Chapter 7. Quantitative Answers

1. (a) The opportunity cost of not seeking employment is given by the expected wage, \( E(w) = \pi w \), where \( \pi \) is the probability of finding a job and \( w \) is the wage. Max’s expected wage is \( 0.92 \times 10 = 9.20 \), which exceeds the value of leisure. Thus, one would expect Max to look for a job, and therefore not be a discouraged worker.

(b) Max’s expected wage is now \( 0.9 \times 9.5 = 8.55 \), which is less than the value of leisure. Thus, one would expect Max to not look for a job, making him a discouraged worker.

2. Consider the retirement choice of a 69-year-old worker who expects to live until age 74. If she retires at age 69, she will receive $17,800 per year in Social Security benefits for the remaining five years of her life. If she delays her retirement until age 70, she will receive $19,800 per year in Social Security benefits for the remaining four years of her life. In addition, she will earn $20,000 this year at her job. What is the discounted present value of her remaining lifetime earnings if she (i) retires at age 69 and (ii) delays retirement until age 70, assuming a discount rate of 3%?

Answers:

(i) If the worker retires at the age of 69, her discounted present value of remaining lifetime earnings will be $81,518.79.

\[
PV = \frac{B_1}{1 + r} + \frac{B_2}{(1 + r)^2} + \frac{B_3}{(1 + r)^3} + \frac{B_4}{(1 + r)^4} + \frac{B_5}{(1 + r)^5}
\]

\[
PV = \frac{17,800}{1 + 0.3} + \frac{17,800}{(1 + 0.3)^2} + \frac{17,800}{(1 + 0.3)^3} + \frac{17,800}{(1 + 0.3)^4} + \frac{17,800}{(1 + 0.3)^5} = $81,518.79
\]

(ii) If the worker retires at the age of 70, her discounted present value of remaining lifetime earnings will be $93,598.55.

\[
PV = \frac{B_1}{1 + r} + \frac{B_2}{(1 + r)^2} + \frac{B_3}{(1 + r)^3} + \frac{B_4}{(1 + r)^4}
\]

\[
PV = \frac{20,000}{1 + 0.3} + \frac{19,800}{(1 + 0.3)^2} + \frac{19,800}{(1 + 0.3)^3} + \frac{19,800}{(1 + 0.3)^4} = $93,598.55
\]

3. Asher is a 65-year-old worker, contemplating retirement at the end of the year, who expects to live to age 70. If he continues working, he can earn $18,000 per year. If he retires this year, he is supposed to receive $13,000 per year from Social Security.

(a) If Asher retires, what is the discounted present value of his income stream (assuming no other income sources and a discount rate of 5%)?

Answers:
If Asher retires at the age of 65, the discounted present value of his income stream will be $56,283.19.

\[ PV = \frac{13,000}{1 + 0.5} + \frac{13,000}{(1 + 0.5)^2} + \frac{13,000}{(1 + 0.5)^3} + \frac{13,000}{(1 + 0.5)^4} + \frac{13,000}{(1 + 0.5)^5} = $56,283.19 \]

(b) If Social Security goes bankrupt and Asher’s benefits are eliminated as a result, how many additional year(s) must he work to obtain an income stream with the same discounted present value as in (a)?

Answers:

In order to obtain the same discounted present value as in (a), Asher must continue to work for 3-1/2 years.

\[ PV = \frac{18,000}{1 + 0.5} + \frac{18,000}{(1 + 0.5)^2} + \frac{18,000}{(1 + 0.5)^3} + \frac{9,000}{(1 + 0.5)^4} = $56,422.79 \]

4. (a) Working 20 hrs/wk yields a weekly income of \(15 \times 20 + 100 = $400/wk\).

(b) Now, Jennifer’s weekly income is given by \(15 \times L + 100 - (10 \times L + 25)\), where \(L\) is hrs/wk of labor supply. Equating this with $400 implies:

\[ 15 \times L + 100 - (10 \times L + 25) = 400 \]

\[ 5 \times L = 325 \]

\[ L = 65\text{hrs/wk} \]

She would now have to work 75 hrs/wk to obtain the same income using market child care as she received working 20 hrs/wk with free child care.

(c) If Jennifer decides not to work instead of paying for 40 hrs/wk of child care, her income will be given by her non-labor income, $100/wk. If she increases her labor supply to 40 hrs/wk, her income will be \(15 \times 40 + 100 - (10 \times 40 + 25) = $275/wk\).

5. (a) If Tatum does not work, she is guaranteed an income of $300/wk through the welfare system. However, she is also guaranteed to receive $100/wk in child support (either from the father, the state, or some combination thereof). Thus, she will receive $100/wk in child support and $200/wk in welfare, for a total income of $300/wk.

(b) Tatum no longer qualifies for welfare is her total income is equal to or exceeds $300/wk. She receives $100/wk in child support. Thus, if she earns $200/wk or more in the labor market, she is no longer eligible for any welfare benefits. If Tatum’s wage is $10/hr, then if she works 20 hrs/wk or more she will not receive any welfare.

(c) If Tatum works 35 hrs/wk, her income from child support will be $100, her labor market earnings will be \(35 \times 10 = $350\), and her welfare benefits will be zero (since her earnings and child support total more than $300). Thus, her total income is $450/wk.