

Solution to Exercise 13.2

Jordan is currently at the end of the sixth policy year and has paid $1,800 \times 6 = 10,800$. The cumulative benchmark premium through the end of the sixth year is $1,500 \times 6 = 9,000$. The table below shows the calculation of the premium that must be paid over the next three years:

Policy Year	Cumulative Benchmark Premium	Actual Premium Paid in Prior Policy Years	Premium Required to Maintain the Secondary Guarantee
7	$1,500 \times 7 = 10,500$	10,800	$Max(10,500 - 10,800, 0) = 0$
8	$1,500 \times 8 = 12,000$	$10,800 + 0 = 10,800$	$Max(12,000 - 10,800, 0) = 1,200$
9	$1,500 \times 9 = 13,500$	$10,800 + 1,200 = 12,000$	$Max(13,500 - 12,000, 0) = 1,500$

Solution to Exercise 13.4

The graded premium life product and the annually renewable term product are very similar in that both have a premium that begins at a low level and increases each year during the early part of the contract. As a matter of fact, the two products often compete with each other for the potential sale where the purchaser is looking to maximize coverage for the lowest price.

The two products differ in the later years. An annual renewable term eventually terminates if the insured lives long enough. The termination could be as early as attained age 70 or as late as attained age 100. The graded premium whole life only terminates upon the death of the insured so the coverage cannot be outlived.

Another difference between the products is that the graded premium whole life product will develop cash values and other nonforfeiture values in the United States, where an annually renewable term does not generate nonforfeiture values.

Solution to Exercise 13.5

Remember the definition - A lapse-supported product is a product that is more profitable if there are more lapses.

Whole Life Insurance – Assuming that premiums are level and the policy contains cash values as required in the United States, a whole life insurance is not a lapse supported product. Because the cash values provide a benefit upon surrender that is approximately equal to the reserves being held, there is no significant gain on surrender. While the premiums are level as in a Term to 100 policy, the surrender value does not permit additional profits as a result of lapses.

Universal Life Insurance policy with secondary guarantees – Such a policy may or may not be lapse supported. A universal life contract where the secondary guarantees are keeping the policy in force is clearly lapse supported. Generally, when the secondary guarantees are keeping the policy in force, the

policy is now or will be generating losses in the future. Therefore, the policy will be more profitable with higher lapses.

Universal Life Insurance policy with level cost of insurance rates – Such policies are lapse supported as the cost of insurance charges are level but the mortality costs are increasing. Therefore, these policies will generate losses in later durations so higher lapses results in greater profits.

Level Term for a Period with an Annual Renewable Term Tail and Level Premium Renewable Term – A level premium renewable term may or may not be lapse supported. To a large extent, the determination is based on the length of the coverage. A term with level premiums where the coverage period is not too long (up to 10 to 15 years) is generally not lapse supported. While the mortality curve is increasing and the premiums are level, over a period of 10 years, the slope of the mortality curve is not steep enough to result in a lapse supported product except at older ages. However, for long periods of coverage, generally equal to or exceeding 20 years, the product will be lapse supported. The addition of the Annual Renewable Term Tail generally would not change the determination.

Annually Renewable Term – Under an Annual Renewable Term, the premiums charged each year increase. These premiums generally follow the mortality curve and are intended to cover the mortality cost each year. Therefore, the policy is not lapse supported.

Solution to Exercise 13.6

First we must calculate the monthly loan payment which is $\frac{8,000}{a_{\overline{24}|1.00\%}} = 376.59$.

The gross death benefit in the fifth month will be $376.59(20) = 7,531.80$.

The net death benefit in the fifth month will be $376.59a_{\overline{20}|1.00\%} = 6,795.77$.

The death benefit under net coverage (present value of future payments) will always be less than the death benefit under gross coverage (sum of future payments) since the present value of future payments is always less than the sum of the future payments.