

HEVAL5120 - Modelling in Economic Evaluation I

Home exam 24th May 2022

8 hours (10:00-18:00)

(Exam consists of 6 pages, including title page)

Read all information carefully

1. Each student will submit two files on Inspera: 1 excel file and 1 word file
 - a. The excel file is to document your work for **QUESTIONS part 1 and part 2**, the word file is to record and describe your complete answers, and state any additional assumptions you made. Please paste relevant tables and figures from excel to the Word document so all answer are comprehensive in the Word document. All figures should be labeled accurately and completely (e.g., axis titles, units, currency).
 - b. Use the provided excel file to document work that labels worksheets using a prefix of 'Q1_1' for all worksheets related to Question 1 part 1, and 'Q1_2' for Question 1 part 2. Add additional worksheets with unique names using these prefixes as needed.
2. Only CANDIDATE NUMBERS on the two submitted file names: candidateNO_Excel; candidateNO_Word, for example: *123456_Excel.xlsm* and *123456_Word.doc*
3. KEEP A COPY OF THE FINAL FILES ON YOUR PERSONAL COMPUTER FOR BACKUP— and do not open these files after they have been submitted--they are time-stamped and if there are any issues with the submitted files, there will be a possibility to check the time stamp if you need to resubmit them.
4. Clarifying questions can be emailed directly to eline.aas@medisin.uio.no .
5. Please check your e-mail and canvas during the exam – in case there is a need to clarify some details in the exam, these will be communicated via canvas (announcements/kunngjøringer and e-mails).

THE BEST OF LUCK!

Questions 1

This exam is about patient with dementia. Read the template carefully, both project information, graphical presentation of the model and description of the parameters.

Guidance introduction:

It is a bonus if the students have an introduction to the exam, by introducing the decision problem and describe the model.

PART I - 65%

In this home exam you will evaluate new treatment options for patients with dementia. Over the last decades there has been few new treatment options, but now there are two new alternatives that are expected to delay progression and reduce mortality.

In PART I, you are going to evaluate and compare all three treatment options

- Standard of care
- Monotherapy (MONO)
- Combination therapy (COMB)

All individuals with dementia starts **in Stage 1 in Cycle 0**

Look at the model to understand the movements in the model

Outcomes are measured in **life-years**

Each cycle is 1 year

Time-horizon is 32 years (age 68 at inclusion)

Costs:

Treatment

Health care is offered in all stages (A to C), where cost per cycle are:

Standard of care £1000

Monotherapy £4670

Combination therapy £8250

Travel costs:

Part of the treatment is follow-up visits, requiring travel cost for the patient. The travel cost vary according to strategy.

Standard of care

12 travels to GP per cycle

20 kilometer per visit (return)

Unit cost per kilometer £0.5

Monotherapy

6 travels to outpatient clinic per cycle

60 kilometer per visit (return)

Unit cost per kilometer £0.5

Combination therapy

12 travels to outpatient clinic per cycle

60 kilometer per visit (return)

Unit cost per kilometer £0.5

Informal care:

Care for patient with dementia is often include substantial informal care. Informal care depend on severiy of the health condition (Stage 1 to 3)

Stage 1

2 hours per week

£20 per hour (gross wage rate)

Stage 2

4 hours per week

£20 per hour (gross wage rate)

Stage 3

7 hours per week

£20 per hour (gross wage rate)

You are going to build the model based on the information in the parameter sheet – only deterministic analysis are required in PART I.

All alternatives should be compared simultaneously – deterministic analysis

- a) Define variables

COMMENT:

Define relative risk.

Check if the estimation of unit costs are defined correctly.

Understand difference between healthcare and social perspective

Use of IF-statement

- b) Finish the Markov model for the three strategies and link the results to the analysis sheet.

Markov traces and coding in excel

Understand difference between healthcare and social perspective

Control that the check-column sum up to 1

- c) When comparing all three alternatives (from lowest to highest cost), from a healthcare perspective, and a threshold value of £30 000 per LY gained, what is your recommendation with regard to recommended treatment option (deterministic analysis)?

Compare all three alternatives, as organized in the excel sheet

Definition of the ICER and threshold

The recommendation is that Combination therapy is recommended as the ICER falls below the threshold

Accepted to compare to standard of care. When compared to standard of care, recommend both treatments.

Generally, it is a bonus if the students comment that this is a recommendation when uncertainty is not accounted for.

Cost effectiveness of drug treatment for patients with dementia					
Healthcare perspective					
Undiscounted and half-cycle corrected results					
Strategy	Cost	LY	INCR COST	INCR LY	ICER
Standard Care	£10 878	10.9			
Monotherapy	£73 257	15.7	£62 380	4.81	£12 971
Combination therapy	£160 002	19.4	£86 745	3.71	£23 398
Discounted and half-cycle corrected results					
Strategy	Cost	LY	INCR COST	INCR LY	ICER
Standard Care	£8 357	8.36			
Monotherapy	£52 016	11.14	£43 659	2.78	£15 696
Combination therapy	£108 361	13.13	£56 346	2.00	£28 222

- d) Does your recommendations change if you in addition to healthcare costs include societal costs (threshold of £30 000)? Discuss the findings.

Important to clarify the content of the societal perspective.

Including the societal costs, changes the recommendation to Monotherapy

Description of the findings and interpretation of the change in ICER between the perspectives is valued.

Total costs (health care and societal)					
Undiscounted and half-cycle corrected results					
Strategy	Cost	LY	INCR COST	INCR LY	ICER
Standard Care	£47 942	10.9			
Monotherapy	£129 935	15.7	£81 992	4.81	£17 049
Combination therapy	£235 981	19.4	£106 047	3.71	£28 604
Discounted and half-cycle corrected results					
Strategy	Cost	LY	INCR COST	INCR LY	ICER
Standard Care	£35 551	8.36			
Monotherapy	£89 928	11.14	£54 377	2.78	£19 550
Combination therapy	£156 590	13.13	£66 662	2.00	£33 389

- e) Create a two-way sensitivity analysis rrMONO and rrDeath_M, when comparing to standard of care (vary rrMONO from 0.3 to 0.95 and rrDeath_M from 0.60 to 0.99. Interpret the findings. (**to reset the parameters before proceeding**)

Important here is to describe the findings and what is the driver for increasing/decreasing ICER. Lower values of relative risk increases the benefit of treatment – increased incremental benefit, but also higher treatment costs. If the analysis is conducted from the societal perspective, delayed progression reduces informal care. The dominating part is the effect on LY.

- f) Create a two-way sensitivity analysis combining the cost of combination treatment from £4000 to £10 000 with the rrCOMB from 0.500 to 0.950. Report the ICER for the comparison between MONO and COMB. Interpret the findings. (**remember to reset the parameters before proceeding**)

Similar argument as e

Part II - 35%

PSA – analysis

Prepare the parameters for a PSA analysis.

In the PSA analysis, you will only evaluate MONO therapy and Combination therapy.

Assign distributions to the relative risks and costs (not transition probabilities)

You may need the following formula for the gamma distribution:

$$\text{Alpha} = \text{mean}^2 / \text{st.error}^2$$

$$\text{Beta} = \text{st.error}^2 / \text{mean}$$

Only distributions to rr and costs

Beta to rr and gamma to costs.

- g) Compare the ICER from the deterministic analysis with the average ICER from the PSA? Discuss briefly.

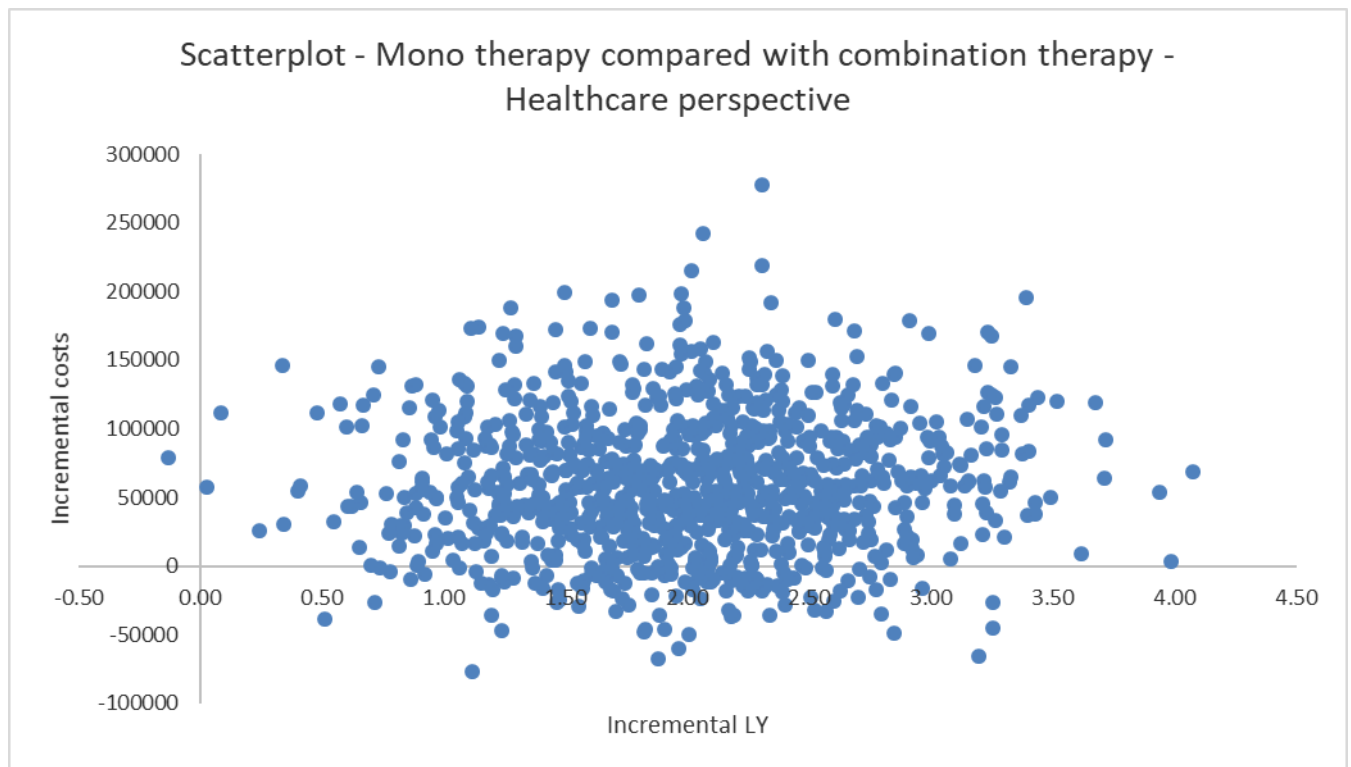
Quite similar findings, but not the same due to non-linear models and skewed distributions.

- h) Present the simulated ICERs in the cost-effectiveness plane (scatterplot of the incremental costs and incremental QALYs). In what quadrants of the cost-effectiveness scatterplot are the simulated ICERs, and what is your interpretation?

Explain the scatterplot

Dominated by scatters in the NE quadrant, but some in the SE.

Bonus if the students used the count if function

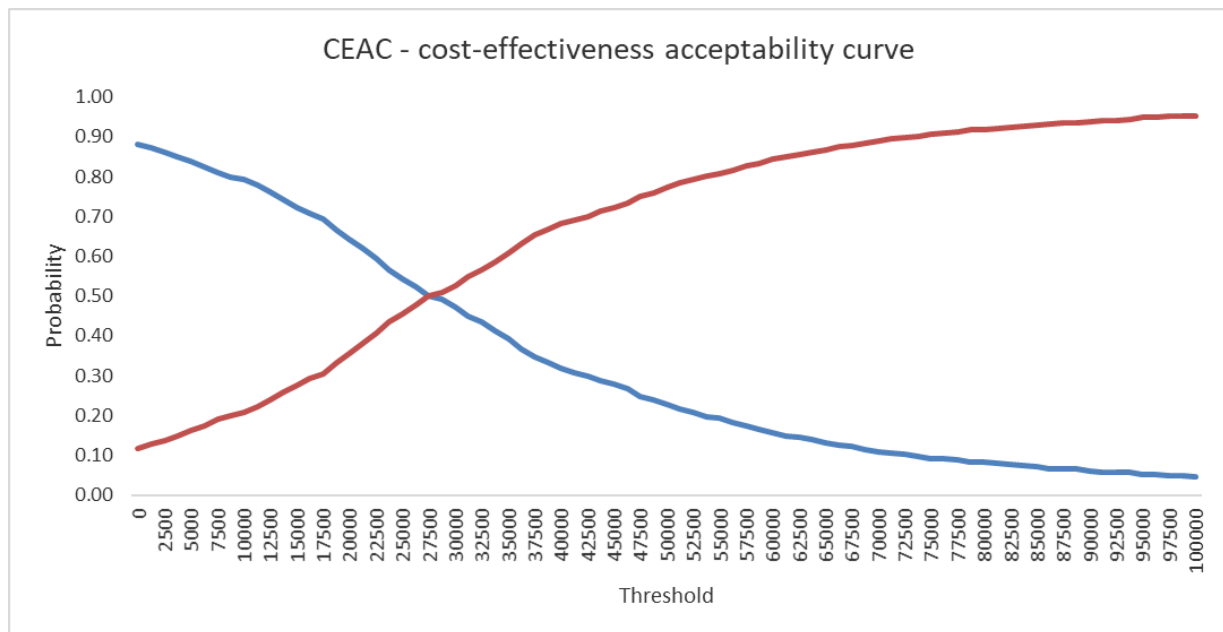


i) Calculate the CEAC and create a graph. Explain the shapes of the curves

Define the CEAC

Explain the shapes of the curves (starting point and convergence). Relate the curves to the scatterplot.

Design of the curve is also valued



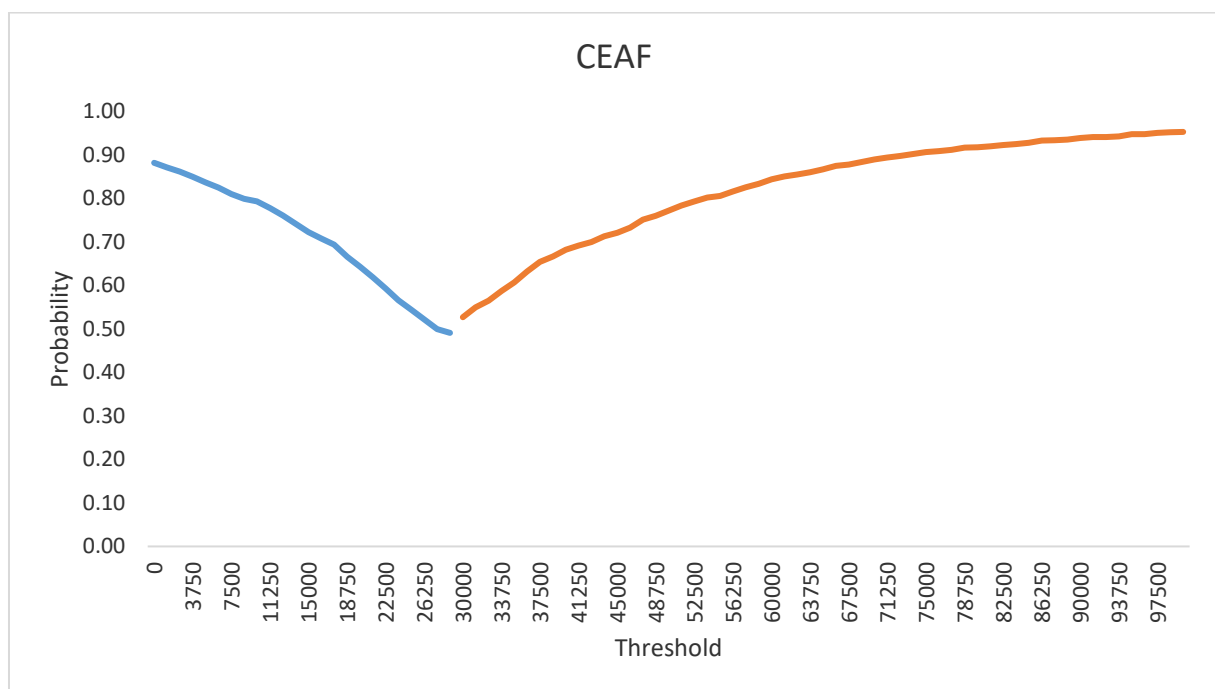
j) Calculate the CEAF and create a graph. Compare the CEAF with the CEAC.

Definition of CEAF and why it can deviate from CEAC.

In this case, the CEAF is not “identical” as the CEAC. Monotherapy is the preferred option even though the CEAC shows a probability of 0.47 (health care perspective).

If the candidate applied the societal perspective, that is OK:

CEAF is the decision tool



- k) Given a willingness-to-pay threshold of £30 000 per LY gained, what is the probability that Combination therapy is cost-effective compared to do nothing?
Would you recommend Combination therapy as an alternative strategy to do nothing?

Read off the CEAF

- l) Does the conclusion in i) change if the threshold is £10000 or £100 000?

Read off the CEAF and explain the findings.

Macro code

```
Sub Simulation()
```

```
,
```

```
' Simulation Macro
```

```
,
```

```
,
```

```
Sheets("Parameters").Select
```

```
Range("E4").Select
```

```
ActiveCell.FormulaR1C1 = "1"
```

```
Application.DisplayStatusBar = True
```

```
Index = 0
```

```
Trials = 1000
```

```
Do
```

```
Sheets("Simulation").Select
```

```
Range("B10:E10").Select
```

```
Selection.Copy
Range("B11:E11").Select
ActiveCell.Offset(Index, 0).Range("A1").Select
Selection.PasteSpecial Paste:=xlPasteValues, Operation:=xlNone, SkipBlanks _
    :=False, Transpose:=False
Application.CutCopyMode = False
```

```
Index = Index + 1
```

```
Application.StatusBar = "Simulation " & Index & " of 1000 trials"
```

```
Loop While Index < Trials
    Sheets("Parameters").Select
    Range("E4").Select
    ActiveCell.FormulaR1C1 = "0"
```

```
End Sub
```