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Solution Manual for the ACF October Exam

Herbert Rijken

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!!!Note on grading of questions Q3 and Q6!!!

- the final score for **questions Q3 and Q6** is computed according to the following formula: $\text{score}_{\text{final}} = 4 + \text{score}_{\text{indicated on exam}}/2$

1 Q1. Prove that the Modigliani and Miller propositions MM1 and MM2 are consistent with each other.

- Answer:

  Proposition 1: $V_u = V_l$, value of equity-only and geared firm must be the same

  Proposition 2: WACC = return on firm assets

Proof: $V_u = CF_u/r_a = CF_l/WACC = V_l$ (k_0 = WACC for unlevered corporation, assuming that cash flows are independent of the way of financing)

- Grading:
  - Total 8 points.
  - State/explain the two propositions (4 points)
  - Demonstrate equivalence (4 points)

2 Q2. Why can the assumption on atomistic competition (for perfect capital markets) be problematic?

- Answer:

Atomistic competition assumption implies:

1. Many small firms and investors, unable to individually influence the market price (price-taking assumption)
2. No information asymmetry and hence no agency costs
3. No economies of scale
4. Firms are price-takers
5. individual investors cannot influence the price of securities
6. Low profits and low prices for consumers

In practice, each of this implications is likely to be violated.

- Grading:
  - Total 8 points
  - State assumptions behind atomistic competition, and explain how they might be violated (3 points per correct assumption/explanation)

3 Q3. What is approximately the credit spread from a banking perspective for a CCC rated non-financial company (one year PD is 10% and LGD = 40%) for two regulatory environments:

1. Basel I environment
2. Basel II environment
3. Answer: Formula for credit spread is given as:

   PD*LGD + K_{basel}*15% + operational cost.

   From the graph it can be deduced that k_{basel} is 8% under Basel I and 20% under Basel II.
4. Grading:
   - Total 8 points
   - Correctly state the formula for the computation of credit spread

4 Q4. Companies put specific assets in SPVs (for example real estate). Mention the most important advantages of doing this? Use the Structured Finance Model as discussed in class.

Answer:

1. Match risk/return preferences
2. split risk-return characteristics of assets -> reduced information asymmetry
3. profit from specific market circumstances (real estate boom, asset securitization fashion)

Grading:

1. Total 8 points
2. 4 points for each correct explanation

5 Q5. Hint Mezzanine Money for Smaller businesses

- What are the advantages of Mezzanine debt financing?
  1. flexibility to lenders and borrowers (optimize trade-off between equity dilution and interest charges)
  2. fixed interest rate (relatively lower due to equity participation of the lender – value of the call option)
- What is the main driver in the security design when optimizing the interest level and the equity portion in the value of the mezzanine debt?
  1. trade-off between equity dilution and interest charges
  2. easy debt service, low equity dilution for the owners.

Grading:

- 8 points in total
- 2 points for each advantage (max 4 points)
- 4 points for correct explanation of the main driver

6 Q6. In explaining leverage by firm characteristics (by a regression analysis) the factor research and development turns out to have a negative relationship with debt/total assets. What could be an explanation for this?

- Collateral hypothesis: R&D expenditure provides little tangible collateral, which in turn decreases the capacity of a firm to borrow.

Grading:

- 8 points in total for adequately stating and explaining the collateral hypothesis or some other plausable alternative.

7 Q7. What do Rating agencies do in the assessment of corporate credit risk of (non-financial) companies? What is the methodology that they have disclosed?

1. TTC (through the cycle)
2. sector analysis
3. competitive position within 3-5 years in the future
4. financial ratios
5. business risk
6. financial risks

Grading:

- 8 points in total
- 3 points for each correctly stated and explained step in the rating process

8 Q8. Describe the economics behind this Basel II formula for capital requirements. Use the variables PD, LGD and rho in your description.

1. Value at risk = EL + UL
2. The remaining tail losses should occur with probability of at most 0.01%.
3. rho measures asset correlation (higher the correlation, the higher the probability of default)
4. definition of PD
5. definition of LGD

Grading:

- 8 points in total
- 2 points for correctly defining PD, LGD, and rho, each.
- 2 points for giving the correct economic intutition behind the components.

9 Q9. Hint: You have more capital than you think article

- Describe the risk balance sheet as proposed by Merton in this paper.
- How is the residual risk computed in this framework?
  1. VaR for each balance sheet item.
  2. sum(VaR of asset items) - sum(VaR of debt items) = VaR of equity (residual risk)

Grading:

- 8 points in total
- 4 points for correctly answering each of the two subquestions.

10 Q10. Hint: Corporate Debt Instruments and leveraged loans (2007) article

- What are CLOs?
    1. a form of securitization where payments from multiple loans are pooled together and passed on to different classes of owners in various tranches.
- For what reason are CLOs created?
    1. find a better match between risk/return preferences of investors and risk/return properties of securities sold/

Grading:

- 8 points in total
- 4 points for correctly defining CLOs,
- 4 points for giving a reason for CLO existence

11 Q11. Valuation convertible bond

- Consider a 2 year discount bond with face value 100
- This bond can be converted into 2 shares at any time during its life
- Current price of the stock = 50
- A dividend payout of 20 takes place just before the end of year 2
- Risk free rate = 6%
- Share price volatility is 40.5% per annum
- Yield on non-convertible bonds = 10%
- Bond is callable by the issuing firm at 110 (callable option)
- The callable option of the firm may be overruled by the conversion option of the bondholders. The conversion option may NOT be overruled by the callable option

Use a two period binomial model to quantify this premium (assume in the discrete time framework the firm has at t = 0, 1 and 2).

Consider first the value of the convertible bond with no callable option. What is the change in value of the convertible bond if the callable option is added?

Answer:

- u = exp(σ Δ t) = exp(0.405) = 1.5, d=1/u=0.67,

p=(e^r-d)/(u-d)=0.47

- Stock prices are as follows:
  - P_0 = 50
  - P_1(u) = 75
  - P_1(d) = 33.33
  - P_2(uu) = 112.5 - 20 = 92.5 (dividend!)
  - P_2(ud) = P_2(du) = 30
  - P_2(dd) = 22.2 - 20 = 0.2
- Debt repayments in final period are as follows:
  - D_2(uu) = 92.5 * 2 = 185 (conversion!)
  - D_2(ud) = D_2(du) = 100
  - D_2(dd) = 100
- Value of debt in period 1
  - D_1(u) = (p*D_2(uu) + (1-p) D_2(du))/1+r = 132.36 < 2*P_1(u) = 150 (thus, conversion!)
  - D_1(d) = (p*D_2(du) + (1-p) D_2(dd))/1+r = 94.45 > 2*D_1(d) = 66.66 (thus, no conversion)
- Value of debt at the beginning is thus:
  - D_0 = (p*D_1(u) + (1-p) D_1(d))/1+r = 100.17
- Callable option has no value, because it is always overrulled by the conversion option

Grading: