

14 Security II (FMS)

A taxpayer, whose total wealth is 300 Galactic Credits (GC), is having her tax return investigated under suspicion of irregularity. The tax inspector offers her a choice: either the investigation goes ahead as normal, which may result in her being cleared or in her having to pay a hefty fine, or she pays a fixed settlement upfront and the investigation is closed. We formalize these options respectively as the *contest* choice (40% chance of being cleared and 60% chance of paying 10 GC) and the *settle* choice (paying a fixed settlement of $s = 5$ GC). Pretend, for simplicity, that the utility of wealth in Expected Utility Theory is $U(w) = \ln(1 + w)$ and that the Prospect Theory diagram has $V(x) = \ln(1 + x)$ in the first quadrant and $V(x) = -2\ln(1 + |x|)$ in the fourth quadrant, with $w, x \in \mathbb{R}$ expressed in GC.

- (a) Answer the following two questions separately for each of the three cases of (1) straightforward probabilistic computation, (2) Expected Utility Theory and (3) Prospect Theory. Compute any numerical values to three decimal digits using a calculator.
- (i) Will the taxpayer prefer *settle* or *contest* in each of the three cases? Justify your answer. [5 marks]
- (ii) What should the value of s be for the taxpayer to be indifferent between the *settle* and *contest* choices in each of the three cases? [5 marks]
- (b) For what range of values of s would the preferences of the taxpayer in the three cases of part (a) be *settle*, *contest*, *contest* respectively? [5 marks]
- (c) For the case of Expected Utility Theory, draw a full-page diagram and explain in detail how to derive *graphically* the value of s for which the choice between *contest* and *settle* does not matter. [5 marks]