

# Report on Bachelor Thesis

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

Student: **Bc. Filip Staněk**  
Advisor: **PhDr. Jiří Kukačka, Ph.D.**  
Title of the thesis: **Testing the Presence of Adaptive Switching Behavior in Equity Markets**

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

The thesis "Testing the Presence of Adaptive Switching Behavior in Equity Markets" suggests a very original theoretical approach how to empirically test for the adaptive switching behaviour of market participants among various trading strategies. The idea of adaptive switching is the core concept of the modern field of the heterogeneous agent-based modelling in economics and finance, that proposes an alternative paradigm to mainstream theories assuming unrealistic as well as often empirically rejected rational expectations. Filip suggests a very general model framework that is not limited by almost any assumption regarding the model design, the form of the switching mechanism, or the specification of the set of available trading strategies. Thus, this original approach developed by Filip certainly surpasses the "state of the art" of the current literature on the empirical verification of heterogeneous market expectations.

I am pleased to summarise at the very beginning that **Filip has written an excellent piece of work bringing a clear scientific contribution** and due to outstanding quality of the entire thesis **I can honestly suggest the highest grade (1)**.

Our cooperation with Filip started by works on his Bachelor thesis and the Diploma thesis topic is a logical continuation of his interest in the field of heterogeneous agent-based modelling. Filip proposes a new and undoubtedly very challenging idea how it might be possible to detect the presence of adaptive switching in equity markets. This is a frequently discussed topic in the current financial empirical literature without a prevailing consensus so far. After formalising a general model inspired by standard modelling approaches, Filip develops a rigorous theoretical background starting by defining so called "elementary strategies", that allow for further describing of almost any conceivable trading rule, and he formalises the general idea of the "leaning against regularities" in equity markets. All propositions are accompanied with a rigorous mathematical proof. Using the idea of encoding the price series using intervals of returns and computational simulations, Filip clearly demonstrates the hypothesised relation between switching and the weak form of market efficiency. Filip further develops a general estimation framework for the econometric test and thoroughly assess its performance in controlled environment using Monte Carlo simulations testing also various situation of possible model misspecifications. The simulation-based results are very convincing with the percentage of false positive detections generally remarkably low. The promising results open up the space for empirical estimation. Filip constructs a huge dataset covering 2,792 stocks ever listed on NYSE covering the period 1962-2015 and runs a comprehensive estimation study combining various possible setting of the model as well as an extensive stability analysis of results w.r.t. various values of the discount factor, possible structural changes in time, or trading volumes of individual stocks. The findings suggest that the null hypothesis of the absence of switching can be generally strongly rejected and it proves to be robust to various stability tests. Moreover, the results indicate that the switching can be understood as a force driving markets toward weak efficiency. This notion of the connection between adaptive switching and market efficiency suggests a new and appealing source of further research inspiration.

The cooperation with Filip from my advisor's point of view was excellent. Although Filip would be well able to work independently, we discussed on a regular basis hours and hours about the design of the model and the method. I have to highlight here that Filip completely rewrote the theoretical part (e.g. all proofs) of the work several times before he was fully satisfied with the final product. The originality of the topic enforced some slight modification of the proposal hypotheses, but it definitely reflects the scientific value added of the real research work.

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The extent of the thesis ranks the work to a group of shorter ones, which is, however, more than fully offset by its scientific contribution and mathematical rigour. The work is well structured and formally more than meets very high academic standards. Moreover, and very importantly, it strongly contributes to recent heterogeneous agent-based literature. The text of the thesis is supplemented by an electronic archive containing all source codes so that everyone can verify complete results.

## Suggested questions for the defense:

- Compare your simplified model approach with a stylised situations of real traders. What simplifications were considered in the model, i.e. w.r.t. trading volume, so that the model could have been constructed and the analysis elaborated using real market data? What might be the impact of these simplifications?
- Expand a bit more the connection between the estimation results and the Efficient Market Hypothesis. What is the role of transaction costs in real markets? Does the existence of transaction cost rather support or challenge the results of the analysis.

## Summary:

As large, I do find this thesis **strongly surpassing academic standards for diploma theses written at IES**. Personally considered, the markedly original contribution and scientific rigour of the research, together with a very careful elaboration of both simulation-based as well as empirical analyses, are the most distinctive qualities of the work.

I need to mention here that I feel personally happy that Filip has finally decided to continue his academic career by Ph.D. studies at CERGE-EI. Thus, he will have a great opportunity to expand his "future research" suggestions from the thesis conclusion.

I am very pleased I can **strongly recommend the thesis of Filip Staněk to defense at the IES FSV UK. With no doubts, I suggest the grade "1".** i.e. "excellent".

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

CATEGORY	POINTS
<i>Literature</i> (max. 20 points)	15
<i>Methods</i> (max. 30 points)	30
<i>Contribution</i> (max. 30 points)	30
<i>Manuscript Form</i> (max. 20 points)	20
<b>TOTAL POINTS</b> (max. 100 points)	<b>95</b>
<b>GRADE</b> (1 – 2 – 3 – 4)	<b>1</b>

**NAME OF THE REFEREE: Jiří Kukačka**

**DATE OF EVALUATION: 31. 8. 2016**

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**Referee Signature**

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## 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	<b>1</b>	= excellent	= výborně
61 – 80	<b>2</b>	= good	= velmi dobře
41 – 60	<b>3</b>	= satisfactory	= dobře
0 – 40	<b>4</b>	= fail	= nedoporučuji k obhajobě