

## Problem 2

(a)

0.0/4.0 points (graded)

Hooli Inc. issues a zero coupon bond with one year to maturity, priced at \$935.657931 per \$1,000 face value.

(a) If investors demand a 4.11% expected return on the bond (effective annual rate with simple compounding), and the default probability at the end of the year is 2.14%, what is the implied recovery amount per \$1,000 face value in the event of a default?

\$ **Answer:** -209.650843

### Explanation

$$935.657931 = \frac{\$1,000(1 - 2.14\%) + R(2.14\%)}{1 + 4.11\%} \Rightarrow R = \$ - 209.650843$$

(b)

0.0/8.0 points (graded)

(b) Consider a portfolio that consists of a long position of \$1,000 face value in the 1-year Hooli bond, and a short position of \$1,000 face value in a 1-year zero-coupon Treasury security priced at \$941.436133. Describe the time 0 and time 1 net cash flows of the portfolio if the Hooli bond does not default and if the Hooli bond defaults. Use positive numbers to denote net cash inflows and negative numbers to denote net cash outflows.

If Hooli bond does not default, the time 0 net cash flow is

\$ **Answer:** 5.778202

If Hooli bond does not default, the time 1 net cash flow is

\$ **Answer:** 0.000000

If Hooli bond does default, the time 0 net cash flow is

\$ **Answer:** 5.778202

If Hooli bond does default, the time 1 net cash flow is

\$ **Answer:** -1209.650843

### Explanation

At time 0, price of Treasury security is \$941.436133, and price of Hooli bond is \$935.657931; then net CF is \$5.778202. At time 1, payoff if no default is \$1,000 - \$1,000 = 0 and is \$ - 209.650843 - \$1,000 = \$ - 1209.650843 if the Hooli bond defaults.

(c)

0.0/8.0 points (graded)

(c) A credit default option written on the Hooli bond promises that in the event of a default, the option writer will pay the difference between the face value of the Hooli bond and its recovery value, in exchange for an upfront fee. Based on the analysis above and the assumption of no arbitrage, what would be the upfront fee to buy protection on \$100,000 face value of the bond?

\$ **Answer:** 577.820200

**Explanation**

The payoff on the portfolio is equivalent to a short position in the option. In the absence of arbitrage opportunities, the upfront fee for the option is the time 0 value of the portfolio because the CFs are the same and the position can be hedged using this portfolio strategy. Price of Treasury security is  $100 \times \$941.436133$  and price of Hooli bond is  $100 \times \$935.657931$ . The upfront fee for the option is hence  $100 \times (\$941.436133 - \$935.657931) = \$577.820200$ .