

# In-Class Practice

1 Sep 2022

## An angel investor

Assume that an angel investor has the following value function under Prospect theory:

$$v(x) = \begin{cases} x^{0.5} & , x \geq 0 \\ -\lambda(-x)^{0.5} & , x < 0 \end{cases}$$

Also assume that the probability weighting function is  $\pi(p) = p$ , that is the investor has the weighting of probability equal to the objective probability.

Consider three startups: SamSan Tech (SST), Syng, and Cazoo. Suppose that the profit levels and their related probabilities for each startup are as follow:

$$SST = (2089, 0.80; 1625, 0.20),$$

$$Syng = (2225, 0.70; 1625, 0.30),$$

$$Cazoo = (3116, 0.70; 996, 0.30)$$

[1.] Suppose that you are a consultant to this angel investor and you are trying to understand his risk preferences. A series of questions was earlier answered by this angel investor with his responses shown below. If the angel investor says he has the targeted profit of US\$1,000 as his reference point, rank the startups from the most to the least preferred from this angel's perspective based on Prospect theory. Explain and show your calculation in detail.

Would you accept the following bet?	The recorded answers:
A coin toss where:	
If tails, lose \$100, heads win \$150?	No
If tails, lose \$100, heads win \$160?	No
If tails, lose \$100, heads win \$170?	No
If tails, lose \$100, heads win \$180?	No
If tails, lose \$100, heads win \$190?	No
If tails, lose \$100, heads win \$200?	Yes
If tails, lose \$100, heads win \$210?	Yes
If tails, lose \$100, heads win \$220?	Yes
If tails, lose \$100, heads win \$230?	Yes
If tails, lose \$100, heads win \$240?	Yes
If tails, lose \$100, heads win \$250?	Yes
If tails, lose \$100, heads win \$260?	Yes

[2.] If the angel investor follows your advice **not to** be loss-averse, will the ordering change? If so, how ? and why ? If not, why not?

[1.] From the table :  $\lambda = \frac{\$200}{\$100} = 2$  (assume  $v(\cdot)$  is linear for elicitation of loss aversion)

$r = \$1000$

With the reference point, the three prospects can be coded to be:

$$SST = (1089, 0.8; 625, 0.2)$$

$$Syng = (1225, 0.7; 625, 0.3)$$

$$Cazoo = (2116, 0.7; -4, 0.3)$$

$$\begin{aligned} V(SST) &= 0.8 (1089)^{1/2} + 0.2 (625)^{1/2} \\ &= 0.8 \times 33^{26.4} + 0.2 \times 25^5 = 31.4 \end{aligned}$$

$$\begin{aligned} V(Syng) &= 0.7 (1225)^{1/2} + 0.3 (625)^{1/2} \\ &= 0.7 \times 35^{24.5} + 0.3 \times 25^{7.5} = 32 \end{aligned}$$

$$\begin{aligned} V(Cazoo) &= 0.7 (2116)^{1/2} - 2(0.3)(4)^{1/2} \\ &= 0.7 \times 46^{32.2} - 1.2 = 31 \end{aligned}$$

$\therefore Syng \succ SST \succ Cazoo$

[2.] IF  $\lambda = 1 \Rightarrow V(Cazoo) = 0.7(2116)^{1/2} - (0.3)(4)^{1/2}$   
 (assume that there is no loss aversion & no loss loving)  
 $= 32.2 - 0.6 = 31.6$

$\therefore Syng \succ Cazoo \succ SST$

because now 1 unit of loss is equally weighted as 1 unit of gain.