Diploma thesis appraisal

Name of the student: Bc. Mengting Ren
Title of the thesis: Portfolio Optimization under Mean-Variance Framework

The topic of the thesis is portfolio optimization under mean-variance approach. The goal of the thesis is to perform ex-post analysis of different active portfolio strategies based on particular optimization problems arising from different risk attitudes. The stated goal is in line with the assignment. As can be seen from the elaboration of the thesis, the goal was fulfilled.

The structure of the thesis is logical and in line with the stated goal. Excluding the introduction and conclusion, the thesis is structured into three main chapters. In the first chapter, the risk attitudes of investors are described as well as different financial markets and investors decision-making. In the second chapter, the portfolio optimization is described under mean-variance framework. In this chapter student describes methods applicable for parameter estimation, Markowitz and Black models, active portfolio strategies arising from these models and performance measures applicable for analyzing ex-post observed wealth paths. The third chapter is the most important part of the thesis as student applies proposed active portfolio strategies on selected historical dataset (the equities in DJIA index) and compares the obtained wealth paths. The computed performance measures of analyzed trading strategies are summarized in Table 4.2 on page 52. The ex-post wealth paths of studied strategies are compared to each other in subchapter 4.4. However, student do not provide analysis of the causes and reasons in the thesis, but only describes the graphs.

It must be said that the elaboration of the diploma thesis required a huge amount of calculations – due to the length of analyzed period student must have done 206 portfolio optimizations in order to find the solutions for minimum variance problem under both Markowitz and Black models. The student’s conclusions i) that portfolio strategy based on Markowitz minimum variance portfolio is the best and ii) that this portfolio recovered from the sub-prime crisis are valid and supported by the presented results. However, there can be made many more interesting conclusions from the obtained ex-post results: i) following minimum variance strategy is superior to following maximum expected return strategy both in terms of final wealth and maximum drawdown; ii) allowing short-selling both decreases the final wealth and increases maximum drawdown; etc. Alas, none of these observations are stated by student in the thesis. Comparison to the passive strategy of investment into DJIA index is missing as well.

Due to my opinion, there are no methodological errors in the thesis, however, the descriptions are poor and confusing, student repeats the description of difference between Markowitz and Black model many times in the thesis and there are also some minor formal problems and grammatical imperfections in the thesis (e.g. the list of bibliography is not sorted
in alphabetical order). Despite all these objections, I can conclude that the goal of the thesis was fulfilled and thus I recommend the thesis for defense at the final exam.

**Question for the defense**

Why in the subchapter 3.4.2 there is a constraint that the sum of the absolute values of the weights must be lower than or equal to three? What is the interpretation of such a constraint and what would happen if the constraint was omitted?

Ostrava, May 4, 2015

Ing. Aleš Kresta, Ph.D.