Federal state educational institution of higher education
RUSSIAN PRESIDENTIAL ACADEMY OF NATIONAL ECONOMY AND PUBLIC ADMINISTRATION

Evseev Alexey Sergeevich

ANALYSIS OF PRICE RIGIDITY IN THE RUSSIAN ECONOMY BASED ON HIGH-FREQUENCY DATA

Speciality: 5.2.1. «Economic theory»

ABSTRACT

of the dissertation for the degree
of Candidate of Economic Sciences

Scientific supervisor:
Candidate of Economic Sciences
Sinelnikova-Muryleva Elena Vladimirovna

Moscow – 2025

Relevance of the research topic.

Ensuring a stable and relatively low level of inflation is one of the key objectives of monetary policy in many countries, including the Russian Federation. Within the framework of the New Keynesian paradigm, which underlies the models used by most central banks, strict assumptions are made regarding the properties of the price-setting process. However, until recently, empirical verification of these assumptions has been constrained by limited access to large-scale price data.

Since the early 2000s, a number of studies have emerged that provide insights into micro-level price-setting behavior. These studies were primarily based on unpublished data from national statistical agencies and possessed both advantages and limitations. Their main advantage was representativeness in terms of coverage of consumer price index categories.

At the same time, such data did not allow for the analysis of a number of important characteristics relevant to modeling pricing processes. In particular, the exclusion of goods from the sample for reasons unrelated to their disappearance from the market led to biased estimates of price duration. In addition, the monthly frequency of observations did not allow for an accurate assessment of price rigidity for goods with shorter price durations. Furthermore, the collection of such data involves significant costs associated with the engagement of statistical personnel.

The expansion of e-commerce has led to the emergence of a new source of price data, namely data obtained through web scraping of online retailers' websites. Web scraping is an automated method of data collection, whereby information from specific parts of websites is extracted into structured datasets. Such data have several advantages: they cover thousands of product categories, are collected at significantly lower cost, and can be obtained at any desired frequency.

At the same time, online data also have certain limitations. In particular, they are less representative than traditional statistical data, as they do not fully cover services and account for a relatively small share of total retail turnover. Nevertheless, empirical

evidence suggests that, despite these limitations, online data are useful for analyzing price behavior and forecasting inflation.

Online retail represents a rapidly developing segment of the market. However, it remains unclear whether the regularities identified in traditional offline price data apply to online markets. In online retail, menu costs — one of the key explanations for price rigidity in New Keynesian theory — are significantly lower. It also remains unclear whether price rigidity changes over time or remains constant, and to what extent price adjustments are coordinated.

Previous studies have shown that when inflation exceeds a threshold of 10 percent, price-setting behavior in traditional markets undergoes significant changes. This raises the question of whether similar effects are observed in the Russian online retail sector. The availability of data since 2019, including the inflation surge in 2022, provides an opportunity to address this issue.

The degree of scientific elaboration of the problem.

The problem of price rigidity and pricing mechanisms has been extensively studied in international economic literature. The theoretical framework includes two main approaches: time-dependent pricing models and state-dependent pricing models. Hybrid pricing models combining elements of both approaches have also been developed, with particular emphasis on sectoral heterogeneity and the role of inflation expectations.

In Russian economic research, macro-level aggregated analyses prevail, while micro-level studies that account for the specifics of different pricing models remain insufficiently developed. Existing studies do not fully address issues related to the empirical verification of pricing models using Russian data, the analysis of transitions between pricing regimes under crisis conditions, and the identification of inflation thresholds at which such transitions occur.

Thus, despite significant progress in theoretical modeling, empirical studies of price rigidity in the Russian economy require further development, particularly in the context of digitalization and macroeconomic instability. The present study is aimed at addressing these gaps.

Purpose and objectives of the study.

The purpose of the dissertation is to identify and analyze empirical regularities of price rigidity in the Russian economy based on high-frequency data and to refine the conclusions of theoretical pricing models.

To achieve this goal, the following objectives are set:

- Systematize theoretical approaches to price rigidity in macroeconomics and to identify key testable predictions of time-dependent and state-dependent pricing models regarding firm behavior;
- Review international and Russian empirical studies on price dynamics in order to identify relevant methodological approaches and tools for the analysis of high-frequency data in the context of the Russian economy;
- Develop and substantiate a methodology for the comprehensive analysis of price rigidity based on high-frequency data, aimed at testing theoretical predictions and identifying specific features of price-setting in the Russian consumer sector;
- Formulate hypotheses on the mechanisms of price rigidity and to estimate its key parameters (frequency, size, and duration of price changes), including during periods of macroeconomic instability, in order to establish stylized facts for the Russian economy;
- Identify a statistically significant inflation threshold associated with a shift from time-dependent to state-dependent pricing behavior;
- Draw conclusions on the applicability of pricing models to the Russian economy based on a synthesis of theoretical and empirical results.

The object and the subject of the study. The object of the study is inflation processes, including price rigidity mechanisms and price dynamics under conditions of macroeconomic instability.

The subject of the study is the influence of macroeconomic factors (including inflation and economic shocks) on price rigidity in the Russian economy, as well as the use of high-frequency microdata for the analysis of pricing models.

Research field. The research field corresponds to Direction 9 "Macroeconomic Theory" of the Passport of the scientific specialty 5.2.1 "Economic Theory" approved by the Higher Attestation Commission of the Russian Federation.

The study is aimed at the theoretical analysis of macroeconomic regularities, including price dynamics, inflation processes, and the behavior of economic agents in response to changes in the macroeconomic environment.

Methods of research. The study employs descriptive, statistical, graphical, and comparative analysis, as well as econometric methods, including time series models, within a systems approach.

Empirical base of the study. The empirical base of the study consists of large-scale high-frequency data collected through web scraping of online retailers' websites, as well as official data from the Federal State Statistics Service (Rosstat) and the Central Bank of the Russian Federation.

The novelty of the results.

The novelty of the results obtained by the author is as follows:

1. For the first time for the Russian economy, a comprehensive approach to the empirical analysis of price rigidity based on high-frequency microdata collected via web scraping from the websites of leading multichannel retailers is proposed and implemented. This approach made it possible to overcome systematic biases inherent in traditional Rosstat data (averaging, imputation of missing observations) and, for the first time, obtain unbiased estimates of key parameters of price dynamics (frequency, size, and duration of price changes) for a wide range of consumer goods and services.
2. For the first time, using a dataset of high-frequency data collected from the Russian consumer market, a complete empirical profile of price rigidity was obtained, refining the understanding of price behavior under different macroeconomic conditions in the country. This result is of particular importance for emerging market economies such as Russia, where strong

exposure of the macroeconomic environment to external shocks affects pricing structures and price dynamics.

3. A methodology for comparing empirical facts of price dynamics with predictions of different theoretical models (time-dependent and state-dependent) is proposed and tested, allowing verification of their applicability to Russian data. For the first time, based on the analysis of such characteristics as the distribution of price change sizes, the shape of the hazard function, the dependence of the size of price changes on the duration of price rigidity, and the decomposition of inflation into extensive and intensive margins, it is shown that the behavior of Russian firms is better described by hybrid models combining elements of both approaches, with a dominance of state-dependent mechanisms during periods of high volatility.
4. The sensitivity of price dynamics characteristics to the macroeconomic environment in the Russian economy is demonstrated. It is shown that the structure of price adjustments depends on the inflation level and varies with macroeconomic conditions. The results indicate that during periods of high inflation, price adjustment mechanisms become more flexible, whereas under stable inflation conditions, price adjustment occurs more slowly.
5. A statistically significant inflation threshold is identified, above which price behavior exhibits a transition from time-dependent pricing models to state-dependent pricing models. This result is of theoretical importance for modeling inflation processes and refines the conditions under which pricing mechanisms switch in macroeconomic models.

Theoretical and practical significance of the dissertation. The dissertation research conducted has yielded important theoretical and practical results. The elements of scientific novelty described above may contribute to the study of pricing in emerging market economies.

The theoretical significance of the work lies in the development of directions in macroeconomic analysis of price rigidity and inflation dynamics based on the use of high-

frequency microdata. The study refines the conditions for the applicability of time-dependent and state-dependent pricing models, reveals the mechanisms of transition between them depending on the level of inflation, and identifies empirical relationships that deepen the understanding of the microeconomic foundations of macroeconomic processes. The obtained results contribute to clarifying behavioral and structural assumptions in inflation modelling and expand the theoretical basis for analyzing the effectiveness of the pricing mechanism under conditions of macroeconomic instability.

The developed methods of data collection and processing can be used by government authorities and analytical centers to improve inflation monitoring. The results of the study may be applied by the Bank of Russia for prompt responses to changes in inflation processes identified using high-frequency data. The findings on price behavior during periods of macroeconomic instability and structural shifts may be of practical value for retailers in developing more effective pricing strategies.

Degree of reliability of the research results. The reliability of the results submitted for defense is confirmed by the use of widely accepted econometric and statistical methods, validation on representative data, as well as their consistent comparison with theoretical findings and empirical studies of other authors.

Approbation and implementation of the research results. The main provisions of the dissertation have undergone scientific and practical approbation and were presented at:

1. The 23rd Yasin (April) International Academic Conference on Economic and Social Development Issues (NRU HSE, 2022);
2. The round table "Forecasting Prices for Goods and Services 2021+" (Analytical Center under the Government of the Russian Federation, 2021);
3. Seminars of the Center for the Study of Central Bank Issues, Institute for Applied Economic Research (IAER) of the Russian Presidential Academy of National Economy and Public Administration (RANEPA, 2019–2022).

Publications. The results of the research and the main scientific and practical findings have been published in five works by the author, with a total volume of

approximately 4 printed sheets. All of them have been published in leading peer-reviewed journals recommended by the Higher Attestation Commission of the Ministry of Education and Science of the Russian Federation and included in the list of publications approved by the Academic Council of the Russian Presidential Academy of National Economy and Public Administration (RANEPA).

Volume and structure of the thesis. The dissertation consists of an introduction, three chapters, a conclusion, and one appendix. The total volume of the dissertation is 137 pages, including 16 figures and 13 tables. The list of references contains 82 sources.