

# Report on Bachelor / Master Thesis

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

<b>Student:</b>	<b>Su Hazal Baylan</b>
<b>Advisor:</b>	<b>prof. Ing. Evzen Kocenda, Ph.D., DSc.</b>
<b>Title of the thesis:</b>	<b>Nowcasting the Real GDP Growth of the European Economies based on Machine Learning</b>

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

## Short summary

The thesis under review analyses the nowcasting of quarterly GDP growth for 9 European economies using dynamic factor model and machine learning methods and number of indicators during covid and before covid. Author finds mixed results, machine learning models provide better forecasting accuracy in comparison to dynamic factor models in stable periods for some countries, while during the periods of high uncertainty author finds dynamic model to outperform machine learning. The thesis is standard work, I believe the analysis is done properly, and brings some empirical results, although the manuscript, and work with literature would need more polishing and care (see my comments below).

## Contribution

The question if machine-learning algorithms can help central banks understand the current state of the economy and improve forecasting of macroeconomic variables is important and timely. Hence the work fits nicely to the current literature trying to employ machine learning methods in macroeconomic forecasting. In terms of the empirical results, the conclusions are mixed, and not rigorously supported so the contribution is limited.

## Methods

The author uses appropriate advanced methodologies for the key questions, including ridge, lasso, elastic nets and random forest.

## Literature

I find description of bridge equations, MIDAS, state-space approaches, or even MF-VAR models on 7 pages of literature review bit useless since they are not used at all while dynamic factor and ML methods are described only shortly. I understand that the literature was evolving in this direction, but I do not see a reason for including equations that are not connected to the text here, and instead I would expect thorough literature review of machine learning methods.

## Manuscript form

The text is bit hard to be followed, in the motivation author states that GDP growth nowcasting was carried for 9 countries with 5 methods, then turns to dataset construction, number of variables used, and all other details that are indeed important, but reader is quickly lost in the logics. Then literature introduces lots of methods that are not used in technical detail with equations, methods section 4 introduces learning models vaguely. The text is generally quite descriptive, but lacks clarity and logical connections oftentimes.

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## Overall evaluation and suggested questions for the discussion during the defense

In conclusion I believe the thesis is a solid piece of work that attempts to use the machine learning methods to improve forecasting of macroeconomic variables. I believe author could clarify following issues during the defense:

1/ Why author choses 9 specific countries? Is there any reason for this choice? If no, how the choice of the data can influence the general conclusions being made?

2/ For a central bank it is important to know what drives the forecast, is there any possibility to interpret the forecasts from machine learning?

3/ The claim of better forecasts by ML models is not well supported since it is based on mere comparison of RMSE losses. What we need to see for a proper testing of hypotheses is some statistical test that will allow us to conclude that loss from one model is statistically different from the other one. Also, from the Tables I can see that the results are more country specific than claimed in the abstract and introduction. This is fine, but can author see any reason for this result in data? IN other words why would central bank of one country use some method and the other one different? How are these results applicable in practice?

In conclusion, I believe that the thesis deserves to be defended without doubts. In case author is confident in presenting the details of the work during the defense, and mostly confident in the discussion and response to my questions, I suggest to award the work with grade "C", although I need to stress that this is conditional on the discussion and excellent presentation!

Finally, the results of the Urkund analysis do not indicate significant text similarity with any other available sources.

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

<b>CATEGORY</b>	<b>POINTS</b>
<i>Contribution</i> (max. 30 points)	24
<i>Methods</i> (max. 30 points)	27
<i>Literature</i> (max. 20 points)	8
<i>Manuscript Form</i> (max. 20 points)	12
<b>TOTAL POINTS</b> (max. 100 points)	<b>71</b>
<b>GRADE</b> (A – B – C – D – E – F)	<b>C</b>

**NAME OF THE REFEREE:** Jozef Barunik

**DATE OF EVALUATION:** 22.8.2023

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**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.*

**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.*

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

**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.*

**Overall grading:**

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