

Marketing
Course Number: 26:630:670
Course Title: Multivariate Analysis

COURSE DESCRIPTION

This course introduces the application of multivariate analysis in business research. It is designed for doctoral students who intend to conduct empirical research in high quality academic journals. The objective of the course is to help students gain competence in initiating and conducting empirical studies in operations/supply chain, management/OB, marketing, and others. We will draw on applied research that has disciplinary foundations including business, economics, psychology, and sociology. The course is designed so that, in their own areas, students will learn how to proceed from having a basic research question to a testable research design and methodology.

Topics covered include theory and hypothesis development, research design, moderation/mediation, construct development, cluster analysis, factor analysis including EFA and CFA, structural equation models, panel data analysis, and other research methods such as difference-in-difference models. The class will conclude with an introduction of different research data sets and research workshop/presentations. Students are expected to read assigned book chapters and research articles prior to each session. A checklist will be provided to help students gauge their learning process throughout the semester. Each session will start with an overview of related topics following by student-led discussion. Each student will be assigned with certain sessions as discussion leader.

A main deliverable from the class is research projects solely developed by students participating in the class. Students are expected to apply multivariate methods to develop a research project throughout the semester. The research topic should be identified and consulted with the instructor around Spring Recess week. A list of available research datasets will be released at the beginning of the semester. Prior to research workshop on week 12, students should have completed the intro & theory sections with a detailed methodological plan for undertaking the proposed study. This plan will incorporate multivariate analysis elements. During the research workshop and presentations weeks (12-14), students are expected to implement multivariate analysis and report their analysis results. Presentations will be critiqued by fellow students and instructor.

COURSE MATERIALS

Required Textbooks:

Method of Multivariate Analysis, 3rd edition by Alvin C. Rencher and William F. Christensen (*RC* in abbreviation). Available for download from Rutgers Library

Introduction to Structural Equation Modeling using IBM SPSS Statistics and AMOS, 2nd edition by Niels J. Blunch. Available for download from Rutgers Library

Suggested Software:

In class examples will utilize SPSS/AMOS and STATA. Students are suggested to bring laptops with SPSS/AMOS and STATA for in-class practices. It is possible that students can also use R for part of the exercises as well.

SPSS/AMOS virtual access (no purchase): <https://software.rutgers.edu/product/3627> - select NB

STATA virtual access (no purchase): <https://software.rutgers.edu/product/3660> - select NB

SPSS/STATA purchase & download: <https://software.rutgers.edu/>

SPSS Intro: <https://libguides.rutgers.edu/c.php?g=336179&p=2271780>

STATA Intro: <https://libguides.rutgers.edu/c.php?g=336179&p=2271781>

COURSE REQUIREMENTS

1. Class usually consists of discussion of readings and reporting of any assignments. Students are expected to complete all relevant reading and assignments prior to class and to actively participate in class discussions.
2. Each student will be responsible of eight article summaries, each of them only one page in length, for which they will have to provide a copy for all class participants. Each student will present the articles that they summarized.
3. The final exam will include key methodological concepts in multivariate analysis. Students will need to answer a list of short-answer questions and perform certain analysis with given data sets.
4. The term paper is an original proposal or paper. Proposals written for other classes may be turned into papers for this class. A complete proposal should consist of sections that include introduction, literature review and hypotheses, and methods, and should be modeled after empirical papers published in top journals in the student's chosen field. Specifically, the proposal should describe the research question, justify its relevance and significance, review theory and research, and describe the proposed sample, measurement and procedure for data collection. **The proposal should be constructed as if it were the first 2/3 of a top journal article.**

ACADEMIC INTEGRITY

I do NOT tolerate cheating. Students are responsible for understanding the RU Academic Integrity Policy <http://academicintegrity.rutgers.edu/>

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I will screen all written assignments

through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

GRADING POLICY

GRADING

Participation to Class Discussions	10%
Leading Class Discussions	25%
Presentations	15%
Final Exam	20%
Research Paper	30%

COURSE SCHEDULE

Wk1 (): Introduction – paradigms, theories

RC text Chapters 2,3 Problems 2.8, 2.11, 2.15, 2.20; 3.15; 3.16;

Schmenner, R. W., Swink, M. L. 1998. On theory in operations management. *Journal of Operations Management*, 17, 97-113.

Hunt, S. D.1983. General theories and the fundamental explananda of marketing. *Journal of Marketing*, 47(4), 9-17.

Flynn, B., et al. 1990. Empirical research methods in operations management. *Journal of Operations Management*, 9(2), 250-284.

Scudder, G. D., Hill, C. A. 1998. A review and classification of empirical research in operations management. *Journal of Operations Management*, 16, 91-101.

Sodhi, M. S., Tang, C. S. 2014. Guiding the next generation of doctoral students in operations management. *International Journal of Production Economics*, 150, 28-36.

Wk2 (): Theory development, causality, correlation, mediation and moderation

RC text Chapter 4 Problems 4.16, 4.21, 4.23

Wacker, J. G. 1998. A definition of theory: research guidelines for different theory-building research methods in operations management. *Journal of Operations Management*, 16, 361-385.

Wiengarten, F. et al., 2014. Do a country's logistical capabilities moderate the external integration performance relationship? *Journal of Operations Management*, 32, 51-63.

Rungtusanatham, M., Miller, J. W., and Boyer, K. K. 2014. Theorizing, testing, and concluding for mediation in SCM research: Tutorial and procedural recommendations. *Journal of Operations Management*, 32, 99-113.

Pieters, R. 2017. Meaningful mediation analysis: Plausible causal inference and informative communication. *Journal of Consumer Research*, 44, 692-716.

Wk3 (): Research design, data, sampling, and endogeneity

RC text Chapter 6 Problems 6.27

Aguinis, H., & Vandenberg, R. J. 2014. An ounce of prevention is worth a pound of cure: Improving research quality before data collection. *Annual Review of Organizational Psychology and Organizational Behavior*, 1: 569-595. Accompanying review video can be found here:

https://www.youtube.com/watch?time_continue=694&v=y1tNSEXh9Gk

Scandura, T. A., Williams, E. A. 2000. Research methodology in management - Current practices, trends, and implications. *Academy of Management Journal*, 43(6), 1248-1264.

Lu, G., Ding, X., Peng, X. et al. 2018. Addressing endogeneity in operations management research: Recent developments, common problems, and directions for future research. *Journal of Operations Management*, In press.

- Available research data sets released
- Research topics solicited

Wk4 (): Constructs, formative vs. reflective measures, dimensionality, reliability & validity

Wacker, J. G. 2014. A theory of formal conceptual definitions: Developing theory-building measurement instruments, *Journal of Operations Management*, 22, 629-650.

Chen, I., Paulraj, A. 2004. Towards a theory of supply chain management: The constructs and measurements, *Journal of Operations Management*, 22(2), 119-150.

Cronbach, L. J., Meehl, P. E. 1955. Construct validity in psychological tests, *Psychological Bulletin*, 52(4), 281-302.

MacKenzie, S. B., Podsakoff, P. M., Podsakoff, P. N. 2011. Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques, *MIS Quarterly*, 35(3), 293-334.

Javis, C. B., Mackenzie, S. B., Podsakoff, P. N. 2003. A critical review of construct indicators and measurement model misspecification in marketing and consumer research, *Journal of Consumer Research*, 30, 199-217.

Wk5 (): Multinomial logit choice model

Agrawal, D., Schorling, C. 1996. Market share forecasting- An empirical comparison of artificial neural networks and multinomial logit model, *Journal of Retailing*, 72(4), 383-407.

Gensch, D. H., Recker, W. W. 1979. The multinomial, multiattribute logit choice model, *Journal of Marketing Research*, 16(1), 124-132.

Verma, R., Pullman, M. E. 1998. An analysis of the supplier selection process, *Omega*, 26(6), 739-750.
<https://statistics.laerd.com/spss-tutorials/multinomial-logistic-regression-using-spss-statistics.php>
<https://stats.idre.ucla.edu/spss/dae/multinomial-logistic-regression/>

Case practice w/ SPSS

Wk6 (): Factor analysis: EFA, principal component analysis

RC text Chapters 12, 13

Stewart, D. W. 1981. The application and misapplication of factor analysis in marketing research. *Journal of Marketing Research*, 18(1), 51-62.

Ford, J. K., MacCallum, R. C., Tait, M. 1986. The application of EFA in applied psychology: A critical review and analysis. *Personnel Psychology*, 39, 291-314.

Choi, T., Hartley, J. L. 1996. An exploration of supplier selection practices across the supply chain. *Journal of Operations Management*, 14, 333-343.

<http://www2.sas.com/proceedings/sugi30/203-30.pdf> <https://stats.idre.ucla.edu/spss/seminars/efa-spss/>

Case practice w/ Stata

Guest Speaker: ()

Wk7 (): Factor analysis: CFA & Structural equation modeling

RC text Chapters 14

Conway, J. M., Huffcutt, A. I. A review and evaluation of EFA and CFA practices in organizational research. *Organizational Research Methods*, 6(2), 147-168.

Segars, A. H., Grover, V. 1993. Re-examining perceived ease of use and usefulness- A confirmatory factor analysis. *MIS Quarterly*, 17(4), 517-525.

Hult, T. M., Ketchen, D. J., Slater, S. F. 2004. Information processing, knowledge development, and strategic supply chain performance. *Academy of Management*, 47(2), 241-253.

Shook, C. L. et al. 2004. An assessment of the use of SEM in strategic management research. *Strategic Management Journal*, 25(4), 397-404.

Shah, R., Goldstein, S. M. 2006. Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management*, 24, 148-69.

Ding, X. et al. (2010), The impact of service system design and flow experience on customer satisfaction in online financial services, *Journal of Service Research*, 13(1), 96-110.

https://stat.utexas.edu/images/SSC/Site/AMOS_Tutorial.pdf

- Case practice w/ SPSS & AMOS <http://www2.sas.com/proceedings/sugi31/200-31.pdf>

<https://stats.idre.ucla.edu/spss/seminars/introduction-to-factor-analysis/a-practical-introduction-to-factor-analysis-confirmatory-factor-analysis/>

- Case practice w/ SPSS & AMOS
- Research topics presented / initial research ideas

Wk8 : Panel data

Ding, X. (2015), The impact of service design and process management on clinical quality: An exploration of synergistic effects, *Journal of Operations Management*, 36(2), 103-114.

Ding, X. (2014), The effect of experience, ownership and focus on productive efficiency: A longitudinal study of U.S. hospitals, *Journal of Operations Management*, 32(1), 1-14.

Senot, C., Chandrasekaran, A., and Ward, P. T. (2016), Role of bottom-up decision processes in improving the quality of health care delivery: A contingency perspective, *Production and Operations Management*, 25(3), 458-476.

Lu, S. F., and Lu, L. X. (2016). Do mandatory overtime laws improve quality? Staffing decisions and operational flexibility of nursing homes, *Management Science*, 63(11), 3566–3585.

Finkelstein, A. (2007). The aggregate effects of health insurance: Evidence from the introduction of Medicare. *The Quarterly Journal of Economics*, 122(1), 1-37.

https://liberalarts.utexas.edu/prc/files/cs/Spring2013_Sasson_Fixed%20and%20Random%20Effects.pdf

<https://www.stata.com/manuals13/xtxtreg.pdf> <https://www.princeton.edu/~otorres/Panel101.pdf>

Video 1: <https://www.youtube.com/watch?v=aUVZWnVnjxs>

Video 2: <https://www.youtube.com/watch?v=TBV9QFMJqoE>

- Case practice w/ STATA

Guest Speaker: ()

Wks9, 10 (), (): Research data sets & other empirical research methods

- a. Data from Health agencies
 - CMS – cost report, HIMSS – health IT application, AHA – hospital annual survey, State Health Agencies – detailed report on financial and operational performance, AHRQ – patient outcomes
- b. Data from WRDS – Wharton Research Data Services
 - Compustat – Capital IQ from S&P, earning statements (inventory cost/value, etc.)
- c. Data from Bureau of Transportation Statistics (BTS.gov) - <https://www.bts.gov/rita>
 - Freight statistics, reports, and resources
- d. Institute for Supply Management <http://www.ism.ws/ISMReport/?navItemNumber=4892>
 - Monthly *ISM Report on Business* which gathers data on new orders and backlogs, production, employment, deliveries, and inventories
- e. Collection of potential research data from manufacturing sector
 - <https://libguides.rutgers.edu/c.php?g=336557&p=2266136>

Wk11-14 () – (): Research workshop and presentations

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at ods.rutgers.edu.

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email dsoffice@echo.rutgers.edu]

[Rutgers University-Newark ODS phone (973)353-5375 or email ods@newark.rutgers.edu]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email jackie.moran@rutgers.edu]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email TitleIX@newark.rutgers.edu]

If you seek *religious accommodations*, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email deanofstudents@echo.rutgers.edu]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email DeanofStudents@newark.rutgers.edu]

If you have experienced any form of *gender or sex-based discrimination or harassment*, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at <http://vpva.rutgers.edu/>.

[Rutgers University-New Brunswick incident report link: <http://studentconduct.rutgers.edu/concern/>. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link:

https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7 . You may also contact the Office of Title IX and ADA Compliance at (973)353-1906 or email at TitleIX@newark.rutgers.edu. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email run.vpva@rutgers.edu]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via <https://temporaryconditions.rutgers.edu> .

If you are a military **veteran** or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. <http://veterans.rutgers.edu/>

If you are in need of **mental health** services, please use our readily available services.

[Rutgers University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>]

[Rutgers Counseling and Psychological Services–New Brunswick: <http://rhscaps.rutgers.edu/>]

If you are in need of **physical health** services, please use our readily available services.

[Rutgers Health Services – Newark: <http://health.newark.rutgers.edu/>]

[Rutgers Health Services – New Brunswick: <http://health.rutgers.edu/>]

If you are in need of **legal** services, please use our readily available services: <http://rusls.rutgers.edu/>

Students experiencing difficulty in courses due to **English as a second language (ESL)** should contact the Program in American Language Studies for supports.

[Rutgers–Newark: PALS@newark.rutgers.edu]

[Rutgers–New Brunswick: eslpals@english.rutgers.edu]

If you are in need of additional **academic assistance**, please use our readily available services.

[Rutgers University-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>

[Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>]

[Rutgers University-New Brunswick Learning Center: <https://rlc.rutgers.edu/>]

[Optional items that many faculty include:

- Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

- Students must sign, date, and return a statement declaring that they understand this syllabus.]