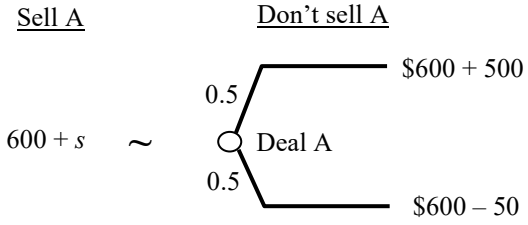
TIE4203 Decision Analysis
Solutions to Assignment #3

(*a*) Jenny's current Wealth = \$600 + Deal A:

Let s = Jenny's personal indifferent selling price for Deal A.



$u(600 + s) = 0.5\ u(600 + 500) + 0.5\ u(600 - 50)$
$u(600 + s) = 0.5\ u(1100) + 0.5\ u(550)$

Assume $s \geq -600$

$ln(601 + s) = 0.5(ln(1101) + ln(551))$
$(601 + s)^2 = 1101 \times 551$
$s =$ **\$ <u>177.88</u>**

(*b*) Given $u(w) = \begin{cases} \ln(1+w) & w \geq 0 \\ w & w < 0 \end{cases}$

$$\Rightarrow \quad u'(w) = \begin{cases} \dfrac{1}{(1+w)} & w \geq 0 \\ 1 & w < 0 \end{cases} \qquad \text{and} \qquad u''(w) = \begin{cases} \dfrac{-1}{(1+w)^2} & w \geq 0 \\ 0 & w < 0 \end{cases}$$

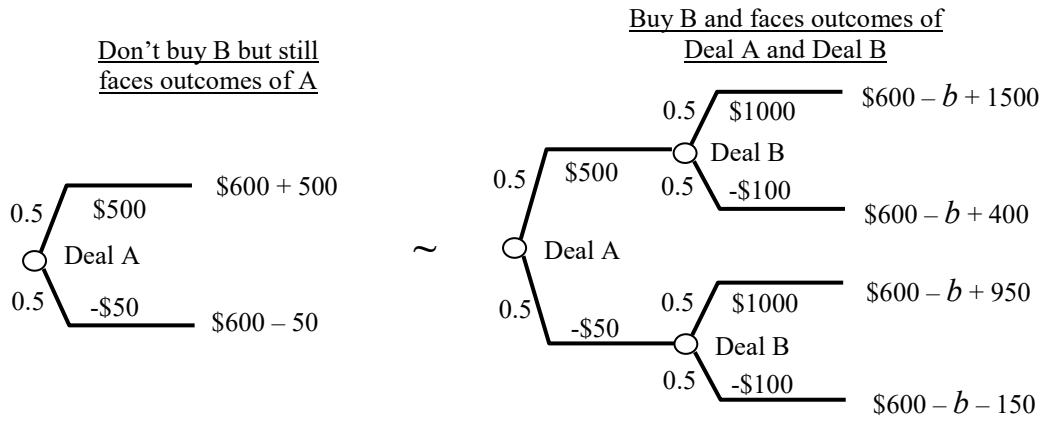
$$\text{Degree of Absolute Risk Aversion } r(w) = \frac{-u''(w)}{u'(w)} = \begin{cases} \dfrac{1}{(1+w)} & w \geq 0 \\ 0 & w < 0 \end{cases}$$

From Part (*a*), Jenny's total wealth certainty equivalent is 600 + 177.88 = \$777.88

Jenny's current risk tolerance = 1 + 777.88 = \$ **<u>778.88</u>**

(*c*) Jenny is currently **risk averse** as her risk tolerance is positive.

(*d*) Let Jenny's personal indifferent buying price for Deal B = b.



$$0.5\,u(600+500)+0.5\,u(600-50)=0.5\,[\,0.5\,u(600-b+1500)+0.5\,u(600-b+400)\,]+0.5\,[\,0.5\,u(600-b+950)+0.5\,u(600-b+150)\,]$$

$$2\,(u(1100)+u(550))=u(2100-b)+u(1000-b)+u(1550-b)+u(450-b)$$

Assume $b \leq 450$

$$2\,(ln(1101)+ln(551))=ln(2101-b)+ln(1001-b)+\ln(1551-b)+ln(451-b)$$

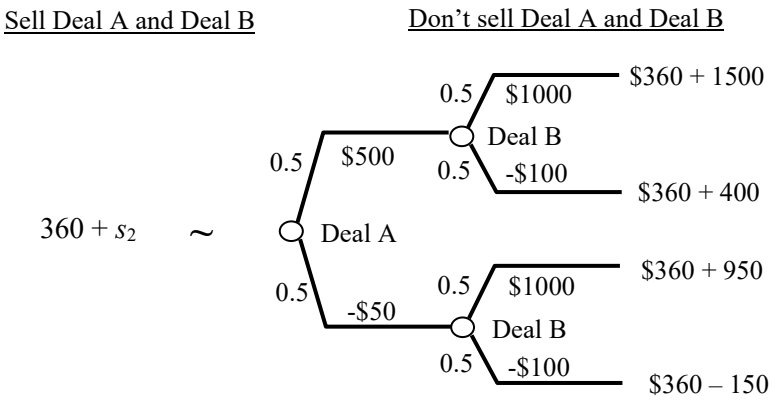
$$(1101\times 551)^2=(2101-b)\,(1001-b)\,(1551-b)\,(451-b)$$

Using an equation solver:

$$b = \mathbf{\$\ \underline{248.38}}$$

(*e*) Jenny's wealth is now \$360 + Deal A + Deal B

Let s_2 = Jenny's personal indifferent selling price for Deals A and B as a bundle.



$$u(360 + s_2) = 0.5\,[\,0.5\,u(360 + 1500) + 0.5\,u(360 + 400)\,] + 0.5\,[\,0.5\,u(360 + 950) + 0.5\,u(360 - 150)\,]$$

$$u(360 + s_2) = 0.25\,[\,u(1860) + u(760) + u(1310) + u(210)\,]$$

Assume $s_2 \geq -360$

$$4\,ln(361 + s_2) = ln(1861) + ln(761) + ln(1311) + ln(211)$$

$$(361 + s_2)^4 = (1861)\,(761)\,(1311)\,(211)$$

$$s_2 = \mathbf{\$\ \underline{430.14}}$$

(*f*) Alice is risk neutral. Her buying price for Deals A and B as a bundle

= EV(Deal A) + EV(Deal B)
= 0.5 (500) + 0.5 (–50) +0.5 (1000) + 0.5 (–100)
= \$ 675.00

Hence the maximum price that Jenney can sell Deals A and B as a bundle to Alice is \$675.00