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Departamento de Economía financiera II

(ECONOMÍA FINANCIERA Y CONTABILIDAD,COMERCIALIZACIÓN E INVESTIGACIÓN DE MERCADOS)

Marketing Research: An Introduction

UNIT 8:

AN INTRODUCTION TO DATA ANALYSIS AND THE PRESENTATION OF RESULTS

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AIMS:

1. To know the areas that make up the marketing decision process.
2. To have an understanding of the general classification of techniques for quantitative data analysis.
3. To give an introduction to the differenent data analysis techniques as tools for giving solution to information problems in marketing.
4. To introduce students to some of the multivariate analysis techniques to be used, in an applied fashion.

Unit 8: An introduction to data analysis and the presentation of results

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8.1. Introduction

On the one hand, analysis techniques cannot rescue an erroneously devised MR study.

On the other hand, an incorrect analytic phase can derail all the previous MR process.

Levels of analysis:

(1) Univariate: Quality of data evaluation and knowing the basic magnitudes → GOOD FOR A FIRST IDEA ABOUT THE PROBLEM.

(2) Bivariate: Knowing the characteristics and most basic differences within a population and among its main groups → IDEAS THAT MIGHT BE CONCLUDING, OR INTRODUCTORY FOR (3)

(3) Multivariate: Give an answer to the final aims of the analytic work → GIVE FORM TO CONCLUDING REMARKS AND RECOMMENDATIONS

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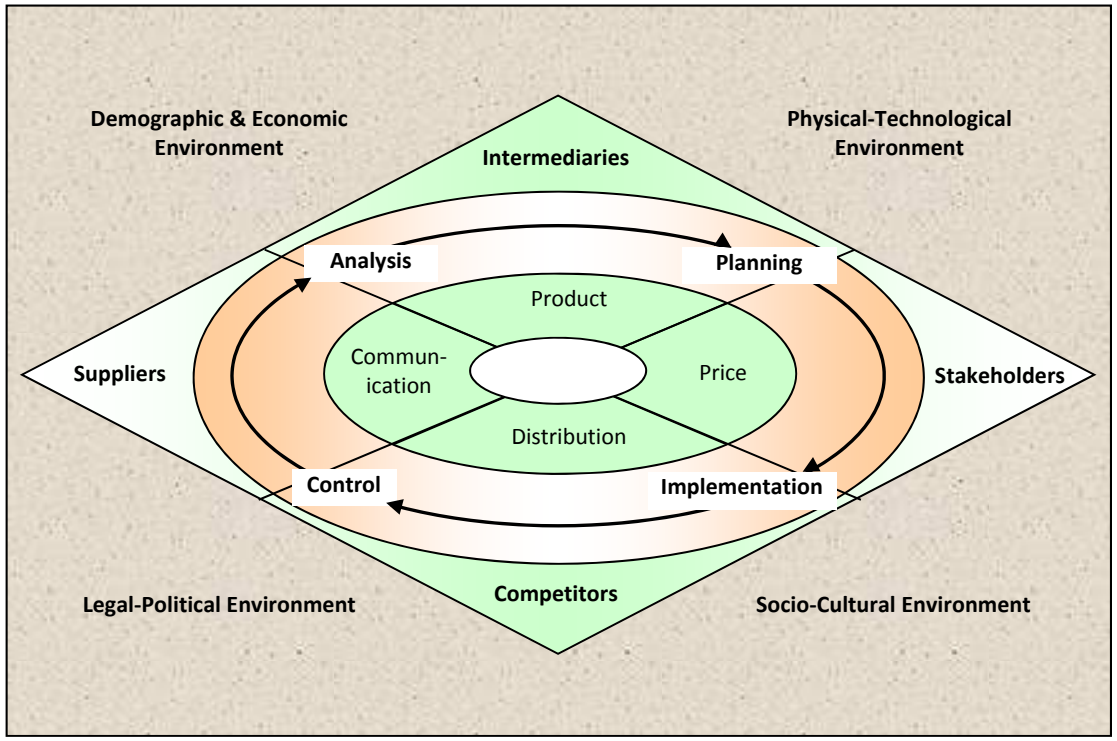
The marketing decision process



Source: Kotler *et al.* (1996): *Op cit.,* p. 51

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8.2. Review of the strategic marketing decision process

The *marketing process* is the sucession of ANALYSIS, PLANNING IMPLEMENTATION and CONTROL of the marketing decisions within a company

Analysis:	Opportunities – Threats / Strenghts – Weaknesses
Planning:	Aims → Strategies → Actions
Implementation:	Putting these into practice
Control:	Follow-up of results (and back again)

Strategy: Is every specific action focused at the consecution of the proposed aims.

- ***Marketing strategy:*** **Set of specific actions in order to attain the aims of the marketing function of the company.**

Types of marketing strategy:

1. **Customer knowledge**
2. **Competitive strategies**
3. ***Marketing-mix* strategies**

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8.2. Review of the strategic marketing decision process

8.2.1. Customer knowledge

Every action focused at identifying the *target group*, knowing its tastes, needs and preferences:

- Competitive environment knowledge
- Demand estimation and forecast
- **Market segmentation**
- Selection of target customers
- **Positioning**

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8.2. Review of the strategic marketing decision process

8.2.2. Strategies with respect to competitors

Finding out in what **situation** the company is and on what **advantages** it can differentiate **with respect to competitors**.

- ***Marketing Research System***
- ***Marketing Intelligence System***

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8.2. Review of the strategic marketing decision process

8.2.3. *Marketing-mix* implementation strategies

- **PRODUCT Policy:**
  - ✓ Decisions on **product references**: Atributos tangibles e intangibles
  - ✓ Decisions on **product range**: Creation, modification and withdrawal.

As regards MR: Concept, product, prototype and market testing, blind tests, etc.

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8.2. Review of the strategic marketing decision process

8.2.3. *Marketing-mix* implementation strategies

- **PRICE Policy:**

Amount of money charged for a product or service.

In a market situation, a customer will never select an offer if s/he thinks that its price is greater than the *perceived value*.

Operationally, for MR, the aforementioned entail finding out the following: *perceived value*, prices set by competitors, market-elasticity studies, effects of a lower price decision (for example, a promotion)...

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8.2. Review of the strategic marketing decision process

8.2.3. *Marketing-mix* implementation strategies

- **PROMOTION Policy:**

Accions aimed at communicating the attributes of an offer or brand, in order to persuade customers and obtain a favourable response from them.

Effects: **Medium range:** Greater market share, improving the product/service positioning, a change of attitudes, etc.

Short range: Immediate positive reaction in order to give way to product stocks, promoting the first purchase of a new product...

Operationally for MR: Relationship between advertisement budget-sales, brand *tracking*, selecting media, etc.

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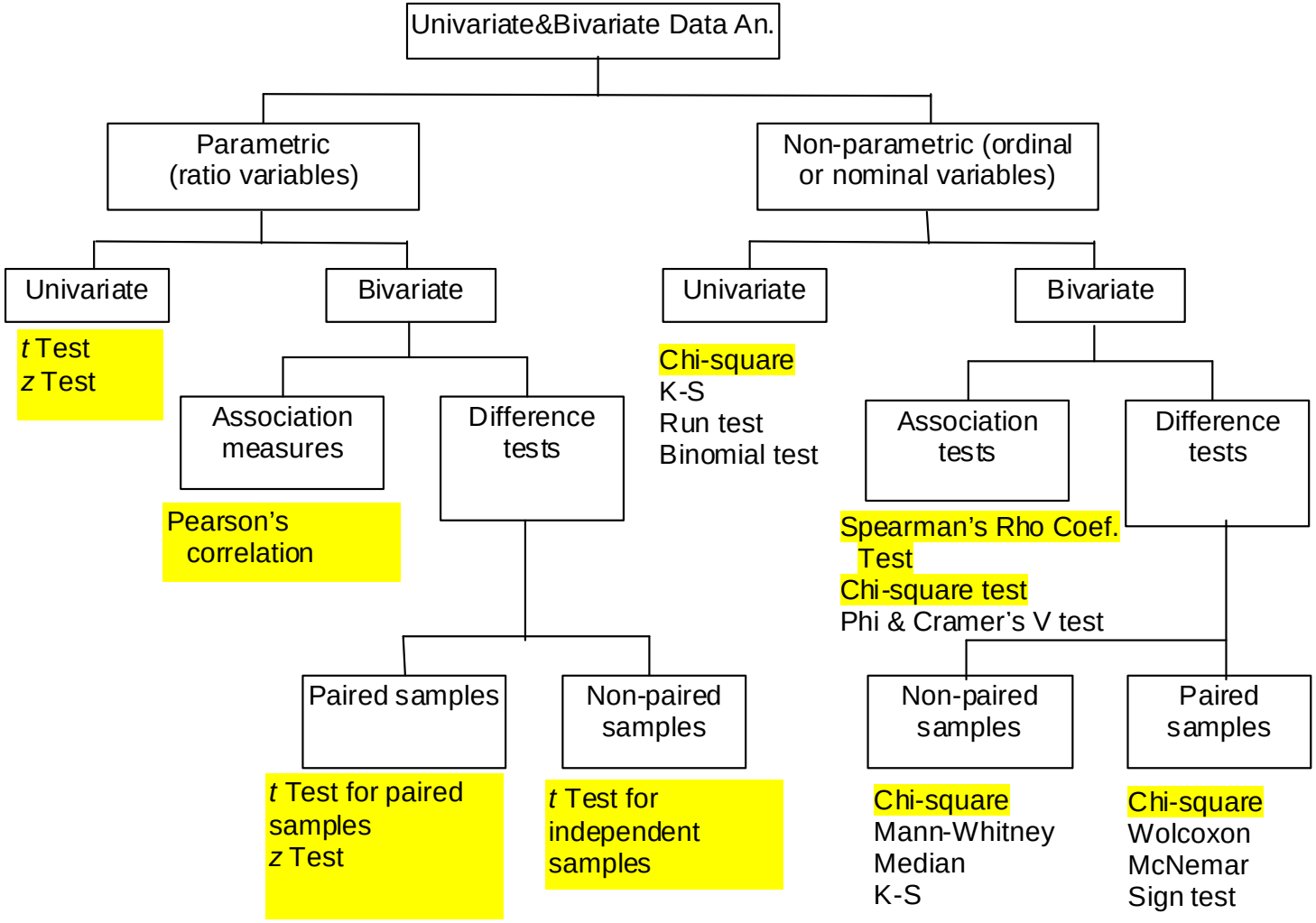
8.3. Univariate and bivariate data analysis



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8.3. Univariate and bivariate data analysis

Bivariant contrast tests and coefficients

Variable #1	Variable #2	Tests
Nominal	Nominal	Two-variable Chi-Sq. test
		Phi and Cramer's V Coefficients**
Nominal	Ordinal	Two-variable Chi-Sq. test
Nominal	Ratio*	Two-sample *t* test for equal means
		Two-sample *t* test for proportions
		Analisis of variance for 1 factor
Ordinal	Ordinal	Spearman's Rho rank correlation
		Two-variable Chi-Sq. test
Ordinal	Ratio	Spearman's Rho rank correlation
		Two-sample *t* test for equal means
		Two-sample *t* test for proportions
		Analisis of variance for 1 factor
Ratio	Ratio	Pearson's linear correlation coefficient
		Simple linear regression

(*)Interval or ratio
(**) Based on the Chi-square test

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8.3. Univariate and bivariate data analysis

a). Two-variable Chi-square test:

Useful for determining if there is association in a set of two ordinal or nominal variables (in a double entry table).

Example: The following table differentiates retailers into associated and non-associated ones, classified by their age in two groups (up to 40 years and 41 or more):

Tabla de contingencia ¿Asociado? - Edad

Recuento

		Edad		
		Hasta 40	41 ó más	Total
¿Asoc.?	No	150	106	256
	Sí	99	133	232
Total		249	239	488

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8.3. Univariate and bivariate data analysis

a). Two-variable Chi-square test:

From the observed frequencies, expected frequencies are calculated. These are the frequencies that ought to exist in the cells in the case of no association between the two variables.

$$E_{ij} = \frac{Row\ Total_i \times Column\ Total_j}{Row\ and\ column\ total}$$

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8.3. Univariate and bivariate data analysis

a). Two-variable Chi-square test:

In the example, expected frequencies are (in red):

Tabla de contingencia ¿Asociado? - Edad

			Edad		Total
			Hasta 40	41 ó más	
¿Asoc?	No	Recuento	150	106	256
		Frecuencia esperada	**130,6**	**125,4**	**256,0**
	Sí	Recuento	99	133	232
		Frecuencia esperada	**118,4**	**113,6**	**232,0**
Total		Recuento	249	239	488
		Frecuencia esperada	**249,0**	**239,0**	**488,0**

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8.3. Univariate and bivariate data analysis

a). Two-variable Chi-square test:

Let ***x*** with a total of $i = \{1,2,3,..., r\}$ categories, and ***y*** with $j = \{1,2,3,..., s\}$ categories, this test consists of determining the size of the χ^2 statistic.

We suppose that χ^2 follows a Chi-square distribution. The contrast hypotheses are:

H_0: There is no association between the categories of ***x*** and ***y***.

H_1: ***x*** and ***y*** are mutually associated.

The Chi-square statistic is:

$$\chi^2 = \frac{\sum_{j=1}^{s}\sum_{i=1}^{r}\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

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8.3. Univariate and bivariate data analysis

$$\chi^2 = \frac{\sum_{j=1}^{s}\sum_{i=1}^{r}\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

a). Two-variable Chi-square test:

where:

O_{ij} is the set of observed cases or individuals belonging to category *i* from variable *x* and *j* from variable *y*,

E_{ij} is the set of expected cases or individuals belonging to category *i* from variable *x* and *j* from variable *y*.

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8.3. Univariate and bivariate data analysis

a). Two-variable Chi-square test :

For the previous example, the result is:

$$\chi^2 = \frac{\sum_{j=1}^{s}\sum_{i=1}^{r}\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

Degrees of freedom = (rows-1) x (columns-1)

Pruebas de chi-cuadrado

	Valor	gl	Sig. asintótica (bilateral)	Sig. exacta (bilateral)	Sig. exacta (unilateral)
Chi-cuadrado de Pearson	12,346[b]	1	,000		
Corrección por continuidad[a]	11,717	1	,001		
Razón de verosimilitud	12,396	1	,000		
Estadístico exacto de Fisher				,001	,000
Asociación lineal por lineal	12,320	1	,000		
N de casos válidos	488				

Significance levels with less than 0.05 or 0.01 mean that Ho should be rejected

a. Calculado sólo para una tabla de 2x2.

b. 0 casillas (,0%) tienen una frecuencia esperada inferior a 5. La frecuencia mínima esperada es 113,62.

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8.3. Univariate and bivariate data analysis

b). Spearman's Rho rank coefficient (r_S):

It provides a measure of assosiation between the ranks of 2 paired variables (for the same set of individuals)

$$r_S = 1 - 6\sum_{i=1}^{n} \frac{d_i^2}{n\left(n^2 - 1\right)}$$

where: $d_i^2 = \left(\text{Rank Variable}\,1 - \text{Rank Variable}\,2\right)^2$

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b). Spearman's Rho rank coefficient (r_S):

Main advantages:

- It makes it possible to correlate both orginal and ratio variables
- It is not affected by the amount of values, as it only considers their ordering.

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8.3. Univariate and bivariate data analysis

c). Pearson's linear correlation coefficient *(r):*

It determines the level of association between two ratio variables. Be *n* a set of individuals measured by two ratio variables, *x* and *y* :

$(x_1 , y_1), (x_2 , y_2), (x_3 , y_3), \ldots , (x_{n-1} , y_{n-1}), (x_n , y_n)$

Pearson's linear correlation coefficient is calculated as follows:

$$r = \frac{\sum_{i=1}^{n} \frac{(x_i - \bar{x})(y_i - \bar{y})}{n-1}}{\sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}\sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})^2}{n-1}}} = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

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8.3. Univariate and bivariate data analysis

Differences between r_S and r :

r_S measures the **coherence** in the ordering of two series of paired data

r measures the **linearity** between both series of data

Suppose that a set of individuals {A, B, C, D, E, F } whose values *x, y* and *y'* are such that:

$$x_A < x_B < x_C < x_D < x_E < x_F \ , \quad y_A < y_B < y_C < y_D < y_E < y_F$$

$$\text{and } y'_A > y'_B > y'_C > y'_D > y'_E > y'_F$$

…such that *x* and *y* have a perfect possitive (Spearmen) rank order (r_S) correlation, and *x* and *y'* a perfect negative one. It can happen any of the two following situations, in which case r could change while r_S not:

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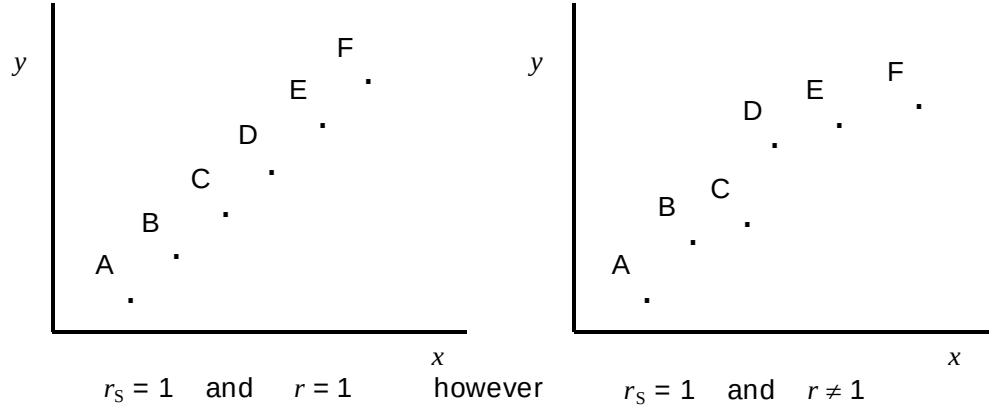
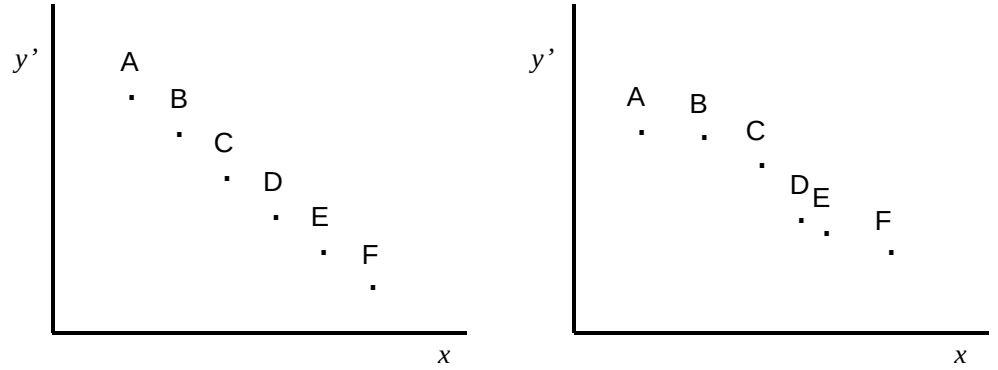
Positive correlation



$r_S = 1$ and $r = 1$ however $r_S = 1$ and $r \neq 1$

Negative correlation



$r_S = -1$ and $r = -1$ however $r_S = -1$ and $r \neq -1$

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8.3. Univariate and bivariate data analysis

d). Two sample *t* test for equal means: 2 situations:

1st: A same variable whose mean is compared in two subsamples:

Be x_1 and x_2 , normally distributed and with the same variance, that is:

$$x_1 \sim N(\mu_1 , \sigma^2) \text{ and } x_2 \sim N(\mu_2 , \sigma^2)$$

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

$$T = \frac{\bar{x}_1 - \bar{x}_2}{S_C \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \sim \quad t(n_1 + n_2 - 2)$$

If $T > K = \left| t(n_1 + n_2 - 2 \text{ ; para } \alpha/2) \right|$ H_0 is rejected

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8.3. Univariate and bivariate data analysis

d). Two sample *t* test for equal means:
2 situations:

2nd: Two paired variables whose difference is compared in a same group:

Be x_1 and x_2 two normally distributed ratio variables measured in the same unit:

$$x_1 \sim N(\mu_1 , \sigma^2_1) \text{ y } x_2 \sim N(\mu_2 , \sigma^2_2),$$

their sample means will be normally distributed:

$\bar{x}_1 \sim N(\mu_1 , \sigma^2_1/n_1)$
$\bar{x}_2 \sim N(\mu_2 , \sigma^2_2/n_2)$

…ann therefore, their difference will also be normal:

$$\bar{d} \sim N(\mu_d = \mu_1 - \mu_2 , \sigma^2_d = \sigma^2_1/n_1 + \sigma^2_2/n_2).$$

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8.3. Univariate and bivariate data analysis

d). Two sample *t* test for equal means:
2 situations:

2nd: Two paired variables whose difference is compared in a same group (cont.):

The test will be:

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

$$t(v) \sim T = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_{x_1}^2}{n_1} + \frac{S_{x_2}^2}{n_2}}}$$

If $T > K = \left| t(v\,;\,\text{para}\,\alpha/2) \right|$ H_0 will be rejected

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8.4. Multivariate data analysis techniques. Selection criteria

Classification of Multivariate analysis techniques