

財務管理 Quiz 1

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一、Valuation of Bond 債券評值

$$V_B = \sum_{i=1}^n \frac{CP}{(1+r)^i} + \frac{FV}{(1+r)^n} \quad \text{CP=Coupon payment; FV=Face value,}$$

CR=Coupon rate; n=Nper; r=Discount rate

T = 10 years , Face Value = \$1,000 , Coupon rate = 8% , r=10%

1. Semi-Annual Coupon payment

(1) **Coupon payment = 1/2*CR* FV = \$40**

(2)
$$V_B = \sum_{i=1}^n \frac{CP}{(1+r)^i} + \frac{FV}{(1+r)^n} = \sum_{i=1}^{20} \frac{40}{(1.05)^i} + \frac{1,000}{(1.05)^{20}} = 40 * PVFA_{5\%,20} + 376.89$$

$$= 40 * 12.4622 + 376.89 = 875.37$$

2. Annual Coupon payment

(1) **Coupon payment = CR*FV=\$80**

(2)
$$V_B = \sum_{i=1}^n \frac{CP}{(1+r)^i} + \frac{FV}{(1+r)^n} = \sum_{i=1}^{10} \frac{80}{(1.1)^i} + \frac{1,000}{(1.1)^{10}} = 80 * PVFA_{10\%,10} + 385.54$$

$$= 80 * 6.1446 + 385.54 = 877.10$$

二、Mortgage Payment

Loan=100K , r=12% , T=30 years

1、monthly loan payment?

$$r_{1/12} = 12\% / 12 = 1\%$$

$$100K = X * PVA_{0.01,360}$$

$$X = 1028.61$$

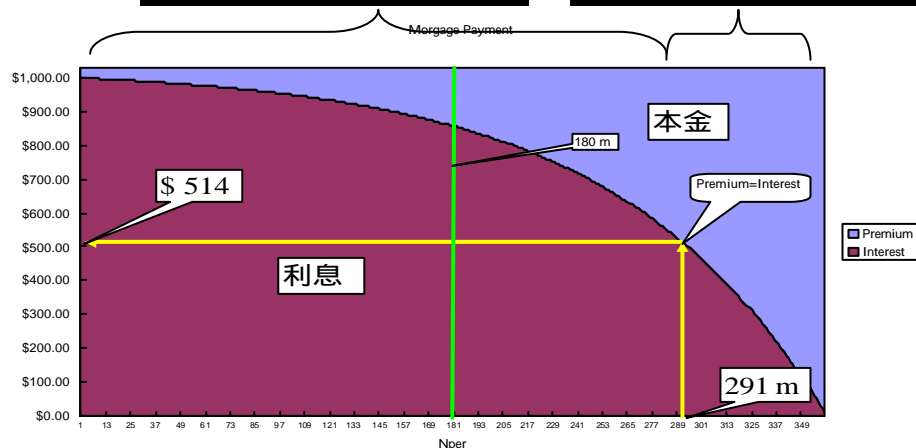
2、Premium vs. Interest

第一期利息 = 100K * 1% = 1,000 , 本金 = 1028.61 - 1000 = 28.61

最後一期本金 = 1028.61 / 1.01 = 1018.43 , 利息 = 1028.61 - 1018.43 = 10.18

前期利息比重高，本金比重低

後期利息比重低，本金比重高



三、Remaining Balance

T=10 years , loan balance? (Balloon payment)

也就是計算仍未付款的 20 年的現在值

$$\text{Loan balance} = 1028.61 * PVA_{0.01, 240} = 93,417.76$$

四、Time value of Money (TVM) analysis

貸款 1,000 元，分 12 期償還，每期攤還 88 元，預估年利率？

估計 $88 * 12 = 1,056 \rightarrow r = 56/1,000 = 5.6\%$ 對不對？

【想法】

每期 88 元，應有 Time value，5.6% 6%，
 $r_{1/12} = 0.5\%$

- (1) 第一期，利息 = $1000 * 0.5\% = 5$ ， 本金還 83 元
- (2) 第二期初，Balance = $1000 - 83 = 917$ ，利息 = 4.59 元
- (3) 並不是如估算的利率 5.6%，而且還要更高。
- (4) 在 11 個月就會還完。

	Balance	Interest	Premium
	1,000.00		
	917.00	5.00	83.00
	833.59	4.59	83.42
	749.75	4.17	83.83
	665.50	3.75	84.25
	580.83	3.33	84.67
	495.73	2.90	85.10
	410.21	2.48	85.52
	324.26	2.05	85.95
	237.88	1.62	86.38
	151.07	1.19	86.81
	63.83	0.76	87.24
	(23.85)	0.32	87.68

【估算】 $\rightarrow Rate \cong \frac{(88 \times 12 - 1000)}{(0 + 1000) \div 2} = 11.2\%$

【精算】

$$PMT \times PVA_{r, 12} = 1,000$$

- (1) $88 \times \frac{1 - \frac{1}{(1+r)^n}}{r} = 1,000$
- (2) $r = 10.18\%$

	Balance	Interest	Premium
	1,000.00		
	920.48	8.48	79.52
	840.29	7.81	80.19
	759.42	7.13	80.87
	677.87	6.44	81.56
	595.62	5.75	82.25
	512.67	5.05	82.95
	429.02	4.35	83.65
	344.66	3.64	84.36
	259.58	2.92	85.08
	173.79	2.20	85.80
	87.26	1.47	86.53
	(0.00)	0.74	87.26

五、Bond valuation analysis

VB=935.08，FV=1,000，T=12，coupon rate = 10%，預估殖利率(YTM)？

估計 $(100 * 12 + (1000 - 935.08)) / 12 \rightarrow 105.41 / \text{year return}$

$r = 105.41 / 1,000 = 10.5\%$ 對不對？

【估算】 $\rightarrow Rate \cong \frac{(100 \times 12 - (1000 - 935.08)) \div 12}{(935.08 + 1000) \div 2} = 10.89464\%$

【精算】 $V_B = \sum_{i=1}^n \frac{CP}{(1+r)^i} + \frac{FV}{(1+r)^n} = \sum_{i=1}^{12} \frac{100}{(1+r)^i} + \frac{1,000}{(1+r)^{12}} = 935.08 \quad r = 12\%$