

Statistical Analysis Using

SPSS

Version 24

WAN MUHAMAD AMIR W AHMAD
MOHAMAD SHAFIQ MOHD IBRAHIM
NURFADHLINA ABDUL HALIM
NOR AZLIDA ALENG @ MOHAMAD

STATISTICAL ANALYSIS USING SPSS VERSION 24

ASST. PROF. DR. MOHAMAD SHAFIQ
MOHD IBRAHIM
Lecturer
Kulliyah of Dentistry
International Islamic University Malaysia (IIUM)
Kuantan Campus

Buy at www.karyausm.my

🌐 www.penerbit.usm.my

✉ penerbit@usm.my

📘 PenerbitUSM

📺 PenerbitUSM

📷 penerbit_usm

© Penerbit Universiti Sains Malaysia, 2019

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Statistical Analysis Using SPSS Version 24 / Wan Muhamad Amir W Ahmad, Mohamad Shafiq Mohd Ibrahim, Nurfadhlina Abdul Halim, Nor Azlida Aleng @ Mohamad
Includes index

ISBN 978-967-461-339-6

e-ISBN 978-967-461-341-9

1. SPSS (Computer file).

2. Social sciences—Statistical methods—Computer programs.

3. Statistics—Data processing. I. Muhammad Shafiq Mohd Ibrahim, 1990—

II. Nurfadhlina Abdul Halim, 1981—. III. Nor Azlida Aleng @ Mohamad, 1982—.

IV. Title.

519.50285536

HA32

Typeset in Adobe Caslon Pro

Copy Editor: Jannatun Hidayah Umar

Cover Designer: Ahmad Fitri Ramli

Proofreader: Aida Izana Yaakub

Typesetter: Farah Hasni Ahmad

Published by Penerbit Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia.
A member of the Malaysian Scholarly Publishing Council (MAPIM).

Printed by Sinaran Bros. Sdn. Bhd., 5-3-18 The Promenade, Persiaran Mahsuri, 10950 Bayan Baru, Pulau Pinang, Malaysia.

CONTENTS

Preface	xi
Introduction	xiii
Chapter 1 Descriptive Statistics and Explore Plots	1
1.1 Descriptive Statistics	1
1.2 Sample Data	1
1.3 Sample Analysis: Descriptive Statistics	3
1.3.1 Output 1	5
1.4 Simple Analysis: Explore Plots	5
1.4.1 Output 1	7
1.5 Simple Analysis Using Crosstabs	12
1.5.1 Output 1	13
1.5.2 Output 2	15
1.5.3 Output 3	16
Chapter 2 Numerical Data Analysis: Parametric Test	17
2.1 One-Sample T Test	17
2.1.1 Sample Data	18
2.1.2 Procedure Through SPSS	18
2.1.3 Output 1	19
2.1.4 Output 2	21
2.1.5 Interpretation and Results Presentation	21
2.2 Independent-Samples T Test	21
2.2.1 Sample Data	22
2.2.2 Procedure Through SPSS	22
2.2.3 Output 1	24
2.2.4 Output 2	26
2.2.5 Interpretation and Results Presentation	27

2.3	Dependent-Samples (Matched-Pairs, Paired-Samples) T Test	27
2.3.1	Sample Data	28
2.3.2	Procedure Through SPSS	28
2.3.3	Output 1	32
2.3.4	Output 2	35
2.3.5	Interpretation and Results Presentation	36
2.4	Correlation	36
2.4.1	Sample Data	37
2.4.2	Procedure Through SPSS	37
2.4.3	Output 1	37
2.4.4	Output 2	39
2.4.5	Interpretation and Results Presentation	39
2.5	Partial Correlation	40
2.5.1	Sample Data	41
2.5.2	Procedure Through SPSS	41
2.5.3	Output 1	42
2.5.4	Interpretation and Results Presentation	42
Chapter 3	Numerical Data Analysis: Nonparametric Test	43
3.1	Kruskal-Wallis Test	43
3.1.1	Sample Data	44
3.1.2	Procedure Through SPSS	44
3.1.3	Output 1	45
3.1.4	Output 2	47
3.1.5	Performing Kruskal-Wallis Test	47
3.1.6	Output 3	49
3.1.7	Output 4	52
3.1.8	Interpretation and Results Presentation	53
3.2	Mann-Whitney U Test	54
3.2.1	Sample Data	55
3.2.2	Procedure Through SPSS	55
3.2.3	Output 1	56
3.2.4	Output 2	58
3.2.5	Output 3	60
3.2.6	Interpretation and Results Presentation	60
3.3	Sign Test	61
3.3.1	Sample Data	62
3.3.2	Procedure Through SPSS	62

3.3.3 Output 1	64
3.3.4 Output 2	66
3.3.5 Output 3	69
3.3.6 Output 4	71
3.3.7 Interpretation and Results Presentation	72
3.4 Wilcoxon Signed-Rank Test	72
3.4.1 Sample Data	73
3.4.2 Procedure Through SPSS	73
3.4.3 Output 1	76
3.4.4 Output 2	78
3.4.5 Interpretation and Results Presentation	79
3.5 Wilcoxon Paired Signed-Rank Test	79
3.5.1 Sample Data	80
3.5.2 Procedure Through SPSS	80
3.5.3 Output 1	82
3.5.4 Output 2	84
3.5.5 Output 3	86
3.5.6 Output 4	88
3.5.7 Interpretation and Results Presentation	88
3.6 Friedman Two-Way Analysis of Variance (ANOVA) by Ranks	89
3.6.1 Sample Data	90
3.6.2 Procedure Through SPSS	90
3.6.3 Output 1	91
3.6.4 Output 2	94
3.6.5 Output 3	95
3.6.6 Output 4	96
3.6.7 Interpretation and Results Presentation	97
3.7 McNemar Test	98
3.7.1 Sample Data	99
3.7.2 Procedure Through SPSS	99
3.7.3 Output 1	101
3.7.4 Interpretation and Results Presentation	102
Chapter 4 Design of Experiment (DOE)	103
4.1 One-Way ANOVA	103
4.1.1 Sample Data	104
4.1.2 Procedure Through SPSS	104

4.1.3 Output 1	106
4.1.4 Output 2	107
4.1.5 Output 3	109
4.1.6 Output 4	111
4.1.7 Interpretation and Results Presentation	112
4.2 Two-Way ANOVA	113
4.2.1 Sample Data	114
4.2.2 Procedure Through SPSS	114
4.2.3 Output 1	116
4.2.4 Output 2	117
4.2.5 Output 3	120
4.2.6 Output 4	127
4.2.7 Output 5	128
4.2.8 Interpretation and Results Presentation	128
4.3 Latin Square Design	132
4.3.1 Sample Data	133
4.3.2 Procedure Through SPSS	133
4.3.3 Output 1	135
4.3.4 Output 2	137
4.3.5 Output 3	140
4.3.6 Output 4	147
4.3.7 Output 5	148
4.3.8 Interpretation and Results Presentation	149
4.4 Repeated Measure Analysis	152
4.4.1 Sample Data	153
4.4.2 Procedure Through SPSS	153
4.4.3 Output 1	155
4.4.4 Output 2	161
4.4.5 Output 3	166
4.4.6 Output 4	168
4.4.7 Interpretation and Results Presentation	168
4.5 Two Way of Repeated Measure Analysis	172
4.5.1 Sample Data	172
4.5.2 Procedure Through SPSS	173
4.5.3 Output 1	174
4.5.4 Output 2	179
4.5.5 Output 3	185
4.5.6 Output 4	186
4.5.7 Interpretation and Results Presentation	186

Chapter 5	Categorical Data Analysis	189
	5.1 Correlation Analysis Using Crosstab	189
	5.1.1 Sample Data	189
	5.1.2 Procedure Through SPSS	190
	5.1.3 Output 1	192
	5.1.4 Interpretation and Results Presentation	193
	5.2 Chi-Square Test (2×2)	194
	5.2.1 Sample Data	195
	5.2.2 Procedure Through SPSS	195
	5.2.3 Output 1	197
	5.2.4 Interpretation and Results Presentation	197
	5.3 Chi-Square Test (2×3)	198
	5.3.1 Sample Data	198
	5.3.2 Procedure Through SPSS	199
	5.3.3 Output 1	200
	5.3.4 Interpretation and Results Presentation	201
Chapter 6	Linear Regression	202
	6.1 Simple Linear Regression	202
	6.1.1 Sample Data	203
	6.1.2 Procedure Through SPSS	203
	6.1.3 Output 1	206
	6.1.4 Output 2	208
	6.1.5 Interpretation and Results Presentation	209
	6.2 Multiple Linear Regression	209
	6.2.1 Sample Data	210
	6.2.2 Procedure Through SPSS	210
	6.2.3 Output 1	213
	6.2.4 Output 2	215
	6.2.5 Interpretation and Results Presentation	215
Chapter 7	Nonlinear Regression	216
	7.1 Quadratic Regression	216
	7.1.1 Sample Data	217
	7.1.2 Procedure Through SPSS	217
	7.1.3 Output 1	218
	7.1.4 Interpretation and Results Presentation	221

7.2 Multiple Logistic Regression	221
7.2.1 Sample Data	222
7.2.2 Procedure Through SPSS	222
7.2.3 Output 1	225
7.2.4 Output 2	227
7.2.5 Interpretation and Results Presentation	228
Chapter 8 Multivariate Analysis	229
8.1 Factor Analysis	229
8.1.1 Sample Data	230
8.1.2 Procedure Through SPSS	230
8.1.3 Output 1	233
8.1.4 Interpretation and Results Presentation	236
8.2 MANOVA for Independent Samples	236
8.2.1 Sample Data	237
8.2.2 Procedure Through SPSS	237
8.2.3 Output 1	240
8.2.4 Interpretation and Results Presentation	245
Bibliography	251
Index	253



STATISTICAL ANALYSIS USING SPSS VERSION 24

This book provides the best solution for students and researchers in understanding the basic concept and the right procedure for data analysis. The main objective of this book is to guide and help students or researchers who are using Statistical Package for the Social Sciences (SPSS) software in performing the statistical methods in their applied research. This book is very easy to follow for beginners in SPSS by following simple step-by-step instructions. It is arranged in a way that it is user friendly and is written in a simple language that can easily be understood by the users. This book will give a straightforward solution to students and can also be used as a guideline in performing the statistical test using statistical analysis tools. Hopefully this book will help students in making good presentations and conclusions based on the results obtained and provides valuable information on statistical methods in applied research.



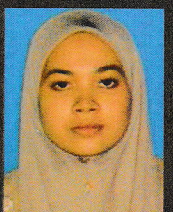
Wan Muhamad Amir W Ahmad is a lecturer at the School of Dental Sciences, Universiti Sains Malaysia (USM). He is a statistician by profession with BSc and MSc in Applied Statistics and PhD in Biostatistics from USM. His core academic teaching includes biostatistics, statistical software application, statistics computing, statistical consultant, epidemiology research designs in health sciences research, research methodology, elementary statistics, time series forecasting, operational research, advanced statistics and design of experiment.



Mohamad Shafiq Mohamad Ibrahim obtained his BSc in Financial Mathematics and MSc in Mathematics from Universiti Malaysia Terengganu (UMT) and PhD in Biostatistics from USM. He has various experiences conducting SPSS workshops at the School of Informatics and Applied Mathematics, UMT. His research interest is in applied linear methods.



Nurfadhline Abdul Halim is a lecturer at the School of Informatics and Applied Mathematics, UMT. She obtained her BSc in Financial Mathematics from UMT, MSc in Management Mathematics and PhD in Mathematics from Universiti Kebangsaan Malaysia (UKM). She has been conducting researches in various mathematics fields, namely financial mathematics, Islamic financial mathematics, mathematical modelling, statistic and optimization.



Nor Azlida Aleng @ Mohamad is a lecturer at the School of Informatics and Applied Mathematics, UMT. She obtained her BSc in Mathematics and MSc in Management Mathematics from UKM. She is currently pursuing her PhD in Biostatistics at USM. She has been conducting researches in the field of biostatistics, neural network, mathematical modelling and Islamic financial in mathematics, and is currently focusing on mathematical modelling in Islamic finance using optimization method.