

BUCHAREST UNIVERSITY OF ECONOMIC STUDIES

**The council for Doctoral Science -
Cybernetics and Economic Statistics**

**QUANTITATIVE TECHNIQUES FOR
RAPID ESTIMATES OF MACROECONOMIC INDICATORS**

ADINA ANDREEA V. NEAMȚU

Academic supervisor: Professor Tudorel Andrei PhD

Bucharest, 2024

CONTENTS

Abstract.....	IV
Acknowledgments.....	V
CONTENTS.....	VI
ABBREVIATION LIST.....	VIII
GENERAL INTRODUCTION.....	1
CHAPTER 1.....	5
1.1 INTRODUCTION.....	5
1.2 MACROECONOMIC INDICATORS.....	7
1.3 OVERVIEW OF TRADITIONAL METHODS.....	11
1.3.2 Dynamic Factor Model.....	15
1.3.3 Autoregressive Integrated Moving Average Model.....	18
1.3.4 Temporal disaggregation of time series.....	20
1.3.5 Dynamic Stochastic General Equilibrium.....	25
1.4 OVERVIEW OF MODERN METHODS.....	28
1.4.1 Big Data.....	28
1.4.2 Artificial Intelligence.....	30
1.5 CONCLUSIONS.....	32
CHAPTER 2.....	34
2.1 INTRODUCTION.....	34
2.2. STATE OF ART.....	37
2.2.1 Introduction.....	37
2.2.2 Databases and software.....	38
2.2.3 Mapping and visualization software.....	43
2.2.4 Conclusions.....	47
2.3. METHODOLOGY.....	48
2.4 RESULTS.....	55
2.5 CONCLUSIONS.....	66
CHAPTER 3.....	69

3.1	INTRODUCTION.....	69
3.2	GROSS DOMESTIC PRODUCT IN ROMANIA.....	71
3.3	THE INDUSTRY SECTOR IN ROMANIA.....	74
3.4	INDUSTRIAL PRODUCER PRICE INDEX IN ROMANIA.....	77
3.5	METHODOLOGY.....	81
3.6	RESULTS.....	85
3.7	CONCLUSION.....	104
	GENERAL CONCLUSIONS.....	106
	BIBLIOGRAPHY.....	108
	ANNEXES.....	124
	TABLE OF EQUATIONS.....	135
	TABLE OF FIGURES.....	136
	LIST OF TABLES.....	138
	LIST OF ANNEXES.....	139

Keywords: rapid estimates, quantitative analysis, temporal disaggregation, GDP Romania

In the present era characterized by the demand for instant access to information, the concept of flash estimates has gained considerable attention, particularly in recent years. One of the most critical macroeconomic indicators, Gross Domestic Product (GDP), is typically released on a quarterly basis with significant delays.

However, in a world where policy decisions often need to be made in real-time with incomplete economic data, necessity for more timely information has become increasingly pronounced. Aligning the release time of GDP data with global standards, such as those observed in the United States, where GDP data is released at intervals of 30-60-90 days, is imperative. Several European countries, including Belgium, Lithuania, and Spain, have explored ways to reduce the time lag in publishing GDP flash estimates, aiming to enhance the efficiency of early warning systems, particularly underscored by the lessons learned from the last recession.

Against this background, nowcasting has become a valuable tool for forecasting present or near-future values of macroeconomic indicators using the available data. Taken into consideration the above-mentioned context, the present PhD thesis aims to explore several advanced econometric techniques and to develop a nowcasting model for Romania.

The research objectives can be summarized as following:

- Assessment of the existing state of art nowcasting techniques for rapid estimates of macroeconomic indicators.
- Comparison and evaluation of trustworthiness of various nowcasting models in real-time economic analysis.
- Classification of challenges and limitations related to nowcasting techniques and proposal of possible resolutions or developments.

The thesis is structured as following:

- **General introduction** sets the stage for the thesis, providing an overview of the research problem, the significance of the paper and its objectives. It introduces the concept of rapid estimates of macroeconomic indicators, explain its importance in economic analysis, and outline the structure of the thesis.

- **Chapter 1: state of art and literature review** delves into the existing literature related to macroeconomic indicators, their estimation methods, and the challenges associated. Various models and techniques employed in nowcasting and estimation, highlighting their strengths and weaknesses. This chapter also identifies the current gaps in literature that our study aims to address.
- **Chapter 2: bibliometrics analysis** focuses on the analysis of literature itself. We perform a comprehensive bibliometric analysis aimed to identify research trends in the rapid estimates' domain. This analysis includes key research topics, the evolution of research focus over time, most influential journals, and most productive countries.
- **Chapter 3: application** represents the core of the thesis, where we present the theoretical foundation for our model, the data sources and methodologies employed, and the empirical results. The practical utility, accuracy and reliability of the model is also addressed within the chapter.
- **General conclusions** synthesize the findings from our thesis and provides a comprehensive conclusion. We revisit the research objectives, summarize the key results, and discuss their implications for the academic environment. This chapter also addresses the limitations and suggests possible directions for future research.