1. 先用內插法求出第4.6年的 SWAP Rate

① 求 F_4:

$$\frac{4-3}{5-4} = \frac{F_4-2.285}{2.355-F_4}$$

$$\rightarrow 2F_4 = 2.355+2.285,\ F_4 = 2.320$$

② 求 F_6:

$$\frac{6-5}{7-6} = \frac{F_6-2.355}{2.44-F_6}$$

$$\rightarrow 2F_6 = 2.44+2.355,\ F_6 = 2.3975$$

2、已知 F_1、F_2 ... F_7 swap_rate 以此求出各年的 zero_rate

想法：利用 固定端價格 = 浮動端價格 求出各期 zero_rate

$$\rightarrow [F_1+1]e^{-S_1} = 1,\ 求 S_1$$

$$F_2 e^{-S_1} + [F_2+1]e^{-S_2 \times 2} = 1,\ 求 S_2$$

$$F_3 e^{-S_1} + F_3 e^{-S_2 \times 2} + [F_3+1]e^{-S_3 \times 3} = 1,\ 求 S_3$$

① 先求出 S_1 為 $\log_e(F_1+1)$

```
zero_rate[0] = log(1 + swap_rate[0]/100); //log()回傳參數的自然對數(base-e對數)。
```

② 發現 loop：計算除了含本金以外的各期總和(period)

並移項(temp = 1 - period)

e.g. $[F_3+1]e^{-S_3 \times 3} = temp$

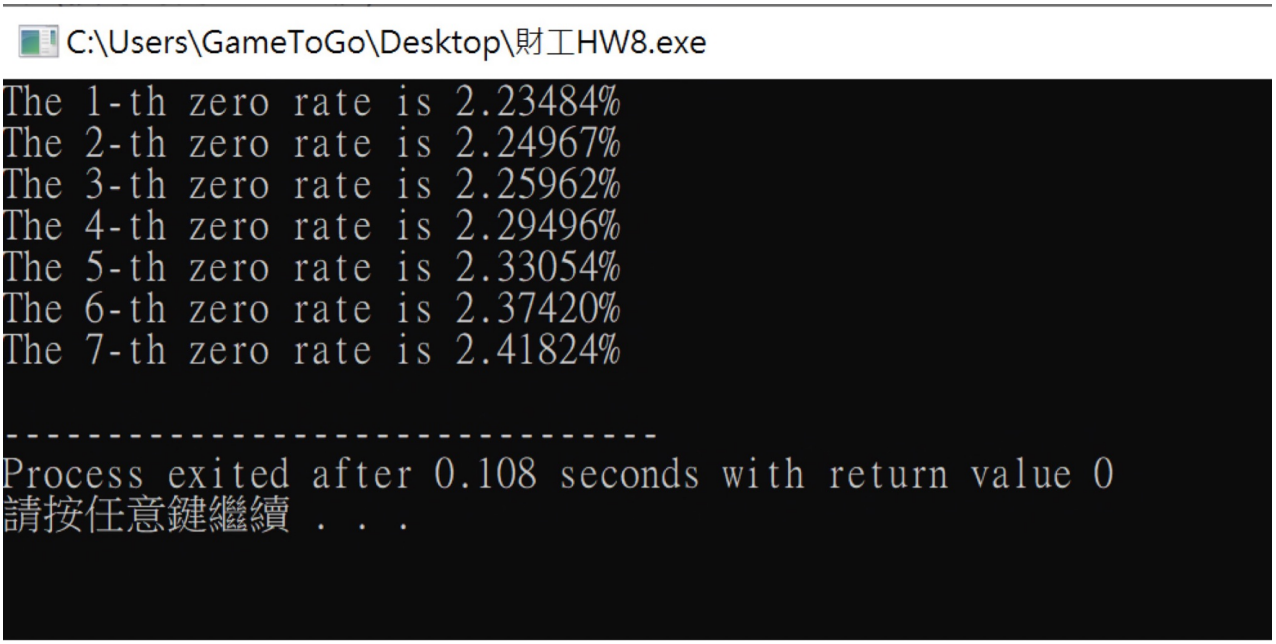
$$= 1-(F_3 e^{-S_1} + F_3 e^{-S_2 \times 2})$$

再次利用 $\log_e$ 求出 $S_3 = (\log_e(F_3+1)/temp) \cdot \frac{1}{3}$

```
for (int i = 1; i < 7; i++)
{
    period = 0;
    for (int j = 0; j < i; j++)
    {
        period+= (swap_rate[i]/100) * exp(-zero_rate[j] * (j+1));
    }

    temp =1-period;
    zero_rate[i] = log((1 + (swap_rate[i]/100))  / temp) / (i + 1);
}
```

結果截圖：


C:\Users\GameToGo\Desktop\財工HW8.exe
The 1-th zero rate is 2.23484%
The 2-th zero rate is 2.24967%
The 3-th zero rate is 2.25962%
The 4-th zero rate is 2.29496%
The 5-th zero rate is 2.33054%
The 6-th zero rate is 2.37420%
The 7-th zero rate is 2.41824%

Process exited after 0.108 seconds with return value 0
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