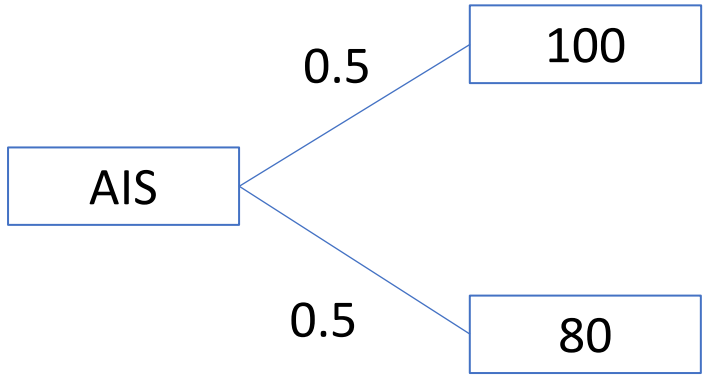
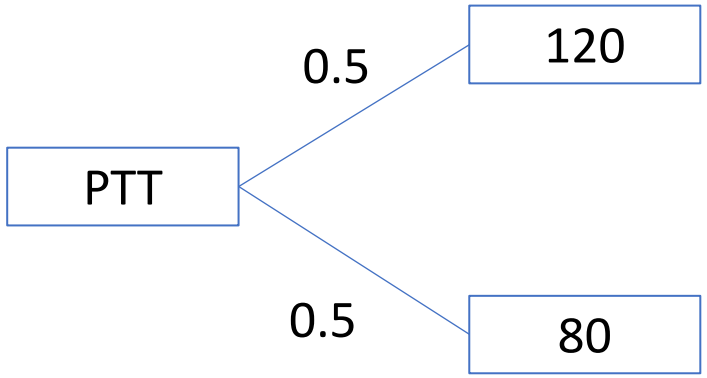
Examples for Lecture 2

Quiz 1 Q2

AIS(100, 80; 0.5)



PTT(120, 80; 0.5)



* Independent assumption : prefer more to less → prefer 120 more <ignore other terms>

* price of PPT stock should greater than 80 and less than 120 → $80 < P_0 < 120$ (open range: 80 to 120)

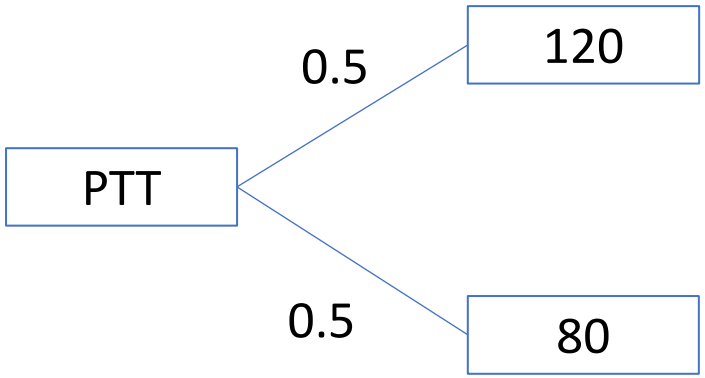
↳ certainty equivalent

From Independence axiom: When comparing their preferences toward AIS and PTT, investors only compare outcome 100 and 120.

From Non-satiation of wants and Independence axioms: We can conclude that PTT ≻ AIS for individuals.

From Non-satiation of wants, Independence and Certainty equivalent axioms: We can conclude that individuals will be willing to pay higher price for PTT than AIS or $P_{PTT} > P_{AIS}$.

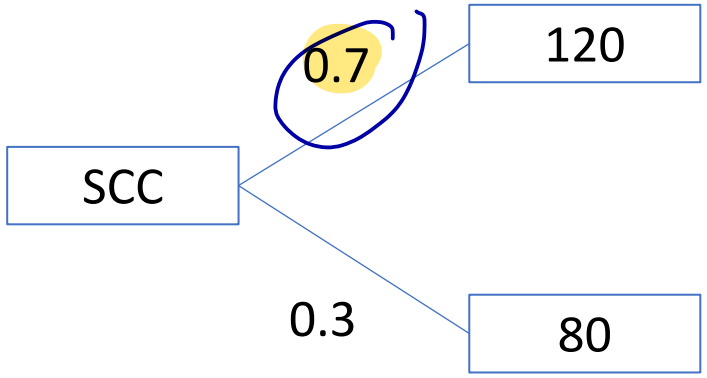
PTT(120, 80; 0.5)



same outcome diff prob

ranking

SCC(120, 80; 0.7)

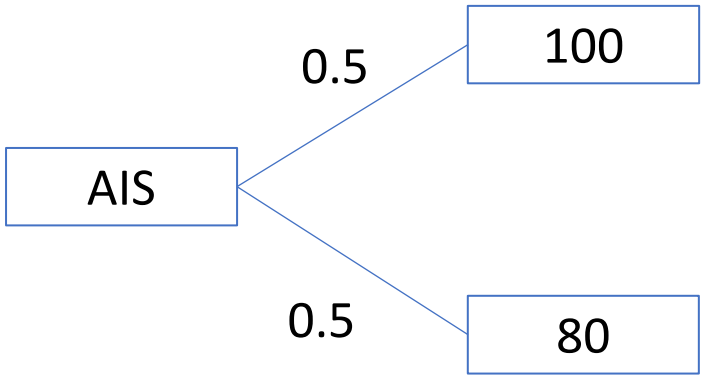


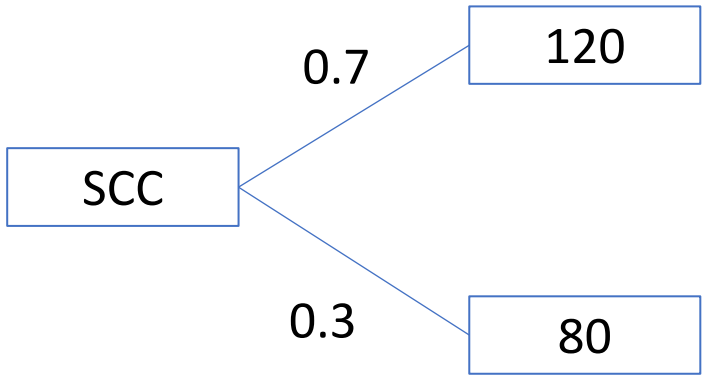
From Ranking axiom: When comparing their preferences toward PTT and SCC, investors only compare the probability of each possible outcome.

From Non-satiation of wants and Ranking axioms:
We can conclude that SCC $\succ$ PTT for individuals.

From Non-satiation of wants, Ranking and Certainty equivalent axioms: We can conclude that individuals will be willing to pay higher price for SCC than PTT or $P_{SCC} > P_{PTT}$.

PPT 0.5 120, 0.5 80





CE ∈ (120, 80)

outcome & prob ต่าง → ดูว่า ตัวไหนดีกว่า e.g. PPT 0.5 120, 0.5 80

PPT & AIS

Use the axioms of choice to show which investment is preferred.

SCC & PPT

Consistency

SCC & AIS

Note, you may want to construct a third security to bridge between AIS and SCC.

outcome เหมือนกัน ต่างแค่ prob

Assume PPT (120, 80, 0.5)

แพงกว่า

ดังนั้น SCC > AIS

individuals' preference toward

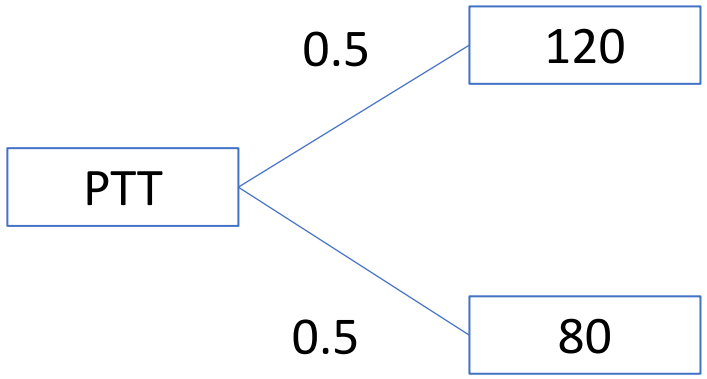
- We cannot compare AIS and SCC directly as the possible outcomes and probability of each possible outcome are not equal.

Thus, we need to construct another security to bridge btw AIS and SCC.

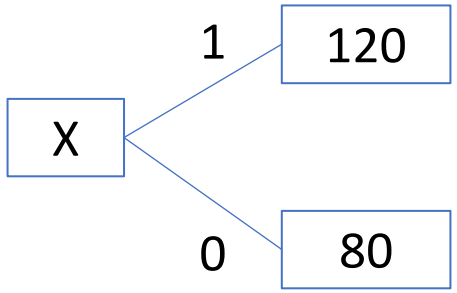
In this case, we use PPT as a bridge. From axioms of non-satiation (prefer more to less) of want and independence (diff outcome), we can conclude that PPT ≻ AIS for individuals.

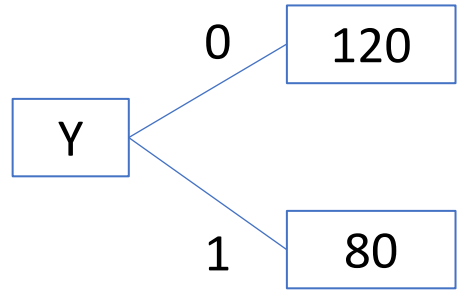
Also, from axioms of non-satiation of want and ranking (diff prob), we can conclude that SCC ≻ PPT. Thus, from axioms of transitivity, we can conclude that SCC ≻ AIS for individuals.

From non-satiation of want, independence, ranking, transitivity, and certainty equivalent axioms, we can conclude that individuals will be willing to pay higher price for SCC than AIS.



What is the possible price range for PTT stock, if investors behave in accordance with the axioms of choice?





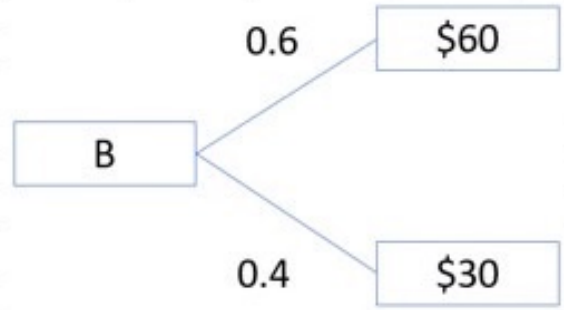
Based on More is preferred to less and Axioms 4 (Independence), $P_X = 120$

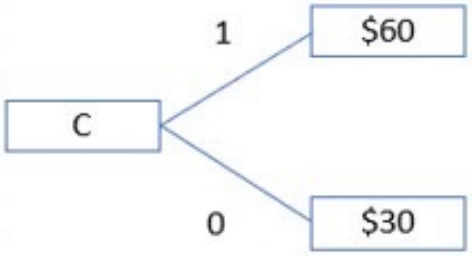
Based on More is preferred to less and Axioms 4 (Independence), $P_Y = 80$

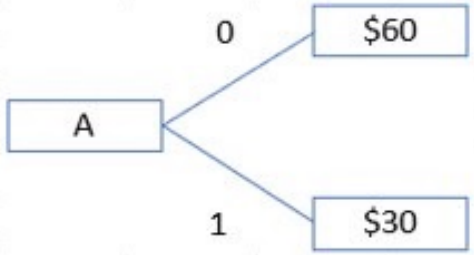
Thus, $80 < P_{PTT} < 120$.

To narrow down the possible price range, we have to add more assumptions about the investor's attitude toward risk.

Q2







From Certain Equivalent: If $x \succ y \succ z$, then there exists a unique α, such that $y \sim [\alpha x, (1-\alpha)z]$.

From more is preferred to less, $\$60 \succ \$30$.

Hence the certain vale y (or P_B) must line within the ($30, $60) such that $P_B \sim [0.6*\$60, 0.4*\$30]$. Hence the price range is $\$30 < P_B < \$60$.

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One may also use the ranking axioms and construct bridging securities to reach the same conclusion.

Asset C gives a certain $60 payoff, hence the $P_C = \$60$.
Asset A gives a certain $30 payoff, hence the $P_A = \$30$.

From more is preferred to less and ranking axiom, $C \succ B$ and $B \succ A$. Hence, $P_A < P_B < P_C$ or $\$30 < P_B < \$60$.

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One can also argue that;
1) If $P_B = 60$, the buyer will at best breakeven and has a chance to make a loss. If $P_B > 60$, the buyer will make a sure loss. Hence, for rational buyer, $P_B < \$60$.
2) If $P_B = 30$, the (short) seller will at best breakeven and has a chance to make a loss. If $P_B < 30$, the (short) seller will make a sure loss. Hence, for rational seller, $P_B > \$30$.

Hence, $\$30 < P_B < \$60$.

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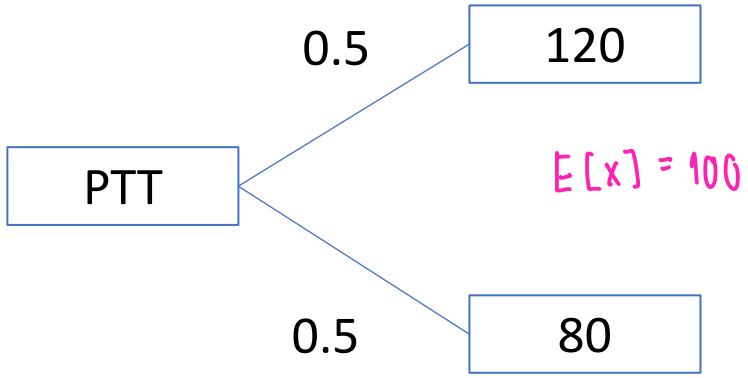
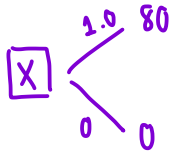
Note: Students must explain why no one will buy at a price $\geq \$60$, and no one will sell at a price $\leq \$30$.

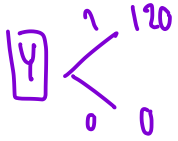
All are rational



$80 < P_0 < 120$



we prefer PTT > X



we prefer Y > PTT

Mr. A wants to buy PTT stock at a max price of ฿90 / share

CE_{PTT} = ฿90

What is the possible price range for PTT stock, if investors are risk averse?

$80 < P_0 < 100$

What is the possible price range for PTT stock, if investors are risk neutral?

$80 < P_0 \leq 100$

What is the possible price range for PTT stock, if investors are risk lover?

$100 < P_0 < 120$

$$\mathrm{Cov}[aX, bY] = a \cdot b\mathrm{Cov}[X, Y]$$

$$\mathrm{Cov}[aX, (b_1Y_1 + b_2Y_2)] = \mathrm{Cov}[aX, b_1Y_1] + \mathrm{Cov}[aX, b_2Y_2]$$

Two Funds Separation (or Tobin's Separation)

There are 2 steps in constructing a complete portfolio: 1) capital allocation and 2) security selection. Capital allocation is dependent on investor's degree of risk aversion. However, security selection is independent from investor's degree of risk aversion. Therefore, these 2 steps can be performed independently. Security selection can be delegated to an agent (i.e., fund manager).