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In-Class Exercise: Conducting Survey Analyses in JMP®

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**NAVAL
POSTGRADUATE
SCHOOL**

IN-CLASS EXERCISE:
CONDUCTING SURVEY ANALYSES
IN JMP®

Survey Research Methods Short Course
Marine Corps Operational Test and Evaluation Activity
Quantico, Virginia

May 8-14, 2008

In-class Exercise:
Conducting Survey Analyses in JMP

Goal: To develop students' ability to conduct survey analyses using JMP® software.

Lab type: Instructor demonstrates software followed by hands-on exercises for students.

Time allotted: 90 minutes.

Data: SurveyData.jmp (see appendix for survey instrument).

DEMONSTRATION

1. One-way goodness-of-fit (Analyze > Distribution)
   (a) One nominal variable
   (b) triangle > Test Probabilities
   (c) Fill in probabilities to test
2. Contingency tables (Analyze > Fit Y by X)
   (a) Two nominal variables
   (b) Mosaic plot
   (c) Tables
       i)   Turn on/off row, column, total percentages
       ii) Show expected counts and/or cell chi-squared values
   (d) Pearson and likelihood ratio tests of independence
3. Simple linear regression (Analyze > Fit Y by X)
   (a) Continuous *Y* and *X*
   (b) triangle > Fit line
       i)   Note other options: Fit mean, Fit polynomial
   (c) Output to data table
       i)   Residuals (triangle next to Linear Fit > Save Residuals)
       ii) Predicted values (triangle next to Linear Fit > Save Predicteds)
   (d) Residual plot: triangle next to Linear Fit > Plot Residuals
   (e) Delete fitted line: triangle next to Linear Fit > Remove Fit
4. Multiple regression (Analyze > Fit Model)
   (a) Continuous *Y* and one or more continuous or discrete *X*s

(b) Enter *X*s using "Add" button

    i)   Can delete using "Remove" button

    ii) Iterative model fitting easy using same Fit Model dialog box

(c) Change "Emphasis" to Minimal report to hide extra output

(d) Note that all observations with one or more missing values in the *Y* or any of the *X*s are ignored

(e) Tabular output:

    i)   Summary of Fit table

    ii) Parameter Estimates table

    iii) Effects Tests table

    iv) Residual plot

(f) Output to data table

    i)   Residuals (triangle > Save Columns > Residuals)

    ii) Predicted values (triangle > Save Columns > Predicted Values)

5. Logistic regression (Analyze > Fit Model)

(a) Same as multiple regression except *Y* must be a nominal variable with only two levels

(b) Tabular output:

    i)   Whole Model Test table

    ii) Parameter Estimates table

(c) Estimated probabilities

    i)   triangle > Save Probability Formula

EXERCISES

1. Goodness-of-fit

   (a) Test whether it is reasonable to assume the probabilities of the responses to question 7 are homogeneous.

      i) Remember to change the variable type to nominal.

      ii) What do you conclude: reject the null hypothesis and conclude that they are not homogeneous, or fail to reject the null and conclude they are homogeneous?

      iii) What does that mean in terms of the survey question?

   (b) Test whether it is reasonable to assume the answers to question 1 came from the following distribution. What do you conclude?

$$Pr(Q1=1) = 0.01$$
$$Pr(Q1=2) = 0.09$$
$$Pr(Q1=3) = 0.15$$
$$Pr(Q1=4) = 0.60$$
$$Pr(Q1=5) = 0.15$$

2. Contingency table

   (a) Create a contingency table of respondent's gender (*Sex*) vs. school (*CurricNumber*).

   (b) Which school has the largest fraction of female students? Did you determine that from the mosaic plot, or the contingency table, or both?

   (c) Reduce the contingency table down to just a table of counts. That is, remove the total percent, row percent, and column percents from the table.

   (d) Based on the hypothesis test results at the bottom of the output, is gender independent of school? That is, can you assume that the distribution of men and women are the same in the schools?

   (e) Do you need to be concerned about the warning at the bottom of the output?

3. Simple linear regression

   (a) After fielding the survey, based on some written comments, it was hypothesized that the respondents didn't distinguish well between questions 2 and 3. Examine this question as follows:

    i)   Create two new variables *Sum2 and Sum3* which are the sums of the answers to questions 2a through 2i and 3a through 3i respectively.

    ii) Regress *Sum3* on *Sum2*. What is the:

        (1) R-square value? _____

        (2) What is the slope for *Sum2*? _____

    iii) Save the residuals from the model in a new column in the data table.

        (1) Create a histogram of the residuals.

        (2) Highlight all the residuals that are between -10 and +10 and exclude the rows corresponding to those residuals.

    iv) Are there any obvious differences in the demographics of those with large residuals and the distribution of demographics for all the respondents?

    v) What do you conclude from this analysis?

4. Multiple regression

  (a) Regress *Sum2* on school (*CurricNumber*), gender (*Sex*), and *Military Branch.*

    i)   Are any of the variables significant? If so, which one(s)?

    ii) Drop the insignificant variables and re-run the model.

    iii) Which Service is most satisfied overall with NPS in-processing? Which "Service" is least satisfied?

    iv) Why doesn't USN show up in the Parameter Effects table?

APPENDIX: SURVEY INSTRUMENT

NPS Student Survey

Introduction

You have been selected to participate in a survey of new Naval Postgraduate School (NPS) students. The purpose of this survey is to assess various aspects of academic life at NPS, including your quality of life, the physical environment and support services, and policies and requirements set forth by NPS. The results of the survey will be used by the NPS Dean of Students, the Director of Institutional Research, and other members of the NPS administration to improve NPS. This is your opportunity to provide NPS with frank feedback on what works well and what does not.

No tangible compensation will be given for participation in the survey. If you agree to participate, you are free to withdraw at any time without prejudice. Upon completion of the research, a copy of the final report will be available from Dr. Fran Horvath, Director of Institutional Research. Your participation in this survey is voluntary, although your input is extremely valuable for the improvement of NPS.

Please note that all survey records and data will be kept strictly confidential. Your participation in the survey and your responses to the survey will not be disclosed outside of the research team. Survey results will only be reported in the aggregate so that individual responses cannot be determined. Upon completion of the survey, all records identifying your participation in the survey will be destroyed.

If you have any questions or comments regarding this survey, please contact Professor Ron Fricker, 831-656-3048 (rdfricker@nps.edu) or LT Brent Olde (NPS IRB chair), 831-656-3807 (baolde@nps.edu).

Quality of Life

We begin with some questions about your experience in-processing (i.e., enrolling) at NPS. Please consider how these services provided by NPS contribute to both your learning experience and your activites outside of academics.

1. In general, how do you rate your satisfaction or dissatisfaction with the IN-PROCESSING procedures at NPS?

- ○ Very Satisfied
- ○ Satisfied
- ○ Neutral
- ○ Dissatisfied
- ○ Very Dissatisfied

NPS Student Survey

2. How do you rate the IN-PROCESSING provided by each of the following support services (briefings, orientation, materials, service, etc.):

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	N/A*
Registrar	○	○	○	○	○	○
Program Office	○	○	○	○	○	○
Student Services	○	○	○	○	○	○
Sponsor Program	○	○	○	○	○	○
Information Technology (ITACS)	○	○	○	○	○	○
Chaplain Services	○	○	○	○	○	○
Medical Services	○	○	○	○	○	○
Morale, Welfare and Recreation (MWR)	○	○	○	○	○	○
Military Housing	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Quality of Life

In the previous question we asked you about the in-processing support you received. Now we would like to know about the service you have received AFTER in-processing.

3. Following in-processing, how do you rate the SERVICE provided by the following organizations at NPS:

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	N/A*
Registrar	○	○	○	○	○	○
Program Office	○	○	○	○	○	○
Student Services	○	○	○	○	○	○
Sponsor Program	○	○	○	○	○	○
Information Technology (ITACS)	○	○	○	○	○	○
Chaplain Services	○	○	○	○	○	○
Medical Services	○	○	○	○	○	○
Morale, Welfare and Recreation (MWR)	○	○	○	○	○	○
Military Housing	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

NPS Student Survey

Quality of Life - Work Load

4. To what level do you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
I am able to pursue interests outside of my studies.	○	○	○	○	○	○
I have sufficient time to spend with my family and/or friends.	○	○	○	○	○	○
My academic workload is high.	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Physical Resources

In this section we would like your opinions on physical resources that support your academic studies. We will ask you about the NPS library, laboratories, classrooms, and other facilities.

5. Please rate your satisfaction or dissatisfaction with the campus workspace(s) available to you (e.g., cubicle, office, library study room, etc.)

○ Very Satisfied
○ Satisfied
○ Neutral
○ Dissatisfied
○ Very Dissatisfied
○ N/A*

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" if this item is not applicable or you do not know.

Physical Resources - Library

NPS Student Survey

6. Please rate your level of satisfaction or dissatisfaction with the following LIBRARY resources:

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	N/A*
Books	○	○	○	○	○	○
Databases/Searches engines	○	○	○	○	○	○
Journals	○	○	○	○	○	○
Facilities (computers, study rooms, carrels)	○	○	○	○	○	○
Reference assistance and instruction	○	○	○	○	○	○
Restricted resources and services	○	○	○	○	○	○
Services (circulation, interlibrary loan, course reserve, printing, etc)	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Support Services - Laboratory

7. Do you personally use a laboratory for any reason in your curriculum (e.g., computer laboratory, research laboratory, etc.)?

○ Yes
○ No

Physical Resources - Laboratory Facilities

NPS Student Survey

8. The LABORATORY facilities for my program are...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
... conveniently located.	◯	◯	◯	◯	◯	◯
... in good working condition.	◯	◯	◯	◯	◯	◯
... equipped with current technologies.	◯	◯	◯	◯	◯	◯
... appropriate for military research.	◯	◯	◯	◯	◯	◯
... well maintained.	◯	◯	◯	◯	◯	◯
... equipped with sufficient resources.	◯	◯	◯	◯	◯	◯
... responsive to course and research needs.	◯	◯	◯	◯	◯	◯

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Physical Resources - Classrooms

9. The CLASSROOMS for my program are...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
... conveniently located.	◯	◯	◯	◯	◯	◯
... in good working condition.	◯	◯	◯	◯	◯	◯
... equipped with current technologies.	◯	◯	◯	◯	◯	◯
... clean.	◯	◯	◯	◯	◯	◯
... comfortable.	◯	◯	◯	◯	◯	◯
... large enough.	◯	◯	◯	◯	◯	◯

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Support Services - Wireless Usage

10. While on the NPS campus, do you use wireless access?

◯ Yes
◯ No

Support Services - Wireless Access

NPS Student Survey

11. While on the NPS campus, is the wireless access sufficient everywhere you need it?

○ Yes
○ No

Support Services - Wireless Locations Needed

12. If you could add or improve wireless capability to one location on campus where it is currently insufficient, where would it be?

Building

Please Select: [_____ ▼]

Other (please specify)

[▲]
[▼]

Support Services - Warfighting Community

During the course of their time here at NPS, many students feel it is important to maintain links to their warfighting or professional community either through E-mail connectivity or research. These communities are typically your sponsoring agency, research organizations you are collaborating with, end-users of your NPS research/coursework, etc.

13. How important do you feel it is to maintain contact with your warfighting or professional community while here at NPS?

○ Very Important
○ Important
○ Neutral
○ Unimportant
○ Very Unimportant
○ N/A*

14. Please rate your satisfaction or dissatisfaction with NPS' resources for maintaining contact with your warfighting or professional community?

○ Very Satisfied
○ Satisfied
○ Neutral
○ Dissatisfied
○ Very Dissatisfied
○ N/A*

OPTIONAL: We appreciate any specific feedback you have on the above items.

[▲]
[▼]

*Please respond "N/A" for any items which are not applicable or you do not know.

Teaching and Learning

You are almost finished. Just a few questions below about academics at NPS.

NPS Student Survey

15. As you think about the INSTRUCTORS you have had thus far at NPS, please indicate your level of agreement or disagreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
My instructors expectations are consistent with what a graduate education should entail.	○	○	○	○	○	○
My instructors actively engage me in the learning process.	○	○	○	○	○	○
My instructors provide useful feedback about my performance.	○	○	○	○	○	○
My instructors provide real world examples during class.	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

Teaching and Learning - Academic Program

16. Now, thinking about your academic program in general, please indicate your level of agreement or disagreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
My academic program is challenging.	○	○	○	○	○	○
My academic program actively engages me in the learning process.	○	○	○	○	○	○
The NPS faculty in my academic program encourage me to participate in defense-related research.	○	○	○	○	○	○
My academic program challenges me to meet high expectations.	○	○	○	○	○	○
The expectations of the faculty in my academic program are consistent with the program's graduation requirements.	○	○	○	○	○	○

OPTIONAL: We appreciate any specific feedback on the above items.

NPS Student Survey

*Please respond "N/A" for any items which are not applicable or you do not know.

Policies and Requirements

17. Please indicate the degree to which you agree or disagree with the following statements below about NPS POLICIES and academic REQUIREMENTS.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A*
I was made aware of NPS' policy on student conduct and behavior (Student Information Handbook).	◯	◯	◯	◯	◯	◯
I was made aware of NPS' grievance procedures for students.	◯	◯	◯	◯	◯	◯
The academic advising I receive at NPS provides useful information.	◯	◯	◯	◯	◯	◯
My academic advisor provides relevant information about academic requirements.	◯	◯	◯	◯	◯	◯
I am clear about the graduation requirements for my program.	◯	◯	◯	◯	◯	◯

OPTIONAL: We appreciate any specific feedback on the above items.

*Please respond "N/A" for any items which are not applicable or you do not know.

End of Survey

18. Is there anything else you would like to tell us about your experiences at NPS?

Thank you

Thank you for taking the time to complete this survey. Your input will help NPS continue to improve the academic environment and student support services for both current and future students.

If you have any questions or comments regarding this survey, please contact Professor Ron Fricker, 831-656-3048 (rdfricker@nps.edu).