



## COURSE DESCRIPTION AND SYLLABUS

"It is unworthy of excellent men to lose hours like slaves in the labor of calculation." Baron Gottfreid Whilhelm von Leibniz (1646-1716)

## TIME and PLACE

Thursday, 9:00 a.m. -12:00 p.m., 5.154 Business Building; most weeks, Tuesday afternoon labs from 4:30 to 6:00 or so (I'm paying for 'za-vittles; and yes, we will go later sometimes).

# FACILITATOR

- DAVE HARRISON: 4.424 GSB, 512/471-4930 (work), 512/471-3937 (work fax), 814/321-1866 or 512/354-1072 (cell/home). The work phone is not particularly useful, being corded and all. I prefer using my cell. I only text with my kids and BFFs. My email is <u>drdaveharrison@mail.utexas.edu</u>. I read it at least once every business day, but it isn't instantaneous. It's not a good venue for urgent or complex questions (requiring more than 3 or 4-sentence answers). Phone calls and face-to-face meetings are better for those, respectively. Leave a message if I don't answer. I *always* call back. Still, for most simple communications, e-mail is best. Please call me 'Dave.' 'Dr. Harrison' only works in horror movies. And no, this is not a horror movie. It's also not a musical. It could be an action-adventure-comedy. Think *Buckaroo Bonsai*, but starring Patton Oswalt.
- OFFICE HOURS: <u>T</u>: 3:00 4:30 p.m. and other times by appointment. Those other appointment times can be flexible, but I travel a lot for my research work, so the middle of the week and some Fridays are preferable. There will likely be days that I can't make these times. I'll give you advance notice and set up alternatives.

## OBJECTIVES

As with all our courses, the general objective is to make you a better organizational scholar, and a rich and famous professorial alumnus! More specifically, MAN 390 is designed to prepare you for issues that you'll deal with in testing hypotheses from covariance or correlation structures in messy, organizational data. By the end of the course, you should have the data prepping and data analytic skills to be competent in and confident about completing a (field-based) dissertation. Specifically, MAN 390 concentrates on development, measurement, and analysis of "real-world" data, data in which you would test hypotheses about natural rather than manipulated covariation between variables.

## 

In the first part of the course, we'll take an in-depth look at what covariances and correlations are, what assumptions they're based on, what factors have an effect on them, and how one can use different

types of correlations to estimate associations between variables. Then, we'll cover how researchers evaluate the instruments they use, primarily by looking at key covariances or correlations among an instrument's items or other such "indicators" of the construct they intend to quantify. These pairwise correlations are at the foundation of most approaches to measurement. Several lectures and exercises will cover how to assess the psychometric or measurement-based properties in one's data (e.g., various estimates of reliability and validity).

The second major segment of the course will involve factor analytic techniques. Factor analysis, although a form of the general linear model, is really a measurement-oriented technique. It will be sharply distinguished from principle component analysis, which does not account for measurement error. We'll examine the art and craft of exploratory factor analysis (EFA), highlighting some of the most common pitfalls that researchers encounter. Although it is not often reported in current journal articles, EFA is very much a part -- and an important part -- of a researcher's toolkit. We'll then turn to confirmatory factor analysis (CFA) using the program LISREL, and we'll go into the explicit testing of latent structure in what is called a "measurement model" for observed and latent variables.

Third, we'll turn to multiple regression as the primary form of hypothesis testing in organizational science. It relies on existing covariation, and it even can be done without access to raw data. After reviewing basics, we'll delve into advanced topics such as solutions to high multicollinearity, and what regression coefficients have to do with semi-partial (part) correlations. We'll also hit on how to do tests for mediating (causal chain) and moderating (causal contingency) hypotheses, which are central to many management theories. We should discuss such hairy beasts as suppressor variables, shrinkage formulae, cross-validation, mediated moderation and moderated mediation. We'll likely go over the distinctions and overlap between linear and logistic regression.

Coverage of CFA and multiple regression are necessary for the course's final segment, testing of unobserved relations between latent constructs: structural equations modeling (SEM). Our look at SEM will begin with techniques often referred to as "path analyses," which model the inter-correlations of independent variables along with their effects on (multiple) dependent variables. Finally, we'll bring the measurement and statistical testing, factor analysis. and regression themes together to tackle SEM (using LISREL again). If we have time, we'll cover both introductory and advanced topics in their application, such as estimation methods, identification problems, goodness of fit indices, robustness, and model modification. More advanced SEM topics are covered in other UT courses.

In each of the statistical or psychometric topics listed above, there are various assumptions that are often unknowingly violated. Yet, they have serious consequences for substantive conclusions. On the other hand, there are some tips, tricks, and tacit knowledge about getting models to fit properly and getting data to behave that are not routinely done, especially for more complex techniques. I'll try to highlight these whenever possible, noting issues that often come up in the review process.

## TEXTBOOKS, READING MATERIALS, AND SOFTWARE

Jöreskog, K. & Sörbom, D. 1998. <u>LISREL 8: Structural equation modeling with the</u> <u>SIMPLIS<sup>tm</sup> command language</u> (2<sup>nd</sup> edition). Hillsdale, NJ: Erlbaum. ISBN: 0894980335. (referred to as <u>JS</u>)

TEXTS: Bobko, P. 2001. <u>Correlation and regression: Applications for industrial-organizational</u> <u>psychology and management</u> (2<sup>nd</sup> edition). Newbury Park, CA: Sage. ISBN: 076192303. (referred to as <u>B</u> in the rest of this syllabus)

The first book is our primary text. It is *easily* the best textbook I've seen on correlation and regression. Even past student reactions have been uniformly positive! The text is very easy to read, with examples that make good sense and generate good insights. Bobko also conveys the enthusiasm that many, including me, have about using appropriate statistical tools to find meaning in data. However, it is sometimes written for a less sophisticated audience than Ph.D. students trying to get <u>AMJ</u> publications. It doesn't hit on some subtle issues that we'll cover with readings (see below) and with the other book.

The second book is a user manual for LISREL. When we get to the part of the course that involves testing confirmatory factor and structural equations models, we'll be using a new version of LISREL, a program designed specifically for such applications. The control code for LISREL used to be arcane, inflexible and generally nasty to novices. In the current product, LISREL 8.8, one command language, SIMPLIS, allows for amazingly simple ease of use. The second text isn't really a textbook as much as a compendium of examples. Learning by example has always been easier for me with statistical software, so we'll try to work from this one.

I'm listing several optional books. The first two, and especially the first one, are gentle introductions to SAS. The third is a more comprehensive reference on using LISREL to get questions answered in your data. I've evaluated several books in each category, and these work the best for me:

- Delwiche, L. D. & Slaughter, S. J. 1998. <u>The little SAS book: A primer</u> (2<sup>nd</sup> edition). Cary, NC: SAS Publishing. ISBN: 1580252397.
- Dilorio, F. & Hardy, K. A. 1995. <u>Quick start to data analysis with SAS</u>. Pacific Grove, CA: Duxbury Press. ISBN: 0534237606.
- Byrne, B. 1998. <u>Structural equation modeling with LISREL, PRELIS, and SIMPLIS:</u> <u>Basic concepts, applications, and programming</u>. Hillsdale, NJ: Lawrence Erlbaum. ISBN: 0805829245.
- READINGS: Although much of what you'll learn about correlation and regression to test hypotheses has been known for some time, there are still many issues yet to be resolved. That is, statisticians and methodologists are continually advancing what we know about important issues, such as the power and optimality of ways to test random-effects interactions or moderators in field data. Therefore, I've also assembled a packet (alright, a *tall stack*) of supplementary articles. Sometimes these articles are optional; other times they will be the main points of discussion in class. All textbook chapters and readings are listed in the "Timetable" at the end of this syllabus. Each is labeled "optional" or "required." *I'm currently trying to make sure all these articles are (scanned) in pdfs. I'd appreciate any help you could provide if I'm missing something.*
- SOFTWARE: The latest SAS version is available free to use on a McCombs server. I prefer to install it on my client, but ilt does take up a whopper bunch of space if you install everything. Although you may have heard scary things about SAS, at least some of them aren't true. We will learn how to write syntax and submit in "batch" mode. The GUI (graphical user interface) is fine; however, using syntax in addition to the GUI can easily increase your productivity by a factor of 5 to 10 times for simple jobs. The increase can easily be 25 times or more for large, complex jobs. Those are estimates from my own comparisons. Furthermore, some of SAS's most advanced features are only available through syntax. As a bonus, syntax files work on all versions of SAS, not just on Windows.

LISREL version 8.8 is the market leader (80+%) in structural equation modeling, for good reason. Karl Jöreskog, its developer, is really the father of this approach. LISREL

was the first SEM program, and it is constantly updated to accommodate new techniques. It is now pretty easy to use, and it even makes decent pictures. I love pictures! There is even a free student version that you can download. The website is <u>http://www.ssicentral.com/lisrel/downloads/LISREL88Student.exe</u>. However, it is limited to importing only ASCII, tab-delimited, or comma-delimited data files. That's really not a huge limitation because you can probably get other stat programs to save datasets in these formats.

### FORMAT

Discussion and preparation on your part will still be critical, however, as one emphasis in the course will be "hands-on" learning. You'll incrementally analyze your <u>own</u>, large, multivariate data set for homework assignments. Don't worry if you struggle with these ideas or analyses in your data set. *Struggling is part of the learning process* and *everyone does so* with any reasonably complex work, even if they have decades of data-analytic experience and mangy-looking grayish hair. Learning SAS will also be difficult at times; <u>I'm scheduling late Tuesday afternoon "lab" sessions for us to concentrate on software implementation</u>. The homework assignments will push along our next emphasis, *creating a useful product for your career.* Therefore, a major requirement will be the final draft of an empirical manuscript you'll put in a format ready to send to a journal or national professional conference in your discipline (for Management Ph.D. students, that would be the Academy of Management convention). It is due at 9:00 a.m. on May 12<sup>th</sup> (the Thursday of finals week), in *hard-copy* form in my mailbox.

Along with assignments that specify a model, estimate correlations, assess measurement properties, and test mediating and/or moderating hypotheses via multiple regression, you will use advanced CFA and SEM procedures discussed in class to test some interesting hypotheses in your multivariate dataset. The assignments will have you doing different stages of analysis on the same dataset, which is the one you'll write up in your journal or conference submission.

### 

This is an advanced course in statistical topics. To be well-prepared for course material, you should have taken a graduate course that covers linear statistical models, either at the masters or Ph.D. level. Knowledge of types of ways to estimate statistical parameters (e.g., maximum likelihood versus least squares) is helpful, as many of the CFA and SEM programs make serious assumptions demanded by the corresponding estimation theory. If you've had it, revisit that material as the term progresses.

Another pre-requisite is facility with SAS (or willingness to acquire it) via a PC. SAS will be our primary tool for data analysis, although I have other tools available. I'll use it in most of my examples in class.

A final pre-requisite is a rich, multivariate dataset. Such a dataset would have (a) multiple independent constructs, (b) (perhaps multiple) dependent constructs, (c) possible mediating or moderating constructs, mostly importantly (d) *multiple (3+) indicators* for at least a couple of those constructs, and (e) a sample size approaching 200 entities if possible but absolutely no less than 120. Psychological or sociological survey data often fit this bill fairly well, but students have also fruitfully used archival data sets in the past. If you don't bring a dataset of your own to work on, I have a large number of them -- covering many issues and constructs at individual, group, and organizational levels of analysis (e.g., behavioral decision-making, strategic cognition, entrepreneurial traits, environmental perceptions, attitudes, survey design, work withdrawal, group diversity, and so on).

#### **EXPECTATIONS FOR CLASS PERFORMANCE**

- ATTENDANCE: Quantitative course material is difficult, and it builds on itself. Therefore, it's important you show up for lectures, even though I won't take daily attendance. We only have 15 sessions! Attendance problems will keep you from doing well.
- DISCUSSION: Although the nature of this class means there will be much more lecture than a typical Ph.D. seminar, you'll also be responsible for some of the discussion in each class period. To prepare for these discussions, you'll need to read the scheduled materials. In terms of the texts on quantitative methods, you probably have some of the most readable material I've ever seen. *Read to get the big picture*. Ask questions to fill in the small pictures that make up the big one. *Read with applications in mind* -- try to connect what you're reading to research projects you've been on, or to your own data. We'll critique some multivariate papers throughout the term. If you find one or two that would be good fodder for critiquing, bring them in. Attendance, Discussion, and Presentation (see below) add up to 16 pts of *Participation*.
- PRESENTATION: You'll give a no-stakes/low-stakes presentation of the ideas for your paper and perhaps analytic progress during the semester, perhaps in a lab session.
- ASSIGNMENTS: There will be two large and involved homework assignments (worth 24 pts. each) designed to further ingrain and illustrate the quantitative issues we cover in class. As mentioned before, the assignments will be done on your own multivariate data set. They will be progressive, building on one another and building toward your final publication-quality paper. They will likely have about 2 weeks or more lead time.
- EXAM: There will be no exams! The faculty have decided that research design issues should be part of your comprehensives, but not necessarily advanced statistical analyses. So, I won't force you to take the bitter pill of a test in this class.
- PAPER: The final paper is worth 36 points. It is NOT just a proposal or "practice" piece. You need to write it in a way that improves its chances of acceptance at a journal or a national conference in your field (including using the proper format and so on).

## GRADES

As with most of my courses, the grading scheme is based on a simple 100-point scale. If you get a certain percentage of those 100 points, you will get a certain grade. Here's how it goes, with 16 (participation) + 48 (2 assignments) + 36 (final paper) = 100 possible points:

Α	=	90-100%	=	90-100 pts.
В	=	80-89%	=	80-89 pts.
С	=	70-79%	=	70-79 pts.
D	=	60-69%	=	60-69 pts.
F	=	< 60%	=	< 60 pts.

Everyone is capable of A-level work, and it's possible that everyone will get an A. I don't force any percentage of B's or C's. I also realize that this course will be hard and we might hit some bumps. Therefore, I've tried to build some flexibility into the course in case we get behind. Each type of reading and assignment should have positive overlap with others. However, if things get too wild or too

oppressive, let me know. Feedback works best *during* the term, as I can use it to make immediate changes. In that regard, *the syllabus will likely change and should be considered tentative,* even though the dates and readings are all laid out.

This should be a rigorous, challenging, and helpful course. The idea is to get everything you need to know about doing bread-and-butter, field-based data analyses for management research. Many students who took other versions of this course have turned their papers into journal submissions and acceptances. I hope you learn a lot, both in front of and behind the curtain. I know I always do!

## ACADEMIC DISHONESTY

A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at Austin, as emphasized in the standards of conduct. More specifically, you and other students are expected to "maintain absolute integrity and a high standard of individual honor in scholastic work" undertaken at the University (Sec. 11-801, Institutional Rules on Student Services and Activities). This is a very basic expectation that is further reinforced by the University's Honor Code. At a minimum, you should complete any assignments, exams, and other scholastic endeavors with the utmost honesty, which requires you to:

- acknowledge the contributions of other sources to your scholastic efforts;
- complete your assignments independently unless expressly authorized to seek or obtain assistance in preparing them;
- follow instructions for assignments and exams, and observe the standards of your academic discipline; and
- avoid engaging in any form of academic dishonesty on behalf of yourself or another student.

For the official policies on academic integrity and scholastic dishonesty, please refer to Chapter 11 of the Institutional Rules on Student Services and Activities.

Personally, I have no tolerance for acts of academic dishonesty. Such acts damage the reputation of the school and the degree and demean the honest efforts of the majority of students. The minimum penalty for an act of academic dishonesty will be a zero for that assignment or exam.

The responsibilities for both students and faculty with regard to the Honor System are described on <u>http://mba.mccombs.utexas.edu/students/academics/honor/index.asp</u> and on the final pages of this syllabus. As the instructor for this course, I agree to observe all the faculty responsibilities described therein. During Orientation, you signed the Honor Code Pledge. In doing so, you agreed to observe all of the student responsibilities of the Honor Code. If the application of the Honor System to this class and its assignments is unclear in any way, it is your responsibility to ask me for clarification.

## STUDENTS WITH DISABILITIES

Upon request, the University of Texas at Austin provides appropriate academic accommodations for qualified students with disabilities. Services for Students with Disabilities (SSD) is housed in the Office of the Dean of Students, located on the fourth floor of the Student Services Building. Information on how to register, downloadable forms, including guidelines for documentation, accommodation request letters, and releases of information are available online at

http://deanofstudents.utexas.edu/ssd/index.php. Please do not hesitate to contact SSD at (512) 471-6259, VP: (512) 232-2937 or via e-mail if you have any questions.



**MANAGEMENT 390** 

Advanced Analytic Skills

### SEMESTER TIMETABLE

Week	Date	Topic and Readings (best if read in the order shown)			
WEEKS 1-2: COVARIANCE AND CORRELATION BASICS					
1	1/20	INTRODUCTION; COVARIANCE AND CORRELATION: PROPERTIES OF AND EFFECTS ON			
		<ul> <li><u>B</u>: 1-30.</li> <li>Tabachnick, B. G., &amp; Fidell, L. S. 1996. Cleaning up your act: Screening data prior to analysis. In <u>Using multivariate statistics</u>, 3<sup>rd</sup> edition. NY: Harper-Collins. <i>(quickie reference guide on shapes of data distributions and what transformations they might take to get closer to normal; REQUIRED).</i></li> <li>Ghiselli, E.E., Campbell, J.P., &amp; Zedeck, S. 1981. Concept of correlation. In <u>Measurement theory for the behavioral sciences</u>, 76-99 &amp; 109-126. San Francisco: W.H. Freeman. <i>(a deeper and more formula-based look at what correlations are; for most it will be helpful review; OPTIONAL).</i></li> <li>Weiss, R. J. 2003. The Excel quick fix. <u>The Industrial-Organizational Psychologist</u>, 41: 95-102. <i>(for those of you who need to enter your own data into files [what a quaint concept, eh?] this article gives you some slick-er ways to do so via Excel; OPTIONAL).</i></li> </ul>			
2	1/27	<ul> <li>PEARSON CORRELATIONS: SAMPLING DISTRIBUTION, TESTS, FISHER Z, UNITS OF ANALYSIS &amp; META-ANALYSIS</li> <li><u>B</u>: 43-66.</li> <li>Schmidt, F. L. 1992. What do data really mean?: Research findings, meta-analysis, and cumulative knowledge in psychology. <u>American Psychologist</u>, 47(10): 1173-1181. (from one member of the two-person team that has done the most to popularize meta-analyze in the applied social sciences; still the zealousness gets out of hand sometimes: see article below:</li> </ul>			

Bobko, P., & Stone-Romero, E. F. 1998. Meta-analysis may be another tool, but it is not a panacea. Research in Personnel and Human Resources Management, 16: 359-397 (the title sums it up pretty nicely; the authors don't have as big an axe to grind as Schmidt, but this serves a useful purpose and brings in those other research issues that tend to be obscured in published meta-analyses [yes, it's the same guy as the text author]; OPTIONAL).

Ostroff, C., & Harrison, D. A. 1999. Meta-analysis, level of analysis, and best estimates of population correlations: Cautions for interpreting meta-analytic results in organizational behavior. Journal of Applied Psychology, 84(2): 260-270. (could be tough sledding; it's written by some clown, but you should try to give it a go; it provides a connection of this material to the multilevel literature; OPTIONAL).

REQUIRED).

#### ---- WEEKS 3-4: COVARIATION, CORRELATION, AND CONSTRUCT MEASUREMENT ----

3

2/3

2/10

SCALES OF MEASUREMENT, SPECIAL CORRELATIONS; CLASSICAL MEASUREMENT THEORY

<u>B</u>: 30-39.

Carroll, J.B. 1961. The nature of the data, or how to choose a correlation coefficient. <u>Psychometrika</u>, 26: 347-372. (older than dirt, but is the best source at laying out reasons for, and choices among, different types of correlations; REQUIRED).

4

ASSIGNMENT 1 HANDED OUT; ESTIMATING A MEASURE'S RELIABILITY AND VALIDITY VIA COVARIANCES AND CORRELATIONS

<u>B</u>: 67-86

- Brown, M. E., Treviño, L. K., & Harrison, D. A. 2005. Ethical leadership: A social learning theory perspective for construct development and testing. Organizational Behavior and Human Decision Processes, 97: 117-134. (example of a traditional approach toward construct development and measurement validation; REQUIRED [moreso for the technical aspects than the substantive ones] -- we'll refer to this a fair amount in class).
- Cortina, J. 1993. What is coefficient alpha?: An examination of theory and applications. Journal of Applied Psychology, 78: 98-104. (some strong points and reminders; a good look at what alpha says; REQUIRED).
- Schmidt, F. L., Le, H., & Ilies, R. 2003. Beyond alpha: An empirical examination of the effects of different sources of measurement error on reliability estimates for measures of individual differences constructs. <u>Psychological Methods</u>, 8: 206-224. (Frank and his colleagues weigh in on the uses and abuses of coefficient alpha; he makes some important points here about sources of error and reliability estimation; REQUIRED).
- Wall, T. D., Michie, J., Patterson, M., Wood, S. J., Sheehan, M., Clegg, C. W., & West, M. 2004. On the validity of subjective measures of company performance. <u>Personnel Psychology</u>, 57: 95-118. (Note how this team of researchers use patterns of correlations to support claims about firm-level instruments; what sources of error are they estimating and how? OPTIONAL).
- Field, H.S., Childress, G.B., & Bedeian, A.G. 1996. Locating measures used in I/O psychology: A resource guide. <u>The Industrial-Organizational Psychologist</u>, 14: 103-107. (friendly primer on how to find a measure of something for use on a survey or elsewhere; OPTIONAL).
- Stanton, J.M., Sinar, E.F., Balzer, W.K., & Smith, P.C. 2002. Issues and strategies for reducing the length of self-report scales. <u>Personnel Psychology</u>, 55: 167-194. (lots of folks want to use a "shortened" version of an existing scale; these authors show the effort it takes to make that happen while retaining the good properties of the original scale; OPTIONAL).
- LeBreton, J. M., & Senter, J. L. 2007. Answers to 20 questions about interrater reliability and interrater agreement. <u>Organizational Research Methods</u>, 10: 1-38. (for those of you with group level or "aggregated" level constructs, this is a very nice reference about issues of convergence of individual or lower-level scores, including conditions of multiple raters; especially helpful for those who might use the r(wg) index; OPTIONAL)

#### ------ WEEKS 5-8: CORRELATIONS, CONSTRUCTS AND FACTOR ANALYSIS ------

5

2/17

FACTOR ANALYSIS FUNDAMENTALS: EIGEN-MANIA! EXPLORATORY FACTOR ANALYSIS (EFA) AND PRINCIPAL COMPONENTS ANALYSIS (PCA);

- MacCallum, R. M. 1998. Commentary on quantitative methods in I-O research. <u>The Industrial-Organizational Psychologist</u>, 19-30. (note especially his comments about factor analysis; comments about structural equation modeling will make sense in a few weeks; REQUIRED).
- Edwards, J. R. 2001. Multidimensional constructs in organizational behavior research: An integrative analytical framework. <u>Organizational Research</u> <u>Methods</u>, 4(2): 144-192. (*this is as tough as readings get all semester; I only want you to read pages 144-153 for now; REQUIRED*).
- Tucker, L. R., & MacCallum, R. C. 1992. <u>Exploratory factor analysis</u>. Unpublished manuscript, University of Illinois. *(from one of the great figures in the history of factory analysis; was never published, but explains the rudiments of EFA nicely; REQUIRED).*
- Mulaik, S. A. 1990. Blurring the distinctions between component analysis and common factor analysis. <u>Multivariate Behavioral Research</u>, 25: 53-59. (rejoinder of sorts to Velicer & Jackson, from one of the grand poobahs of factor analysis and structural equation modeling; OPTIONAL).
- Hinkin, T. R. 1998. A brief tutorial on the development of measures for use as in survey questionnaires. <u>Organizational Research Methods</u>, 1: 104-121. (again, I don't necessarily agree with everything said here, but this is a simple and succinct introduction to the construct development process, and it shows how exploratory factor analysis has a place; OPTIONAL).
- FOUR BASIC EFA PROBLEMS: 1. COMMUNALITIES, 2. EXTRACTION, 3. NUMBER OF FACTORS (RETENTION)
  - Conway, J. M., & Huffcutt, A. I. 2003. A review and evaluation of exploratory factor analysis practices in organizational research. Organizational Research Methods, 6, Iss. 2; p. 147-168. (what to do and what not to do, updates a 1986 piece that is often cited; REQUIRED).
  - Loehlin, J.C. 1992. Exploratory factory analysis: I. Extracting the factors. In Latent variable models, 134-161. Hillsdale, NJ: Earlbaum. (not easy, but important synthesis of lots of EFA terminology, graphics, and topics; REQUIRED).
  - Hayton, J. C., Allen, D. G., & Scarpello, V. 2004. Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. <u>Organizational</u> <u>Research Methods</u>, 7: 191-205. *(a helpful little piece on how to get the best method for retaining factors to work; REQUIRED).*
  - Costello, A. B., & Osborne, J. W. 2005. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. <u>Practical Assessment, Research, & Evaluation</u>, 10: 1-9. (*gentle introduction and explanation of the major choices in EFA; OPTIONAL*).
  - Velicer, W.F., & Fava, J.L. 1998. Effects of variable and subject sampling on factor pattern recovery. <u>Psychological Methods</u>, 3(2): 231-251. (*simulation showing that more subjects and more items, but <u>not</u> more subjects per item [n/p] are important for getting decent factor analytic results; some helpful guidelines; OPTIONAL).*

6

2/24

- Lautenschlager, G.J., Lance, C.E., & Flaherty, V.L. 1989. Parallel analysis criteria: Revised equations for estimating the latent roots of random data correlation matrices. <u>Educational and Psychological Measurement</u>, 49: 339-345. (equation and table on pp. 342-343 let you construct your own scree plot for random data with generating the data yourself; OPTIONAL).
- FOUR BASIC EFA PROBLEMS: 4. ROTATION; INTRO TO CONFIRMATORY FACTOR ANALYSIS (CFA)
  - Preacher, K. J., & MacCallum, R. C. (2003). Repairing Tom Swift's electric factor analysis machine. <u>Understanding Statistics</u>, 2: 13-32. *(a milder and more fun version of the issues covered in the article below; REQUIRED).*
  - Fabrigar, L. R., Wegener, D. T., MacCallum, R. C. & Strahan, E. J. 1999. Evaluating the use of exploratory factor analysis in psychological research. <u>Psychological Methods</u>, <u>4(3)</u>, 272-299. (terrific article, one I cited about once a month in my editorial work; re-iterates a few things about EFA and provides a bridge to CFA for next week; REQUIRED).
  - Loehlin, J.C. 1992. Exploratory factory analysis: II. Transforming the factors to simpler structure. In <u>Latent variable models</u>, 134-161. Hillsdale, NJ: Earlbaum. (even tougher than earlier Loehlin, but most thorough treatment of all possible factor rotations; REQUIRED).
  - Schriber, J. B. 1987. Some time dimensions of work: Measurement of an underlying aspect of organization culture. Journal of Applied Psychology, 72: 642-650. (an example of an entirely different set of EFA choices; check their EFA/PCA rationale against the other papers you're reading; OPTIONAL).
  - McArdle, J.J. 1996. Current directions in structural factor analysis. <u>Current</u> <u>Directions in Psychological Science</u>, 4: 11-18. *(overview of confirmatory factor analysis for the uninitiated; unfortunately, he refers to CFA as SFA; OPTIONAL).*
- <u>3/10</u> <u>Assignment 2 Handed Out;</u> CFA Estimation: Multivariate Distributions, Fit statistics, & Other Issues

Worksheet for Greek alphabet (yep, it's gonna get hairy).

- Bernstein, I.H., & Teng, G. 1989. Factoring items and factoring scales are different: Spurious evidence for multidimensionality due to item categorization. <u>Psychological Bulletin</u>, 105: 467-477. (can an analytic technique be too powerful? Watch CFA spin out of control; although somewhat old, the same would happen now under typical estimation conditions; REQUIRED).
- Curran, P. J., West, S. G., & Finch, J. F. 1996. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. <u>Psychological Methods</u>, 1: 16-29 (*another cautionary tale, just like the title says*).

#### ------ WEEKS 9-12: CORRELATION AND REGRESSION ------

- 3/24 CFA ADVANCED TOPICS; MULTIPLE REGRESSION ABC'S: ASSUMPTIONS, BASICS, COEFFICIENTS
  - <u>B</u>: 118-157, 177-206

7

8

9

3/3

- Harrison, D. A. 1995. Volunteer motivation and attendance decisions: Competitive theory testing in multiple samples from a homeless shelter. Journal of <u>Applied Psychology</u>, 80: 371-385. (reasonable example of linear and logistic regression use [see next week] and good fodder for discussion and criticism; find the mistakes; REQUIRED).
- Huselid, M.A., Jackson, S.E., & Schuler, R.S. 1997. Technical and strategic human resource management effectiveness as determinants of firm performance. <u>Academy of Management Journal</u>, 40(1): 171-188. (ditto the above, but without the shameless self-promotion; REQUIRED).
- Hayduk, L. A. 1987. Traditional basics. In <u>Structural equation modeling with</u> <u>LISREL: Essentials and advances</u>, 32-55. Baltimore: Johns-Hopkins University Press. (another nice summary of regression assumptions and interpretations; briefly touches on issues we'll be covering for a few weeks, OPTIONAL).
- 10

3/31

- MULTIPLE REGRESSION PROBLEMS; SHRINKAGE & FIT; COMMON METHODS VAR.; MODELS FOR LIMITED RANGE DEPENDENT VARIABLES: LOGISTIC REGRESSION
  - <u>B</u>: 239-267
  - Darlington, R. 1990. Major and minor problems: An overview. In <u>Regression and</u> <u>linear models</u>, 191-207. New York: McGraw-Hill. (cogent summary of regression troubles likely to be encountered in real data; REQUIRED).
  - Podsakoff, P. M., MacKenzie, S. B., Lee, J-Y, & Podsakoff, N. 2003. Common methods biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88: 897-903. (not so much about regression, but is a monster effort to get on top of a problem that many think will bias correlation [and mistakenly, regression parameter] estimates upward; note the connections to SEM as well; REQUIRED and an excellent reference paper).
  - Ostroff, C., Kinicki, A. J., & Clark, M. A. 2002. Substantive and operational issues of response bias across levels of analysis: An example of climatesatisfaction relationship. (*all is not lost when it comes to common method variance, especially if you have data (a) from multiple or unit group members, and/or (b) over time.* OPTIONAL, but nifty and helpful nonetheless).
  - Harrison, D. A. 2001. Structure and timing in limited range dependent variables: Regression models for predicting if and when. In F. Drasgow & N. Schmitt (Eds.), <u>Measuring and analyzing behavior in organizations</u>, 446-497. San Francisco: Jossey-Bass. (connects and then disconnects linear and logistic regression; read only 446-472; REQUIRED).
  - MULTIPLE REGRESSION: INDIRECT EFFECTS, MEDIATION, AND MORE TESTS
    - James, L. R., & Brett, J. M. 1984. Mediators, moderators, and tests for mediation. Journal of Applied Psychology, 69: 307-321. (fundamental, cited everywhere; REQUIRED).
    - Baron, R. M., & Kenny, D. A. 1986. The moderator-mediator distinction in social psychology: Conceptual, strategic, and statistical considerations. Journal of <u>Personality and Social Psychology</u>, 51: 1173-1182. (a citation classic, cited more than 11000 times!; note how and where their approach is different, and how poorly they use path diagrams; REQUIRED).
    - Kenny, D. A. 2007. <u>Mediation</u>. from http:/davidakenny.net/cm/mediate. (kinda nice overview from the web; Kenny backs off one of the requirements from B&K, 1986).

4/7

- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. 2002. A comparison of methods to test mediation and other intervening variable effects. <u>Psychological Methods</u>, 7: 83-104. (most technical reading of entire semester, yet is the most authoritative on what constitutes effective mediation tests; note how Baron & Kenny lose, big time, and why; REQUIRED).
- Mathieu, J.E., & Taylor, S.R. 2006. Clarifying conditions and decision points for mediational type inferences in organizational behavior. <u>Journal of</u> <u>Organizational Behavior</u>, 27: 1031-1056. (some reasonably cogent recommendations for tests and language to distinguish indirect effects, partial mediation, and full mediation; REQUIRED).
- Florey, A. F., & Harrison, D. A. 2000. Responses to informal accommodation requests from employees with disabilities: Multi-study evidence on willingness to comply. <u>Academy of Management Journal</u>, 43: 224-233. (easy-to-follow example, wink-wink, nudge-nudge; also uses a version of the theory serving as the basis for the running example; OPTIONAL).
- Muller, D., Judd, C. M., & Yzerbyt, V. Y. 2005. When moderation is mediated and mediation is moderated. <u>Journal of Personality and Social Psychology</u>, 89: 852-863. (just when you thought you had mediation and moderation down, separately, now comes the joint occurrence of these -- ay carrumbal; OPTIONAL, despite their distaste for non-experimental designs, it is important as a good reference).
- 4/14 MULTIPLE REGRESSION POLYNOMIALS, POWERS; MODERATORS AND TESTS FOR HIGHER-ORDER EFFECTS
  - <u>B</u>: 207-238

12

- Darlington, R. 1990. Designs with interaction effects. In <u>Regression and linear</u> <u>models</u>, 311-343. New York: McGraw-Hill. *(in-depth look at how one works with double and triple interactions; REQUIRED).*
- Ganzach, Y. 1997. Misleading interaction and curvilinear terms. <u>Psychological</u> <u>Methods</u>, 2(3), 235-247. (carefully describes the tricky distinctions between quadratic and multiplicative terms in regression; REQUIRED).
- Aguinis, H. 1995. Statistical power problems with moderated multiple regression in management research. Journal of Management, 21: 1141-1158. (handily pulls together how and why it's so hard to detect moderators; REQUIRED).
- McClelland, G.H. & Judd, C.M. 1993. Statistical difficulties of detecting interactions and moderator effects. <u>Psychological Bulletin</u>, 114: 376-390. (some surprising and influential findings; REQUIRED).
- Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. 2002. Time, teams, and task performance: Changing effects of diversity on group functioning. <u>Academy of Management Journal</u>, 45: 1029-1045. (a simple example of moderation tests; more shameless self-promotion, anyone?; I could make this required, but ... OPTIONAL).

#### ------ WEEKS 13-15: COVARIANCE AND REGRESSION WITH LATENT VARIABLES ------

- 13 4/21 PRESENTATIONS; (BUFFER WEEK; MAYBE LEVELS OF ANALYSIS ISSUES[?])
- 14 4/28 BASICS OF STRUCTURAL EQUATION MODELS (SEM); PATH ANALYSIS

- Harris, M. M. & Schaubrock, J. 1990. Confirmatory modeling in organization behavior/human resource management: Issues and applications. <u>Journal of</u> <u>Management</u>, 16: 337-360. (worthwhile overview of foundational issues and misinterpretations; REQUIRED).
- Iacobucci, D. 2009. Everything you always wanted to know about SEM (structural equations modeling) but were afraid to ask. <u>Journal of Consumer</u> <u>Psychology</u>, 19: 673-680. (fairly gentle overview with LISREL output, but still a lot of Greek letters and matrices, REQUIRED)
- Shaffer, M.A., & Harrison, D.A. 1998. Expatriates' psychological withdrawal from international assignments: Work, nonwork, and family influences. <u>Personnel Psychology</u>, 51: 87-118. (decent write-up of path analysis -really, single-indicator SEM -- techniques, as well as some rationale for doing some things and not others in this framework; OPTIONAL).

5/5

15

- INTERMEDIATE AND ADVANCED SEM: MEASUREMENT & STRUCTURAL MODEL TOGETHER
  - Anderson, J.C. & Gerbing, D.W. 1988. Structural equation modeling in practice: A review and recommended two-step approach. <u>Psychological Bulletin</u>, 103: 411-423. (one of the most often-cited pieces in SEM history; REQUIRED).
  - McDonald, R. P., & Ho, M-H. R. 2002. Principles and practice in reporting structural equation analyses. <u>Psychological Methods</u>, 7: 64-82. (excellent reference piece, with good advice for what to put in a journal article; REQUIRED).
  - lacobucci, D. 2010. Structural equations modeling: Fit indices, sample size, and advanced topics. Journal of Consumer Psychology, 20: 90-98. (more hand-holding and a lovely follow-up to last week's piece, REQUIRED).
  - Boyd, B. K., Gove, S., & Hitt, M. A. 2004. Consequences of measurement problems in strategic management research: The case of Amihud and Lev. <u>Strategic Management Journal</u>, 26: 367-375. (even strategy folks care about this stuff, and if they don't care, they get hammered by friendly critics like Mike Hitt; OPTIONAL).
  - Shaffer, M. A., Harrison, D. A., & Gilley, M. K. 1999. Dimensions, determinants, and differences in expatriate adjustment. <u>Journal of International Business</u> <u>Studies</u>, 30: 557-581. (reasonably understandable application -- I hope -- of several of the techniques we will have talked about in class; OPTIONAL)
  - Medsker, G.J., Williams, L.J., & Holahan, P.J. 1994. A review of current practices for evaluating causal models in organizational behavior and human resources management research. <u>Journal of Management</u>, 20: 439-464. (some good pointers from a leader in applying SEM models, Larry Williams; OPTIONAL).
  - Cordano, M., & Frieze, I. H. 2000. Pollution reduction preferences of U.S. environmental managers: Applying Ajzen's theory of planned behavior. <u>Academy of Management Journal</u>, 43: 627-641. (*SEM application that uses the TPB, same as we're using in class; OPTIONAL*).
  - Williams, L. J., Edwards, J. R., & Vandenberg, R. J. 2003. Recent advances in causal modeling methods for organizational and management research. <u>Journal of Management</u>, 29: 903-936. (mainly what's on the bleeding edge, but also some of the things reviewers might ask you to do in the near future, so good to have around; OPTIONAL).

16

5/12 FINAL PAPERS DUE: 9:00 A.M. \*\*\*\*IN DAVE'S MAILBOX\*\*\*\*