Risk appetite
Reaching for the frontier

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1 Game, rules and players

Dutch risk professionals (n=56) participated in a game. They were given a matrix containing 25 risks and a budget that could either be spent on risk mitigation or be used as a buffer to protect against losses. To stimulate participants to employ a variety of strategies, separate groups were exposed to two incentive conditions:

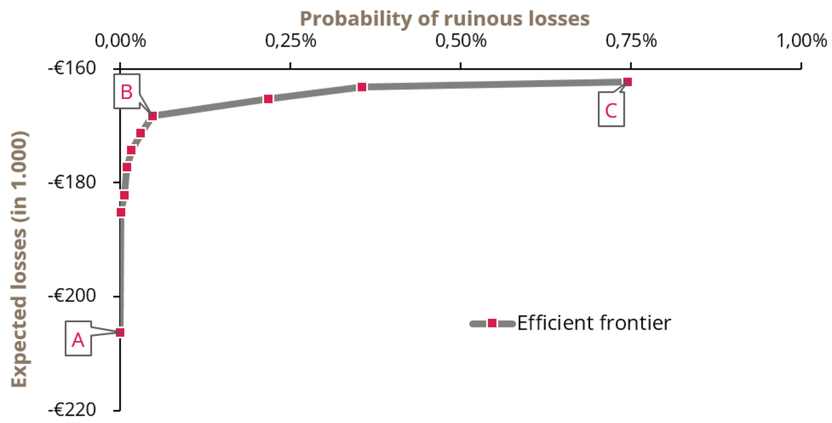
- A fixed fee condition that stimulates participants to act risk averse, avoid a ruinous loss and survive the game.
- A variable fee condition that stimulates participants both to avoid a ruinous loss and to minimize expenditures on risk reduction.

Contrary to our expectations, these conditions made no difference!

Activity of participants	
Financial services	32
Industry and energy	11
Health and welfare	3
Hospitality	3
Transport	3
Construction	2
International Trade	2

2 Monte Carlo simulation

Monte Carlo simulation was used to calculate probabilities of ruin and expected losses (including mitigation costs) of different strategies. Optimal strategies were located on an efficient frontier (see graph).



A

Probability					
80%	x	4x	←		
40%	x	4x			
20%	x	4x	←		
10%	x	4x			
5%	x	x	3x		
	€5	€10	€20	€40	€80
	Outcome (x -1.000)				

B

Probability					
80%	x	4x	←		
40%	x	x	3x		
20%	x	x	3x	←	
10%	x	x	x	2x	
5%	x	x	x	2x	
	€5	€10	€20	€40	€80
	Outcome (x -1.000)				

C

Probability					
80%	x	4x	←		
40%	x	x	3x	←	
20%	x	x	x	2x	
10%	x	x	x	x	x
5%	x	x	x	x	x
	€5	€10	€20	€40	€80
	Outcome (x -1.000)				

3 Median result

The median response of participants was to move risks out of the 6 cells in the upper right triangle.

Probability					
80%	x	x			
40%	x	x	2x		
20%	x	x	x	2x	
10%	x	x	x	x	x
5%	x	x	x	x	x
	€5	€10	€20	€40	€80
	Outcome (x -1.000)				

4 Finding #1

The median and mode (n=15) response correspond with expected value (EV) calculation. Here the cost of risk reduction (e.g. €5) is lower than the gain in terms of reductions in expected losses (e.g. from €80 to €40 at 20% probability, i.e. €8).

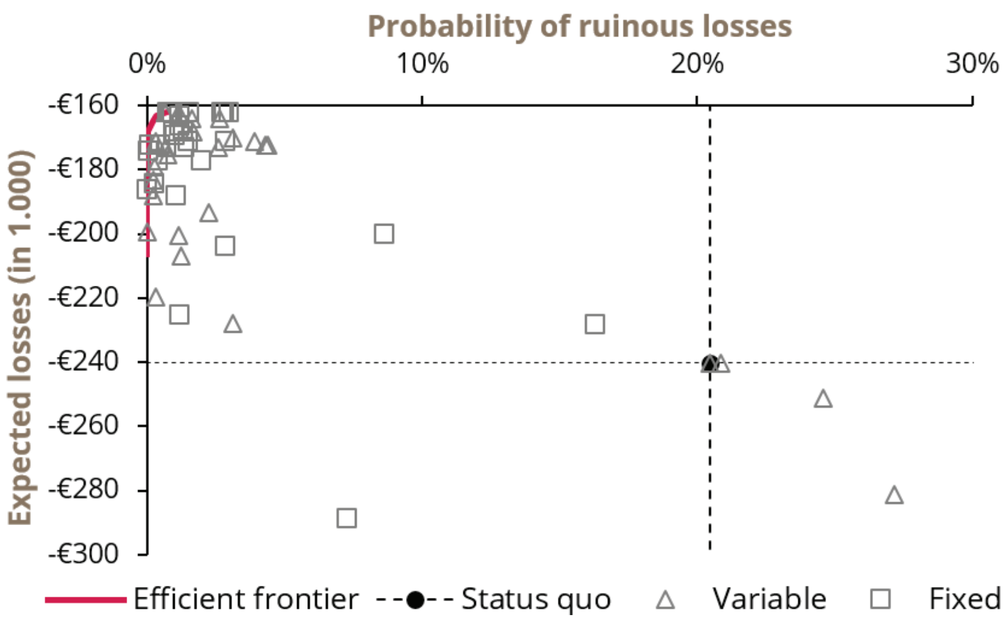
5 Finding #2

The optimum response, moving risks to the left (see ← in 2), was chosen by 12.

Four strategies used to move risks	
Risk averse	To the left – Reduce impact (12)
Risk seeking	Downward – Reduce probability (6)
Mixture	Reduce impact and probability (36)
Status quo	Do nothing (2)

6 Finding #3

The graph shows the probability of ruinous losses and expected losses for each participants strategy. Six participants played strategy C (see 2). They were the only participants who reached the efficient frontier.



7 Conclusions & Take away

Conclusion

11% of risk professionals found optima by using

- a risk neutral strategy to choose which risks to mitigate,
- impact reduction, a risk averse strategy to reduce risk.

No participants found other optima along the frontier.

Take away

- Along the efficient frontier, a higher expected loss can be traded for a lower probability of ruin.
- Reducing impact lowers probability of ruin.

Recommendations

- Apply Monte Carlo simulation to your risk matrix.
- Assess how your strategy effects probability of ruin.

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