



FINAL ASSESSMENT 2016

Course: Honours in Economics and Econometrics

Subject: Advanced Microeconomics (EKN 01X7)
Microeconomics 4 (MIE 8X01 and EKN 4801)

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THIS PAPER CONSISTS OF 5 PAGES

Question 1: Game theory**[20]**

- 1.1 Top Golf and Golf Galore are the two market leaders in the golf equipment industry. The main selling activities of the two firms are golf club equipment (golf clubs & golf bags) and non-golf equipment products (golf gear & soft golf equipment). Analysts are of the opinion that no gains are possible if both firms increase their activities in the same sector (golf club equipment and non-golf equipment products). Top Golf should gain 8% of the market share and Golf Galore should gain 5% of the market share if Top Golf expand its golf club equipment activities and Golf Galore at the same time expands its non-golf equipment products. On the other hand, Top Golf should gain 6% of the market share and Golf Galore should gain 4% of the market share if Top Golf expand its non-golf equipment products and at the same time Golf Galore expands its golf equipment products.

State the conditional format of the strategies (in tabular format), plot the sequential payoff matrix (in tabular format), determine the formal Nash equilibria and determine the sub-game perfect equilibrium (illustrate with the aid of a diagram). (12)

- 1.2 Assume that the competition for certain product lines between these two firms is so strong that it can be described as a zero gain situation. Top Golf has decided to concentrate its activities on the selling of golf clubs & golf bags while Golf Galore has decided to concentrate its activities on golf gear & soft golf equipment. Top Golf preferred option is golf clubs while Golf Galore's preference is to expand its golf gear activities. The payoff matrix is as follow:

			Golf Galore	
		Golf gear		Soft golf equipment
	Golf clubs	+R25m / -R25m		+R15m / -R15m
Top Golf				
	Golf bags	+R22m / -R22m		+R18m / -R18m

Determine the Nash equilibrium probabilities of Top Golf opting for golf clubs (**gc**) and Golf Galore opting for golf gear (**gg**).

What would the success rates be for the companies at Nash equilibrium? (8)

- 1.3 The management of Top Golf must determine whether to expand its golf clubs product line or to expand its golf bags product line. From market studies management constructed the following payoff matrix of the present value of all future net profits under different time frames:

Golf clubs			Golf bags	
Time frame	Probability	Profit	Probability	Profit
1 year	0.4	R18m	0.3	R16m
2 years	0.2	R20m	0.3	R18m
3 years	0.4	R24m	0.4	R20m

The manager's utility for the money function is:

$$U = 5M - 0.02M^2 \text{ (Where M refers to rand).}$$

- 1) Is the managerial team risk seeking, risk neutral or a risk averse?
- 2) If the managerial teams' objective was profit maximisation regardless of risk, which sales activity should it introduce?
- 3) If the managerial teams' objective was utility maximisation, which sales activity should it introduce?
- 4) Assume i) that the present value cost outlay of the new golf club equipment is R8m ii) the discount rate is 10% and the certainty-equivalent coefficient is 0.85. Use the valuation model to indicate whether Top Golf should continue with its golf club sales expansion program (explain your answer).
- 5) Assume that the present value cost outlay of the extension of the golf bag sales activity is R6m. Use the maximin and minimax regret criteria to determine whether Top Golf should proceed with its sales expansion program.

(14)

1.4 Top Golf is requesting you to perform an economic impact study (specifically on indirect and combined income generating and job creation aspects) on its expansion of its golf clubs product line country-wide. The following information is given to you. You are provided with the attached input-output tables.

- **The present values per product/service category**

Product/service category	PV of forecasted sales
Golf clubs	R22 000 000

Compile a brief report for management.

(6)

Question 2: Demand analysis

[40]

2.1 Market research clearly indicates that the consumer demand for a set of golf clubs is determined by the average price of a set of golf clubs, the average prices of the other golf equipment (golf bag, soft golf equipment, golf gear), the average cost of other sport activities, the amount spend on advertising, the density of golf courses in a particular area & the monthly disposable income of households in the particular area where a Top Golf shop is situated.

The following demand function for the golf clubs market of Top Golf was estimated. A sample period of 20 quarters was used (2011:1 - 2015:4).

The following table contains i) the parameter estimates ii) the standard errors and iii) the R^2 .

Demand function

R^2 : 0.82

Variable	Estimate	Standard error
Intercept	36.42	3.85
$P_{\text{average set of golf clubs}}$	-2.20	3.12
$P_{\text{average price of golf gear}}$	-10.14	2.05
$P_{\text{average price of a golf bag}}$	-12.25	3.22
$P_{\text{average price of a soft golf equipment}}$	-6.76	1.24
$P_{\text{average price of other sport activities}}$	6.42	2.33
Marketing expenses	2.46	5.62
Density of golf courses in a particular area	14.88	4.04
Disposable income of households	2.42	2.05

($P_{\text{average price set of golf clubs}}$; $P_{\text{average price golf bag}}$; $P_{\text{average price of golf gear}}$; $P_{\text{average price of a soft golf equipment}}$ and $P_{\text{average price of other sport activities}}$ are expressed in thousands of rand, marketing expenses are expressed in tens of thousands of rand, the density of golf courses in a particular area is expressed as a density index (the more golf courses in a particular

area the greater the index) and the disposable income of households in tens of thousands of rand. Consensus forecasts for the different variables for 2016:1 are listed in the following table.

Variable	2016:1
P _{average set of golf clubs}	R11 500
P _{average price of golf gear}	R 1500
P _{average price of a golf bag}	R 1200
P _{average price of a soft golf equipment}	R 500
P _{average price of other sport activities}	R650
Marketing expenses	R50 000
Density of golf courses in a particular area	0.35
Disposable income of households in a particular area	R44 800

- Are the estimates of the variables statistically significant?
- Use the forecasted values of the first quarter and determine the elasticity coefficients of the demand function. How would you explain the degree of sensitivity of each elasticity coefficient?
- Assume the following scenario for quarter 2. The price of a set of golf clubs increases with ½%; the average price of golf gear and a golf bag is estimated to increase with 1%; the average price of soft golf equipment is expected to decrease by 2% due to an improvement in the exchange rate; the price of other sport activities is expected to increase by 1%; marketing expenses is expected to increase by ½%; the density of golf courses index is expected to increase to 0.40; due to higher inflation and an increase in personal tax rates disposable income of households is expected to decrease by 1%. Estimate sales of golf clubs for the 2nd quarter.
- Assume that the aim of the firm is to maximise its revenue position. What should the price per set of golf clubs be in quarter 1? (18)

2.2 Top Golf needs advice on the setting of a profit-optimal price for its higher-end golf gear market. The current average market price is R2500 per total outfit. The variable cost is R400 per total outfit. The estimated quarterly demand for its product is: (8)

$$Q = 60\,000 + 1000P^{GM} - 12P^{GT}$$

(where P^{GM} = average price per outfit in the market and P^{GT} = average price per outfit that Top Golf charges)

2.3 Top Golf has estimated a multiplicative demand function for its soft golf equipment.

$$Q_p = 4.2P_o^{-0.54}P_{COMP}^{0.87}A^{1.5}P_{golf\ clubs}^{-3.43}Inc^{5.02}$$

(where Q_p = quantity, P_o = own price, P_{COMP} = average price of competitors, A = advertising expenses, $P_{GOLF CLUBS}$ = average price per set of golf clubs and Inc = disposable income of households)

Advice Top Golf on the interpretation of estimated function. (6)

2.4 Assume the following estimated trend forecast equation for golf bags sold by Top Golf.

$$Q_{GB} = 12.03(1.03)^t$$

The sample period for the estimated function was 2011:1 – 2015:4. Do a trend forecast for the four quarters of 2016.

In order to cater for any seasonal variation dummy variables were introduced for each quarter. The estimated function after the introduction of these dummy variables is:

$$S_T = 260.45 - 24.25D_{1T} - 8.58D_{2T} + 10.65D_{3T} + 23.65D_{4T} + 0.03t$$

(where D_{1T} is the dummy variable for the 1st quarter, D_{2T} is the dummy variable for the 2nd quarter, D_{3T} is the dummy variable for the 3rd quarter and D_{4T} is the dummy variable for the 4th quarter)

Adjust the trend forecast for seasonal variation. (8)

Question 3: Production & cost analysis**[20]****3.1** Derive the Cobb-Douglas efficiency criteria.**(5)**

3.2 Top Golf is concerned about the returns to scale, optimality of its input mix and its cost efficiency. A Cobb-Douglas estimation as well as cost estimations were done for a twenty quarter period. The following estimation results apply:

Dependent variable: Log Q**R²: 0.88**

Variable	Estimate	Standard error
Intercept	-3.2	0.56
Log K	0.52	0.02
Log L	0.38	0.01

Variance-covariance matrix

	Intercept	LogK	LogL
Intercept	0.030	-0.002	0.009
Log K	-0.002	0.0025	-0.001
Log L	0.005	-0.001	0.0009

The average values for output and input usage (all in thousands of units) are:

Q	32
K	82
L	4.5
r (price of capital)	0.32
w (price of labour)	71

Dependent variable: Log(TC/r)**R²: 0.71**

Variable	Parameter estimate	Standard error
Intercept	-0.42	0.02
LogQ	1.22	0.08
Log(w/r)	1.11	0.30

You have to advice Top Golf on i) the statistical significance of the estimates ii) the returns to scale position iii) the optimality of the input mix and iv) the long-run cost efficiency.

(10)

3.3 Top Golf has a capacity constraint in its soft golf equipment division. Individual store space allocated to the combined sales of golf balls (product GB) and golf gloves (product GG) cannot exceed 12m². Assume that the estimated profit function for the soft golf equipment section per store is:

$$\Pi = 70GB - 2GB^2 - (GB)(GG) - 4GG^2 + 90GG$$

Apply the Lagrangian multiplier in order to determine the impact on the profits of soft golf equipment per store if store space increases by 1m².

(5)