

Report on Master Thesis

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

Student:	Bc. Josef Štefl
Advisor:	Mgr. Petr Polák, M.Sc., Ph.D.
Title of the thesis:	High Frequency Price Index of Construction Materials: Nowcasting of Producer Prices

Short summary

This thesis offers a comprehensive investigation into the dynamic behavior of construction material prices in the Czech Republic over a three-year period, using innovative data collection methods. The study centers on the Construction Materials Price Index (CMPI), developed through web scraping techniques, and compares it with established indices to assess its validity and potential for macroeconomic forecasting.

Contribution

The thesis introduces the CMPI as a potential alternative to the official Material Inputs for Construction Work Price Index (MIPI), validating its accuracy over 144 weeks. Additionally, the study identifies key commodity prices (electricity, diesel, and copper) that influence the price of construction materials during periods of external shocks, such as the COVID-19 pandemic and geopolitical events. The most significant contribution is the development of a nowcasting model using the CMPI to predict the MIPI with a one-month lead, reducing forecast errors by 25%. This showcases the value of high-frequency data for enhancing predictive accuracy in economic models.

Methods

The thesis employs web scraping for real-time data collection, extending traditional econometric modeling with ARIMA and ARIMAX frameworks. The integration of big data techniques with econometric analysis sets a strong methodological foundation. The models are rigorously tested, including a pseudo-real-time nowcasting experiment, further confirming the practical benefits of using high-frequency data to improve inflation forecasting. Despite limitations in commodity price integration, the thesis provides a compelling case for further exploration of long-term relationships in macroeconomic modeling.

The methodology section is lengthy and inconsistent. In section 3.3.1 the author in fact does not formulate the ARIMA model itself, only a few special cases. Throughout the manuscript, the author systematically calls single equations to be models, that should not occur in Master's level texts. Equation (model) (3.12) is not ARIMAX model, so is not (3.13) unless $Y'_t = (1-B)^d Y_y$ (which is not introduced in the text). Content of sections 3.3.4 up to 3.3.11 are not presented for ARIMAX but mostly for a simple linear regression model, using alternative notation of parameters of the model, and as such I find it confusing for the reader.

Literature

The thesis demonstrates a strong engagement with relevant literature, however I find the literature review rather lengthy, at least with respect to the number of references used. Furthermore, I find its organization a bit confusing (e.g. in Section 2.1 the references could be organized chronologically) and repetitive (all subsections of 2.1 could be outlined in a more effective way). Some parts of Chapter 2 would play a better role in section Methodology, e.g. subsection 2.1.4. References are appropriately cited, reflecting a solid understanding of the current state of the field and supporting the study's methodology and findings with well-chosen sources.

Manuscript form

The thesis is logically organized and consistently uses appropriate academic language. The student's use of English is nearly flawless.

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However, the manuscript form is the major weakness of the thesis. The thesis uses old thesis template, and as such does not contain declaration of AI-based tools used in the thesis. The author uses emphasized text in a rather random way (in some cases I did not understand the reason for emphasis). On many occasions, the author is inaccurate in his text, e.g. on page 13, he introduces ARIMA as autoregressive moving average (model), omitting the „integrated“ part. Introduction Section is rather lengthy, and does not contain the basic outline of the remaining text, which is something that I find a must in Introduction section of academic texts. I find the use of footnotes both unnecessary and inconvenient, as the author uses a „star“ symbols and the label system of footnotes resets with a new page. Some figures are not mentioned in the text, e.g. Figure 1. The graphic layout of figures is inconvenient as the white text on a light blue background is virtually invisible. The Conclusion section should be shorter to emphasize the actual contribution. Finally, I do not find Appendix C useful; the author could include a link to a corresponding website instead.

Overall evaluation and suggested questions for the discussion during the defense

In my view, the thesis fulfills the requirements for a bachelor thesis at IES, Faculty of Social Sciences, Charles University, I recommend it for the defense and suggest a **grade C**. The results of the Turnitin analysis do not indicate significant text similarity with other available sources.

I suggest the following questions to be raised during the thesis defense:

- On page 76 you mention considering a VAR model. What results did you obtain using that type of models compared to AR(I)MA models?
- In Figure 5 you consider multiple structural breakpoints. If decided to work with 2 or 3 structural breaks, to which dates and which events would the additional break points correspond?

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

CATEGORY	POINTS
<i>Contribution (max. 30 points)</i>	28
<i>Methods (max. 30 points)</i>	24
<i>Literature (max. 20 points)</i>	15
<i>Manuscript Form (max. 20 points)</i>	10
TOTAL POINTS (max. 100 points)	77
GRADE (A – B – C – D – E – F)	C

NAME OF THE REFEREE: RNDr. Michal Červinka, Ph.D.

DATE OF EVALUATION: 15.9.2024

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