$$\left|\frac{u''(c)}{u'(c)}\right| = \text{absolute risk aversion}$$

WE TAKE THE ABSOLUTE VALUE, BECAUSE $u''(c) < 0$

$$u(c) = \log c$$ yields $$\left|\frac{u''(c)}{u'(c)}\right| = \frac{1}{c}$$

decreasing absolute risk aversion

$$\left|\frac{u''(c)}{u'(c)}\right| \cdot c = \text{relative risk aversion}$$

notice that $u(c) = \log(c)$ yields: decreasing absolute risk aversion and constant relative risk aversion

$$= \left|\frac{\partial u'(c)}{\partial c}\right| \cdot \frac{c}{u'(c)}$$

= (ABSOLUTE VALUE OF) ELASTICITY OF MARGINAL UTILITY WITH RESPECT TO CONSUMPTION

RISK AVERSE agents

each faces damage $D = 10000$ with probability $\pi_b^i = 0.01$

agent i pays 10 to j if b^j occurs

THE AGENTS FORM A SOCIETY OF MUTUAL INSURANCE

1000 agents

expected number of b events $= \pi_b^i \cdot 1000 = 10$

EXPECTED INDIVIDUAL PAYMENT TO OTHER AGENTS IS THE expected individual cost OF FULL INSURANCE $= 10 \cdot 10 = 100$

i's payment for each bad event

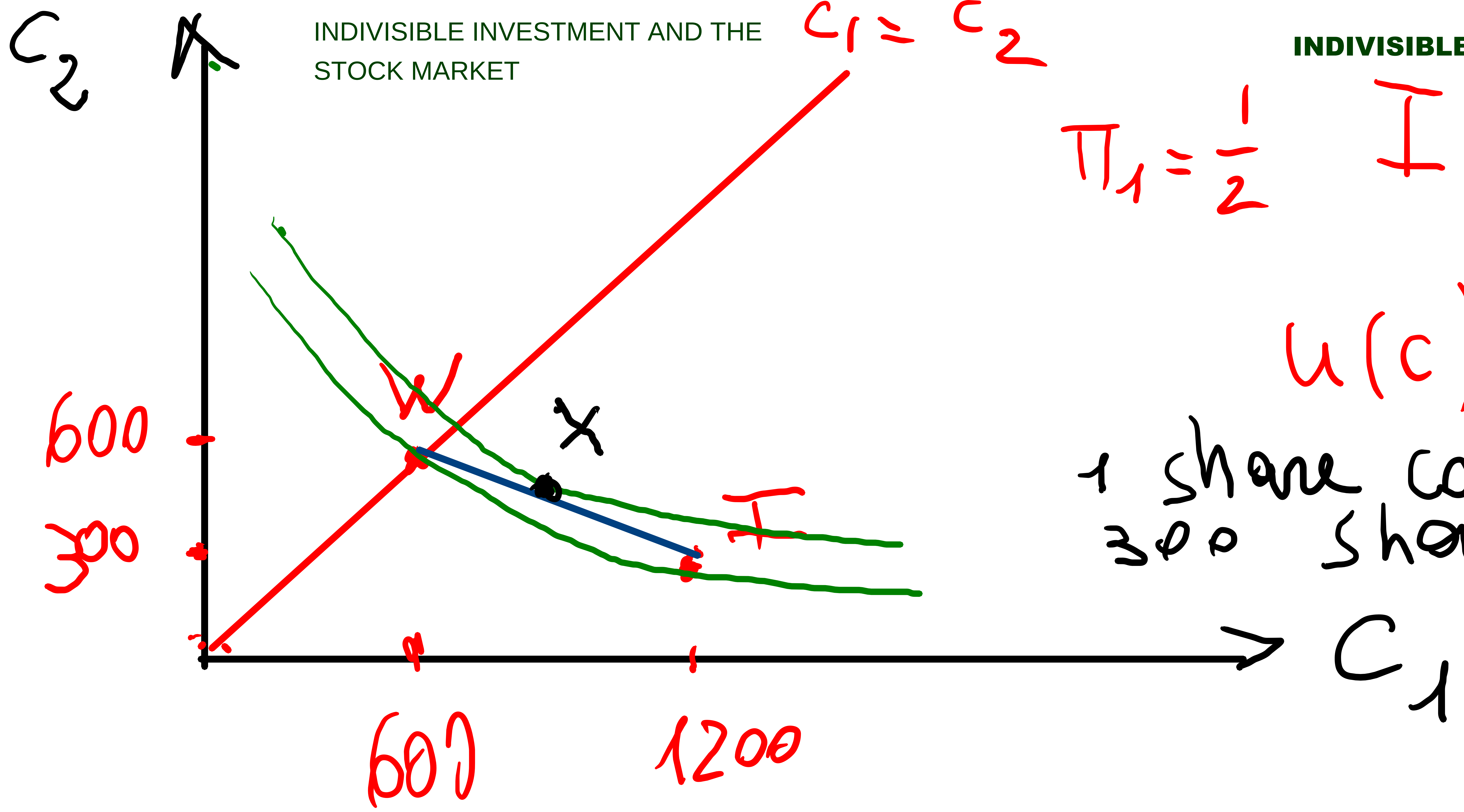
expected number of bad events

$\gamma_{fair} = 0.01$

$\gamma D = 100$

If premium is fair, a risk averge agent wuld buy full insurance K = 10000 AND PAYS A TOTAL PREMIUM 100. THE SAME REULT IS ACHIEVED THROUGH MUTUAL INSURANCE: EACH AGENT PAYS 'ON AVERAGE' 100, TO GET FULL INSURANCE

INDIVISIBLE INVESTMENT AND THE STOCK MARKET



INDIVISIBLE INVESTMENT:

$\pi_1 = \frac{1}{2}$ $I = 300$ → 900 if 1 (**REVENUE**); → 0 if 2

COST

$u(c) = \log c$

1 share cost 1

300 shares

x number of shares bought

$$EU(I) = u(W) = \log 600 = \frac{1}{2}\log 1200 + \frac{1}{2}\log 300$$

CONSUMER IS INDIFFERENT BETWEEN MAKING AND NOT-MAKING investment I at COST 300. SHE STRICTLY PREFERS BUYING A POSITIVE NUMBER x of SHARES OF I, IF THIS OPPORTUNITY IS OFFERED BY THE STOCK MARKET. SO THE STOCK MARKET INCREASES INVESTMENT OPPORTUNITIES TRHOUGH RISK SHARING

x = number of shares = payment to buy x shares

CONSUMPTION IN STATE 1 $C_1 = W - x + 3x = W + 2x$

CONSUMPTION IN STATE 2 $C_2 = W - x$

SLOPE OF BUDGET LINE IS $\dfrac{C_2 - W_2}{C_1 - W_1} = -\dfrac{x}{2x} = -\dfrac{1}{2}$

THE BUDGET LINE IS A STRAIGHT SEGMENT WITH SLOPE - 1/2, JOINING THE SURE ENDOWMENT W = (600, 600) AND THE RISKY CONSUMPTION BUNDLE I = (1200, 300). THE EXISTANCE OF A STOCK MARKET MAKES ANY POINT ON THE BUDGET LINE ACCESSIBLE. iN THIS WAY, THE STOCK MARKET INCREASES INVESTMENT OPPORTUNITIES THROUGH RISK SHARING.

Savage (1954) proposes Subjective EU

$u(0) = 0$

SUBJECTIVE EXPECTED UTILITY IS CRITICISED BY DANIEL ELLSBERG, through the following experiment

Box 1
- Red BALLS R_1 — $\pi(R_1) = 1/2$
- Black BALLS B_1 — $\pi(B_1) = 1/2$

R1 is indifferent to B1 implies that the probability of R1 and B1 are equal

Box 2
- 50 Red BALLS R_2 — $\pi(R_2) = 1/2$
- 50 Black BALLS B_2 — $\pi(B_2) = 1/2$

R2 is indifferent to B2 implies that the probability of R2 and B2 are equal. HERE the conclusion is supported by the knowledge of the number of balls

IF ONE BETS ON R OR B AND WINS, THE REWARD IS 100, THE REWARD IS ZERO OTHERWISE

$$EU(R_2) = \pi(R_2) \cdot u(100) + \pi(B_2) \cdot u(0)$$

$$EU(R_1) = \pi(R_1) \cdot u(100) + \pi(B_1) \cdot u(0)$$

MOST PARTICIPANTS TO THE EXPERIMENT DECLARED THEY PREFERRED BETTING ON R2 RATHER THAN on R1. THIS IMPLIES PROBABILITY OF EVENT R2 IS HIGHER THAN PROBABILITY OF EVENT R1.

$$\frac{1}{2} = \pi(R_1) < \pi(R_2) = \frac{1}{2}$$

THIS SHOWS THAT USING THE AXIOMS OF SUBJECTIVE EXPECTED UTILITY TO INTERPRET THE EXPERIMENTAL EVIDENCE LEADS TO CONTRADICTION.
ELLSBERG INTERPRETS THE EXPERIMENTAL EVIDENCE ON THE GROUND THAT THE PROBABILITIES OF EVENTS R1 AND B1 ARE AMBIUGUOUS BECAUSE THEY ARE NOT SUPPORTED BY ADEQUATE KNOWLEDGE OF THE RESPECTIVE NUMBER OF R AND B BALLS IN BOX 1.
BETTING ON R2 IS PREFFEREED TO BETTING ON R1, AND BETTING ON B2 IS PREFERRED TO BETTING TO B1, BECAUSE AGENTS SHOW 'AVERSION TO AMBIGUOUS PROBABILITIES'. THIS IS AMBIGUITY AVERSION, NOT RISK AVERSION

Consumer surplus

$p_2 = 1$

m income

reservation price

x_1 discrete x_2 divisible

RESERVATION PRICE:

max price at which agent is pleased to buy 1 additional unit of x_1

GIVEN ANY WELL BEHAVED UTILITY FUNCTION

$$u(x_1, x_2)$$

r_1 = RESERVATION PRICE OF 1st UNIT OF x1

r_2 = RESERVATION PRICE OF 2nd UNIT OF x1

$u(x_1, x_2)$

r_1 IS DEFINED BY: $u(0, m) = u(1, m - r_1)$

r_2 IS DEFINED BY: $u(1, m - r_2) = u(2, m - 2r_2)$

r_n S DEFINED BY: $u(n-1, m-(n-1)r_n) = u(n, m - n r_n)$

$$u(x_1, x_2) = v(x_1) + x_2$$

NOW RESTRICT THE UTILITY FUNCTION TO BE QUASI - LINEAR

$$u(x_1, x_2) = v(x_1) + x_2$$

$$r_1: \quad v(0) + \cancel{m} = v(1) + \cancel{m} - r_1$$

$$r_1 = v(1) - v(0) = \text{marg. utility of first unit}$$

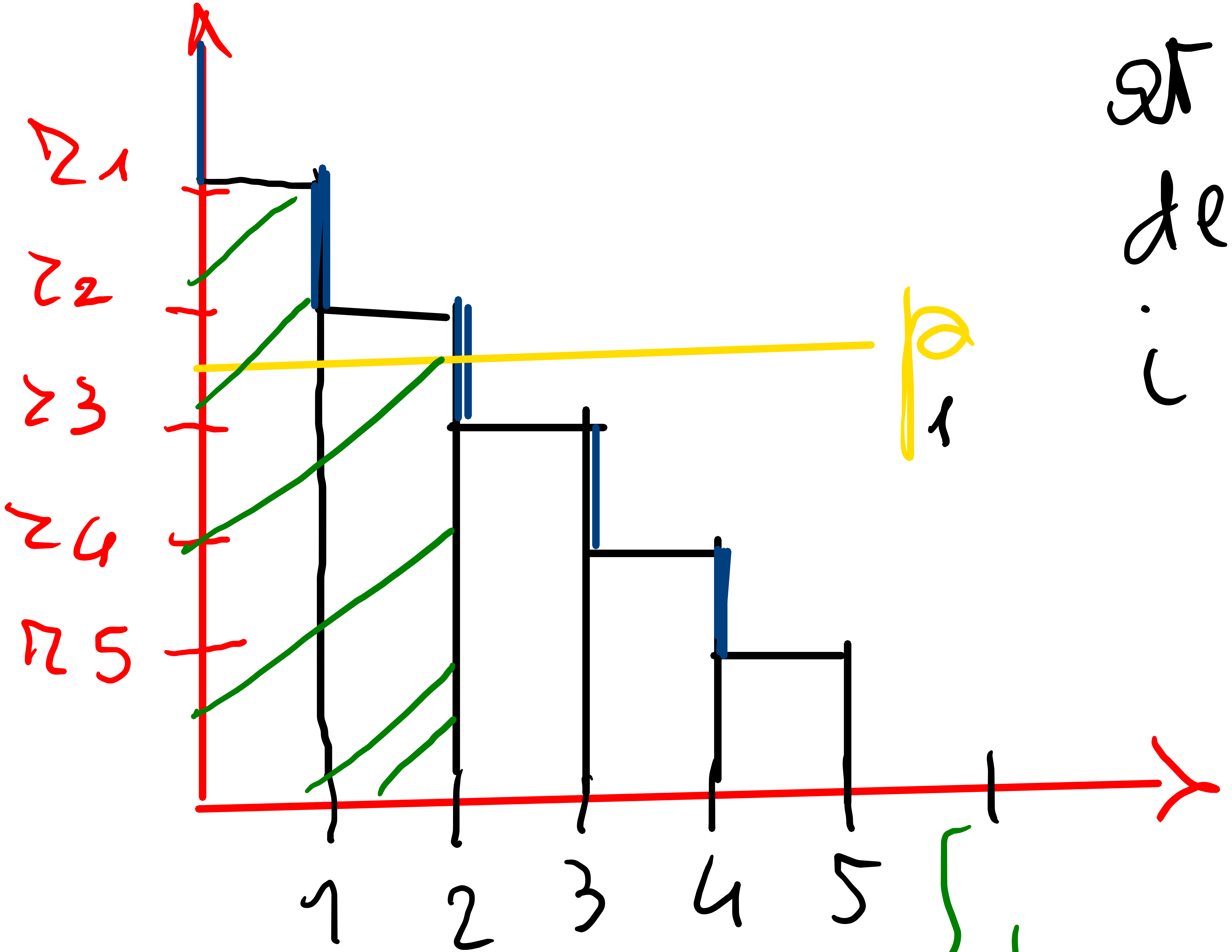
$$r_2 = v(2) - v(1)$$ = marginal utility of second unit of x1

THE INCOME TERMS DISAPPEAR BECAUSE THE DEMAND OF x1 DOES NOT DEPEND ON INCOME

$$r_2: \quad v(1) + \cancel{m} - r_2 = v(2) + \cancel{m} - 2r_2$$

$v'(x_1)$ is decreasing: $\quad r_1 > r_2 > r_3 > \cdots r_m >$

since preference are strictly convex, |MRS| is decresing with respect to x1. Here the marginal utility of x2 is constant (= 1); it follows that the marginal utility of x1 must be decreasing with respect to x1. This proves that the sequence of reservation prices is decreasing

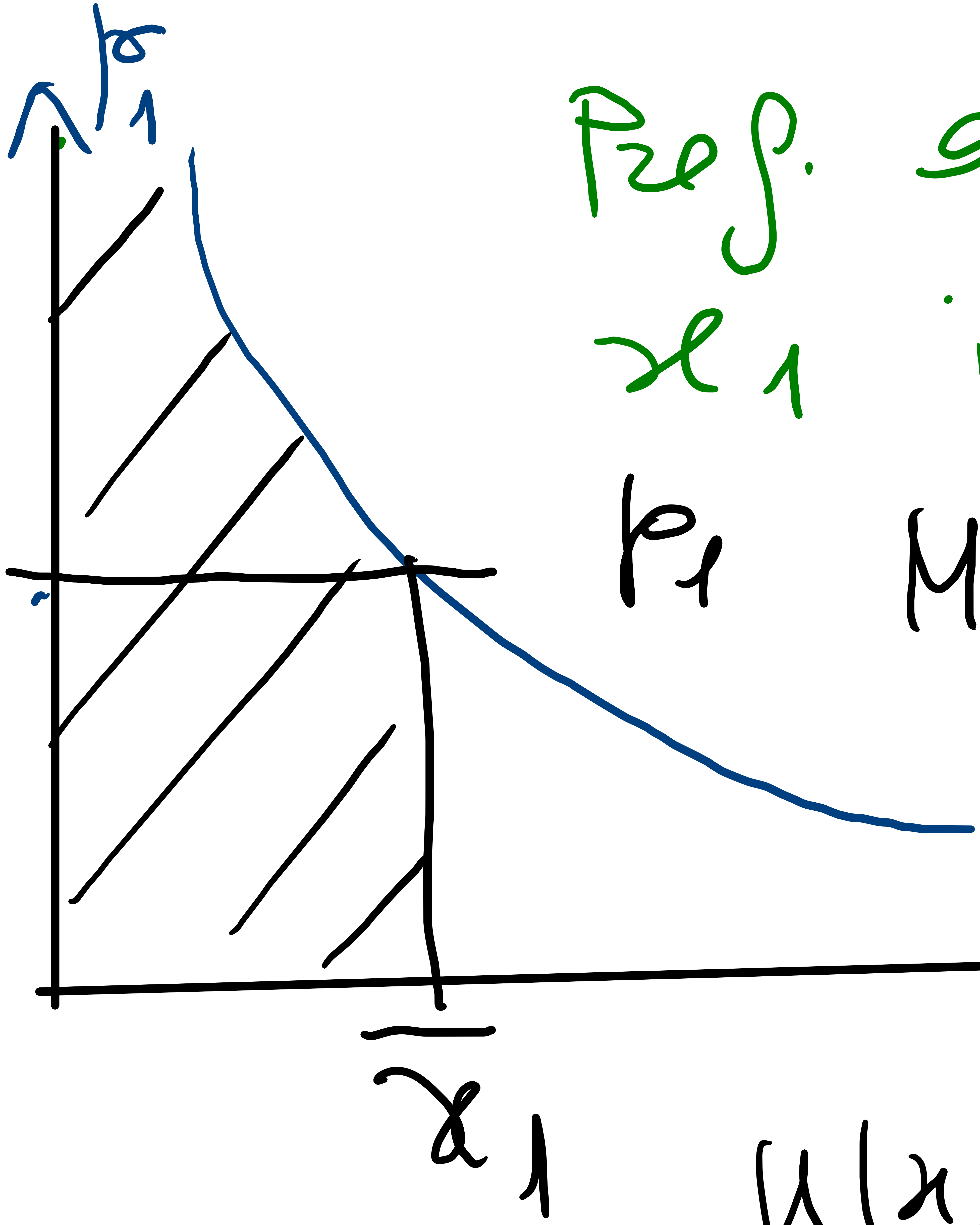


at price p_1
demand is $x_1(i)$
$i = \max n$ s.t.
$r_n \geq p_1$

$r_1 + r_2 =$
total contribution
to utility from
consuming $x_1 = 2$

GROSS CONSUMER'S SURPLUS = total contribution to utility from consuming $x_1 = 2$

Pref. quasi linear but x_1 is divisible



$$MU_1 = \frac{MU_1}{MU_2} = \frac{p_1}{p_2} = p_1$$

$$p_2 = 1$$

$$u(x_1, x_2) = v(x_1) + x_2 \qquad MU_2 = 1$$