Huisw: I — 1 — 07 Dec 11

Today PT. Rof dep. h.av. — P&R $\tilde{5}$

Important: Hard to model (very irrational)

A duality (to prepare) in RDU, confusing all novices

KT79 vs Arrow

We argued: do not transform fixed outc. prob^s, but goodnews-prob^s ; ranks

~~Marginal revolution in Neo-classical~~

Imagine alternative:

Someone says: "No, you are wrong"

(Better bad-news events!

bring with fire

loss-rank l: prob getting outcome ranked worse.

loss-ranked prob: $A_l = P_l$ iso p^r

igo w

Take $z: [0,1] \to [0,1]$

$p_1 x_1 \ldots p_n x_n$ with $x_1 \geq \ldots \geq x_n$

$$\sum \pi_j U(x_j)$$

$\downarrow$

$$z(p_j + \cdots + p_n) - z(p_{j+1} + \cdots + p_n)$$

Marginal z contribution of p_j to $p_{j+1} + \cdots + p_n$

Why not??

Answer: Does not matter!
Is the same!

π & w are each others' duals:

$\pi(p) = 1 - w(1-p)$; or:
$w(p) = 1 - \pi(1-p)$

w is rank-weighter
π is loss-rank weighter

$p_1 \cdots\ p_{j-1}\ p_j\ p_{j+1} \cdots\ p_n$

$w(p_j + \cdots + p_1) - w(p_{j-1} + \cdots + p_1) =$

$1 - \pi(p_{j+1} + \cdots + p_n) - (1 - \pi(p_j + \cdots + p_n)) =$

$\pi(p_j + \cdots + p_n) - \pi(p_{j+1} + \cdots + p_n)$

Fig 7.6.1, p. 220. $r = p_1 + \cdots + p_{j-1}$, $l = p_{j+1} + \cdots + p_n$

Later, for PT, we will use loss-ranks for losses. → Early papers

Just as matter of convenience.
Our critic was not criticizing us. Was saying the same thing.

2017. 10:40 - 10:50

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10:15 - 10:25

§ 8.1, Fig 8.1.1

Fig b nu geheel recht ~~tekenen~~.

Culprit? (2012: Did not raise this question early enough, because discussion went mildly differently)

Empirical explanation:
reference dependence.

Ch. 8 NOT MUCH THEORY

Most important: loss aversion.

Here is the modeling of ref. dep. (yet without saying much about w)

ref point $\theta = 0$ notation

$u: \mathbb{R} \to \mathbb{R}$: basic utility
scaling: $u(0) = 0$.
λ : loss aversion

Overall utility U:

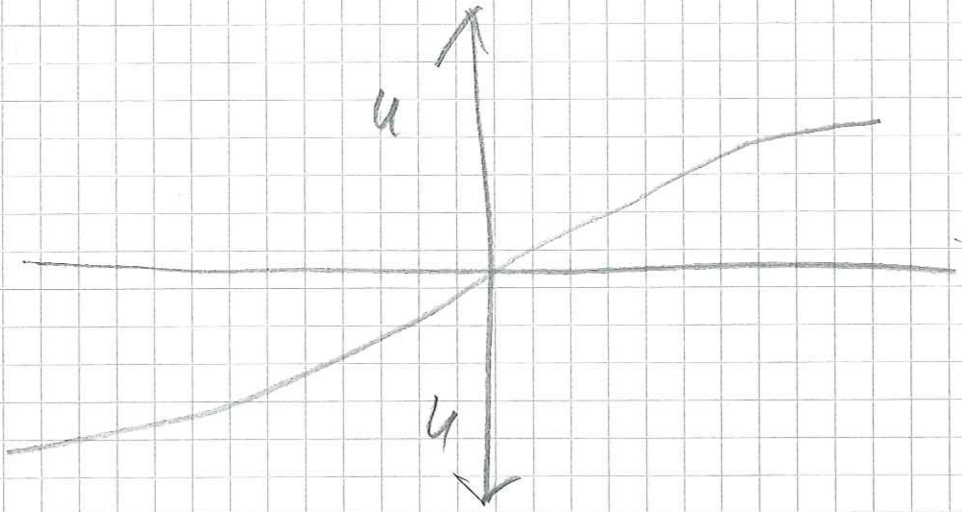
$\alpha \geq 0$: $U(\alpha) = u(\alpha)$

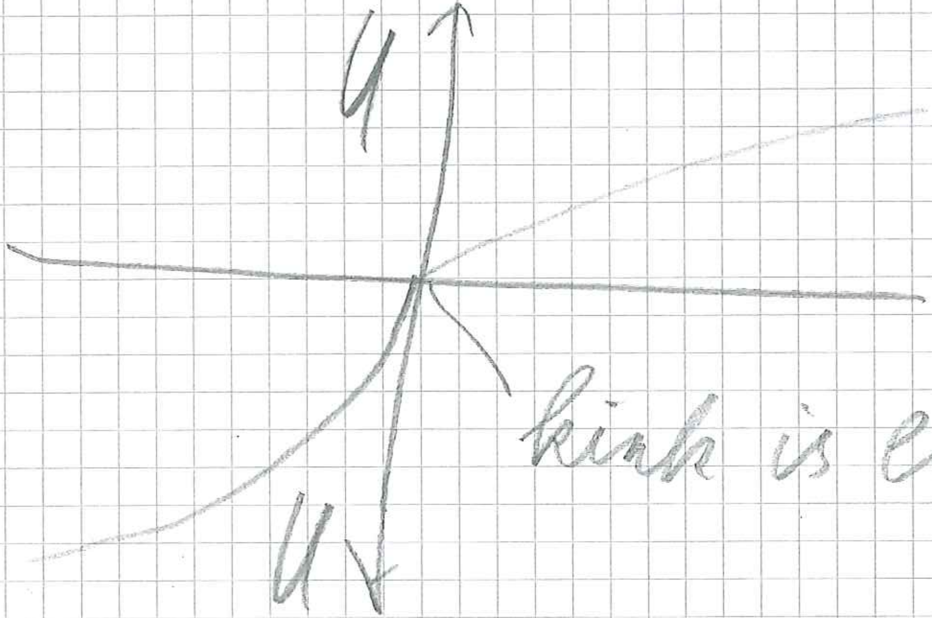
$\alpha < 0$: $U(\alpha) = \lambda u(\alpha)$

also $U(0) = 0$

Loss aversion: $\lambda > 1$

Can do ref-dep generalization of EU.





kink is loss av.

Rabin's paradox

Assume $0 \succ \begin{array}{l} \xrightarrow{.5} 11 \\ \xrightarrow{.5} -10 \end{array}$ $(*)$

At every wealth level m.

Reference dependence through subscript m in U_m

No prob. weighing for now.

$(*) \Rightarrow$

$$U_m(11) - U_m(0) < U_m(0) - U_m(-10)$$

So: every U_m moderately concave around 0.

That's it!

Classical - What would happen to you had you not taken my course?

Researcher does not recognize reference dependence. Does final wealth, regular (concave) U (as in most of your other courses)

Thinks:

$$U(m+11) - U(m) < U(m) - U(m-10)$$

$$\frac{U(m+11) - U(m)}{11} < \frac{10}{11} \; \frac{U(m) - U(m-10)}{10}$$

$$U'(m+11) < \frac{10}{11} \; U'(m-10)$$

$\forall m$: Not plausible!

U' dropping by $\frac{10}{11}$ over every increase by 21 ??

Over 210 by $\left(\frac{10}{11}\right)^{10} < 0.4$

Over 2100 by factor

$$\left(\frac{10}{11}\right)^{100} = 0.0001 \; ??$$

bomb, always under EU. Rabin showed it.

Refuse $M_{0.5}(-100)$ $\forall M$???

Ref. Dep. Almost no theory yet.

Ex. 0.7.1 Assume no w.

R. av. & U not concave:

α vs P :

take α as ref point (plausible)

U steeper for losses than for gains. ⇒

$0 \succsim P$ whenever $EV(P) = 0$

say for all U_α : ⇒

$0 \succsim_\alpha P$ " "

Implies

But now $\beta \succsim_\alpha P$

for $\beta \neq \alpha$ meaningless.

$\succsim_\alpha$ not complete. We need new theory!

New theorems! Bleichrodt...!

Köszegi & Rabin first operational theory. 9

We, From now on theory with fixed ref. point.

Still completeness ...

Ch. 9. PT

Ch. 9. PT [11:13 - 11:25] 10

although no ref. dep,
still sign dep: Gains ≠ losses
Now: U on $\mathbb{R}^+$, U on $\mathbb{R}^-$; w^+, w^-, λ

Symmetries about 0 plausible.
To illustrate:

$U(1020) - U(1010) < U(20) - U(10)$

How about

$U(-1010) - U(-1020)$ $U(-10) - U(-20)$?

Economics:

$>$!

$\forall$ & PT: $<$!

U convex on $(-\infty, 0)$!
Flies in face of classical theory - Jaśniance

W^+: For gains, (gain-)ranks:
Being remote from 0 (ref. point)
Look from 0 up!

Symmetric for losses:
Look from 0 down!
Relate everything to 0.

So, for losses, loss-ranks
$\simeq$ gain-ranks.

Although formally equivalent,
more natural to use loss-ranks
for losses.

W^- as loss-rank w. fcn
$\simeq$ W^+

If W^+ underweighs gain-ranks
(pessimism)
W^- underweighs loss-ranks.
(optimism)

Reflection: u & w do it.

More risk av. for gains ⇒
more risk seeking for losses.

See Figure 8.1.1. (the opening
paradox in
Ch. 8)

Def PT: $\exists\ U, u, \lambda, w^+, w^-$, s.t.

$x = p_1 x_1 \cdots p_n x_n$

Complexly sign-ranked:

$x_1 \geq \cdots \geq x_k \geq 0 \geq x_{k+1} \geq \cdots \geq x_n$

$$PT(x) = \sum_{j=1}^{n} \pi_j U(x_j)$$

$x_i > 0 \ (i \leq k)$:

$$\pi_i = \pi(p_i^{p_1 + \cdots + p_{i-1}}) = w^+(p_i + \cdots + p_1) - w^+(p_{i-1} + \cdots + p_1)$$

$x_j < 0$:

$$\pi_j = \pi(p_j{}_{p_{j+1} + \cdots + p_n}) = w^-(p_j + \cdots + p_n) - w^-(p_{j+1} + \cdots + p_n)$$

//

$x = x^+ + x^-$ (define)

$PT(x) = PT(x^+) + PT(x^-)$

Is sum of two different RDU's

π_i s need not add to 1.

Violates math, as did old Edwards?

No!

Measuring $U_{\alpha|R|}$ w^+: just say

$U_{\alpha \, R^-}$ w^-: the same

λ, pragmatic:

$$\alpha_{\frac{1}{2}}(-1) \sim 0 \Rightarrow \alpha = \lambda$$

$$\cancel{w^+(\tfrac{1}{2})}\, U(\alpha) + \cancel{w^-(\tfrac{1}{2})}\, U(-1) = 0$$

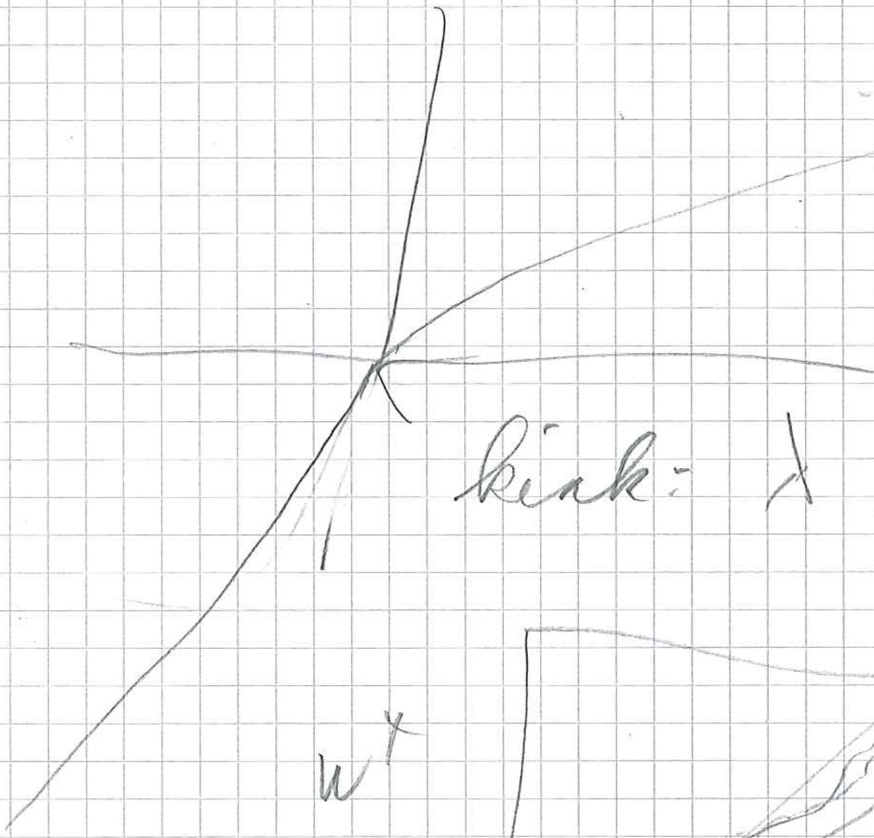
$$u(\alpha) + \lambda u(-1) = 0$$

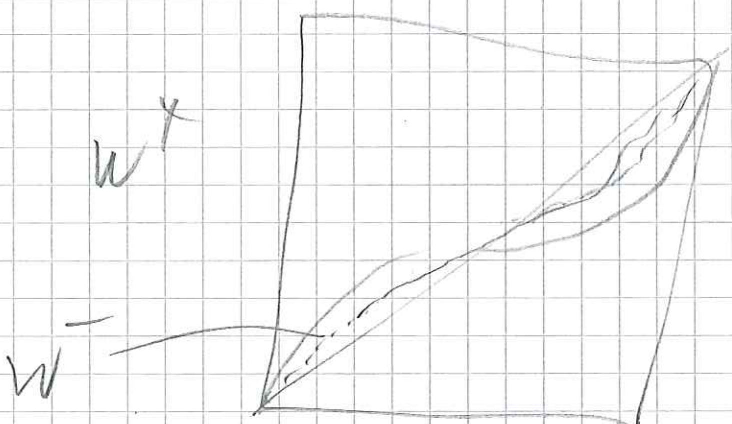
$u \approx$ linear

$$\alpha - \lambda = 0$$

9.5. Empirical findings

reflection for losses,
but less pronounced, closer to EV.





4-fold pattern

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$\lambda \simeq 2$ volatile ...

(more than w,

more than U)

pragmatic- Forgains: U: U say $1-\exp^{-\theta\alpha}$

Losses: $U(\alpha) = -U(-\alpha)$

λ

$w^- = w^+ =$ T&K 92

3 parameters