EXAMINATION I

Economics

Corporate Finance

Financial Accounting and Financial Statement Analysis

Equity Valuation and Analysis

Solutions

Final examination

September 2015

Question 1: Economics **(35 points)**

a)
The theory of (relative) purchasing power parity postulates that the evolution of the nominal exchange rate reflects differences between inflation rates. Specifically, we should observe that: $s_{t-1,t} = \pi_{t-1,t} - \pi^{F}_{t-1,t}$.

Here, $s_{t-1,t}$ is the growth rate of the Swiss Franc against the Euro, i.e. – 33% [Note that we are using the price notation, i.e. an *appreciation* is reflected by a *negative* growth of the exchange rate].

According to relative PPP, the Eurozone inflation rate between October 2007 and August 2011 should have exceeded the inflation rate in Switzerland by 33%.

b)
Goods prices are usually "sticky" in the short run – i.e. producers do not immediately react to exchange-rate fluctuations by adjusting the prices of their goods. As a result, inflation rates (CPIs) move more slowly than the nominal exchange rate, the evolution of the nominal exchange rate is decoupled from inflation differentials, and PPP fails in the short run.

In the long run, the price of the goods has time to adjust. Therefore, many empirical analyses of the long-run relationship between exchange rates and inflation rates support the concept of PPP.

c)
The real exchange rate is defined by:

$$S_{real} = \frac{S \cdot P^{F}}{P}$$

The growth rate of the real exchange rate can be approximated by:

$$s_{real,t-1,t} = s_{t-1,t} + \pi^{F}_{t-1,t} - \pi_{t-1,t}$$

We have (in %):
$s_{t-1,t} = -33$, $\pi^{F}_{t-1,t} = 7.1$ and $\pi_{t-1,t} = 1.6$, thus $s_{real,t-1,t} = -27.5$.
Hence, in real terms, the Swiss Franc appreciated by 27.5%.

d)
Net exports NX are given by the following expression:

$$NX = X(Y_F, S_{real}) - S_{real} \cdot M(Y, S_{real})$$

A real exchange rate appreciation reduces the quantity of exports *X* since it makes domestic goods more expensive for foreigners. It raises the quantity of imports *M* since it makes foreign goods less expensive for domestic residents. These two relationships suggest that net exports decrease if the currency appreciates in real terms.

However, there is also a price effect running in the opposite direction, since a decrease in S_{real} reduces the *value* of imports.

If the Marshall-Lerner condition is satisfied, i.e. if the sum of export and import elasticities exceeds one, the quantity effects dominate, and net exports decrease as a result of a real appreciation.

e)
A central bank that wants to avert a nominal appreciation intervenes in foreign exchange markets by selling domestic currency-denominated assets and purchasing foreign currency-denoted assets. The additional liquidity created eventually raises commercial banks' reserves and thus increases the monetary base. In terms of the balance sheet of the central bank unsterilized interventions have effects on the total value of the assets.

f)
With a sterilized foreign-exchange intervention, the central bank combines the (expansionary) foreign-exchange intervention with the sale of assets that reduce liquidity on the domestic money market.

g)
The idea of the inconsistent triangle (or "impossible trinity") postulates that a fixed exchange rate and perfect capital mobility are not compatible with an autonomous monetary policy: Central banks have to abandon at least one of these goals.

For the special case of the SNB, the reason is that, with perfect capital mobility and a fixed exchange rate, any exogenous expansion (contraction) of the money supply has to be counteracted by a monetary contraction (expansion) that maintains the fixed exchange rate.

[Or, alternatively, any excess of CHF demand on the market (again the EUR) should be totally compensated by the SNB by increasing its currency reserve (in EUR) to maintain the CHF/EUR exchange rate.]

Question 2: Financial Accounting and Financial Statement Analysis (56 points)

a)
a1)
Let's consider each of the investments in turn to determine if control exists and, therefore, if they should be accounted for as a subsidiary.

Chi Co – Alpha Co has more than 50% of the shares – ie an 80% equity holding. This gives them control and, therefore, Chi Co is a subsidiary.

Psi Co – as Alpha Co only has a 30% of the equity shares, they do not have control and, therefore, Psi Co is not a subsidiary.

Omega Co – by looking at the percentage of equity shares, you may incorrectly conclude that Omega Co is not a subsidiary, as Alpha Co has less than half of the voting rights. However, by looking at the fact that Alpha Co has appointed five of the seven directors, effectively they have control over the decision making in the company. This control should make you conclude that Omega Co is a subsidiary.

a2)
See Table 2.

b)
b1)

		CU ,000
	Fair value of the consideration transferred for 80% interest in Scarlett Co	150
plus	Fair value of non-controlling interest in Scarlett Co	42
less	Fair value of the identifiable net assets acquired (250 – 50)	-200
	Goodwill (negative goodwill, or gain on bargain purchase)	-8

b2)
See Table 3.

b3)
"Negative goodwill":
Occasionally, an acquirer will make a bargain purchase, which is a business combination in which the net of the acquisition-date amounts of the identifiable assets exceeds the aggregate of (i) the consideration transferred, (ii) the amount of any non-controlling interest in the acquire, and (iii) in a business combination achieved in stages, the acquisition-date fair value of the acquirer's previously held equity interest in the acquire. The acquirer shall recognise the resulting gain in profit or loss on the acquisition date.

Potential reasons:

- Financial distress of target firm
  (e.g. business acquired out of bankruptcy or in bankruptcy, distressed company, acquired form incurring operating losses or consuming cash, a forced sale in which the seller is acting under compulsion, etc.)
- Tax benefits available to acquiring firm
  (e.g. net operating loss tax benefits that can be realized by the profitable acquiring firm, etc.)
- Characteristics of acquiring firm
  (e.g. good fit with the selling firm's needs, experience of the buyer in the business or in completing similar transactions, etc.)
- Flaws in the bidding process
  (e.g. sale not an open market process, only one bidder in the auction process, market illiquidity, etc.)
- Changes in business strategy of target firm
  (e.g. business no longer fits, strategic focus on core business, etc.)
- Nature of the business of target firm
  (e.g. a difficult business operate, etc.)
- Market environment
  (e.g. depressed market conditions, difficult global economy, etc.)

c)
c1)
Beta Co acquired eight million shares and Sigma Co has 10 million CU 1 shares, this gives a controlling interest of 80% and a non-controlling interest of 20%.

	CU ,000
Immediate cash [8,000,000 · CU 4.00)]	32,000
Deferred consideration [5,400 / (1 + 0.08)]	5,000
Non-controlling interest [10,000,000 · 20% (see above) · CU 3.50]	7,000
Issued capital	-10,000
Pre-acquisition retained earnings	-12,000
Fair value adjustments - plant	-4,000
- intangible	-3,000
Goodwill arising on acquisition	15,000

c2)
The URP in Sigma Co's inventory (supplied by Beta Co) of CU 2.6 million is CU 600,000 (2,600,000 · 30/130).

c3)

Post-acquisition adjusted profit of Sigma Co	CU ,000
Profit as reported	6,000
Additional depreciation of plant [CU 4,000 / 4 years]	-1,000
Additional amortization of intangibles [CU 3,000 / 6 years]	-500
	4'500

c4)

Beta Co Group's consolidated retained earnings	CU ,000
Beta Co's retained earnings [25,700 + 8,800]	34,500
Sigma Co's post-acquisition profits [4,500 (see c3) · 80%]	3,600
URP in inventory (see c2)	-600
	37,500

c5)

Non-controlling interest.

	CU ,000
Fair value on acquisition (see c1)	7,000
Post-acquisition profits [4,500 (see c3) · 20%]	900
	7,900

Table 2

Alpha Co Group		
Effects of acquisition of 30% stake in Psi on the Statement of financial position	**31 December N**	**Ref.**
	(in CU ,000)	
ASSETS		
Property, plant and equipment		
Goodwill		
Investments in associates	+430	(i)
Deferred tax assets		
Other assets		
Total non-current assets	**+430**	
Inventories		
Trade and other receivables	0	(ii)
Other assets		
Cash and bank balances	-600	(iii)
Total current assets	**-600**	
Total assets	**-170**	
EQUITY AND LIABILITIES		
Issued capital and share premium		
Other reserves		
Retained earnings	-170	(iv)
Equity attributable to owners of the company	**-170**	
Non-controlling interests		
Borrowings		
Deferred tax liabilities		
Provisions		
Other liabilities		
Total non-current liabilities		
Trade and other payables	0	(ii)
Borrowings		
Other liabilities		
Total current liabilities		
Total equity and liabilities	**-170**	

Psi Co is not a subsidiary (see solution to a1), it is an associate. According to IAS 28, an *associate* is an entity over which the investor has significant influence, and *significant influence* is the power to participate in the financial and operating policy decisions of the investee but is not control or joint control of those policies.

Because Alpha Co holds 30% of the voting power of Psi Co, it is presumed that the entity has significant influence. Moreover, the existence of significant influence is evidenced by a one-member representation on the board of directors.

Therefore, Alpha has to use the equity method to account for its investments in Psi Co in its (consolidated) financial statements.

(i) Investments in associates:
Carrying amount of Psi Co at 31 December N

	in CU ,000
Cash consideration	600
Share of post-acquisition profits ((350 – 250) · 30%)	30
Impairment loss	-200
Investments in associates	430

(ii) Trade and other receivables:
Psi Co is accounted for as an associate. Therefore, intercompany assets and liabilities (e.g. Trade payables) do not have an effect on Alpha Co Group's financial statement.

(iii) Cash and bank balances:
Alpha had to pay a cash consideration of CU 600 at the acquisition date.
Therefore, Cash = -CU 600.

(iv) Retained earnings:
The profit or loss of investor Alpha Co includes its share of the profit or loss of the investee (Psi Co). Psi Co's 'Retained Earnings' have risen by CU 100, therefore they influence Alpha Co's 'Retained earnings' by CU 30. On the other hand the investment in Psi Co was impaired by CU 200.

	in CU ,000
Share of post-acquisition profits ((350 – 250) · 30%)	30
Impairment loss	-200
Retained earnings	-170

Table 3

Pink Co Group		
Consolidated Statement of financial position at 31 December N		
	+/- (in CU ,000)	**Comment**
ASSETS		
Cash and bank balances	-150	Cash consideration paid
Goodwill	0	
Other non-current and current assets	250	Identifiable assets acquired
Total assets	100	
EQUITY AND LIABILITIES		
Equity attributable to owners of the company	8	Gain on bargain purchase[1]
Non-controlling interests	42	Non-controlling interest in Scarlett Co
Non-current liabilities and current liabilities	50	Liabilities assumed
Total equity and liabilities	100	
[1] If the acquirer has made a gain from a bargain purchase that gain is recognised in profit or loss.		

Question 3: Corporate Finance **(35 points)**

a)
CAPM gives equity cost of capital:
$k_E = R_F + Beta_E \cdot MRP = 0.01 + 1.6 \cdot 0.10 = 0.17 = 17\%$

WACC then becomes:
$WACC = E / (E + D) \cdot k_E + D / (E + D) \cdot (1 - \text{tax rate}) \cdot k_D$
$= 60\% \cdot 17\% + 40\% \cdot (1 - 25\%) \cdot 4\% = 10.2\% + 1.2\% = 11.4\%$

b)
The decision is taken by evaluating along the net present values (NPV) of the projects A and B.

$NPV_A = -3000 + 800/1.114 + 1000/1.114^2 + 1300/1.114^3 + 1400/1.114^4 + 2500/1.114^5 + 3000/1.114^6 = 3400.19$

$NPV_B = -1900 + 1300/0.114 \cdot [1 - 1/1.114^6] = 3536.90$

Hence, shareholder value maximization is reached by realizing project B.

c)
The capital restructuring changes the equity cost of capital and hence the weighted average cost of capital.

The current leverage is:
$D / (D + E) = 40\% \Rightarrow E / (D + E) = 60\% \Rightarrow D / E = 40\% / 60\% = 2/3$

Unlevering Expansion Co.'s equity beta gives the asset beta:
$Beta_A = Beta_E / [1 + (1 - \text{tax rate}) \cdot D/E]$
$= 1.6 / [1 + (1 - 25\%) \cdot 2/3] = 1.6 / [1 + 1/2] = 1.6 / 1.5 \approx 1.07$

Levering Expansion Co.'s asset beta with the new leverage gives the new equity beta:
$Beta_E = Beta_A \cdot [1 + (1 - \text{tax rate}) \cdot D/E]$
$= 16 /15 \cdot [1 + (1 - 25\%) \cdot 2] = 16/15 \cdot 10/4 \approx 2.67$

According to the CAPM, the new equity cost of capital is:
$k_E = R_F + Beta_E \cdot MRP = 0.01 + 8/3 \cdot 0.10 \approx 27.67\%$

With $D = 2 \cdot E$, the new WACC then becomes:
$WACC = E / (E + D) \cdot k_E + D / (E + D) \cdot (1 - \text{tax rate}) \cdot k_D$
$= 1/3 \cdot 83/300 + 2/3 \cdot (1 - 25\%) \cdot 4\% = 83/900 + 2/3 \cdot 3/100 \approx 11.22\%$

d)
Under the presumed reinvestment policy, for mutually exclusive investment projects with unequal lives the investment decision is taken along the equivalent annual annuity for a usage cycle of equal length.

NPV_A = 3400.19 (See question b)
$NPV_C = -3000 + 900/1.114 + 1000/1.114^2 + 1400/1.114^3 + 5000/1.114^4 = 2872.99$

$NPV_A = EAA_A/WACC \cdot [1 - 1/(1 + WACC)^6]$
$\Leftrightarrow EAA_A = NPV_A \cdot WACC / [1 - 1/(1 + WACC)^6] = 3400.19 \cdot 0.114 / [1 - 1/(1.114)^6]$
= 813.01

$NPV_C = EAA_C/WACC \cdot [1 - 1/(1 + WACC)^4]$
$\Leftrightarrow EAA_C = NPV_C \cdot WACC / [1 - 1/(1 + WACC)^4] = 2872.99 \cdot 0.114 / [1 - 1/(1.114)^4]$
= 933.96

Hence, shareholder value maximization is reached by realizing project C repeatedly as repeated investment generates a higher equivalent annual annuity although the net present value of project C from one-shot investment is lower.

[An alternative approach is to calculate NPV of Project A (1x replaced) and the NPV of Project C (2x replaced), so 12-year time span for both.

	Project A				Projet C		
Year	Investment	Cash flows	NPV		Investments	Cash flows	NPV
0	-3000		-3000		-3000		-3000
1		800	718.13			900	807.90
2		1000	805.80			1000	805.80
3		1300	940.35			1400	1012.68
4		1400	909.05		-3000	5000	1298.64
5		2500	1457.18			900	524.59
6	-3000	3000	0.00			1000	523.23
7		800	375.75			1400	657.55
8		1000	421.62		-3000	5000	843.23
9		1300	492.01			900	340.62
10		1400	475.64			1000	339.74
11		2500	762.44			1400	426.96
12		3000	821.29			5000	1368.82
NPV			**5179.258336**				**5949.77966**

We find that NPV 3x C > NPV 2x A.]

Question 4: Equity valuation and analysis (38 points)

a)
The three components of DuPont System:

		Year N
Profit margin = $\frac{\text{Net Income}}{\text{Net Sales}}$ (A)	$\frac{32{,}100}{297{,}200}$	= 0.1080
Asset turnover ratio = $\frac{\text{Sales}}{\text{Total Assets}}$ (B)	$\frac{297{,}200}{353{,}800}$	= 0.8400
Equity multiplier = $\frac{\text{Total Assets}}{\text{Total Equity}}$ (C)	$\frac{353{,}800}{168{,}500}$	= 2.100
ROE = A · B · C		= 19.05%
The sustainable or implied growth rate of a firm is a function of its return on equity (ROE) and its earnings retention ratio. g = ROE · retention ratio		
Payout ratio = $\frac{\text{Dividends}}{\text{Net Income}}$	$\frac{12{,}840}{32{,}100}$	= 0.40
Retention ratio, RR = (1 - payout ratio)	(1 – 0.40)	= 0.60
Sustainable growth rate = ROE x RR	19.05 · 0.60	= 11.43%

b)
- Increasing quarterly dividends increases the payout ratio, and thus reduces the retention rate. A decrease in retention rate results in a lower sustainable growth rate.

- A stock split does not impact any of the components of ROE or the retention rate. Therefore, a stock split has no impact on sustainable growth rate.

- Increasing long-term debt increases the equity multiplier (financial leverage). An increase in the equity multiplier increases ROE and sustainable growth rate. But at the same time interest cost of the new debt may lead to a decrease of Net Income and therefore a decrease of Profit margin. A decrease in the Profit margin decreases ROE and sustainable growth rate. It is not clear which one of the two effects is stronger.

- Cutting expenses leads to an increase in net profit, and therefore, the profit margin. An increase in the profit margin increases ROE and sustainable growth rate.

c)
Based on the risk-free rate, k_{RF}, expected market-return, k_M, and the beta of its stock, β_i, IFC's cost of equity (required rate of return) can be calculated by using the capital asset pricing model (CAPM):
$k_s = k_{RF} + \beta_i (k_M - k_{RF})$
$k_s = 1.5 + 1.10 (8.0 – 1.5) = 1.50 + 7.15 = 8.65\%$

d)
The weighted-average cost of capital (WACC, k_a) is the weighted average of the costs of all components of capital. IFC does not have any preferred stock:
$k_a = W_d k_d \cdot (1 - T) + W_s k_s$

Where,
W_d = Weight of debt in the capital structure
W_s = Weight of common equity in the capital structure
k_d = Before-tax cost of debt
k_s = Cost of common equity
T = Marginal Tax rate

The market value weights of debt and equity are 30% and 70%, respectively.

Therefore, IFC's WACC:
$k_a = 0.30 \cdot 7.8 \cdot (1 – 0.40) + 0.70 \cdot 8.65 = 1.404 + 6.055 = 7.46\%$.

e)
The value of the common stock using the dividend discount valuation model (DDM) is the present value (V_0) of all future cash flows (dividends and the stock's terminal value). For IFC stock, the two stage dividend discount model for stock valuation:

$$V_0 = \frac{D_1}{(1+k_s)} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \frac{V_3}{(1+k_s)^3}$$

Where,
D_1 = dividend per share at the end of year 1 (N+1)
D_2 = dividend per share at the end of year 2 (N+2)
D_3 = dividend per share at the end of year 3 (N+3)
V_3 = Value of stock at the end of year 3 (N+3)
k_s = Equityholders' required rate of return

After the first three years, IFC's dividends are expected to grow at an annual constant rate of 5% forever. Therefore, we can use the constant growth valuation model to calculate the value of IFC's stock at the end of year 3, V_3:

$$V_t = \frac{D_{(t+1)}}{(k_s - g)}$$

Where,
V_t = Value of the stock at time t
$D_{(t+1)}$ = Dividend in time (t + 1)
k_s = Equityholders' required rate of return
g = Constant growth rate of dividends

Thus:

$$V_3 = \frac{D_4}{(k_s - g)}$$

We know that the last year (N) dividend (D_0) was equal to USD 1.38.

$$\left(\frac{\text{Cash Dividend}}{\text{Number of shares outstanding}} = \frac{12{,}840}{9{,}304} = \text{USD}1.38 \right)$$

Dividends are expected to grow at a rate of 11.43% for the next three years.

Therefore, the dividend at the end of Year N+1:
$D_1 = D_0 \cdot (1 + g) = 1.38 \cdot (1 + 0.1143) = 1.54$

Similarly,
$D_2 = D_1 \cdot (1 + g) = 1.54 \cdot (1 + 0.1143) = 1.72$

And,
$D_3 = D_2 \cdot (1 + g) = 1.72 \cdot (1 + 0.1143) = 1.92$

After the three abnormal growth years, the dividends are expected to grow at a constant rate of 5% forever. Thus, the dividend at the end of year 4 can be calculated as follows:
$D_4 = D_3 \cdot (1 + g) = 1.92 \cdot (1 + 0.05) = 1.92 \cdot 1.05 = \text{USD } 2.02.$

[Note: here g is the constant growth rate of dividends (5%) after Year 3.]

Therefore, the value of IFC stock at the end of Year 3, V_3:

$$V_3 = \frac{2.02}{(0.0865 - 0.05)} = \frac{2.02}{0.0365} = \text{USD}\,55.34$$

The value of the stock at the beginning of N+1 (V_0) is the present value of the future cash flows discounted at IFC's cost of equity:

$$V_0 = \frac{1.54}{(1+0.0865)} + \frac{1.72}{(1+0.0865)^2} + \frac{1.92}{(1+0.0865)^3} + \frac{55.34}{(1+0.0865)^3}$$

$= 1.42 + 1.46 + 1.50 + 43.15 = \text{USD } 47.53$

[Note: The intermediate and final answers may vary due to rounding. The accurate final number is USD 47.18.]

f)
Gordon growth model is a mathematical simplification of the dividend discount model under the assumption that dividends grow at a constant rate forever.

The strengths of the model include:

- It is a widely used model for valuing the stock of established dividend paying companies.
- It is widely used for valuing broader stock market indexes because the companies and their dividends, in aggregate, are expected to experience a steady growth as the broader economy steadily grows.
- The model is easy to use for stock valuation.
- The model demonstrates how the value of a stock is a function of payout ratio, dividend growth rate, and the required rate of return.

- The model is useful for estimating the expected rate of return of steady growth companies when their dividend per share and the share price are known.
- The model is widely used as a part of a more complex multipart dividend discount model for companies that are currently growing at a high rate but where their dividends are expected to grow at a stable rate after some time.

The Gordon growth model suffers from the following weaknesses:

- The model is not useful for valuing non-dividend paying companies.
- The model is also not useful for directly valuing dividend paying firms if the dividends are not growing at a stable rate.
- The estimated stock values are very sensitive to assumed required rate of return and the growth rate. Even a small variation in the assumed required rate of return or growth rate leads to a relatively large variation in the estimated stock value.

Question 5: Equity valuation and analysis (16 points)

a)
The value (price) of a stock today is the present value of all future cash flows discounted at an appropriate required (expected) rate of return. There are four variables associated with the valuation of a stock being held for a single-period:
(i) Value (price) of the stock today, V_0 (P_0),
(ii) Expected dividend at the end of the first year, D_1,
(iii) Price of the stock at the end of the first year, P_1, and
(iv) Required (expected) rate of return, k_s.

The present value model is provided below:

$$V_0 = \frac{D_1 + P_1}{(1 + k_S)}$$

①
For Stock A, we are given all other variables and need to solve for V_0:

$$V_0 = \frac{2 + 56}{(1 + 0.08)} = 53.70$$

②
For Stock B, we are given all other variables and need to solve for the expected price, P_1. Rearranging the above equation and solving for P_1 we get:
$P_1 = V_0 \cdot (1 + k_s) – D_1 = 40.0 \cdot (1 + .07) - 1.60 = \text{USD } 41.20$

③
For Stock C, we are given all other variable and need to solve for expected dividend, D1. Rearranging the above equation and solving for D1, we get:
$D_1 = V_0 \cdot (1 + k_s) – P_1 = 85.0 \cdot (1 + .085) – 90.0 = 92.\ 23 – 90.0 = \text{USD } 2.23$

④
For Stock D, we are given all other variables and need to solve for the required rate of return, k_s. Rearranging the above equation, we get:

$$k_S = \frac{D_1 + P_1}{P_0} - 1 = \frac{2.20 + 60.0}{54.56} - 1 = 0.14 = 14\%$$

b)
The required rate of return for Howard can be calculated using the capital asset pricing model (CAPM):

$$k = k_{RF} + \beta_i \cdot (k_M - k_{RF}) = 1.6 + 1.10 \cdot (7.2 - 1.6) = 7.76\%$$

The Gordon growth valuation model:

$$P_0 = \frac{D_1}{k - g}$$

Dividing both sides of the above equation by next year's earnings per share, E_1:

$$\frac{P_0}{E_1} = \frac{\frac{D_1}{E_1}}{k - g}$$

For Howard, the dividend payout ratio using the current year information:

$$\frac{D_0}{E_0} = \frac{0.88}{2.20} = 0.4$$

Given that the company is growing at a constant rate, the payout ratio is also constant. That is:

$$\frac{D_1}{E_1} = 0.4$$

Thus, the justified leading P/E (based on the next year's earnings) is:

$$\frac{P_0}{E_1} = \frac{0.40}{0.0776 - 0.052} = 15.63$$