

### Ralph's Relative Performance Evaluation

Output from a production process owned by Ralph can be  $x_1$  or  $x_2$ . The manager's input can be L or H. Ralph is risk neutral while the manager is the usual constant risk aversion type with  $r = 0.0001$ , personal cost  $c_H = 4,000$ , and  $c_L = M$  (reservation wage) = 0. Ralph desires the supply of input H where the probability structure is

	$x_1$	$x_2$
$\Pr(x H)$	0.1	0.9
$\Pr(x L)$	1	0

The only contractible performance measure is the manager's output where  $x_1 < x_2$ .

Suggested:

- (a) Determine an optimal pay-for-performance arrangement.
  
- (b) Suppose Ralph owns two such production processes and employs an identical manager in each. Further suppose the two environments are perfectly correlated. If both managers supply input H their performance measures will agree (either both  $x_1$  or both  $x_2$ ). Suppose Ralph offers to pay each 4,000 if their outputs agree and -10,000 otherwise. Verify that if one manager supplies input H the best the other can do is also supply input H.
  
- (c) What happens in the above arrangement if one manager supplies input L. Is the other manager's best response to supply input L? How do you think they will play the game?
  
- (d) Amend the arrangement so that the supply of input H by both managers is a unique equilibrium. Intuitively describe why your modification leads to a unique equilibrium. What difficulty is associated with your modification?