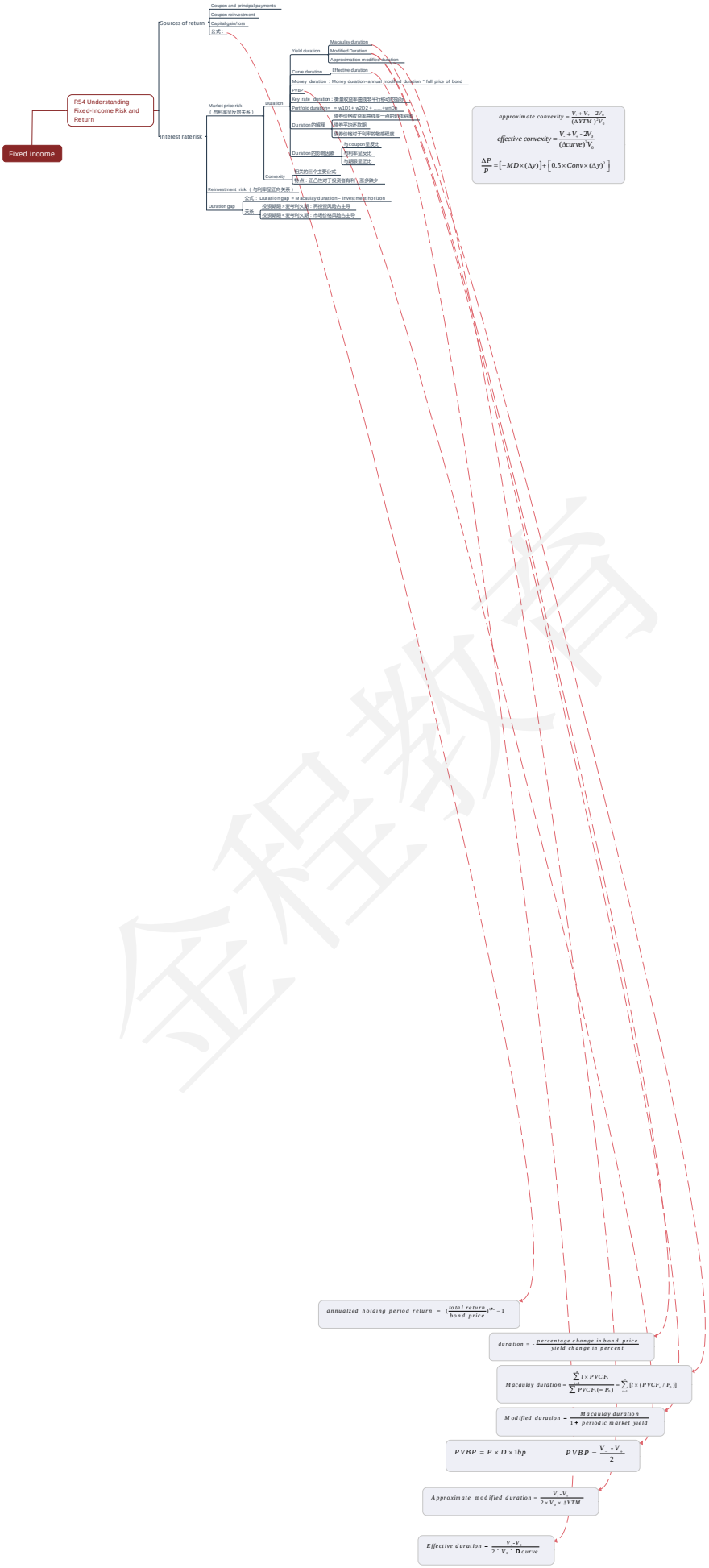
Fixed income
R54 Understanding Fixed-Income Risk and Return
Sources of return
Coupon and principal payments
Coupon reinvestment
Capital gain/loss
公式：
Interest rate risk
Market price risk（与利率呈反向关系）
Duration
Yield duration
Macaulay duration
Modified Duration
Approximation modified duration
Curve duration
Effective duration
Money duration：Money duration=annual modified duration * full price of bond
PVBP
Key rate duration：衡量收益率曲线发平行移动的影响
Portfolio duration= = w1D1+ w2D2 + ……+wnDn
Duration的偏离
债券价格收益率曲线第一点的四阶导数
债券平均还款期
衡利率给定于利率波动敏感程度
Duration的影响因素
与coupon呈反比
与利率呈反比
与期限呈正比
Comavity
凸度的三个主要公式
特点：正凸性对于投资者有利，跌多跌少
Reinvestment risk（与利率呈正向关系）
Duration gap
公式：Duration gap = Macaulay duration – investment horizon
关系
投资期限 > 麦考利久期：再投资风险占主导
投资期限 < 麦考利久期：市场价格风险占主导
$approximate\ convexity = \frac{V_+ + V_- - 2V_0}{(\Delta YTM)^2 V_0}$
$effective\ convexity = \frac{V_+ + V_- - 2V_0}{(\Delta curve)^2 V_0}$
$\frac{\Delta P}{P} = \left[-MD \times (\Delta y)\right] + \left[0.5 \times Conv \times (\Delta y)^2\right]$
$annualized\ holding\ period\ return = \left(\frac{total\ return}{bond\ price}\right)^{1/n} - 1$
$duration = -\frac{percentage\ change\ in\ bond\ price}{yield\ change\ in\ percent}$
$Macaulay\ duration = \frac{\sum_{t=1}^{n} t \times PVCF_t}{\sum_{t=1}^{n} PVCF_t (= P_0)} = \sum_{t=1}^{n} [t \times (PVCF_t / P_0)]$
$Modified\ duration = \frac{Macaulay\ duration}{1 + periodic\ market\ yield}$
$PVBP = P \times D \times 1bp$
$PVBP = \frac{V_- - V_+}{2}$
$Approximate\ modified\ duration = \frac{V_- - V_+}{2 \times V_0 \times \Delta YTM}$
$Effective\ duration = \frac{V_- - V_+}{2 \times V_0 \times \Delta curve}$

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