# Are the steps of the analysis clearly described?

In step 2, they left out to describe the market return and variance, which is crucial for the analysis. In step 3, they call the other portfolio besides the GMV the tangency, but that is just another portfolio without any worth mentioning meaning. Step 4 clearly describes the procedure, but doesn't provide the actually results op the weights of the tangency portfolio, which is a quite odd. Also, they don't describe its properties in step 4, but in step 5, which is a bit confusing. They also don't discuss the gross risk-free rate in step 5, so we are wondering if they used one rate for all data points or that they just picked a number for the gross risk-free rate and don't mention it because they perhaps can't motivate their choice. Also, they forgot to draw the inefficient part of the frontier with a riskless asset. In step 7, the procedure of the GRS test is not described at all. The rest of this report is clearly described. One last remark overall, is that the steps are numbered, which is not the right thing to do. According to the assignment, you can only use these steps to structure it, not really use them in the actual report.

# Are the steps of the analysis clearly motivated? Do you agree?

The motivation of the choice portfolios is a bit unclear. We don't understand why they chose the factors size and bm instead of for example also momentum. In step 3, the motivation why the GMV performs better than the market portfolio is on the other side great. They say in step 6 that all the beta's are significantly different from zero, but we don't say anywhere prove of that in a form of a test. Furthermore, everything else is motivated in a clear way.

# Are the results correct and clearly reported?

In table 1a, the average returns for the different portfolios do look normal. That is, when looking at the portfolios sorted on size, the historical relation between smaller firms and higher returns is satisfied. Also, a low book-to-market ratio may indicate growth opportunities and in this table the growth opportunities may be symbolized by the low returns. Therefore, no strange results are present in table 1a. In table 1b then, higher realized variances are obtained for smaller firms and this is in accordance with observations from the past. This result could be reasonable, as the financial balance of smaller firms may be less stable than that of bigger firms. From figure 1, there can be concluded that the Global Minimum Variance (GMV) portfolio and the other portfolio, which are obtained from minimizing the variance given a desired return, a budget constraint and the absence of a risk free asset, are correctly calculated. Namely, the GMV portfolio lies on the outer left point of the efficient frontier and the other portfolio lies on the efficient frontier. Also, the market portfolio lies in the efficient frontier, which is correct. Also, it is clearly explained why the GMV portfolio has a lower volatility and a higher return than the market portfolio. Then, in figure 2 the frontiers with and without a risk-free asset are drawn. It contains the tangency portfolio instead of the drawn GMV and the other portfolio in figure 1. The results of the portfolios are clearly reported in table 3. Then, in table 4 the estimated betas of the GRS test are all roughly somewhat more than 1 in value which indicates the portfolios are somewhat higher estimated in return than the market portfolio and the values of beta differ to some extent for each portfolio and this is clearly explained. The standard errors of the alphas and betas do look correct and the GRS test seems to be clearly reported by including the rejection region and p-value. The conclusion of the GRS test is clearly reported by reasoning using the Sharpe ratios of the market portfolio and the market portfolio with test assets. As a last note, from table 5 the conclusion was drawn that portfolios with higher book-to-market ratios and an average size implicitly means on average higher sharpe ratios. There could be more elaborated why this is the case for this set of portfolios.

# Do the implications and conclusions follow from the results?

On page 2 there is a logical explanation for the high correlations between different portfolios, namely, due to the presence of a common driving factor. Next, from figure 1 there is a logical explanation about why the return and volatility of the market portfolio are respectively lower and higher than the return and volatility of the GMV portfolio. Namely, they argued that the GMV lies on the efficient frontier, instead of the market portfolio. However, in table 3 sharpe ratios of the tangency portfolio and the market portfolio are given, but it could be mentioned that the tangency portfolio significantly outperforms the market portfolio. Nothing is said about this. Then, in table 4 there is talked about the values of the betas and that they are significant, but it is not clearly explained what the implication of the significant betas is. Subsequently, there is a good conclusion about the result of the GRS test. Namely, the CAPM is not able to predict the portfolios well given the assumptions of the CAPM and the sharpe ratio of the market portfolio including test assets outperforms the sharpe ratio of the market portfolio. However, it is again not clearly mentioned that this outperformance is significant. At last, the authors argue that some other factors could be included to reduce the mentioned outperformance, which is a logical solution.

# Is the use of graphs and tables good? Is the use of language good?

When looking at the graphs, they are just fine, meaning that the graphs contain all necessary information that is needed to answer the questions about the efficient frontier. The tables are also just fine and standard, except the heat map, a nice feature as the reader can quickly determine how big or small a particular value is. The use of language does not deviate much from the use of language in a standard report.