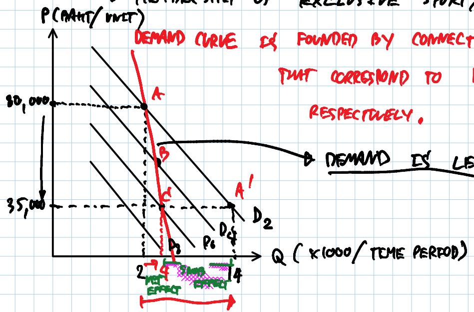
NEGATIVE NETWORK EXTERNALITIES

SNOB EFFECT : NEGATIVE NETWORK EXTERNALITY IN WHICH A BUYER WISHES TO OWN AN EXCLUSIVE OR UNIQUE GOOD.

EX:
- RARE WORKS OF ART BY VAN GOGH
- MADE-TO-ORDER CLOTHES BY A FAMOUS DESIGNER
- MEMBERSHIP OF EXCLUSIVE SPORT/GOLF CLUB



DEMAND CURVE IS FOUNDED BY CONNECTING POINT A, B, C THAT CORRESPOND TO D_2, D_4, D_6 RESPECTIVELY.

DEMAND IS LESS ELASTIC!

PURE PRICE EFFECT WHEN NO SNOB EFFECT

NEXT TOPIC: INTERTEMPORAL CONSUMPTION CHOICE

NOW, SUPPOSE THAT A CONSUMER HAVE CHOICES BETWEEN CONSUMING TODAY (CURRENT PERIOD) AND/OR CONSUMING TOMORROW (FUTURE OR NEXT PERIOD).

PERSONS OFTEN GET INCOME IN "LUMPS", i.e., MONTHLY SALARY. HOW IS A LUMP OF INCOME SPREAD OVER THE FOLLOWING MONTH (SAVING NOW FOR CONSUMPTION LATER)? OR HOW IS CONSUMPTION FINANCED BY BORROWING NOW AGAINST INCOME TO BE RECEIVED AT THE END OF THE MONTH?

SO, WE BEGIN W/ SOME FINANCIAL ARITHMETIC.
- TAKE JUST 2 PERIODS: 1 AND 2.
- LET r DENOTE THE INTEREST RATE PER PERIOD.

EG. IF $r = 0.1$, THEN 100 BAHT SAVE AT THE START OF PERIOD 1 $\xrightarrow{\text{BECOMES}}$ 110 BAHT AT THE START OF PERIOD 2.

SO, THE VALUE NEXT PERIOD OF 1 BAHT SAVED NOW IS CALLED "FUTURE VALUE OF THAT BAHT"

GIVEN INTEREST RATE r, FUTURE VALUE ONE PERIOD FROM NOW OF 1 BAHT IS $FV = 1 + r$

GIVEN INTEREST RATE r, FUTURE VALUE ONE PERIOD FROM NOW OF m BAHT IS $FV = m(1+r)$.

PRESENT VALUE CONCEPT

Q: SUPPOSE YOU CAN PAY NOW TO OBTAIN 1 BAHT AT THE START OF NEXT PERIOD. WHAT IS THE MOST YOU SHOULD PAY?

A: 1 BAHT? → NO!

IF YOU KEPT YOUR 1 BAHT NOW AND SAVE IT, THEN THE START OF NEXT PERIOD, YOU WOULD HAVE $1 + r > 1$,

SO PAYING 1 BAHT NOW FOR 1 BAHT NEXT PERIOD IS A BAD DEAL.

M BAHT SAVED NOW BECOMES $m(1+r)$ BAHT AT THE START OF NEXT PERIOD SO WE WANT THE VALUE OF m FOR WHICH

$$m(1+r) = 1$$

THEN $\boxed{m = \frac{1}{1+r}}$ IS THE "PRESENT VALUE"

OF 1 BAHT OBTAINED AT THE START OF NEXT PERIOD!

$PV = \frac{1}{1+r}$ ⇒ PRESENT VALUE OF 1 BAHT AVAILABLE AT THE START OF THE NEXT PERIOD

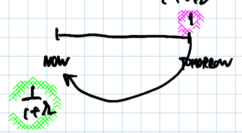
$PV = \frac{m}{1+r}$ ⇒ PRESENT VALUE OF m BAHT AVAILABLE AT THE START OF THE NEXT PERIOD

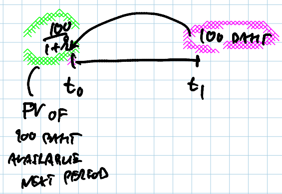
EX: IF $r = 0.1$ (OR 10%), THE MOST YOU SHOULD PAY NOW FOR 1 BAHT AVAILABLE NEXT PERIOD IS

$$PV = \frac{1}{1+0.1} = 0.91 \text{ BAHT}$$

IF $r = 0.2$ (OR 20%) THE MOST YOU SHOULD PAY NOW FOR 1 BAHT AVAILABLE NEXT PERIOD IS

$$PV = \frac{1}{1+0.2} = 0.83 \text{ BAHT}$$





INTERTEMPORAL CHOICE PROBLEM

- LET m_1 AND m_2 BE INCOMES RECEIVED IN PERIOD 1 AND 2.
- LET c_1 AND c_2 BE CONSUMPTIONS IN PERIOD 1 AND 2.
- LET P_1 AND P_2 BE THE PRICES OF CONSUMPTION IN PERIOD 1 AND 2

INTERTEMPORAL CHOICE PROBLEM: GIVEN m_1, m_2, P_1, P_2
WHAT IS THE MOST PREFERRED INTERTEMPORAL CONSUMPTION BASKET (c_1, c_2)?

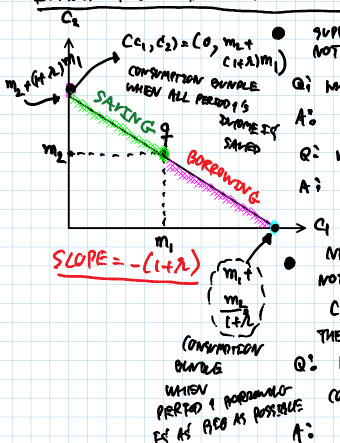
TO ANSWER THIS QUESTION, WE NEED 2 THINGS

1. INTERTEMPORAL BUDGET CONSTRAINT
2. INTERTEMPORAL CONSUMPTION PREFERENCES.

TO START, LET'S IGNORE PRICE EFFECTS BY SUPPOSING THAT

$P_1 = P_2 = 1$ (BAHT)

INTERTEMPORAL BUDGET CONSTRAINT:



- SUPPOSE THAT THIS GUY CHOOSES NOT TO SAVE OR TO BORROW.

Q: WHAT WILL BE CONSUMED IN PERIOD 1?

A: $c_1 = m_1$

Q: WHAT WILL BE CONSUMED IN PERIOD 2?

A: $c_2 = m_2$

- NEXT SUPPOSE THAT HE SPENDS NOTHING ON CONSUMPTION IN PERIOD 1, $c_1 = 0$ AND HE SAVE $S_1 = m_1$. THE INTEREST RATE IS r.

Q: WHAT NOW WILL BE PERIOD 2'S CONSUMPTION LEVEL?

A: $c_2 = m_2 + (1+r)m_1$.

FUTURE-VALUE OF THE INCOME ENDOWMENT (WE MAY CALL IT)

- NOW SUPPOSE THAT HE SPENDS EVERYTHING POSSIBLE ON CONSUMPTION IN PERIOD 1, $c_2 = 0$

Q: WHAT IS THE MOST THAT HE CAN BORROW IN PERIOD 1 AGAINST HIS PERIOD 2 INCOME OF m_2?

A: m . (WHY?)

THINK: ONLY m_2 WILL BE AVAILABLE IN PERIOD 2 TO PAY BACK b_1 BAHT BORROWED IN PERIOD 1.

SO $b_1(1+r) = m_2$

THEN $b_1 = \dfrac{m_2}{1+r}$.

THEREFORE, THE LARGEST POSSIBLE PERIOD 1 CONSUMPTION LEVEL IS

$$c_1 = m_1 + \frac{m_2}{1+r}.$$

SUPPOSE THAT c_1 UNITS ARE CONSUMED IN PERIOD 1. THIS COSTS c_1 BAHT AND LEAVES $m_1 - c_1$ SAVED. SO, PERIOD 2 CONSUMPTION WILL THEN BE

$$c_2 = m_2 + (1+r)(m_1 - c_1)$$

WHICH IS

$$\boxed{c_2 = \underbrace{m_2 + (1+r)m_1}_{\text{INTERCEPT}} \underbrace{- (1+r)}_{\text{SLOPE}} c_1}.$$

INTERTEMPORAL BUDGET CONSTRAINT EQUATION.

REARRANGING GIVES:

$$\boxed{(1+r)c_1 + c_2 = (1+r)m_1 + m_2}$$

IS "FUTURE-VALUE" FORM OF THE BL.

$$\boxed{c_1 + \frac{c_2}{1+r} = m_1 + \frac{m_2}{1+r}}$$

IS "PRESENT-VALUE" FORM OF THE BL. (WHY?)

SINCE ALL TERMS ARE REPORTED/DISCOUNTED TO PERIOD 1.

NOW... LET'S ADD PRICES p_1 AND p_2 FOR CONSUMPTION IN PERIOD 1 AND 2. HOW DOES IT AFFECT THE BUDGET CONSTRAINT?

MAXIMUM POSSIBLE EXPENDITURE IN PERIOD 2 IS

$$m_2 + (1+r)m_1$$

SO, MAXIMUM POSSIBLE "CONSUMPTION" IN PERIOD 2 IS

$$c_2 = \frac{m_2 + (1+r)m_1}{p_2}.$$

SIMILARLY, MAXIMUM POSSIBLE "CONSUMPTION" IN PERIOD 1 IS

$$c_1 = \frac{\left(m_1 + \frac{m_2}{1+r}\right)}{p_1}$$

FINALLY, IF THIS GUY ACTUALLY CONSUMES c_1 UNITS IN PERIOD 1, HE WILL HAVE TO SPEND $p_1 \cdot c_1$, LEAVING $m_1 - p_1 c_1$ SAVED FOR PERIOD 1.

AVAILABLE INCOME IN PERIOD 2 WILL BE

$$m_2 + (m_1 - p_1 c_1)(1+r)$$

SO, $p_2 c_2 = m_2 + (m_1 - p_1 c_1)(1+r)$

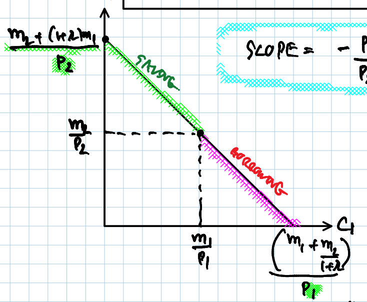
REARRANGING GIVES

$$\boxed{(1+r)p_1 c_1 + p_2 c_2 = (1+r)m_1 + m_2}.$$

OR

$$\boxed{p_1 c_1 + \frac{p_2 c_2}{1+r} = m_1 + \frac{m_2}{1+r}}.$$

OR $\boxed{P_1 C_1 + \frac{P_2 C_2}{1+r} = m_1 + \frac{m_2}{1+r}}$



$\boxed{\text{SLOPE} = -\frac{P_1(1+r)}{P_2}}$

LET'S DEFINE "INFLATION RATE" BY π WHERE

$$P_1(1+\pi) = P_2 .$$

IF $\pi = 0.2$ MEANS 20% INFLATION

IF $\pi = 1.0$ MEANS 100% INFLATION.

NEXT, SETTING $P_1 = 1$. SO $P_2 = 1+\pi$.

THEN WE CAN REWRITE THE BUDGET CONSTRAINT

$$P_1 C_1 + \frac{P_2 C_2}{1+r} = m_1 + \frac{m_2}{1+r}$$

AS $$C_1 + \frac{(1+\pi) C_2}{1+r} = m_1 + \frac{m_2}{1+r} . \Rightarrow \frac{(1+r)}{(1+\pi)} C_1 + C_2 = \frac{(1+r)}{(1+\pi)} m_1 + \frac{\cancel{(1+r)}}{(1+\pi)} \frac{m_2}{\cancel{(1+r)}}$$

THEN ISOLATING C_2:

$$C_2 = -\frac{(1+r)}{1+\pi} C_1 + \frac{1}{1+\pi}\left\{ m_1(1+r) + m_2 \right\}$$

$$C_2 = \frac{(1+r)}{(1+\pi)} m_1 + \frac{m}{(1+\pi)} - C_1 \frac{(1+r)}{(1+\pi)}$$

$$= \frac{1}{1+\pi}\left[(1+r)m_1 + m_2 - C_1(1+r)\right]$$

$$= -\frac{(1+r)}{(1+\pi)} C_1 + \frac{1}{1+\pi}\left[m_1(1+r) + m_2\right]$$

SLOPE OF THE INTERTEMPORAL BL $= -\frac{(1+r)}{(1+\pi)}$.

NOTICE THAT WHEN THERE WAS NO INFLATION, $(P_1 = P_2 = 1)$, THE SLOPE OF THE BL $= -(1+r)$.

NOW, W/ INFLATION, LET'S DEFINE THE FOLLOWING:

RHO

$$-(1+\rho) = -\frac{(1+r)}{(1+\pi)}$$

ρ IS KNOWN AS "REAL INTEREST RATE".

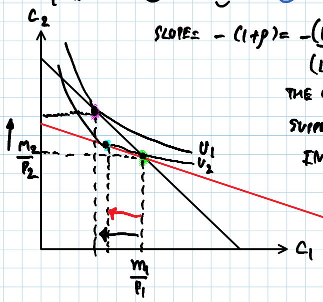
$$\rho = \frac{r - \pi}{1+\pi}$$

FOR LOW INFLATION RATES ($\pi \simeq 0$), $\rho \simeq r - \pi$

FOR HIGH INFLATION RATES, THIS APPROXIMATION BECOMES POOR.

r	0.3	0.3	0.3	0.3	0.3
π	0.0	0.05	0.10	0.20	1.00
$r-\pi$	0.3	0.25	0.20	0.1	-0.7
$\frac{r-\pi}{1+\pi} = \rho$	0.3	0.24	0.18	0.08	-0.35

BIG GAP WHEN $\pi = 1.00$



SLOPE $= -(1+\rho) = -\frac{(1+r)}{(1+\pi)}$

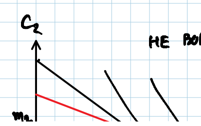
THE CONSUMER SAVES.

SUPPOSE INTEREST RATE $\downarrow$ AND/OR INFLATION RATE $\uparrow$.

THE BL BECOMES "FLATTER".

RESULT: HIS SAVING AND HIS UTILITY REDUCES.

HE IS STILL A LENDER.

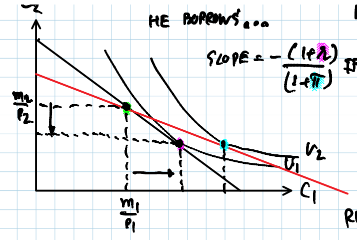


HE BORROWS...

SLOPE $= -\frac{(1+r)}{(1+\pi)}$ IF INTEREST RATE $\downarrow$ AND/OR

HE BORROWS...

HE IS STILL A LENDER.



$\text{SLOPE} = -\frac{(1+r)}{(1+\pi)}$

IF INTEREST RATE ↓ AND/OR π ↑, THE BL PIVOTS AROUND THE INITIAL ENDOWMENT.

RESULT: HE BORROWS MORE AND HIS UTILITY RISES.

DIY

① SHOW THE OUTCOME OF WHEN r ↑ WHEN THE CONSUMER IS A LENDER. [DOES HE REMAIN A LENDER?, HOW ABOUT HIS UTILITY?]

② SHOW THE OUTCOME OF WHEN r ↑ WHEN THE CONSUMER IS A BORROWER. [DOES HE REMAIN A BORROWER? HOW ABOUT HIS UTILITY?]

SO FAR, WE HAVE SEEN THE EFFECTS OF π AND r ON INTERTEMPORAL CHOICE OF A CONSUMER.

- DECISION TO SAVE / CONSUME.
- DECISION TO BORROW / LEND.

NEXT LET'S INTRODUCE "UNCERTAINTY" INTO DECISIONS MADE BY A CONSUMER / INVESTOR.

CH.5 UNCERTAINTY AND CONSUMER BEHAVIOR.
(PINDYCK)

SO FAR WE HAVE ASSUMED THAT PRICES, INCOMES, AND OTHER VARIABLES ARE KNOWN W/ CERTAINTY.

HOWEVER, MANY CHOICES THAT PEOPLE MAKE INVOLVE UNCERTAINTY.

OBJECTIVES HERE:

① WE WANT TO BE ABLE TO "QUANTIFY" (= MEASURE) RISK IN ORDER TO "COMPARE" RISKINESS OF ALTERNATIVE CHOICES

② WE WANT TO EXAMINE PEOPLE'S PREFERENCE TOWARD RISK

- SOME FIND RISK UNDESIRABLE. (RISK AVERSE)
- SOME LOVE TO BEAR SOME RISK (RISK LOVER)
- SOME ARE RISK NEUTRAL. (RISK NEUTRAL)

TO SOME EXTENT, PEOPLE MUST CHOOSE AMOUNT OF RISK THEY WISH TO "BEAR".

③ WE WANT TO SEE HOW PEOPLE CAN REDUCE RISK OR EVEN ELIMINATE RISK

METHODS:
- DIVERSIFICATION
- INSURANCE
- BUYING INFORMATION

Ⅰ DESCRIBING "RISK".

PROBABILITY: LIKELIHOOD THAT "A GIVEN OUTCOME" WILL OCCUR. (CHANCE)

- **OBJECTIVE PROBABILITY** ⇒ USE INFORMATION AND EXPERIENCES IN THE PAST TO ACCESS LIKELIHOOD OF POSSIBLE OUTCOMES. EX: OIL EXPLORATION COMPANY USE INFORMATION IN THE PAST TO SEE A CHANCE OF BEING SUCCESS OR FAILURE.
- **SUBJECTIVE PROBABILITY** ⇓ USE PERSONAL JUDGEMENT TO EVALUATE A LIKELIHOOD.

EXPECTED VALUE: PROBABILITY-WEIGHTED AVERAGE OF "THE PAYOFFS" ASSOCIATED W/ ALL POSSIBLE OUTCOMES.

PAYOFFS: VALUE ASSOCIATED W/ A POSSIBLE OUTCOME

EX:

EXPECTED VALUE = Pr(SUCCESS)(40 US$/SHARE) + Pr(FAILURE)(20 US$/SHARE)

$$= \frac{1}{4}\cdot 40 + \frac{3}{4}\cdot 20$$

2 S-O-W

SUCCESS (0.25) PROB

FAILURE (0.75) PROB

= 25 US$/SHARE.

SHOW "CENTRAL TENDENCY" - THE PAYOFF OR VALUE THAT WE WOULD "EXPECT" ON AVERAGE.

W/ 2 POSSIBLE OUTCOMES, THE EXPECTED VALUE IS

$$E(X) = Pr_1 X_1 + Pr_2 X_2 .$$

WHEN THERE ARE n POSSIBLE OUTCOMES, THE EXPECTED VALUE BECOMES

$$E(X) = Pr_1 X_1 + Pr_2 \cdot X_2 + Pr_3 \cdot X_3 + \dots + Pr_n \cdot X_n .$$

* VARIABILITY: DEGREE OF WHICH POSSIBLE OUTCOMES OF "UNCERTAIN EVENT" "DIFFER".

EX:

	OUTCOME 1 PROB	OUTCOME 1 INCOME	OUTCOME 2 PROB	OUTCOME 2 INCOME	EXPECTED INCOME
JOB 1: SALES (COMMISSION)	.5	2000	.5	1000	.5 · 2000 + .5 · 1000 = 1500
JOB 2: FIXED SALARY	.99	1510	.01	510	.99 · 1510 + .01 · 510 = 1500

STANDARD DEVIATION

	OUTCOME 1	DEVIATION ($X_i - E(X)$)	OUTCOME 2	DEVIATION (FROM ITS EXPECTED INCOME)
JOB 1	2000	500	1000	-500
JOB 2	1510	10	510	-990

TO CALCULATE VARIANCE:

THE AVERAGE OF THE SQUARED DEVIATION UNDER JOB 1

$$= 0.5(500)^2 + 0.5(-500)^2$$

$$\sigma^2 = 250{,}000$$

$$S.D(\sigma) = \sqrt{\sigma^2} = \sqrt{250{,}000} = 500 \rightarrow \text{STANDARD DEVIATION}$$

JOB 2: $\Rightarrow$

$$\sigma^2 = .99(10)^2 + .01(-990)^2$$

$$= .99(100) + .01(980{,}100)$$

$= 9900$

$S.D.(\sigma) = \sqrt{\sigma^2} = \sqrt{9900} = 99.50 \rightarrow$ STANDARD DEVIATION

CONCLUSION EVEN THOUGH THE EXPECTED INCOMES FROM JOB 1 AND JOB 2 ARE THE SAME, JOB 2 IS MUCH LESS RISKY THAN JOB 1 (SUGGESTED BY S.D.)

DECISION MAKING

$[x_i - E(x)]^2$

	OUTCOME 1	DEVIATION SQUARED	OUTCOME 2	DEVIATION SQUARED	EXPECTED INCOME	S.D.
JOB 1	2100	250,000	1100	250,000	1600	500
JOB 2	1510	100	510	980,100	1500	99.5

JOB 1: EXPECTED INCOME = 1600, S.D = 500

JOB 2: EXPECTED INCOME = 1500, S.D. = 99.5

WHICH ONE TO BE CHOSEN DEPENDS ON PE

ATTITUDE TOWARD RISK.

DIFFERENT PREFERENCES TOWARD RISK

SOME PEOPLE ARE RISK AVERSE (= TRY TO AVOID RISK).
SOME ARE RISK-LOVING.

DEFINITION

RISK AVERSE: CONDITION OF PREFERRING A CERTAIN INCOME TO A RISKY INCOME WITH THE SAME EXPECTED VALUE.

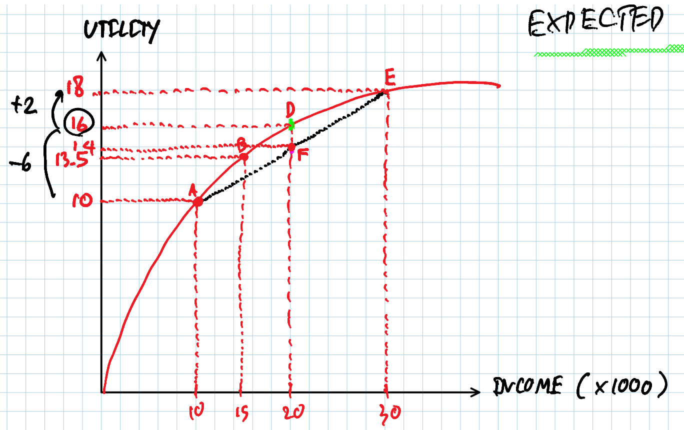
RISK LOVING: CONDITION OF PREFERRING A RISKY INCOME TO A CERTAIN INCOME WITH THE SAME EXPECTED VALUE

RISK NEUTRAL: CONDITION OF BEING INDIFFERENT BETWEEN A CERTAIN INCOME TO A RISKY INCOME W/ THE SAME

$$\sqrt{0.5 \cdot (250{,}000) + 0.5\,(250{,}000)}$$

EOPLE'S

EXPECTED VALUE.



OBSERVATION 1: CONSUMER'S MARGINAL UTILITY DIMINISHES AS INCOME RISES.
NOTICE THAT WHEN INCOME RISES FROM 10 TO 20, MU = 6. WHEN INCOME RISES FROM 20 TO 30, MU IS ONLY 2.

SUPPOSE THIS GUY HAS A CERTAIN INCOME OF 15,000 AND HE IS NOW CONSIDERING A NEW BUT RISKY SALES JOB THAT WILL DOUBLE HER INCOME TO 30,000 OR CAUSE IT TO FALL TO 10,000 BAHT. EACH OUTCOME HAS PROBABILITY = 0.5.

TO EVALUATION THE NEW JOB, SHE QUICKLY CALCULATE THE EXPECTED VALUE OF "THE RESULTING INCOME".

SINCE INCOME → UTILITY (HAPPINESS), THEN, WE CALCULATE "EXPECTED UTILITY" (E(U)) THAT SHE CAN OBTAIN.

EXPECTED UTILITY: SUM OF THE UTILITY ASSOCIATED WITH ALL POSSIBLE OUTCOMES, WEIGHTED BY THE PROBABILITY THAT "EACH OUTCOME" WILL OCCUR.

$$\boxed{E(U) = \underbrace{(\cdot)}_{\substack{\text{PROB}_1 \\ 0.5}}\ \underbrace{(\cdot)}_{U(\cdot),\ 10{,}000} + \underbrace{(\cdot)}_{\substack{\text{PROB}_2 \\ 0.5}}\ \underbrace{(\cdot)}_{U(\cdot),\ 30{,}000}}$$

$$E(U) = (1/2)\,U(10{,}000) + \tfrac{1}{2}\,U(30{,}000)$$
$$= 0.5\cdot(10) + 0.5\cdot(18)$$
$$= 14 > 13.5 \text{ (UTILITY FROM THE ORIGINAL JOB)}$$

THE RISKY NEW JOB IS THUS PREFERRED TO THE ORIGINAL JOB "IF" SHE WISHES TO GET HIGHEST POSSIBLE EXPECTED UTILITY.

Q: GIVEN THE PICTURE ABOVE, IS SHE RISK AVERSE?

A: CONSIDER 2 ALTERNATIVES

OPTION 1: RISKY JOB
- 10,000 W/ PROB = 0.5
- 30,000 W/ PROB = 0.5

OPTION 2: A CERTAIN JOB W/ 20,000 → PROB = 1.00

EXPECT INCOME FROM THE RISKY JOB = 0.5 (10,000) + 0.5 (30000) = 20,000

RISKY JOB

RISKY JOB $\Rightarrow$ $E(U) = 0.5\, U(10{,}000) + 0.5 \cdot U(30{,}000)$

$= 0.5(10) + 0.5(18)$

POINT A POINT E

$= 14$

A CERTAIN JOB $\Rightarrow$ $U = U(20{,}000)$

$= 16$

SO, SHE IS RISK AVERSE B/C SHE WOULD PREFER A CERTAIN INCOME OF 20000 (W/ UTILITY OF 16) TO A GAMBLE W/ .5 OF HAVING 10,000 AND .5 OF HAVING 30,000 (W/ "EXPECTED" UTILITY OF 14)

NOTE THAT FOR RISK AVERSE PEOPLE, THEY CARE MORE ABOUT LOSS RATHER THAN GAINS.

IN OTHER WORDS, LOSSES ARE MORE IMPORTANT THAN GAINS. (IN TERM OF CHANGES IN UTILITY)

RISK AVERSE	RISK NEUTRAL	RISK LOVING

RISK AVERSE

$U(x) = x^a$ WHEN $a < 1$

EX: $U(x) = x^{0.5}$

SUPPOSE $x_1 = 100$ (BAD STATE)

$x_2 = 400$ (GOOD STATE)

$Pr(x_1) = 0.5$

$Pr(x_2) = 0.5$

$E(x) = 100 \cdot 0.5 + 400 \cdot 0.5$

$= 50 + 200$

$= 250 \rightarrow$ EXPECTED INCOME

SUPPOSE $U(100) = 10$

$U(400) = 20$

$E[U(x)] = \frac{1}{2} \cdot U(100) + \frac{1}{2} U(400)$

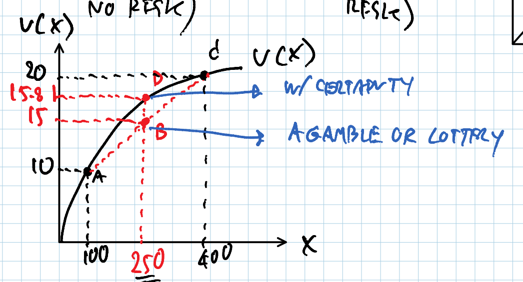
$= \frac{1}{2} \cdot 10 + \frac{1}{2} \cdot 20$

$= 15 \rightarrow$ EXPECTED UTILITY

$U(250) = \sqrt{250} = 15.81$

$U[E(x)] > E[U(x)]$

15.81 (W/ CERTAINTY OR NO RISK) 15 (W/ UNCERTAINTY OR RISK)



AT THE SAME EXPECTED INCOME (250),

RISK NEUTRAL

$U(x) = 2x$

$[\,U(x) = Ax^a$ WHERE $a = 1\,]$

SUPPOSE $x_1 = 100$ W/ $Pr = \frac{1}{2}$

$x_2 = 400$ W/ $Pr = \frac{1}{2}$

$E(x) = 250$

$E[U(x)] = \frac{1}{2} U(100) + \frac{1}{2} U(400)$

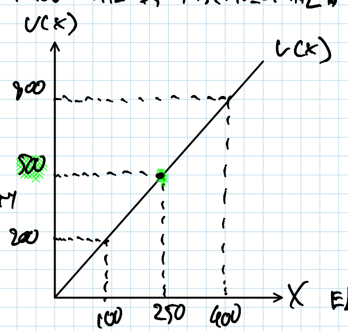
$= \frac{1}{2}(2 \cdot 100) + \frac{1}{2}(2 \cdot 400)$

$= 500$

$U(250) = 2 \cdot 250 = 500$

SINCE $E[U(x)] = U(E(x))$

THEN HE IS RISK-NEUTRAL.



HE IS INDIFFERENT BETWEEN CERTAIN EVENT AND UNCERTAIN EVENT WITH THE SAME EXPECTED INCOME.

RISK LOVING

$U(x) = Ax^a$ WHERE $a > 1$

SUPPOSE $U(x) = x^2$

SUPPOSE $x_1 = 100$ W/ $Pr = 0.5$

$x_2 = 400$ W/ $Pr = 0.5$

$E(x) = 250$

$E[U(x)] = \frac{1}{2} U(100) + \frac{1}{2} U(400)$

$= \frac{1}{2}(100)^2 + \frac{1}{2}(400)^2$

$= 85{,}000$

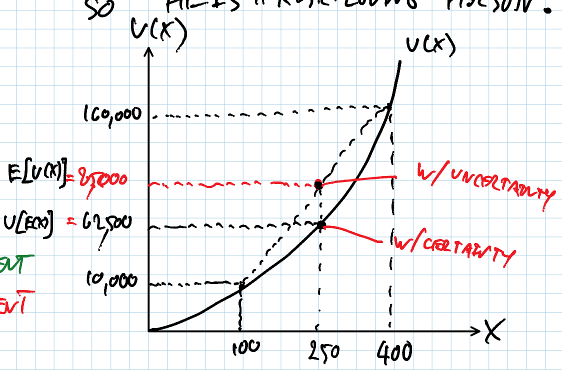
$U(E(x)) = U(250) = (250)^2 = 62{,}500$

AT THE SAME EXPECTED INCOME OF 250, WE FOUND THAT

$E[U(x)] > U(E(x))$.

85,000 62,500

SO HE IS A RISK-LOVING PERSON.



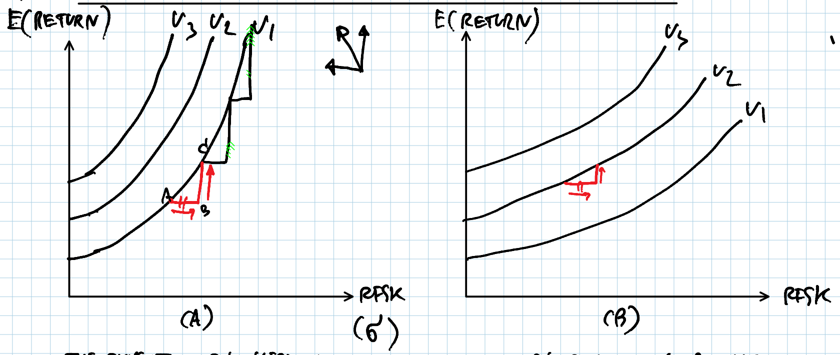
AT THE SAME EXPECTED INCOME (250),

SINCE $U[E(X)] > E(U(X))$,

HE IS RISK-AVERSE PERSON.

NOTE MU OF INCOME ↓ AS INCOME ↑.

RISK AVERSION AND INDIFFERENCE CURVES

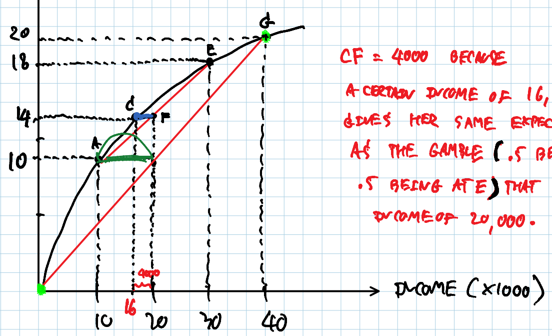


THE INVESTOR IS HIGHLY RISK AVERSE : HE REQUIRES A LARGE INCREASE IN EXPECTED RETURN TO COMPENSATE WITH MORE RISK TO GET BACK TO HIS IC.

THIS INVESTOR IS SLIGHTLY RISK AVERSE : HE REQUIRES A RELATIVELY SMALL INCREASE IN EXPECTED INCOME TO COMPENSATE W/ MORE RISK TO GET BACK TO HIS IC.

Q: HOW MUCH MONEY AT MAXIMUM YOU ARE WILLING TO PAY TO MOVE YOURSELF FROM RISKY CHOICE TO A SECURE CHOICE?

RISK PREMIUM : MAXIMUM AMOUNT OF MONEY THAT A RISK-AVERSE PERSON WILL PAY TO AVOID RISK.



CF = 4000 BECAUSE A CERTAIN INCOME OF 16,000 (POINT C) GIVES HER SAME EXPECTED UTILITY (14) AS THE GAMBLE (.5 BEING AT A AND .5 BEING AT E) THAT HAS AN EXPECTED INCOME OF 20,000.

HOW TO AVOID OR REDUCE RISKS?

SINCE UNCERTAINTY AND RISK IS PERVASIVE, A RISK-AVERSE INVESTOR/INDIVIDUAL WILL TRY TO REDUCE OR AVOID RISK BY ...

1. DIVERSIFICATION : DO NOT PUT ALL EGGS IN ONE BASKET.
2. BUYING INSURANCE EX: HEALTH INSURANCE, CAR INSURANCE, HOME INSURANCE, ETC.
3. INVESTING TO OBTAIN MORE INFORMATION

I) **DIVERSIFICATION** : PRACTICE OF REDUCING RISK BY ALLOCATING RESOURCES TO A VARIETY OF ACTIVITIES WHOSE OUTCOMES ARE NOT RELATED.

	HOT WEATHER (Pr = 0.5)	COLD WEATHER (Pr = 0.5)	E(X)	S.D.	COEFFICIENT OF VARIATION (CV)
AIRCON	30,000	12,000	$30{,}000 \cdot \frac{1}{2} + 12{,}000 \cdot \frac{1}{2} = 21{,}000$	$\sqrt{\frac{1}{2}(30{,}000-21{,}000)^2 + \frac{1}{2}(12{,}000-21{,}000)^2} = 9000$	$\frac{9000}{21{,}000} = \ldots$
HEATER	12,000	30,000	$30{,}000 \cdot \frac{1}{2} + 12{,}000 \cdot \frac{1}{2} = 21{,}000$	9000	$\frac{9000}{21000}$
DIVERSIFICATION	$\frac{1}{2} \cdot 30000 + \frac{1}{2} \cdot 12{,}000 = 21{,}000$	$\frac{1}{2} \cdot 12000 + \frac{1}{2} \cdot 30{,}000 = 21{,}000$		0	0

$CV = \frac{S.D.}{E(X)}$

DIVERSI-FICATION	$\frac{1}{2}\cdot 30000 + \frac{1}{2}\cdot 12{,}000 = 21{,}000$	$\frac{1}{2}\cdot 12000 + \frac{1}{2}\cdot 30{,}000 = 21{,}000$		0	0

IF YOU SELL ONLY AIRCON OR ONLY HEATER, YOUR EXPECT INCOME WILL BE 21,000 BAHT.

IF YOU SELL BOTH BY ALLOCATING YOUR TIME EQUALLY, YOUR INCOME WILL BE 21,000 CERTAINLY, REGARDLESS OF WEATHER! THAT MEANS WHEN WEATHER IS HOT, YOU WILL EARN 15,000 FROM AIRCON AND 6000 FROM HEATER SALES. IF IT IS COLD, YOU WILL EARN 6,000 FROM AIRCON AND 15,000 FROM HEATER.

THEREFORE, DIVERSIFICATION ELIMINATES ALL RISK!

KEEP IN MIND THAT, DIVERSIFICATION WORKS EFFECTIVELY WHEN OUTCOMES ARE NOT RELATED.

EX: AIRCON & HEATER SALES ARE NEGATIVELY CORRELATED VARIABLES.

II BUYING INSURANCE

EX: YOUR NOTEBOOK'S VALUE = 50,000 BAHT

INSURANCE	GET DAMAGE (Pr. = 0.1)	NO DAMAGE (Pr = 0.9)	E(X)	S.D. $= \sqrt{Pr(X - E(X))^2}$	C.V. $= \frac{SD}{E(X)}$
DO NOT BUY	40,000	50,000	49,000	3000	$\frac{3000}{49{,}000}$
BUY	50,000 − 1000 − 10,000 + 10,000 = 49,000	50,000 − 1000 = 49000	49000	0	0
	−9000	−1000			

SUPPOSE THAT COST OF INSURANCE = 1000 BAHT AND DAMAGE = 10,000 BAHT

THEREFORE, BUYING THE INSURANCE ELIMINATES RISK.