EXAMINATION:	MARKETING MODELS & ANALYSIS SS 2010
EXAMINER:	PROF. DR. B. ERICHSON, NUMBER OF LECTURE: 20205

You are allowed to use a non-programmable pocket calculator without communication functions.
The answers to all questions should be made in one language, please use English or German. Use the space under the question for your answer!
All of the 6 exam questions must be answered (the estimated time for each question is given).
This examination has 8 pages.
Attention: Instead of a decimal "." point in numbers we use a comma "," here!

1. Model Estimation with Excel (10 Min.)

Mr. Otto, the marketing-manager of the company Guericke & Co., wants to support his decisions on price and advertising by marketing engineering with the help of MS Excel.

For this purpose he has collected data on sales (Y), price (P) and advertising (W) and specified the following **Demand Model** (market-response function):

$$Y = a + b_1 \cdot P + b_2 \cdot \sqrt{W} + u$$

The spreadsheet below shows the data of Mr. Otto and procedures for estimation and decision.

a	Which **estimation principle** uses Mr. Otto for the calibration of his model?
b	Mr. Otto wants to use the Excel Solver for estimating the parameters of his model. Please help him to specify the parameters in the Solver window! b1) **target cell** (objective function) b2) **target value** (Min or Max) b3) **changing cells** (parameters to be estimated)
c	The spreadsheet below already shows the result of the estimation. Please write down the **estimated function**!
d	How well does Mr. Otto´s model explain the sales data? Give the **percentage of explained variation**!

Mr. Otto´s Excel Spreadsheet:

Demand Model: $\hat{Y} = a + b_1 \cdot P + b_2 \cdot \sqrt{W}$

Parameter: a = 19,400; b1 = -2,000; b2 = 0,500

A. Data and Estimation

Sales Y	Price P	Avertising W	$\hat{Y}$	$(Y-\hat{Y})^2$	Total Variation
12	4	1	11,90	0,01	6,76
8	6	1	7,90	0,01	1,96
13	4	4	12,40	0,36	12,96
7	7	4	6,40	0,36	5,76
10	6	4	8,40	2,56	0,36
9	5	4	10,40	1,96	0,16
11	5	9	10,90	0,01	2,56
7	6	4	8,40	1,96	5,76
11	5	9	10,90	0,01	2,56
6	7	4	6,40	0,16	11,56
Mean: 9,4	5,50	4,40	SSR =	7,40	SST = 50,4

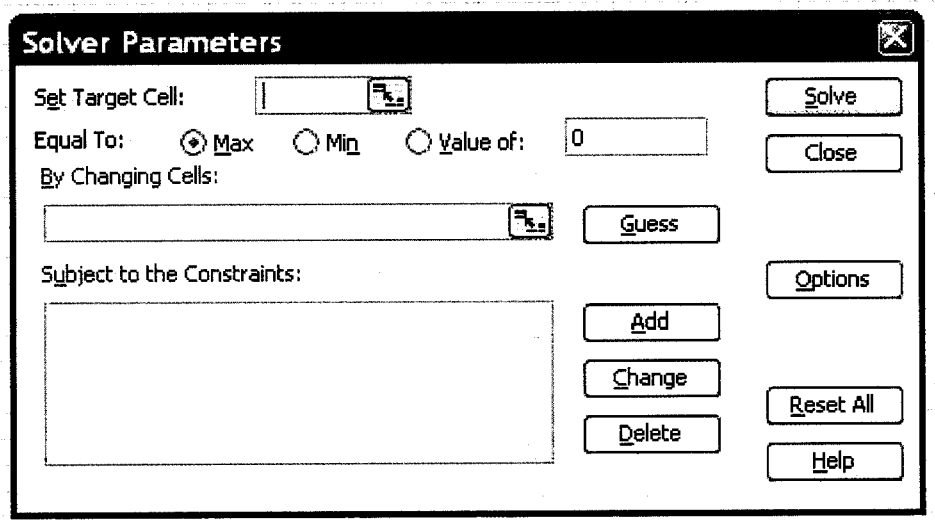
R-Square = 0,853

B. Decision

Revenue	R = p * y		
Cost	C = Cf + k*y+w	with	Cf = 8,00
Profit	Profit = R - C		k = 3,00

Calculation:

p	w	y	R	C	Profit
0,00	0,00	19,40	0,0	66,2	-66,2



2. Marketing Decision Making with Excel (10 Min.)

Mr. Otto wants to use the spreadsheet above also to find the price and advertising spending that maximize his profit.

a	Please write down the target function!
b	Please help Mr. Otto! Specify in the Solver window b1) the **target cell** (objective function) b2) the **target value** (Min or Max) b3) the **changing cells** (parameters to be estimated)
c	On which button in the solver window must Mr. Otto click to get his solution?
d	After clicking the correct button, alas Mr. Otto´s gets a degenerated solution. What can he do?

3. Advertising Decision without Excel (10 Min.)

After finding the optimum price and advertising budget with the help of Excel alas Mr. Otto´s PC breaks down. Mr. Otto can only remember the optimum price: $p^* = 6{,}61$.

By knowing this he can simplify his demand function to:

$$\hat{Y} = 6{,}18 + 0{,}50 \cdot \sqrt{W}$$

Mr. Otto remembers that in ancient times managers used to determine the optimum advertising budget without a computer by use of an obscure method called "differential calculus". Alas he does not know how this method works. Please help him!

a	Determine the optimum advertising budget w*! Given: Demand $y = 6{,}18 + 0{,}50 \cdot \sqrt{w}$, Price $p^* = 6{,}61$, Cost $C = C_f + k \cdot y = 8{,}0 + 3{,}0y$
b	How will w* change, if Mr. Otto rises his price to p = 7,00? Give the value of w*!
c	How will Mr. Otto´s profit change, if he rises his price to p = 7,00? Will it rise, shrink or stay equal?
d	How will p* change, if Mr. Otto spends more for than w* for advertising? Will it rise, shrink or stay equal?

4. Dynamic Advertising Models (10 Min.)

The MMM company estimated the following advertising response function:

$$y_t = 2000 + 500 \cdot \ln(w_t) + 0{,}6 \cdot y_{t-1}$$

with y_t = sales in period t

w_t = advertising spending in period t

Aassume: p = 5 price per unit

k = 3 variable cost per unit

a	Which type of model is used here?
b	What is the optimal advertising budget, if you take a short term perspective?
c	What is the optimal advertising budget, if you take a long term perspective?
d	Explain the "flat maximum principle" for advertising decisions! Which conclusions can you draw from it?

5. Methodology (10 Min.)

The empirical application of mathematical models requires calibration, i.e. fitting to reality by estimation of the model parameters on the basis of empirical data.

a	Which estimation methods (principles) can be used for the calibration (estimation) of models?
b	Statistical estimation requires always the optimization of a certain criterion. Name methods that can be used for **optimization**?
c	For estimation it is important to distinguish between linearity in variables (regressors) and linearity in parameters. Which type of **linearity** is required for the application of linear regression analysis?
d	Try to **linearize** the following function for estimation by linear regression! $Y = \alpha \cdot X_1^{\beta_1} \cdot X_2^{\beta_2} \cdot u$
e	Try to **linearize** the following function for estimation by linear regression! $Y = 1 - \alpha \cdot e^{-\beta \cdot X} + u$

6. Linear Regression Analysis with SPSS (10 Min.)

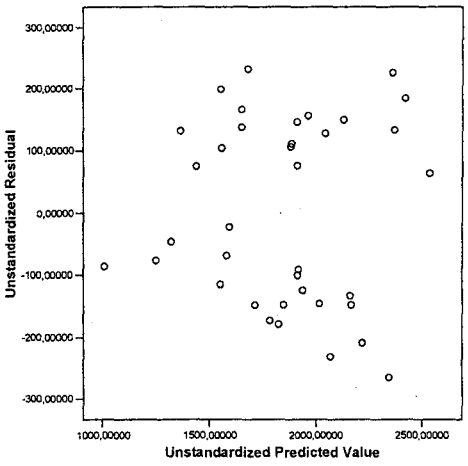
The SPSS-Output below is given.

ANOVA(b)

Model		Sum of Squares
1	Regression	4395065
	Residual	796097
	Total	5191162

a Predictors: (Constant), visits, price, promotion
b Dependent Variable: sales

Durbin/Watson Statistic
2,020



Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	764	223,946		3,410	,002		
	price	-45,18	16,102	-,191	-2,806	,008	,998	1,002
	promotion	1,12	0,102	,753	10,925	,000	,978	1,023
	visits	9,70	1,658	,404	5,854	,000	,976	1,024

a Dependent Variable: sales

a	Write down the **estimated function**!
b	Judge the global **goodness of fit** of this function by computing R^2!
c	Judge the **importance** of variables (regressors) and **significance** of their coefficients!

d	Check the multiple regression model with respect to **multicollinearity**! What does VIF mean?
e	Interpret the **Durbin/Watson Statistic**!

Good Luck!