Spread

**第一种，折现法，教材**

- 有风险时，未来收到 1 块钱
  - $(1-\mathrm{PD})\times 1+\mathrm{PD}\times \mathrm{RR}=(1-\mathrm{PD})\times 1+\mathrm{PD}\times \mathrm{RR}\times 1=1-\mathrm{EL}$
  - 无风险折现到现在$\frac{1-\mathrm{EL}}{1+r}$
  - 回收的 recover rate 是基于未来值(本金加利息)的
- 补偿风险，加上风险溢价，未来收到 1 块，现值是
  - $\frac{1}{1+y}$
- 等式
  - $\frac{1}{1+y}=\frac{1-\mathrm{EL}}{1+r}\rightarrow z=y-r=\frac{EL}{1+y}$

**第二种，未来值**

- **现值本金** 1 块
- 无风险时，按照自然利率 $\mathrm{FV}=1+\mathrm{r}$
- 有风险时
  - $\mathrm{FV}=(1-\mathrm{PD})\times(1+\mathrm{y})+\mathrm{PD}\times\mathrm{RR}=(1-\mathrm{PD})\times(1+\mathrm{y})+\mathrm{PD}\times\mathrm{RR}\times 1$
  - 回收的 recover rate 是基于本金的
- 等式
  - $1+r=(1-\mathrm{PD})\times(1+\mathrm{y})+\mathrm{PD}\times\mathrm{RR}$
  - $\rightarrow 1+\mathrm{r}=1-\mathrm{PD}+\mathrm{y}\times(1-\mathrm{PD})+\mathrm{PD}\times\mathrm{RR}$
  - $\rightarrow \mathrm{r}=\mathrm{y}\times(1-\mathrm{PD})-\mathrm{PD}\times\mathrm{LGD}=\mathrm{y}\times(1-\mathrm{PD})-\mathrm{EL}$
  - $\rightarrow \mathrm{y}=\frac{\mathrm{r}+\mathrm{EL}}{1-PD}$
  - $\rightarrow \mathrm{z}=\mathrm{y}-\mathrm{r}=\frac{\mathrm{r}\times\mathrm{PD}+\mathrm{EL}}{1-PD}$
- Application
  - Bond face value and recovery rate?

**2017 Practice Q43**

**Explanation:** This can be calculated by using the formula which equates the future value of a risky bor
with
yield (y) and default probability (p) to a risk free asset with yield (r). That is,

1 + r = (1 – π) * (1 + y) + πR

where π = Probability of default and R = Recovery rate