

Solution Sheet on Problem Set 1

**Mean-variance analysis**

Deadline: 18/10/2018

***Solved by Lukas Schreiner***

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| **Task** | **Answer** | **Points Earned** |
| 1. **1)**  * mean daily return * mean weekly return * mean monthly return * mean annual return   Comment on whether the expected return increases or decreases with the horizon. | | **in %** | **Daily** | **Weekly** | **Monthly** | **Yearly** | | --- | --- | --- | --- | --- | | **Mean** | 0.029713 | 0.143241 | 0.621640 | 7.327088 | | **Std** | 0.964509 | 2.271903 | 4.166587 | 15.716742 | | **Variance** | 0.009303 | 0.051615 | 0.173604 | 2.470160 |   **The expected return rises with the time horizon. This is not surprising.** |  |
| 1. **2)**  * mean daily * mean weekly * mean monthly * annual   variance & standard deviation values  Comment on whether the variance of returns increases or decreases with time horizon.  Compare the scale of the horizon for the variance and standard deviation with the one of the returns, from question (1a). | **See table in 1.1.**  **The variance and standard deviation of returns increases as well with the time horizon. The risk increases as we have longer exposure to the market.** |  |
| **1. 3)** Report the value of the investment at the end of 2017. | Value of 1 USD Investment today: 161.32 USD |  |
| **1. 4)** Report the cumulative excess return for the period of January 3. 2000 to December 29, 2017. | The excess return over the period is 8.9233 percent |  |
| **1. 5)**   * daily * weekly * monthly Sharpe ratios   Comment 1  Comment 2 | | **.** | **Daily** | **Weekly** | **Monthly** | **Yearly** | | --- | --- | --- | --- | --- | | **Sharpe Ratio** | 0.607171 | 0.937168 | 1.242186 | 0.921079 |   **Comment 1**  **It seems that the Sharpe ratio increases with a bigger time horizon.**  **Comment 2**  **You could say that on average the long-term equity markets offer a better risk/ return profile. However, this does not take the investor’s risk profile into account.** |  |
| 1. **6)** Insert your explanation here |  |  |
| 1. **1)** Insert your plots here   Comments: | **../../../../../../Chart.png**  **../../../../../../lg.png**  **Some stock prices seem to exhibit correlation with LISN, whereas returns are mostly uncorrelated.** |  |
| 1. **2)** Weights of the RF asset for the 1st, 10th, 30nd , and 39th portfolios. Do we borrow or lend more when we require a higher return? | | **Expected Return** | **1%** | **10%** | **30%** | **39%** | | --- | --- | --- | --- | --- | | **Exp Ret** | 0.000750 | 0.017931 | 0.516195 | 0.688010 | | **Std** | 0.000000 | 0.003576 | 0.107272 | 0.143030 | | **Weight rf** | 0.996986 | 0.927917 | -1.075092 | -1.765784 | |  |
| **2. 3)** Plot the MVF for the 30 portfolios (6-stock case).  Comment | **../../../../../../E23.png** |  |
| **2. 4)** Plot the MVF for the 30 portfolios (including all 48 stocks). What happens to the MVF as we add assets to it? | **../../../../../../Eff_fron.png** |  |
| **2. 5)** Report the weights of Credit Suisse and Novartis in the tangency portfolio (including all 48 stocks). Plot of the MVF together with tangency portfolio |  |  |
| **2. 6)** Why is the tangency portfolio far from the MVF, which you built in 2.5? Which input and how would you change so that your tangency portfolio is on the MV frontier?  Insert the resulting figure. | **../../../../../../E24.png** |  |
| **2. 7)** Report the weights of UBS, ABB, and Roche in the minimum-variance portfolio (including all 48 stocks). | ../../../../../../minvar.png  Weight of UBS in the Min Var Port. is 3.43%  Weight of ABB in the Min Var Port. is -2.49%  Weight of Roche in the Min Var Port. is 4.61% |  |
| 2. 8) Why are the weights so different in both the MVP and the tangency portfolio for SPSN and CLN? | **The reason for that is correlation. Even though a risk / return profile of a stock might be better than another asset, the stock might therefore not be well suited for diversification. That is the same reason why the risk-free asset is so useful for portfolios. By being uncorrelated, it can improve portfolios significantly.** |  |
| 2. 9) Report the weights and comment on why we assign the corresponding weights to CSGN versus TEM given that it contradicts their risk-return trade-off? | Weight of CS in the Min Var Port. is 0.9%  Weight of CS in the Tangency Port. is -7.92%  Weight of Temenos in the Min Var Port. is -0.71%  Weight of Temenos in the Tangency Port. is -3.08%  **In the Min Var Portfolio we are trying to minimize variance and nothing else. For that reason even a stock with a negative Sharpe Ratio (SR) like CS might get a positive weight if its variance is sufficiently low. For Temenos it might the case that the return trade of is indeed better than the one from CS, but that doesn’t mean that there are many other assets that have even better SR that Temenos. In this scenario it makes sense to short a stock like Temenos and CS in order to increase the positions in stocks with really high SRs. The fact the weight for CS in the tangency portfolio is even more negative than the one for Temenos is an indicator for their relative SRs.** |  |
| 2. 10) Why is the variance of the MVP equal to the covariance of the MVP with the tangency portfolio? |  |  |