

Sample Question

AWM

Open Question

Question

You are a wealth adviser at Jumbo Bank, a Swiss bank specializing in wealth management and asset management. You are responsible for supervising private clients who have signed a discretionary management or advisory mandate with Jumbo Bank.

- a) Monday, October 8th, you are invited to participate at the annual client event organized by your bank at the Kemps Hotel. On this occasion, you have the opportunity to meet several of your clients.

Mrs. Smith would like to invest USD 500,000 in the Domus Multi-Assets investment fund for a 5 years' time horizon. She is considering investing in this fund because it realized an exceptional 9.8% return last year, which was one of the best performances of the multi-assets funds category. She explains that she is convinced that the Domus Investment fund will continue to outperform the other investment funds for the next 5 years.

There is no doubt for you. Mrs. Smith has a behavioural bias in her investment decision.

- a1) What is this behavioural bias and which measure could you implement to mitigate this bias? Explain. (7 points)
- a2) What is the risk for Mrs. Smith to have this type of behavioural bias? (2 points)
- a3) In terms of Behavioural Finance Macro, what could be the expected effect of this type of behavioural bias on the equity market? Explain. (4 points)

Mr. Apple intervenes in the discussion. He explains to Mrs. Smith:

"I have been a very successful investor for years. Today, I received some very good information about the Zoffy Equity investment fund from a person I met this morning. I am sure that this fund will outperform all other investment funds over the next 5 years. I am going to subscribe to this fund as soon as possible".

Again, there is no doubt for you. Mr. Apple has a behavioural bias in his investment decision.

- a4) What is this behavioural bias and what will be the consequence on Mr. Apple's behavioural bias in the future if the Zoffy Equity investment fund outperforms the other investment funds over the next 5 years? Explain. (6 points)

- b) Tuesday, October 9th, Mr. Pepper, one of your clients, comes to visit you in order to get new investment proposals.

After some words on the recent election of Mr. Ratopoulos as President of Daisyland, Mr. Pepper asks you what the potential impact of his economic agenda could be on the gross domestic product (GDP). He explains that the key elements of this agenda are tax cuts, infrastructure investment and regulatory reform.

- b1) Using the formula for the aggregate demand curve, explain which variables of this formula would be affected by President Ratopoulos's agenda and why. Mention two possible consequences per element of the agenda and explain. (12 points)

After spending some time analysing President Ratopoulos's economic agenda and which sectors might be most impacted, you have settled on the materials industry, believing that it will be positively affected by the plan for infrastructure investment.

After further analysis, you conclude that Daisyland Metal might be an interesting company to invest in, as it will see the most positive impact. You are now in the process of valuing the company. At the end of 2018, the share price of Daisyland Metal is USD 116 and you have the following data:

	2014	2015	2016	2017	2018	2019 (estimated)	2020 (estimated)	2021 (estimated)
Net Income (in million USD)	-52.59	19.78	205.09	221.6	395.2	541.54	745.21	963.81
Number of shares outstanding (in million)	130.1	131.1	133	134.8	135.5	134.5	130.7	126.6

- b2) Based on this, Mr. Pepper asks you to calculate the earnings per share (EPS) for the years 2017 to 2021 (estimated) and the Price-to-Earnings ratio (P/E) for 2018 to 2021. (5 points)
- b3) Looking at the earnings profile of Daisyland Metal between 2014 and 2021, what can you say to Mr Pepper about the characteristics of the firm? Is the P/E the best method to value this company? Explain. (6 points)

After having looked at a number of individual companies, Mr. Pepper comes to the conclusion that since the full details of President's Ratopoulos's agenda is not known, it is hard for him to determine which individual company will be most affected. He tells you that he would like to invest in an actively managed investment fund.

After some analysis, you have narrowed your choices down to three funds: a value fund, a growth fund and an index fund. The performance characteristics (before fees) as well as the volatility over 5 years are virtually identical for the three funds. The index fund has a total expense ratio (TER) of 0.25% while the value fund and the growth fund both have a TER of 2.1%.

- b4) Based on this information, which of the three funds would you recommend to

Mr. Pepper? Explain.

(8 points)

- c) Wednesday, October 10th, you control the portfolios of clients who have signed a discretionary management mandate.

For Mrs Weber, the strategic asset allocation is 30% in bonds and 70% in equities. The rebalancing of her portfolio is done every semester.

c1) Complete the following table:

(8 points)

Asset Class	Initial allocation	Semi-annual change in value	Allocation after the semi-annual change	Weight after the semi-annual change	Actions to be taken to rebalance the portfolio
Bonds	...	+ CHF 3,000
Equities	...	+ CHF 52,500
Total	CHF 500,000		NA

- c2) What is the annualized performance in % of each asset class and of Mrs Weber's portfolio over the past semester?

(6 points)

- c3) You have heard that Mrs Weber is about to withdraw CHF 100,000. Does this event modify the actions to be taken to rebalance the portfolio? If no, explain. If yes, what will these new actions be?

(6 points)

You are interested in investing in the two following investment funds (Fund A and Fund B). Their historical semi-annual returns over 6 semesters are the following:

	Return in %	
Semester	Fund A	Fund B
1	8.4	3.9
2	-1.4	8.7
3	26.7	7.3
4	-13.5	2.4
5	-3.0	-3.0
6	4.8	3.6

- c4) What are the mean and the standard deviation of the funds A and B semi-annual returns? Show your calculations (rounded to 2 digits after the decimal point).

(8 points)

- c5) What are the annualized mean and standard deviation of the funds A and B? Based on your results, what is the riskier fund? Show your calculations and justify your answer.

(6 points)

- c6) Assume that the returns of the funds follow a normal distribution. How can you use the values of the mean and standard deviation to estimate the distribution (or the probability) of the future returns? Use the results obtained in c5) for funds A and B to illustrate your answer with an example.

Note: If you didn't answer question c5), consider for the fund A a mean of 7% and a standard deviation of 17% and for the fund B a mean of 5% and a standard deviation of 6%. (6 points)

- c7) The correlation coefficient between the funds A and B is about 0.45. Calculate the annual standard deviation of a portfolio with 50% of fund A and 50% of fund B.

Note: If you didn't answer question c5), consider for the fund A a mean of 7% and a standard deviation of 17% and for the fund B a mean of 5% and a standard deviation of 6%. (4 points)

- d) Thursday, October 11th, you are preparing the visit of Mrs. Queen, who is domiciled for tax purposes in Germany. She holds in her portfolio 10,000 Credit Suisse shares, a company domiciled in Switzerland. On May 8th, Credit Suisse paid a dividend of CHF 0.25 per share. Switzerland and Germany have agreed in their double taxation agreement (DTA) that both countries may levy withholding tax of no more than 15% on gross dividend amounts. The Swiss Withholding Tax rate applied to dividends is equal to 35%. The EUR/CHF rate was equal to 1.1445 on May 8th.

- d1) What amount has been paid to Mrs. Queen on May 8th? Explain. (4 points)

- d2) What is the CHF withholding tax amount that can be reclaimed by Mrs. Queen according to DTA? (2 points)

- e) Friday, October 12th, you are in charge of the organization of the weekly team meeting during which trainees have the opportunity to ask questions on financial instruments. In this context, your boss asks you to prepare the answers to the questions transmitted in advance by the trainees.

- e1) Why can government bonds be considered as the reference (benchmark) for bond markets? Explain in words and illustrate your answer graphically. (8 points)

- e2) Describe the notion of "Yield to maturity". Explain by also using a formula if necessary. (6 points)

- e3) What conditions must be fulfilled to have an ex-post effective realized return equal to the yield to maturity? (6 points)

- e4) Mention 4 factors influencing the yield-to-maturity of a bond. Explain. (8 points)

Consider the following information on S&P 500 call options:

	Option 1	Option 2
Underlying	S&P 500	S&P 500
Option type	European Call	European Call
Strike	2870	2970
Time to maturity in days	45	45
Price	50.50	13.376
Delta	0.593	0.235
Gamma	0.00381	0.00303
Vega	1.53096	1.22755
Theta	0.43858	0.345
Rho	0.7686	0.314

The tick size is equal to 1 point and the tick value is equal to USD 100. It means that 1 index point is equal to USD 100. The S&P 500 is currently at 2,888.

- e5) The option premium is composed of 2 elements: the intrinsic value and the time value. What are these values in USD for the two call options (option 1 and option 2)?
(6 points)
- e6) Mr. Duplo holds a portfolio consisting of 50 long 2870 calls and 50 short 2970 calls. It is mentioned in the portfolio management system (PMS) that the delta of this portfolio is equal to 1,790. Detail the calculations done by the PMS to get this value. How do you interpret this value?
(8 points)
- e7) What is the meaning of vega? All things being equal, how can you interpret the difference in the “vega” of these two options?
(4 points)
- e8) Would the vega of an equivalent put option (same underlying asset, same maturity date, same strike price) be positive or negative? Explain.
(2 points)
- e9) Would the vega of a short position in the call options be positive or negative? Explain.
(2 points)

Solution:

a)

a1)

Mrs. Smith presents a representativeness bias.

When confronted with new circumstances that may be inconsistent with existing classifications, human beings often rely on a “best fit” process to determine which category should house and form the basis for understanding the new circumstance.

This is exactly what Mrs. Smith does by relying on a favourable statistical series over a small period. With this representation, she thinks that this will continue in the future, whereas a longer-term analysis would show that the recent performance would have been rather exceptional.

To mitigate this bias, you should present Mrs. Smith with the past performance of the investment fund over a much longer time period in order to show her that the last year performance was indeed exceptional.

a2)

The risk is that the future performance will not be as good as expected, and that focusing on the well-performed funds on a short period of time will neglect those which have a very good performance on the long term.

a3)

On the contrary of Behavioural Finance Micro, Behavioural Finance Macro (BFMA), describes “anomalies” or irregularities in the overall market that contradict the efficient market hypothesis.

Representativeness bias can induce an overvaluation (overpriced) of equities that have outperformed in the short run (because of a large demand to buy and a low demand to sell) and an undervaluation of equities that underperformed in the short run (because of a large demand to sell or a low demand to buy).

This can contradict the efficient market hypothesis and induce market anomalies called Fundamental anomalies.

a4)

Mr. Apple presents an overconfidence bias.

Indeed, Mr. Apple tends to overestimate both his predictive abilities as well as the precision of the information he has been given. As a result of "private" information, Mr. Apple overestimates his ability to make a good investment choice, also in connection with the good past results.

His overconfidence bias will be amplified, if the fund performs well.

b)

b1)

Total spending = $C + I + G + X - M$

Tax cuts would result in lower taxes for corporates and possibly individuals.

For individuals, lower taxes could have a positive impact on consumption (for local as well as for imported goods and services) which could increase, as well as savings. Consumption (C) as well as imports (M) would thus be impacted.

For corporates, lower taxes mean that the after-tax return on their business projects increases, which could encourage them to invest more. Private investment (I) would thus increase.

Infrastructure investment corresponds to government spending (G) and should have a positive impact on G. (What is not known is how this will be financed).

It could also imply job creation which in turn could lead to higher consumption and higher imports.

Regulatory reform is a wider concept, but in general it implies lower regulations which should decrease the impediments of doing business and increase the willingness of corporates to invest.

Here too, private investment would be positively affected.

It could also imply job creation which in turn could lead to higher consumption and imports since total spending will be higher (note that C increases more than M).

b2)

	2014	2015	2016	2017	2018	2019 (estimated)	2020 (estimated)	2021 (estimated)
Net Income (USD million)	-52.59	19.78	205.09	221.6	395.2	541.54	745.21	963.81
Number of shares outstanding (in millions)	130.1	131.1	133	134.8	135.5	134.5	130.7	126.6
EPS				1.64	2.92	4.03	5.70	7.61
Price					116	116	116	116
P/E					39.77	28.81	20.34	15.24

EPS = Net Income/ Number of shares outstanding

P/E = Price/EPS

b3)

In 2014, Daisyland Metal made heavy losses with profitability increasing thereafter especially in the years 2019 – 2021. This is likely due to a recovery in the economy as well as the positive impact of the Ratopoulos administration's expected infrastructure spending. Daisyland Metal looks to be very much affected by the economy and is thus a cyclical firm.

The P/E is probably not the best method to value a cyclical company. At cyclical firms, for example, stock prices reflect expectations of the future while earnings follow the economy. P/E ratios at cyclical firms may peak at the bottom of a recession and trough at the peak of a boom, rendering them useless for comparison purposes.

b4)

Mr Pepper would like to invest in an active fund. This excludes the Index fund, which is

passive.

You thus have to choose between the value fund and the growth fund. Both share similar characteristics.

However, the TER does not include the transaction costs related to buying and selling securities.

Growth funds typically have a higher turnover rate than value funds, implying that the true cost or True TER will be higher for a growth fund than for a value fund.

If all the other elements are identical for the two funds, the value fund will have a lower cost, implying better performance after costs for the client. It would thus be logical to choose the value fund for your client

c)

c1)

Asset category	Initial allocation	Semi-annual change	Allocation after the semi-annual change	Weight after the semi-annual change	Actions to be taken to rebalance the portfolio
Bonds	$0.3 \times 500,000 = 150,000$	+ CHF 3,000	$150,000 + 3,000 = \text{CHF } 153,000$	$153,000 / 555,500 = 27.5\%$	$0.3 \times 555,500 = 166,650 \Rightarrow$ we must buy bonds for CHF 13,650 ($= 166,650 - 153,000$)
Equities	$0.7 \times 500,000 = 350,000$	+CHF 52,500	$350,000 + 52,500 = \text{CHF } 402,500$	$402,500 / 555,500 = 72.5\%$	$0.70 \times 555,500 = 388,850 \Rightarrow$ we must sell equities for CHF 13,650 ($= 402,500 - 388,850$)
Total	CHF 500,000	+55,500	$500,000 + 55,500 = \text{CHF } 555,500$	100%	NA

c2)

The semi-annual performance of the bond asset class: $3,000 / 150,000 = 2\%$. Annualized: $2\% \times 2 = 4\%$.

The semi-annual performance of the equity asset class is: $52,500 / 350,000 = 15\%$. Annualized: $15\% \times 2 = 30\%$.

The semi-annual performance of the portfolio is: $(3,000 + 52,500) / 500,000 = 55,500 / 500,000 = 11.1\%$ Annualized: $11.1\% \times 2 = 22.2\%$.

[Note:

- Calculating the annualized returns by using continuously compounded returns is also correct, if properly explained.]

c3)

Yes, if the client wants to withdraw CHF 100,000, you must sell bonds and equities from the portfolio (from CHF 555,500). Therefore CHF 455,500 will be the new value of the portfolio after withdrawal.

The rebalanced portfolio will be:

- Position in bonds after the withdrawal: $\text{CHF } 455,500 \times 0.30 = \text{CHF } 136,650 \Rightarrow$ we must sell CHF 16,350 in bonds (= CHF 153,000 – CHF 136,650)
- Position in equities after the withdrawal: $\text{CHF } 455,500 \times 0.70 = \text{CHF } 318,850 \Rightarrow$ we must sell CHF 83,650 in equities (= CHF 402,500 - CHF 318,850)

c4)

	Return in % (R_t)		$(R_t - \text{mean})^2$	
Semester	Fund A	Fund B	Fund A	Fund B
1	8.4	3.9	$(8.4-3.67)^2 = 22.40$	$(3.9-3.82)^2 = 0.01$
2	-1.4	8.7	$(-1.4-3.67)^2 = 25.67$	$(8.7-3.82)^2 = 23.85$
3	26.7	7.3	$(26.7-3.67)^2 = 530.53$	$(7.3-3.82)^2 = 12.13$
4	-13.5	2.4	$(-13.5-3.67)^2 = 294.69$	$(2.4-3.82)^2 = 2.01$
5	-3.0	-3.0	$(-3.0-3.67)^2 = 44.44$	$(-3.0-3.82)^2 = 46.47$
6	4.8	3.6	$(4.8-3.67)^2 = 1.28$	$(3.6-3.82)^2 = 0.05$
Sum	22.0	22.9	919.03	84.51

Using the results of the table above, we find that:

For Fund A:

- Mean = $22/6 = 3.67\%$
- Variance = $919.03/6 = 153.17$
- Standard-deviation (Std) = $153.170.5 = 12.38\%$

For Fund B:

- Mean = $22.9/6 = 3.82\%$
- Variance = $84.51/6 = 14.09$
- Standard-deviation (Std) = $84.510.5 = 3.75\%$

[Notes to the correctors:

- Calculating the annualized volatility by using the mathematical mean of the continuously compounded returns is also correct.
- Calculating the annualized volatility by using the arithmetic mean of the returns can also be accepted.]
- Using a sample of (n-1) for the denominator (so dividing by 3 instead of 4) is also correct.

c5)

For Fund A:

- Mean = $3.67 \times 2 = 7.34\%$
- Std(A) = $12.38\% \times \sqrt{2} = 17.50\%$

For Fund B:

- Mean = $3.82 \times 2 = 7.64\%$
- Std(B) = $3.75\% \times \sqrt{2} = 5.30\%$

The fund is A is riskier than the fund B since $\text{Std}(A) > \text{Std}(B)$.

c6)

If the returns follow a normal distribution, we can say that there is about 68% of the returns that are more or less 1 standard deviation from the mean.

For example:

- For Fund A, 68% of the annual returns will be between -10.16% and 24.84% ($\Rightarrow 7.34\% - 17.50\% = -10.16\%$ and $7.34\% + 17.50\% = 24.84\%$). This also means that 32% (100% - 68%) of the annual returns will be outside this interval.
- For Fund B, 68% of the annual returns will be between 2.34% and 12.94% ($\Rightarrow 7.64\% - 5.30\% = 2.34\%$ and $7.64\% + 5.30\% = 12.94\%$).

c7)

Standard deviation of the portfolio is: $\sqrt{\sigma_p^2}$

$$\text{where } \sigma_p^2 = w_A^2 \cdot \sigma_A^2 + w_B^2 \cdot \sigma_B^2 + 2 \cdot w_A \cdot w_B \cdot \sigma_A \cdot \sigma_B \cdot \rho_{AB}$$

$$\text{with } w_A = w_B = 0.5$$

$$\text{and } \rho_{AB} = 0.45$$

and the results from question c5), we get:

$$\sigma_p^2 = 0.5^2 \cdot 0.175^2 + 0.5^2 \cdot 0.053^2 + 2 \cdot 0.5 \cdot 0.5 \cdot 0.175 \cdot 0.053 \cdot 0.45$$

$$\sigma_p^2 = 0.010445$$

$$\sqrt{\sigma_p^2} = 0.1022, \text{ i.e. } 10.22\%$$

d)

d1)

The dividend gross amount is equal to CHF 2,500 ($=10,000 \cdot 0.25$)

The amount of Swiss Withholding tax is equal to CHF 875 ($=2,500 \cdot 0.35$)

The net amount paid to Ms. Weber on May 8th is equal to Dividend gross amount – Swiss Withholding tax amount = CHF 1,625 ($2,500 - 875 = 1,625$)

d2)

The tax refund according to DTA is equal to CHF 500 ($=2,500 \cdot 0.2$).

e)

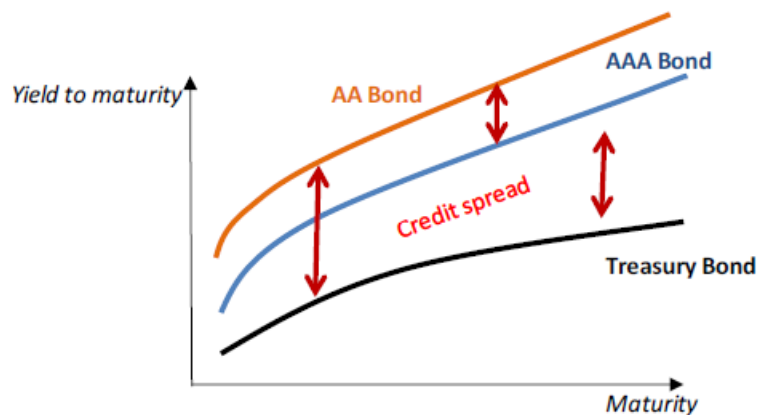
e1)

Credit risk (or default risk) is the risk that the issuer doesn't respect his payment obligations (interests and capital redemption).

To be compensated for this credit risk, investors require a higher expected return in the form of a credit risk premium. The higher the default risk is, the higher the credit risk premium will be.

Government bonds are supposed to have the lowest credit risk premium. In some cases, government bonds are considered as credit risk free because the central bank can always create money to finance the government's obligations. In this case, government bonds are only sensitive to interest rate movements, and not to default risk premium variations.

This can be easily explained by using the following graph:



e2)

The yield to maturity is the discount rate k that equates the present value of the bond's future cash flows to maturity with the bond's current market price.

Just after the coupon payment, we have:

$$P = \sum_{t=1}^T \frac{CF_t}{(1+k)^t} = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_T}{(1+k)^T}$$

where CF_t is the cash flow received at the end of period t (coupons or repayment), and T is the remaining life of the bond (time to maturity).

It can also be defined as the internal rate of return of the bond.

This indicator measures the annual yield an investor would obtain by buying the debt instrument today, holding it up to maturity and reinvesting all the coupons received on the debt instrument at this interest rate up to the debt instrument's maturity.

e3)

The yield to maturity will be equal to the ex-post realized return if, whatever the maturity, there is only one prevailing rate to lend and borrow money (flat interest rates term structure), and that this rate will never change in the future during the life of the bond so that the coupons can be reinvested at that rate.

e4)

The Yield-to-maturity (YTM) of a bond depends on:

- Risk free interest rates, the higher the risk-free interest rates are, the higher the YTM is

- The maturity of the bond, the higher the maturity is, the higher the YTM is
- The coupons rate paid on the bond, the higher the coupon rate is, the lower the YTM is
- The credit quality (credit risk) of the issuer and/or its guarantor, the lower the credit quality (the higher the credit risk) is, the higher the YTM is
- Expectations on inflation, the higher the inflation expected is, the higher the YTM is
- Liquidity of the bonds, the lower the liquidity is, the higher the YTM is
- All other premia required by investors to hold the bond. The higher the premium is, the higher the YTM is

e5)

2870 Call option

The premium in USD for the 2870 call = $50.50 \cdot \text{USD } 100 = \text{USD } 5,050$.

The intrinsic value is equal to the maximum between the difference between the spot price of the index minus the strike price and zero (the intrinsic value cannot be negative, since there is no obligation for the holder to exercise the option if it is out-of-the-money):

Intrinsic value = $\text{Max } [0; (S_t - K) \cdot (\text{Tick Value} / \text{Tick size})] = \text{Max } [0; (2,888 - 2,870) \cdot \text{USD } 100] = \text{USD } 1,800$.

The time value is equal to the option premium minus the intrinsic value.

Time value = $\text{USD } 5,050 - \text{USD } 1,800 = \text{USD } 3,250$

2970 Call option

The premium in USD for the 2970 call = $13.376 \cdot \text{USD } 100 = \text{USD } 1,337.6$.

The intrinsic value is equal to 0 (out-of-the-money option).

The time value is equal to the option premium.

e6)

The delta of the portfolio is equal to $100 \cdot [(50 \cdot 0.593) - (50 \cdot 0.235)] = 1,790$.

Delta measures the change in the value of the options position for a 1 point move in the index.

That is, if the index gains 1 point and moves from 2,888 to 2,889, the position in these options gains USD 1,790.

e7)

Vega measures the sensitivity of an option's premium to a change in expected volatility of the underlying asset. The higher the vega of the option is, the higher the premium of the option will be sensitive to a change in the expected volatility.

Since the 2870 call has a higher vega than the 2970 call, its premium will be more sensitive to a change in the volatility of the underlying asset.

e8)

There is a positive relation between the volatility of the underlying asset and the option premium. Therefore, the equivalent put option would have a positive vega.

e9)

There is a positive relation between the volatility of the underlying asset and the option premium. For a short position in option, an increase in volatility will increase the option premium, inducing a loss for a short position holder. Therefore, the vega in a short option position is negative.