

# Session 7: Hands-on Exercises (Decision Modeling)

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Summer School on “*Modeling and Decision Making Using Bayesian Statistics*”  
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## Course schedule

Day 1 Monday

**Session 1: Introduction to Bayesian inference**

**Session 2: Bayesian networks**

**Session 3: Building Bayesian networks**

**Session 4: Hands-on exercises (Bayesian networks)**

Day 2 Tuesday

**Session 5: Learning Bayesian networks and causal discovery**

**Session 6: Decision theory and decision analysis**

**Session 7: Hands-on exercises (learning)**

**Session 8: Hands-on exercises (decision modeling)**

## Session overview

### Three exercises:

1. Solving of a (discrete) influence diagram.
2. Sensitivity analysis
3. Value of information.
4. Utility.

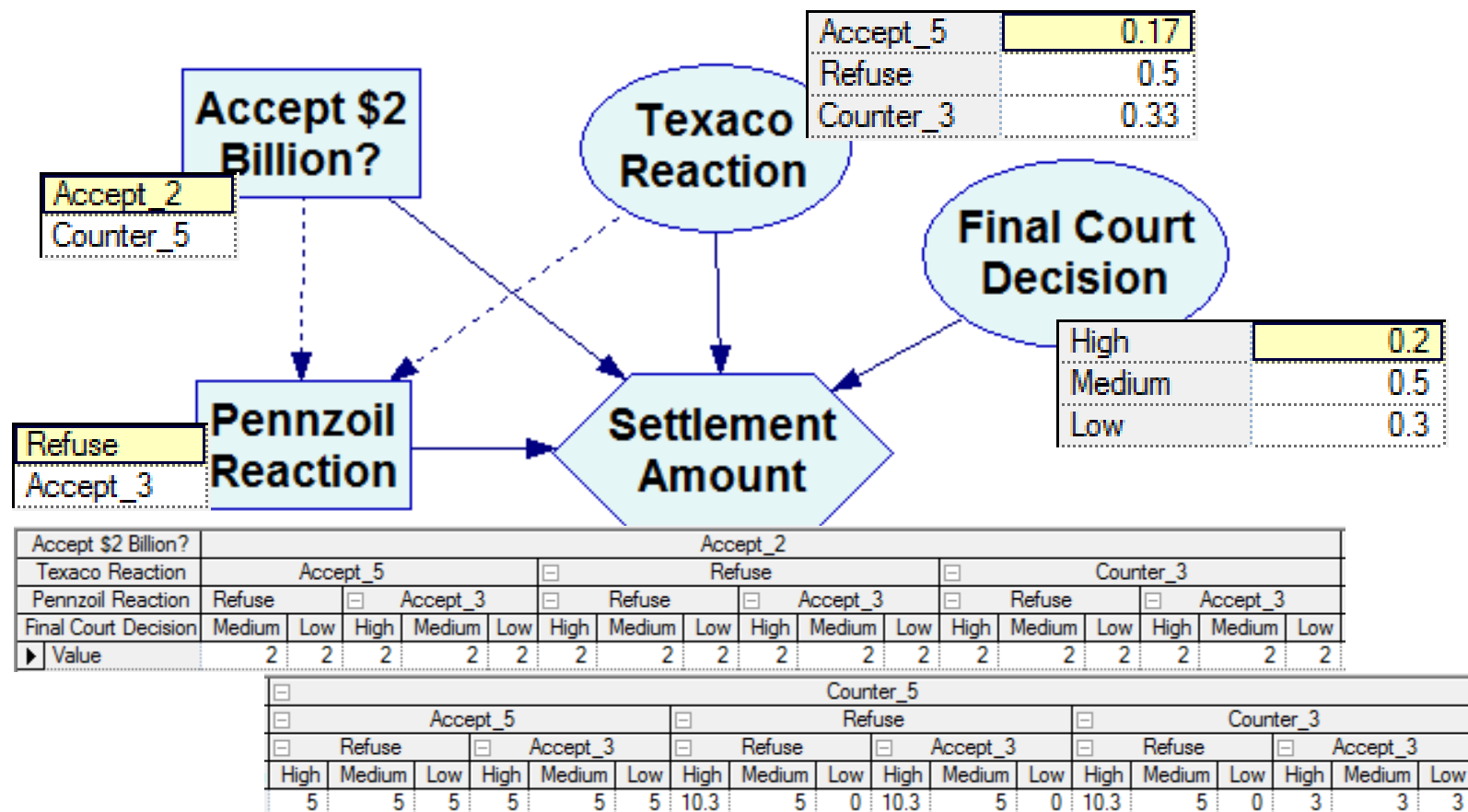
- This is group work (ideally pairs of participants).
- Individual work is possible, although discouraged (you typically learn more when working in a small group).
- I will be there to help you (raise your questions – they may be of interest to everybody).

## What I want you to know after this session?

- Know how to solve influence diagrams in *GeNIe*.
- Know how to perform decision-analytic sensitivity analysis
- Know how to perform decision-analytic Value of Information computation.
- Understand the role of risk attitudes on decisions

# Exercise 1

Create the following influence diagram in *GeNIe*:



Based on Clemen "Making Hard Decisions." Duxbury  
Thomson Learning, Belmont, California, 2001

## Exercise 2

Check sensitivity of the decision to the probability of the high outcome of the final court decision (currently 0.2) over the range 0.1-0.3.

## Exercise 3

What is the VOI for the decision maker (Pennzoil) of Texaco's reaction to its counter-offer of \$5B?

Timing of the information may be of importance.

- (a) What is the VOI of final court decision before Pennzoil makes its first decision (i.e., accept \$2B or counteroffer \$5B)?
- (b) What is the VOI of final court decision after Pennzoil makes its first decision but before a possible the second decision (i.e., accept \$3B counteroffer from Texaco)?

EVI in (b) should be lower than in (a). Why? If it does not come out lower, please check your calculations 😊.

## Exercise 4

Let Pennzoil's utility function over money be specified in the following table:

Final outcome (\$B)	Utility
10.3	1.00
5.0	0.75
3.0	0.60
2.0	0.45
0.0	0.00

- (a) What would be Pennzoil's risk attitude given the above utility function?
- (b) Solve the influence diagram using the above utility function (replace the final amounts with the utility values from the above table). What strategy would you recommend? Is the optimal strategy the same?

