Chapter 8. Quantitative

1. (a) When \( p = 0.01 \), \( w = 10 + 25(0.01) = $10.25/hr \). When \( p = 0.05 \), \( w = 10 + 25(0.05) = 11.25 \).
(b) Utility from the first job offer is \( U(10.25, 0.01) = 10.25 - 5\sqrt{0.01} = 9.75 \). Utility from the second job offer is \( U(11.25, 0.05) = 11.25 - 5\sqrt{0.05} = 10.13 \). Thus, she will choose the second, more risky job.
(c) Now, her utility from the two job offers is \( U(10.25, 0.01) = 10.25 - 10\sqrt{0.01} = 9.25 \) and \( U(11.25, 0.05) = 11.25 - 10\sqrt{0.05} = 9.01 \). As a result, Aliyah will now prefer to change jobs and work at the safer job for less pay.

2. Connor’s utility from the rural police force’s job offer is \( U = \sqrt{30,000/100(0.01)} = 173.21 \). His utility from the urban police force’s job offer is \( U = \sqrt{w/100(0.03)} \). Equating this to 173.21 and solving for \( w \) yields:
\[
\sqrt{w} = 346.42 \Rightarrow w = 120,006.82
\]
Thus, the urban police force must pay an annual salary of at least $120,006.82/yr.

3. (a) \( w_A = -5 + 2.5(16) + 200(0.02) = $39/hr \); \( w_B = 2 + 0.5(10) + 100(0.06) = $13/hr \).
(b) A has a higher wage and a lower probability of death; B has a lower wage and a higher probability of death. As a result, the correlation between \( w \) and \( p \) is negative. While this appears contrary to the theory of compensating differentials, it neither proves nor disproves the theory since the correlation does not control for the fact that average schooling levels differ across occupations and schooling is (positively) correlated with both wages and (negatively) correlated with the probability of death.

4. (a) Anthony ... At the first job, Anthony receives utility in the amount of \( U_1 = \sqrt{22,500} = 150 \). His utility from the second job is \( U_2 = 0.5\sqrt{0} + 0.5\sqrt{Y_{busy}} \). \( U_2 > U_1 \iff 0.5\sqrt{Y_{busy}} > 150 \iff Y_{busy} > $90,000 \).
Austin... At the first job, Austin receives utility in the amount of \( U_1 = 22,500 = 22,500 \). His utility from the second job is \( U_2 = 0.5(0) + 0.5(Y_{busy}) \). \( U_2 > U_1 \iff 0.5(Y_{busy}) > 22,500 \iff Y_{busy} > $45,000 \).
(b) Anthony’s average salary at the rival firm is \( 0.5 \times 0 + 0.5 \times 90,000 = $45,000 \) > \( $22,500 \).
Austin’s average salary at the rival firm is \( 0.5 \times 0 + 0.5 \times 45,000 = $22,500 \) = \( $22,500 \).
Thus, Anthony expects to receive an extra $22,500 in compensation for the layoff risk. Austin is not paid anything extra. This is because Anthony’s utility function is concave, while Austin’s utility function is a straight line. As a result, Anthony is said to be risk averse and must be compensated for the uncertainty, whereas Austin is said to be risk neutral and no compensation is necessary.

5. (a) Jodi ... At firm A, Jodi receives utility \( U_1 = 25,000 + 10,000 = 35,000 \). Her utility at firm B is \( U_1 = 33,000 \). Thus, she opts for firm A. Shayna ... At firm A, Shayna receives utility \( U_2 = 25,000 \). Her utility at firm B is \( U_2 = 33,000 \). Thus, she opts for firm B.
(b) Under the law, neither woman’s utility from the job at firm A changes. Jodi’s new utility if she works for firm B is \( U_1 = 28,000 + 5,000 = 33,000 \). This is still less than firm A. So, Jodi...
still opts for firm A and the law has no effect on her utility. Shayna’s new utility if she works for firm B is $U_2 = 28,000$. This is still more than firm A. So, Shayna still opts for firm B. However, the result of the law is a loss in utility (of 5,000). This is because the law mandates a benefit for which Shayna obtains no utility from, but the firm passes on the cost of the ‘benefit’ to its workers.