Solutions to Lab 4: Credit Risk

Question 1:

Time (years)	Default probability	Recovery amount ($)	Risk-free value ($)	Loss given default ($)	Discount factor	PV of expected loss
1.0	Q	30	104.78	74.78	0.9704	$72.57 \cdot Q$
2.0	Q	30	103.88	73.88	0.9418	$69.58 \cdot Q$
3.0	Q	30	102.96	72.96	0.9139	$66.68 \cdot Q$
4.0	Q	30	102.00	72.00	0.8869	$63.86 \cdot Q$
						Total: $272.69 \cdot Q$

The bond pays a coupon of $\$2$ every six months and has a continuously compounded yield of 5% per year. Its market price is $\$96.19$. The risk-free value of the bond is obtained by discounting the promised cash flows at 3%. It is $\$103.66$. The total loss from defaults should therefore be equated to $103.66 - 96.19 = \$7.46$. The value of Q implied by the bond price is therefore given by $272.69 \cdot Q = 7.46$, that is, $Q = 0.0274$. The implied probability of default is 2.74% per year.

Question 2:

Time (years)	Default probability	Recovery amount ($)	Risk-free value ($)	Loss given default ($)	Discount factor	PV of expected loss
0.5	Q	40	106.73	66.73	0.9753	$65.08 \cdot Q$
1.5	Q	40	105.97	65.97	0.9277	$61.20 \cdot Q$
2.5	Q	40	105.17	65.17	0.8825	$57.52 \cdot Q$
3.5	Q	40	104.34	64.34	0.8395	$54.01 \cdot Q$
4.5	Q	40	103.46	63.46	0.7985	$50.67 \cdot Q$
						Total: $\boldsymbol{288.48 \cdot Q}$

The risk-free value of the bond is $\$104.09$, while the market price of the corporate bond is $\$95.34$. Therefore the total loss from defaults is $\$8.75$.
Then, $288.48 \cdot Q = 8.75$, or equivalently, $0.03033 = 3.033\%$