Report on Bachelor / Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	Bc. Matěj Urban
Advisor:	PhDr. Milan Rippel
Title of the thesis:	Optimal Investment Portfolio with Respect to the Term Structure Of the Risk-Return Tradeoff

***OVERALL ASSESSMENT** (provided in English, Czech, or Slovak):*

The main topic of the thesis is the analysis of investment strategies in long investment horizon. The author compares short-term and long-term properties of assets. In particular he focuses on risk of assets, often expressed in terms of variance of returns, and differences in covariance structure of investment portfolios in short and long investment horizon. The author uses his own numerical results on empirical data to comment on investment strategies in Czech pension funds in which the long investment horizon plays a crutial role.

The author first reviews briefly the classical Markowitz model and asset return predictability models (11 pages). The main part of the thesis consists of data analysis and application of statistical/econometrical models such as short-term mean-variance model and vector autoregressive model on different data sets (35 pages). These results are used for an optimal portfolio allocation analysis (10 pages). In the final part of the thesis (12 pages) the author breifly comments on characteristics of pension funds and attempts on comparison of results from previous parts of the thesis with the actual asset structure of Czech pension funds.

The author surely proved his ability in modeling investment portfolia and work with data sets. However, the thesis suffers serious shortcomings in mutiple aspects of the text. The list of major comments follows:

- The literature overview includes only two of the basic approaches and seems incomplete. Surely, the Markowitz model is the basic element of modern portfolio analysis and description of vector autoregressive model is important for the empirical analysis used in the thesis, but the list should be much longer, including e.g. multiple-stage stochastic optimization models, stochastic differential equation models and econometric models besides vector autoregression model.
- It is common knowledge that the basic disadvantage of Markowitz model is the symmetric risk measure in terms of variance since it puts the same value of risk to deviations from extected return and treats excess profit similarly risky as the excess loss. Many subsequent models after Markowitz try to take this in account by using assymmetric risk measures. There is however no note on this in the whole thesis and all analysis is with respect to variance.
- Many crutial aspects of methods that the author applied remain unexplained. Also the author uses so complicated sentences that the reasoning is absolutely unclear to the reader, e.g. „The mean-reversion in bond returns caused by the nominal T-bill forecast is lowered by the mean-aversion driven by the fact that the yield spread forecasts bond returns positively and its shocks record low positive correlation with unexpected bond returns." Overall, the author does not take into account that if the reasoning is not absolutely clear and previously unexplained terms are frequently used, the reader will have serious troubles following the text.
- The author is careless in mathematical notation (e.g., in (1) he uses a vector *x* which is explained few lines below as *X*), does not care about stating dimensions of introduced mathematical objects, often does not explains notation upon its first use. E.g., the identity matrix was used on the last line of page 22 but the notation „*I*" is explained on page 23 line 5 from above. Another example, „OLS" was mentioned for the first time on page 24 although the meaning of the abbreviation is explained on page 30 – well, either the reader knows that OLS stands for ordinary least squares and does not need any explanation at all, or the explanation is provided after its first appereance in the text. On

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top of that, in Section 5, the author becomes repetetive and „recalls" some equations (even) with the same label and comments.

- The used level of English is just average and on many occasions the structure of sentences seem to follow rather Czech than English grammar rules. The proof-reading has been careless and the text contains a bit too many missprints, some of which might have been intentional (e.g., box-cox on page 32 line 7 from below – Box-Cox transformation bears names of its authors, George E.P. Box and David Cox and hence capitals are in order).
- The author is inconsistent in use of quotation marks (sometimes „", sometimes " "), in labeling tables and figures (one can find Figure 1, figure (6), figure 7 and Figure (11) in the text), in format of numbers in tables (Table 3 contains 9 digit numbers, Table 4 only 4 digit numbers) and in figures (in Figures 26 and 27 one can find a different order of time horizons). Most notably, the bibliographical section hardly follows widely accepted standard of citation (e.g.,papers are sometimes refered with the range of pages with „pp.", sometimes with „p.", sometimes with also total numbers of pages and sometimes with no pages at all).
- The simple optimization problem introduced on page 52 is does not model the minimum variance portfolio problem. First of all, the use of star to denote the control variable is unfortunate since from that point of view the objective and constraints do not contain the control variable and in the presented form problem is trivial minimization of a constant. I'm sure this was not the intention. Secondly, the nonegativity contraints on weights are not included in the formula (although they are mentioned in the subsequent text) and thus the optimization problem does not correspond to the minimum variance portfolio problem as claimed since also negative investment would be allowed.
- According to the enclosed Master Thesis Proposal, I believe that some proposed goals have not been achieved. This apply to „I will employ the four factor Famma&French model to investigate performance and its persistence of actively managed funds." Famma&French model is nowhere else to find in the thesis. Also, according to the proposed Outline, the whole section on „Alternative Investments" is missing.

Analysis from the URKUND system detected only 5% similarity with other texts, mostly single ordinary sentences. The reviewer believes that it indicates the text originated from Mr. Urban and that 5% of text similarity is well acceptable.

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SUMMARY OF POINTS AWARDED (for details, see below):

CATEGORY		POINTS
Literature	*(max. 20 points)*	8
Methods	*(max. 30 points)*	20
Contribution	*(max. 30 points)*	20
Manuscript Form	*(max. 20 points)*	8
TOTAL POINTS	*(max. 100 points)*	**56**
GRADE	**(1 – 2 – 3 – 4)**	**3**

NAME OF THE REFEREE: RNDr. Michal Červinka, Ph.D.

DATE OF EVALUATION:6.6.2011

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Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

LITERATURE REVIEW: *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

Strong	Average	Weak
20	10	0

METHODS: *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

Strong	Average	Weak
30	15	0

CONTRIBUTION: *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

Strong	Average	Weak
30	15	0

MANUSCRIPT FORM: *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Strong	Average	Weak
20	10	0

Overall grading:

TOTAL POINTS	GRADE		
81 – 100	1	= excellent	= výborně
61 – 80	2	= good	= velmi dobře
41 – 60	3	= satisfactory	= dobře
0 – 40	4	= fail	= nedoporučuji k obhajobě