Realised compound rate of return

1. This is the compound rate of return on a bond with all coupons reinvested until maturity.
    a. the calculation is like the calculation of the zero rate. See what will be the cash flows at the maturity date (e.g. V2). And the compound rate of return is calculated by V2/V0. As the compound rate of return is compounded, the annualised return is the geometric mean.
2. Realised compound interest has an advantages over the YTM, as it takes into account the variation of the reinvestment rate. YTM only assumes the coupon can be reinvest under the YTM.
3. However, the compound interest rate needs a forecast of the reinvestment rate, the forecast can be not-reliable.
4. The selling proceed is the price of the bond at the time sold. At maturity, the price of the bond will be the par-value.
5. The calculation is not the same as the calculation of the holding period return.

Comparing the compound rate of return to the YTM

1. If the reinvestment rate of the coupon can is the same as the YTM, then the compound interest rate is the same as the YTM.
2. If the reinvestment rate of the coupon can be higher than the YTM, then the compound interest rate is higher than the YTM.
3. If the reinvestment rate of the coupon can be lower than the YTM, then the compound interest rate is lower than the YTM.
4. YTM is the internal rate of return (IRR) of the bonds, It assumes holding the bonds to maturity.

Horizon analysis

1. The calculation is the same as the compound rate of return (i.e. (V2 - V0)/V0). but the V2 here is not necessarily the maturity date.
    a. Thus we need to calculate the selling price of the bond at , say time 2.
    b. We also need to calculate the reinvestment of the coupon using ANNUITY.
    c. The V2 is the sum of this two
2. To do the above calculation, we need to forecast
    a. The YTM at the time it is sold (e.g. The YTM from year 20 to the time maturity). Because the YTM changes over time. We need to use this to calculate the selling price at time T.
    b. The reinvestment rate to reinvest the coupon from now to the time you sell it. And we need to use this to calculate the future value of the reinvestment of the coupon.
    c. With a longer horizon, the reinvestment proceed will be higher than the selling proceed.

Calculation

1. **Annuity**:
    a. if we are given a series coupons payments and the interest rate, and we need to calculate the future value of this. We use the sum of the GEOMETRIC SERIES.(i.e. a1*(1 - q^n)/(1 - q))
        i. the n ranges from 1, when n = 1, the sum = a1.
    b. we need to use it at the horizon analysis.
2. **Coupon** pricing at different point in time
    a. Divide BOTH the coupon payment and the YTM by the term (for example, half year, divide by 2).

3. The zero rate is always the effective interest rate. The zero rate is not the market rate, it is the rate that is IMPLIED given the price. The price is determined by the market force.
4. Current yield is ANNUAL COUPON PAYMENT/current price. Even if the coupon is paid semi-annually, the nominator is ANNUAL COUPON PAYMENT. This is for consistency.

General

1. When deciding if arbitrage opportunity exists, we compare the present value of all future cash flows to the current price.
2. The curve between the bond price and the interest rate is negative and concave (i.e. decreasing marginal).
3. The price of the bond quoted on the press is the flat price (i.e., the invoice price subtract the accrued interest)
4. Current yield is different from the yield to maturity. Current yield only reflects the current coupon gain/loss, while the yield to maturity takes into account the capital gain/loss at the maturity date.
    a. As a result, If the current yield > the coupon rate --- this implies the current price is lower than the par value (at premium). YTM will be higher than current yield, as the YTM takes into account the capital gain (i.e. buy low sell high) at the maturity date. Vice versa, if the current yield < the coupon rate – this implies the current price is higher than the par value. YTM will be lower than the current yield, as the YTM takes into account the capital loss (i.e. buy high sell low) at the maturity date.
5. Each bond offers investors the same total rate of return, otherwise the market will adjust the price.
6. Security return should be after-tax and risk-adjusted basis.
7. If the yield to maturity YTM falls, the holding period return (HPR) will increase.
8. When the price is higher than the par-value, there will be capital LOSS for the new entrants, (Measured by the YTM), but there will be capital GAIN for the buyers who bought the bond earlier(measured by the holding period return).
9. Fixed income is called fixed income does not only because they have fixed stream of income, but also may because the stream of income can be determined by specific formula.
10. All types of bonds can be classified as zero bonds and coupon bonds.
11. Because the discount factor can be different for each different cash flows, this is the reason that the interest rate is different from the YTM. YTM is the internal rate of return, so, the YTM for each cash flow is the same.
12. Regardless of time remained to maturity, as long as the coupon rate is equal to the YTM, the price will the same as the par value.

Definition:

1. **Accrued interest**: interest unpaid.
2. **Yield to maturity**: It is equal to the internal rate of return on an investment in the bond. The initial YTM is assuming those described cash flows (i.e. coupons and par) will be made on schedule (i.e.no default risk).
3. **Current yield**: the coupon payment/the price today (p.s. not the par value)
4. **Initial yield to maturity**: Initial yield to maturity = the coupon rate, as the yield solely comes from the coupon at the initial. The issued price = par value.