

23 NOV 11 R&R 4<sup>th</sup> session

1. Pref. foundations (de FQ)

VNM, Savage

⇒ Big book 1950-1980

But deviations. We saw.

Allais; our exp<sup>t</sup>

Bernoulli 1738: deviation from objectivity

PT (K&T)

: deviation from rationality

Behavioral revolution

Topic today

Before: irrational is chaotic (Arrow)

Took mix of 44 marks

Main sep: Quiggin & Sch.

↓  
today

How I invented

I Deliberately slow.  
So you get it

Home work  
I asked fingers for trig  
2.6.11

Q Higgins' invitation powerpoint  
file § 1-4 (Definition of RDU) 2

Then § 6.1:

11:02-11:13

Prob. w. fcn:  $w: [0,1] \rightarrow [0,1]$

$w(0) = 0$ ,  $w(1) = 1$ ,  $w$  str. inc.

Need not be continuous.

$U: \mathbb{R} \rightarrow \mathbb{R}$  is as usual

One fixed prospect for a while  
( $p_1: x_1, \dots, p_n: x_n$ )  
Complete ranking of outcomes:

$$x_1 \succeq \dots \succeq x_n$$

more general than Ch. 5

E.g.  $(\frac{1}{6}: 9, \frac{1}{3}: 9, \frac{1}{2}: 3)$

Can rewrite  $(\frac{1}{2}: 9, \frac{1}{2}: 3)$  collapsed form

||  
9 3  
   $\frac{1}{2}$   
  2

Flexibility of weak inequalities is often convenient.

Now first some preparatory concepts  
Before RDU-def. of "rank" and of d.w.

Rank of  $p_i$ :  $p_{i-1} + \dots + p_1$

Rank of  $x_i$ . Depends on whole prospect, and, on the notation we chose.

Logical problems?  
No, ~

Decision weights of  $p_i$ . Depends on pair of prob.<sup>s</sup>  
Depends on outcome prob.  $p_i$  (as in EU)  
also on rank  $p_{i-1} + \dots + p_1 = R_i$

In general, ranked probability:

$p^i$  or  $p^r$  with  $p \geq 0, r \geq 0, p+r \leq 1$

Decision weight is

$$\pi(p^r) = w(p+r) - w(r)$$

Decision weight = marginal w-contribution of outcome prob. to rank

Assume DMR

RDU holds if:

$\exists$  prob.  $w$  from  $\mathcal{W}$

$\exists$   $U$ , from  $U: \mathbb{R} \rightarrow \mathbb{R}$

s.t.

$$\begin{aligned}
 (p_1: x_1, \dots, p_n: x_n) &\longmapsto \sum \pi_j U(x_j) \\
 \text{with } x_1 \geq \dots \geq x_n & \\
 &= \pi(p_j^{\uparrow j}) \\
 &= W(p_j^{\uparrow \dots \uparrow p_1}) - W(p_{j-1}^{\uparrow \dots \uparrow p_1}) \\
 \text{Notations: } \pi_j, \pi(p_j), \pi(x_j) &
 \end{aligned}$$

The RDU of the prospect.

Here  $U$  &  $w$  subj. parameters

EU:  $w$  is linear

Elicitation method is more difficult.

Lexicographic convention:

$r=0$ : best rank

low rank  $\rightarrow$  good outcome within a given prospect

$p^0$  → best rank. Also:  $p^b$  ↗  
 $p^1-p$  → worst rank. Also  $p^w$  - no  
confusion  
with w-  
fion

Differences of  $w$  rather than  $w$  absolute  $\approx$  marginal revolution  
Quiggin  
Schmeidler

Probabilistic risk attitude:

Quiggin's invention  
powerpoint file  
the rest.  $\$5$  ff.