# Report on Bachelor / Master Thesis

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

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| **Student:** | **Su Hazal Baylan** |
| **Advisor:** | **Evžen Kočenda** |
| **Title of the thesis:** | **Nowcasting the Real GDP Growth of the European Economies based on Machine Learning** |

***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.*

**Contribution**

The thesis analyzes the nowcasting of quarterly GDP growth in nine European countries (Belgium, Czechia, Denmark, Finland, France, Hungary, Italy, Portugal, and Slovenia) using a dynamic factor model and four different machine learning models (Ridge, Lasso, Elastic Net, and Random Forest). The nowcasting evidence shows that overall machine learning models provide better forecasting accuracy than dynamic factor models and benchmark model (AR), albeit only for relatively stable periods (before covid). During more volatile periods with higher economic uncertainty, the dynamic factor model outperforms machine learning models, though. In terms of economic size, the Random Forest model outperforms the other three models during stable periods in the case of small economies (eg. Slovenia and Portugal). The contribution is based on a well-executed methodology and articulated correctly.

**Methods**

The nowcasting is done with the use of a dynamic factor model (DFM) and four different machine learning models (Ridge, Lasso, Elastic Net, and Random Forest), plus a simple benchmark model (AR). These are standard techniques correctly employed on the multi-type data. The data set includes ten hard and fifteen soft indicators for each country. Nowcasting iterations are performed for pre-covid (more stable) and covid (more volatile) periods. For machine learning, models are fed with the extracted factors that are obtained from the dynamic factor model. For all nowcasting models expanding window approach is selected to estimate nowcasting iterations. The methods and data are described in detail and sufficiently. The methods are correctly employed, and the computations are well-executed.

**Literature**

The literature review section summarizes the current state of research related to the topic of the thesis quite well. Moreover, the literature review covers separately various methodological approaches employed in the literature and provides a review of the nowcasting methodologies from the perspective of the single equation approach, state-space approach, and machine-learning methods. Hence, the literature is reviewed in detail and covers all relevant papers and angles.

**Manuscript form**

The manuscript conforms to the formal requirements for the master thesis. The text reads well but it could be improved after some imperfections in sentences and grammar are accounted for. The results are presented with enough detail. The introduction is informative and the goal of the thesis is clearly stated. Data are described with sufficient detail. Hypotheses are clearly stated in the thesis itself. Tables and figures are presented in an organized and legible manner, but they lack self-explanatory

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notes; on the other hand, a brief explanation is always found in the text close to a table. References are complete.

**Summary and suggested questions for the discussion during the defense**

The thesis represents good empirical work on GDP growth nowcasting. The results of the Urkund analysis do not indicate significant text similarity with other available sources. In my view, the thesis fulfills the requirements for a master's thesis at IES, Faculty of Social Sciences, Charles University. I suggest a grade of A.

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

| **CATEGORY** | | **POINTS** |
|---|---|---|
| *Contribution* | *(max. 30 points)* | 27 |
| *Methods* | *(max. 30 points)* | 28 |
| *Literature* | *(max. 20 points)* | 20 |
| *Manuscript Form* | *(max. 20 points)* | 18 |
| **TOTAL POINTS** | *(max. 100 points)* | **93** |
| **GRADE** | **(A – B – C – D – E – F)** | **A** |

***NAME OF THE REFEREE: Evžen Kočenda***

***DATE OF EVALUATION:***

Evzen Kocenda Digitally signed by Evzen Kocenda
Date: 2023.09.04 10:34:54 +02'00'

***Referee Signature***