Distributions and Stochastic Modeling

Bain, Lee and Max Engelhardt. 1978. *Introduction to Probability and Mathematical Statistics.* Boston: Duxbury press. What the title says, plus a pretty good introduction to the most popular probability distributions, and a nice presentation of lots of the tricks of stochastic modeling. Chapters 10-14 and 16 are less useful.

Rothschild, V. and N. Logothetis. 1987. *Probability Distributions.* New York: Wiley. A very inexpensive picture book of distributions; goes well with Bain and Engelhardt.

Johnson, Norman L. and Samuel Kotz. 1969. *Distributions in Statistics*, Wiley. a 4-volume set. Everything you ever wanted to know about probability distributions. The set is expensive (roughly $150) and out of date, but it is still the best available reference.

Econometrics

Amemiya, Takeshi. 1985. *Advanced Econometrics.* Cambridge, MA: Harvard University Press. Advanced summary of properties of ML, NLLS, etc., and good chapters on categorical and limited dependent variables.

Harvey, A. C. 1981. *The Econometric Analysis of Time Series.* Oxford: Philip Allan. Good summary of the time series literature.

Judge, George G.; W.E. Griffiths; R. Carther Hill; Helmut Lutkepohl; and Tsoung-Chao Lee. 1985. *The Theory and Practice of Econometrics.* 2nd ed. New York: Wiley. Long and comprehensive (though not exhaustive) summary of primarily linear econometrics.

Spanos, Aris. 1986. *Statistical Foundations of Econometric Modeling.* Cambridge: Cambridge University Press. Contains some nice histories of the development of the central limit theorem, as well as some of the topics Amemiya covers, although it takes many pages to get going.

Limited-Dependent and Qualitative Variables

Ben-Akiva, Moshe and Steven R. Lerman. *Discrete Choice Analysis: Theory and Application to Travel Demand.* Cambridge, MA: MIT Press. The best book on discrete choice models (unidimensional, multidimensional, multicategory, and nested logit and probit)

Maddala, G.S. 1983. *Limited-Dependent and Qualitative Variables in Econometrics.* New York: Cambridge University Press. Good book on this subject which covers a wider range of models than Ben-Akiva and Lerman. Careful of the typos.

McCullagh, P. and J.A. Nelder 1983. *Generalized Linear Models.* London: Chapman and Hall. A specialized book on this class of models. The idea is to estimate β in the equation $E(Y) = g(X, \beta)$, with g and the distribution of Y specified, by an iterative WLS algorithm that turns out to produce maximum likelihood estimates in most situations.

Graphics

Cleveland, William S. 1985. *The Elements of Graphing Data*, Monterey, California: Wadsworth. Reports on perceptual experiments to determine the most effective graphic formats.

Tufte, Edward. 1983. *The Visual Display of Quantitative Information.* Graphics press. Presents many ideas and examples of graphical analyses.

Mathematics

Kleppner, Daniel and Norman Ramsey. 1985. *Quick Calculus.* 2nd edition. New York: Wiley.

Miscellaneous

Kotz, Samuel; Norman Johnson; and Campbell Read. *The Encyclopedia of the Statistical Sciences.* New York: Wiley. This one's too expensive to buy (about $900 for nine volumes), but it is a useful reference.

Methodology in Graduate Political Science Programs

Nancy Elizabeth Burns, Harvard University

What do methodology requirements look like in political science departments around the country? Do most graduate political science departments offer a field in methodology?

In order to answer these questions and in order to assist people interested in restructuring methodology requirements and fields at their universities, I performed a survey of the "top" 25 graduate political science departments (as measured by Klingemann, 1986: table 2). I phoned these departments (response rate of 22 out of the 25) and spoke with various graduate advisers, undergraduate advisers, and methodology professors. The results of the survey suggest that methodology is considered a "field" on comprehensive examinations in most graduate departments (15 out of 22). Furthermore, departments with methodology requirements usually offer *fewer* methodology courses. Other results are as follows.

Courses Departments have between zero and sixteen graduate methodology courses: Princeton and University of California-Irvine, with no graduate methodology courses, and the University of Michigan, with sixteen, are the two ends of the continuum. Formal theory courses and scope and methods courses are considered part of methodology in many of the surveyed programs—for example, the University of California-Berkeley, Duke University, and the University of Illinois consider formal theory to be part of methodology, while the University of Hawaii and Brandeis University consider scope and methods courses to be part of methodology. The average number of graduate methods courses is 4.6. Departments offer relatively fewer undergraduate methodology courses. The range is from zero (Michigan, Columbia, and Indiana) to 5 (Rochester) with an average of 1.5. When they do offer an undergraduate course, it is generally an elementary quantitative methods course.

Requirements Fifteen of the twenty-two departments have a graduate methodology requirement. These come in various forms. Hawaii and Brandeis require one scope and methods course. Columbia, USC, UCSD, Harvard, Stanford, and Johns Hopkins require one elementary quantitative methods course; one of these departments (UCSD) has additional requirements for students majoring in particular fields: Americanists must take two methodology courses. Four of the departments (UCLA, Cornell, Duke, and Princeton) have an either-or requirement: either a language or some level of proficiency in quantitative methods (generally one elementary quantitative methods course). Three (Rochester, Northwestern, and Yale) require more than two courses in methodology for a graduate degree.

Undergraduate methods requirements are rare. Only five (Rochester, Berkeley, Northwestern, Hawaii, and UCSD) of twenty-two departments require undergraduates to take methodology courses.

Departments *without* a methodology requirement, in fact, offer *more* methodology courses than do other departments. (It seems as if some departments institute required courses to substitute for strong methodology programs.) Departments with no requirement average 6.7 methods courses; Michigan, Berkeley, Indiana, Chicago, Illinois, Wisconsin, and UC-Irvine fall into this category. Departments with a methodology requirement offer only an average of 3.7 courses.

Field Fifteen of the twenty-two departments consider methodology to be a field. Generally, these are departments that actually have courses in methodology beyond the basic introductory statistics courses. In ten of these fifteen departments (Michigan, Rochester, Berkeley, UCLA, Chicago, and Wisconsin, for example), methodology is considered on par with the other fields: Students can elect methodology as a field in the same way that they might choose American politics. In the other five departments with a methodology field, students can only "minor" in methodology or can only elect a "sub-field" in methodology.

The inclusion of methodology as a field has little direct connection to whether a department also has a methodology requirement, as can be seen in Table 1. The correlation between the two is actually negative (-0.26), suggesting that departments that introduce a methods field eventually eliminate their required methods courses.

Table 1

		Methodology Field NO	Methodology Field YES
Methodology Requirement	NO	1	6
	YES	6	9

The inclusion of methodology as a field has a great deal of connection to the number of methodology professors in a department (range: [0,9]; mean: 3.5); the causality probably runs both ways. The correlation between the two is 0.69.

Methodology, then, occupies a range of positions in graduate political science programs. Sometimes methodology exists only as a perfunctory course in introductory statistics (to teach students how to "read the literature"). Sometimes methodology is a major commitment in the department, with many students specializing in methodology, many professors teaching methodology, and many course offerings in methodology. By and large, however, methodology seems to exist somewhere in between.

Klingemann, Hans-Dieter. 1986. "Ranking the Graduate Departments in the 1980s: Toward Objective Qualitative Indicators." *PS* 19, 3 (Summer):651–660. TPM

A Crosstabs Program *Philip Schrodt, University of Kansas (email: Schrodt@UKanVM.Bitnet)*

Make_XTABS_Data (MXD) is a "data set compiler" which works with Version 1.1 of the Houghton Mifflin Co "Crosstabs" program that accompanies the Janda, Berry and Goldman *Challenge of Democracy* textbook. MXD allows the entry of up to six separate data sets, each having up to 4000 cases and 80 variables. Data are entered using ASCII files; the program is menu-driven and sample data input files are available. The Crosstabs program is intended for instructional use and is largely self-documenting; it uses a screen-oriented statistics approach to display data through menus and interaction with the screen. Both MXD and Crosstabs are available for Macintosh and MS-DOS systems. For a copy of the program, please send me a bitnet note at the above address. TPM

Econometric Earthquake Relief *Ken White, author of SHAZAM*

SHAZAM has announced the first earthquake relief program in econometrics. Effective immediately, any area with an earthquake of 6.9 or above is eligible for relief. All existing SHAZAM sites may obtain a free replacement copy of SHAZAM for their machines. The SHAZAM earthquake relief program means that users can run regressions without fear of earthquakes. Earthquake victims may receive relief for up to 30 days after the quake. TPM

COUNT: A Program for Estimating Event Count and Duration Regressions, Version 2.1

Gary King, Harvard University

Hardware and Software Requirements All software required to use COUNT is available free by writing me. COUNT will run on any IBM PC, XT, AT, PS/2, or true compatible with a math coprocessor (8087, 80287, or 80387). A hard disk is desirable but not required. Most people take about five minutes to begin using the program.

The programs in COUNT are also available within the Gauss software package, but you do *not* need Gauss to use this program.[2]

Introduction COUNT implements maximum likelihood estimators for parametric statistical models of events data. Data based on events come in two forms: event counts and durations between events. *Event counts* are dependent variables that take on only nonnegative integer values, such as the number of wars in a year, the number of medical consultations in a month, the number of patents per firm, or even the frequency in the cell of a contingency table. Dependent variables that are measured as *durations between events* measure time and may take on any nonnegative real number; examples include the duration of parliamentary coalitions or time between coups d'etat. Note that the *same* underlying phenomena may be represented as either event counts (e.g., number of wars) or durations (time between wars), and some of the programs included in COUNT enable you to estimate exactly the same parameters with either form of data.

A variety of statistical models have been proposed to analyze events data, and this program provides some that I have developed, along with others I have found particularly useful in my research. I list here some of the main program options, the statistical models each can estimate, and citations to the work for which I wrote each program. More complete references to the literature on event count and duration models appear in the annotated bibliography that follows.

POISSON Poisson regression (King, 1988, 1987), truncated Poisson regression (1989d: Section 5), and log-linear and log-proportion models for contingency tables (1989a: Chapter 6).

[2]Gauss is an extremely flexible matrix algebra programming language and statistical package. It is available from Aptech Systems, Inc., 26250 196th Place South East, Kent, Washington 98042; 206-631-6679.

NEGBIN Negative binomial regression (1989b), truncated negative binomial regression (1989d: Section 5), truncated or untruncated variance function models (1989d: Section 5), overdispersed log-linear and log-proportion models for contingency tables (1989a: Chapter 6).

HURDLEP Hurdle Poisson regression model (1989d: Section 4).

SUPREME Seemingly unrelated Poisson regression model (1989c).

SUPREME2 Poisson regression model with unobserved dependent variables (1989d: Section 6).

EXPON Exponential duration model with or without censoring (King, Alt, Burns, and Laver, 1990).

EXPGAM Exponential-Gamma duration model with or without censoring (King, Alt, Burns, and Laver, 1990).

PARETO Pareto duration model with or without censoring (King, Alt, Burns, and Laver, 1990).

Annotated Bibliography of Event Count and Duration Models

Allison, Paul. 1984. *Event History Analysis.* Beverly Hills: Sage. [A simple overview of event history methods for duration data.]

Bishop, Yvonne M.M.; Stephen E. Fienberg; and Paul W. Holland. 1975. *Discrete Multivariate Analysis* Cambridge, Mass.: M.I.T. Press. [Models for contingency tables.]

Cameron, A. Colin and Pravin K. Trivedi. 1986. "Econometric Models Based on Count Data: Comparisons and Applications of Some Estimators and Tests," *Journal of Applied Econometrics* 1, 29–53. [Review of the econometric literature on event counts.]

Grogger, Jeffrey T. and Richard T. Carson. 1988. "Models for Counts from Choice Based Samples," Discussion Paper 88–9, Department of Economics, University of California, San Diego. [Truncated event count models.]

Gourieroux, C.; A. Monfort; and A. Trognon. 1984. "Pseudo Maximum Likelihood Methods: Applications to Poisson Models," *Econometrica* 52: 701–720. [A three-stage robust estimation method for count data.]

Hall, Bronwyn H.; Zvi Griliches; and Jerry A. Hausman. 1986. "Patents and R and D: Is there a Lag?" *International Economic Review.* 27, 2 (June): 265–83. [Nice example of applying a variety of different estimators to single equation count models.]

Hausman, Jerry; Bronwyn H. Hall; and Zvi Griliches. 1984. "Econometrics Models for Count Data with An Application to the Patents-R&D Relationship," *Econometrica*. 52, 4 (July): 909–938. [Count models for pooled time series cross sectional panel data.]

Holden, Robert T. 1987. "Time Series Analysis of a Contagious Process," *Journal of the American Statistical Association*. 82, 400 (December): 1019–1026. [A time series model of count data applied to airline hijack attempts.]

Jorgenson, Dale W. 1961. "Multiple Regression Analysis of a Poisson Process," *Journal of the American Statistical Association* 56,294 (June): 235–45. [The Poisson regression model.]

Kalbfleisch, J.D. and R.L. Prentice. 1980. *The Statistical Analysis of Failure Time Data*. New York: Wiley. [Summary of research on many models of duration data.]

King, Gary. 1989a. *Unifying Political Methodology: The Likelihood Theory of Statistical Inference*. New York: Cambridge University Press. [Introduction to likelihood, maximum likelihood, and a large variety of statistical models, including count models, as special cases; shows how to derive new statistical models; see Section 5.2 to interpret parameters.]

———. 1989b. "Variance Specification in Event Count Models: From Restrictive Assumptions to a Generalized Estimator," *American Journal of Political Science*, Vol. 33, No. 3 (August, 1989): 762–784. [Poisson-based models with over- and under-dispersion, including the negative binomial.]

———. 1989c. "A Seemingly Unrelated Poisson Regression Model," *Sociological Methods and Research*. 17, 3 (February, 1989): 235–255. [A model for simultaneously analyzing a pair of event count variables in a SURM framework.]

———. 1989d. "Event Count Models for International Relations: Generalizations and Applications," *International Studies Quarterly*, Vol. 33, No. 2 (June, 1989): 123–147. [Hurdle models, truncated models, and models with unobserved dependent variables, all for event count data.]

———. 1988. "Statistical Models for Political Science Event Counts: Bias in Conventional Procedures and Evidence for The Exponential Poisson Regression Model," *American Journal of Political Science*, 32, 3 (August): 838–863. [Introduction to count models; analytical and Monte Carlo comparisons of LS, logged-LS, and Poisson regression models.]

———. 1987. "Presidential Appointments to the Supreme Court: Adding Systematic Explanation to Probabilistic Description," *American Politics Quarterly*, 15, 3 (July): 373–386. [An application of the Poisson Regression model.]

King, Gary; James Alt; Nancy Burns; Michael Laver. 1990. "A Unified Model of Cabinet Duration in Parliamentary Democracies," forthcoming, *American Journal of Political Science*. [Exponential model of duration data with censoring.]

McCullagh, P. and J.A. Nelder 1983. *Generalized Linear Models*. London: Chapman and Hall. [A unified approach to specifying and estimating this class of models. Some count and duration models are covered.]

Mullahy, John. 1986. "Specification and Testing of Some Modified Count Data Models," *Journal of Econometrics*. 33: 341–65. [Several hurdle-type models of event count data.]

Tuma, Nancy Brandon and Michael T. Hannan. 1984. *Social Dynamics*. New York: Academic Press. [Many types of duration models.] TPM

Event History Workshop

Paul D. Allison, Department of Sociology, University of Pennsylvania (email: allison@penndrls.bitnet)

A five-day course on event history analysis will be offered June 18–22 and again July 16–20 in Philadelphia. The instructor is Paul D. Allison, Professor of Sociology at the University of Pennsylvania. He is the author of the Sage monograph *Event History Analysis*, and has conducted this course for the past four summers. The course will emphasize models for longitudinal event data in which the rate of event occurrence is a log-linear function of a set of explanatory variables. Topics include censoring, accelerated failure time models, proportional hazards models, partial likelihood, time-dependent covariates, competing risks, repeated events, and discrete time methods. Participants will get hands-on experience with IBM-XT's. Enrollment is limited to 25 persons in each session. The fee of $700 covers all course materials but does not include lodging or meals. For further information call 215-898-6717 or write Paul D. Allison 3718 Locust Walk, Philadelphia, PA 19104-6299. TPM

Call for Monographs

Michael S. Lewis-Beck, Editor, Sage Quantitative Applications in the Social Sciences Green Monograph Series, University of Iowa

I am especially interested in seeing monograph proposals of two types: those that focus on fundamental techniques, and those that provide an introduction to well-known advanced techniques.

Consider the first. While the series certainly covers many of the "fundamentals," it does not cover them all. For example, we do not have monographs that directly and exclusively focus on the following topics: probably, graphics, quasi-experimental design, math for statistics, calculus, univariate statistics, hypothesis-testing, introduction to data analysis, correlation, the general linear model, nonlinearity. Others could be added to this list, or perhaps something already in the series deserves fresh treatment.

Consider the second, that of advanced topics. Many researchers turn to the series "for the latest thing." I am especially interested here in monographs that manage to treat a popular but sophisticated topic in an applied, accessible way. An example would be a monograph on maximum likelihood estimation. Other popular advanced topics seem amenable to introductory treatment: contextual effects, robust regression, transfer function, cost- benefit analysis, regression diagnostics, forecasting, quantitative use of historical materials, to name some.

If you are interested in submitting a proposal, please send me the following: an overview, chapter outline, content summary, discussion of need, discussion of audience, and current vita. Address letters to: Michael S. Lewis-Beck, Editor, Sage QASS Series, Department of Political Science, University of Iowa, Iowa City, Iowa 52242. TPM

More Words and a Picture about Words and Pictures

Charles H. Franklin, Washington University

"One picture is worth a thousand words." That simple phrase has caused me no end of trouble since last fall's issue of *The Political Methodologist* appeared. The problem is what equation should be used to represent the relationship of words and pictures. In my previous article (*TPM*, vol. 2, no. 2., pp 7–9) I expressed this relationship as

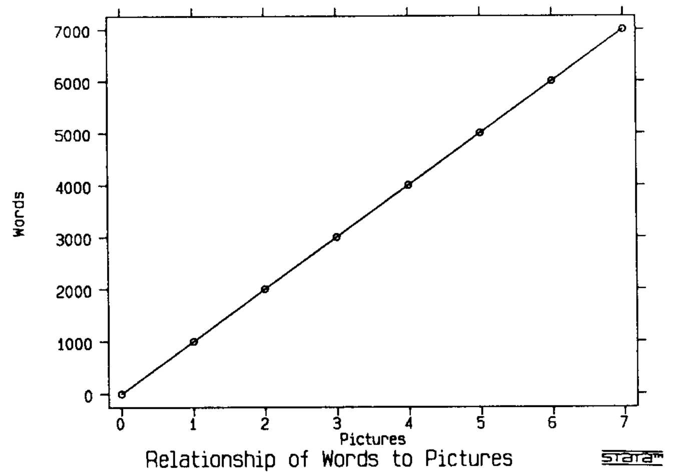
$$\text{Words} = \beta\text{Pictures}$$

and claimed that $\beta = 1000$. That assertion has produced a chorus of outrage. Friends, colleagues, students, people I have never met, and even my spouse, have delighted in sending Bitnet messages pointing out the gaffe. All members of this howling chorus have claimed that the proper expression should be

$$\text{Pictures} = 1000\text{Words}$$

or in other words, I have it exactly backwards and should be stripped of my methodological shingle. I hope that a few words, and a single picture, will show that my formulation is not as dumb as it appears.

Let us start with something I think we can all agree on: one picture *is* worth a thousand words. Then how many



words are two pictures worth? 2,000? Is that controversial? I hope not. And three pictures are worth? 3,000? I hope that all will agree. For symmetry, I hope we can also agree that zero pictures are worth zero words. This reasoning gives us the following relationship between words and pictures:

Pictures	Words
0	0
1	1000
2	2000
3	3000
4	4000
5	5000
etc.	

Once more, I hope all will agree with this expression of the relationship.

Now let us turn to a picture in which we plot the number of words against the number of pictures (see figure). You will again agree that this figure is non-controversial as it simply represents the above table in graphical form.

Now, and let me warn you this is the tricky part, what linear equation would represent the relationship shown in the figure? As drawn, words is the left-hand-side variable and pictures is the right-hand-side variable. Clearly the intercept is zero, since the line passes through the origin. What is the slope of the line? As pictures increases by one unit, words increases by 1000, right? So the slope is equal to 1000. So the linear relationship is given by the equation

$$\text{Words} = \beta\text{Pictures}$$

with $\beta = 1000$, as I originally asserted.[3] My critics may send abject apologies now.

So why is it natural to write

$$P = 1000W$$

[3]Note that I can find the number of words given the number of pictures from this equation and reproduce the table: for one picture 1000 x 1 = 1000 words, for two pictures 1000 x 2 = 2000 words and so on.

and why am I able to get the right answers using this equation as well? That is, if $P = 1000W$ then $2P = 2 \times 1000W = 2000W$ which is also the correct relationship and $3P = 3 \times 1000W = 3000W$ and so on. How can both equations be correct?

The answer is that in $P = 1000W$ the P and W represent units of measure, not variables taking on values. This expression is the equivalent of saying "one pound equals 16 ounces" or "one foot equals 12 inches". In contrast, the linear equation that I prefer treats the symbols as variables, not as mere units. In my equation, we substitute $P = 3$ to find that three pictures implies $W = 3000$ while in the unit relations equation, we multiply both sides of the equation by three to find the answer. Both equations express the same relationship but in different ways.

In fact, a moment's thought shows that the unit relations give the slope in the linear equations: "one foot equals 12 inches" says that for each unit of feet there are 12 units of inches, or that the slope of the line relating inches to feet is 12.

So which expression is correct? Both are, but it is important to know whether we are expressing unit relations or linear functions relating variables. I tend to think in terms of functional relations, usually linear ones such as regression equations. So when I read "one picture is worth a thousand words" I see this as a linear relationship and write the equation appropriately with a slope of 1000. Were I trained to think in terms of unit relations, as for example the butcher might be used to relating pounds and ounces, I might see the equation differently. But the butcher and I can at least agree that a picture is worth a thousand words, even if we express it a little differently. TPM

1990 American Political Science Association, Political Methodology Program

Nathaniel Beck, University of California, San Diego, and Gary King, Harvard University; Section Heads for APSA and the Political Methodology Organized Group

Panel 1: "Formal and Methodological Advances in Comparative Politics" [Joint with Comparative Politics Section] Are you in comparative politics and interested in modern methods of political science? Then don't miss this panel. These scholars review existing methods, introduce proposals for new approaches, and conduct state-of-the-art applications.

CHAIR: D. Roderick Kiewet, *California Institute of Technology*

PAPERS: "Political-Economic Cycles" Alberto F. Alesina, *Harvard University* and Nouriel Roubini, *Yale University (Department of Economics)*

"Methodology in Comparative Politics" James E. Alt and Gary King, *Harvard University*

"The Information-Economizing Organization of Parliaments" Ronald Rogowski, *University of California, Los Angeles*

DISC: TBA

Panel 2: "Pooled Analysis in State Politics Research" [Co-sponsored with State Politics Section This panel is co-sponsored with the State and Local subfield. Come and find out if substance and method can live happily together on the same panel. Tell your colleagues in state and local government about this one; maybe they will learn why good methodology is important.

CHAIR: William D. Berry, *University of Kentucky*

PAPERS: "State Tax Policy Innovation" Fran S. Berry, *Council of State Governments* and William D. Berry, *University of Kentucky*

"Models of Dichotomous Choice in State Supreme Courts" Paul R. Brace, *New York University* and Melinda Gann Hall, *North Texas State University*

"Expenditure Tradeoffs in the American States: A Pooled Cross-Section Analysis" James C. Garand, *Louisiana State University* and Rebecca Hendrick, *University of Wisconsin, Milwaukee*

DISC: Ken Meier, *University of Wisconsin, Madison*

James A. Stimson, *University of Iowa*

Panel 3: "New Methods for International Relations" The cutting edge of modern quantitative IR. Leaders in the field will debate about the future of quantitative IR through several new statistical and modeling applications.

CHAIR: John T. Williams, *University of Illinois at Chicago*

PAPERS: "Pride and Place: The Origin of German Hegemony" Bruce Bueno de Mesquita, *Hoover Institution, Stanford University*

"Statistical Methods for Estimating Action-Reaction Models" John T. Williams, *University of Illinois at Chicago*; Michael D. McGinnis, *Indiana University, Bloomington*, and Marc V. Simon, *Indiana University*

"The Level of Analysis Problem Revisited" Dina Zinnes, *University of Illinois at Urbana-Champaign* and Robert Muncaster, *University of Illinois Urbana-Champaign (Department of Mathematics)*

DISC: Harvey Starr, *University of South Carolina*

Panel 4: "The Future of Dimensional Analysis" The heavyweight championship of the multidimensional scaling world will be decided at this three-way fight between Henry Brady, Keith Poole & Stephen Spear, and Doug Rivers. Note the title of Brady's paper, and be careful of flying sparks.

CHAIR: Gary King, *Harvard University*

PAPERS: "Sense and Nonsense in Multidimensional Scaling" Henry E. Brady, *University of Chicago*

"Statistical Properties of Metric Unidimensional Scaling" Keith T. Poole and Stephen Spear, *Carnegie-Mellon University*

DISC: Douglas Rivers, *Stanford University*

Panel 5: "Statisticians and Political Methodologists" Statisticians visit with political methodologists for this very special panel. Do not miss Statistics Professor David Freeman argue that political scientists should never use methods more complicated than contingency tables. Mel Hinich and Gisele De Meur will counter with some of their state-of-the-art political applications, Manny Parzen will speak about bringing statistical methods of data analysis to diverse disciplines, and Andrew Gelman will try to reconcile all these diverse viewpoints.

CHAIR: Melvin J. Hinich, *University of Texas at Austin*

PAPERS: "The Problem of Nonlinear and Non-Gaussian Innovation for Standard Linear Time Series Analysis" Melvin J. Hinich, *University of Texas at Austin*

"Vectorial Analysis of Data" Gisele De Meur, *Centre d'Economie Mathematique et d'Econometrie, Universite Libre de Bruxelles*

"Data Analysis" Emanuel Parzen *Texas A&M University, (Department of Statistics)*

DISC: David Freedman, *University of California, Berkeley, (Department of Statistics)*

Andrew Gelman, *Harvard University (Department of Statistics)*

Panel 6: "Mistaken Measures, Crazy Correlations, and Sophisticated Solutions in Survey Research" Do the Michigan Surveys produce anything more than random noise? If so, how can you distinguish the signal from the noise? You will never look at survey research the same way again after attending this panel.

CHAIR: Richard W. Boyd, *Wesleyan University*

PAPERS: "The Nature of Survey Response" Stanley Feldman, *University of Kentucky*

"Counter Arguments in Survey Research: Non-Attitudes and Issue Politics" Joseph F. Fletcher, *University of Toronto*

"Nonrandom Error and the Perils of NES Data" Donald Green, *Yale University*, Brad Palmquist, *University of California, Berkeley*, and Jonathan Cowden, *Yale University*

"Chance Correlations in Voting Research: Gemini, Monday's Child, and the Year of the Rabbit" Carol L. Mock, *University of Illinois, Urbana* and Herbert Weisberg, *Ohio State University*

DISC: Helmut Norpoth, *State University of New York at Stony Brook*

Panel 7: "Solving Methodological Problems in International Relations" Political methodologists take on long-standing problems in the IR literature. If you are planning to do research in IR anytime soon, don't miss this panel and be left behind.

CHAIR: Lisa Martin, *University of California, San Diego*

PAPERS: "Ordinal Scaling of International Conflict and Cooperation" Francis A. Beer, Jeff Ringer, Alice F. Healy (Department of Psychology), Grant P. Sinclair (Department of Psychology), and Lyle E. Bourne, Jr. (Department of Psychology), *University of Colorado, Boulder*

"Ridge Regression Analysis of Collinear Data: An Application to the Study of National Security," Alex Mintz and Chi Huang, *Texas A&M University*

"Sequence Analysis Techniques for Political Research" Philip A. Schrodt, *University of Kansas*

DISC: Steven Greffenius, *University of Wisconsin, Madison*

Panel 8: "Computational Issues in Political Methodology" This is not just a review of computer programs for analyzing data. Scholars discuss new and exciting uses of the computer for political science research—techniques that are only possible in the new machine age.

CHAIR: Glen Mitchell, *University of Iowa*

PAPERS: "Social Choices in Multidimensional Policy Spaces: A Computer Simulation" Eric C. Browne, *University of Wisconsin, Milwaukee*; Peggy James, *University of Wisconsin, Parkside*; Martin Miller, *University of Wisconsin, Milwaukee (Department of Social Science Research)*

"Non Linear Simulations of Voter's Behavior" Georg Erdman, *ETH Zurich, Center for Economic Research*

"Comparing Expert Systems Algorithms with Other Multivariate Procedures" G. David Garson, *North Carolina State University*

"Measuring the Effects of Qualitative Variables on Regression Models: The ALSOS-Bootstrap Approach" William G. Jacoby, *University of South Carolina*

DISC: Robert G. Brookshire, *James Madison University*

James A. McCann, *University of Colorado, Boulder* and *Harvard University*

Panel 9: "New Methods for Old Data" There is more to life (and quantitative research) than the general linear model!

CHAIR: Paul R. Abramson, *Michigan State University*

PAPERS: "Modeling Political Relationships: An Extension of Network Analysis Procedures" Michael L. Berbaum and John M. Bolland, *University of Alabama (Institute for Social Science Research)*

"Multi-Case Analysis — The 'Missing Link' Between Configurative and Macro-Quantitative Approaches, Some Examples From Current Research" Dirk Berg-Schlosser, *Institut fur Politikwissenschaft*

"Estimating Turnout as a Guide to Predicting Election Outcomes" John Petrocik, *University of California, Los Angeles*

"Comparing Methods for Analyzing Perceptions of Political Problems" Wijbrandt H. Van Schuur, *University of Groningen*

DISC: William T. Bianco, *Duke University*

Panel 10: "Reciprocal Causation and Causation That is Reciprocal" Most political relationships involve simultaneous relationships. Yet, we still have not solved all of the methodological problems required to adequately study these phenomena. This panel features two distinguished sociological methodologists, Rob Mare and Chris Winship, with a new approach to this problem, and several well known political scientists: Charles Franklin builds a formal model of this process, and John Jackson & Liz Gerber estimate their own model.

CHAIR: John R. Freeman, *University of Minnesota*

PAPERS: "A Model of Campaign Strategy and Voter Response" Charles Franklin, *Washington University, St. Louis*

TBA, John E. Jackson and Elisabeth Gerber *University of Michigan, Ann Arbor*

"Log-Linear Models for Reciprocal Causation and Other Simultaneous Effects" Robert D. Mare, *University of Wisconsin, Madison (Department of Sociology)* and Christopher Winship, *Northwestern University (Department of Sociology)*

DISC: Douglas Rivers, *Stanford University*

Panel 11: "Ecological Fallacies and Inferential Truths: Statistical Models for Aggregate Data" Come to this panel, and learn how to analyze aggregate data properly. Watch Chris Achen and Ken McCue debate new methods of making inferences about individuals using only aggregate data. Hear Luc Anselin and John O'Loughlin discuss spatial variation and spatial autocorrelation in aggregate data. Listen to both groups wrestle with how to combine their respective interests to generate valid statistical estimates.

CHAIR: Robert S. Erikson *University of Houston*

PAPERS: "Prospective Voting Implies a New Statistical Method for Ecological Inference" Christopher H. Achen, *University of Chicago*

"Spatial Analysis of International Conflict and Cooperation" Luc Anselin, *University of California, Santa Barbara (Department of Geography)* and John O'Loughlin, *University of Colorado, Boulder (Department of Geography)*

"Homogeneity and Proximity in the Analysis of Aggregate Electoral Returns" Kenneth F. McCue, *California Institute of Technology (Research Scientist)*

DISC: Howard Rosenthal, *Massachusetts Institute of Technology*

Panel 12: "New Methods for Voting Research" Voting research is probably the most methodologically sophisticated area of research in the discipline. Scholars on this panel push the frontier even further. Do not miss the action in this fast moving field.

CHAIR: Samuel Popkin, *University of California, San Diego*

PAPERS: "Survival Functions of Strong and Weak Partisans: An Analysis of NES Panel Data" Mark Fenster, *University of Wisconsin, Milwaukee*

"Do Party Elites Pick Better Presidential Candidates than Primary Voters?" Theresa Marchant Shapiro, *Union College* and Christopher H. Achen, *University of Chicago*

"An Exploration of Negative Voting Schemes: A Computer Simulation Model" Marcia Lynn Whicker, *Virginia Commonwealth University* and Lee Sigelman, *University of Arizona*

DISC: Arthur W. (Skip) Lupia, *California Institute of Technology*

Panel 13: "Philosophy for Methodology" Do any of the above 12 panels contain anything of interest? This panel provides the answer. Theorists Tracy Strong and William Corlett moderate an attempt to see if there really is any philosophy of social science.

CHAIR: Tracy Strong, *University of California, San Diego*

PAPERS: "Explanation in Political Science" Milton Hobbs *University of Illinois at Urbana-Champaign*

"Causality for the Social Science" Lawrence B. Mohr, *University of Michigan, Ann Arbor*

"Are We Too Certain of Our Uncertainty?" Carolyn V. Lewis, *University of Houston*

"Counterfactuals and Hypothesis Testing in Political Science" James D. Fearon, *University of California, Berkeley*

DISC: William Corlett, *Bates College*

Panel 14: "Modern Methodology and Post-Modern Philosophy" And now for something completely different. Using interpretive and deconstructionist methods common in post-modern theory, Ed Malecki discusses power, Bert Kritzer shows how to interpret statistical results, and Owen & Zerilli deconstruct survey questionnaires.

CHAIR: Henry Kariel, *University of Hawaii at Manoa*

PAPERS: "The Disappearing Citizen in Political Science Research" Diana Owen and Linda Zerilli, *Rutgers University*

"Quantitative Research as Interpretive Social Science" Herbert M. Kritzer, *University of Wisconsin*

"Learning Lessons From the Critics: Post-Modern Insights Into the Study of Power" Edward S. Malecki, Jr., *California State University*

DISC: Michael J. Shapiro, *University of Hawaii, Honolulu.* TPM