TEST YOURSELF – MATHEMATICS

The CIWM® programme assumes a certain level of mathematical knowledge. In the experience of our training providers, candidates with the following qualifications often lack a sufficient grounding in mathematics:

- A vocational diploma; or
- A school-leaving certificate qualifying for university entrance (A-Levels, Abitur, Matura, …) where mathematics has not been part of the core modules; or
- A university degree where mathematics has not been among the subjects studied.

The following questions have been compiled in order to allow for testing your mathematical abilities. They also indicate the most important topics such as basic statistical measures such as mean, standard deviation, variance, correlations, their financial interpretations as risk and return, regressions, basic equation systems.

The test is designed for about 75 minutes, i.e., roughly 1 minute per point, assuming that certain aides such as formulae collections are readily available. The solutions are provided separately. If you feel that you can easily reach about half the points in the given time frame, the quantitative parts of the course should not prevent your success. Else, we strongly recommend improving your mathematical capabilities prior to starting the coursework. Some training providers offer special induction courses in mathematics. Please enquire.

Test Yourself - Mathematics (75 points)

1) Solve for Y and X respectively:

a) $Y = C0 + C1 \cdot Y + I + G$
(2 points)

b) $A = [X \cdot B + (1 - X) \cdot C]^{½}$
(2 points)

2) Consider the following equation system:

$$\begin{cases} X_1 + X_2 = 1 \\ X_1 \cdot 6 - X_2 \cdot 3 = 6 \end{cases}$$

Determine X_1 and X_2.
(4 points)

3)

a) The simple return is -4%. Determine the corresponding continuous return (round to two decimal digits).
(2 points)

b) The continuous return is +5%. Determine the corresponding simple return (round to two decimal digits).
(2 points)

4) A portfolio reports 10% return p.a. How many years does it take until the capital has doubled (assuming that the 10% return p.a. last forever and all interests gained are reinvested in the portfolio)? Answer by applying a special property of the natural logarithm.
(4 points)

5) For a given title, the following values have been observed at the end of each of the previous six months:

200, 190, 210, 230, 210, 220

a) Calculate the simple and the continuous return for each of the five periods.
(8 points)

b) Determine the arithmetic mean for both measures (rounded to two decimal digits) and compare.
(6 points)

6) Over a period of six months, the monthly performance of an investor $r_{P,t}$ (expressed in continuous terms) is compared with that of a benchmark $r_{M,t}$. The following values have been observed (all in %) :

t	*1*	*2*	*3*	*4*	*5*	*6*
$r_{P,t}$	-3	5	-1	-6	6	-1
$r_{M,t}$	-1	1	0	-3	2	-2

a) Visualise the return of the investor as a function of the return of the benchmark (scatter plot, with points). Based on your graph (and the cloud of points you see), do you think it makes sense to analyze the performance using a linear regression? Explain.
(8 points)

b) Calculate the mean and the standard deviation (sample) of the benchmark returns.
(8 points)

c) Calculate the mean and the standard deviation (sample) of the investor's returns.
(8 points)

d) Calculate the covariance (sample) and the correlation coefficient of the two return series and interpret you results.
(8 points)

e) Calculate the estimated parameters of a simple linear regression (β and α), regressing the investor's return $r_{p,t}$ against that of the benchmark $r_{M,t}$ (i.e., using $r_{p,t} = \alpha + \beta \cdot r_{M,t} + \varepsilon_t$).
(5 points)

f) Calculate the regression coefficient. Do you think the linear regression is significant?
(4 points)

g) Based on the linear regression, what is your forecast for the investor's return assuming a benchmark return of 2%?
(4 points)