

Answer to all following questions. Each question makes up 25 points out of the total 100. You may answer either in Finnish or English. Dictionaries or calculators are NOT permitted.

1. *Chi-square test.* Explain what is chi-square test and give an example of a market research problem in which you could use the chi-square test. Also, describe how chi-square test is reported (i.e. what statistics are reported and what is their interpretation).
2. *t tests and Analysis of variance (ANOVA)*
  - a. What types of research questions can be addressed with t tests? What kind of data is required?
  - b. Give an example of a market research problem in which you can use the t test.
  - c. When should you use analysis of variance instead of t tests? What kind of data is required for analysis of variance?
  - d. Give an example of a market research problem in which you can use analysis of variance.
3. *Regression analysis.* Interpret the results of the regression analysis presented in the Table below by answering the following questions:
  - a. Which of the variables in Model 8 have a significant effect on return on equity (ROE)
  - b. Interpret the significant regression coefficients in plain English.
  - c. How much of the variation in the dependent variable is explained by the model? What does this tell you about the practical importance of the results?
  - d. Suppose you see the statement below. Do you think that multicollinearity is a problem in this case? Explain why / why not.

*“Examination of the independent variables shows a high correlation of 0.71 among the two control variables of prior ROE and equity/debt ratio. To address this potential multicollinearity issue, we examined the variance inflation factors (VIF) for all regressions below. Among all regressions, the range of VIF values was 1.02 to 1.93...”*

Table 3. Regression results of TMT sociobehavioral integration and action aggressiveness on firm performance<sup>a</sup>

Variables	Profit margin				Return on equity			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
TMT size	0.17 <sup>+</sup>	0.17 <sup>+</sup>	0.17 <sup>+</sup>	0.17 <sup>+</sup>	0.12	0.13	0.09	0.10
TMT average age	-0.04	-0.03	0.00	0.01	-0.11	-0.09	-0.06	-0.05
TMT educational heterogeneity	0.02	0.05	0.04	0.06	0.07	0.10	0.07	0.10
Firm age <sup>b</sup>	-0.07	-0.08	-0.10	-0.10	-0.02	-0.02	-0.05	-0.05
Firm size <sup>b</sup>	0.02	0.03	-0.01	0.00	-0.02	0.01	-0.05	-0.03
Profit margin (t-1)	0.26 <sup>*</sup>	0.23 <sup>+</sup>	0.29 <sup>*</sup>	0.26 <sup>*</sup>				
Return on equity (t-1)					0.25 <sup>+</sup>	0.17	0.25 <sup>+</sup>	0.18
Slack (current ratio)	0.02	0.03	0.01	0.02	-0.15	-0.15	-0.15	-0.15
Slack (equity/debt)	-0.14	-0.15	-0.17	-0.17	0.03	0.05	0.02	0.04
Hypercompetitive environment	0.16	0.10	0.06	0.02	0.16	0.08	-0.02	-0.06
TMT sociobehavioral integration		0.17 <sup>+</sup>		0.14		0.25 <sup>*</sup>		0.21 <sup>+</sup>
Action aggressiveness			0.21 <sup>*</sup>	0.19 <sup>+</sup>			0.31 <sup>*</sup>	0.27 <sup>*</sup>
N	104	104	104	104	91	91	91	91
R <sup>2</sup>	0.10	0.12	0.13	0.15	0.08	0.13	0.14	0.18
R <sup>2</sup> change <sup>c</sup>		0.03	0.03	0.03		0.05	0.07	0.05

<sup>a</sup> Standardized regression coefficients are shown. <sup>+</sup> p < 0.10; \* p < 0.05; \*\* p < 0.01.

<sup>b</sup> Logarithm.

<sup>c</sup> Values are rounded to 0.01 when necessary. Because of rounding, values of R<sup>2</sup> change may not exactly equal to the R<sup>2</sup> differences between models.

*Notes: TMT refers to top management team; Slack refers to resource availability; TMT sociobehavioral integration refers to “the degree to which TMT members work together as a team”; Action aggressiveness refers to “the extent to which a firm is likely to engage with its rivals and act swiftly in its engagement”*

Source: Chen, M.-J., Lin, H.-C., & Michel, J. G. 2010. Navigating in a hypercompetitive environment: the roles of action aggressiveness and TMT integration. *Strategic Management Journal*, 31(13): 1410–1430.

4. *Factor analysis and cluster analysis.* Explain what factor analysis and cluster analysis are to a manager with little knowledge of multivariate statistics.
  - a. Give example of market research problem to which factor analysis can be applied.
  - b. Give example of market research problem to which cluster analysis can be applied.
  - c. What are the requirements for data for factor analysis and cluster analysis?
  - d. What statistics are reported when factor analysis is reported and what do they tell us?
  - e. What statistics are reported when cluster analysis is reported and what do they tell us?