



SPSS: *MULTIPLE REGRESSION*



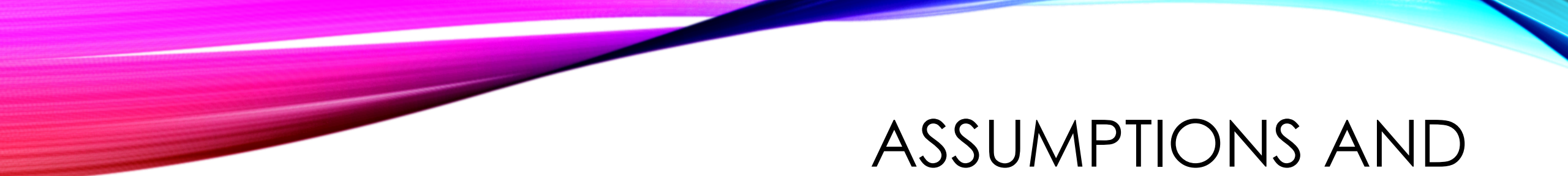
MULTIPLE REGRESSION

- An extension of correlation when using **more than one IV**
- Assesses the combined association effect of IV's = multiple regression
- Explores **prediction** rather than relationships



MULTIPLE REGRESSION

- Three elements:
 - Predictors (IV's) treated as separate variables as well as a combined variable in relation to the DV
 - Assessment of how 'associated' they are as a whole
 - How 'predictive' they are of the DV as a whole
- Ideal for investigation of complex-real life research questions
 - Less used in lab-based experimental designs and far more applied designs
 - Ideal for longitudinal prospective designs



ASSUMPTIONS AND REQUIREMENTS FOR DATA

- MR is a fussy analysis! Makes many assumptions about data (and not all that forgiving if these are violated).
1. Continuous data is best (interval or ratio)
 2. Normal distribution of data (normality)
 3. Linear relationship between IV's and DV (linearity)
 4. Sample size is important!

ASSUMPTIONS AND REQUIREMENTS FOR DATA

5. Multi-collinearity

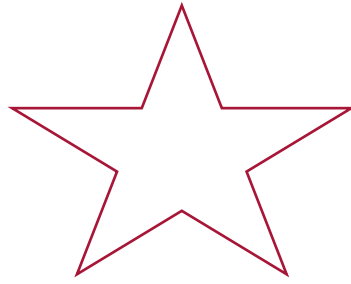
6. Singularity

7. Outliers

- a) Very sensitive to outliers so always check during cleaning and screening
- b) Standard residuals should not be below -3.3 / above 3.3

8. Homoscedasticity

- a) Variances of errors the same across all IV's
- b) Check using residuals scatterplot



STUDY EXAMPLE

- Predicting intentions to quit smoking using components of the Theory of Planned Behaviour (TPB)
- We need:
 - One continuous DV = Intentions
 - The three other components of TPB [Attitudes, Subjective Norm, Perceived Behavioural Control] as continuous IV's.
- Note:
 - There are likely multiple things you need to do to/with data to get them to the point of being able to be analysed!

RESULTS

- Main elements:
 - Correlations
 - Report the significant correlations between the IV's and DV (and any strong correlations between IV's themselves)
 - Put this information into a table
 - Ad. R^2 (model summary table)
 - **0.815**
 - Regression model (ANOVA table)
 - **$F(3, 16) = 28.94, p < .001$**

We need to convert this to a %.
This suggests that 81.5% of the variation in participants intention scores can be explained by **the model as a whole**

Here we can see we have a significant regression equation. The ANOVA results get reported as any other ANOVA.

RESULTS

- Prediction of IV's (coefficients table – standardised co-efficients)
 - **Attitudes** - $\beta = .74, p < .001$
 - **Subjective norm** - $\beta = .24, p > .05$
 - **PBC** - $\beta = -.15, p > .05$

We have one unique significant independent predictor; attitude scores significantly predict intention scores.

We can use these values to state by how much SD in intentions increase (.74) when attitude scores increase by 1 SD.

The other two predictors are not significant in their prediction of intentions to quit smoking.

INTERPRETING RESULTS

A multiple regression analysis was conducted to assess whether the components of the Theory of Planned Behaviour (Attitudes, Subjective Norms, and Perceived Behavioural Control) were predictive of intentions to quit smoking. Table 1 summarises the means and standard deviations for each variable, with scores for each variable ranging between 1 and 7.

Tip 1 for MR
results: Use
tables!

Table 1.

Means and Standard Deviations of all Variables Included in Analysis

	<i>M</i>	<i>SD</i>	<i>N</i>
Attitude	3.10	1.19	20
Subjective Norm	2.87	1.49	20
Perceived Behavioural Control	6.27	.96	20
Intentions	3.68	2.09	20

INTERPRETING RESULTS

Correlations between the predictor variables and dependent variable are highlighted in table 2. As can be seen, attitude had a strong positive correlation with intentions to quit smoking, as did subjective norm. Control was found to have a moderate negative correlation with intentions. Between the predictor variables themselves, attitudes and subjective norm were moderately positively correlated with one another ($r = .41, p < .001$).

Tip 2 for MR results: Use notes at the bottom of tables to indicate level of sig.

Table 2.

Correlations Between Variables.

	Attitude	Subjective Norm	Perceived Behavioural Control	Intentions
Attitude	-	.41*	-.09	.85**
Subjective Norm	.41*	-	-.69**	.65**
Perceived Behavioural Control	-.09	-.69**	-	-.38*
Intentions	.85**	.41*	-.38*	-

* $p < .05$

** $p < .001$

INTERPRETING RESULTS

The regression analysis showed that as an overall model, the set of independent variables (attitude, subjective norm and control) were statistically significant ($F(3,16) = 28.94, p < .001$) and produced an adjusted R-squared value of 0.82. The combined IV's therefore explained 82% of the variance in intention to quit smoking scores. Table 3 shows the coefficients for the separate IV's in the analysis.

The variable Attitude was a unique significant independent predictor ($p < .001$) with a Beta value of .74. This indicated a positive prediction, with an increase of .74 standard deviations in intention scores found for every one standard deviation increase in attitude scores. The variables of subjective norm and perceived behavioural control were not statistically significant in contributing to the prediction of participants' intention to quit smoking ($p > .05$).

Attitude scores explain 42% of the variance in intention scores.

Table 3.

Beta Coefficients for Independent Variables on the DV of Intention.

Variable	Beta Value
Attitude	.74**
Subjective Norm	.24
Perceived Behavioural Control	-.15

** $p < .001$

PREDICTING NEW CASES

- We can use the information provided in your linear regression output to predict new cases using the regression equation:

$$Y = bX + a$$

Where:

Y = predicted criterion score

X = observed predictor score

a = intercept value

b = slope value

To predict a new case, you just need a value for X.