00 Q11

Math 402 Quiz 11 Spring 2019 Name____________________

t	Pr_t	$_tp_x$	Π_t	$NPV(t) = \sum_{k=0}^{t} \Pi_k v_r^k$	
0	−5000.00	1	−5000.00	−5000	
1	2953.10	~~0.95800~~ .985	2953.10	−2315.3636	$= -5000 + 2953.1/1.1$
2	2133.60	0.96826	2101.65	−578.4628	$= -2315.3636 + 2101.65/(1.1)^2$
3	750.60	0.94986	726.78	−32.4222	$= -578.4628 + 726.78/(1.1)^3$
4	799.60	0.92991	759.51	486.3333 ← DPP = 4	$= -32.4222 + 759.51/(1.1)^4$
5	655.60	0.90759	609.65	864.8780 ← NPV	$= 486.3333 + 609.65/(1.1)^5$

1) a) For the above table with $r = 0.1$, fill in the last column, find the DPP (if it exists), and find the NPV. DPP = 4, NPV = 864.8280

b) Suppose the gross premium is $G = 19500$. Find APV(gross premiums). $= G \sum_{t=0}^{n-1} v_r^t \, {}_tp_x$ swap

$$19500\left[1 + \frac{.985}{1.1} + \frac{.96826}{(1.1)^2} + \frac{.94986}{(1.1)^3} + \frac{.92991}{(1.1)^4}\right]$$

$$= 19500(4.0445) = \boxed{78866.8596}$$

c) Find the profit margin. $= \dfrac{NPV}{APV(\text{Premiums})} = \dfrac{864.8780}{78866.8596}$

$$= \boxed{0.01097}$$

d) Show that the internal rate of return ≈ 0.1939, that is show that the NPV ≈ 0 if $r = 0.1939$. $= r_{IRR}$

$$NPV = \sum_{k=0}^{n} \frac{\Pi_k}{(1-r)^t} =$$

$$-5000 + \frac{2953.1}{1.1939} + \frac{2101.65}{(1.1939)^2} + \frac{726.78}{(1.1939)^3} + \frac{759.51}{(1.1939)^4} + \frac{609.65}{(1.1939)^5}$$

$$= \boxed{.1386 \approx 0}$$