Assignment 2

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Contents

1 Simulation

1.1 a)

	Own business										Steady job				
	Year1	Year 1 total	Year2	Year2 total	Year3	Year3 total	Year4	Year4 total	Year5	Year5 total	Year1	Year2	Year3	Year4	Year5
Can not cover expensives		4 %		8 %		11 %		15 %		20 %	0 %	0 %	0 %	0 %	0 %
Average income		17 741		19 236		19 461		19 485		18 541	7 528	7 748	7 563	7 402	7 536
1	36 587	15 111	48 984	26 774	29 322	8 178	30 771	7 492	31 748	9 461	5 010	6 783	7 460	6 864	9 816
2	30 692	6 011	36 958	14 314	24 811	3 338	22 994	-1 064	13 074	-9 335	5 157	9 192	7 997	9 823	6 880
3	38 468	16 584	32 253	10 334	37 742	15 201	40 470	16 645	33 193	11 709	9 466	8 762	8 222	9 485	8 994
4	32 215	12 208	35 131	14 512	42 032	17 744	40 780	18 579	37 882	13 185	5 810	6 267	8 498	9 096	7 532
5	26 473	2 044	13 894	-10 253	-3 321	-26 612	-8 220	-29 931	-19 241	-42 459	6 152	5 189	7 396	8 128	7 934
6	53 857	30 798	63 557	42 555	61 534	38 028	63 648	39 368	64 831	43 809	7 226	7 220	9 032	5 698	6 506
7	49 641	27 903	54 971	34 083	67 017	44 949	80 162	56 928	68 098	47 137	5 686	8 242	9 359	8 725	6 629
8	27 352	4 839	35 635	15 398	41 180	16 736	38 949	14 667	26 484	3 830	9 167	5 369	8 049	7 615	6 140
9	46 697	23 034	27 803	6 852	46 209	25 238	60 452	39 082	59 094	36 155	8 092	5 060	6 045	6 686	6 701
10	50 698	27 413	51 089	29 599	68 425	47 194	68 523	44 638	82 517	59 534	8 184	8 938	6 352	6 474	8 910

Figure 1: Capion here

1.2 b)

Table 1: Average cash flow for fives years for both the steady job and own business ventures.

	Year 1	Year 2	Year 3	Year 4	Year 5
Steady job	7 528	7 748	7 563	7 402	7 536
Own business	17 741	19 236	19 461	19 485	18 541

Based on the simulations, it seems that starting a own business venture would for sure be the more lucrative, and better, option. However, an average over 200 replications might give us an overly optimistic outlook.

1.3 c)

We can see the probabilities from Table 2. We can see that initially the probability is approximately 5% and rises to approximately 20% in year 5. For the steady job, as the maximum of the expenses is less than the constant income, the probability that he is not able to cover his expenses is 0% for all years.

Table 2: Probability that Dr. Cuckoo cannot cover his expenses each year for both the steady job and own business ventures.

	Year 1	Year 2	Year 3	Year 4	Year 5
Steady job	0 %	0 %	0 %	0 %	0 %
Own business	4 %	8 %	11 %	15 %	20 %

2 Decision trees

3 Elicitation of utility functions

We start by calculating the different values for the utility functions. We normalize the utility function such that $u(10M) = 1$ and $u(-2M) = 0$. We can thus calculate:

$$u(1.5\text{M}) = 0.5u(10\text{M}) + 0.5u(-2\text{M}) \tag{1}$$
$$u(1.5\text{M}) = 0.5 \cdot 1 + 0.5 \cdot 0 \tag{2}$$
$$u(1.5\text{M}) = 0.5 \tag{3}$$
$$u(4\text{M}) = 0.5u(10\text{M}) + 0.5u(1.5\text{M}) \tag{4}$$
$$u(4\text{M}) = 0.5 \cdot 1 + 0.5 \cdot 0.5 \tag{5}$$
$$u(4\text{M}) = 0.75 \tag{6}$$
$$u(0.1\text{M}) = 0.5u(-2\text{M}) + 0.5u(1.5\text{M}) \tag{7}$$
$$u(0.1\text{M}) = 0.5 \cdot 0 + 0.5 \cdot 0.5 \tag{8}$$
$$u(0.1\text{M}) = 0.25 \tag{9}$$
$$u(6\text{M}) = 0.4u(10\text{M}) + 0.6u(4\text{M}) \tag{10}$$
$$u(6\text{M}) = 0.4 \cdot 1 + 0.6 \cdot 0.75 \tag{11}$$
$$u(6\text{M}) = 0.85 \tag{12}$$
$$\tag{13}$$

The plotted utility function can be seen in Figure 2. As we can see, the function is somewhat concave. According to EUT, Dr. Stoveo is, as he says, risk averse.

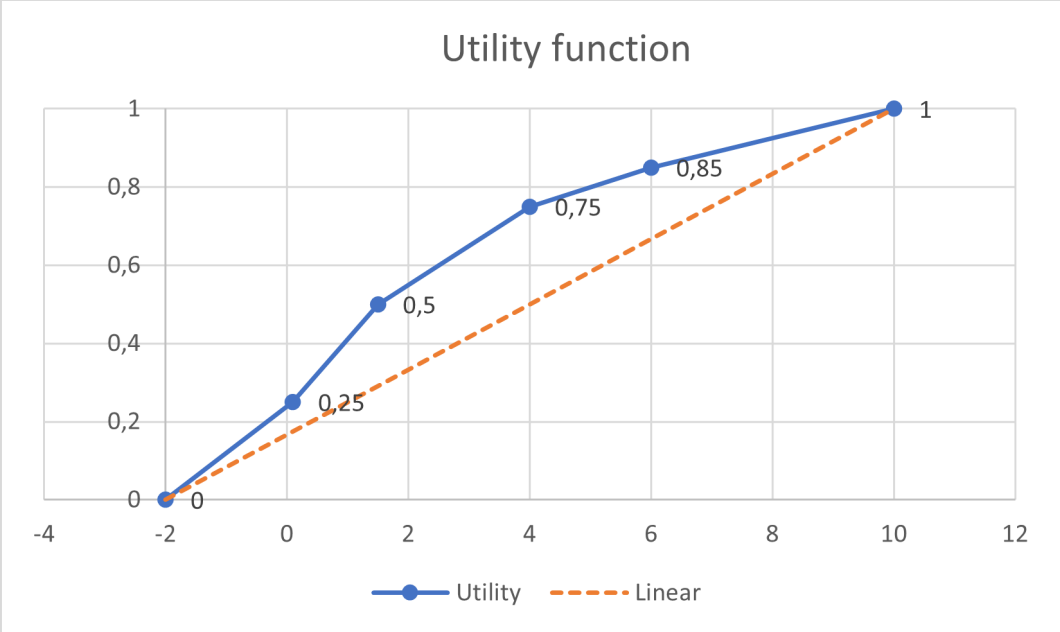

Figure 2: The plotted utility function based on Dr. Stoveos choices.

4 Expected utility, risk-attitude, and risk measures

4.1 a)

In order to find out what the investors risk attitude is, we will use first and second order derivaties.

$$\frac{d}{dx}\sqrt{x} = \frac{1}{2}x^{-\frac{1}{2}} \tag{14}$$

$$\frac{d^2}{dx^2}\sqrt{x} = -\frac{1}{4}x^{-\frac{3}{2}} \tag{15}$$

$$\frac{d}{dx}x^3 = 3x^2 \tag{16}$$

$$\frac{d^2}{dx^2}x^3 = 6x \tag{17}$$

From these we can see that Rick Averell's utility functions first order derivative is always positive and hence is the utility function increasing. The second order derivative is always negative the growth is decreasing. From this we can conclude that the function is concave and Rick Averell is risk averse. We can draw conclusions in the same way for Ricki Seeck. Since both order derivatives are positive, we know that the function is increasingly positive and thus convex. Mr. Seeck's utility function is thus risk seeking.

4.2 b)

4.2.1 i

We can calculate the expected utility as $E[u(X)] = \int f_x(x)u(x)dx$.

$$f_x(t) = \begin{cases} \frac{1}{50}, & 50 \leq x \leq 100 \\ 0, & \text{otherwise} \end{cases} \tag{18}$$

By integrating over the whole space we get,:

$$\int f_x(x)u(x)dt = \tag{19}$$

$$\int_{50}^{100} \frac{1}{50}u(x)dt \tag{20}$$

We count the expected utility for Rick Averell:

$$\int_{50}^{100} \frac{1}{50}\sqrt{x}dx = \tag{21}$$

$$\Big/_{50}^{100} \frac{1}{50}\frac{3}{2}x^{\frac{3}{2}} = \frac{3}{2}x^{\frac{3}{2}} = \tag{22}$$

$$\Big/_{50}^{100} \frac{3}{100}x^{\frac{3}{2}} \approx 8.62 \tag{23}$$

Using the same logic we calculate the expected utility for Ricki Seeck:

$$\int_{50}^{100} \frac{1}{50}x^3dx = 468750. \tag{24}$$

To summarize, the expected utilities are $E[u(X)]_{RickAverall} \approx 8.62$ and $E[u(X)]_{RickiSeeck} = 468750$

The certainty equivalent is calculated by $CE[x] = u^{-1}(E[u(X)])$. For Rick Averall this means

$$CE[x]_{RickAverall} = u^{-1}(E[u(X)]) = E[u(X)]^2_{RickAverall} \approx 74.3 \tag{25}$$

and for Ricki Seeck

$$CE[x]_{RickiSeeck} = u^{-1}(E[u(X)]) = \sqrt[3]{E[u(X)]_{RickiSeeck}} \approx 77.7. \tag{26}$$

The risk premia is calculated as $RP[X] = E[X] - CE[X]$. For Rick Averall this becomes:

$$E[u(X)]_{RickAverall} - CE[x]_{RickAverall} \approx -65.7, \tag{27}$$

and for Ricki Seeck:

$$E[u(X)]_{RickiSeeck} - CE[x]_{RickiSeeck} \approx 468672 \tag{28}$$