IN ASSOCIATION WITH
FACULTY DEVELOPMENT AND RESEARCH (TITLE III)

VALUE-ADDED MODELING SEMINAR
OCTOBER 16, 2008 THROUGH FEBRUARY 21, 2009

REGISTRATION FORM

(Please type or print)

Name _____________________    Title _______________________    Department ______________

Institution ______________________   Address _______________________    City _____________

State ___    Zip __________

Telephone (____)______________   Fax (____)____________________

Email Address ________________________________

Please note special needs, including access, accommodations and dietary __________________________

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By signing up for this series of working sessions, you acknowledge that you understand that they meet one
Thursday afternoon and one Saturday morning a month October 2008 – February 2009.

Sessions will meet in the Teaching Learning Institute, 203C Gore Education Complex.

Please mail to: Teachers for a New Era, Florida A&M University, Gore Education Complex – 203C, P.O. Box
70571, Tallahassee, Fl 32307 or
Submit by email to: teachersforanewera@famu.edu, or
FAX to: (850) 412-7202.
For additional information, contact Mrs. Deloris Harpool at (850) 599-3319.
Goal: Each participant will be able to comprehend and apply the statistical results of a value-added model.

Objectives:
Participants will be able to frame questions and problems as value added measurements.
Participants will be able to articulate previous research about value added measurement issues.
Participants will be able to frame valued added research problems, questions, and hypotheses.
Participants will be able to collect or obtain data relevant to value added measurement research.
Participants will be able to analyze gathered data.
Participants will be able to write and present valid, common defensible conclusions based upon data analysis.
Participants will understand the basic elements of multivariate regression analysis as illustrated in their written and oral presentations.
Participants will obtain a working knowledge of STATA as demonstrated in written reports.

Approach: The course will omit formal derivations and proofs and instead focus on understanding the jargon of regression analysis and how to interpret the results of value-added models. When necessary, the instructor will discuss important statistical formulas where the emphasis is placed on increasing intuitive understanding.

Work Session 1: Thursday, October 16, 2008


I. First step: policy issues, theory, and statistics.

Policy issues

American students are legally required to remain in high school until they are at least sixteen years of age. Most students obtain twelve to thirteen years of education. Dropping out, or obtaining fewer than 12 years of education, is a problem for some socioeconomic groups. One empirical issue to analyze is: What factors determine whether or how students will fall into the
following groups: no high school diploma or general equivalency degree, general equivalency degree, or high school diploma. This is an issue of educational attainment or years of education.

A second empirical issue concerns the quality of education, sometimes referred to as educational achievement of students in at-risk socioeconomic groups. For any given level of educational attainment, students vary according to educational achievement. Currently, standardized test scores, such as the FCAT, are used to measure educational achievement. For each level of educational attainment, there may be some minimum expected level of proficiency to test the quality of education. For instance, students might be required to achieve some minimum FCAT score in order to be ranked as proficient, while another score would be ranked as above average, etc.

Third, the issues of educational attainment and educational achievement may be evaluated at both pre- and post-secondary levels. Specifically, universities have differing graduation rates, whether measured at four or six years. Further, universities offer differing qualities of education.

Theoretical framework.

Each policy issue has a common statistical framework:

i) \( \text{Student learning} = f(\text{Nature and significance of teaching, } X) + \epsilon. \)

ii) More or better teaching yields more or better student learning.

iii) There are other systematic factors that affect student learning (X).

iv) Student learning is also affected by some non-systematic or purely random factors (\(\epsilon\)).

Empirical issues.

i) Each study must decide the meaning and measurement of student learning.

Does the study focus on educational achievement of elementary and middle school students, high school students, or college students? Does the study focus on high school or college drop outs? Does the study focus on post-secondary outcomes such as enrollment in vocational/technical institutions, enrollment in two-year colleges, enrollment in a four-year university, or no enrollment in any educational institution?

How does one measure educational achievement?

The value-added literature focuses on educational achievement of elementary, middle, and high school students. Standardized test scores are used as the achievement metric. In Florida, the achievement metric is the FCAT.

ii) How can the nature and significance of teaching be measured? For value-added studies, this is the $1 trillion question!
Some teachers might have greater ability than others and the quality of teaching increases with ability. So, ability might be captured by the teacher’s high school GPA along with SAT and ACT scores. Label this T1.

Teacher training should contribute to student achievement, which might captured by whether individuals entered education through the College of Education major or through alternative certification. Also, the choice of college major affects the quality of teacher training. Label this T2.

The teacher’s quality of education might be important. This may be captured by FTCE scores. Label this T3.

A teacher’s years of education may be important. This might be captured by whether teacher has a BA, MA, or higher level degree. Label this T4.

A teacher’s behavioral history may matter. For example, some teachers were well behaved in high school and college and some were not. Perhaps, badly behaved students become teachers who cannot maintain class discipline. Or, maybe badly behaved students become exceptional disciplinarians as teachers because they have a solid personal understanding of bad behavior. Label this T5.

Teacher demographic characteristics may matter, such as race, gender, and socioeconomic background. Label this T6.

A teacher’s pedagogical style may matter. Label this T7.

The nature and extent of a teacher’s interaction with parents may matter. Label this T8.

A teacher’s expectations of and faith in students may matter. Label this T9.

A teacher’s enthusiasm and interaction with students may matter. Label this T10.

*Regression model.*

\[
FCAT = f(T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, X) + \epsilon,
\]

Suppose T1 is changed by one unit, for example, increase teacher ability by 1 standard deviation as captured by the SAT score. How much does changing T1 by one unit change the student’s FCAT score? That is value-added modeling.

Which, if any, of the teacher characteristics are statistically significant?

Which, if any, of the teacher characteristics are substantively important?

Are the teacher characteristics collectively significant?
Are the teacher characteristics collectively substantively important?

Are the effects of individual characteristics statistically identical?

What should be included in X in order to make sure the answers to the above questions are valid?

Answering these questions requires an understanding of multivariate regression analysis.

II. Examine the data.

A. What information is required from the data? What are the research questions?
   1. What the effect of teacher quality on learning outcomes?
   2. How are teacher quality and learning outcomes measured?
B. STATA programming to read raw data file.
C. STATA programming to describe the data.
D. Manipulating data: three important identification codes (k20_edw_id, employee_edw_id, course_offering_id).
E. E. STATA programming to merge files.

III. Florida A&M teaching graduates data: an extended discussion.

Work Session 2: Saturday, October 25, 2008.


I. Alternative value-added models.

Doug Harris and Tim Sass, “Value added models and the measurement of teacher quality.”

II. Univariate value added model.

A. Estimating the coefficients.
B. Goodness of fit ($R^2$ and SER).
C. Crucial assumptions.
D. Sampling distributions of OLS estimators.


I. Hypothesis tests and confidence intervals.
   A. Two-sided and one-sided tests:
      1. Significance levels.
      2. P-values.
   B. Confidence intervals.
   C. Binary variables.
   D. Heteroskedasticity and homoskedasticity.

II. Violation of assumption: Omitted Variable Bias.

III. Multivariate value-added model.

IV. Interpreting the Coefficients.

V. Goodness of fit (R2, Adjusted R2, SER).

VI. Assumptions.

Work Session 4: Saturday, November 22, 2008.


I. Distribution of OLS estimators.

II. Multicollinearity.

III. Hypothesis testing: multivariate regression models.

IV. Function form and interpretation of coefficients.

Work Session 5: Thursday, December 4, 2008.

A. Internal validity.
B. External validity.
C. Misspecification of functional form
   a. Error-in-dependent variable.
   b. Error-in-explanatory variable.
   c. Sample selection bias.
   d. Simultaneous causality.
   e. Heteroskedasticity.
   f. Multicollinearity.

**Work session 6: Saturday, January 10, 2009.**


Panel data: Understanding random effects and fixed effects.

**Work Session 7: Thursday, January 22, 2009.**


Value-added models: Statistical results and an extended discussion.

**Work Session 8: Saturday, February 21, 2009.**

Concluding session.

Participants will propose their own research questions along with group work on designs, data collection plans, and appropriate methodology.