Handout 4

Is it Rational to Have Faith?

1. Buchak's Theory of Faith

A proposition X is a *candidate for faith* for a person S if S care that X holds and is uncertain that X holds on the basis of evidence alone.

S *has faith* that X if and only if
    (1) X is a candidate for faith for S
    (2) S is willing to take a risk on X without looking for additional evidence; and
    (3) S is willing to follow through on such risky actions even when he receives evidence against X.

Examples: Faith that your friend will keep your secret, Moses' faith that God would lead his people out of Egypt, Anna's faith that Bates is innocent.

When is it rational to have faith?

Buchak's answer: when you're antecedently quite confident in the proposition in question, and when the evidence you might encounter against the proposition is sparse or unreliable.

The intuitive idea: if you're risk averse, even weak evidence will sway you. In such circumstances the risk of misleading evidence may outweigh the benefit of non-misleading evidence.

2. Buchak's Theory of Risk Aversion

	Heads	Tails
Deal 1 (A)	0 utility points (utiles)	10 utility points
Deal 2 (~A)	5 utility points	5 utility points

$EU(A) = (.5)(0) + .5(10) = 5$
$EU(\sim A) = 5$

How do we rationalize a preference for Deal 2?

Consider a case in which A yields O1, if S obtains, O2 if ~S obtains and where $u(O2) \leq u(O1)$

	S	~S
A	O1	O2

$EU(A) = p(S)u(O1)+p(\sim S)u(O2)$
      $= u(O2) + p(S)[u(O1)-u(O2)]$

Buchak proposes

$$REU(A) = u(O2) + \mathbf{r}(p(S))[u(O1)-u(O2)]$$

$\mathbf{r}$ is a risk function. Example $r(p) = p^2$

If a risk function has a high value for a particular probability the possibility of improving over the minimum by that probability will count for a lot in the agent's estimation, and if it has a low value then it will not count for much.
An agent with a convex risk function is *risk avoidant* - in general risk avoidant agents aim to decrease the spread of possible value.

3. The Value of Information

It's a theorem that the expected utility of performing an experiment with no cost is either positive or zero. In other words, it never hurts to gain more information before making a decision, and in many cases it helps. *This isn't true if you're risk averse*!

Why? Gaining more information is, in a sense, a risky action. It could lead to a worse outcome than you'd get otherwise if you get misleading information. For risk averse agents, the prospect of gaining non-misleading information may not outweigh the risk of getting misleading information.

Say Anna doesn't wait for the verdict:

	Bates is innocent	Bates is guilty
Anna says yes	10	0
Anna says no	1	1

Suppose her risk function is $r(p) = p^2$

$REU(Yes) = 0 + \mathbf{r}(p(Innocent))(10-0)$
$REU(No) = 1$

Suppose she's currently confident enough in Bates' innocence that, despite being risk averse, it makes sense for her to marry him. (This will hold as long as she's more than ~34% confident)

And suppose Anna thinks that there's a 90% chance there will be an innocent verdict and 10% chance there will be a guilty verdict.
Supposing an innocent verdict, there's a 99% chance Bates is innocent, and a 1% chance he isn't.
Supposing a guilty verdict, there's an 88% chance Bates is guilty and a 12% chance he's innocent.

Given her risk aversion, a guilty verdict is enough to sway her not to marry Bates:

$REU_{\text{guilty verdict}}(Yes) = (.12)^2(10) = .144$
$REU_{\text{guilty verdict}}(No) = 1$
(But she would still marry him if she were an EUT maximizer!)

So does it make sense to wait? No!

	Bates is innocent, investigation finds him innocent p = .891	Bates is innocent, investigation finds him guilty p = .012	Bates is guilty, investigation finds him guilty p = .088	Bates is guilty and the investigation finds him innocent p = .009
Say yes to Bates now	10	10	0	0
Say no to Bates now	1	1	1	1
Wait for the verdict and then decide	10	1	1	0

REU (Decide now)= 0+0+.903(10)+0 = 9.03
REU(Wait for the verdict) = $0+.991^2(1)+ 0 + .89^2(9) = 8.11$

So should you have faith/avoid information/ignore information? If you're a risk-avoidant, pretty confident in the claim in question, and the risk of misleading evidence is sufficiently high, then yes.

"If you are risk avoidant, then you require a higher degree of belief to take a risk; therefore, you are more easily talked out of taking a risk. Consequently, if the negative evidence wouldn't be conclusive so that backing out on bad information and backing out on good information are both possible, *you are in particular danger of the former*." (11)

"Faith keeps us from being blown about by the changing winds of evidence" (14).