

目标: 求出 static spread.

已知 $y_1, y_2, y_3, \dots, y_n$ (每期殖利率報價)

→ 用 bootstrap 求出 0 息利率 z_1, z_2, \dots, z_n

```
//第一期Zero rate=Yield
ZeroRate[0] = Yield[0];

//計算i+1期zero rate
for (int i = 1; i < n; i++)
{
    float BondValue = 0;
    for (int j = 0; j <= i; j++)
    {
        float Discount = 1;
        for (int k = 0; k <= j; k++)
            Discount = Discount / (1 + Yield[i]);
        BondValue = BondValue + Discount * C;
        if (j == i)
        {
            BondValue = BondValue + Discount * 100;
        }
    }

    for (int j = 0; j < i; j++)
    {
        float PV = C;
        for (int k = 0; k <= j; k++)
        {
            PV = PV / (1 + ZeroRate[j]);
        }
        BondValue = BondValue - PV;
    }

    ZeroRate[i] = pow((C + 100) / BondValue, 1.0 / (i + 1)) - 1;
}
```

計算市面上債券價格:

$$= \sum_{i=1}^n \frac{C}{(1+R+S)^i} + \frac{100}{(1+R+S)^n}$$

```
float price = 0;
for (int i = 1; i <= n; i++) //計算債券價格
{
    price = price + (C * pow(((1 + Yield[i - 1]) + yieldSpread), -i));
    if (i == n)
    {
        price = price + 100 * pow((1 + Yield[i - 1] + yieldSpread), -n);
    }
}
```

市場上看到的 $\sum \frac{C_t}{(1+y_n+(y_n'-y_n))^t} = \sum \frac{C_t}{(1+z_t+s)^t}$

R: 報酬 | yield spread: S

→ 目前只有 S 為未知, 可以求解!
(static rate)

```
float s = 0.01; //先假定的一個值
while (((fun(staticSpread, n, ZeroRate, C) - price)) != ((fun(s, n, ZeroRate, C) - price)))
{
    s = staticSpread;
    staticSpread = staticSpread - (fun(staticSpread, n, ZeroRate, C) - price) / drv(staticSpread, n, ZeroRate, C);
}
```

調整方法:

```
float drv(float s, int n, float z[], float c)
{
    float sum = 0;
    for (int i = 1; i <= n; i++)
    {
        sum = sum + ((i * c) / pow((1 + s + z[i - 1]), (i + 1)));
        if (i == n)
        {
            sum = sum + (100 * n / pow((1 + s + z[i - 1]), (i + 1)));
        }
    }
    return -sum;
}

float fun(float s, int n, float z[], float c)
{
    float sum = 0;
    for (int i = 0; i < n; i++)
    {
        sum = sum + (c * pow((1 + z[i] + s), -i - 1));
        if (i == n - 1)
        {
            sum = sum + (100 / pow((1 + s + z[i]), (i + 1)));
        }
    }
    return sum;
}
```

選取 C:\Users\GameToGo\Desktop\財務工程\HW5\財工HW5.exe

```
輸入期數:5
輸入債息:0.5
輸入yield spread:0.04
輸入第1期殖利率:0.01
輸入第2期殖利率:0.02
輸入第3期殖利率:0.02
輸入第4期殖利率:0.04
輸入第5期殖利率:0.05
Static spread:0.0397333

-----
Process exited after 54.91 seconds with return value 0
請按任意鍵繼續 . . .
```