

# Report on Bachelor / Master Thesis

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

Student:	Michal Sabol
Advisor:	Mgr. Vojtěch Pištora
Title of the thesis:	Accuracy of Leading Economic Indicators

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

The thesis is an empirical study of how leading economic indicators influence the target variable, economic activity, proxied by GDP. There are 15 pages introducing the economic indicators and measurement of their forecasting ability, about 15 pages describing the actual methods, 35 pages describing the results and 7 pages of results annex.

I consider literature review of the economic indicators to be consistent with bachelor level. For the parts until 1.2, I have no reservations other than minor issues such as occasional minor issues, e.g. some nonstandard formatting and missing (technical/data) description to Figure 1.

The methodology part (Sections 1.3, 2) are however quite sparsely cited, in contrast to the review of economic indicators. Nonetheless I consider the methodological approach to be sensible, and the methods used to be a very strong aspect of this work. The author uses HP filter to extract cyclical components and runs Granger causality tests, and conducts an extensive out-of-sample forecasting accuracy exercise using ARMAX time series models (in addition to basic correlation analysis). The time series work is following done thoroughly with all the ACF, PACF, information criteria, dynamic forecasting (for t-2) and forecasting accuracy metrics. There is an abundance of results, which can be considered useful, and some of them are meaningfully interpreted. I believe that especially the rather extensive analytical work was quite laborious and the author has learned a lot.

With regard to the empirical gist of the thesis, I have the following concerns, any of which could be potential discussion topics for the defence (in decreasing order of importance):

- The author includes on p. 28 "Montgomery, Jennings & Kulahci (2008) warn that the MPE and MAPE are applicable only for the time series that doesn't include zero values." While MAPE cannot by definition be used with "zero" values, it can certainly lead to biases even with series with both negative and positive values that simply can go close to zero – such as cyclical components that are used by this work. This leads to very high MAPE ratios above 6 etc. (that are not observed for RMSE ratios) and could bias the results
- In some sense, reading the positive results and conclusions section I get the impression that adding leading indicators into the regressions must have improved the results significantly, however reviewing the tables on the MAPE, RMSE ratios, values above 1 are seen very often, so that I get the impression that especially the conclusion that only one leading indicator is not a universal recipe should be emphasized. However if the X variables were significant in the regressions, forecasting should most likely be improved too. Did successful X variables lead to a better forecasting performance *across time periods*?
- Although I could understand the data based on the methodology sections and all are from public sources, some data section would be helpful (with summary statistics, number of observations etc)
- Because the regressions are rolling, their omission is understandable, however perhaps at least some output or code on a DVD could improve the transparency of the work (we are having a regression based work but do not see an estimated regression coefficient)
- (concerns structure only) Section 1.3 is part of "theoretical background" but it seems to be already describing the approach taken

The following are additional questions that could be discussed during the defence:

- On p. 33, we learn that "Six of these indicators Granger causes reference series of the Czech Republic as well as that of Germany." Did we observe any asymmetry here, given German

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indicators should intuitively have a higher impact on CZ, than vice versa? (concerns both types of qualitative indicators)

- To what extent can indicators such as "Production of total industry" considered leading indicators, given they are correlated with the reference series by definition? Is there value especially due to such indicators being released earlier than GDP, or is there something more to it?

With regard to the manuscript form, the thesis could use some proofreading. Certain principles of academic English are violated at times (e.g. by using the word "proliferated" meaning simply "increased"). I am unsure about some of the notation in tables,

In the case of successful defense, I recommend "**velmi dobře**" (good, 2).

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

CATEGORY		POINTS
Literature	(max. 20 points)	16
Methods	(max. 30 points)	27
Contribution	(max. 30 points)	22
Manuscript Form	(max. 20 points)	13
<b>TOTAL POINTS</b>	(max. 100 points)	<b>78</b>
<b>GRADE</b>	<b>(1 - 2 - 3 - 4)</b>	<b>2</b>

**NAME OF THE REFEREE:** Vojtěch Pištora

**DATE OF EVALUATION:** May 23, 2016



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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