



B.Com Honours

Semester IV

Calicut University

STATISTICAL SOFTWARE FOR DATA ANALYSIS

Course Code: COM4FV110 • Module 4 Notes

Module IV: Overview of Inferential Statistical Techniques in SPSS

Covers inferential testing procedures in SPSS including Pearson correlation, partial correlation, multiple regression modeling, independent t-tests, One-Way ANOVA, and MANOVA.

Unit 14: Correlation, Partial Correlation, & Multiple Regression

- 1. Bivariate Correlation:** Analyze → Correlate → Bivariate.
- 2. Partial Correlation:** Measures relationship between 2 variables while controlling for 3rd confounding variable:

$$r_{\{12,3\}} = \frac{r_{\{12\}} - r_{\{13\}} \cdot r_{\{23\}}}{\sqrt{(1 - r_{\{13\}}^2)(1 - r_{\{23\}}^2)}}$$

- 3. Multiple Regression:** Predicts continuous dependent variable from multiple predictors (Analyze → Regression → Linear). Key Assumptions: Multicollinearity (VIF (< 10), Tolerance (> 0.10)), Homoscedasticity, and Residual Normality.

Unit 15: Exploring Group Differences – T-Tests & One-Way ANOVA

- 1. Independent Samples T-Test:** Compares means of 2 independent groups (Analyze → Compare Means → Independent-Samples T Test).

$$(t = \frac{\bar{x}_1 - \bar{x}_2}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}})$$

Evaluates Levene's Test for Equality of Variances. If Levene's ($p > 0.05$), equal variances assumed.

- 2. One-Way ANOVA:** Compares means across 3+ groups (Analyze → Compare Means → One-Way ANOVA):

$$(F = \frac{MS_{\text{between}}}{MS_{\text{within}}})$$

Unit 16: Two-Way ANOVA, MANOVA, & ANCOVA

Two-Way ANOVA: Evaluates main effects of 2 categorical factors and their interaction effect.

MANOVA: Evaluates multiple continuous dependent variables simultaneously across groups (Wilks' Lambda (Lambda)).

Practical Case Framework 1 (SPSS Multiple Linear Regression Output Table): Interpret SPSS Multiple Regression Model Summary and Coefficients tables predicting Sales Revenue.

SPSS Multiple Linear Regression Coefficients Output Table:

Model Predictor Variable	Unstandardized B	Std. Error	Standardized Beta (β)	(t)-statistic	Sig. ((p)-value)
(Constant)	12.450	2.100	-	5.928	< 0.001
Ad Budget ((X_1))	0.450	0.085	0.520	5.294	< 0.001
Sales Force Size ((X_2))	1.200	0.310	0.380	3.871	< 0.001

Model Fit: $R^2 = \mathbf{0.684}$, Adjusted $R^2 = \mathbf{0.672}$, ANOVA $F = \mathbf{45.20}$ ($p < 0.001$) → Both predictors statistically significant!

Practical Case Framework 2 (SPSS Independent Samples T-Test Output Table): Interpret SPSS Independent Samples Test output comparing satisfaction scores between Online and Retail store shoppers.

SPSS Independent Samples T-Test Output Table:

Equal Variances Condition	Levene's F	Levene's Sig.	(t)-statistic	df	Sig. (2-tailed)	Mean Diff
Equal variances assumed	1.240	0.268	3.450	148	0.001	0.850
Equal variances not assumed	-	-	3.420	142.5	0.001	0.850

Levene's Sig. = 0.268 (> 0.05) → Equal variances assumed. $t(148) = 3.450$, $p = 0.001$ (< 0.05) → Statistically significant mean difference!

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