

Report on Bachelor / Master Thesis

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

Student:	Jonáš Kratochvíl
Advisor:	RNDr. Michal Červinka, Ph.D.
Title of the thesis:	Efficiency of Prague Stock Exchange Market using Markov Chains

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

Please provide your assessment of each of the following four categories, summary and suggested questions for the discussion. The minimum length of the report is 300 words.

The thesis provides an alternative approach to testing the Efficient Market Hypothesis via Markov Chains (of order 1 or higher). In particular, the author explores the link between random walk hypothesis and weak form stock market efficiency via tests of the optimal order of Markov chain. The presented theory is then applied to real data of Prague Stock Exchange and achieved results are confronted with results previously published on this topic.

Contribution, Methods and Manuscript Form

To my knowledge, neither the Markov chains theory nor basic concepts of Bayesian statistics and econometrics are being taught on the Bachelor level at IES. The author thus absorbed a significant part of nontrivial mathematical concepts beyond his current level of studies and managed to apply them in a mathematically correct and fashionable way.

In particular, section 4 serves as a more or less standalone introduction to theory of Markov chains with discrete states and discrete time in the form which is comprehensible by any third-year bachelor student at IES exposed to standard mandatory subjects. Section 5 contains a mathematically correct derivation of MLE of TPM (unlike some cases of the referenced source literature).

The author also demonstrates high computational skills to achieve numerical results based on real Prague Stock Exchange data. I have very much enjoyed the subsequent close analysis and interpretation of the numerical results. The author's discussion on results give rise to many possible extensions of the presented analysis which, however, go beyond the scope of the thesis and far beyond the bachelor level.

The author uses well crafted mathematical notation despite a non-trivial high amount of variables used. Moreover, the author includes many, yet not an overwhelming large number of illuminating figures and diagrams, most of which are author's own creations. Last but not least, the author uses near flawless English which contributes to the high readability of the manuscript.

Literature

Although the literature review may seem a bit brief, the thesis contains an impressive amount of references which are listed in a standard citation form.

Summary and suggested questions for the discussion during the defense

To summarize, it was my pleasure to supervise this thesis and I am happy to recommend this thesis to be awarded with the top grade A, cf. the table summary below.

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

CATEGORY	POINTS
Contribution (max. 30 points)	27
Methods (max. 30 points)	29
Literature (max. 20 points)	17
Manuscript Form (max. 20 points)	19
TOTAL POINTS (max. 100 points)	92
GRADE (A – B – C – D – E – F)	A

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

DATE OF EVALUATION: June 5, 2018

Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

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.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
30	15	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.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
30	15	0

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

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
20	10	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.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
20	10	0

Overall grading:

TOTAL	GRADE
91 – 100	A
81 - 90	B
71 - 80	C
61 – 70	D
51 – 60	E
0 – 50	F