

ECO 120

Final Exam Suggested Solutions

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1. I don't present detailed answers here as these are from the reading.
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4.
 - (a) See lecture notes for examples on how to do this.
 - (b) Expected utility for the low-risk type from borrowing is $p(L - (1 + i)K)$. This must be greater than 0 to want to borrow, which implies that $1 + i \leq \frac{L}{K}$. For the high risk type, the condition is that $1 + i \leq \frac{H}{K}$.
 - (c) Zero profits from lending to the low risk types implies that $rK = pi_LK - (1 - p)K$, or that $i_L = \frac{1+r}{p} - 1$. Similarly $i_H = \frac{1+r}{q} - 1$.
 - (d) Zero profits imply that

$$rK = s(piK - (1 - p)K) + (1 - s)(qiK - (1 - q)K)$$

or that

$$r = spi - s(1 - p) + (1 - s)qi - (1 - s)(1 - q)$$

which gives us that

$$i = \frac{r + s(1 - p) + (1 - s)(1 - q)}{sp + (1 - s)q}$$

- (e) Plugging in gives us that $i_L = 0.2$, $i_H = 0.6$, and that $i = \frac{0.1}{0.1+0.9(0.25)} = 0.31$. If both borrow, the interest rate is 31%. But since this is higher than the maximum the low risk types will pay, they drop out of the market. Only the high risk types borrow. Zero profits imply that the interest rate is $\frac{r}{q}$ or 0.4, which is lower than the maximum the high risk types will pay. The market has failed here - adverse selection has driven out the low risk types.
- (f) Now $i = 0.18$. This is less than i_L so both types can borrow. The adverse selection problem isn't as serious now and so the low risk types can borrow.
- (g) Expected utility for low risk types if now

$$p(L - (1 + i)K) + (1 - p)(-C)$$

To borrow, this must be greater than 0, which means that

$$C \leq \frac{p}{1 - p}(L - (1 + i)K)$$

For the high risk types the condition is

$$C \leq \frac{q}{1 - q}(H - (1 + i)K)$$

- (h) The low risk types care about the interest rate because they pay that back more often than the high risk types (since you only pay back if successful). The high risk types care more about collateral because they lose that more than the low risk types (since collateral is only seized if unsuccessful). Thus, the bank can lower i and reduce C to get better selection on types.
- (i) Zero profits imply that $rK = piK + (1 - p)(C - K)$, or that

$$C - K = \frac{K(r - pi)}{1 - p}$$

or that

$$C = K\left(1 + \frac{r - pi}{1 - p}\right)$$