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ILLUSION OF STABILITY: AN EMPIRICAL ANALYSIS OF INFLATION DATA MANIPULATION BY RUSSIA AFTER 2022

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Abstract

This paper explores the perceived resilience of russia's economy under severe sanctions, investigating the potential falsification of economic data to demonstrate the growth. The hypothesis is that the relationship between the official inflation rate and the FMCG deflator index during 2019–2021 significantly differs from that of 2022–2024. Statistical methods, such as correlation analysis, Granger causality tests, and differences tests (e.g., t-tests and Wilcoxon tests), are used along with vector autoregressive (VAR) models and robust linear regressions. The study covers the pre-invasion period (2019–2021) and the post-invasion period (2022–2024), focusing on indicators like the official inflation rate, inflation expectations, CPI, and the FMCG deflator index. Findings reveal a shift from a direct to an inverse correlation between official inflation and the FMCG deflator post-2022, suggesting data manipulation. Pre-2022 models predict inflation 2-3 times higher than both post-2022 models and official statistics, raising concerns about the reliability of russia's economic data. Further research should explore indirect metrics, such as electricity production and cargo shipments, for additional evidence of data falsification.

Keywords data manipulation, inflation, FMCG deflator, sanctions, statistics, russian economy

JEL Classification E31, C22, O11

INTRODUCTION

Russia is the most sanctioned country in the world. CORRECTIV (2024) has calculated more than 34200 different sanctions against russia. According to Castellum (2024), more than 22,000 different sanctions are currently active against russia. This is the highest number ever in human history. Russia is 3+ times more sanctioned than Iran, 5+ times more than Syria or North Korea. Majority of these sanctions are against the russian economy. All key sectors of Russian economy are sanctioned, including energy sector, metallurgy and machinery, coal and lumber industries, gold and diamonds.

Despite this, in 2023–2024, russian economy demonstrated stable growth: GDP increased by 3.6% in 2023 and as expected by the International Monetary Fund (IMF, 2024) will increase by 3.2% in 2024. Industrial production increased by 3.5% in 2023 (Statista, 2024). World Bank based on Atlas method has included russia to the group of high-income countries (Metreau et al., 2024).

A potential explanation to this phenomenon is simple: stable growth is a statistical fake generated by russian authorities like Rosstat (responsible for collection and publication of economic data), meaning

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this is a form of a russian propaganda. The Center for Countering Disinformation (2024) reported that, according to the approved budget for 2025, russia plans to allocate over USD 1.4 billion for propaganda, including television, radio, and internet resources, which represents a 13% increase compared to the previous year.

It happens that there is a real world where economy is under the pressure with some sectors close to collapse and official (virtual) world where russian economy overcome the burdens of sanctions, has successfully transformed and evolved. The closest analogue to this explanation is elections in russia where sometimes 100%+ can be achieved. For example, after the end of voting in the State Duma (russian Parliament) elections in December 2011, the graphs shown on television showed figures according to which 146% of voters in Rostov Oblast voted, 129% in Voronezh Oblast, and 115% in Sverdlovsk Oblast (RBC, 2016).

The same is true for the cases of fake "referendums" with fake results after the annexation of Crimea in 2014 or parts of other Ukrainian regions after 2022. This is rather confusing that international community do not recognize the results of elections in russia because they are fake, but still discuss the data from the Rosstat as something real.

The Stockholm Institute of Transition Economics (SITE) at the Stockholm School of Economics (SITE, 2024) claims that "since russia's full-scale war against Ukraine, economic indicators have become a part of the russian propaganda." They warned that "key economic indicators such as inflation and real GDP growth should be treated with a significant degree of care and official numbers of these variables should not be cited without an explicit warning that they are part of the russian propaganda narrative."

1. LITERATURE REVIEW AND HYPOTHESIS

Information and digital resources have become powerful tools of influence, reshaping traditional concepts of warfare and political struggle, leading to new challenges in the realm of national and international security. Taddeo (2012) notes that information and the information space are now considered the fifth domain of warfare, alongside physical domains such as land, air, sea, and space. This has given rise to the now widely-used term "information warfare" (Schleher, 1999), whose primary objective is to achieve information superiority (Vuletić & Stanojević, 2022). In its classical understanding, information warfare is conducted in cyberspace and is characterized by cybercriminal activities (Bielawski & Radomska, 2017).

In the context of russia, information warfare has been, and remains, a central element of state security strategy and foreign policy, a legacy inherited from the Soviet Union. Accordingly, the use of certain tools of information warfare in russia is not necessarily linked to active military operations or even military conflict but is instead viewed as a "continuous process of engagement with the adversary" (Heickerö, 2010; Franke, 2015). This process reflects a persistent state of paranoia concerning the protection of national interests, ensuring security, and maintaining influence (Tachev et al., 2019).

Falkheimer and Heide (2018) observe that during russia's aggression in eastern Ukraine and Crimea in 2014, russia actively employed information technologies and disinformation as a means of influencing international politics, leveraging all types of strategic communication (social, mass, organizational, visual, etc.). Notably, russian disinformation tools such as fake news and the deliberate distortion of facts (Kornieiev et al., 2022) have gained popularity, enabling the manipulation of large populations by presenting a favorable narrative of events.

Statistical manipulation is another crucial tool of disinformation, used to alter societal perceptions of reality. Guriev and Treisman (2019) highlight that in the context of modern information autocracies, the main rhetoric has shifted from instilling fear and obedience to manipulating public

opinion through the creation of an illusion of national productivity and the competence of its leaders. Martínez (2022) empirically demonstrates that authoritarian regimes often distort economic indicators, particularly GDP growth data, to sustain a positive image of their policies and control public opinion. Hollyer et al. (2015) note that government transparency in the disclosure of economic data has a destabilizing effect on autocracies by triggering mass protests and mobilizing the public.

There are many different instruments to moderate the reality: propaganda, media framing, social media algorithms manipulation of financial reports, surveys and polls, control of information flow, etc. russia actively uses all of them.

For example, in 2022 most of the leading global automakers have stopped production. In russia, if one would try to google the queries like "plant is not working," "factory is closed" or "production is stopped" and similar requests related to automobile production, there would be counted units of search results given the impression that there are no changes at all, everything is working as usual. In the real world at that time for months the whole automotive industry was frozen. Even according to official data as of May 2022, car production in russia fell by 96.7% (Shirokun, 2022). This is how the control of information flow works.

However, the most actively used and the most efficient tool is manipulation of statistics. This is not only about classic tactics like cherry-picking data or the use of the small basis effect to demonstrate significant results, but a direct falsification of data.

In September 2024, former Chief Economist at the Institute of International Finance (IIF) Robin Brooks claimed that russia is very likely understating its current account surplus (Brooks, 2024). The idea of Brooks (2024) is plain: before 2022, there was a specific relationship between official indicators and other indicators (uncontrollable by russia). This relationship is based on the economic nature (for instance, if oil prices are increasing, current account surplus of country with high oil revenues is increasing). This economic nature is like a constant because it is based on economic laws and rationale. That is why if after 2022 the relationship was broken this might be evidence in favor of data manipulation (falsification) from russian officials.

Aragão and Linsi (2022) distinguish four types of manipulation: outright manipulation (type 1), politically motivated guesstimating (type 2), the opportunistic use of methodology space (type 3), and indicators-management through indirect means (type 4). After 2022, russia has used a number of methods to manipulate the statistical data mentioned by Aragão and Linsi (2022) and other methods as well.

Numerous analytical platforms and experts indicate that the Kremlin's official policy is focused on strictly limiting access to data (Kokorin et al., 2024). Some of the most sensitive and problematic datasets were simply closed, so russian institutions have stopped publishing data fully or partially. The list of closed indictors includes all foreign trade data; data on gas and oil production; data on capital inflows and outflows; financial reports of many companies; data on airline and airport passenger traffic; a range of Central Bank data, including statistics on gold and foreign exchange reserves, etc.

Based on estimations by "To be precise" project after February 24, 2022, at least 44 state agencies closed previously published data. 35 of them removed statistical indicators (Cedar, 2024). The rest – official information (lists of regional divisions and subordinate organizations). 22 agencies hid indicators that were often noted by journalists and analysts. Almost 500 datasets have been removed from the official websites of federal government agencies alone over the past two years (Gi, 2023). Selected examples of closed data sets by institutions are provided in Table A1.

Kasyanchuk (2024) explains this by sanctions risks with the aim to reduce them and partially in order to hide statistical information to prevent its analysis. The most efficient tool to manipulate the data is methodology revisions: changes in the process of calculation of specific indicators. Boyko and Romanov (2023) provide the following example. The sharp depreciation of the ruble in late July and early August 2023 triggered a chain reaction of rising prices in the russian economy. In an at-

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tempt to conceal the true extent of price increases, Rosstat decided to postpone the inclusion of data from online receipts in the calculation of the Consumer Price Index.

Bakhvalova (2019) revealed additional examples. After the revision of the methodology for calculating GDP in 2014, the nominal GDP of the russian Federation increased by more than 5 trillion rubles. In 2019, Rosstat recalculated the real incomes of russian citizens using a new methodology, leading to a significant upward adjustment. After the revision, the real income for 2017 was reported at 52.193 trillion rubles, compared to 48.094 trillion rubles under the previous calculation method, resulting in a discrepancy of over 4 trillion rubles.

For the case of consumer inflation and Rosstat data, potential spheres of manipulations include:

- the set of goods and services used in the calculation of the consumer price index;
- weights of different indicators used in the calculation of the consumer price index;
- formula to calculate the consumer price index.

The set of goods and services used in the calculation of the consumer price index is constantly updated. For example, since the start of invasion there were four updates:

- Rosstat order from March 30, 2022, No. 165;
- Rosstat order from December 23, 2022, No. 975;
- Rosstat order from December 19, 2023, No. 665;
- Rosstat order from March 7, 2024, No. 91.

Moreover, there were changes in the official statistical methodology for monitoring consumer prices of goods and services and calculating consumer price indices (Rosstat order from July 22, 2022, No. 512). Overall, there are 17 different documents with changes to methodology of consumer price index since annexation of Crimea in 2014 (Rosstat, 2024).

As a result, constant updates of statistical data from Rosstat act as a tool to "correct" data. Kopytok (2023) claims that Rosstat consistently revises data retroactively. He showed that one year after the initial publication more than 50% of real disposable income estimates and approximately 45% of real income estimates are adjusted. Typically, these are positive adjustments. For example, in 2023, Rosstat significantly updated two key indicators. The estimate of real monetary incomes for the first quarter of 2023 increased by 2.9 percentage points, while the estimate of real disposable incomes of the population (also for the first quarter of 2023) rose by 4.3 percentage points. These were the highest ever positive revisions. In addition, Rosstat did not provide any explanations to these changes.

The same is true for the case if industrial production. In 2023, data for 2022 were updated from –0.6% to +0.6%:

- mining growth rates were revised from 0.8% to 1.3%;
- manufacturing growth rate improved from –1.3% to 0.3% (Rosstat, 2023).

Molyarenko (2019) has identified additional cases of manipulations and their roots. She claims that the manipulation of data in the public health and housing sectors in russia can serve multiple administrative and financial purposes. For instance, under health initiatives aimed at reducing cardiovascular diseases, there have been reports of doctors altering cause-of-death classifications. If a patient who died from a stroke also had a history of diabetes, the cause of death might be attributed to diabetes rather than the stroke. This practice allows the healthcare system to show better progress in reducing stroke-related deaths, even if it is not entirely reflective of the actual situation.

Similarly, in the housing and communal services sector, local authorities sometimes underreport the amount of dilapidated and emergency housing. This manipulation reduces the official share of such housing, which helps local governments avoid the costs associated with repair and construction. It also prevents penalties or sanctions that could arise from having a higher proportion of unsafe or uninhabitable buildings, as this would require corrective action and financial resources.

Molyarenko (2019) noted that the statistical growth in wages for doctors and teachers in russia was achieved largely through formal mechanisms rather than real improvements. This was done by incorporating incentive bonuses into the base salary, increasing workloads (such as more teaching hours or patient consultations per shift), and reducing "excess" staff in the healthcare and education sectors. As a result, the real wages for some doctors and teachers actually decreased.

A potential solution to mentioned above issues is the use of mirroring statistics. The unavailability of international trade data for the case of russia especially in 2022 prompted mirroring statistics efforts from, among others, BOFIT at the Bank of Finland (Simola, 2022) and Bruegel (Darvas et al., 2022). CREA's "Fossil fuels tracker" details russia's fossil exports (CREA, 2024). These independent efforts bring important insights into the true state of the russian economy, while they also each have their limitations. As for mirroring statistics from Bruegel, this covers 38 economies (about 80 percent of russia's 2019 trading partners) and reports values of trades only. While CREA does report on volumes, it covers no other goods than fossil fuels and data are available only from 2022 and onward.

Other alternative sources are increasingly being used by researchers and think tanks concerned with understanding the Russian wartime economy and effects from targeted sanctions. For instance, Schmidt and Sakhno (2023) construct alternative activity trackers of the russian economy. Authors draw data from sources including Google (Google Trends), Romir, Sberbank, QuantCube, trading countries' statistical databases, Kpler and EUROSTAT, to name a few. In addition, some private russian companies provide detailed customs and railway data; however, they require knowledge of russian and typically a personal contact as well as payment to access the data. While the abovementioned studies only paint part of the full picture, they are important efforts to counter the propaganda that is often part of the data published by russian authorities and then uncritically reused and redistributed by some think tanks and journalists.

Another promising approach is based on the use of indirect economic indicators that are not subject to strong administrative or political control. For instance, discrepancies between official GDP figures and data on electricity production or freight volumes can raise suspicions of possible manipulations and based on econometric modeling even reveal the real data. In addition, similar metrics from alternative (non-state) sources can be used.

SITE (2024) provide quite interesting estimations: if russia's GDP growth would be adjusted not for official inflation, but for ROMIR data, then the annual growth of GDP in 2023 instead of 3.6% turns into an 8.7% decline. SITE (2024) assumptions about discrepancies between various measures of consumer prices in russian economy before and after 2022 are based on visual analysis that can only serve as preliminary evidence. More robust results, using econometric modeling, are necessary to demonstrate that russia is manipulating statistical data.

This paper aims to show that russia manipulates the economic statistical data and prove that current results are fakes. The following hypothesis is tested in this paper:

H1: A relationship between the official inflation rate and the unofficial FMCG deflator index for the period 2019–2021 differs from that of 2022–2024.

Significant inconsistencies will evidence in favor of manipulation or misrepresentation of official data to prove that official statistics may be artificially adjusted to present a more favorable economic picture.

2. METHODS

This paper explores a number of inflationary metrics for the case of russian economy, including:

- the official inflation rate (*infl*) as determined by the Bank of russia (official data);
- the level of inflation expectations among the population, specifically the median inflation rate observed (*obsinf*) and expected (*expinf*) by the population, based on surveys conducted by LLC "inFOM" (unofficial data);

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- the consumer price index (*CPI*) as determined by Rosstat (official data);
- the FMCG deflator index, which reflects changes in the overall price level for fast-moving consumer goods (*FMCG*), calculated by the research holding ROMIR (unofficial data).

The study is conducted in two phases. The first phase covers the period from January 2019 to December 2021, representing the time before russia's full-scale invasion of Ukraine. The second phase spans from January 2022 to August 2024, representing the period of active military conflict. The selected period is constrained by the availability of publicly accessible data from official organization websites, which provide monthly comparable indicators for analysis (notably, the first available data for the FMCG deflator begin in January 2019).

To make sure there is a relationship between indicators, the first step is to conduct the correlation analysis. A range of parametric and non-parametric methods, including Pearson's and Spearman's correlation, were used to evaluate the strength and direction of the linear and monotonic relationships between the studied variables. As a result, a pair of most correlated indicators (official and unofficial) is chosen for the next step of analysis.

Given that the data consist of time series with monthly frequency, further analysis was conducted to identify causal relationships between the variables, particularly using Granger causality Wald tests.

To assess the nature of the relationships between the variables, a vector autoregressive (VAR) model and basic linear robust regression were constructed, which formed the basis for forecasting alternative values for 2022–2024. Specifically, the VAR model assumes that each variable in the system can be described as a linear function of the previous values of all the variables.

$$\widehat{y_t} = c_1 + \sum_{i=1}^{p} \alpha_{1i}\, y_{t-i} + \sum_{i=1}^{p} \beta_{1i}\, x_{t-i} + \varepsilon_{1t}, \quad (1)$$

where $\hat{y}$ is the predicted value of the dependent variable at time t; p is the number of lags (determined for each variable); c_1 is the constant; α_{1i} and β_{1i} are the VAR model coefficients for the lagged values of y and x; x is the independent variable; ε_{1i} is the random error term.

The robust linear regression equations are used to forecast future values of the dependent variables based on past data and the obtained coefficients:

$$\hat{y} = \beta_0 + \beta_1 x + \varepsilon, \quad (2)$$

where $\hat{y}$ is the predicted value of the dependent variable; β_0 is the intercept; β_1 is the regression coefficient for the independent variable; x is the independent variable; ε is the random error term.

Additionally, the study applies statistical tests for difference (Student's *t*-test and the Wilcoxon Signed Rank Test) to explore results of calculations based on different models for the same initial data. The presence of differences points on disparency between models.

The final step is comparison of modeling results for the case of model based on pre-invasion data with the results based on post-invasion model and actual data for the case of the latest available period (August 2024).

3. RESULTS

According to official statistical data, the second quarter of 2024 showed a high level of inflationary pressure, with inflation reaching 9.05% as of August. In contrast, data from a public survey conducted by the "Public Opinion" Foundation indicated that the median estimate of annual inflation observed in August was significantly higher and reached 15.0% (Bank of russia, 2024). The dynamics of the annual inflation rate and inflation expectations among the population (median inflation observed and expected by the public) is presented in Figure 1.

Overall, similar trends can be observed between the official inflation rate and inflation expectations among the population. Following the onset of russia's full-scale invasion in Ukraine in 2022, a significant spike in prices was noted, reaching its peak in April-May 2022 (the official inflation rate stood at 17.83%, while inflation as perceived by the population reached 25.1%). Notably, the official infla-

Source: Calculations are based on Bank of russia and LLC "inFOM" data using Stata/SE 12.0 software.

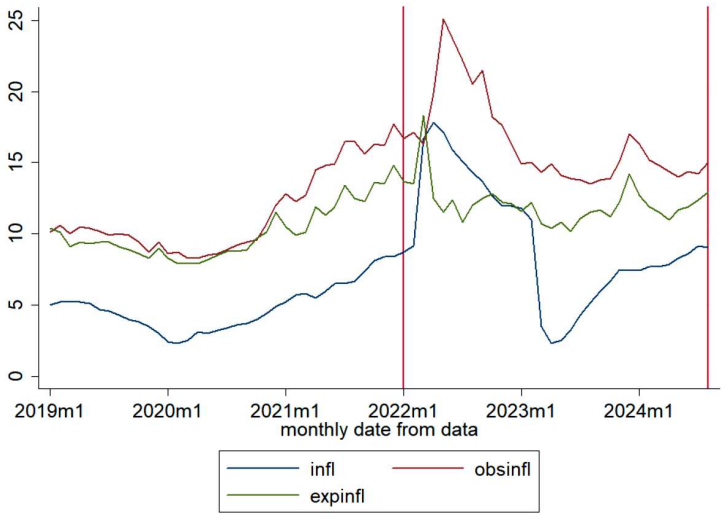

Figure 1. The dynamics of the official inflation rate and inflation expectations among the population (median observed and expected inflation values) in russia for the period 2019–2024

tion rate consistently remained significantly lower, which became particularly evident in April 2023 when, according to the Bank of russia, inflation was reported at 2.31% despite the target rate of 4%.

The analysis of the Consumer Price Index (CPI) dynamics (Figure 2) reveals similar trends, particularly the extraordinary surge following the beginning of the full-scale invasion of Ukraine (reaching 107.61 in March 2022). Since then, a relative stabilization has been observed, although the upward trend has continued into 2024.

In contrast, the dynamics of the FMCG deflator, which reflects consumer inflation for everyday goods, demonstrates different trend: a steady increase is observed throughout 2022–2024 (Figure 3). As of August 2024, it reached its historical maximum of 227.7%.

The parametric and non-parametric correlation analysis reveals a significant shift in the relationship between the inflation rate, inflation expectations, and the FMCG deflator across the first (2019–2021) and second (2022–2024) periods

Source: Calculations are based on Rosstat data using Stata/SE 12.0 software.

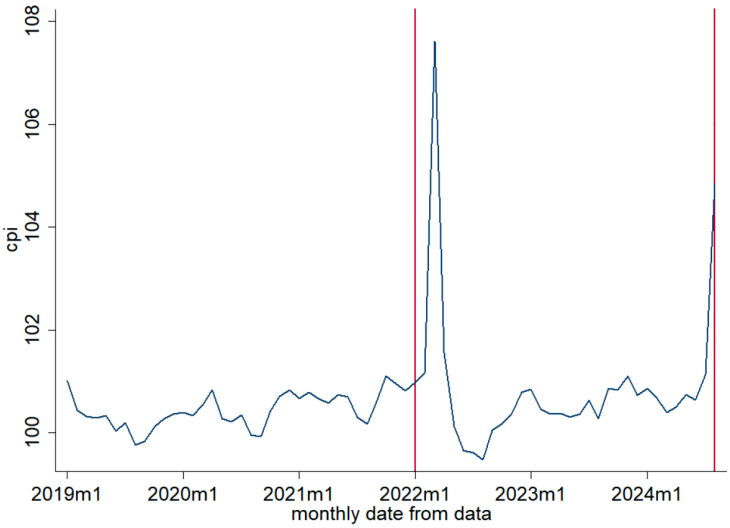

Figure 2. The dynamics of the Consumer Price Index (CPI) of russia from 2019 to 2024

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Source: Calculations are based on research holding ROMIR data using Stata/SE 12.0 software.

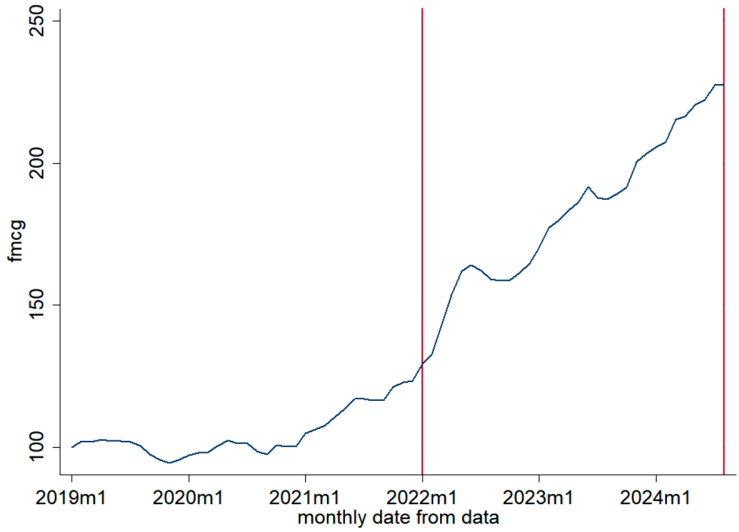

Figure 3. Dynamics of russia's FMCG Deflator for 2019–2024

(Table 1). Specifically, while a direct correlation was observed before 2022, it reversed after 2022. A visual confirmation of this change for the official inflation rate (*infl*) and the FMCG deflator (*fmcg*) is presented in Figure 6. Meanwhile, for the pair of indicators related to the Consumer Price Index (*cpi*) and the FMCG deflator (*fmcg*), the relationship becomes statistically insignificant after 2022, which could indicate a potential anomaly in the data (see Figure 4). The highest values of correlation for the case of pair official-unofficial data are observed for the case of FMCG deflator and the official inflation rate. Given these results, further analysis steps were conducted for the first pair – *infl – fmcg*.

Granger causality Wald tests (Table 2) identified that the lagged values *fmcg* cause *infl*. This finding indicates that fluctuations in the volumes of fast-moving consumer goods influence future inflation levels, while no reverse causal relationship was detected, suggesting unidirectional causality.

Table 2. Granger causality Wald tests for *infl – fmcg*

Source: Authors' calculations using Stata/SE 12.0 software.

Pairwise relationships	Period	chi2	df	Prob > chi2
infl ← fmcg	2019–2021	6.712	2	0.035*
	2022–2024	4.139	2	0.126
Fmcg ← infl	2019–2021	3.991	2	0.136
	2022–2024	2.569	2	0.277

Note: * – significant at the 5% level.

Table 3 presents the results the Vector Autoregression (VAR) modelling and basic linear regression model. The results confirm the earlier hypothesis of a fundamental shift in the relationship. For instance,

Table 1. Correlation analysis

Source: Authors' calculations uisng Stata/SE 12.0 software.

Pairwise relationships	Correlation type	Period	
		2019–2021	2022–2024
infl – fmcg	Pearson's coefficient	0.907*	–0.595*
	Spearman's rho	0.852*	–0.657*
obsinf – fmcg	Pearson's coefficient	0.945*	–0.546*
	Spearman's rho	0.802*	0.774*
expinf– fmcg	Pearson's coefficient	0.914*	–0.383*
	Spearman's rho	–0.637*	–0.368*
cpi – fmcg	Pearson's coefficient	0.504*	–0.193
	Spearman's rho	0.408*	0.126

Note: * – significant at the 5% level.

Source: Authors' calculations using Stata/SE 12.0 software.

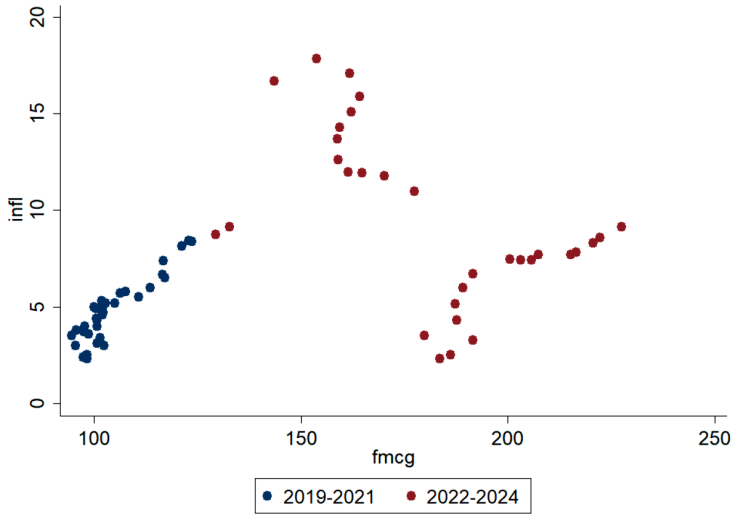

Figure 4. Comparison of scatterplot of inflation rate versus FMCG deflator for 2019–2021 and 2022–2024 periods

according to the results of basic linear regression, a one-unit increase in the FMCG deflator led to a 0.182 increase in inflation levels before 2022, while after 2022, inflation decreased by 0.088 units. Similarly, in the VAR model, the relationship also shifts from positive to negative after 2022.

The results of the basic linear regression analysis serve as the basis for forecasting values for the years 2022 to 2024, conducted using the following models:

- predicted model No. 1 (model_1): *infl* = –14.207 + 0.182 *fmcg*;
- predicted model No. 2 (model_2): *infl* = 25.322 + 0.088 *fmcg*.

Next, actual inflation data (*infl*) were compared with predicted data for the case of model_1 (based on pre-invasion data: *pred_infl1*) and model_2 (based on post-invasion data: *pred_infl2*). Also, data sets generated by both models were compared with each other. In theory, they should belong to the same general population.

The obtained values were compared using Student's *t*-test and the Wilcoxon Signed Rank Test (Table 4), indicating a significant difference in means between *infl* vs *pred_infl1* and M*pred_infl1* vs *pred_infl2*. Model based on data from 2019–2021 is not working for the case of 2022–2024 and vise verse: model based on 2022–2024 data cannot predict inflation over the period 2019–2021. However, no significant difference was found for *infl* vs. *pred_infl2*, which is entirely rational (means model No. 2 explains dynamics of inflation during 2022–2024 quite well, because it was created based on these data).

Table 3. Testing the direction of the regression relationship

Source: Authors' calculations using Stata/SE 12.0 software.

Pairwise relationships	Period	Coefficient	Std. err	t	P>|t|	R-squared
VAR model						
infl ← fmcg	2019–2021	2.028	1.019	1.99	0.037*	0.961
	2022–2024	–0.266	1.311	–1.86	0.039*	0.985
Basic linear regression						
infl ← fmcg	2019–2021	0.182	0.015	12.52	0.000*	0.822
	2022–2024	–0.088	0.027	–3.29	0.003*	0.272

Note: * – significant at the 5% level.

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Table 4. Testing differences between forecast models

Pairs of data sets	Student's t-test			Wilcoxon Signed Rank Test
	Mean Δ	Std. dev. Δ	t Pr(|T| > |t|)	Z Pr(|T| > |z|)
infl vs *pred_infl1*	–9.572	8.067	–6.712 (0.000*)	–4.338 (0.000*)
infl vs *pred_infl2*	0.184	3.771	0.276 (0.784)	0.467 (0.640)
pred_infl1 vs *pred_infl2*	9.756	7.342	7.517 (0.000*)	4.619 (0.000*)

Note: * – significant at the 5% level.

Figure 5 presents the results of forecasting, clearly illustrating that, based on forecast for the case of model_1, the inflation rate would have continued to rise sharply, potentially reaching 27.2% by August 2024. However, based on model_2 calculations, there is a decline in the indicator: this model suggests a decrease in the inflation rate to an anticipated 5.2%, compared to the official rate of 9.05% recorded in August. As can be seen, the difference between model_1 forecast and actual data is almost 3 times. This model (model_1) was working quite well for the case of pre-invasion data. This might be evidence in favor of data manipulation by russian authorities.

According to the results of the vector regression modeling (the case of model_1), inflation in russia exhibits a conditionally steep upward trajectory (Figure 6), which significantly differs from the data provided by Rosstat. This is another indirect evidence in favor of manipulations by the Rosstat.

In general, these results align with those obtained by SITE (2024) or Brooks (2024): there is a significant positive bias in the official statistical data. The differences between official and unofficial data are measured in hundreds of percent.

One potential explanation explored is the falsification of statistical data – official figures that suggest economic growth may be biased, with the actual situation differing significantly.

Based on inflationary data analysis it can be seen that after 2022 the nature of relationship between official and unofficial inflation metrics in russia has changed dramatically: from

Source: Authors' calculations using Stata/SE 12.0 software.

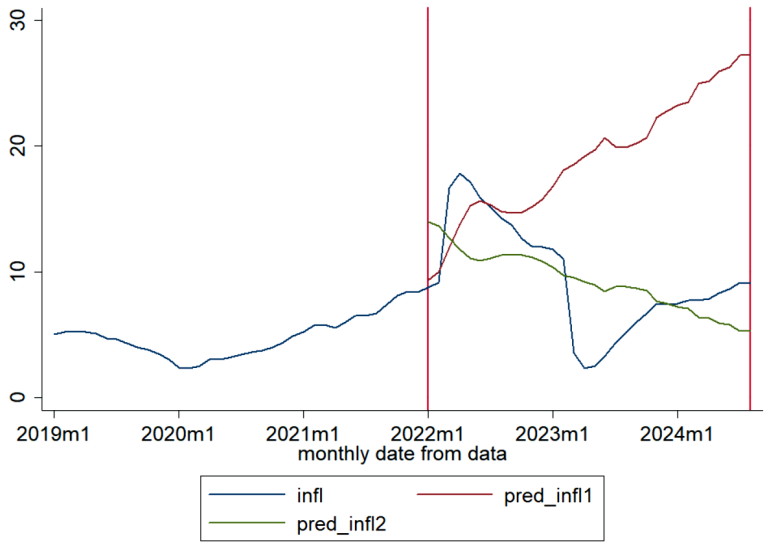

Figure 5. Comparison of scatterplot of inflation rate versus predicted model No. 1 and predicted model No. 2 for 2019–2021 and 2022–2024 periods

Source: Authors' calculations using Stata/SE 12.0 software.

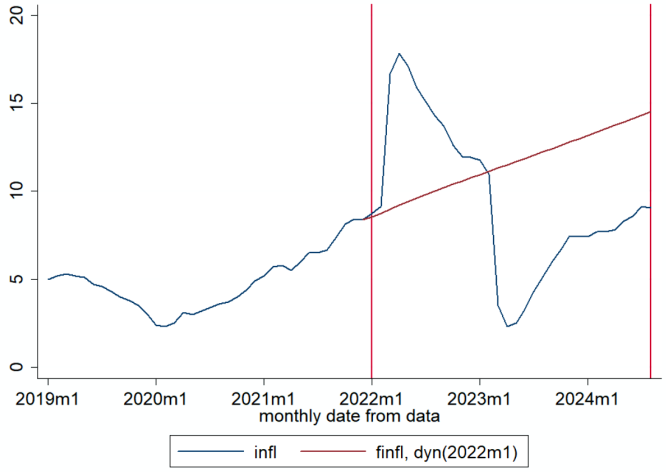

Figure 6. Comparison of scatterplot of inflation rate versus predicted model No. 1 and predicted model No. 2 for 2019–2021 and 2022–2024 periods for the case of vector regression modeling

direct relationship to indirect. Results based on models calibrated on pre 2022 data statistically differ from those generated on models calibrated on post 2022 data. Forecasts based on pre 2022 models show 2-3 times difference compared with the results for the case of post 2022 model data and actual data from official sources. A potential explanation to this phenomenon is falsification of data from the Bank of russia in order to demonstrate that sanctions are not working.

Further research could focus on other indirect and unofficial metrics, such as electricity production, cargo shipments by rail and water transport, the "Free Money" index, and the S&P Global Manufacturing and Services Purchasing Managers' Indices (Table B1). Analyzing the relationships between these indicators and official data, such as industrial production and GDP, might provide further evidence of discrepancies between "what should be" and "what is" and offer additional support for the hypothesis of data falsification in russia.

CONCLUSION

This study analyzes the discrepancies between the official inflation rate and the unofficial FMCG deflator index in russia across two distinct periods: 2019–2021 (pre-invasion) and 2022–2024 (post-invasion). Using an array of statistical techniques, including Pearson's and Spearman's correlation analyses, Granger causality tests, and comparative statistical methods such as Student's t-test and the Wilcoxon Signed Rank Test, the relationships and differences between these indicators are assessed. Vector autoregressive (VAR) models and linear robust regression analyses are used to estimate this relationship.

Results indicate a dramatic shift in the relationship between official inflation and the FMCG deflator. Previously, a direct relationship was observed, which is rational as these indicators reflect the same underlying economic factors. However, after 2022, this relationship became inverse, which is quite irrational. Statistical tests confirmed this: models calibrated on pre-2022 data significantly differ from those based on post-2022 data. One plausible explanation is that the russian authorities may be falsifying data to pretend that sanctions are not impacting the economy.

To estimate the extent of this falsification, the August 2024 inflation level was calculated. Forecasts based on pre-2022 models show a 2-3 times difference when compared to results from post-2022 models and actual official data. These findings raise doubts about the reliability of official statistics, implying they may have been manipulated to present a more favorable economic picture.

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APPENDIX A

Table A1. russian statistical data closed after February 24, 2024

Source: Based on results from Gi (2023).

Who closed the data?	What data were closed?	Degree of closure
Government	Corporate information of stock market participants	Full
State Duma	Income and expenses of officials	Full
Central Bank	Information on bank owners, international reserves with asset breakdown; Bank financial statements	Partial
Treasury	Income and expenses of the budget; Federal property owned by the agency; State procurement of sanctioned companies	Partial
Federal Customs Service (FCS)	Import and export data from January 2022; Employee income	Full
Ministry of Energy	Extraction, export, and processing of oil, coal, and gas; Lists of power plants and nuclear waste disposal sites; Employee income	Full
Ministry of Industry and Trade	Import of technological equipment; License registries for the development and production of aviation equipment and weapons; Registries of technoparks, ports, and customs posts	Full
Ministry of Agriculture	Export of agricultural products	Full
System Operator of the Unified Energy System (UES)	Energy consumption	Partial
Rosstat (Federal State Statistics Service)	Extraction and sale of hydrocarbons; Number of deaths by cause of death	Partial
Prosecutor General's Office	Analytical reports and crime statistics from January 2023	Full
Ministry of Internal Affairs	Migration statistics	Partial
Ministry of Defense	Number of departmental pensioners; Benefits for relatives of deceased soldiers	Full
Federal Penitentiary Service	Number of prisoners by type of correctional facility; Mortality and morbidity	Partial
Pension Fund of russia	Monthly updates of the disability registry	Full
Federal Protective Service	Public assessment of the government and socio-economic situation	Partial
Ministry of Culture	Budget appropriations; Lists of international agreements; Part of cinema statistics, theaters, installations, and attendance	Partial

APPENDIX B

Table B1. The list of indirect economic indicators for the case of russia

Indicator	Description	Prepared by	Frequency
Electricity production (% to the same quarter last year)	Reflects changes in electricity production volumes compared to the same quarter of the previous year.	Center for Economic Research "RIA Rating" of "russia Today" media group	Quarterly
Volume of main cargoes loaded onto rail transport (thousand tons)	Reflects the amount of cargo loaded onto rail transport for a given period (in thousand tons).	Federal State Statistics Service	Monthly
Shipment of cargo by water transport (thousand tons)	Demonstrates the volume of cargo shipped by water transport over a given period.	Federal State Statistics Service	Monthly
"Free Money" Index	Shows changes in households' ability to spend money on goods and services that are not essential needs.	Research holding ROMIR	Monthly
S&P Global Manufacturing Purchasing Managers Index (PMI)	Reflects business activity in the manufacturing sector. It is based on surveys of company purchasing managers and covers aspects such as new orders, production levels, employment, and supply.	S&P Global	Monthly
S&P Global Services Purchasing Managers Index (PMI)	Reflects business activity in the services sector, based on surveys of purchasing managers in companies operating in the service industry.	S&P Global	Monthly

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