

ISSN 2789-3308

ECONOMIC REVIEW

National Bank of the Republic of Kazakhstan

No. 1, Special Issue, 2026



NATIONAL BANK OF KAZAKHSTAN

ECONOMIC REVIEW
National Bank of the Republic of Kazakhstan

Published by: National Bank of the Republic of Kazakhstan

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ISSN 2789-3308

This Special Issue is dedicated to the 6th scientific and practical conference of the National Bank of the Republic of Kazakhstan “Introspective Analysis of Economic Policy: From Expectations to Decisions”.

This issue includes research findings presented at the 6th Scientific and Practical Conference “Introspective Analysis of Economic Policy: From Expectations to Decisions”, held on April 30, 2026, in Almaty.

The conference was attended by the National Bank of Kazakhstan staff, independent experts in economics and finance, representatives of the academic community, research centers, financial and international organizations, and government institutions.

The conference program was developed based on the relevance of topics and included four sessions.

The first session, devoted to inflation expectations, examined the behavioral aspects of inflationary processes, the regulator’s communication policy, and ways to improve the credibility and predictability of monetary policy.

The second session focused on the correlation between macroeconomic shocks and public finances. The results of studies on the procyclicality of fiscal policy were reviewed, along with an assessment of the impact of fiscal policy on macroeconomic stability.

The third session discussed the relationship between the lending structure, the credit cycle, and financial stability. Current research on characteristics of lending and their impact on financial stability was presented, and proposals were made for improving the accuracy of analytical tools used by regulators to assess the credit gap.

The fourth session examined vulnerabilities of the domestic capital market at the sovereign and corporate levels. This session studied the nature of economic risks, the relationship between sovereign and corporate financial indicators, and discussed ways to strengthen stability of the financial system as a whole.

The conference served as a follow-up of the National Bank’s open monetary policy and a fundamental basis for further work and dialogue with the public, experts, researchers, and government agencies.

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Session 1.

Inflation Expectations and Inflation Perception: Factors and Mediarhetoric



Identification of Key Consumer Categories of Goods and Services as Factors in the Formation of Perceived Inflation

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Inflation expectations play a significant role in shaping the economic behavior of the population and represent an important indicator for monetary policy. The formation of inflation expectations among households is driven not only by macroeconomic indicators but also by subjective observations of price changes in everyday life. In this context, salient goods are particularly important, as they largely shape the perception of current inflation and are reflected in expectations about future price developments. This study attempts to identify which categories of the consumer basket are perceived by the population as salient goods and exert the strongest influence on perceived inflation.

Several complementary quantitative approaches are applied in this study. First, a method of automatic enumeration of various combinations of consumer basket categories is used, taking into account the official weighting scheme. This allows for the identification of indices that exhibit the highest correlation with the dynamics of perceived inflation. Second, a regularized ElasticNet regression is employed, incorporating additional variables that reflect price dynamics in the housing market.

The results indicate that some of the most frequently identified categories include food products, fuel and lubricants, and housing and communal services. In addition, when forming inflation assessments, households also take into account changes in housing prices, despite the fact that these indicators are not reflected in the consumer price index (CPI).

Additionally, using a vector autoregression model (VAR), an asymmetry was identified in the response of perceived inflation to price changes in salient goods: an acceleration in price growth elicits a more pronounced reaction than a deceleration. The findings provide a deeper understanding of the structure of households' inflation perceptions and the mechanisms underlying their formation.

Key Words: inflation expectations, perceived inflation, salient goods.

JEL Classification: E31, C82, C43.

<https://nationalbank.kz/file/download/115572>

<https://nationalbank.kz/file/download/115569>

<https://nationalbank.kz/file/download/115575>

Inflation Expectations in Kazakhstan: Empirical Analysis of Responses and the Tone of News Rhetoric

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This paper assesses the anchoring of inflation expectations in Kazakhstan. It uses an approach based on assessing the reaction of inflation expectations to macroeconomic shocks. The empirical analysis rests on two vector autoregression (VAR) models, which assess the response of inflation expectations to changes in actual inflation and the tenge/US dollar exchange rate for January 2016 – December 2025. The results show no statistically significant reaction of inflation expectations to shocks to actual inflation, indicating a weak link between expectations and official price movements. However, a statistically significant short-term response of expectations to exchange rate movements is revealed: the tenge depreciation leads to an increase in inflation expectations with a one-month lag. This is an evidence of an explicit exchange rate channel in the formation of expectations and the lack of anchoring in the used interpretation. To explain the findings, an additional analysis of news rhetoric was conducted using 101,190 Russian-language economic publications in Kazakhstani media for January 2009–December 2025. Thematic modeling and sentiment analysis reveal that the economic media agenda in Kazakhstan is systematically biased toward currency topics, while inflation is covered more rarely. The results indicate that the country's information environment itself reproduces and structurally reinforces the currency-centric nature of expectations in Kazakhstan. This underscores the importance of the central bank's communication policy aimed at increasing the public visibility of actual inflation information and explaining the relationship between exchange rate dynamics, inflation, and monetary policy measures.

Key Words: inflation expectations, inflation, communication policy, economic news, mediarhetoric, tone.

JEL Classification: E31, E52, E58.

1. Literature Review: Approaches to Assessing the Anchoring of Inflation Expectations

One of the key conditions for achieving sustainably low inflation within an inflation targeting regime is the shaping of anchored inflation expectations. Modern economic literature has confirmed that inflation expectations have a significant impact on actual price dynamics in both theoretical models and empirical studies (Coibion et al., 2019; Kumar et al., 2015; Armantier et al., 2015).

Despite the widespread use of the term of “anchored inflation expectations” in central bank communications, a single, generally accepted definition of anchoring is lacking in the academic literature. Existing approaches can be roughly divided into three groups.

The first (“hard”) approach considers expectations to be anchored if they coincide with the central bank's inflation target (Demertzis, Marcellino, and Vieg, 2012; Kumar et al., 2015). However, this approach has limited applicability to emerging economies, where inflation expectations may persistently exceed the target due to institutional and structural factors (Gust, Herbst, and Lopez-Salido, 2024). Furthermore, it is less capable of analyzing the behavioral response of expectations to macroeconomic shocks (Miyajima and Yetman, 2018), as it effectively

only captures the degree of deviation from the target without revealing the mechanisms by which expectations are formed.

The second, more flexible approach interprets anchoring as the lack of response of long-term inflation expectations (5–10 years ahead) to fluctuations in short-term expectations (up to one year ahead) (Buono and Formai, 2018; Moessner and Takats, 2020). Under this approach, expectations are considered anchored if long-term inflation estimates remain stable despite changes in short-term expectations.

The third approach is based on an analysis of the response of inflation expectations to actual inflation shocks and other macroeconomic variables. This approach considers expectations anchored if they do not respond to macroeconomic shocks, whether to actual inflation or other macroeconomic indicators. A similar methodology is presented, for example, in Davis (2014), who examines the response of 12-month inflation expectations to shocks of actual inflation and global oil prices. The application of the second approach to the anchoring analysis in Kazakhstan is associated with a number of limitations. First, the National Bank of Kazakhstan publishes data on inflation expectations over a five-year horizon only since the beginning of 2025, which does not provide a long enough time series for a robust econometric assessment. Second, in developing economies, long-term expectations may be characterized by increased volatility and limited information content due to the shorter planning horizons of households and firms (De Pooter et al., 2014). Given these limitations, for the analysis of the anchoring of inflation expectations in Kazakhstan, it seems appropriate to use an approach based on assessing the reaction of expectations 12 months ahead in response to shocks of actual inflation and other observable macroeconomic variables.

It should be noted that an assessment of the anchoring of inflation expectations in Kazakhstan has already been conducted (Kulkayeva and Seidakhmetov, 2023). This study contributes to the analysis of the relationship between short-term (one month ahead) and medium-term (12 months ahead) inflation expectations, as well as inflation expectations and actual inflation. The authors use a rolling regression method to estimate the change in the corresponding coefficients over time and show that before 2021, the coefficient of effect of actual inflation on inflation expectations is statistically insignificant, while after 2021, its value exceeds one, which is interpreted as an indication of unanchored expectations.

However, the rolling regression method allows estimating the evolution of coefficients over time, but does not reflect the dynamic response of inflation expectations to shocks. In this regard, in international practice, VAR models with impulse response estimation are more widely used to analyze the anchoring of inflation expectations, which enables to take into account the mutual dynamics of variables within a single system (Goel and Tsatsaronis, 2022; Nautz, Strohsal and Netsunajev, 2019).

This study considers the methodological limitations of previous works and expands the analysis by including the dynamics of the nominal exchange rate of the tenge against the US dollar as an additional potential factor in the formation of inflation expectations. It should be noted that Kulkayeva and Seidakhmetov (2023) also look at the influence of exchange rate on inflation expectations, but use the nominal effective exchange rate (NEER). Meanwhile, the bilateral exchange rate of the tenge against the US dollar is a more observable and informationally accessible indicator for the population compared to the NEER. This thesis is confirmed by the results of the media flow analysis conducted within the framework of this study: in a sample including 101,190 unique economic news publications from 18 Kazakhstani news sources during January 2009 - December 2025, the dynamics of the KZT/USD exchange rate is the most frequently mentioned currency topic, while mentions of the NEER in the media are sporadic¹.

¹ The total collected news database for the specified period comprises 337,000 unique news items, of which 96,800 are on economic topics.

In this regard, this paper assesses the reaction of inflation expectations over a 12-month horizon to shocks in actual annual inflation, as well as separately to the movement (growth rate) in the nominal exchange rate of the tenge against the US dollar in accordance with the methodological approaches presented in the works by Goel and Tsatsaronis (2022), Nautz, Strohsal and Netsunajev (2019).

2. Methodology and Data

To assess the dynamic relationship between inflation expectations and actual inflation, as well as between inflation expectations and the exchange rate, this paper uses two standard vector autoregressive (VAR) models. The VAR approach allows us to analyze the joint dynamics of variables within a single system and assess their response to shocks by constructing impulse response functions. The optimal lag length in the models is determined based on the Akaike Information Criteria (AIC) and Schwarz Information Criteria (BIC), which ensures a balance between the quality of the model's fit and the degree of its parameterization.

Table 1 presents the data used to construct the two models.

Table 1

Description of variables and data sources

Title	Designation in the model	Unit of measurement	Source	Comment
Inflation	Inflation_yoy	month on month of the previous year, as %	BNS ASPR RK	Annual inflation (CPI, % y/y – deviation from 100)
Growth rate of the tenge/US dollar exchange rate	USD_KZT_t	month to the previous month, as %	NB RK	Growth rate of the USD/KZT exchange rate
Inflation expectations over the next 12 months	Inflation_exp_12	%	NB RK	Median estimate of inflation expectations over the next 12 months

The time period covered by the study is January 2016 to December 2025. Actual inflation is preliminarily de-seasonalized using the standard X-13 ARIMA-SEATS procedure. Seasonal adjustment is necessary to exclude regular seasonal effects that can distort the assessment of dynamic relationships. At the same time, it should be noted that the rate of the exchange rate movement was not subject to seasonal adjustment. This is determined by the efficient financial markets hypothesis (Fama, 1991), whereunder the prices of currencies and other financial assets reflect all available information. If persistent seasonal patterns existed in the dynamics of the exchange rate, they would become the subject of arbitrage and speculative operations, which would lead to their rapid disappearance. Thus, the absence of de-seasonalization of the exchange rate is methodologically justified and is consistent with the approach used in studies of the seasonality of prices for commodities and financial instruments (see, for example, Gorton, 2006 (“the theory of storage”²)). The data series on inflation expectations in Kazakhstan does not include an observation for January 2022. To maintain continuity of the time series, the figure for this period was approximated as the arithmetic mean of the indicators for December 2021 and February 2022.

One of the basic requirements when working with time series is their stationarity. Therefore, after seasonal adjustment (where necessary), the relevant variables were tested for unit roots using the augmented Dickey-Fuller (ADF) test. The analyzed series of inflation, exchange rate, and inflation expectations exhibited pronounced shock episodes in the first quarter of 2022, related to the January events in Kazakhstan and geopolitical instability. Therefore, to account for

² The theory of storage assumes that predictable spot seasonality is built into futures prices. If a stable seasonal premium remained in the price level, it would be arbitrated.

these structural breaks, a dummy variable reflecting the relevant periods was included in both VAR models as a standard exogenous variable³.

After determining the optimal lag structure and estimating the parameters of the VAR model, impulse response functions are constructed to assess the reaction of inflation expectations to shocks to actual inflation and changes in the exchange rate of the tenge against the US dollar.

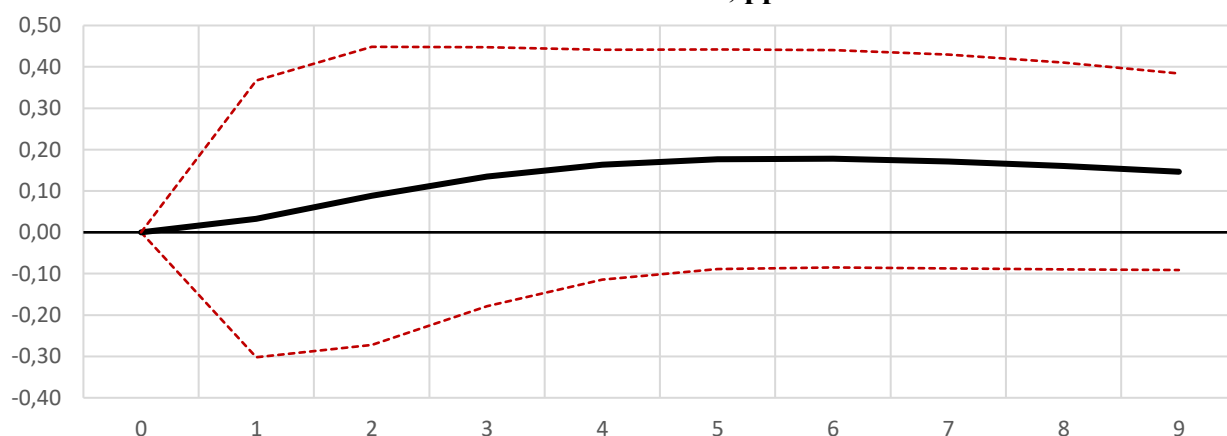
3. Results and Interpretation

Below are the results of estimating the VAR models in the form of impulse response functions.

The first model analyzes the response of inflation expectations (12 months ahead) to shocks of actual inflation. The optimal lag length, determined using the Akaike and Schwartz information criteria, is two periods. The resulting estimates show that the confidence intervals of the impulse response function intersect the zero axis throughout the entire time horizon (Figure 1). This indicates the absence of a statistically significant response of inflation expectations to changes in actual inflation. In other words, fluctuations in current inflation do not lead to a revision of household expectations regarding future price dynamics. This result is consistent with the findings of Kulkayeva and Seidakhmetov (2023), who also obtained statistically insignificant coefficients for the effect of actual inflation on inflation expectations through the end of 2021⁴.

Figure 1

Impulse response of inflation expectations (over the next 12 months) in response to the shock of actual inflation, pp

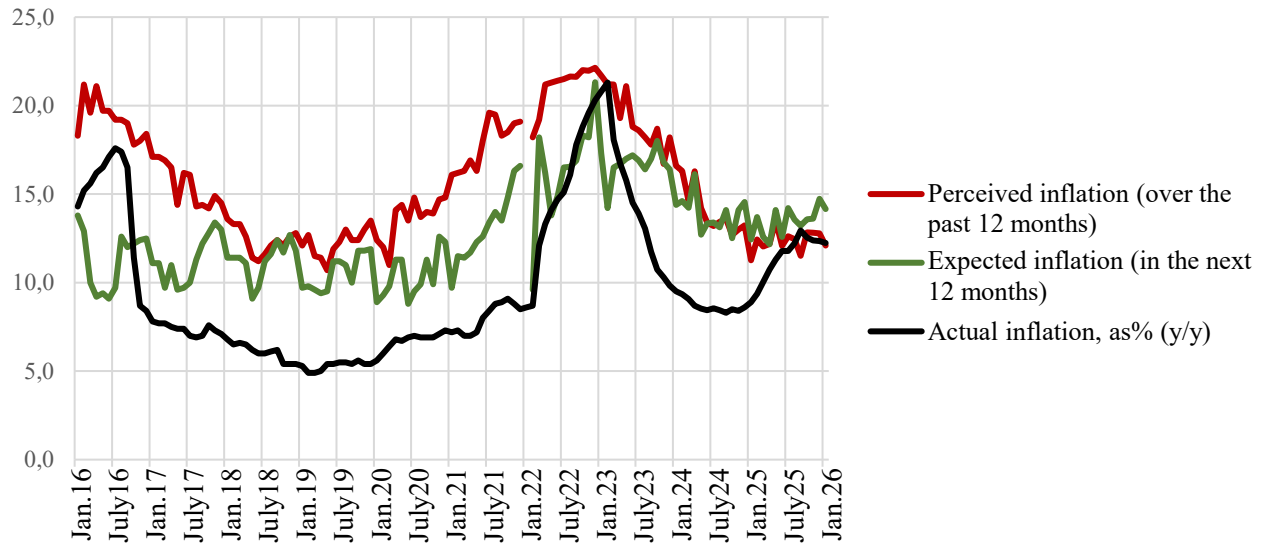


Formally, the absence of a statistically significant response of inflation expectations to shocks of actual inflation can be interpreted as a sign of their anchoring. However, such interpretation appears superficial or incomplete without taking into account the specifics of how the population perceives inflation. Thus, an analysis of data for 2016–2025 reveals a persistent gap between officially measured inflation and the public's perceived price level: according to surveys published by the National Bank of Kazakhstan, subjective assessments of current inflation, on average, exceed the official figure by 3–6% pp (Figure 2)

³ For more details on the approach using dummy variables in VAR models, see Garavaglia S, Sharma A. A Smart Guide to Dummy Variables: Four Applications and a Macro [Internet]. Los Angeles (CA): Statistical Consulting Group, UCLA.

⁴ The emergence of statistically significant estimates in 2021–2022 in the aforementioned work may be associated with a sharp acceleration in actual inflation, resulting in its dynamics approaching the level of inflation expectations (in prior years, inflation expectations consistently exceeded actual price growth, demonstrating a weak correlation).

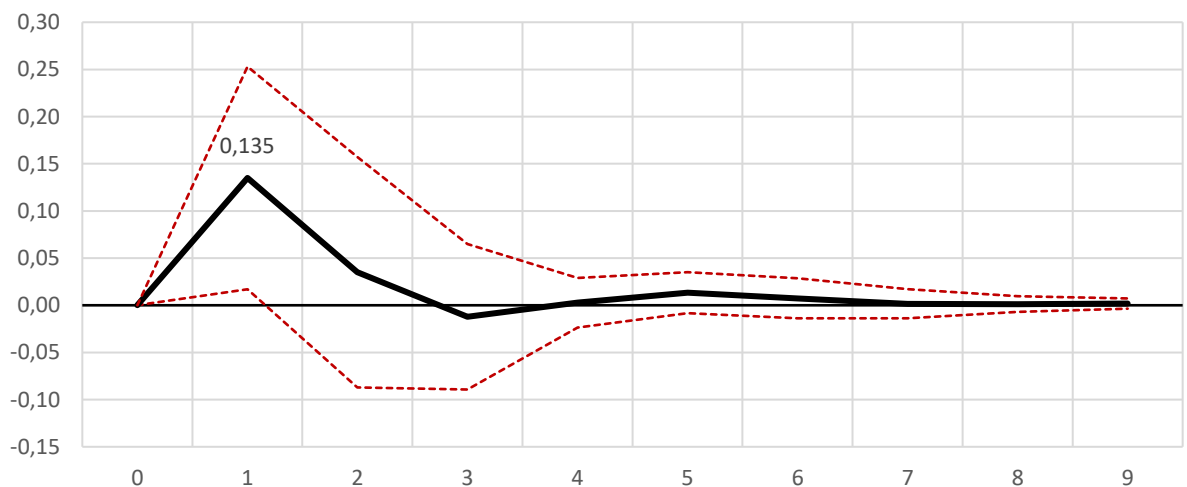
Figure 2

Median estimates of expected and perceived inflation and actual inflation (month to the corresponding month of the previous year), %

Source: NB RK, BNS ASPR RK

The existence of this gap cannot be ignored when assessing inflation expectations, as high perceived inflation itself can systematically create an upward bias for inflation expectations. Under these conditions, the lack of a statistically significant reaction to official inflation may reflect not the anchoring of expectations, but rather differences in the information benchmarks used by the population to form their assessments. In other words, when shaping inflation expectations, households may rely not on official statistical indicators of price dynamics, but on alternative signals that serve as behavioral anchors. Thus, empirical studies in the EU confirm that household expectations are largely influenced by subjective factors (personal experience of price changes and media information), rather than by official inflation statistics (D'Acunto, et al. 2024).

Figure 3

Impulse response of inflation expectations (over the next 12 months) in response to the exchange rate shock, pp

Further evidence supporting the lack of anchoring of inflation expectations in Kazakhstan comes from the results of the second VAR model, which estimates their response to changes in

the nominal exchange rate of the tenge against the US dollar (Figure 3). The optimal lag length according to the Akaike criterion is two periods, and according to the Schwartz criterion, one period. The baseline specification uses a second-order lag. Moreover, the results are robust to changes in the lag structure: when using a first-order lag, a statistically significant response of inflation expectations to the pace of exchange rate appreciation is also observed in the first month after the shock.

The estimates demonstrate a statistically significant impulse response: a 1% depreciation of the tenge against the US dollar leads to an increase in inflation expectations of approximately 0.13 percentage points with a one-month lag. In subsequent periods, the response becomes statistically insignificant, indicating the short-term nature of the exchange rate shock's impact.

These results indicate the presence of a pronounced exchange rate channel in the formation of inflation expectations: exchange rate changes are quickly integrated into household perceptions of future price dynamics. Thus, inflation expectations in Kazakhstan demonstrate sensitivity to exchange rate fluctuations while simultaneously lacking a statistically significant response to actual inflation.

Taken together, the obtained results allow formulating two conclusions:

1. Inflation expectations demonstrate statistically significant sensitivity to short-term exchange rate shocks. Within the framework of the anchoring definition chosen in this study as the lack of responsiveness of expectations to macroeconomic shocks, this result shows the absence of anchoring of inflation expectations in Kazakhstan.

2. The lack of reaction of inflation expectations to official inflation indicates a weak connection between expectations and published official statistical indicators and confirms that when shaping inflation expectations in Kazakhstan, the population is guided by alternative information signals (as shown by model 2), primarily by the dynamics of the exchange rate.

From a practical perspective, the findings highlight the importance of central bank communications. In a small, open, commodity-based economy, communications should take into account the role of the exchange rate as an important information benchmark for households and, as a result, include an explanation of the relationship between exchange rate dynamics, inflation, and monetary policy measures.

4. News Rhetoric in Kazakhstan and Inflation Expectations

The revealed sensitivity of inflation expectations to exchange rate dynamics suggests the existence of stable information channels through which exchange rate fluctuations are translated into public expectations. One such channel may be the media environment. In recent years, a significant number of empirical studies have examined the role of the media environment in shaping inflation expectations (Conrad, Enders, Glas, 2022; Fiore et al., 2024). Next, an analysis of news rhetoric in Kazakhstan is conducted to assess the relative frequency of mentions of inflation and the tenge/US dollar exchange rate.

Collecting the Base of Economic News in the Kazakhstani Mass Media. The economic news section was compiled through automated data collection (web scraping) from specialized information portals covering business, financial, and macroeconomic topics. A full list of Kazakhstani news portals used in the analysis is provided in Appendix 1. The sample included publications from the “Business”, “Finance”, “Economy”, and other relevant sections, allowing for a focus on materials reflecting the dynamics of economic processes, the state of financial markets, and government economic policy.

The technical implementation of the data collection procedure was based on network session management mechanisms and sending HTTP requests to web resources. HTML markup parsing was used to extract the content elements of publications. Target structural elements (title, publication date, abstract, main text) were identified by processing the document's DOM structure.

Final data aggregation and structuring were performed using spreadsheet tools, ensuring the database was saved in formats suitable for subsequent statistical and econometric analysis.

The collection procedure involved sequentially crawling listing pages within specified thematic categories. In the first stage, news card metadata was extracted, including the URL, title, and preliminary timestamp. This data formed an intermediate list of links subject to detailed analysis. Next, each publication was examined to extract the full text content and clarify the publication date.

The base had been formed within the given time interval $[T_{start}, T_{end}]$, where the start date was pre-set, and the end date was determined automatically at program launch. All timestamps were converted to a single local time zone, ensuring the accuracy of chronological filtering and the comparability of observations. To improve the accuracy of time identification, a two-level date check was used: preliminary filtering during the listing processing stage and subsequent verification after extracting the exact timestamp directly from the article page.

After clicking on a relevant link, the page was parsed, extracting key fields: URL, publication date, title, short description (if available), and main text. A key step in data preparation was cleaning the text content of irrelevant elements, including ad units, navigation bars, scripts, multimedia inserts, and social plugins. Text normalization was performed by removing relevant HTML tree nodes and then correcting character sequences, including eliminating excess spaces and incorrect line breaks. This ensured standardization of the text array and reduced noise during analysis. To prevent duplicate publications, a URL uniqueness check was used. Before adding a new record, a check was performed against previously saved observations, eliminating the need to reprocess identical materials.

Topic Modelling. At this stage of the study, the thematic structure of the news text corpus was determined using the BERTopic model – a modern approach to topic modeling that combines transformative language representations and density clustering in semantic space. Unlike classical probabilistic models (e.g., LDA), which assume that documents are represented as mixtures of word distributions, BERTopic assumes that the semantic similarity of documents can be identified based on their contextual vector representations obtained using deep neural networks.

In the first stage, each document was transformed into a dense vector of fixed dimension using a pre-trained transformer model from the Sentence-BERT family. This class of models allows for the generation of context-sensitive embeddings that take into account the meaning of a word in a specific context, not just its frequency. Formally, a mapping was calculated for each document d_i :

$$e_i = f_{\theta}(d_i), e_i \in \mathcal{R}^k \quad (1)$$

where (f_{θ}) – a transformer model, and (k) – latent space dimension.

The use of embeddings ensured accurate accounting of the semantic similarity of texts even with differences in their lexical composition, which is especially important for analyzing a news corpus, in which the same economic issue may be described using different linguistic means.

Since the resulting embeddings are high-dimensional, nonlinear dimensionality reduction using the UMAP (Uniform Manifold Approximation and Projection) method was applied in the next step. This algorithm preserves the local structure of the data and allows for the formation of compact clusters in a reduced space, which increases the stability of subsequent clustering. UMAP parameters were selected empirically to minimize topic fragmentation while maintaining the distinguishability of semantically distant document groups.

Document clustering was performed using the HDBSCAN algorithm, a hierarchical density-based method that does not require an a priori specification of the number of clusters. Unlike methods based on partitioning into a fixed number of groups, HDBSCAN automatically determines the number of stable thematic clusters and allows for the identification of noisy

observations. Each identified cluster was interpreted as a separate topic, and documents not included in dense clusters were considered thematically unspecified.

To interpret the resulting clusters, a modification of TF-IDF—class-based TF-IDF (c-TF-IDF)—was used. This approach treats each cluster as an aggregated document, allowing for the identification of words most representative of the corresponding topic relative to the entire collection. This provides a more precise thematic interpretation compared to classic TF-IDF, which is applied at the individual document level.

A zero-shot approach to topic modeling was additionally employed. Its use was motivated by the fact that before running the algorithm, an a priori understanding of the likely set of economic topics present in the database existed. This understanding was formed based on a preliminary data analysis, as well as expert assessment of the subject area by the authors of the current study. Thus, the initial list of topic areas reflected both the statistical properties of the corpus and the substantive structure of the economic agenda.

Within the zero-shot approach, text descriptions of predefined topics were also converted into embeddings, after which the cosine similarity between its vector representation and the vector of the corresponding topic was calculated for each document. A document was assigned to a topic if the specified similarity threshold was exceeded. This mechanism allowed for matching automatically identified clusters with predefined economic categories and ensuring substantive validation of the topic structure. Unlike completely unsupervised clustering, zero-shot modeling allows for the integration of expert knowledge into the algorithmic process.

The quality of the resulting thematic structure was assessed using both internal metrics (theme coherence, intra-cluster semantic similarity) and external validation on a labeled sample. The results demonstrated high interpretability and stability of the themes, as well as their relevance to the economic subject area.

Determining the Tone of the News. After the corpus's thematic structure had been established, the next stage of the study involved assessing the sentiment of news articles at the level of individual publications and aggregated thematic clusters. This study utilized the large-scale Gemini language model, implemented in instruction-based zero-shot classification mode using standardized prompts. Unlike traditional dictionary-based methods or pre-trained sentiment analysis models, this approach allows for the complex contextual structure of economic texts, including forecast formulations, statistical data interpretations, regulatory commentary, and macroeconomic expectations.

The problem was formulated as a mapping of document d_i into a discrete set of classes of the tone $S(d_i) \in \{-1, 0, 1\}$, where the value (-1) corresponded to negative sentiment, 0 to neutral, and 1 to positive. Sentiment was understood as an assessment of the potential economic impact of a news report, rather than its emotional coloring in the narrow linguistic sense. Specifically, the potential impact of news content on inflation expectations, business activity, and perceptions of the macroeconomic situation was assessed.

Classification was based on a standardized prompt, which included a description of the task, criteria for assignment to each class, and a requirement for the response to be presented in a strictly formalized format. The instructions separately specified that the model should evaluate the economic impact of an event or information, rather than rely solely on emotionally charged vocabulary. Thus, the Gemini model was used as a zero-shot classifier without additional training, and its behavior was controlled by formalizing the instructions.

To ensure reproducibility of results, fixed generation parameters, a uniform prompt structure for the entire corpus, and automated response format checking were used. In the event of deviation from the specified structure, the request was resubmitted with clarified requirements. Document processing was performed in batches, ensuring comparability of assessments across the entire dataset.

After receiving a tonal assessment at the level of individual documents, the indicators were aggregated according to thematic clusters formed at the previous stage. For each topic T_k , the average sentiment index was calculated as an aggregate measure of the informational background, defined as the arithmetic mean of all documents within the corresponding cluster. Additionally, the proportion of negative publications within each topic was analyzed, which made it possible to identify areas associated with a heightened negative informational agenda.

Validation of the automatic tagging quality was performed manually on a subsample of tagged news items. Comparison of the results allowed assessing the consistency between the expert and model classifications. The resulting quality metric values indicate a high degree of consistency between the automatic assessment and the substantive interpretation of the economic context.

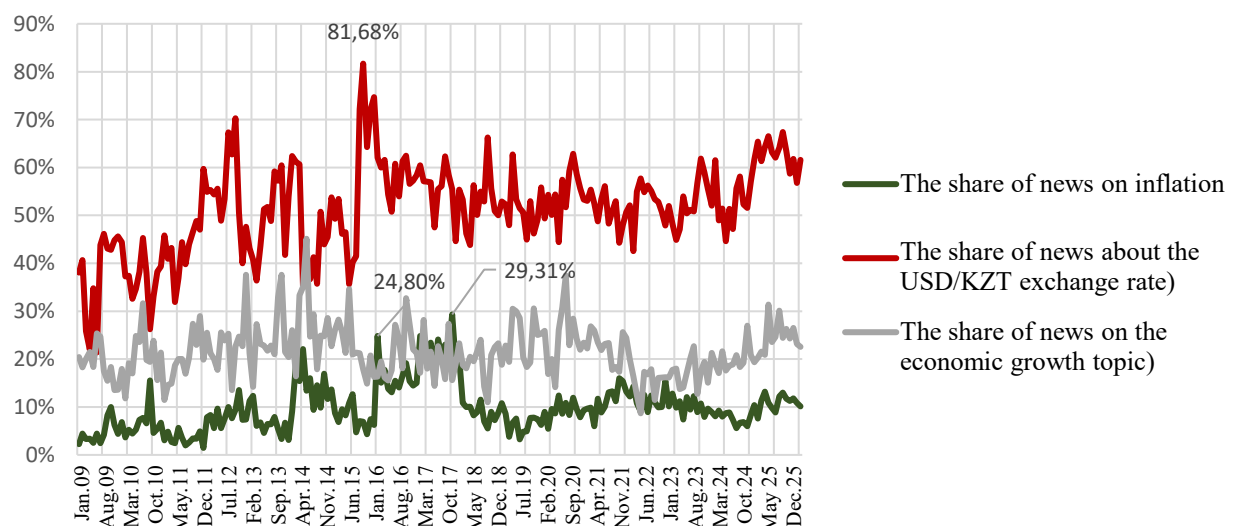
The Results of the News Time Series Analysis. After categorizing all publications, selecting economic-focused materials, and categorizing them into thematic groups, the following results were obtained. For the period from January 2009 to December 2025, the sample included 101,192 unique news items on economic topics (economics and macroeconomics, finance, investments, and the banking sector). The overall number of economic publications shows a pronounced upward trend, reflecting increased media attention to economic issues. Thus, while 2,344 economic-focused materials were published in all of 2009, the number for 2025 was 11,054.

Of the entire economic news collection for the period 2009–2025, 10,575 publications contained mentions of inflation or price increases, and 54,396 materials were devoted to the dynamics of the tenge/US dollar exchange rate. Thus, 53.8% of economic news rhetoric in Kazakhstan during the period under review was related to the exchange rate discussion.

The intensity of coverage of currency topics varied significantly over time. Figure 4 shows a graph of the share of publications on inflation and exchange rates in total economic news by month.

Figure 4

Share of news on inflation, economic growth, and the exchange rate in total economic news in Kazakhstani media in January 2009 – December 2025



Source: Author's calculations based on a collected sample of news publications from 18 Kazakhstani media outlets

A sharp surge in publications devoted to exchange rate dynamics was observed in August 2015: news about the tenge/US dollar exchange rate reached 81.7% of all economic materials. This surge coincided with the National Bank of Kazakhstan's decision to move from a fixed to a floating exchange rate regime. Since this period, exchange rate topics have consistently accounted for over 40% of economic news coverage.

The upturn in inflation discussions occurred with a slight lag in relation to the transition to inflation targeting. The first noticeable surge was recorded in January 2016, when the share of publications devoted to inflation reached 24.8%. A further increase in interest in inflation was observed in October 2017, coinciding with the publication of inflation data for September 2017 and discussions of the processes to normalize inflation around 7%, corresponding to the upper limit of the National Bank's target range (previously, the inflation target was defined as a range of 6-8%).

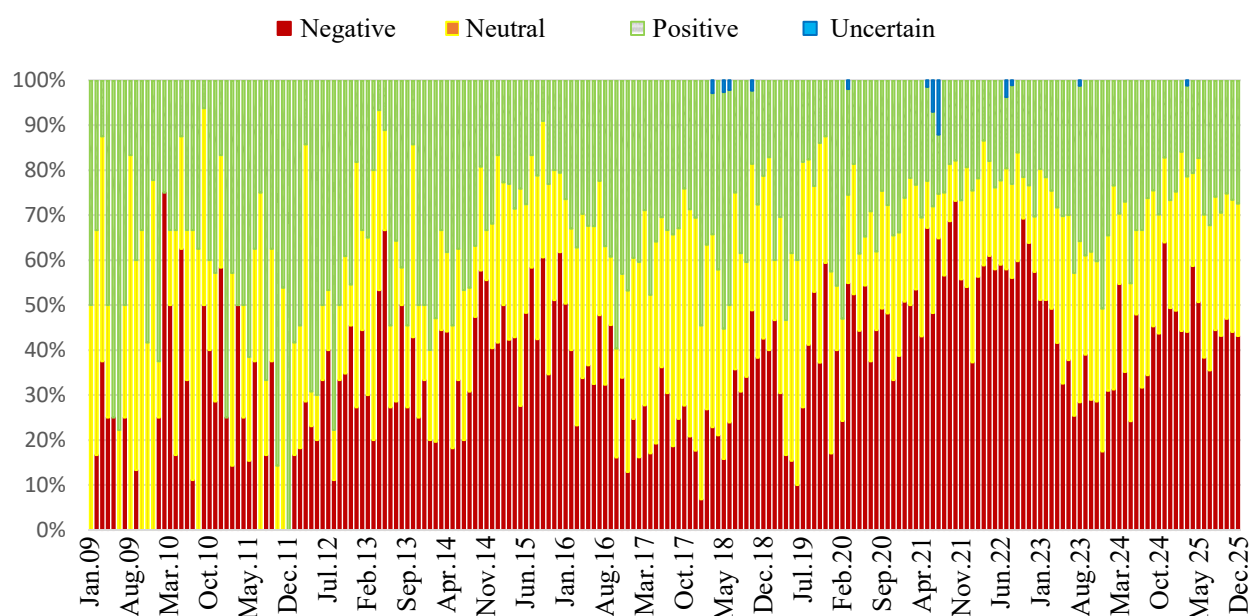
Despite an increase in the share of publications on inflation following the transition to inflation targeting, it averages around 10% and remains at least three times lower than the share of publications devoted to the exchange rate.

In addition to analyzing the frequency of mentions of inflation and the exchange rate, it is important to assess the nature of the information environment in which these topics are covered, as inflation expectations are shaped not only by the volume of information but also by its emotional tone. In this regard, the sentiment analysis of publications devoted to inflation and the tenge/US dollar exchange rate is presented below, classifying them as negative, neutral, and positive. Figure 5 shows the structure of inflation-related news by sentiment.

On average, from January 2016 to December 2025, the share of inflation-related news with a negative sentiment accounted for 40% of the total number of news articles on this topic. The most pronounced surge in negative publications on inflation was recorded in 2021–2022, reflecting the media's reaction to the acceleration of actual price dynamics in the country. Since this period, the share of negative news on inflation has generally predominated (with the exception of certain months in 2024). Notably, in July 2021 and July 2022, isolated surges in publications with mixed sentiment were observed, with a single piece combining elements of positive, neutral, and negative rhetoric. In the remaining periods, the share of news with an ambiguous sentiment in the total volume of publications on inflation did not exceed 1%.

Figure 5

**Tonal structure of inflation-related news,
% of total inflation-related publications**



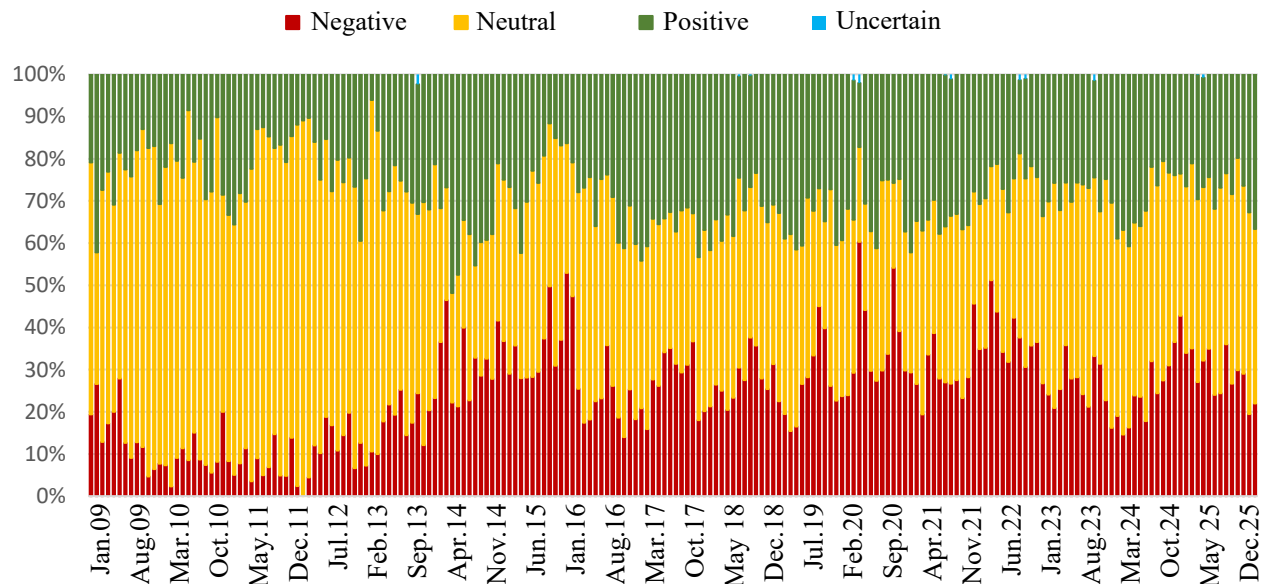
Source: the authors' computations

On the exchange rate topic, the share of negative publications from January 2016 to December 2025 was 29% (24% for the entire period under review, from January 2009 to December

2025). This average was only exceeded in 2022, when the share of negative news reached 36% of the total volume of publications on the exchange rate topic. Overall, currency coverage in Kazakhstani media is characterized by a predominance of neutral tone (Figure 6).

Figure 6

Tonal structure of news on the exchange rate topic, % of total publications on the USD/KZT exchange rate topic



Source: the authors' computations

5. Findings and Recommendations

Taken together, the obtained results show that inflation expectations in Kazakhstan demonstrate a weak connection with actual price dynamics and are characterized by an explicit currency-centric nature.

Additionally, an analysis of the media rhetoric of economic topics shows that throughout the entire period observed, the share of publications devoted to inflation systematically remained lower than the share of materials related to exchange rate dynamics. In other words, the information environment itself reproduces and structurally reinforces the currency-centric nature of expectations in Kazakhstan, reinforcing the secondary role of inflation as a public nominal benchmark.

These findings have practical implications for the monetary regulator's communication policy. In particular, empirical studies indicate a stable relationship between information consumption and the accuracy of inflation perceptions: Kumar et al. (2015) demonstrated that greater consumption of media information about inflation is associated with a smaller error in assessing both actual inflation and the inflation target. This, in turn, points to the need to deliberately increase the public availability of high-quality information on actual inflation. Messages accessible to the general public through media outlets are of key importance, rather than communication through the regulator's official websites, as empirical studies show that households do not consult official statistics and press releases (Munday, Brookes, 2021).

Strengthening systemic communication on the exchange rate issues seems justified. Although the exchange rate does not formally act as a nominal anchor under inflation targeting, the identified sensitivity of inflation expectations to the tenge exchange rate indicates that communication regarding exchange rate factors can be considered an element of the policy of anchoring expectations. In this context, the objective of the National Bank of Kazakhstan's communications is not to set exchange rate targets, but to reduce excessive alarmist media rhetoric

surrounding the foreign exchange market and gradually weaken its influence on inflation expectations by raising public awareness. At the same time, systemic communication on the exchange rate issues should be accompanied by an expansion of public information coverage of topics related to actual inflation. This is necessary to gradually shift the focus of information from exchange rate dynamics to the actual price level as the key nominal benchmark for shaping inflation expectations.

References

1. Kulkayeva, A., Seidakhmetov, A. (2023). Assessing the Anchoring of Inflation Expectations in Kazakhstan. NBK's Economic Study No.2023-1.
2. Armantier, O., Bruine de Bruin, W., Topa, G., van der Klaauw, W., & Zafar, B. (2015). Inflation expectations and behavior: Do survey respondents act on their beliefs? *International Economic Review*, 56(2), 505–536.
3. Buono, I., Formai, S. (2018). New Evidence on the Evolution of the Anchoring of Inflation Expectations. *Journal of Macroeconomics*, 57(C), 39–54.
4. Coibion, O., Gorodnichenko, Y., Weber, M. (2019). Monetary Policy Communications and their Effects on Household Inflation Expectations. NBER Working Paper No. 25482
5. Conrad, C., Enders, Z., & Glas, A. (2022). The role of information and experience for households' inflation expectations. *European Economic Review*, 143.
6. Davis, J. S. (2014). Inflation Targeting and the Anchoring of Inflation Expectations: Cross-Country Evidence from Consensus Forecasts. Globalization and Monetary Policy Institute Working Paper, No. 174, Federal Reserve Bank of Dallas.
7. D'Acunto, F., Charalambakis, E., Georgarakos, D., Kenny, G., Meyer, J., & Weber, M. (2024). Household inflation expectations: An overview of recent insights for monetary policy. CEPR Discussion Paper, 19167.
8. De Fiore, F., Maurin, A., Mijakovic, A., & Sandri, D. (2024). Monetary policy in the news: Communication pass-through and inflation expectations. BIS Working Papers No. 1231. Bank for International Settlements.
9. De Pooter, M., Robitaille, P., Walker, I., Zdinak, M. (2014). Are Inflation Expectations Well Anchored in Brazil, Chile, and Mexico? *International Journal of Central Banking*, 10(2), 337–400.
10. Demertzis, M., Marcellino, M., Vieg, N. (2012). A Credibility Proxy: Tracking US Monetary Developments. *The B.E. Journal of Macroeconomics*, 12(1), 1–36.
11. Fama, E. F. (1991). Efficient Capital Markets: II. *The Journal of Finance*, 46(5), 1575–1617.
12. Goel, T., Tsatsaronis, K. (2022). Anchoring of Inflation Expectations: Has Progress Paid Off? BIS Bulletin, No. 51. <https://www.bis.org/publ/bisbull51.htm>
13. Gorton, G. (2006). Facts and Fantasies About Commodity Futures. *Financial Analysts Journal*, 62(2), 47–68. <https://doi.org/10.2469/faj.v62.n2.4083>
14. Gust, C. J., Lopez-Salido, J. D. (2024). Optimal monetary policy with uncertain private sector foresight. Finance and Economics Discussion Series, 2024-059. Board of Governors of the Federal Reserve System.
15. Kumar, S., Afrouzi, H., Coibion, O., Gorodnichenko, Y. (2015). Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand. *Brookings Papers on Economic Activity*, 2, 151–225.
16. Moessner, R., Takats, E. (2020). How Well-Anchored Are Long-Term Inflation Expectations? BIS Working Paper, No. 869.

17. Miyajima, K., Yetman, J. (2018). Assessing Inflation Expectations Anchoring for Heterogeneous Agents: Analysts, Businesses and Trade Unions. BIS Working Paper, No. 759.
18. Munday, T., Brookes, J. (2021). Mark my words: the transmission of central bank communication to the general public via the print media. Bank of England working papers 944, Bank of England
19. Nautz, D., Strohsal, T., & Netšunajev, A. (2019). The anchoring of inflation expectations in the short and in the long run. *Macroeconomic Dynamics*, 23(5), 1959–1977.

**A Complete List of News Portals of the Republic of Kazakhstan Included in the Sample
(marketing names are shown)⁵**

1. Atameken InBusiness
2. Azattyq
3. BesMedia
4. Business Kazakhstan (DKNews.kz)
5. Forbes.kz
6. Informburo.kz
7. Kapital.kz
8. Kazakhstanskaya Pravda
9. Kursiv Media Kazakhstan
10. Liter.kz
11. LS
12. Nur.kz
13. OTYRAR
14. Sputnik Kazakhstan
15. TengriNews
16. Time. General Intrest Newspaper (time.kz)
17. Ulysmedia.kz
18. Zakon.kz

⁵ Text data was collected from open sources in accordance with the current legislation of the Republic of Kazakhstan, including the provisions of Article 20 of the Constitution of the Republic of Kazakhstan (as amended at the time of the study) on freedom of information dissemination. The methodology used complies with international standards for academic research in the field of news corpus and text data analysis.

Assessing the Perception by the Population of the National Bank of Kazakhstan's Communications: Economic Narratives and Twin-Deficit

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This study examines key elements of the communication environment, institutional conditions, and monetary policy parameters in Kazakhstan in the context of their impact on the measures taken by the National Bank of Kazakhstan to enhance transparency and openness.

An analysis of the constraints affecting the effectiveness of the communicative approaches applied is also conducted, focusing on the problem of the twin deficit in communications – a trust deficit and a deficit of understanding [1]. These categories reflect the institutional and cognitive levels of perception of central bank signals. A trust deficit is expressed in low public confidence in the integrity, consistency, and predictability of the regulator's actions, while a deficit of understanding is associated with difficulties in interpreting economic information, as well as linguistic and cognitive barriers. Together, these components form the systemic problem of the "communication gap", characteristic of countries with developing financial systems. An adapted T&U-Framework model is used to analyze these components, where the T component reflects the perception of institutional transparency, integrity, and consistency, and the U component reflects the clarity, readability, and accessibility of the communication language. This approach allows assessing the extent to which central bank transparency leads not only to information but also to public understanding and trust.

The main academic innovation in this paper is the analysis of empirical data – the results of a marketing survey conducted specifically for this study among professional market participants, as well as findings from surveys and focus groups among the general public.

Key Words: monetary policy, communication policy, twin-deficit, confidence and understanding deficit, financial literacy, behavioral economics, narrative economics, inflation targeting.

JEL Classification: E52, E58, D83, G41, L82.

<https://nationalbank.kz/file/download/115061>

<https://nationalbank.kz/file/download/115064>

<https://nationalbank.kz/file/download/123419>



Session 2.

Public Finances in the Environment of Macro Shocks



Macroeconomic Shocks and Public Finances: Some of the Mechanisms of Influence and Implications for Kazakhstan

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This study aims to identify and quantify the impact of inflation and exchange rate dynamics on fiscal parameters of the Kazakh economy. Using a vector error correction model (VECM), impulse responses of fiscal parameters (budget revenues, expenditures, non-oil deficit, primary balance, and external debt) to inflation and exchange rate shocks were obtained.

The analysis results show that inflation and currency depreciation exert a divergent but overall destabilizing effects on public finances. Elevated inflation is accompanied by a temporary increase in nominal revenues, but in the medium term leads to higher expenditures and deterioration in the fiscal balance. Exchange rate depreciation exacerbates the debt burden and increases budget expenditures due to the revaluation of foreign currency liabilities and higher import costs. Thus, sustainably low inflation and a balanced exchange rate are necessary conditions for maintaining fiscal sustainability.

Key Words: inflation, exchange rate, VECM, budget revenues and spending, non-oil budget deficit, primary balance, external debt

JEL Classification: E31, E62, F31, C32, H62.

1. Preamble

Inflation and the exchange rate are key macroeconomic variables that have a complex impact on public finances. These factors form an interconnected system of channels through which they influence the revenue and expenditure sides of the budget, debt dynamics, and the overall sustainability of the country's fiscal position.

In the short term, rising inflation can nominally improve budget indicators by increasing tax revenues at current prices, which is associated with the expansion of the nominal tax base. However, in the medium and long term, inflationary processes lead to a ramp-up in the budget spending due to the indexation of social benefits, higher government procurement costs, and higher debt servicing costs. Similarly, a weakening exchange rate has a mixed effect: it increases exporters' revenues in the tenge but at the same time it brings up the cost of import purchases and foreign currency debt obligations, creating additional pressure on budget expenditures.

Existing studies more often analyze the impact of fiscal policy on macroeconomic indicators. In this regard, the relevance of this study lies in examining the reverse channel, that is, how inflation and exchange rate shocks are reflected in fiscal indicators, which allows supplementing the existing empirical base.

The purpose of this study is to conduct an in-depth analysis of the impact of inflation and the exchange rate on Kazakhstan's fiscal parameters. The study examines the theoretical frameworks and channels of influence, and presents an econometric assessment based on the VECM model, which allows for the identification of long-term relationships and dynamic effects.

The structure of this paper is presented by the literature review, description of the methodology of instruments and the input data used, and discussion of the results obtained and by the conclusion.

2. Literature Review

As the empirical studies show, depreciation of the national currency and acceleration of inflation generate serious fiscal risks for the emerging markets and open economies.

Two classical mechanisms explain why inflation worsens real tax revenues:

1) collection lags (Oliver-Tanzi effect): when there are delays between the creation of an obligation and its payment before it reaches the budget, the real value of taxes is depreciated, which reduces revenues (Tanzi, 1977);

2) a “fiscal drag” and nominal distortions (relevant for countries with progressive tax rates): as prices and wages rise, taxpayers shift to higher nominal rates, even while their real ability to pay remains unchanged. Without automatic adjustment, this increases the average tax burden by default, distorting incentives. In corporate and capital taxation, the taxable base includes nominal interest expenses and nominal income, which, under inflation, systematically distorts effective rates and the behavior of firms/households (Beer, Griffiths, Klemm 2023). A study by the Bank of Spain (Banco de España, 2024) analyzes the effect of the fiscal drag using a Personal Income Tax (PIT) microsimulation. The rise in inflation caused an effective increase in the tax burden (ERTI) of approximately 1.85 times the target level, and the contribution of the fiscal brake to the growth of the PIT/GDP ratio amounted to about half of the increase in 2019–2023. These results are consistent with international observations for 2021–2022, when the positive effect of rising inflation on revenues was combined with a subsequent rollback (IMF, 2023).

The current literature identifies three main channels through which inflation and exchange rate depreciation affect the fiscal position: 1) debt dynamics (through nominal GDP, real interest rates, and the revaluation of the foreign exchange component of debt); 2) budget revenues; 3) budget expenditures. Country reviews emphasize that short-term gains for debt due to an inflation shock are often offset by persistent inflation, weak anchoring of inflation expectations, and rising expenditures, especially in countries with high foreign exchange risks and incomplete tax indexation (IMF, 2023; García-Macia, 2023). A cross-country IMF study found that unexpected inflation spikes improve the primary balance in the short term and technically reduce the debt-to-GDP ratio (through nominal GDP growth), but the effect is uneven and quickly dissipates when inflation is anticipated and embedded in wage/price indexation processes (García-Macia, 2023). According to an IMF policy brief (IMF, 2023), the 2021–2022 episodes were accompanied by positive revenue effects amid high inflation, but also by increased automatic spending pressures, so the net fiscal effect was mixed and depended on the structure of institutions and indexation policies. The same brief emphasizes that persistently high inflation, unlike a short-term spike, worsens the fiscal position through erosion of the real tax base and higher interest costs with rising risk premiums.

The results of SVAR estimates of the impact of inflation, interest rate, and debt dynamics confirm that inflation shocks can temporarily reduce the real cost of public debt servicing but the effect is transitory. With high initial debt, the path reverses over time and the impact becomes unfavorable, meaning debt dynamics worsen (Tkačevs & Staehr, 2025).

Currency Revaluation and Debt Servicing. For countries with a significant share of external debt, a depreciating national currency immediately increases the cost of external debt servicing and its nominal value (in the national currency), which worsens the balance and the share of debt in GDP. Analysis for debtor countries emphasizes that a weakening exchange rate can worsen the budget by increasing the cost of foreign currency debt, imported goods, and transfers, especially if the revenue base is oriented towards the non-tradable sector (Reisen, 1990). Cross-country estimates confirm that a weakening currency statistically increases the public debt-to-GDP

ratio, with the effects being nonlinear and stronger in economies with a high share of external debt and poorly anchored inflation expectations. Researchers note that increasing central bank independence and anchoring inflation expectations at a low, stable level reduce the pass-through of exchange rate changes to inflation and debt dynamics (Fisera et al., 2021).

Indexation of Spending and Investment Costs. Inflation indexes a significant portion of expenditures (social benefits, wages, contracts), and also makes public procurement more expensive. Public investment is a separate issue. The World Bank data shows that with the acceleration and scaling of investment programs, a U-shaped relationship is observed between average costs and the share of investment in GDP; exceeding $\approx 7\text{--}10\%$ of GDP and accelerated investment lead to a surge in costs/expenditures, which, in an inflationary environment, places even greater pressure on the budget (Gurara et al., 2020).

The energy price shocks of 2021–2022 led to large-scale temporary support measures; their fiscal cost in a number of countries reached and exceeded 1% of GDP, strengthening the spending impulse amid rising prices (IMF, 2023).

Inflation, Exchange Rate and Transmission Mechanism as a Fiscal Booster. The pass-through effect (ERPT) is the key link between exchange rate depreciation and inflation, which subsequently impacts the budget. An empirical study using a country panel data has shown that better anchored inflation expectations and high confidence in inflation targeting significantly reduce ERPT. Conversely, high dispersion of expectations is associated with higher ERPT, especially in developing countries and emerging markets, where volatility is higher (Carrière-Swallow et al., 2023). This means that the wave of exchange rate depreciation through inflation increases fiscal pressure in places where expectations are anchored weaker.

The study on economies with the “Dutch disease” demonstrates that attempts to stabilize the nominal exchange rate in response to shocks can worsen welfare by amplifying distortions. For fiscal policy, such regimes often lead to a buildup of quasi-fiscal risks (including guarantees and interventions), especially if “hard” exchange rate targets are persistently maintained (Lama & Medina, 2012). For oil-exporting economies, a cross-country analysis shows that external balance management through exchange rate changes yields worse results than fiscal instruments (taxes/spending), i.e., fiscal policy remains the primary stabilizer in terms of both the external sector (current account) and the domestic sector (Behar & Fouejieu, 2016).

In the Kazakhstan literature, studies have primarily focused on the negative impact of expansionary fiscal policy on inflation during economic upturns. For example, Zhakupova and Khanetova (2023) note that fiscal expansion during an economic boom, when output already exceeds its potential level, leads to negative consequences, such as higher inflation, reduced public investment efficiency, and crowding out private investment. Using VECM and FAVAR models, Tuleuov, Zhuzbayev, and Bagzhanov (2021) show that, prior to the introduction of inflation targeting, a 10% increase in national budget expenditures in Kazakhstan resulted in a cumulative increase in inflation of 0.68 percentage points over 12 months. After the introduction of inflation targeting, a similar increase in budget expenditures leads to a smaller, but still significant, cumulative acceleration of inflation – by 0.41 pp over 12 months. Turabay et al. (2023) find that, according to estimates, in Kazakhstan, a 1% increase in budget spending excluding debt service costs in the current month leads to a 0.6% rise in imports net of oil companies in the following month, followed by a complete attenuation of the impulse after five months. Taken together, an average 1% increase in budget expenditures in the current month leads to a cumulative rise in net imports of 1.42% over five months. All else being equal, a larger increase in imports than the impulse itself ($1.42\% > 1\%$) may be a consequence of the multiplier effect of government spending on overall economic spending. Moreover, government spending stimulates demand not only for capital goods and intermediate goods for investment projects, but also for consumer goods.

In its Article IV consultation reports for 2022, 2023, and 2024, the IMF mentions the high impact of inflation risks. The reports note that high inflation exacerbates social tensions and

negatively impacts economic activity, and may also trigger fiscally demanding measures by the government. The 2022 report also reflects a significant deterioration in external debt dynamics in response to a 30% exchange rate shock.

In summary, the literature supports the thesis of negative impact of persistent inflation and exchange rate depreciation on the budget. The fiscal drag and the Oliver-Tanzi effect undermine real revenues and distort the tax burden. Short-term unexpected inflation sometimes improves indicators (through nominal GDP and debt revaluation), but this effect is short-lived and sensitive to the response of monetary policy and the degree of anchoring of inflation expectations. Exchange rate depreciation directly increases expenditures through foreign currency debt and import-dependent items, and with weakly anchored expectations, it exacerbates inflation, thereby multiplying the pressure on expenditures. Investment and procurement costs grow disproportionately as government programs expand in an inflationary environment, which worsens the budget position when projects are scaled up.

In Kazakhstan, the focus of research is primarily on the negative impact of feedback loops, that is, the influence of overly stimulative fiscal policy on various macroeconomic indicators, including inflation and external sector indicators. The IMF, in its Article IV consultation reports, notes the negative impact of inflation and exchange rate shocks on fiscal policy.

3. Research Methodology and Input Data

Trends observed in a variety of macroeconomic indicators have stimulated the development of non-stationary time series analysis methods. The relationship between two such series can be expressed as follows:

$$y_t = \alpha * x_t + \varepsilon_t, \quad (1)$$

where y_t and x_t – non-stationary time series;

ε_t – random error.

Using non-stationary variables when constructing regression equations often leads to spurious regression, where statistically significant results cannot be interpreted. This is because standard estimation methods fail to account for trends and other properties of non-stationary data, resulting in biased parameters.

However, according to the approach of Engle and Granger (Econometrica, 1987), a linear combination of several non-stationary variables can be stationary. If such a combination exists, the time series is called cointegrated, and the corresponding expression is called a cointegration equation. It reflects the existence of a long-run equilibrium relationship between the variables.

To identify cointegration, the current literature uses the vector error correction model (VECM), which is a modified version of the VAR model constructed in differences. This model combines the short-run dynamics of variables with a mechanism for returning them to long-run equilibrium. This process is ensured by including an error correction term in the equation (ECM).

Formally, the VECM is written as follows:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-1} + BX_t + u_t, \quad (2)$$

where Πy_{t-1} – error correction term/matrix, where matrix Π of dimension $k \times k$ (k – is the number of endogenous variables), is an element responsible for a long-term relationship of the system of variables;

y_t – vector of endogenous variables;

Γ_i – a coefficient matrix with lags;

X_t – vector of exogenous variables;

u_t – random error vector;

B – a coefficient matrix with exogenous variables;

β_0 – a vector of constants;

p – the number of lags in the model.

The VECM is a type of vector autoregression model (VAR). VAR models are used to estimate short-term dynamic effects and the response of indicators to sudden changes. In VAR models, the current value of each endogenous variable depends on its own previous values, as well as on the lags of other system variables. This approach allows for the study of mutual influence and causal relationships between indicators, as well as the quantitative assessment of the system's responsiveness to external shocks.

In an economic context, an example of a cointegrating relationship is the long-run relationship between stock prices and dividends. Under normal conditions, the dividend-to-stock price ratio remains relatively stable. However, during market bubbles, stock prices can rise significantly faster than dividend payments, leading to a temporary imbalance. Similarly, during recessions, stock prices decline more sharply than dividends, and the ratio also deviates from the normal level. Over time, the market tends to restore equilibrium, and this ratio returns to its stable value. A similar effect is observed in the ratio of rent to housing cost.

The study used quarterly data for the period from 2010 to 2025 as part of the empirical assessment (Table 1).

Table 1

The data used and their symbols

Indicator	Symbol
GDP (excluding the mining industry)	y_noil
Inflation	p
Exchange rate (KZT/USD)	fx
Money market rate (TONIA)	r
Budget revenues	rev
Budget spending	spend
Non-oil budget deficit	noil buddef
Primary balance	pb

Variables with a detected seasonal component were seasonally adjusted using the X-12-ARIMA method. For scale comparability, the indicators are presented in indices to the 2009 baseline, followed by the logarithmization. This normalization allows for interpretation of percentage changes and makes the dynamics of different indicators comparable. The interest rate indicator is used in its original form (as a percentage). For budget balance indicators (non-oil deficit and primary balance), a shift (subtraction of a constant value) was preliminarily performed to eliminate negative values before logarithmization. This allows for correct application of logarithmic transformation, with a reduction in the corresponding index being interpreted as a deterioration in the indicator. Thus, the model was built using the logarithms of the specified indices and the interest rate in the original state.

In the first stage, the stationarity of all series was tested using the Dickey-Fuller test. The augmented Dickey-Fuller test showed that the series were non-stationary at levels and became stationary at first differences. For illustration purposes, examples are provided in Figures 1 and 2 (using income as an example); the results for the other variables are similar. Thus, the series behave as $I(1)$, which justifies the use of VECM and the analysis of long-term relationships in a multivariate system.

In the second stage, the Johansen test was performed, which confirmed the presence of several long-run equilibrium relationships between variables. According to the test results, up to two or three cointegrating equations were identified. The illustration is shown in Figure 3.

Figure 1

ADF in levels**Augmented Dickey-Fuller Unit Root Test on L_REV**

Null Hypothesis: L_REV has a unit root
Exogenous: Constant
Lag Length: 4 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.353447	0.9099
Test critical values: 1% level	-3.544063	
5% level	-2.910860	
10% level	-2.593090	

*Mackinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(L_REV)
Method: Least Squares

Figure 2

ADF in the first differences**Augmented Dickey-Fuller Unit Root Test on D_L_REV**

Null Hypothesis: D_L_REV has a unit root
Exogenous: Constant
Lag Length: 4 (Fixed)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.248298	0.0013
Test critical values: 1% level	-3.546099	
5% level	-2.911730	
10% level	-2.593551	

*Mackinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(D_L_REV)
Method: Least Squares

Figure 3

Results of the Johansen test for cointegration between the variables of the income model

Endogenous variables: L_Y_NOIL L_P L_FX R L_REV
Deterministic assumptions: Case 2: Cointegrating relationship includes a constant

Rank Tests

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.525515	116.6622	76.97277	0.0000
At most 1 *	0.370837	68.94858	54.07904	0.0014
At most 2 *	0.277142	39.29321	35.19275	0.0171
At most 3	0.176686	18.52252	20.26184	0.0852
At most 4	0.090624	6.079814	9.164546	0.1847

Trace test indicates 3 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

In the context of the study, after constructing the cointegration equation, the VECM model was used to analyze the dynamic response of the selected variables to shocks using impulse response functions, which made it possible to identify the nature and duration of the impact of changes in explanatory indicators on the target variables.

For each model, the optimal lag length was selected based on the standard Akaike Information Criteria (AIC) and Schwartz Information Criteria (SC), with an additional check for the absence of autocorrelation of the residuals. In most specifications, the second lag proved optimal.

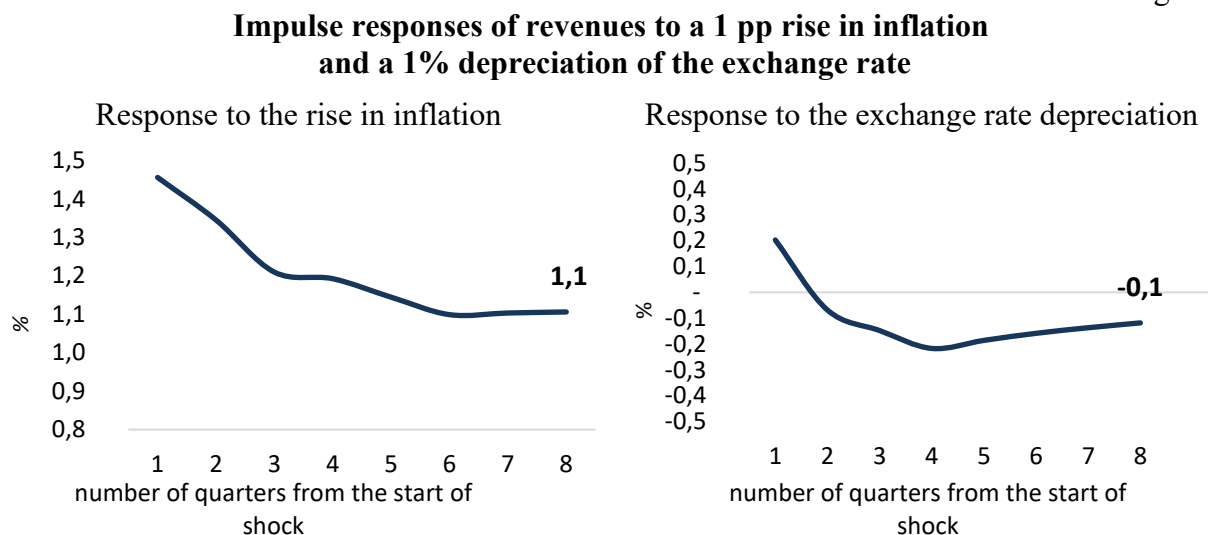
The reason for including other variables (non-oil deficit, inflation, the US dollar/tenge exchange rate, and the money market rate) in the model along with the studied variables is to increase the model's structurality.

Structural shocks were identified using the Cholesky decomposition of the model's error covariance matrix.

4. Discussion of Results

Budget Revenues (excluding transfers from the National Fund). According to model estimates (Figure 4), an inflation shock leads to an increase in nominal revenues. Over a one-year and two-year horizon, the effect is approximately 1.2% and 1.1%, respectively. This mechanism involves expanding the nominal tax base. The budget receives a kind of “inflation tax”, so revenues respond faster than other fiscal indicators. However, according to model estimates, revenues do not increase with the weakening of the national currency against the US dollar. On the contrary, the model predicts a slight decline of approximately 0.2% over one year and approximately 0.1% over two years, despite a potential positive effect on certain export-oriented industries and associated budget revenues. This may be associated with the fact that a weakening currency results in higher prices for imported goods. This, in turn, reduces the purchasing power of households and businesses, dampening domestic consumer and investment demand, leading to lower tax collection.

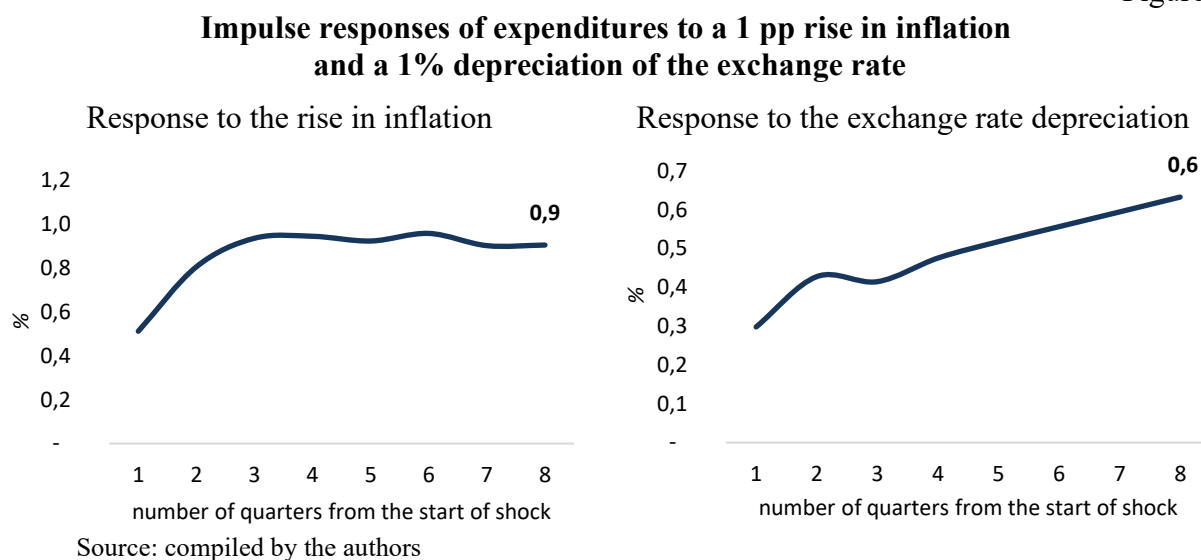
Figure 4



Source: compiled by the authors

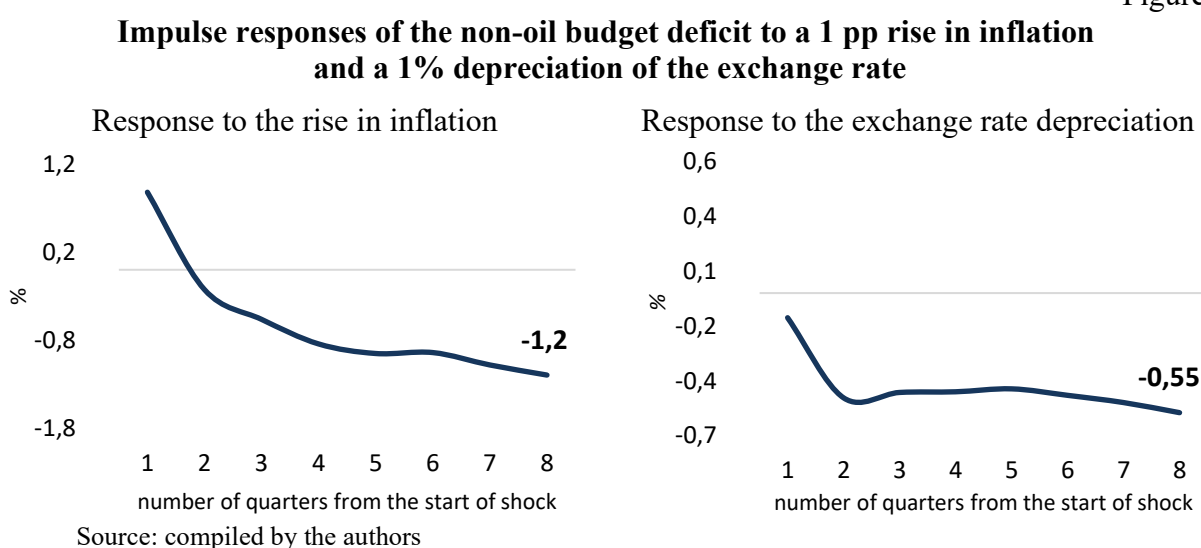
Budget spending. The response of expenditures to the inflation shock is positive and manifests itself with a time lag (Figure 5). According to estimates, a 1 pp rise in inflation leads to an increase in nominal expenditures by approximately 0.9% over one and two years. The effect manifests itself after one to two quarters and is expressed through the probable indexation of certain social benefits and increased costs of public procurement. Taking into account average annual inflation of 11.4% in 2025 and the resulting estimate (a 1% inflation shock leads to an increase in budget expenditures for the year by 0.9%), the cumulative contribution of inflation to expenditure growth amounted to approximately 10.3 pp. In absolute terms, this corresponds to approximately 3.2 trl tenge, indicating a significant role of inflation in budget expenditure growth in 2025. The exchange rate shock (Figure 5) also leads to a cumulative increase in expenditures of 0.5 and 0.6% over one and two years, respectively. This increase is associated with more expensive import purchases. Thus, in the inflation channel, the expansion of expenditures partially offsets the income impulse, while in the exchange rate channel, its weakening leads to a slight decrease in income and an increase in expenditures, which worsens the fiscal position.

Figure 5



Non-Oil Budget Deficit. To analyze the fiscal position, an indicator net of oil and gas revenues and transfers is used. Compared to the overall deficit, it better captures the reaction of fiscal policy to domestic shocks. According to the impulse responses (Figure 6), an inflation shock of 1 pp is accompanied by a decrease in the non-oil balance of approximately 0.9% over the course of a year and approximately 1.2% over two years. Within the adopted transformation, this is interpreted as a decrease/deterioration in the non-oil budget balance, i.e., an increase in the deficit or a decrease in the surplus relative to the path without the shock. An exchange rate shock leads to a similar result. Thus, the non-oil budget balance index decreases by approximately 0.45% over a one-year horizon and by approximately 0.55% over a two-year horizon in response to the shock of the national currency depreciation. These dynamics are consistent with the negative effect of the weakening on budget revenues and the growth of expenditure commitments, including import items.

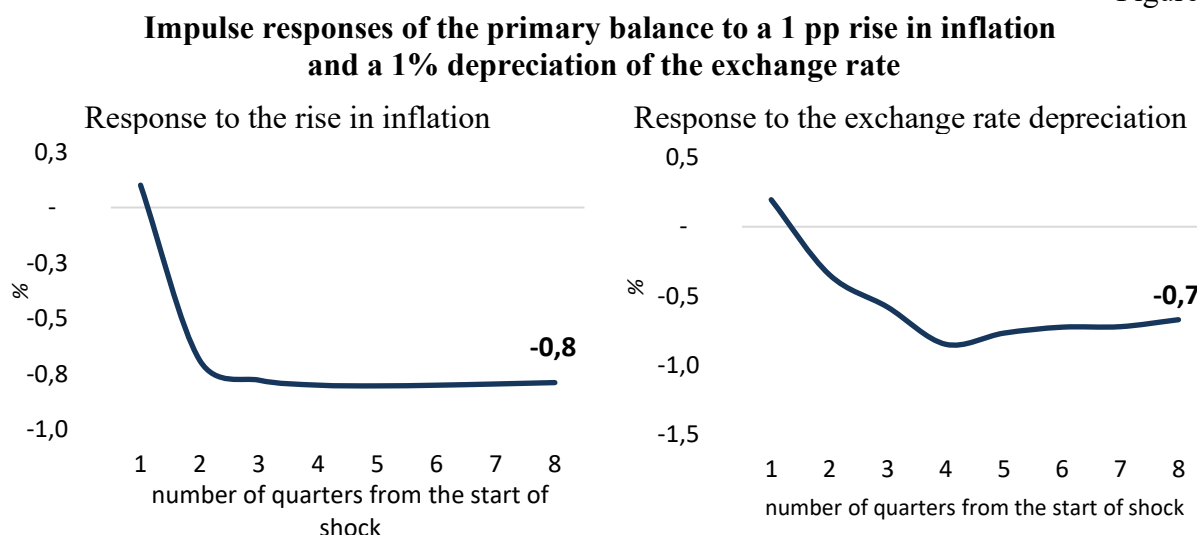
Figure 6



Primary balance. This indicator excludes debt servicing costs and is therefore a more comprehensive indicator of the impact of fiscal policy on economic activity. According to the model estimates (Figure 7), an inflation shock leads to a reduction in the primary balance index by approximately 0.8% over one year and approximately 0.79% over two years. This implies a

deterioration in the primary balance at both horizons. Exchange rate depreciation produces a more pronounced negative reaction. The primary balance index declines by approximately 0.84% by the end of the first year and by approximately 0.7% over two years. This result is consistent with the increase in the cost of import purchases in the tenge (increased expenditures).

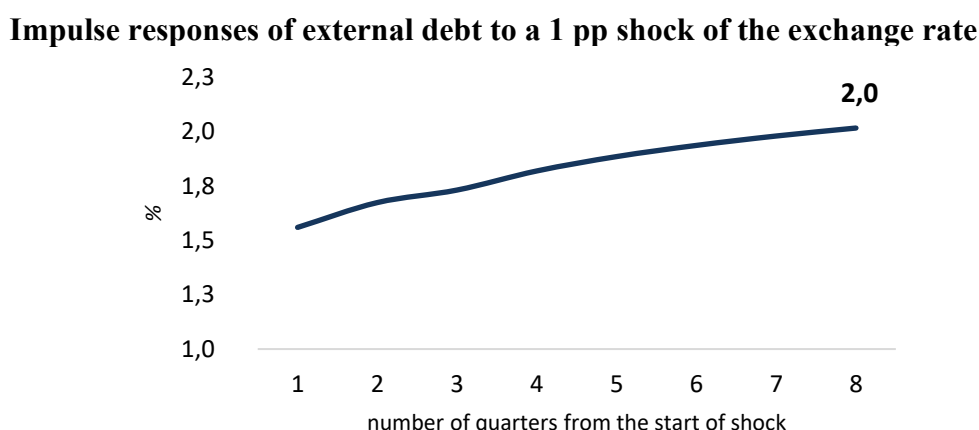
Figure 7



Source: compiled by the authors

External Debt. For external debt, the key driver is the exchange rate of the national currency against the US dollar. An exchange rate shock (Figure 8) causes a significant increase in the value of external liabilities in the tenge terms. According to the impulse response, an increase of approximately 1.8% is observed during the first year and about 2% over two years in response to a 1% exchange rate shock. This is a direct effect of revaluation of the debt's foreign currency component. The response to a purely inflationary shock was not separately assessed, since the main channel of influence is through the exchange rate.

Figure 8



Source: compiled by the authors

Taken together, the results demonstrate different mechanisms for transmitting price and exchange rate impulses to fiscal indicators. An inflation shock generates nominal revenue growth with moderate but steady expenditure growth. However, the primary balance and budget deficit are already worse within a year than they would have been without the shock, and continue to deteriorate over a two-year horizon. The exchange rate shock does not support budget revenues

and concurrently increases pressure on expenditure growth through indexed expenditures, growth in the tenge-denominated import purchases, and the revaluation of external liabilities. This also results in a deterioration in the non-oil budget balance and the primary balance of the general budget, while the debt burden in national currency increases.

Thus, according to the model estimates, rising inflation and a weakening exchange rate do not lead to improvements, but rather worsen fiscal performance and reduce the state of public finances. This suggests that moderately low inflation, as well as a stable or stronger exchange rate, lead to an improvement in the state of public finances.

5. Conclusion

The results of the analysis confirm that inflation and exchange rate depreciation have a significant and predominantly negative impact on Kazakhstan's fiscal performance. Despite short-term nominal benefits in the form of increased budget revenues, inflationary pressures lead to a progressive increase in expenditures and a deterioration in the primary balance. Shocks of the national currency depreciation, in turn, exacerbate the debt burden, raising the cost of servicing of foreign currency liabilities and import purchases, without providing a compensating increase in revenue.

The empirical results show that low and stable inflation, as well as more balanced exchange rate dynamics, contribute to improved fiscal sustainability. These findings underscore the importance of achieving moderately low inflation not only for the central bank but also for fiscal policy. In the long term, a balanced combination of these two indicators helps strengthen the sustainability of public finances and reduce Kazakhstan's macroeconomic vulnerability.

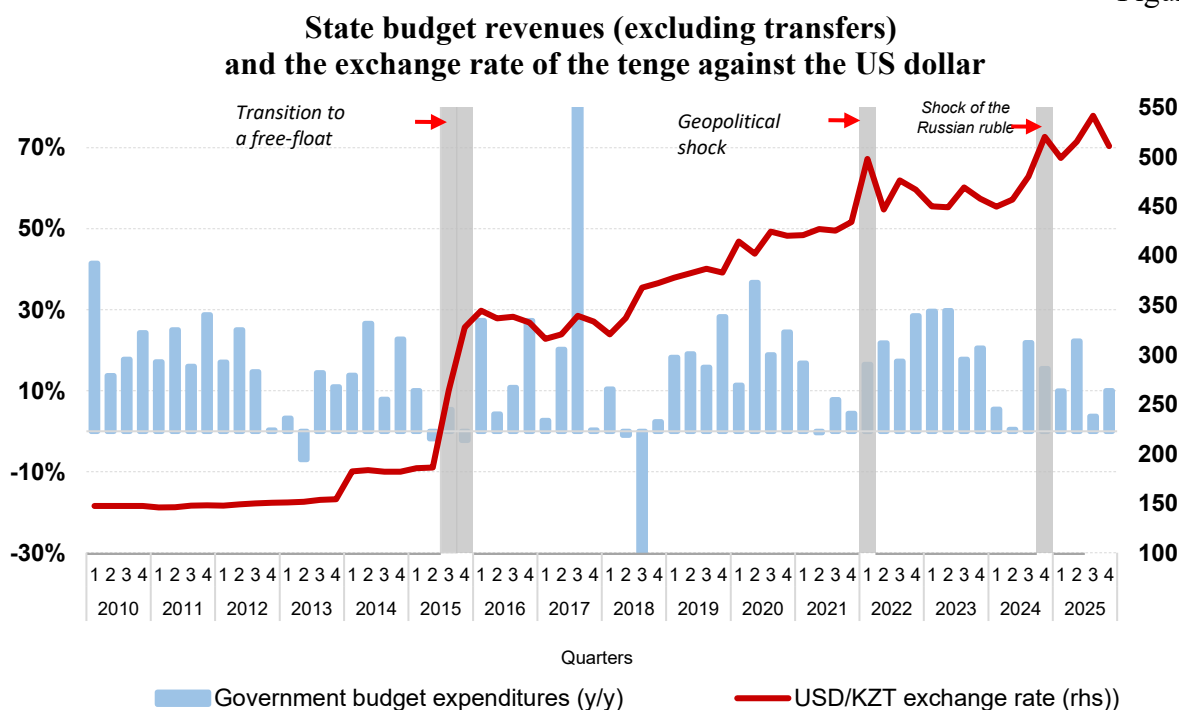
A study of the disaggregated impact of inflation and the exchange rate on the country's fiscal parameters could be an area for future research.

References

1. Acosta-Ormaechea, S. (2020). *Public Debt Dynamics and Intra-Year Exchange Rate Fluctuations* (IMF Working Paper No. 20/261). International Monetary Fund. <https://doi.org/10.5089/9781513561585.001>
2. Behar, A., & Fouejieu, A. (2016). *External Adjustment in Oil Exporters: The Role of Fiscal Policy and the Exchange Rate* (IMF Working Paper No. 16/107). International Monetary Fund. <https://doi.org/10.5089/9781484379929.001>
3. Beer, S., Griffiths, M., & Klemm, A. (2023). *Tax Distortions from Inflation: What Are They? How to Deal with Them?* (IMF Working Paper No. 23/18). International Monetary Fund.
4. Carrière-Swallow, Y., Gruss, B., Magud, N. E., & Valencia, F. (2021). Monetary Policy Credibility and Exchange Rate Pass-Through. *International Journal of Central Banking*, 17(3), 61–94.
5. Fisera, B., Workie Tiruneh, M., & Hojdan, D. (2021). *Currency Depreciations in Emerging Economies: A Blessing or a Curse for External Debt Management?* IES Working Paper 2021/06, Charles University (published version: *International Economics*, 2021).
6. García-Macia, D. (2023). *The Effects of Inflation on Public Finances* (IMF Working Paper No. 23/93). International Monetary Fund.
7. García-Miralles, E., & Balladares, S. (2024). *Fiscal Drag: The Heterogeneous Impact of Inflation on Personal Income Tax Revenue* (Banco de España Occasional Paper No. 2422). Banco de España.
8. Gurara, D., Kpodar, K. R., Presbitero, A. F., & Tessema, D. (2020). *On the Capacity to Absorb Public Investment: How Much Is Too Much?* (IMF Working Paper No. 20/48). International Monetary Fund. (Published subsequently in *World Development*, 145, 105525.)
9. International Monetary Fund. (2023, April). *Fiscal Monitor: Chapter 2 – Inflation and Disinflation: What Role for Fiscal Policy?* International Monetary Fund.

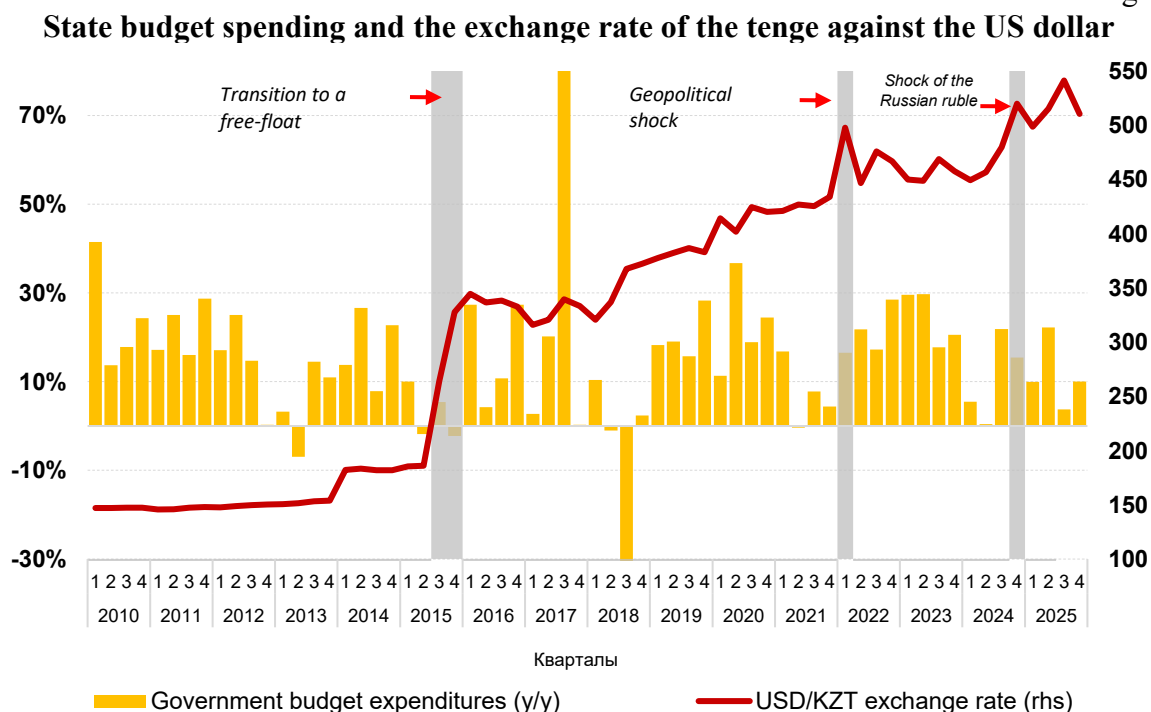
10. International Monetary Fund. (2022, December 14). Republic of Kazakhstan: 2022 Article IV Consultation – Press Release; Staff Report; and Statement by the Executive Director for the Republic of Kazakhstan (IMF Country Report No. 22/367). International Monetary Fund.
11. International Monetary Fund. (2024, February 7). Republic of Kazakhstan: 2023 Article IV Consultation – Press Release; Staff Report; and Statement by the Executive Director for the Republic of Kazakhstan (IMF Country Report No. 24/46). International Monetary Fund.
12. International Monetary Fund. (2025, January 31). Republic of Kazakhstan: 2024 Article IV Consultation – Press Release; and Staff Report (IMF Country Report No. 25/30). International Monetary Fund.
13. Lama, R., & Medina, J. P. (2012). Is Exchange Rate Stabilization an Appropriate Cure for the Dutch Disease? *International Journal of Central Banking*, 8(1), 5–46. (Earlier version: IMF Working Paper No. 10/182.)
14. Reisen, H. (1990). Interaction Between the Exchange Rate and the Public Budget. In V. Tanzi (Ed.), *Fiscal Policy in Open Developing Economies* (pp. 74–84). International Monetary Fund. (ISBN 978-1-55775-171-3).
15. Tanzi, V. (1977). Inflation, Lags in Collection, and the Real Value of Tax Revenue. *IMF Staff Papers*, 24(1), 154–167.
16. Tkačevs, O., & Staehr, K. (2025). *The Effects of Macroeconomic and Budget Balance Shocks on Public Debt Trajectories in the Euro Area* (Latvijas Banka Working Paper No. 8/2025). ISBN 978-9934-578-80-9.
17. Zhakupova, M., & Khanetova, A. (2023). Kazakhstan's Fiscal Policy Parameters (Working Papers of the National Bank of the Republic of Kazakhstan, No. 2023/9). National Bank Republic of Kazakhstan.
18. Tuleuov, O., Zhuzbayev, A., & Bagzhanov, B. (2021). The Role of Fiscal Policy in the Price (In) Stability in Kazakhstan: Empirical Assessment and Macroeconomic Equilibrating Mechanism (Working Papers, National Bank of the Republic of Kazakhstan, No. 2021/3). National Bank of the Republic of Kazakhstan.
19. Turabay, B., Uskenbayev, A., Muratov, Zh., Almagambetova, M., & Ospanov, N. (2023). The Impact of the Government Expenditures on the Current Account of the Balance of Payments of Kazakhstan through the Channel of Import of Goods (Working Papers, National Bank of the Republic of Kazakhstan, No. 2023/5). National Bank of the Republic of Kazakhstan.
20. Robert F. Engle, C. W. J. Granger, «Co-Integration and Error Correction: Representation, Estimation, and Testing», *Econometrica*, Vol. 55, No. 2. (Mar., 1987), 251-276

Figure 1



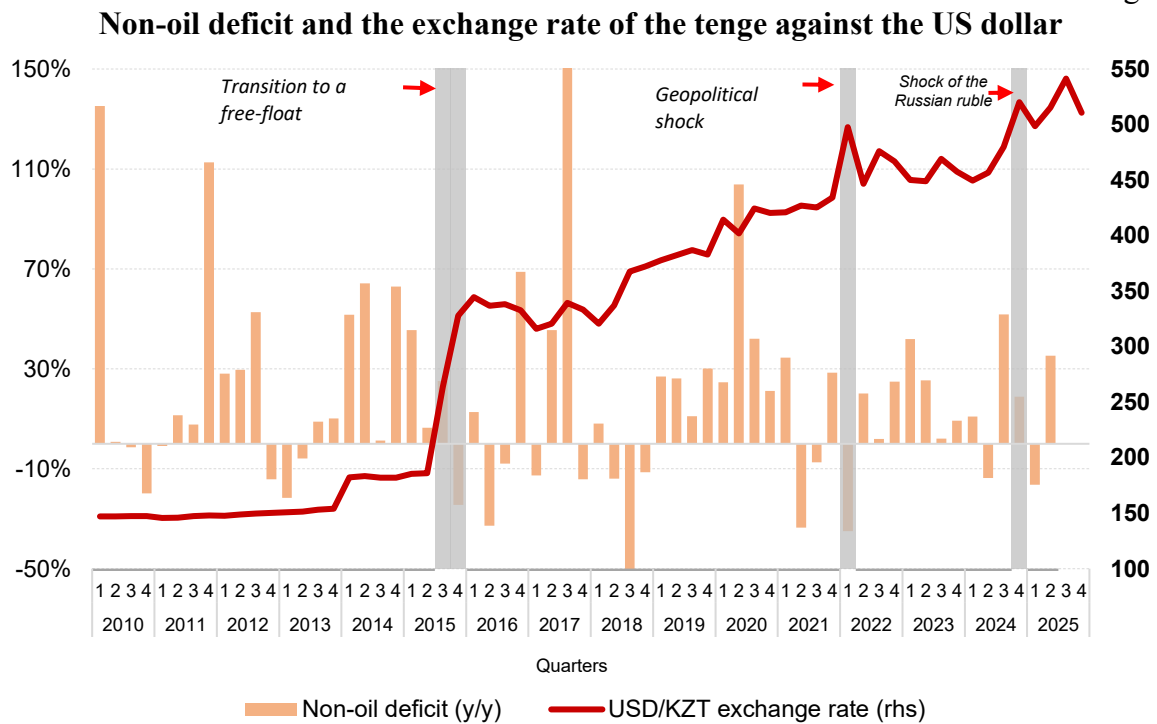
Source: NB RK, MF RK, the authors' computations

Figure 2



Source: NB RK, MF RK, the authors' computations

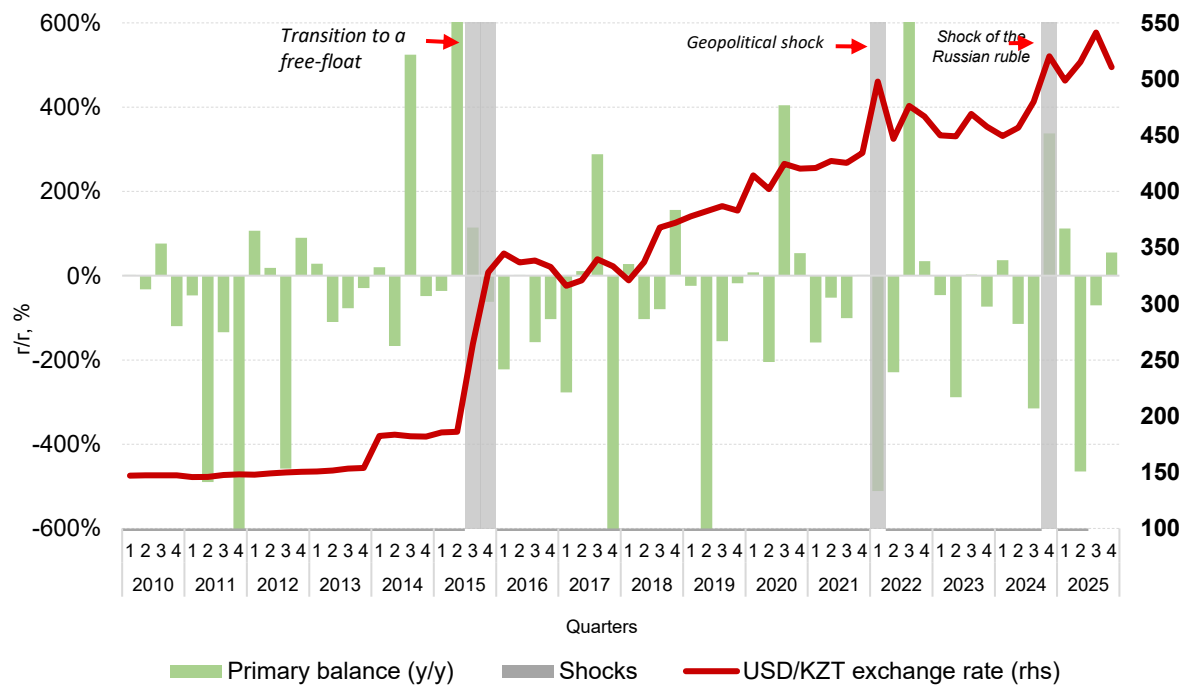
Figure 3



Source: NB RK, MF RK, the authors' computations

Figure 4

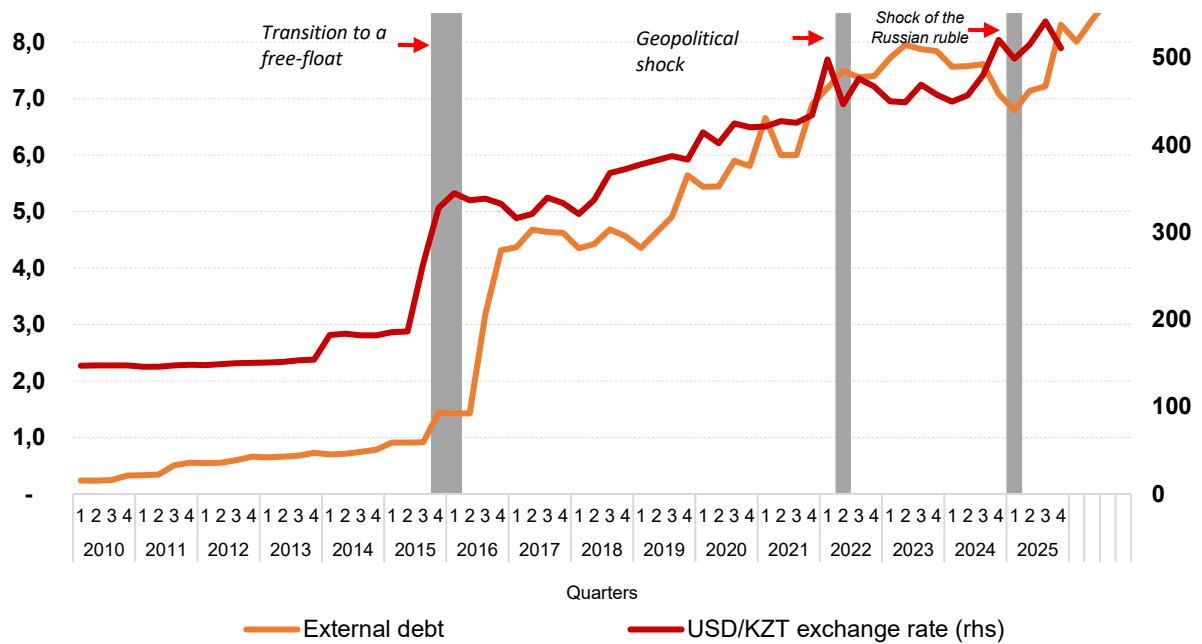
Primary balance of the state budget and the exchange rate of the tenge against the US dollar



Source: NB RK, MF RK, the authors' computations

Figure 5

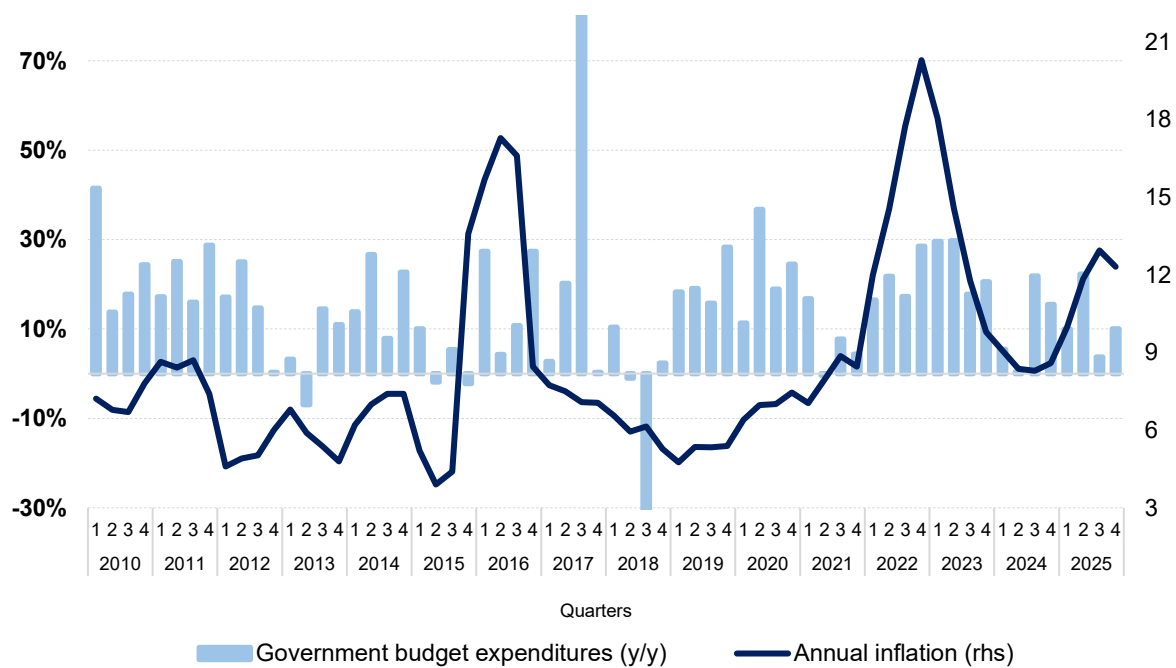
Dynamics of the external debt and the exchange rate of the tenge against the US dollar



Source: NB RK, MF RK, the authors' computations

Figure 6

State budget revenues (excluding transfers) and annual inflation



Source: NB RK, MF RK, the authors' computations

Figure 7

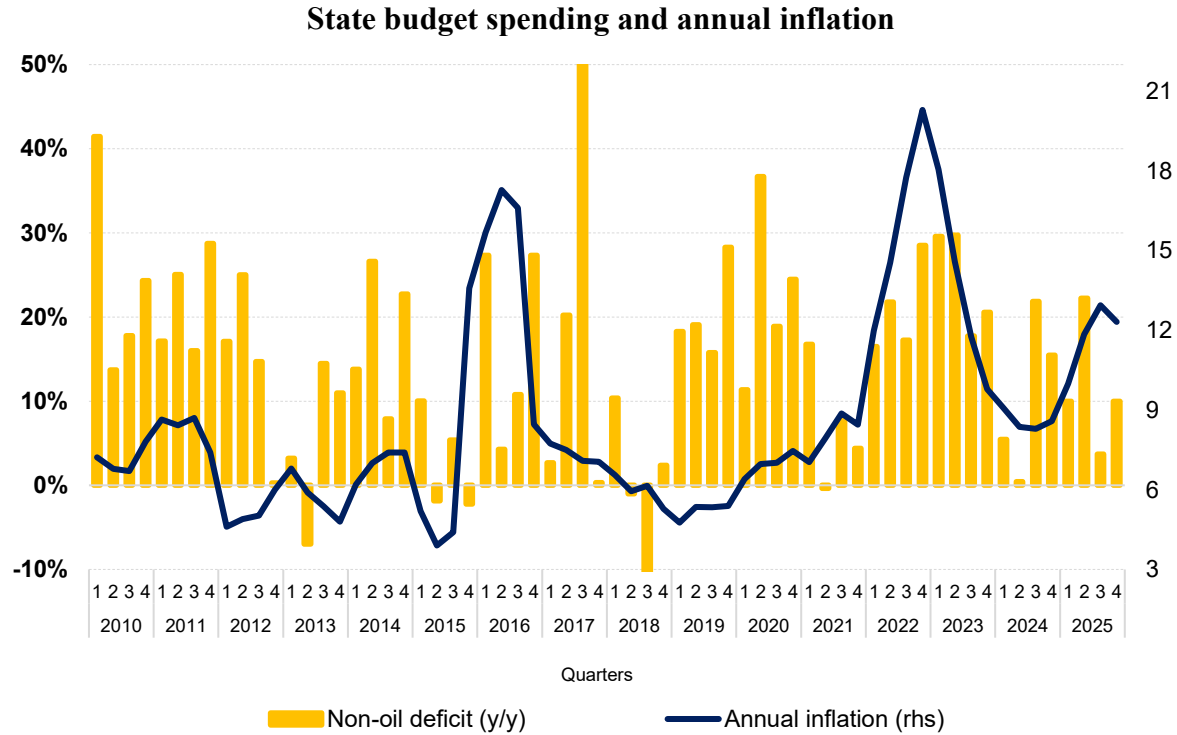
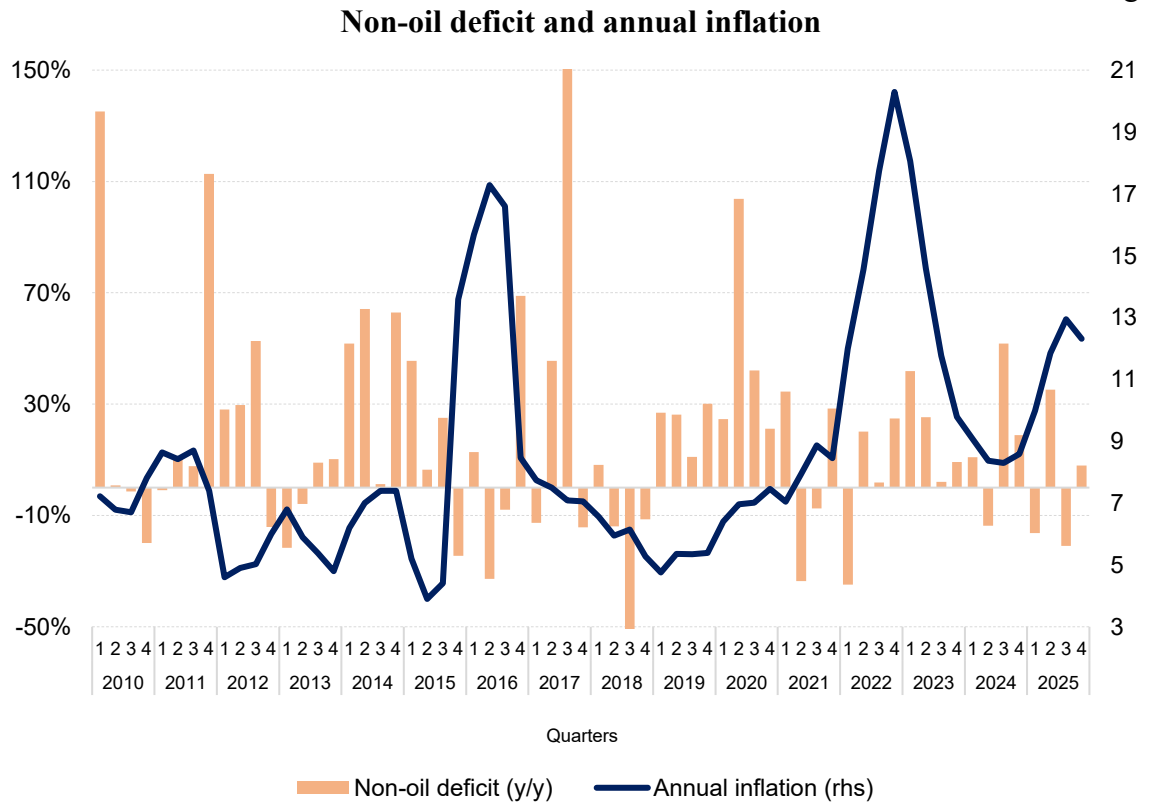
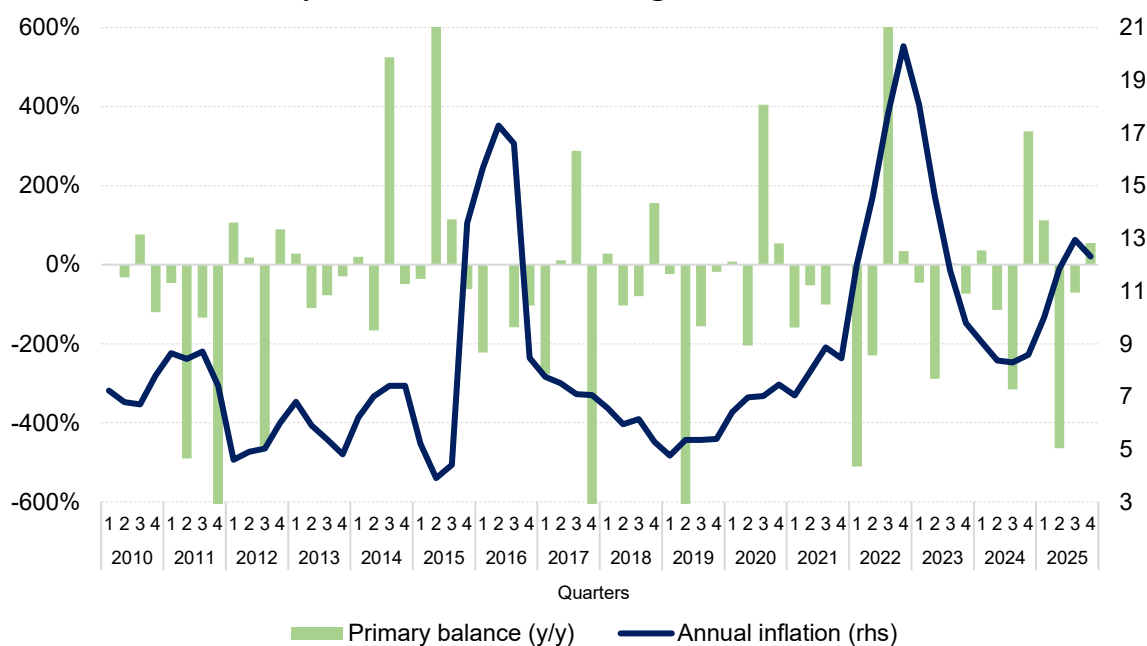


Figure 8



Primary balance of the state budget and annual inflation



Structural Implications of Procyclical Fiscal Policy: Inflationary Financing of Public Debt

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This paper examines the mechanisms of “self-financing” of public debt in Kazakhstan – the repayment of the primary fiscal impulse through endogenous growth of the tax base and the inflation channel. Using a New Keynesian DSGE model parameterized for the Kazakh economy, the contribution of each channel is quantified. The modeling results demonstrate the predominant role of the tax-base channel. The contribution of the inflation channel is determined by the slope of the Phillips curve. In the absence of discretionary fiscal adjustment, the share of self-financing asymptotically approaches 100%. The paper emphasizes the need to improve the countercyclical design of fiscal rules to prevent the accumulation of persistent budget imbalances under the current restrictions on the use of oil rents.

Key Words: public debt, “self-financing”, inflation, taxable base, fiscal impulse.

JEL Classification: E31, E62, H63.

1. Preamble

Historically, public debt in Kazakhstan has remained relatively low. By the end of 2025, the public debt ratio (including publicly guaranteed debt and government-guaranteed debt) to GDP was 24.3%. This low figure was achieved, among other things, through the use of oil rents in the form of transfers from the National Fund of the Republic of Kazakhstan (NFRK) to the national budget, which limited the budget deficit. At the same time, as will be shown in Section 2, Kazakhstan has been characterized by a procyclical fiscal policy, which prevailed during the periods of a positive output gap.

The fiscal reform, effective 2026, will create new conditions for public finances and maintain macroeconomic stability in the medium term. While the reform has tightened the rules for allocating transfers from the NFRK (see Section 2), it does not guarantee an automatic transition to a countercyclical regime, leaving the problem of procyclicality of budget expenditures unresolved. Such conditions create prerequisites for the formation of sustainable budget imbalances, which in the long term could affect the growth of public debt.

Under the existing circumstances, the question of sources to finance the growing public debt is becoming increasingly relevant. Since the new Budget Code limits the use of oil rents, and the Tax Code, which has become effective, has already increased the tax burden, only two mechanisms remain for debt coverage in the absence of sequestration: increasing tax revenues through economic expansion and accelerating inflation. Since both channels operate through endogenous macroeconomic dynamics and do not require direct discretionary adjustments by fiscal authorities, in this paper they are defined as mechanisms for “self-financing” of public debt.

To quantify the share of debt “self-financing”, this paper suggests constructing a DSGE model. The methodological framework is based on the work of Angeletos, Lian, and Wolf (2024), and the parameters were calibrated taking into account the specifics of the Kazakh economy. One of the most significant and difficult to identify parameters influencing the estimate of the share of debt “self-financing” through inflation is the slope of the Phillips curve, κ . A rigorous econometric estimate of κ is beyond the scope of this study and requires separate investigation.

The results show that with a steeper Phillips curve, the main source of debt “self-financing” is the expansion of the tax base. However, the inflation channel also makes a significant positive contribution, which increases with the lag of fiscal adjustment. Thus, if fiscal adjustment is delayed

for four quarters after the government spending shock, the overall share of “self-financing” is 29.0%, of which 7.1 percentage points (pp) are provided by inflation. After 12 quarters, the corresponding values increase to 45.2% and 13.2 pp, and after 16 quarters, to 54.8% and 16.8 pp. With further delays in fiscal adjustment, the overall share of “self-financing” asymptotically approaches 100%, and the share of inflation approaches 33.75%.

Constructing a model with a flatter Phillips curve leads to a decrease in the inflationary contribution, while leaving the contribution of tax base expansion unchanged. With an adjustment lag of 16 quarters, inflationary financing covers only 4.7% of the shock. Asymptotically, the overall share of “self-financing” also approaches 100%, while the share of inflation decreases to 11.74%.

The obtained results show a possible path for the development of fiscal sustainability in Kazakhstan. The current fiscal rule, together with the maintenance of a procyclical fiscal policy, create conditions for the growth of public debt. Increased public debt, on the one hand, can lead to economic stimulation and subsequent “self-financing” through the expansion of the tax base (the scale of this effect depends on the government spending multiplier). On the other hand, the fiscal impulse translates into unexpected price increases, and thus inflation acts as a tool for “co-financing” of the debt.

Although the current low level of public debt does not pose immediate risks to Kazakhstan’s fiscal sustainability, further progress toward a countercyclical fiscal rule is a priority in the medium term. Otherwise, public debt dynamics will accelerate, partially relying on the pro-inflationary method of “self-financing”.

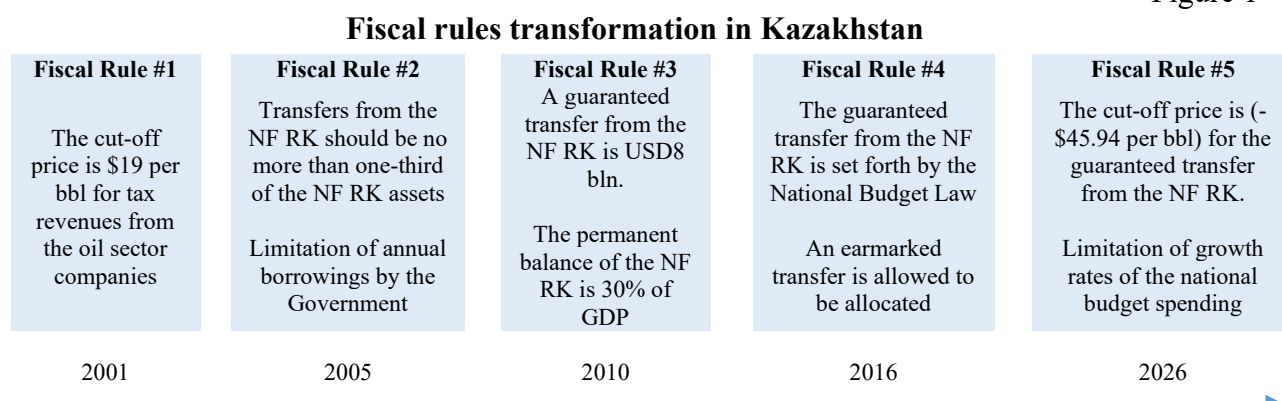
Section 2 contains a retrospective analysis of Kazakhstan’s fiscal policy since 2011, and a literature review is presented in Section 3. Section 4 describes the DSGE model and its calibration, Section 5 presents the results of assessing the contributions of debt “self-financing” channels, and Section 6 provides the conclusion.

2. Institutional Environment and Fiscal Policy of Kazakhstan

In a resource-based economy, fiscal rules are an important element in ensuring macroeconomic stability. On the one hand, they shape the management of resource rents, determining the proportions of their distribution between current consumption and accumulation for future generations. On the other hand, fiscal rules define the cyclical nature of fiscal policy and, with appropriate institutional design, serve as a barrier to excessive expansion of public spending during the periods of favorable economic conditions.

In Kazakhstan, fiscal rules have traditionally been approved by presidential decrees within the framework of various concepts. Only in 2025 were these norms formalized through codification in the Budget Code, significantly strengthening the mandatory nature of their compliance.

Figure 1



Source: the authors’ diagram

At the same time, fiscal rules in Kazakhstan have been subject to frequent changes. Since 2001, five different rules have been adopted, each fundamentally differing from the other (Figure 1).

Fiscal Rule No. 1. The first fiscal rule in Kazakhstan was adopted by the Decree of the President of the Republic of Kazakhstan dated January 29, 2001, “On Amendments to Some Legislative Acts Regarding the Functioning of the National Fund of the Republic of Kazakhstan”. It was based on a cut-off price mechanism, which was used to approve planned tax revenues from oil sector organizations. If actual revenues exceeded the approved figures, the difference was transferred to the NFRK, and if they fell short, funds were allocated from the NFRK to the national budget.

The key feature was that all revenues were initially accumulated in the national budget, and transfers to the NFRK were made on a residual basis after the planned figures were met.

Fiscal Rule No.2. In 2005, the President of the Republic of Kazakhstan adopted a Decree on the Concept for the Formation and Use of the NFRK Resources for the Medium Term. Under this fiscal rule, the procedure for transfer of resources was changed: oil revenues began to flow directly to the NFRK, and the budget received a guaranteed transfer that could be used exclusively to finance budget development programs.

The guaranteed transfer was defined as a fixed amount plus a portion of the National Fund assets for the previous period. The volume of this transfer depended on a constant figure that ensured a guaranteed minimum transfer to the national budget and was determined based on the average expenditure on budget development programs for a given period, as well as on the *b* coefficient, corresponding to the average level of investment income for a given period. The amount of the guaranteed transfer was not to exceed one-third of the NFRK assets. A limit on government borrowing was also imposed, amounting to 1% of the average GDP over five years.

Fiscal Rule No.3. The next fiscal rule was adopted by Decree of the President of the Republic of Kazakhstan on April 2, 2010. This time, the amount of the guaranteed transfer was rigidly fixed at USD8 billion, making the budget sensitive to exchange rate volatility. At the same time, prohibitions were introduced on the use of NFRK assets for lending, earmarked transfers, the acquisition of Kazakhstani securities, and as collateral for the fulfillment of obligations, and the permanent balance for the Fund’s resources was fixed at 30% of GDP.

Fiscal Rule No.4. On December 8, 2016, the Concept for the Formation and Use of Resources of the National Fund of the Republic of Kazakhstan was adopted by the Presidential Decree. This resulted in a transition to the transfer amount being determined by the law on the national budget, with the possibility of adjustment. Thus, the transfer amount became discretionary. The areas where the resources could be used were expanded: the Presidential order enabled to allocate earmarked transfers for anti-crisis and socially significant projects of national significance, often unprofitable ones. However, prohibitions on the acquisition of Kazakhstani securities, lending, providing finance to the second-tier banks, and the use of assets as collateral for the fulfillment of obligations remained.

Fiscal Rule No.5. The current fiscal rule was first formulated in the Concept of Public Finance Management of the Republic of Kazakhstan until 2030, dated September 10, 2022, and was subsequently enshrined in the Budget Code of the Republic of Kazakhstan, dated March 15, 2025. The rule reverted to the cut-off price mechanism, stipulating that the volume of the guaranteed transfer cannot exceed the projected revenues to the NFRK from the oil sector, calculated using the cut-off price.

This was based on the experience of applying the 2001–2005 fiscal rule, which did not take into account oil production volumes. The new rule corrects this omission and provides for a proportional reduction in the cutoff price when oil production exceeds the threshold of 90.5 million tons per year.

Furthermore, the rule capped the growth rate of national budget expenditures at the level of long-term economic growth (average real GDP growth over the prior 10 years), increased by the inflation target. The rule contains conditions under which deviations from the budget rule are possible: 1) in crisis situations resulting in a lack of economic growth and a decline in budget revenues, an increase in government liabilities and budget expenditures not covered by budget revenues; 2) during a state of emergency or state of martial law in the Republic of Kazakhstan.

The NFRK is limited in lending to individuals and legal entities, in acquiring domestic financial instruments from Kazakhstani issuers, and in financing current budget expenditures in the form of earmarked transfers. However, an exception is made for debt securities of the National Welfare Fund and the national management holding company issued for the implementation of national significance projects. Such projects are subject to review by the NFRK Management Board.

Thus, Kazakhstan's current fiscal rule, through its enshrinement in the Budget Code, has undergone institutional development and become more legally binding. At the same time, the cut-off price mechanism underlying to the rule marks a return to the logic of fiscal rule No. 1, which was initially replaced by a discretionary system for distributing oil rents between consumption and savings. The fact that the rule's design, having come full circle, has returned to its original version creates the risk of a repeat of the same development trajectory: under severe constraints, there may be a temptation to abandon automatic mechanisms in favor of more discretionary instruments for determining transfers.

The current fiscal rule, as an element of the institutional environment of a resource-based economy, represents a twofold change. On the one hand, it introduces a significantly stricter limit on the guaranteed transfer from the NFRK. This limitation is clearly quantifiable: while in 2024 and 2025, transfer amounts were 5.60 and 5.25 trln tenge, respectively, in 2026, their volume has decreased to 2.77 trln tenge.

On the other hand, the new fiscal rule does not guarantee countercyclical fiscal policy, as the expenditure limit is tied to historical average growth rates, not the current phase of the economic cycle. Furthermore, retrospective analysis demonstrates that procyclical fiscal policy has traditionally prevailed in Kazakhstan. This propensity for procyclical policy, coupled with the historical practice of frequently amending the fiscal rule, only increases the risk of persisting procyclicality in fiscal policy, in terms of institutional inertia.

As a result, the combination of strict restrictions on the use of oil rents and the procyclical nature of fiscal policy creates the preconditions for the formation of persistent budget imbalances. While these imbalances were previously covered by transfers from the National Fund of the Republic of Kazakhstan, under the current restrictions on the use of oil rents, these imbalances will translate into increased public debt.

Clearly, to meet the intertemporal budget constraint, growing debt can be financed through increased taxation, expenditure sequestration, greater allocation of oil rents to current consumption, growth of the tax base due to accelerated economic growth, and an unexpected increase in inflation that reduces the real value of liabilities. The first two financing methods seem unlikely in Kazakhstan's context due to the fiscal consolidation that began in 2025. The current fiscal rule, as shown earlier, limits the use of oil rents, which rules out the third method. Consequently, only the last two methods of servicing the increased debt are remaining. Since both channels operate by force of endogenous macroeconomic dynamics and do not require direct discretionary adjustments by the fiscal authorities, in this paper they are defined as mechanisms of "self-financing" of public debt.

These circumstances necessitate a quantitative assessment of the share of "self-financing" in the absence of discretionary fiscal adjustment. However, before analyzing these processes, the authors present a retrospective analysis of how Kazakhstan's fiscal policy correlated with

economic cycle phases. This will provide empirical support for the above-stated thesis on the prevalence of procyclical fiscal policy.

Retrospective Analysis of Kazakhstan's Fiscal Policy. To determine whether fiscal policy in Kazakhstan is countercyclical or procyclical, it is necessary to compare the dynamics of the fiscal impulse with the phases of the economic cycle. This approach allows us to determine whether the government implements expansionary or contractionary policies during periods of accelerated or slower economic growth. The analysis below examines the period 2011–2025.

The phases of the economic cycle are determined by the output gap: the deviation of actual GDP from its potential value. A positive output gap indicates economic overheating, while a negative gap means underutilization.

Potential GDP was estimated using the two-sided Hodrick-Prescott filter (HP filter), a one-dimensional time-series smoothing method. Calculations for Kazakhstan were performed using annual GDP data expressed in constant 2005 prices. Since the filter is applied to annual data, the smoothing parameter λ is set to 100. To minimize the classic problem of instability of HP filter estimates at the ends of the sample, forecast GDP values for 2026–2029 were included in the calculation. The forecasts are based on the Focus Economics consensus forecast (April 2026), which projects Kazakhstan's economic growth to be 4.7% in 2026, 4.2% in 2027, 4.0% in 2028, and 3.7% in 2029. The output gap (OG_t) was determined under the following formula:

$$OG_t = \frac{Y_t - Y_t^p}{Y_t^p}, \quad (1)$$

where:

Y_t^p – potential GDP in year t;

Y_t – actual GDP in year t.

Fiscal impulse serves as an indicator of the nature of fiscal policy. A positive impulse (an increasing deficit or a decreasing surplus) means an expansionary policy. A negative impulse (a decreasing deficit or an increasing surplus) points to a contractionary policy.

To accurately assess fiscal impulse, it is important to isolate the government's discretionary decisions from the influence of economic conditions, automatic stabilizers, and fluctuations in global energy prices. To this end, the fiscal impulse in Kazakhstan was calculated based on the dynamics of the structural cyclically adjusted primary balance of the state budget. This indicator takes into account three key adjustments.

Cyclical Adjustment of Revenues and Expenditures. Individual budget items automatically respond to economic conditions, so they were adjusted cyclically according to the following formula:

$$X_t^{CA} = X_t \left(\frac{Y_t^p}{Y_t} \right)^{\varepsilon_{G,Y}}, \quad (2)$$

where:

X_t^{CA} – a cyclically adjusted revenue/expenditure item of the state budget in year t,

X_t – a revenue/expenditure item of the state budget in year t,

$\varepsilon_{X,Y}$ – elasticity of revenues/expenditures to the GDP gap.

On the revenue side, a cyclical adjustment was made to tax revenues excluding export duties on crude oil and revenues from the use of natural and other resources. On the expenditure side, spending on social welfare and social security was adjusted. The elasticity of tax revenues to the output gap was assumed to be equal to 1, and the elasticity of expenditures on social welfare and social security was assumed to be (-)0.1.

Primary Balance Identification. When calculating the budget balance, only primary expenditures were taken into account, defined as expenditures excluding public debt servicing. This allows for an assessment of the government's current fiscal efforts, unencumbered by borrowing decisions made in prior periods.

Adjustment of Oil Revenues. For the purposes of this study, oil revenues are defined as the sum of export customs duties on crude oil and transfers from the NFRK to the national budget, which, according to preliminary data, accounted for 23% of all state budget revenues in 2025.

The dynamics of export customs duties on crude oil depend on the situation in global commodity markets. Thus, as oil prices rise, budget revenues from these duties also increase. Therefore, this factor must be isolated when calculating the fiscal impulse to eliminate the influence of external price volatility on the assessment of the government's discretionary measures.

Unlike duties, the volume of transfers was determined by the government's discretionary decisions. However, this discretionary nature has a counterintuitive logic, violating the traditional relationship between the budget balance and the direction of fiscal policy. For example, if, all other things being equal, the government increases government spending and the volume of transfers by the same amount, the budget balance will formally remain unchanged. However, in reality, aggregate demand from the government will increase while the tax burden remains unchanged, which is consistent with a stimulative policy.

When only transfers increase, which should be interpreted as a stimulative measure, the deficit actually shrinks rather than grows. This inversion makes the standard budget balance an unrepresentative indicator of fiscal momentum. To accurately assess the latter, structural oil revenues were used instead of oil revenues, calculated using the following formula:

$$SOR_q = s_q * Exp_q^{est}; \quad (3)$$

$$Exp_q^{est} = barr_q * p^{cutoff} * USD/KZT_q; \quad (4)$$

$$s_q = \frac{OR_q}{barr_q * p_{q-1} * USD/KZT_q}, \quad (5)$$

where:

q – quarter;

SOR_q – structural oil revenues (mln tenge);

Exp_q^{est} – revenues of crude oil exporters at a cut-off price (mln tenge);

s_q – Kazakhstan's share in oil export proceeds;

$barr_q$ – export volume of crude oil and crude petroleum products extracted from bituminous rocks (mln barrels);

p^{cutoff} – cut-off price (US dollars/barrel);

USD/KZT_q – an average quarterly USD/KZT exchange rate;

OR_q – the sum of direct taxes from organizations in the oil sector and export customs duties on crude oil (mln tenge);

p_{q-1} – an average quarterly Brent oil price (US dollars/barrel).

This system of equations describes structural oil revenues as the budget's share of oil export revenues that would have accrued had crude oil been sold at the cut-off price. This share is calculated as the ratio of actual oil revenues to the estimated revenues of oil exporters. The oil price of the previous quarter was taken into account when determining exporter revenues, as statistical oil export data are reported with a lag of up to 90 days.

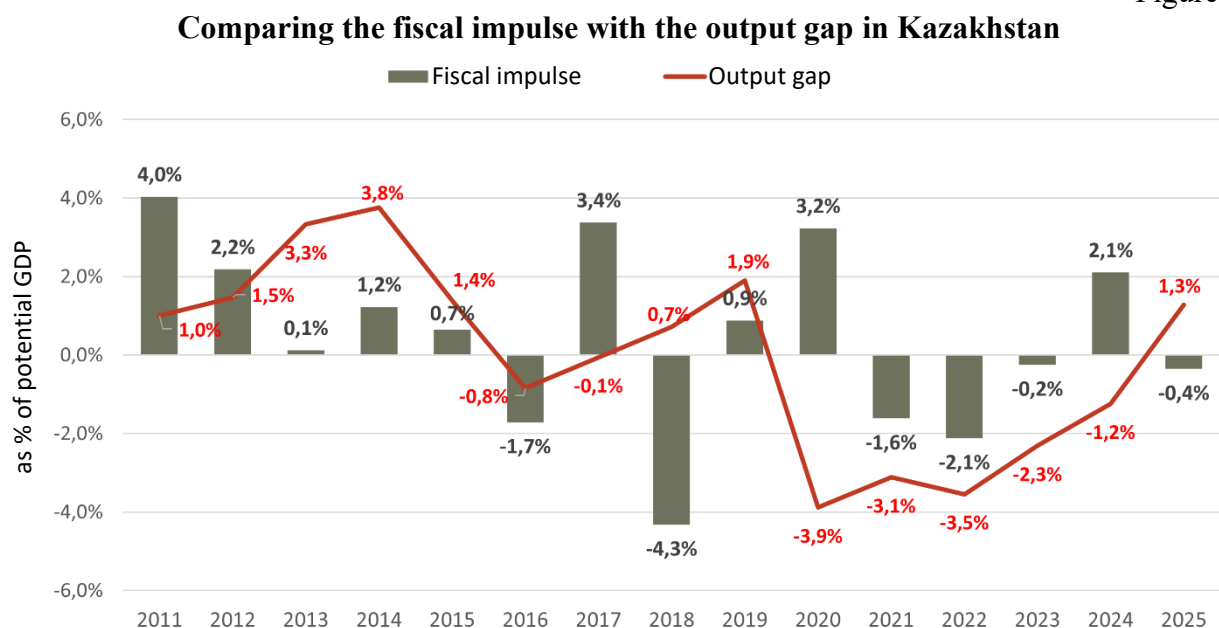
The cut-off price was set in accordance with the rule approved by the order of the Deputy Prime Minister – Minister of National Economy of the Republic of Kazakhstan dated May 12, 2025. Thus, the cut-off price was set at USD45.94 per barrel throughout 2024, and USD41.82 per barrel in 2025, as oil and gas condensate production reached 99.4 million tons.

The resulting fiscal impulse (FI_t) was determined as a change in structural primary balance (Sb_t) in relation to potential GDP, as taken with a reverse sign: $FI_t = -Sb_t + Sb_{t-1}$.

Results and Interpretation. Comparing the fiscal impulse and output gap allows assessing the nature of fiscal policy: opposite signs of the indicators point to countercyclicality, while

coinciding signs mean procyclicality. The calculation results are presented in Figure 2. The analysis showed that procyclical fiscal policy prevailed in Kazakhstan: since 2011, it was observed in 10 of the 15 years under review. Furthermore, the presented calculations indicate that procyclicality is most characteristic of the periods of overheating, when actual GDP exceeds potential. Specifically, out of the 8 years with a positive output gap, stimulatory policy was implemented in 6 cases. Thus, the fiscal authorities exacerbated cyclical fluctuations at a time when the economy was already growing above its potential. It is worth noting that in the last two years of observation, Kazakhstan's fiscal policy began to exhibit countercyclicality. This trend is expected to continue in 2026: a combination of a positive output gap and negative fiscal impulse is predicted. Despite the positive dynamics, there are two critical aspects that call into question the sustainability of this trend. First, the above calculations were based exclusively on the state budget data (the combined national and local budgets). Quasi-fiscal transactions, for which data is extremely limited, are excluded from the analysis. This creates a serious methodological limitation, as a reduction in the state budget deficit could be offset by an increase in quasi-fiscal expenditures. For example, the planned expenditure volume of the "Baiterek" National Investment Holding Company in 2026 is 8 trln tenge, which could significantly shift the final fiscal stimulus towards procyclicality. Second, the expenditure limit does not depend on the current phase of the economic cycle, and Kazakhstan's historical experience speaks for frequent changes to fiscal rules, which, from an institutional inertia perspective, creates the risk of their further revision.

Figure 2



Source: the authors' computations

Thus, Kazakhstan's institutional environment is characterized by a combination of strict formal restrictions on the use of oil resources and a de facto propensity for procyclical expansion of public spending. Given that new fiscal rules limit the NFRK's ability to cover emerging imbalances, debt accumulation is a potential consequence. In this regard, the question of the extent to which this growing debt can be financed not through discretionary fiscal adjustment, but through endogenous economic mechanisms, becomes crucial. Analyzing these processes requires assessing the share of public debt "self-financing", which is the subject of subsequent sections of the paper.

3. Literature Review

In general, the mechanisms for public debt financing can be described through the government's intertemporal budget constraint, represented by the following equation:

$$\frac{B_{t-1}}{P_t} = E_t \sum_{i=0}^{\infty} \frac{s_{t+i}}{\beta^i}, \quad (6)$$

where:

B_{t-1} – nominal level of public debt at end-period $t-1$;

P_t – price level;

$E_t \sum_{i=0}^{\infty} \frac{s_{t+i}}{\beta^i}$ – expected amount of discounted budget surplus.

This equation describes the condition of fiscal sustainability, under which the current real value of government debt must be equivalent to the expected net present value of budget surpluses. If a government spending shock occurs without immediate fiscal adjustment (i.e., without a comparable increase in the tax burden), the right-hand side of the equation contracts. To maintain equality, either an increase in expected budget revenues or a comparable decrease in the left-hand side of the equation, or a combination of both, must be observed.

The mechanisms of the fiscal impulse “self-financing” are fully consistent with the logic of this identity. Accelerated economic growth as a result of the fiscal impulse and the resulting expansion of the tax base increase the right-hand side of the equation, while higher inflation reduces the real value of government debt, decreasing the left-hand side.

The study of the impact of fiscal stimulus on economic activity and inflation is a central topic in macroeconomic literature. The Keynesian approach views government spending as a tool for stimulating aggregate demand, which, under conditions of underutilization of factors of production, price stickiness, and the absence of crowding-out effects, leads to an increase in output and employment.

New Keynesianism complements this analysis with microeconomic foundations, the instrumentality of household intertemporal consumption, and rational expectations of agents, confirming the positive impact of government spending on aggregate output. Galí et al. (2007) demonstrated that in the presence of liquidity-constrained households without access to financial markets, government spending can increase private consumption, enhancing the multiplier effect. Studies by Christiano et al. (2011) and Woodford (2011) demonstrate that the fiscal multiplier can significantly exceed unity in a zero-interest-rate environment. The greater the share of spending carried out during a period when interest rates are unresponsive to inflation, the higher the multiplier. Empirical confirmation of the stimulative effect of spending through the identification of exogenous fiscal shocks was presented in Blanchard and Perotti (2002), where the authors proposed standard methods for estimating fiscal multipliers.

The impact of fiscal stimulus on inflation in the New Keynesian model is interpreted through the aggregate demand channel. Increased government spending increases the output gap, which, given nominal price rigidity, leads to higher marginal costs for firms and accelerated inflation in accordance with the Phillips curve.

Neoclassical literature and real business cycle models point to crowding-out effects. An increase in government spending due to expectations of a future tax increase reduces current household consumption but simultaneously increases labor supply. As a result, output increases on the supply side, and inflationary pressure in these models is limited. An important complementary approach is provided by studies on the nonlinearity of fiscal effects. In particular, Auerbach and Gorodnichenko (2012) showed that the fiscal multiplier is significantly higher during recessions than during periods of economic overheating.

Despite the extensive literature, most studies examine the impact of public finances on inflation primarily through the aggregate demand channel. However, this approach takes less

account of the impact of fiscal policy on public debt dynamics and the persistence of the intertemporal budget constraint.

Of particular interest is the Fiscal Theory of Price Level, which posits that fiscal policy determines inflation dynamics not through demand, but through the condition of equality between the real value of debt and the present value of future surpluses. Within this theory, budget policy acts as an independent factor in prices, especially under a fiscal dominance regime. The foundation of the fiscal theory of price levels was laid in the article by Sargent and Wallles (1981), which formulated the idea that monetary authorities lose control over inflation dynamics in the long run under dominant fiscal policy. The additional assumption of rational expectations of economic agents leads to more rigorous conclusions about the loss of control over inflation already in the short term. The fiscal theory of price levels was further developed in the works of Leeper (1991), Sims (1994), Woodford (1995, 2001), and Cochrane (1998, 2001, 2023). The basic idea of this theory can also be described by the intertemporal budget constraint equation. Moreover, agents' expectations regarding the future trajectory of finances are critical: a deterioration in expectations regarding surpluses requires a compensatory increase in prices to maintain the budget identity.

Within the fiscal theory of price level, two transmission channels are typically distinguished. The first, proposed by Sargent and Wallles (1981), suggests that, under unbalanced fiscal policy, the central bank is forced to monetize public debt to prevent default, leading to an increase in the money supply and inflation. This approach is based on the monetarist idea of the relationship between the money supply and the price level. Under rational expectations, the projected future debt monetization is transformed into price increases in the short term.

The second channel, proposed by Woodford (1995), explains price increases through the wealth effect that households experience as a result of increased public debt. When the budget deficit increases without an increase in budget revenues, economic agents with rational expectations interpret such changes as an increase in their current wealth, perceiving bonds as pure wealth. This is because, with expected disposable income remaining constant, they consume greater volumes of private and public goods. As a result, rising perceived well-being stimulates current consumption, which, given unchanged supply, creates inflationary pressure. Price increases continue until they restore equilibrium through a decline in the real value of household assets.

Thus, when fiscal sustainability declines, price increases become a mechanism for restoring equilibrium. Failure to meet the intertemporal budget constraint is, in the extreme case, equivalent to default, and to prevent it, there are several options for restoring fiscal sustainability: accelerated economic growth, fiscal consolidation, or inflation. The latter mechanism is described by the fiscal theory of prices. The relevance of this theoretical framework is confirmed by the analysis of inflation processes during the COVID-19 pandemic in the works of Bianchi and Melosi (2022) and Bianchi et al. (2023), where the surge in inflation is interpreted as a result of the price level adjusting to accumulated fiscal imbalances. Institutionally, the fiscal theory of prices substantiates the role of transparency and compliance with fiscal rules. Similar to the anchoring of inflation expectations in the targeting regime, stable rules help stabilize agents' expectations regarding the sustainability of public finances. Otherwise, negative expectations can trigger self-fulfilling inflation even with a formally sustainable budget.

To summarize the above, it can be concluded that modern economic thought identifies two non-discretionary channels that ensure fiscal sustainability in the face of exogenous expenditure shocks. The first is the real output channel, implemented through the fiscal multiplier and expansion of the tax base. The second is the inflation channel, which depreciates the value of liabilities in real terms. However, for Kazakhstan's resource-based economy, quantifying the role of these channels remains an open research question. The next section of the paper proposes a DSGE model that allows for the simulation of a fiscal shock and the calculation of the share of the public debt "self-financing" under given macroeconomic parameters.

4. DSGE Model Structure, Parametrization and General Equilibrium

This section presents a New Keynesian DSGE model used to quantify the share of “self-financing” in public debt. The methodological basis is the study by Angeletos, Lian, and Wolf (2024).

The key assumptions of the model are nominal price stickiness and a violation of Ricardian equivalence. The latter is realized through a scenario in which an exogenous shock to government spending is not immediately accompanied by an equivalent increase in the tax burden. This combination allows the fiscal impulse to have a stimulating effect on real economic activity. Furthermore, an important assumption of the model is the condition that the real interest rate exceeds the real growth rate of the economy over the long term ($r > g$). The opposite situation was studied in detail in Blanchard (2019), where the author demonstrated the possibility of issuing debt without a subsequent tax increase (*debt rollover*). Under conditions where the interest rate is lower than the economic growth rate, government borrowing may effectively incur no fiscal costs. The present study, however, allows analyzing the case where $r > g$.

The proposed model examines the dynamic response of macroeconomic indicators to a one-time exogenous shock to government spending in period $t = 0$. Equilibrium conditions allow determining the dynamics of public debt, inflation, and real output in response to the shock, which are used to calculate shares of the shock’s “self-financing”.

Angeletos, Lian, and Wolf (2024) presented results modeling the fiscal adjustment rule using a coefficient of the fiscal adjustment speed varying from 0 to 1, and ignoring government spending. This paper uses a specification with a fiscal adjustment lag measured in quarters and budget expenditure integration.

Households. The behavior of households is formalized through an overlapping-generations (OLG) model with a constant survival probability $\omega \in (0, 1]$, according to Blanchard (1985). In this case, the model specifies the condition $\omega < 1$, which ensures more intensive discounting of future incomes and, as a consequence, a higher marginal propensity to consume.

It is assumed that upon the death of an individual, a new economic agent takes their place. There is no altruism toward future generations, meaning the economic agent does not consider the utility of the individual replacing them.

In accordance with the methodology of Angeletos, Lian, and Wolf (2024), the assumption of equality of dividend income among individuals is adopted. It is also assumed that trade unions establish uniform working hours and equalize disposable wages, resulting in equal incomes and tax payments among agents.

Economic agents maximize the following utility function:

$$E_t \left[\sum_{k=0}^{\infty} (\beta \omega)^k (u(C_{i,t+k}) - v(L_{i,t+k})) \right], \quad (7)$$

where:

β – discount factor.

Utility of consumption (C) and labor (L) are defined by standard functions:

$$u(C) = \frac{C^{1-1/\sigma}}{1-1/\sigma}$$

$$v(L) = \frac{L^{1+1/\varphi}}{1+1/\varphi}$$

where:

σ – elasticity of intertemporal substitution;

φ – elasticity of labor supply.

The budget constraint for individuals is defined by the following equation:

$$A_{i,t+1} = \frac{I_t}{\omega} (A_{i,t} + P_t(W_t L_{i,t} + Q_{i,t} - C_{i,t} - T_{i,t} + S_{i,t})), \quad (8)$$

where:

$A_{i,t}$ – nominal savings of the individual i at the beginning of period t ;

I_t – nominal interest rate;

P_t – price level;

$W_{i,t}$ – salary of the individual i in period t ;

$Q_{i,t}$ – dividends of the individual i in period t ;

$T_{i,t}$ – income taxes of the individual i in period t ;

$S_{i,t}$ – a transfer/contribution to the social fund by the individual i in period t .

The social fund is designed to ensure that all individuals, regardless of their age, have the same wealth and, consequently, consumption in a state of stable equilibrium. Individuals living for more than 1 period make a contribution to the social fund in the amount of S^{old} . The accumulated funds are fully distributed among the new agents, who receive a transfer in the amount of S^{new} . Condition of balanced budget of the social fund is: $S^{new}(1 - \omega) = S^{old}\omega$.

The economy operates under proportional taxation, therefore, $T_{i,t}$ is determined by the rate τ_y , and the equalized wage is described by the following equation:

$$(1 - \tau_y)W_t = \frac{L_t^{1/\varphi}}{\int_0^1 C_{i,t}^{-\frac{1}{\sigma}} di}$$

Firms. The manufacturing sector consists of a continuum of monopolistically competitive firms producing differentiated goods. The production function looks as:

$$Y_t(i) = A_t N_t(i)^{1-\alpha}, \quad (9)$$

where:

A_t – exogenous labor productivity;

$N_t(i)$ – the quantity of labor used;

$1 - \alpha$ – output elasticity of labor.

The pricing mechanism is based on the Calvo model, according to which in each period the firm can revise the price with a fixed probability of $1 - \theta$. Optimal pricing, which maximizes the present value of expected profit, reduces the system to a New Keynesian Phillips curve of the form:

$$\pi_t = \kappa y_t + \beta E_t[\pi_{t+1}] - \kappa \frac{\frac{1}{\sigma}}{\frac{1}{\varphi} + \frac{1}{\sigma}} g_t, \quad (10)$$

where:

π_t – deviation of inflation from stable equilibrium, $\log(\frac{\Pi_t}{\Pi_{ss}})$;

κ – slope of the Phillips curve;

$E_t[\pi_{t+1}]$ – inflation of the period $t+1$ as expected in the period t ;

y_t – deviation of real output from stable equilibrium, $\log(\frac{Y_t}{Y_{ss}})$;

g_t – deviation of government spending from stable equilibrium.

Government. The government in the model is represented by fiscal and monetary authorities.

Fiscal authorities collect taxes, generate a portion of aggregate demand through government spending, and issue risk-free debt securities with a maturity of $T = 1$.

The budget constraint of the fiscal authorities in levels is written as:

$$D_{t+1} = R_t(D_t - T_t + G_t) \left(\frac{E_t[\Pi_{t+1}]}{\Pi_{t+1}} \right), \quad (11)$$

where:

D_t – real cost of public debt at the beginning of period t ;

R_t – real interest rate;
 T_t – real value of tax revenues to the budget during the period t ;
 G_t – real value of public spending during the period t ;
 $E_t[\pi_{t+1}]$ – inflation in the period $t+1$ as expected in the period t ;
 π_{t+1} – actual inflation in the period $t+1$.

This equation demonstrates how unexpected inflation devalues government bonds, acting as a source of “self-financing”. After log-linearization with respect to stable equilibrium, the budget constraint takes the following form:

$$d_{t+1} = \frac{1}{\beta} [d_t - t_t + g_0] + \frac{D^{ss}}{Y^{ss}} r_t - \frac{D^{ss}}{Y^{ss}} (\pi_{t+1} - E_t[\pi_{t+1}]), \quad (12)$$

where:

d_t – deviation of the real public debt from stable equilibrium, $\frac{D_t - D^{ss}}{Y^{ss}}$;

t_t – deviation of tax revenues from stable equilibrium, $\frac{T_t - T^{ss}}{Y^{ss}}$;

g_0 – public spending shock;

D^{ss} – the level of real public debt in stable equilibrium;

Y^{ss} – the level of real output in stable equilibrium;

r_t – deviation of the real interest rate from stable equilibrium, $\log(\frac{R_t}{R^{ss}})$.

Following a government spending shock, fiscal authorities can initiate a retaliatory measure in the form of a discretionary increase in the tax burden. This response is called fiscal adjustment and is carried out to offset the increased spending. The adjustment can be implemented immediately or with a certain time lag. Given the described structure, the fiscal adjustment rule is defined as follows:

$$t_t = \begin{cases} \tau_y y_{i,t}, & t \in \{0, \dots, H-1\} \\ d_t, & t \geq H \end{cases}, \quad (13)$$

where:

H – adjustment lag.

According to this rule, before period H tax revenues are driven by the dynamics of output against a constant tax rate: $t_t = \tau_y y_{i,t}$. In the period H a fiscal adjustment in the form of $t_t = d_t$ is conducted in such a way that public debt comes back to the stable equilibrium level.

Monetary authorities set a nominal interest rate according to the following rule:

$$\frac{I_t}{\pi^{ss}} = R^{ss} E_t \left(\frac{\pi_{t+1}}{\pi^{ss}} \right) \left(\frac{Y_t}{Y^{ss}} \right)^\phi, \quad (14)$$

where:

I_t – nominal interest rate;

ϕ – cyclic response coefficient of the monetary rule.

After the log-linearization, the equation is written as $r_t = \phi y_t$.

Within the framework of this study, the monetary policy is assumed as neutral ($\phi = 0$), which means constancy of the real interest rate regardless of the output gap.

Based on the above system of equations, solutions for the dynamics of real output, public debt, and inflation are presented below.

Solving the household utility maximization problem (7) under a given budget constraint (8), taking into account the fiscal adjustment rule (13) and monetary policy neutrality ($\phi=0$), allows deriving the aggregate demand function:

$$y_t = \chi_{H-t} d_t + g_t, \quad (15)$$

where:

$$\chi_{H-t} = \frac{\frac{(1-\beta\omega)(1-\omega)}{\beta\omega}}{1 + \frac{(1-\beta\omega)(1-\omega)}{\beta\omega} \tau_y} + \frac{\frac{1}{\beta}(1-\tau_y \chi_{H-t})}{1 + \frac{(1-\beta\omega)(1-\omega)}{\beta\omega} \tau_y} \chi_{H-t-1}.$$

From the budget constraint of the fiscal authorities (12), the condition of monetary policy neutrality and the fiscal adjustment rule (13), the equation of the dynamics of real public debt is derived:

$$d_{t+1} = \frac{1}{\beta} (d_t - \tau_y y_t + g_t) - \frac{D^{ss}}{Y^{ss}} (\pi_{t+1} - E(\pi_{t+1})), \quad (16)$$

with $t \in \{0, \dots, H-1\}$.

Starting from period H public debt comes back to stable equilibrium.

Thus, equations (10), (15), and (16) enable to analyze how the lag of fiscal adjustment affects the dynamics of output, inflation, and public debt. Based on these equations, we derive equations for the shares of “self-financing” sources.

The share of “self-financing” from the growth of taxable base:

$$v_y = \frac{\tau_y (\sum_{k=0}^{\infty} \beta^k E_0(y_k))}{g_0} \quad (17)$$

The share of “self-financing” from acceleration of inflation:

$$v_p = \frac{1}{g_0} \frac{D^{ss}}{Y^{ss}} \pi_0 \quad (18)$$

Table 1

Calibration of model parameters

Parameter	Value
β	0.985
κ	0.4
ω	0.9
τ_y	0.2
$\frac{D^{ss}}{Y^{ss}}$	0.3
ϕ	0.0
σ	1.0

The calibration is performed for a small open economy with parameters similar to Kazakhstan. In particular, $\beta = 0.985$, which corresponds to a real annual interest rate of 6.1%. The real rate is assumed constant, i.e., $\phi = 0$. The equilibrium ratio of public debt to GDP is 0.3, the income tax rate is 0.2, and the parameter $\omega = 0.9$.

One of the most significant and difficult to identify parameters influencing the estimate of the share of “self-financing” through inflation is κ , the slope of the Phillips curve. The paper compares two model configurations: $\kappa = 0.1$ and $\kappa = 0.4$. The values are chosen to define a range of possible estimates. The results show that a steeper Phillips curve ($\kappa = 0.4$) leads to an increase in the share of the deficit covered by inflation.

A number of studies (e.g., Baba et al., 2023) show that developing countries are characterized by a steeper Phillips curve slope, reflecting the high sensitivity of inflation to changes in the output gap. Furthermore, the literature specifies that the slope of the Phillips curve depends on the phase of the business cycle (Boehn and Pandalai-Nayar, 2022; Forbes et al., 2021). Specifically, estimates show a decrease in the slope during recessions and an increase during expansions. This circumstance suggests that the empirical estimation of the Phillips curve slope for Kazakhstan is beyond the scope of this paper and requires separate study.

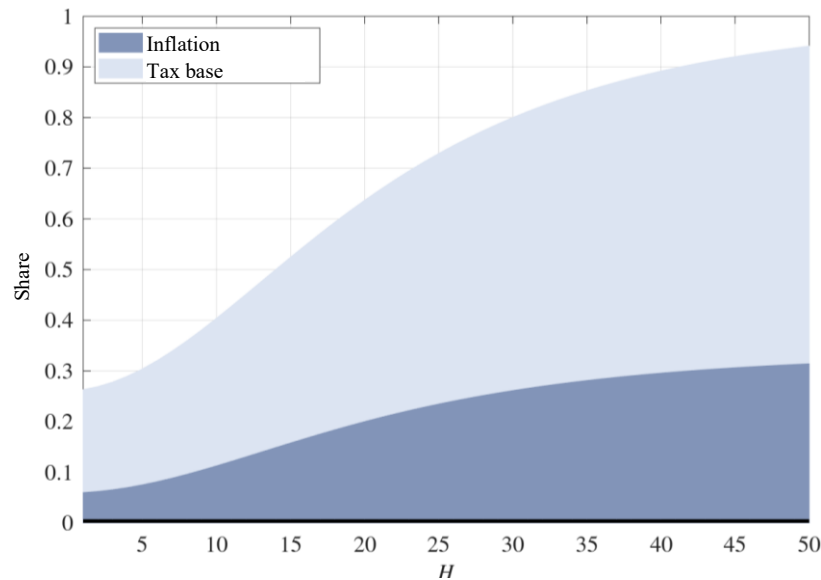
5. Results

The DSGE model presented in the previous section, in combination with the calibration parameters, allows quantifying the share of “self-financing” of exogenous shock to government

spending implemented in the period $t = 0$. Below are the results of calculations depending on the length of the fiscal adjustment lag, starting from the basic specification of the model, in which the Phillips curve slope κ is taken to be equal to 0.4.

Figure 3

The share of “self-financing” of the government spending shock with $\kappa = 0.4$



Source: the authors' computations

According to the estimation results presented in Figure 3, with a given calibration of the model parameters, the channel for expanding the taxable base acquires a dominant role in “self-financing”. The contribution of both channels increases with the increase in the lag of fiscal adjustment. Thus, in the absence of adjustment for 4 quarters after the shock, the total share of “self-financing” is 29.0%, of which 21.9 pp is provided by the growth of the taxable base and 7.1 pp – by the inflation channel. With an increase in the lag to 12 quarters, the corresponding values grow to 45.2%, 32.0 pp and 13.2 pp, and after 16 quarters they reach 54.8%, 38.0 pp and 16.8 pp. With a further delay of fiscal adjustment, the total share of “self-financing” asymptotically approaches 100%, and the share of inflation tends to 33.75%.

“Self-financing” through the tax base expansion channel arises due to the stimulating effect of the fiscal impulse. The individual’s survival probability ω plays a significant role here. Intuitively, the influence of this parameter is explained as follows: as the survival probability decreases, the marginal propensity to consume increases. In response to the increased government spending, the individual increases current consumption, since the expected future fiscal adjustment is less likely to affect them. Consequently, economic agents in this model are less inclined to increase savings in the current period to pay future taxes. Thus, the lower the value of ω , the higher the share of “self-financing” through tax base expansion.

The income tax rate τ_y becomes another determining factor. It determines what portion of the positive output gap will be returned to the budget as tax revenues.

Formulas (10) and (18) provide an idea of the potential for inflationary “self-financing”. This potential is determined by the structural characteristics of the economy, including the public debt-to-GDP ratio in steady-state equilibrium and the Phillips curve slope. Thus, the higher the debt level relative to GDP in steady-state equilibrium, the greater the volume of bonds that depreciate with the same unexpected price surge. In the low-debt economy, even high inflation is unable to provide significant support for debt financing, whereas with a high debt-to-GDP ratio, the inflation channel has a high return. In turn, the Phillips curve slope determines what portion of the positive output gap is transformed into inflation.

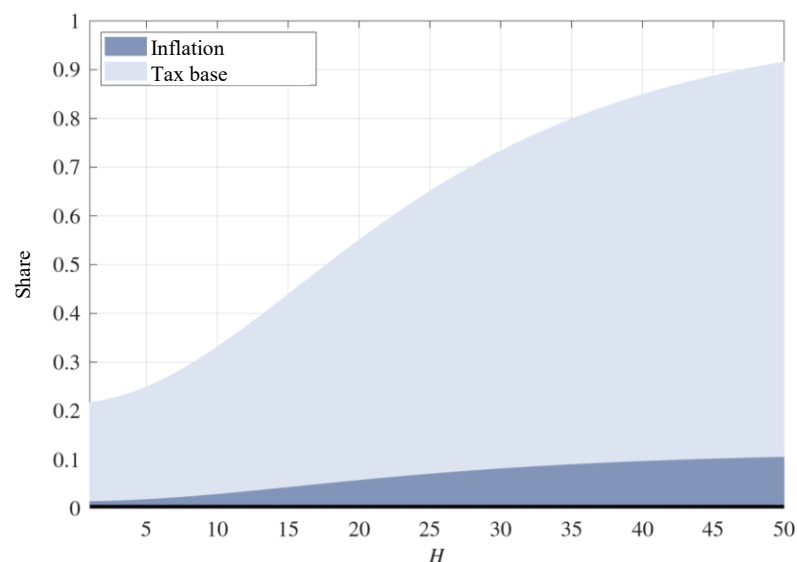
It is important to emphasize that, under inflationary “self-financing”, only the jump in inflation in the zero period, immediately at the moment of the fiscal shock, becomes significant. Under equilibrium conditions, inflation is expected, and rational agents, when purchasing government bonds, factor a premium into the nominal interest rate to compensate for the expected depreciation of money. Thus, expected inflation does not ensure the government’s “self-financing”. However, when a government spending shock materializes, the initial jump in inflation is unexpected, allowing for a one-time depreciation of accumulated liabilities at previously fixed rates. After the shock materializes, agents adjust their expectations, and subsequent inflation dynamics become predictable. Equation (18) confirms this thesis, indicating that real debt is reduced solely by the amount of unexpected inflation.

The role of fiscal adjustment in this system manifests itself through the wealth effect. The longer the adjustment lag, the less weight future taxes have for current consumers due to discounting. As a result, an increase in spending with deferred taxes is perceived by agents as a greater increase in net wealth. This causes a larger increase in aggregate demand and, according to the Phillips curve equation (10), a stronger initial price hike. Thus, delaying fiscal consolidation increases the contribution of both “self-financing” channels.

Considering an alternative specification with a flatter Phillips curve ($\kappa = 0.1$) does not fundamentally change the findings (Figure 4). As the lag increases, the overall share of “self-financing” increases, while the dominance of the tax base channel remains. The main difference lies in a significant reduction in the effectiveness of the inflation mechanism: with an adjustment lag of 16 quarters, inflation financing covers only 4.7% of the shock. In this specification, the overall share of “self-financing” also asymptotically approaches 100%, but the contribution of inflation decreases to 11.74%.

Figure 4

The share of “self-financing” of the government spending shock with $\kappa = 0,1$



Source: the authors' computations

6. Conclusion

This study demonstrated that Kazakhstan’s fiscal framework, despite the evolution and consolidation of budget rules in the Budget Code, does not preclude procyclicality in budget policy. A retrospective analysis for 2011–2025 empirically confirmed that in 10 out of 15 years, fiscal policy exacerbated cyclical fluctuations, which was most pronounced during periods of a positive output gap. Under the conditions of restrictions on the use of oil rents that came into effect in 2026, maintaining a procyclical fiscal policy creates the preconditions for accelerated growth

of public debt. This circumstance increases the relevance of studying the macroeconomic consequences and debt servicing mechanisms. Since the current budget rule significantly limits the volume of transfers from the NFRK, and another increase in the tax burden and expenditure sequestration appear unlikely in the medium term, this paper analyzed non-discretionary debt financing methods.

The New Keynesian DSGE model examined in this paper allowed to quantitatively identify two channels of fiscal shock “self-financing”: expansion of the tax base due to the stimulating effect of government spending and the depreciation of liabilities through unexpected inflation. The results showed that, with the baseline calibration ($\kappa = 0.4$), the tax channel is the dominant instrument. With a fiscal adjustment lag of 16 quarters, the total share of “self-financing” reaches 54.8%, of which 38.0 pp is provided by output growth and 16.8 pp by the inflation tax. It was also found that effectiveness of the inflation channel is directly proportional to the Phillips curve slope and the equilibrium ratio of public debt to GDP. When fiscal adjustment is lagged, the share of “self-financing” asymptotically approaches 100%, while the share of the inflation channel reaches 33.75%.

The obtained results allow formulating important conclusions for macroeconomic policy. A government spending shock can be fully “self-financed” owing to the positive impact of the fiscal impulse on economic growth dynamics (66.25% of the contribution) and the depreciation of bonds as a result of unexpected inflation (33.75%). Formally, this does not require fiscal authorities to increase tax rates or employ other discretionary consolidation measures.

However, two important reservations should be expressed. First, the modeling shows that full “self-financing” is achieved over a long-term horizon – more than 50 quarters after the government spending shock. Second, the results are obtained for a one-time shock. In the case of periodic recurrence of shocks, multiple increases in spending will lead to a significant deviation of government debt from its stable equilibrium (specified in the model at 30% of GDP). As a result, “self-financing” will appear to be unable to contain the growth of government debt.

Although Kazakhstan’s current public debt level (24.3% of GDP) does not pose an immediate threat to fiscal sustainability, the current fiscal rule, which imposes a cap on the NFRK transfers and does not preclude procyclicality, creates prerequisites for accelerated public debt growth.

It is important to note that these findings should not be interpreted as an argument for easing restrictions on the use of oil transfers. Instead, improving the countercyclical design of fiscal rules should be a priority. This implies using a cut-off price not to determine annual transfers from the NFRK, but to shape its stabilization function, define fiscal benchmarks and anchors, expand the scope of the rules to the quasi-public sector, increase transparency and fiscal discipline, engage the private sector in the formulation of medium-term fiscal policy, and institutionalize tax forecasting in accordance with international practice (tax policy units). As an additional constraint, the possibility of introducing a limit on the structural budget deficit should be explored. A World Bank study (2026) based on data from 116 countries shows that deficit-limiting rules are the most effective in improving the cyclically adjusted primary balance. Such rules maintain their positive effects even in the presence of weak institutions and are often applied in conjunction with debt and expenditure growth caps.

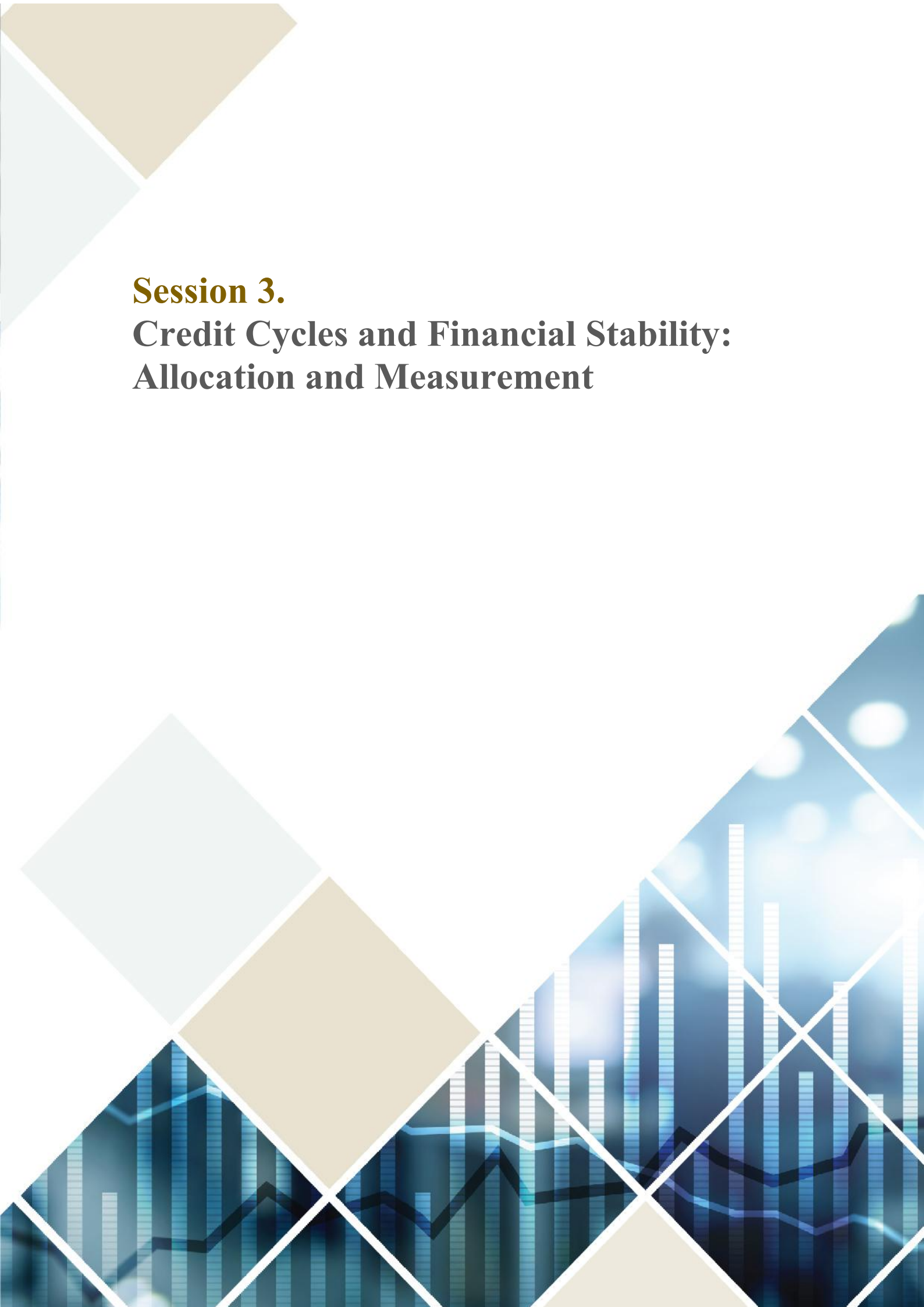
Further research on this topic could focus on a more accurate empirical assessment of the Phillips curve slope for different phases of Kazakhstan’s business cycle, which would allow for a more precise determination of the limits of “self-financing” of fiscal impulses.

References

1. Angeletos, G.-M., Lian, C., & Wolf, C. K. (2024). Can deficits finance themselves? *Econometrica*, 92(5), 1351-1390.

2. Auerbach, A. J., & Gorodnichenko, Y. (2012). Measuring the output responses to fiscal policy. *American Economic Journal: Economic Policy*, 4(2), 1-27.
3. Baba, C., Duval, R., Lan, T., & Topalova, P. (2023). The inflation surge in Europe (IMF Working Paper No. WP/23/30). International Monetary Fund.
4. Bianchi, F., Faccini, R., & Melosi, L. (2023). A fiscal theory of persistent inflation. *The Quarterly Journal of Economics*, 138(4), 2127-2179.
5. Bianchi, F., & Ilut, C. (2017). Monetary/fiscal policy mix and agent's beliefs. *Review of Economic Dynamics*, 26, 113-139.
6. Bianchi, F., & Melosi, L. (2022). Inflation as a fiscal limit (Working Paper No. 2022-37). Federal Reserve Bank of Chicago.
7. Blanchard, O. J. (1985). Debt, deficits, and finite horizons. *Journal of Political Economy*, 93(2), 223-247.
8. Blanchard, O., & Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *The Quarterly Journal of Economics*, 117(4), 1329-1368.
9. Blanchard, O. J. (2019). Public debt and low interest rates. *American Economic Review*, 109(4), 1197-1229.
10. Boehm, C. E., & Pandalai-Nayar, N. (2022). Convex supply curves. *American Economic Review*, 112(12), 3941-3969.
11. Christiano, L., Eichenbaum, M., & Rebelo, S. (2011). When is the government spending multiplier large? *Journal of Political Economy*, 119(1), 78-121.
12. Cochrane, J. H. (1998). A frictionless view of U.S. inflation. *NBER Macroeconomics Annual*, 13, 323-384.
13. Cochrane, J. H. (2001). Long-term debt and optimal policy in the fiscal theory of the price level. *Econometrica*, 69(1), 69-116.
14. Cochrane, J. H. (2023). *The fiscal theory of the price level*. Princeton University Press.
15. Forbes, K., Gagnon, J., & Collins, C. G. (2021). Low inflation bends the Phillips curve around the world (NBER Working Paper No. 29323). National Bureau of Economic Research.
16. Galí, J., López-Salido, J. D., & Vallés, J. (2007). Understanding the effects of government spending on consumption. *Journal of the European Economic Association*, 5(1), 227-270.
17. Leeper, E. M. (1991). Equilibria under 'active' and 'passive' monetary and fiscal policies. *Journal of Monetary Economics*, 27(1), 129-147.
18. Sargent, T. J., & Wallace, N. (1981). Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*, 5(3), 1-17.
19. Sims, C. A. (1994). A simple model for study of the determination of the price level and the interaction of monetary and fiscal policy. *Economic Theory*, 4(3), 381-399.
20. Woodford, M. (1995). Price-level determinacy without control of a monetary aggregate. *Carnegie-Rochester Conference Series on Public Policy*, 43(1), 1-46.
21. Woodford, M. (2001). Fiscal requirements for price stability. *Journal of Money, Credit and Banking*, 33(3), 669-728.
22. Woodford, M. (2011). Simple analytics of the government expenditure multiplier. *American Economic Journal: Macroeconomics*, 3(1), 1-35.
23. World Bank. (2026). *Global economic prospects*, January 2026. World Bank.
24. Bekishev, R. A., Park, E. A., & Aigazin Zh. Zh. (2023). Assessing the Fiscal Multiplier for the Kazakh Economy. *Economy: Strategy and Practice*, 18(3), 251-267.
25. Zhakupova, M. M., & Khanetova, A. B. (2023). Parameters of Kazakhstan's Fiscal Policy.

26. The Order of the Deputy Prime Minister – Minister of the National Economy of the Republic of Kazakhstan dated May 12, 2025 No. 26. (2025).
<https://adilet.zan.kz/rus/docs/G25NT000026/info>.



Session 3.

Credit Cycles and Financial Stability: Allocation and Measurement

Distribution of Credit Resources Across Economic Sectors and Financial Stability

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Credit is traditionally viewed as a key tool for stimulating economic activity. However, its impact is ambiguous: on the one hand, expanding access to borrowed funds promotes investment, consumption growth, and production development. On the other hand, excessive concentration of loans in certain segments can exacerbate imbalances and undermine financial stability.

In recent years, the Kazakh economy has seen a significant shift in the lending structure: the retail segment is demonstrating higher growth rates than the corporate segment. While loans to businesses previously accounted for the major part of the loan portfolio, consumer lending is now becoming more prominent. As of March 1, 2026, the share of consumer loans reached 62.1% of the total portfolio, while loans to businesses accounted for 37.9%. An analysis of the sectoral distribution of lending will help identify potential risks to the system stability and sustainable economic growth.

Key Words: lending to the economy, lending structure, financial stability.

JEL Classification: E51, G32.

1. Literature Review

In our paper, we build on the findings of Müller and Verner (2024) to further analyze the role of sectoral composition of lending in financial stability and systemic risk.

Based on a detailed database for 116 countries from 1940 to 2014, Müller and Verner (2024) show that lending to households and businesses in the non-tradable sector (e.g., construction, real estate, and consumer services) is associated with a higher probability of financial crises, a decline in productivity, and lower economic growth. In contrast, increased lending to the tradable sector (industry, agriculture, and mining) promotes sustainable economic growth without increasing systemic risk. The authors explain this by three factors: first, excessive demand growth financed by the credit market leads to economic overheating; second, households and non-tradable sectors are more vulnerable to changes in financing conditions; third, reallocation of resources from more productive tradable industries to less efficient sectors reduces the overall level of productivity.

Other studies also highlight the importance of differences in lending sectors in the creation of financial imbalances. For example, Büyükkarabacak and Valev (2010) argue that the expansion of household lending is a statistically and economically significant predictor of banking crises; the impact of corporate lending is also associated with crises, but is weaker and less persistent. Jordà et al. (2022) conclude that, unlike household debt, corporate debt does not lead to financial instability and a protracted recovery; however, weak mechanisms of corporate debt resolution contribute to lower investment, the persistence of “zombie firms”, and a slower economic recovery. Mamonov and Pestova (2022) show that the economic response of a boom followed by a bust (the so-called “boom-bust” dynamics) is characteristic exclusively of the expansion of household lending, especially if it is caused by aggregate demand shocks in developed countries.

At the same time, rising corporate lending doesn't trigger a boom-and-bust effect, but rather immediately increases the risk of recession due to an exogenous easing of lending conditions by banks. Müller (2022) notes that rising debt burdens in the real estate sector – both household and corporate – often precede episodes of financial instability. Mian et al. (2017) show that growing global household debt relative to GDP predicts a slowdown in global economic growth in the medium term. Moreover, the relationship identified using data prior to 2000 accurately reflects the actual decline in global growth after 2007, which is associated with a sharp increase in household debt in the early and mid-2000s.

2. Data

Financial Stability Index. As a proxy for financial stability, we use the Financial Stability Index (FSI), calculated quarterly from 2007 to 2024. This indicator is a composite index consisting of macroeconomic and financial indicators for quantifying financial stress, enabling to determine the overall level of risk in the system and identify key factors affecting financial stability. The FSI is based on indicators from five sectors: monetary, financial, external, household, and corporate. The FSI calculation methodology was first published in the Financial Stability Report of Kazakhstan for 2022, after which the data is regularly published in subsequent reports.

It should be noted that, starting in 2023, information on the Financial Vulnerability Index (FVI) has been also published. It was developed to assess and identify potential risks over the medium and long term by measuring the financial system's vulnerability to internal and external shocks. The index is calculated based on a wide range of factors, including the size of debt in credit markets, which is also an early indicator of imbalances. Since the FVI is an early warning indicator reflecting, among other things, lending dynamics, this study decided to use the FVI as an indicator of the actual state of financial stability in the system.

Loans. We look at loans of Kazakhstan's second-tier banks by economic sector as key explanatory variables. The aggregated sectoral lending indicators distinguish between loans to households and businesses, including individual entrepreneurs. Specifically, we specify lending to industry, agriculture, construction, transport, communications, and wholesale and retail trade. We further combine the industry and agriculture into the "tradable sector" category, and classify the remaining industry groups as the "non-tradable sector", as Müller and Werner (2024) did in their study, as well as other researchers in their work on international macroeconomics. For a more detailed analysis, we also categorize loans to households by purpose: mortgage lending, consumer lending, and other types of loans.

Macroeconomic Data. The study uses official data on gross domestic product (GDP), calculated using the production method, published by the Office for National Statistics. The analysis is based on quarterly GDP values at current prices, aggregated to an annualized rate. In the empirical analysis, we examine the credit-to-GDP ratio across the following segments: household loans, business loans in the tradable sector, and business loans in the non-tradable sector.

3. Methodology

This study uses the local projections (LP) approach proposed by Jorda (2005) and applied by Müller and Werner (2024) to estimate the dynamic impact of changes in sectoral credit allocation on financial stability. This method was chosen owing to its advantages when working with small samples and analyzing causal inferences. The LP approach is robust to model misspecification: it estimates impulse response coefficients directly for each horizon, avoiding the error accumulation that is typical of recursive VAR forecasts, where any specification error leads to incorrect estimates with increasing horizon. Although LP estimates have higher variance, they provide low bias and, therefore, more robust inferences, particularly with respect to uncertainty estimation. This makes LP the preferred tool in cases where the accuracy of estimating the dynamic causal effect is important. In the context of our study, which aims to identify the impact of credit

allocation shocks on financial stability, the lower bias and greater flexibility of the LP method make it more robust and suitable than the VAR. To estimate the local projection equations, we use the Newey-West HAC Covariance Matrix Estimation (HAC Covariance Matrix Estimation), which ensures that standard errors are robust to heteroscedasticity and autocorrelation of the residuals.

To identify the effects of credit allocation on financial stability, we construct impulse responses based on local projections, varying the specification of credit allocation:

$$\Delta \text{IFSC}_{t+h} = \sum_{j=0}^J \beta_{h,j}^k \Delta d_{t-j}^k + \sum_{j=0}^J \gamma_{h,j} \Delta \text{IFSC}_{t-j} + \epsilon_{t+h},$$

where:

ΔIFSC_{t+h} – a change in the composite financial stability index from time t to time $t+h$;

Δd_{t-j}^k – a change in loans in sector k in relation to GDP from time $t-1$ to time t ;

$h = 1, \dots, H$ – projection horizons.

It is noteworthy that this study does not attempt to differentiate or analyze the factors that determine lending dynamics. Our primary focus is on assessing the dynamic response of the financial stability index to the increased lending activity across economic sectors, regardless of the factors that influenced its growth, whether changes in demand or supply.

In the baseline model, additional control variables are not included for several reasons. First, the specification already factors in the lags in the financial stability index itself, allowing for control over its own dynamics and reducing the risk of error autocorrelation. Second, given a limited sample, adding controls increases the dimensionality of the system, and multicollinearity, and reduces the precision of the estimates, making it difficult to identify specific credit shocks. Third, the composite financial stability index itself aggregates a broad set of macro- and financial indicators from five key economic sectors. Therefore, its dynamics already reflect underlying macro-financial conditions, and the model's response can be interpreted as based on these conditions, reducing the need to include additional macroeconomic variables as controls.

We would like to highlight the difference in data frequency and forecast horizons. Müller and Werner (2024) use annual series; they estimate responses over a horizon of up to 10 years ($H = 10$) and take approximately five lags ($J = 5$) based on the fact that credit expansions typically last 3–4 years, after which growth slows and output declines. Our study uses quarterly data. The local projection horizon is set at $H = 16$ quarters (4 years), which allows capturing the short- and medium-term phase of shock transmission and in parallel avoid long horizons, where the uncertainty of estimates increases significantly. The lag order chosen is $J = 4$ (one year), which ensures that inertia and possible seasonality are taken into account without excessive parameterization.

4. Results

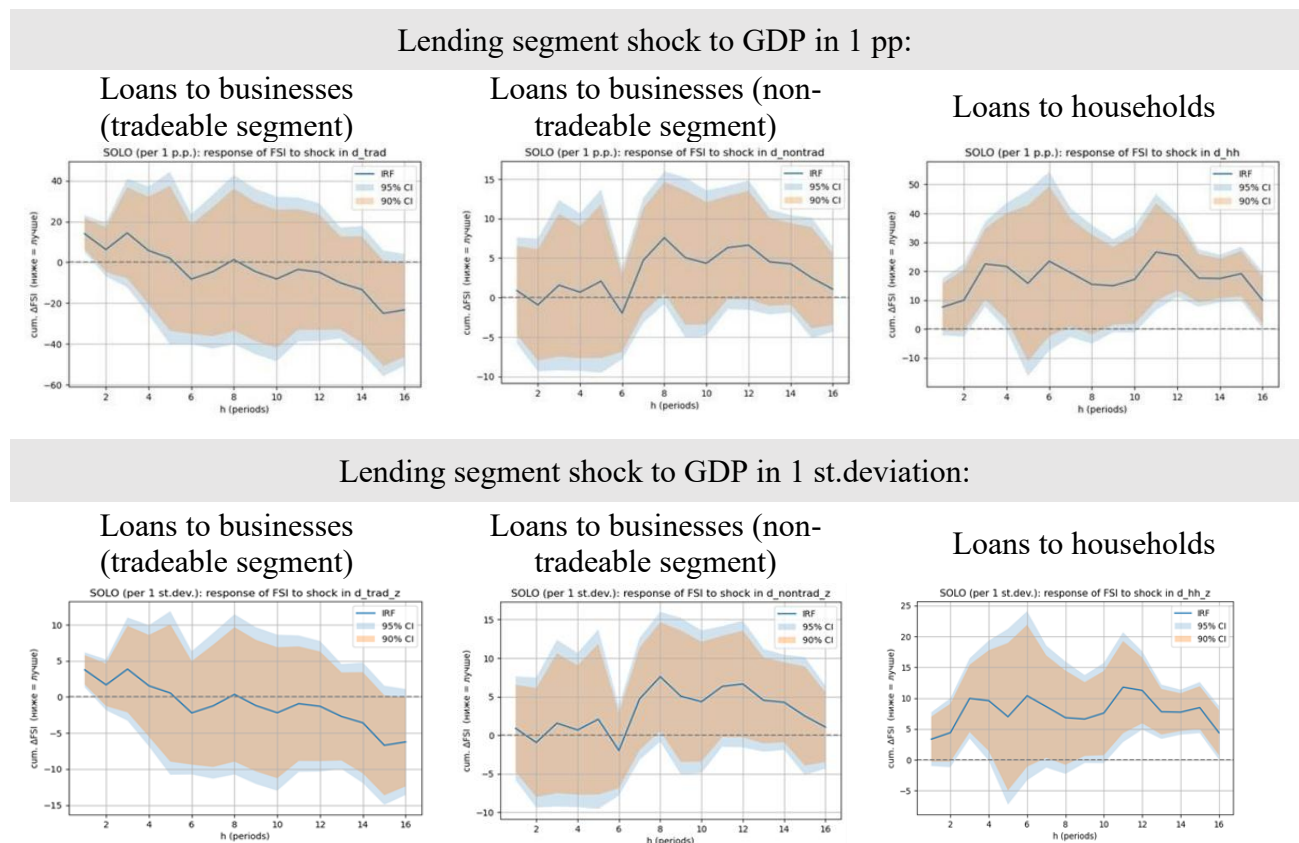
Local projection estimates show that the structure of credit growth matters for financial stability. For example, impulse responses obtained using local projections demonstrate that expansion of lending to households and the non-tradable sector is accompanied by a slight deterioration in the FSI, while loans to the tradable sector have a more stabilizing effect and indicate a reduction in financial stability risks (an increase in the FSI points to the heightening of financial stability risks, while its reduction indicates a decrease). Moreover, the confidence intervals for some horizons include zero, limiting the statistical significance of the results. This is largely due to the limited sample size: the period from Q4 2008 to Q1 2025 includes only 66 quarters, and taking into account the use of lags and the forecast horizon, the effective number of observations is reduced to approximately 40–45, leading to wide variation in estimates and a lower significance of statistical tests. Nevertheless, the identified patterns persist across various specifications and are consistent with both economic logic and the results of other studies.

Therefore, despite the limited sample size and the partial overlap of confidence intervals with zero, the effects obtained can be interpreted as economically significant.

Analyzing the response of the FSI to individual lending segments, we observe differences in the response dynamics. For the tradable sector, after a short-term increase in the FSI level over a horizon of $h = 1-3$, the effect becomes negative and persists until the end of the period, indicating a reduction in the overall risk level. Thus, over a horizon of $h = 16$ quarters, an increase in the share of tradable sector loans in GDP by 1 pp demonstrates a stabilizing effect and is accompanied by a decrease in the FSI by approximately 20 pp (with a shock of 1 standard deviation, a decrease of more than 5 pp). In the non-tradable sector, by contrast, a short-term decrease in risk levels gives way to an increase in them over medium horizons. Over the interval of $h = 7-13$ quarters, an increase in the share of non-tradable sector loans in GDP by 1 pp is associated with an increase in the FSI by 5 pp or more (with a shock of 1 standard deviation, similar dynamics are observed). Despite the lack of statistically significant results for the tradable and non-tradable segments, the results allow assessing the dynamic relationship, demonstrating the multidirectional nature of the effects. In the case of an increase in the share of household lending in GDP, a positive cumulative response is observed already at early horizons (a statistically significant increase is observed at the third-quarter horizon) and reaches a maximum at $h = 11$ (an increase in the FSI level of more than 25 points for a 1-pp shock and over 11 points for a 1-standard-deviation shock).

Figure 1

Impulse responses from FSI to shocks in the lending segments



Source: constructed by the authors based on the NBK data

It is important to mention the differences in interpretation of impulse responses across sectors. In the non-tradable segment, a short-term reduction in risks (up to $h = 4$) may be associated with higher loan turnover in the trade, construction, services, and transportation sectors, which allows for faster revenue generation and debt servicing. However, over the medium and long term, risks increase due to the domestic market overheating and a lack of foreign exchange earnings. In

the tradable sector, by contrast, a short-term increase in the FSI (up to $h = 3$) reflects high capital intensity and debt burden at the initial stage of investment, while in the long term, loans contribute to production expansion, growth in export potential, and foreign exchange earnings, which strengthens financial stability.

The results obtained are also consistent with the findings of the international literature regarding the impact of sectoral lending allocation on systemic risks in the banking sector. Specifically, the reduction in vulnerabilities in the tradable sector is consistent with arguments about the stabilizing role of export earnings and high-quality collateral in this segment, while the increase in risks in the non-tradable sector and households is consistent with research on the procyclicality of domestic demand, overheating of the real estate and services markets, and the high sensitivity of the debt burden in these segments to interest rates.

5. Findings

The results demonstrate that the sectoral composition of lending can play a significant role in ensuring financial stability. Rapid expansion of lending to the non-tradable sector and households can pose procyclical risks and increase the economy's sensitivity to fluctuations in domestic demand. At the same time, lending to the tradable sector has a stabilizing effect in the long term by expanding export potential and strengthening external sources of income. These findings do not imply that lending should be concentrated exclusively in certain segments; balance and constant monitoring of potential overheating arising from excessive resource concentration are essential. Structural changes in the economy must also be taken into account: export potential can manifest itself not only in the industry and agriculture, but also in emerging sectors. Overall, the results highlight the need to monitor not only aggregate lending indicators but also its distribution across segments, as the speed and quality of credit growth have a key impact on risk dynamics.

One limitation of the study is the relatively short historical data series; with a longer data series, the estimates may become more reliable and allow for a more comprehensive understanding of structural relationships. Furthermore, it would be appropriate to examine this issue taking into account the role of development institutions and specialized financial organizations that directly provide credit resources to the corporate sector and can influence risk distribution. It seems promising to study the sectoral distribution of the total credit market volume, taking these factors into consideration, and its relationship with financial stability.

References

1. Karsten Müller and Emil Verner. (2024). *Credit Allocation and Macroeconomic Fluctuations*. The Review of Economic Studies, 91 (6), 3645-3676. <https://doi.org/10.1093/restud/rdad112>
2. Berrak Büyükkarabacak, Neven T. Valev. (2010). *The role of household and business credit in banking crises*. Journal of Banking & Finance, 34 (6), 1247-1256. <https://doi.org/10.1016/j.jbankfin.2009.11.022>.
3. Òscar Jordà, Martin Kornejew, Moritz Schularick, Alan M Taylor. (2022). *Zombies at Large? Corporate Debt Overhang and the Macroeconomy*. Review of Financial Studies, 35(10), 4561–4586. <https://doi.org/10.1093/rfs/hhac018>
4. Mamonov, Mikhail and Pestova, Anna. (2022). *Bank Credit and the Risk of Recession: The Role of Business Cycle Shocks*. SSRN Working Paper No. 4118596. <https://dx.doi.org/10.2139/ssrn.4118596>
5. Müller, Karsten. (2023). *Sectoral Credit Booms and Financial Stability*. B Leveraged: The New Economics of Debt and Financial Fragility. University of Chicago Press. <https://doi.org/10.7208/chicago/9780226816944.003.0012>

6. Atif Mian, Amir Sufo, Emil Verner. (2017). *Household Debt and Business Cycles Worldwide*. The Quarterly Journal of Economics, 132 (4), 1755-1817.
<https://doi.org/10.1093/qje/qjx017>

Measuring Credit Gaps: A Restricted Hodrick-Prescott Filter Approach

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An analysis of the credit activity dynamics in various countries raises key questions about whether the current phase of credit growth can be classified as expansionary and what stage of the credit cycle the respective economies are in. Answers to these questions are critical for monetary and macroprudential regulators: timely identification of a phase of excessive lending allows for proactive corrective measures aimed at mitigating accumulated systemic risks and preventing credit booms that could undermine macrofinancial stability.

Empirical studies demonstrate a consistent link between periods of sharp credit growth and subsequent financial crises. For example, Kaminsky et al. (1998), Kaminsky and Reinhart (1999), Borio and Lowe (2002a), Borio and Lowe (2002b), Alessi and Detken (2011), Jorda et al. (2011), Gourinchas and Obstfeld (2012), Mendoza and Terrones (2012), and Schularick and Taylor (2012) convincingly demonstrate that indicators of excessive credit growth can detect early signs of growing vulnerabilities in the financial system.

One of the most recognized and widely used early warning signals is the credit gap – a measure defined as the deviation of the actual credit-to-GDP ratio from its estimated long-term trend. Proposed by Borio and Lowe (2002a) and later institutionalized under the Basel III agreement, the credit gap not only identifies phases of abnormal credit expansion but also quantifies the degree to which the financial system deviates from its stable equilibrium.

Despite its widespread popularity and acceptance by regulators, the Bank for International Settlements (BIS)-recommended credit gap calculation method, based on the one-sided Hodrick–Prescott (HP) filter with a smoothing parameter of $\lambda=400,000$ (Hodrick and Prescott, 1997; BCBS, 2010), has been heavily criticized by both academic community and practicing economists. The criticism focuses on several key aspects: the statistical properties of the filter itself, its dependence on cycle length assumptions and the choice of the smoothing parameter, and the practical challenges associated with its implementation in real time (Edge and Meisenzahl, 2011; Drehmann and Tsatsaronis, 2014; Bezborodova and Novopol'tsev, 2017; Deryugina and Ponomarenko, 2017; Hamilton, 2018).

The BIS-recommended approach is used as the basic methodology in this paper. Given the known constraints of this approach, the paper additionally calculates the credit gap using a two-sided HP filter. Comparing the results allows identifying differences in the dynamics of the trend components and assessing the impact of the filter choice on the credit gap estimate. The two-sided HP filter, using all available information, including future observations, provides a more accurate retrospective estimate of the trend component. However, when new data arrives, it recalculates the trend for the entire time series. Unlike the two-sided HP filter, the one-sided HP filter guarantees that the trend component calculated at time t will not be revised in the future. This ensures the consistency and reproducibility of regulatory decisions in real time.

The main contribution of this paper is the proposal of a modified approach to calculating the credit gap, combining the advantages of one- and two-sided HP filters. Specifically, we

propose using the one-sided HP filter with linear constraints on the trend component, generated expertly based on the dynamics of the two-sided HP filter. To decide whether such constraints are necessary, a criterion based on bootstrap replications was developed: if the difference between the estimates of the one- and two-sided HP filters is statistically significant, then constraints are introduced into the one-sided model during periods of deviation.

Special attention is paid to finding the optimal value of the smoothing parameter λ based on an analysis of the credit cycle duration in the economy. The BIS recommendation to use a smoothing parameter of $\lambda = 400,000$ for quarterly data assumes that the average duration of the credit cycle is approximately 30 years (BCBS, 2010; Galán, 2019). However, empirical studies show that this assumption is not always correct, and all agree that the cycle is significantly shorter. One approach to optimizing λ is based on the analysis of the spectral density of the time series. Applying this approach to each of the EFSD member countries analyzed, optimal values of the λ parameter were determined (from 173 for Kazakhstan to 523 for Russia, corresponding to a credit cycle length of 4 to 7 years, respectively). This confirms the thesis that there is no universal parameter and that it needs to be calibrated to the specific credit cycle of each individual economy.

Furthermore, the paper proposes a solution to the “endpoint” problem by forecasting the dynamics of the credit-to-GDP ratio at least two quarters in advance. To generate such forecast, the paper proposes using an ARIMA(p,d,q) model supplemented with a residual bootstrapping procedure. The median value from the distribution of bootstrapped realizations is used as the point forecast for filtering purposes.

To enhance the practical significance of the paper, we proposed an algorithm for estimating the credit gap, comprising six sequential steps: from data preparation and determining the optimal parameter λ to applying one- and two-sided HP filters with expert constraints. Based on actual data, it was demonstrated that our approach yielded balanced and more robust credit gap estimates for EFSD member countries. Thus, the approach proposed in the paper is aimed at increasing the stability, interpretability and operational applicability of the credit gap in real time, which is especially relevant for countries with relatively short and volatile time series (characteristic of many developing economies).

Key Words: credit gap, credit cycle, Basel III, trend, Hodrick-Prescott Filter, expert constraints, bootstrap modeling.

JEL Classification: C18, C22, E32, E44, E58, G01, G28.

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Session 4.

Kazakhstan's Capital: Macro and Micro Outlook



External and Internal Shocks as the Drivers of Sovereign Credit Risk of Kazakhstan: Empirical SVAR-Based Analysis of CDS

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This study provides a structural analysis of the factors influencing the dynamics of Kazakhstan's sovereign credit default swaps (SCDS) using a SVAR model. Using monthly data for 2018–2025, the impact of external shocks (oil prices, global VIX volatility) and domestic macroeconomic conditions (business activity index, inflation, exchange rate, and money market rate) is assessed. The results show that oil and currency shocks, as well as global uncertainty, are the key drivers of SCDS, while the impact of domestic inflation and monetary shocks is limited to the short-term horizon. This paper presents the first structural assessment of the determinants of Kazakhstan's sovereign risk and highlights the importance of managing commodity and currency risks for enhancing the country's financial resilience.

The author expresses gratitude to the Monetary Operations Department of the National Bank of Kazakhstan for providing data and methodological support in preparing this study. Special thanks to colleagues B. A. Vakhidov, D. A. Ayubaev, and E. E. Arnabekova for valuable comments, discussions, and expert opinions that contributed to improving the analytical portion of the study. Responsibility for the interpretation of results and any potential inaccuracies rests entirely with the author.

Key Words: sovereign credit default swaps (CDS); oil shocks; global volatility (VIX); exchange rate; structural VAR model (SVAR).

JEL Classification: C58, G15.

1. Preamble

In an environment of increasing global and regional financial connectivity and elevated volatility in global markets, assessing sovereign credit risk is becoming a key area of macroeconomic and financial analysis. For open commodity-based economies like Kazakhstan, this issue is particularly important: changes in oil prices, global uncertainty, domestic macroeconomic stability, and monetary policy form a complex set of interrelated factors influencing investor sentiment and the probability of default, reflected in the dynamics of sovereign credit default swaps (SCDS).

SCDS are financial contracts in which a sovereign acts as the reference issuer, and investors receive protection against default risk. SCDS reflect the market-set price of sovereign default insurance: the wider the spread, the higher the perceived credit risk of a sovereign, while the narrower the spread, the lower the risk. Default can occur either due to a lack of economic resources or due to a political decision to forego payment of obligations (Yu, 2016). Thus, the value of CDS spreads serves as a market indicator of the credit risk of a sovereign issuer and allows financial market participants to hedge the risk of default, which increases the stability of the international financial system (Aytekin & Abdioglu, 2021).

First developed by JP Morgan Chase in 1995, CDS contracts have quickly become one of the most liquid and informative instruments in the global financial market. According to ISDA data, the aggregate notional value of active CDS contracts reached USD9.3 trillion by June 2022, underscoring the scale and importance of this class of instruments. In emerging economies, where macroeconomic and political instability are traditionally higher, CDS spreads play a particularly important role in assessing borrowing costs and sovereign risk perception (Yuan & Pongsiri, 2015). Growing CDS spreads signal to investors and creditors an increased risk of default, leading to

higher borrowing costs for the government, worsening financing conditions, and potential downgrading of the sovereign credit rating (Aizenman et al., 2013).

Importantly, CDS spreads react significantly faster than ratings from Moody's, Fitch Ratings, or Standard & Poor's, as they reflect current market expectations rather than the discretionary decisions of analysts. Studies by Flannery et al. (2010) and Damodaran (2023) show that the CDS market during crises, including in 2008, responded to deteriorating global conditions significantly faster than changes in credit ratings, making CDS a more timely risk indicator.

The practical significance of analyzing Kazakhstan's sovereign CDS is enhanced by the active placement of the country's securities on international capital markets. In 2024, the Republic of Kazakhstan placed 10-year Eurobonds, and in 2025, new issuances with maturities of 5, 7, and 12 years were conducted. The total volume of placements over the two years amounted to approximately USD 5.5 billion. Since the cost of sovereign borrowing is directly dependent on the credit risk perceived by investors, understanding the factors that determine the dynamics of CDS spreads is of not only academic but also practical importance. In theory, the premium on sovereign bonds relative to the risk-free rate (US Treasuries) is closely linked to the CDS spread, which reflects the market assessment of the probability of default and the compensation required by investors for credit risk. Consequently, studying the determinants of CDS allows for a better understanding of the mechanisms that shape the cost of Kazakhstan's external borrowing and the factors influencing the country's access to international capital markets.

Further motivation for studying Kazakhstan's CDS comes from the results of Guo et al. (2020). The authors found that Kazakhstan, despite its relatively small economy, occupies a central position in the regional CDS market network: lagged changes in Kazakhstan's CDS markets statistically significantly predict the dynamics of CDS markets in China, India, Malaysia, South Korea, Thailand, and other countries. Kazakhstan demonstrates the strongest leading effect among all Asian issuers, which is explained by the economy's high sensitivity to oil shocks, the structural features of the quasi-sovereign debt market, and its integration into international financial flows. This finding underscores Kazakhstan's systemic role in credit risk transmission in the region and reinforces the need for an in-depth analysis of the determinants of its CDS spreads.

Despite the extensive international literature, there is virtually no research devoted to Kazakhstan's sovereign CDS. Kazakhstan is a typical open commodity-dependent economy, where key external shocks (oil prices, global volatility), domestic macrofinancial conditions (inflation, exchange rate, monetary policy), and structural features (export dependence, oil revenues) determine the dynamics of credit risk perception.

The aim of this paper is to structurally describe and quantify for the first time the impact of external and domestic macroeconomic shocks on Kazakhstan's SCDS in 2018–2025. A structural vector autoregressive (SVAR) model with block exogeneity is used to separate the influence of global and domestic factors. Impulse response analysis (IRF) allows identifying key sources of CDS variation and rank shocks by the strength and speed of their impact.

This study contributes to the sovereign risk literature by providing the first structural assessment of Kazakhstan's CDS determinants and offers a basis for further research in macro-financial policy, debt sustainability, and risk management of emerging economies.

2. Literature Review

Sovereign credit default swaps (CDS) are one of the most informative and market-oriented indicators of a country's credit risk. They have attracted considerable attention from researchers due to their sensitivity to macroeconomic, financial, and political conditions (Bomfim, 2022). Several key areas of analysis for CDS spread factors have emerged in the literature.

One of the most studied factors is macroeconomic activity. Studies by Matsumura & Vicente (2010), Baldacci et al. (2011), Tang & Yan (2010), and Brandorf & Holmberg (2010) confirm that faster economic growth contributes to lower CDS spreads by improving the

perception of fiscal sustainability, reducing the probability of default, and strengthening investor confidence. High-frequency indicators, such as the PMI and similar indices, also show a strong correlation with CDS dynamics (Bekaert et al., 2019; Garcia & Rigobon, 2018).

Another important factor is exchange rate dynamics. Carr & Wu (2007), Liu & Morley (2012), Bordo et al. (2009), and Wang et al. (2013) note that changes in the exchange rate of a domestic currency increase the cost of servicing of foreign currency debt, increase external vulnerability, and lead to widening CDS spreads.

Inflation is of fundamental importance, affecting the expansion of CDS premiums through the channel of macroeconomic instability and declining investor confidence (Beirne & Fratzscher, 2013; Aytekin & Abdioglu, 2021). High inflation increases uncertainty about future monetary policy, increases the risk of sharp exchange rate adjustments, and deteriorates the quality of the economy's nominal anchor.

Interest rates also play a significant role, reflecting both domestic money market conditions and the monetary authorities' response to inflation and exchange rate risks. Augustin et al. (2018), Gupta et al. (2020), and Naifar (2020) show that rising short-term rates in emerging economies are often interpreted by the market as a signal of stressed liquidity conditions, leading to increasing CDS spreads.

For commodity-exporting countries, the key factor is the oil price. Studies by Broda (2004), Mohaddes & Pesaran (2016), Hussain et al. (2019), Ertuğrul et al. (2017), and Barros (2020) show that rising oil prices improve the external and fiscal balances of commodity-exporting countries, reducing sovereign risks and leading to narrowing CDS spreads.

Several studies analyze the impact of global financial uncertainty on sovereign CDS spreads using the CBOE Volatility Index (VIX) as a proxy for global risk appetite. Studies by Augustin et al. (2018), Brown & Choudhury (2020), and Ceylan (2023) show that a rise in the VIX leads to a broad-based increase in CDS spreads in emerging markets due to capital outflows and an increase in the risk premium.

An important area of the literature is research on the contagion of sovereign risk across countries. Ang & Longstaff (2013) and Caceres et al. (2010) show that global factors explain a significant portion of CDS synchronicity. In the Asian context, the study by Guo et al. (2020) is key, demonstrating that Kazakhstan occupies a central position in the regional sovereign credit risk network: lagged changes in its CDS systematically predict the CDS of other Asian countries. Kazakhstan exhibits the greatest predictive power among all the issuers studied, which is explained by its high sensitivity to oil cycles and the structural features of the quasi-sovereign debt market. The authors note that the relatively low liquidity of the Kazakhstan CDS market and the high sensitivity of prices to new information result in sharper and earlier CDS changes, reinforcing its leading role in the contagion of sovereign risks in the region.

In recent years, the global COVID-19 pandemic has received considerable attention in academic writing. Pan et al. (2021), Kartal (2020), Daehler et al. (2021), and Ceylan (2023) demonstrate that the pandemic has been one of the drivers of the sharp widening of CDS spreads in most emerging economies, although individual epidemiological indicators (number of cases, deaths) do not always have a direct statistically significant impact.

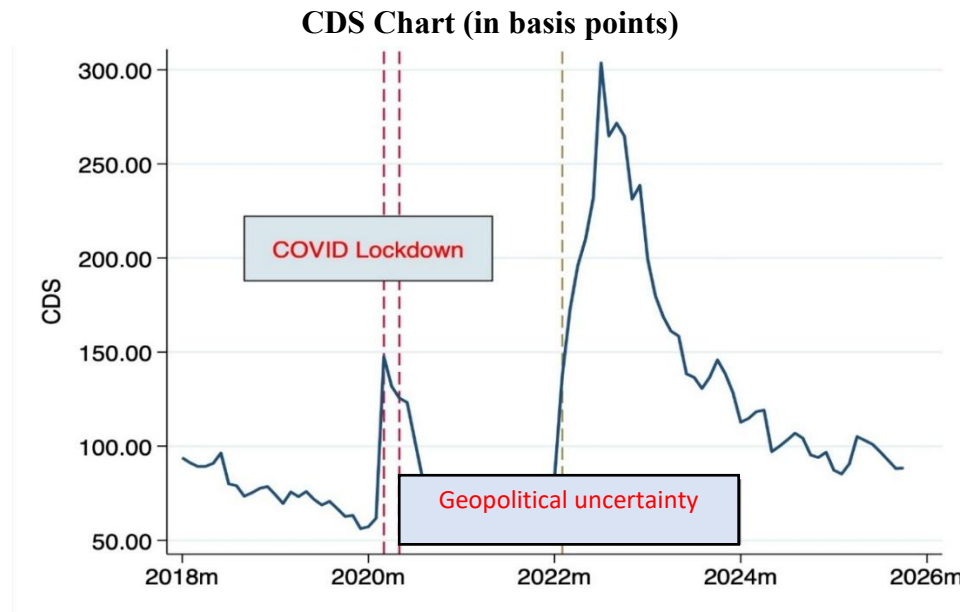
Despite the extensive literature on developing country CDS, there is virtually no research on Kazakhstan's CDS.

This study fills this gap by offering the first structural examination of the determinants of Kazakhstan's CDS spreads, applying an SVAR model with block exogeneity, a detailed assessment of CDS responses to external and domestic shocks, using the high-frequency business activity index (BAI) as a proxy for GDP, and analyzing the 2018–2025 period, including the COVID-19 pandemic and oil shocks.

3. Data

For the empirical analysis, monthly data for January 2018–October 2025 were used. Key macroeconomic and financial indicators – Kazakhstan’s 5-year dollar credit default swap (CDS) spreads, the price of Brent crude oil, the US dollar/tenge exchange rate (USD/KZT), the VIX index, the CPI inflation rate, and the TONIA money market rate – were obtained from the Bloomberg system. The Business Activity Index (BAI) was taken from the official website of the National Bank of the Republic of Kazakhstan.

Figure 1



Endogenous variables used in the study are determined as follows:

$$Y_t = [Oil_t, VIX_t, BAI_t, CPI_t, ER_t, INT_t, CDS_t]$$

where:

Oil_t – oil price at the end of a period;

VIX_t – S&P500 volatility index at the end of a period;

BAI_t – business activity index at the end of a period;

CPI_t – annual inflation in Kazakhstan at the end of a period;

ER_t – exchange rate USD/KZT at the end of a period;

INT_t – TONIA money market rate at the end of a period;

CDS_t – spreads on 5-year CDS at the end of a period.

Table 1

Statistics						
	Mean	Max.	Min.	Std. Dev.	Skewness	Kurtosis
<i>Oil</i>	72.80	122.84	22.74	17.71	−0.13	4.00
<i>VIX</i>	19.92	53.54	12.12	7.08	1.82	7.65
<i>BAI</i>	49.73	53.09	36.42	2.37	−3.06	15.25
<i>CPI</i>	9.41	21.30	4.80	4.09	1.22	3.74
<i>ER</i>	433.90	548.97	318.31	53.51	−0.10	2.61
<i>INT</i>	12.05	17.63	7.89	3.43	0.22	1.43
<i>CDS</i>	109.98	303.63	56.20	55.05	1.63	5.18

All indicators were pre-transformed to ensure comparability and stationarity, which is a prerequisite for estimating VAR/SVAR models. Logarithms were applied to CDS, oil prices, the US dollar/tenge exchange rate, the VIX index, and the BAI; the model includes their first differences, interpreted as approximate growth rates. Inflation and TONIA are included as changes relative to the previous month.

In addition to the main variables, the model includes an exogenous dummy variable, COVID-19. Results from the reduced VAR model show that the coefficient on the COVID-dummy in the CDS equation is statistically significant at the 5% level. However, the main impact of the pandemic on sovereign risk in the model is reflected through the dynamics of oil prices, global financial volatility, and the exchange rate. Therefore, the COVID-dummy is used primarily as a control variable to account for specific effects of the pandemic period that are not fully explained by the included macroeconomic factors.

The Business Activity Index (BAI) is used as a proxy for the gross domestic product (GDP). Although GDP is traditionally viewed as the primary indicator of economic activity, its quarterly frequency and the delay in publication limit its applicability to financial market research. Modern macroeconomic literature increasingly uses high-frequency indicators, such as the Purchasing Managers' Index (PMI), as they allow for rapid tracking of changes in the economic environment and reflect information available to market participants in real time (Stock & Watson, 2002; Giannone et al., 2008; Banbura & Modugno, 2014). The BAI serves a similar function for the economy of Kazakhstan, providing a monthly assessment of business activity. In this regard, the use of the BAI appears preferable to GDP for analyzing the short-term dynamics of sovereign CDS spreads.

The resulting data set is consistent, stationary (after transformations) and suitable for further use in a structural VAR model.

4. Methodology

The macroeconomic determinants of Kazakhstan's sovereign CDS spreads are analyzed using a structural vector autoregressive (SVAR) model. This approach allows for the identification of structural shocks and the study of their impact on CDS, which is particularly important for open commodity-based economies. The methodology builds on the classic works of Sims (1980), Bernanke (1986), and Cushman & Zha (1997) and replicates the logic of constructing short-run structural constraints applied in Gürel (2021).

The structural form of the SVAR model is given by the equation:

$$AY_t = A_0 + A_1(L)Y_{t-1} + \dots + A_p(L)Y_{t-1} + B\varepsilon_t, \quad (4.1)$$

where A – a matrix of contemporaneous relationships;

B – structural shock matrix;

$A_i(L)$ – lag operator polynomials;

ε_t – orthogonal structural innovations.

The equation (4.1) is transformed into a reduced form:

$$Y_t = C(L)Y_{t-1} + u_t, \quad u_t = A^{-1}B\varepsilon_t, \quad (4.2)$$

With the reduced form error covariance matrix:

$$\Sigma_u = A^{-1}BB'(A^{-1})'.$$

Before estimating the model, all variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) (Annex) tests. Additionally, the autocorrelation and partial autocorrelation function (ACF and PACF) plots presented in the annex were analyzed. The optimal number of lags for the VAR model was determined based on the AIC, HQIC, SBIC, and FPE information criteria, as well as the results of *Lagrange multiplier (LM)* test for residual

auto-correlation. The AIC and FPE criteria point to the optimal specification with two lags, while the HQIC indicates the optimal specification with one lag, whereas a more conservative criteria *SBIC* offers a model without lags. Despite this, the unlagged specification does not allow for the dynamic relationships between variables, which are the primary focus of VAR/SVAR models. Given the monthly frequency of the data and the fact that the impact of macroeconomic and financial shocks is typically realized with a time lag, the VAR(2) model was chosen as the baseline specification, providing a balance between the quality of fit, the dynamic completeness of the model, and economic interpretability of the results. The resulting specification satisfies the stability condition, since all eigenvalues of the characteristic polynomial are located within the unit circle. The results of all diagnostic tests are presented in the appendix.

Additionally, the distribution properties of the residuals of the VAR model were analyzed using the *Jarque – Bera* normality test. The results show that the hypothesis of joint normality of the residuals is rejected. The main contribution to the deviation from normality comes from the equations for oil prices, inflation, and the exchange rate, which exhibit statistically significant asymmetry and increased kurtosis. This result is typical for macroeconomic and financial time series containing periods of crises, sharp exchange rate fluctuations, and commodity shocks. At the same time, the normality hypothesis is not rejected ($p = 0.747$) for the CDS equation, which is a positive result in terms of interpreting the key dependent variable of the study. Given the stability of the VAR process, the absence of residual autocorrelation, and the correctness of the structural identification, the identified non-normality of individual equations does not preclude further SVAR analysis.

In accordance with the concept of block exogeneity (Cushman & Zha, 1997; Gürel, 2021), the external variables – Oil and VIX – are considered exogenous for Kazakhstan, reflecting the country's status as a price taker in commodity markets and its limited influence on global financial indicators. The internal block includes BAI, CPI, ER, INT and CDS.

The system's structural form is written as follows:

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ NA & 1 & 0 & 0 & 0 & 0 & 0 \\ NA & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & NA & 1 & NA & 0 & 0 \\ NA & NA & 0 & 0 & 1 & NA & 0 \\ 0 & 0 & NA & 0 & 0 & 1 & 0 \\ NA & NA & NA & NA & NA & NA & 1 \end{bmatrix}}_A \underbrace{\begin{bmatrix} u_{Oil_t} \\ u_{VIX_t} \\ u_{BAI_t} \\ u_{CPI_t} \\ u_{ER_t} \\ u_{INT_t} \\ u_{CDS_t} \end{bmatrix}}_{u_t} = B \underbrace{\begin{bmatrix} \varepsilon_{oil,t} \\ \varepsilon_{vix,t} \\ \varepsilon_{bai,t} \\ \varepsilon_{cpi,t} \\ \varepsilon_{er,t} \\ \varepsilon_{int,t} \\ \varepsilon_{cds,t} \end{bmatrix}}_{\varepsilon_t}$$

In matrix A: 1 – normalizing; 0 – restriction; NA – a free parameter subject to estimation. Matrix B is diagonal, while reflecting orthogonality of structural shocks:

$$B = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} \end{bmatrix}$$

After identification, the structural form is represented as:

$$Y_t = \Theta(L)\varepsilon_t, \quad (4.3)$$

which allows computing impulse responses (IRF) and perform Forecast Error Variance Decomposition (FEVD), whose results are presented in the Results section.

The oil price (Oil) is treated as a completely exogenous variable. Kazakhstan lacks sufficient scale to influence the global oil market, so the country's domestic macroeconomic indicators are unable to immediately impact global oil prices.

The VIX is also included in the external block of the model. However, its contemporaneous response to oil shocks is assumed, as significant changes in the global commodity market can be accompanied by changes in global risk appetite. At the same time, Kazakhstan's internal variables do not immediately affect the VIX, consistent with the block exogeneity assumption.

The BAI assumes an immediate response to oil prices. This constraint reflects the high dependence of the Kazakhstan economy on the oil sector through export earnings, budget revenues, investment activity, and business expectations. The impact of global financial volatility on business activity is limited by the lag structure, as changes in global financial conditions are typically transmitted to the real sector not immediately, but through investment decisions, financial conditions, and foreign trade channels.

The *CPI* equation assumes an instantaneous reaction to the BAI and the exchange rate (ER) is allowed. The relationship with the BAI reflects the domestic demand channel: an acceleration of economic activity may be accompanied by increased price pressure. The inclusion of the exchange rate in the contemporaneous inflation structure is due to the high openness of the Kazakhstan economy, a significant share of imported goods in the consumption structure, and the presence of an exchange rate pass-through effect. The study by Seydazov (2024) shows that a 10% weakening of the tenge can lead to an increase in inflation by 1–1.4 pp over the course of a year, and the results of Arnabekova & Brinshinov (2025) indicate that a 1% change in the exchange rate is accompanied by an increase in inflation by approximately 0.12 pp. Despite the fact that a significant part of this effect is realized with a lag, the stability and statistical significance of the exchange rate channel justify the inclusion of the exchange rate in the short-term structure of the model.

At the same time, the direct instantaneous impact of global oil prices on inflation is limited to zero. This assumption is based on the institutional characteristics of Kazakhstan: for a significant portion of the period under consideration, fuel and lubricant prices were regulated by the state through price caps and other containment mechanisms. As a result, the impact of oil shocks on inflation was realized primarily indirectly – through the exchange rate, fiscal channels, and inflation expectations. Therefore, the exchange rate is considered the main channel for transmitting external shocks to consumer prices within the SVAR model specification under consideration.

Exchange rate (ER) is looked at as a fast-responding financial variable and allows for an immediate reaction to oil prices, global volatility, and money market conditions. This specification reflects three key channels of influence: the commodity channel through export revenues, the global financial channel through changes in risk appetite, and the interest rate channel through changes in the relative attractiveness of domestic currency assets. The impact of business activity, inflation, and CDS is assumed to be predominantly lagged.

The money market rate (INT), represented by TONIA, allows for an immediate response to business activity. This constraint reflects the relationship between economic activity, demand for liquidity, and money market conditions. Furthermore, TONIA is the money market operating rate and is determined to a greater extent by current liquidity conditions in the banking system and the National Bank operations than by short-term exchange rate fluctuations. Therefore, the exchange rate's immediate impact on TONIA is constrained to zero. Despite close relationship between the foreign exchange market and monetary policy, the impact of exchange rate shocks on the money market is typically realized indirectly through inflation expectations, the inflation forecast, and the subsequent response of the National Bank. Under an inflation-targeting regime, monetary policy decisions are made based on their impact on inflation and macroeconomic stability, rather than in response to short-term exchange rate fluctuations. Therefore, it is assumed

that the impact of exchange rate shocks on TONIA is predominantly lagged and is reflected through the dynamic interrelations of variables within the model.

Finally, the CDS is placed as the last variable in the system and allows for an immediate response to all structural shocks. This assumption reflects the nature of the CDS as a market indicator of sovereign credit risk, capable of quickly factoring in the changes in the global market environment, the state of the real sector, inflationary processes, the foreign exchange market, and money market conditions. Therefore, the CDS is considered the most endogenous variable in the model.

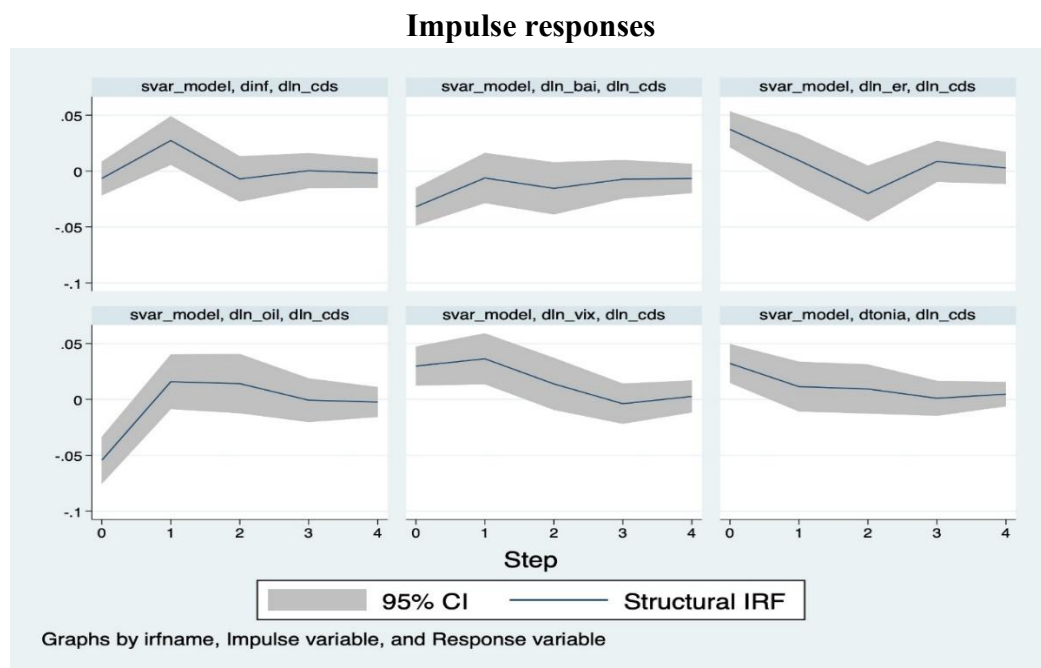
Overall, the chosen system of constraints allows for the reconciliation of the assumption of block exogeneity of external factors with economically justified shock transmission channels within a small, open, commodity-based economy. This identification scheme provides an economically interpretable decomposition of structural shocks and allows for the analysis of the response of Kazakhstan's sovereign CDS to external and domestic macroeconomic impulses.

5. Results

Before analyzing the impulse responses, the properties of the estimated VAR model underlying the SVAR were tested. Information criteria point to an optimal lag length of 2, with the model demonstrating satisfactory statistical properties. A Lagrange test for residual autocorrelation does not reject the null hypothesis of no autocorrelation, and a robustness check shows that all eigenvalues lie within the unit circle, meaning the stability of the VAR process. The LR test for over-identifying restrictions ($\chi^2(7)=6.06$, $p=0.533$) does not reject the imposed restrictions, confirming the correctness of the chosen structural identification scheme.

The impulse responses of the structural SVAR model are presented in Figure 2. Because the oil, VIX, business activity, exchange rate, and CDS variables are used in log-differences, the IRF values are interpreted as the approximate percentage change in CDS in response to a standard structural shock to the corresponding variable. For inflation and TONIA, the responses reflect the CDS reaction to a standard shock to these variables.

Figure 2



The strongest response is observed in reaction to the oil price shock. A positive structural shock to global oil prices leads to a statistically significant decrease in Kazakhstan's CDS spreads

by 5.4% at the outset (95% CI: $[-7.5\%; -3.3\%]$). Over a one- to two-month horizon, the response becomes positive, but is not statistically different from zero, and then completely fades. This result confirms the importance of the oil factor for the perception of Kazakhstan's credit risk as a commodity exporter.

A shock to global financial volatility has the opposite effect. Heightened global uncertainty is accompanied by an immediate increase in CDS spreads by approximately 3.0% (95% CI: $[1.2\%; 4.7\%]$). The following month, the effect increases slightly to 3.6%, after which it quickly loses statistical significance. This demonstrates the high sensitivity of Kazakhstan's sovereign risk to changes in global risk appetite.

The Business Activity Index (BAI) shows a statistically significant decline in CDS at the onset of the shock. A positive shock to economic activity is accompanied by a reduction in CDS of approximately 3.2% (95% CI: $[-4.9\%; -1.5\%]$). Over subsequent horizons, the effect remains negative but becomes statistically insignificant. This result suggests that an improvement in the current economic environment is perceived by financial markets as a factor reducing sovereign risk, but this information is quickly reflected in market prices.

The CDS response to an inflation shock is delayed. At the onset of the shock, the impact of inflation is statistically insignificant. However, after just one month, a positive and statistically significant response is observed: CDS increases by approximately 2.7% (95% CI: $[0.6\%; 4.9\%]$). After this point, the effect quickly fades and ceases to be significant. This result may indicate that investors need some time to reassess the implications of the inflation shock for macroeconomic stability and the future path of monetary policy.

Among domestic factors, the exchange rate is particularly significant. A positive shock to the US dollar/tenge exchange rate is accompanied by an immediate increase in the CDS by approximately 3.7% (95% CI: $[2.1\%; 5.3\%]$), which is one of the strongest responses among all the variables considered. Over subsequent horizons, the effect quickly declines and loses statistical significance. This result suggests that exchange rate shocks play an important role in shaping the perception of Kazakhstan's sovereign risk and reflect investors' high sensitivity to exchange rate fluctuations.

The TONIA money market rate also shows a statistically significant positive response. At the moment of shock, the CDS increases by approximately 3.2% (95% CI: $[1.5\%; 5.0\%]$). After one month, the effect remains positive, but is no longer statistically significant, and gradually fades thereafter. This suggests that unexpected changes in money market conditions can temporarily increase perceived credit risk but do not have a sustained effect on long-term CDS dynamics.

Overall, the impulse response results show that Kazakhstan's sovereign CDSs are most sensitive to oil, currency, and global financial shocks. Domestic factors – business activity, inflation, and money market conditions – also exert a statistically significant influence, but their impact is primarily short-term and fades quickly. These results are consistent with Kazakhstan's characteristics as a small, open, commodity-based economy, where sovereign risk perceptions are largely determined by external conditions and the state of the foreign exchange market.

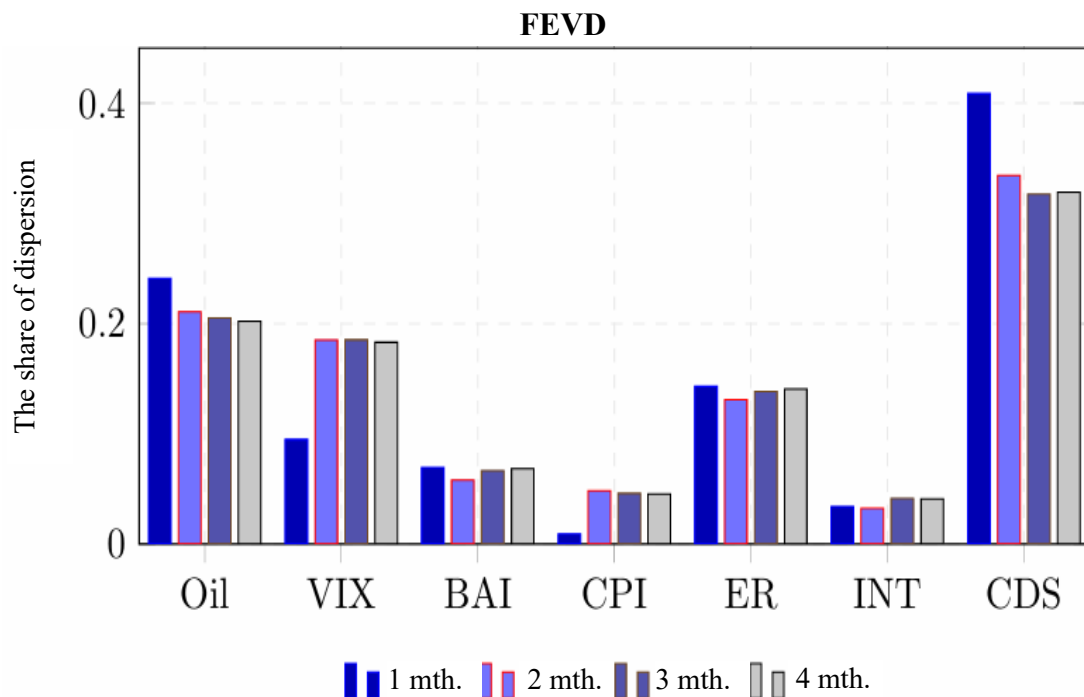
The quantitative role of each type of shock in shaping the CDS dynamics can be estimated using the Forecast Error Variance Decomposition (FEVD). Table 2 and Figure 3 present the shares of contribution made by structural shocks to the CDS forecast variance over a horizon of one to four months. After one month, about 24.1% of CDS variance is explained by oil shocks, 14.3% - by exchange rate shocks, 9.5% by global financial volatility (VIX), and 6.9% by changes in business activity. The contribution of inflation and interest rate shocks is less than 5%, while the CDS own shocks account for the largest share of variance (40.9%). As the forecast horizon increases, the relative roles of individual factors gradually stabilize. Over a four-month horizon, CDS own shocks remain the largest source of variance, explaining about 31.9% of the variance. Among the observed macroeconomic factors, oil shocks (20.2%) and global financial volatility

(18.3%) remain the largest contributors. Exchange rates also play a significant role (14.1%), while business activity contributes approximately 6.8%, inflation – 4.5%, and the TONIA rate – 4.1%.

Table 2

FEVD values							
Period	Oil	VIX	BAI	CPI	ER	INT	CDS
1	0.24	0.10	0.07	0.01	0.14	0.03	0.41
2	0.21	0.19	0.06	0.05	0.13	0.03	0.33
3	0.21	0.19	0.06	0.05	0.14	0.04	0.31
4	0.20	0.18	0.07	0.05	0.14	0.04	0.32

Figure 3



The results show that Kazakhstan's sovereign CDS dynamics are largely determined by external factors. The combined contribution of oil shocks and global financial volatility reaches almost 39% of the forecast variance over a four-month horizon, and exceeds 50% with consideration of the currency channel. This confirms the high dependence of Kazakhstan's sovereign risk perception on the external environment, global risk appetite, and exchange rate dynamics. At the same time, the significant share of intrinsic CDS shocks points to the presence of factors not fully reflected by the included macroeconomic variables, such as CDS market liquidity, external debt structure, political and geopolitical risks, and changes in international investor sentiment.

6. Discussion and Recommendations

The results confirm that Kazakhstan's sovereign CDS performance is largely determined by external factors. CDS exhibit the strongest response to oil price shocks, global financial volatility, and the exchange rate. Furthermore, the FEVD results show that the aggregate

contribution of oil price shocks, the VIX, and the FX channel exceeds 50% of CDS variance over a four-month horizon. This suggests that Kazakhstan's sovereign risk perception is largely shaped by external conditions and global financial conditions.

The negative CDS response to oil price shocks is consistent with the Kazakh economy's high dependence on the commodity sector. Rising oil prices improve the country's fiscal and foreign trade indicators, which is immediately reflected in a reduction in the sovereign risk premium. At the same time, the significant response to the VIX confirms Kazakhstan's sensitivity to changes in global risk appetite and international capital flows.

Among domestic factors, the exchange rate plays the most significant role. Currency shocks trigger one of the strongest CDS reactions, comparable in scale to the impact of global volatility. This result highlights the importance of the exchange rate channel in shaping the market assessment of sovereign risk and confirms the special role of exchange rate stability for open emerging economies.

The results also show that business activity, inflation, and money market conditions have a statistically significant impact on CDS, but their contribution to the overall variance is significantly lower than that of external factors. This suggests that investors consider the state of the domestic macroeconomic environment, but external shocks remain decisive for Kazakhstan's sovereign risk.

The high share of CDS own variance, which amounts to approximately 32% over a four-month horizon, deserves special attention. This result points to the presence of risk factors that are not fully reflected by the macroeconomic variables used. These may include CDS market liquidity, the structural characteristics of public and quasi-public debt, geopolitical factors, and changes in global investment sentiment.

The obtained results allow formulating several practical conclusions for economic policy. First, the high sensitivity of CDS to oil shocks underscores the importance of further strengthening of fiscal stabilizers and reducing public finances' dependence on the commodity cycle. Second, the significant role of the foreign exchange channel indicates the need to develop the domestic foreign exchange market, expand foreign exchange risk management tools, and further reduce the dollarization of the economy. Third, the presence of a statistically significant response of CDS to inflation and interest rate shocks confirms the importance of maintaining a predictable and consistent monetary policy. Finally, the significant contribution of CDS dynamics points to the need for further financial market development, increased transparency of debt policy, and a broader investor base, which could contribute to a reduction in the sovereign risk premium.

7. Finding

This study analyzes the macroeconomic determinants of Kazakhstan's sovereign credit default swaps using a structural vector autoregression (SVAR) model with block exogeneity. Using monthly data for 2018–2025, the study assesses the impact of external and domestic macroeconomic shocks on the dynamics of Kazakhstan's 5-year CDS spreads.

The results demonstrate that external factors play a key role in shaping sovereign credit risk. Positive oil shocks are accompanied by a statistically significant reduction in CDS spreads, while increased global financial volatility leads to their widening. Among domestic factors, exchange rate shocks have the most significant impact, demonstrating the importance of the foreign exchange channel in shaping the market assessment of sovereign risk. Shocks to business activity, inflation, and money market rates also have statistically significant effects, but their influence is more limited.

The results of the forecast error variance decomposition confirm the dominant role of external factors. The combined contribution of oil shocks, global volatility, and the exchange rate exceeds half of the CDS variance over a four-month horizon. At the same time, about a third of

the CDS variance is explained by the indicator's own dynamics, evidencing the presence of additional risk factors not fully reflected by standard macroeconomic variables.

The scientific novelty of the study lies in its being one of the first studies devoted to a structural analysis of the determinants of Kazakhstan's sovereign CDS using the SVAR approach. The obtained results expand our understanding of the mechanisms underlying sovereign risk in a small, open, commodity-based economy and can be used to improve macrofinancial monitoring, debt sustainability analysis, and assessment of the Republic of Kazakhstan's external borrowing conditions.

References

1. Aizenman, J., Hutchison, M., & Jinjara, Y. (2013). What is the risk of sovereign debt default? *Journal of International Money and Finance*, 34, 37–59.
2. Ammer, J., & Cai, F. (2011). Sovereign CDS and bond pricing dynamics in emerging markets. *Journal of International Financial Markets, Institutions and Money*, 21(3), 298–314.
3. Andrew Ang and Francis A. Longstaff, "Systemic Sovereign Credit Risk: Lessons from the U.S. and Europe," NBER Working Paper 16982 (2011), <https://doi.org/10.3386/w16982>.
4. Arnabekova E. & Brinshinov A., 2025. "[The Impact of Oil Shocks on Macroeconomic Indicators of Kazakhstan](#)," *Economic Review(National Bank of Kazakhstan)*, National Bank of Kazakhstan, issue 1, pages 23-30.
5. Augustin, P., Subrahmanyam, M. G., Tang, D. Y., & Wang, S. Q. (2018). Credit default swaps: A survey. *Foundations and Trends in Finance*, 13(1), 1–168.
6. Aytekin, S. and Abdioglu, N. (2021) 'Do CDS spreads and inflation move together? The experience of the fragile five countries and the BRICS-T', *Scientific Annals of Economics and Business*, 68 (2), pp. 163-175.
7. Baldacci, E., Gupta, S., & Mati, A. (2011). Political and fiscal determinants of sovereign credit risk. *IMF Working Paper*, WP/11/152.
8. Banbura, M., & Modugno, M. (2014). Maximum likelihood estimation of factor models on datasets with arbitrary pattern of missing data. *Journal of Applied Econometrics*, 29(1), 133–160.
9. Barros, C. P. (2020). Oil price shocks and sovereign risk in oil-exporting economies. *Energy Policy*, 147, 111885.
10. Bekaert, G., Engstrom, E., & Ermolov, A. (2019). Bad environments, good environments: A non-Gaussian asymmetric volatility model. *Journal of Econometrics*, 212(1), 26–45.
11. Beirne, J., & Fratzscher, M. (2013). The pricing of sovereign risk and contagion during the European sovereign debt crisis. *Journal of International Money and Finance*, 34, 60–82.
12. Bomfim, A. (2022). *Understanding credit default swaps*. Oxford University Press.
13. Brandorf, C. and Holmberg, J. (2010) 'Determinants of sovereign credit default swap spreads for piigs-a macroeconomic approach',
14. Broda, C. (2004). Terms of trade and exchange rate regimes in developing countries. *Journal of International Economics*, 63(1), 31–58.
15. Carr, P., & Wu, L. (2007). Theory and evidence on the dynamic interactions between sovereign credit risk and exchange rates. *Journal of Banking & Finance*, 31(8), 2383–2403.
16. Ceylan, Ö. (2023) 'Analysis of Dynamic Connectedness among Sovereign CDS Premia', *World Journal of Applied Economics*, 9 (1), pp. 33-47.
17. Seidazov B.A. (2024). *The Impact of Nominal Exchange Rate Pass-Through on Inflation in Kazakhstan*. Economic Study No.2024–12. National Bank of the Republic of Kazakhstan.
18. Ceylan, R. (2023). COVID-19 and sovereign CDS spreads in emerging markets. *Emerging Markets Finance & Trade*, 59(1), 112–132.

19. Cushman, D. O., & Zha, T. (1997). Identifying monetary policy in a small open economy under flexible exchange rates. *Journal of Monetary Economics*, 39(3), 433–448.
20. Daehler, T., et al. (2021). COVID-19 and sovereign risk. *IMF Working Paper*.
21. Damodaran, Aswath, Country Risk: Determinants, Measures and Implications – The 2023 Edition (July 14, 2023). Available at SSRN: <https://ssrn.com/abstract=4509578> or <http://dx.doi.org/10.2139/ssrn.4509578>
22. Ertuğrul, H. M., Soytaş, U., & Ertuğrul, Y. (2017). The asymmetric impact of oil prices on Turkey's sovereign credit risk. *Energy Economics*, 61, 287–294.
23. Flannery, M.J., Houston, J.F. and Partnoy, F. (2010) 'Credit default swap spreads as viable substitutes for credit ratings', *University of Pennsylvania Law Review*, pp. 2085–2123.
24. Garcia, D., & Rigobon, R. (2018). What's news? A new perspective on measuring news influence. *Journal of Financial Economics*, 128(3), 384–412.
25. Giannone, D., Reichlin, L., & Small, D. (2008). Nowcasting: The real-time informational content of macroeconomic data. *Journal of Monetary Economics*, 55(4), 665–676.
26. Guo, Biao & Han, Qian & Liang, Jufang & Ryu, Doojin & Yu, Jinyoung. (2020). Sovereign Credit Spread Spillovers in Asia. *Sustainability*. 12. 1472. 10.3390/su12041472.
27. Gupta, R., Lau, C. K. M., & Wohar, M. E. (2020). The role of economic policy uncertainty in predicting sovereign credit risk for emerging markets. *Journal of International Money and Finance*, 102, 102104.
28. Gürel, S. P. (2021). How the macroeconomic conditions and global risk factors affect sovereign CDS spreads? New evidence from Turkey. *Business and Management Studies: An International Journal*, 9(2), 547–560.
29. Ho, S. Y. (2016). Current accounts and CDS spreads. *International Review of Economics & Finance*, 45, 140–155.
30. Kartal, M.T. (2022) 'The Role of Macroeconomic and Market Indicators in Explaining Sovereign Credit Default Swaps (CDS) Spread Changes: Evidence from Türkiye', *Romanian Journal of Economic Forecasting*, 25 (2), pp. 145.
31. Liu, X., & Morley, B. (2012). Sovereign CDS and exchange rates. *Applied Financial Economics*, 22(14), 1171–1180.
32. Matsumura, M.S. and Vicente, J.V.M. (2010) 'The role of macroeconomic variables in sovereign risk', *Emerging Markets Review*, 11 (3), pp. 229–249.
33. Miguel A. Segoviano & Carlos Caceres & Vincenzo Guzzo, 2010. "[Sovereign Spreads: Global Risk Aversion, Contagion or Fundamentals?](#)", "[IMF Working Papers](#) 2010/120, International Monetary Fund.
34. Mohaddes, K., & Pesaran, M. H. (2016). Country-specific oil supply shocks and the global economy. *Energy Economics*, 59, 382–399.
35. Naifar, N. (2020) 'What explains the sovereign credit default swap spreads changes in the GCC region?', *Journal of Risk and Financial Management*, 13 (10), pp. 245
36. Pan, J., & Singleton, K. (2008). Default and recovery implicit in the term structure of sovereign CDS spreads. *Journal of Finance*, 63(5), 2345–2384.
37. Pan, W.-F., Wang, X., Wu, G. and Xu, W. (2021) 'The COVID-19 pandemic and sovereign credit risk', *China Finance Review International*, 11 (3), pp. 287–301.
38. Stock, J. H., & Watson, M. W. (2002). Macroeconomic forecasting using diffusion indexes. *Journal of Business & Economic Statistics*, 20(2), 147–162.
39. Tang, D. Y., & Yan, H. (2010). Market conditions, default risk and credit spreads. *Journal of Banking & Finance*, 34(4), 743–753.
40. Yildirim, Z., & Yildirim, D. Ç. (2017). Macroeconomic dynamics of sovereign credit risk. *Economic Modelling*, 64, 221–230.

41. Yu, F. (2016). Sovereign default risk and CDS pricing. *Review of Financial Studies*, 29(5), 1470–1504.
42. Yuan, C. and Pongsiri, T.J. (2015) 'Fiscal austerity, growth prospects, and sovereign CDS spreads: The Eurozone and beyond', *International Economics*, 141, pp. 50-79.
43. Wang, A.T., Yang, S.-Y. and Yang, N.-T. (2013) 'Information transmission between sovereign debt CDS and other financial factors. The case of Latin America', *The North American Journal of Economics and Finance*, 26, pp. 586-601.

Annex
Table 1

Stationarity Tests		
Variables	ADF	Phillips – Perron
<i>Oil</i>	−1.65	−1.99
ΔOil	−5.06***	−8.02***
<i>VIX</i>	−2.65*	−4.51***
ΔVIX	−6.03***	−13.62***
<i>BAI</i>	−2.81*	−3.03**
ΔBAI	−4.51***	−9.07***
<i>CPI</i>	−2.42	−1.22
ΔCPI	−3.04**	−5.82***
<i>ER</i>	−3.34*	−1.29
ΔER	−8.60***	−11.57***
<i>INT</i>	−2.04	−0.86
ΔINT	−4.48***	−13.67***
<i>CDS</i>	−2.35	−1.84
ΔCDS	−3.71***	−7.95***

Note: *,** and *** denote statistical significance at the levels of 10%, 5% and 1% , respectively

Figure 1

ACF and PACF charts

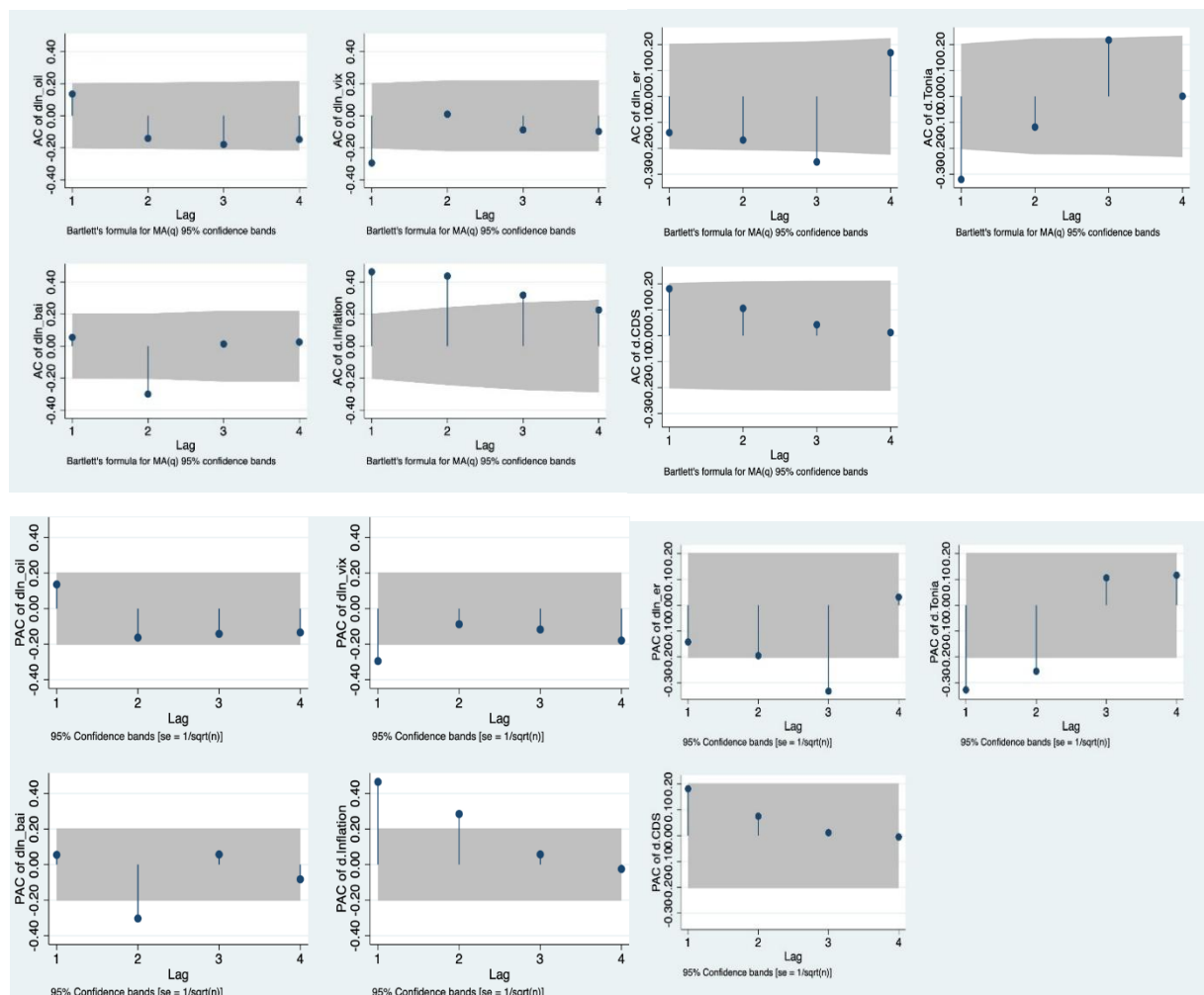


Table 2

Criteria for the choice of optimum number of lags

Lag-order selection criteria

Sample: 2018m6 thru 2025m10

Number of obs = 89

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	305.586				3.4e-12	-6.55249	-6.3947	-6.16102*
1	396.469	181.77	49	0.000	1.3e-12	-7.49368	-6.78362*	-5.73206
2	463.708	134.48	49	0.000	9.0e-13*	-7.90355*	-6.64122	-4.77178
3	505.005	82.594	49	0.002	1.1e-12	-7.73045	-5.91585	-3.22853
4	541.63	73.251*	49	0.014	1.7e-12	-7.45236	-5.0855	-1.5803

* optimal lag

Endogenous: dln_oil dln_vix dln_bai dln_er dln_cds

Exogenous: covid _cons

Table 3

VAR regression

```
. var dln_oil dln_vix dln_bai dln_er dln_er dtonia dln_cds, lags(1/2) exog(covid)
```

Vector autoregression

```
Sample: 2018m4 thru 2025m10           Number of obs   =          91
Log likelihood = 477.5548              AIC              = -8.034172
FPE              = 7.85e-13            HQIC             = -6.787433
Det(Sigma_ml)   = 6.52e-14            SBIC             = -4.943884
```

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dln_oil	16	.116025	0.2737	34.29916	0.0031
dln_vix	16	.23494	0.2777	34.98662	0.0025
dln_bai	16	.025843	0.4725	81.51253	0.0000
dln_er	16	.507459	0.5776	124.4396	0.0000
dln_er	16	.032055	0.2281	26.88803	0.0297
dtonia	16	.910588	0.4229	66.6879	0.0000
dln_cds	16	.126432	0.3157	41.98376	0.0002

dln_cds						
dln_oil						
L1.	.3887119	.1404363	2.77	0.006	.1134617	.663962
L2.	.1716803	.1499433	1.14	0.252	-.1222031	.4655637
dln_vix						
L1.	.1903129	.0606722	3.14	0.002	.0713976	.3092282
L2.	.1368534	.061762	2.22	0.027	.0158021	.2579047
dln_bai						
L1.	.1522619	.5717935	0.27	0.790	-.9684327	1.272957
L2.	-.9591566	.5676326	-1.69	0.091	-2.071696	.1533829
dln_er						
L1.	.0610368	.0242177	2.52	0.012	.013571	.1085025
L2.	-.0601952	.0242324	-2.48	0.013	-.1076899	-.0127005
dln_er						
L1.	.4815352	.4998048	0.96	0.335	-.4980642	1.461135
L2.	-1.287777	.522893	-2.46	0.014	-2.312629	-.2629259
dtonia						
L1.	.0114263	.0149609	0.76	0.445	-.0178965	.0407491
L2.	.0249794	.0147214	1.70	0.090	-.003874	.0538328
dln_cds						
L1.	-.004023	.1352295	-0.03	0.976	-.2690679	.2610219
L2.	.094585	.1366701	0.69	0.489	-.1732834	.3624534
covid						
L1.	.1725536	.0806905	2.14	0.032	.0144031	.330704
L2.	-.0064497	.0136909	-0.47	0.638	-.0332834	.0203839

Figure 2

Stability test

Eigenvalue stability condition

Eigenvalue	Modulus
$-.04077923 + .7587172i$	.759812
$-.04077923 - .7587172i$	.759812
$.6190819 + .1206263i$	.630724
$.6190819 - .1206263i$	.630724
$.3087368 + .5262232i$	.610106
$.3087368 - .5262232i$	.610106
$-.4419418 + .2988239i$	.533487
$-.4419418 - .2988239i$	.533487
$-.2573335 + .4269292i$	.498487
$-.2573335 - .4269292i$	.498487
$-.4318744$	.431874
$-.2245593 + .3058657i$	.379448
$-.2245593 - .3058657i$	.379448
$.07552125$	.075521

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

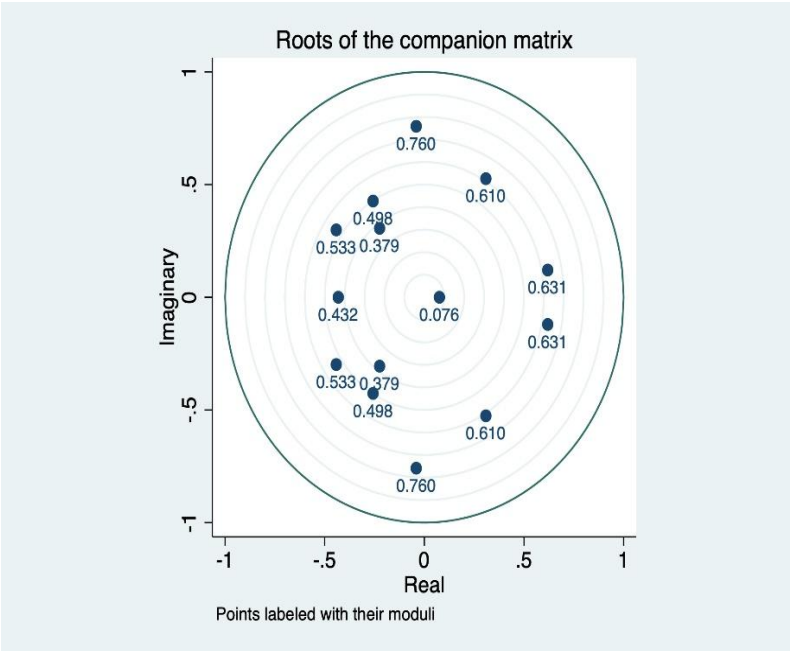


Table 4

LM auto-correlation test

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	54.3696	49	0.27740
2	41.3652	49	0.77248
3	48.4892	49	0.49374
4	55.8975	49	0.23173

H0: no autocorrelation at lag order

Table 5

Testing the normality of VAR model residuals

Jarque-Bera test

Equation	chi2	df	Prob > chi2
dln_oil	91.317	2	0.00000
dln_vix	4.438	2	0.10873
dln_bai	0.404	2	0.81716
dinf	132.786	2	0.00000
dln_er	95.201	2	0.00000
dtonia	4.757	2	0.09268
dln_cds	0.584	2	0.74676
ALL	329.487	14	0.00000

Kurtosis test

Equation	Kurtosis	chi2	df	Prob > chi2
dln_oil	7.4759	75.960	1	0.00000
dln_vix	3.6366	1.537	1	0.21510
dln_bai	3.0884	0.030	1	0.86328
dinf	8.255	104.706	1	0.00000
dln_er	7.1986	66.842	1	0.00000
dtonia	3.2916	0.322	1	0.57015
dln_cds	2.901	0.037	1	0.84719
ALL		249.434	7	0.00000

Skewness test

Equation	Skewness	chi2	df	Prob > chi2
dln_oil	-1.0062	15.357	1	0.00009
dln_vix	.43734	2.901	1	0.08853
dln_bai	-.15707	0.374	1	0.54072
dinf	-1.3607	28.080	1	0.00000
dln_er	1.3674	28.359	1	0.00000
dtonia	.54075	4.435	1	0.03521
dln_cds	.18989	0.547	1	0.45959
ALL		80.053	7	0.00000

Table 6

Results of the SVAR model

Sample: 2018m4 thru 2025m10
Overidentified model

Number of obs = 91
Log likelihood = 474.525

	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
/A						
1_1	1 (constrained)					
2_1	.8921358	.190555	4.68	0.000	.5186548	1.265617
3_1	-.1195428	.019701	-6.07	0.000	-.158156	-.0809297
4_1	0 (constrained)					
5_1	.0890412	.0290893	3.06	0.002	.0320273	.1460552
6_1	0 (constrained)					
7_1	.0578288	.0973425	0.59	0.552	-.132959	.2486166
1_2	0 (constrained)					
2_2	1 (constrained)					
3_2	0 (constrained)					
4_2	0 (constrained)					
5_2	.0002163	.0141769	0.02	0.988	-.0275699	.0280024
6_2	0 (constrained)					
7_2	-.1558816	.0401753	-3.88	0.000	-.2346239	-.0771394
1_3	0 (constrained)					
2_3	0 (constrained)					
3_3	1 (constrained)					
4_3	4.867211	2.067132	2.35	0.019	.8157063	8.918715
5_3	0 (constrained)					
6_3	11.78407	3.48103	3.39	0.001	4.961373	18.60676
7_3	1.19582	.4142023	2.89	0.004	.3839986	2.007642
1_4	0 (constrained)					
2_4	0 (constrained)					
3_4	0 (constrained)					
4_4	1 (constrained)					
5_4	0 (constrained)					

6_4	0	(constrained)				
7_4	.0147626	.0172178	0.86	0.391	-.0189836	.0485088
1_5	0	(constrained)				
2_5	0	(constrained)				
3_5	0	(constrained)				
4_5	1.760851	1.674424	1.05	0.293	-1.52096	5.042662
5_5	1	(constrained)				
6_5	0	(constrained)				
7_5	-1.412525	.2986125	-4.73	0.000	-1.997795	-.8272554
1_6	0	(constrained)				
2_6	0	(constrained)				
3_6	0	(constrained)				
4_6	0	(constrained)				
5_6	-.0090285	.0033378	-2.70	0.007	-.0155705	-.0024865
6_6	1	(constrained)				
7_6	-.0282318	.0102316	-2.76	0.006	-.0482855	-.0081782
1_7	0	(constrained)				
2_7	0	(constrained)				
3_7	0	(constrained)				
4_7	0	(constrained)				
5_7	0	(constrained)				
6_7	0	(constrained)				
7_7	1	(constrained)				
/B						
1_1	.1053325	.0078078	13.49	0.000	.0900295	.1206354
2_1	0	(constrained)				
3_1	0	(constrained)				
4_1	0	(constrained)				
5_1	0	(constrained)				
6_1	0	(constrained)				
7_1	0	(constrained)				
1_2	0	(constrained)				
2_2	.1914711	.0141928	13.49	0.000	.1636538	.2192885
3_2	0	(constrained)				
4_2	0	(constrained)				
5_2	0	(constrained)				
6_2	0	(constrained)				
7_2	0	(constrained)				
1_3	0	(constrained)				
2_3	0	(constrained)				
3_3	.0197957	.0014674	13.49	0.000	.0169197	.0226716
4_3	0	(constrained)				
5_3	0	(constrained)				
6_3	0	(constrained)				
7_3	0	(constrained)				
1_4	0	(constrained)				
2_4	0	(constrained)				
3_4	0	(constrained)				
4_4	.4467718	.0331169	13.49	0.000	.3818639	.5116798
5_4	0	(constrained)				
6_4	0	(constrained)				
7_4	0	(constrained)				
1_5	0	(constrained)				
2_5	0	(constrained)				
3_5	0	(constrained)				
4_5	0	(constrained)				
5_5	.0258943	.0019194	13.49	0.000	.0221323	.0296563
6_5	0	(constrained)				
7_5	0	(constrained)				
1_6	0	(constrained)				
2_6	0	(constrained)				
3_6	0	(constrained)				
4_6	0	(constrained)				
5_6	0	(constrained)				
6_6	.7790691	.0577484	13.49	0.000	.6658842	.892254
7_6	0	(constrained)				
1_7	0	(constrained)				
2_7	0	(constrained)				
3_7	0	(constrained)				
4_7	0	(constrained)				
5_7	0	(constrained)				
6_7	0	(constrained)				
7_7	.0733809	.0054394	13.49	0.000	.06272	.0840418
LR test of identifying restrictions: chi2(7) = 6.06 Prob > chi2 = 0.533						

The Map of Financial States of Kazakhstan's Companies Based on Administrative Microdata

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Using administrative microdata, this paper identifies persistent patterns in the capital and structure (equity-to-assets ratio) and operating efficiency (ROA) of Kazakhstan's companies. The joint distribution of ROA and ER reveals a stable statistical relationship that is persistent over time and observed across most industries. Companies with low equity capital tend to have low return on assets, while well-capitalized companies tend to have high return on assets. For state-owned companies, the relationship weakens and takes on a different character, associating equity with predominantly low returns. For privately held companies, the relationship is driven solely by intercompany variation, itself due to unobservable factors. No relationship was found between the two indicators over time at the individual company level, although statistically weak evidence emerges at the aggregate level. The persistently large share of companies with negative equity that continue to operate suggests weak institutions of corporate insolvency resolution or a hybrid nature of their debt instruments. The analysis demonstrated that the causes of operational weakness are not so much related to the lack of external finance, equity or debt, but rather to unobservable factors that from the start influence both its profitability and the choice of capital structure, and are reproduced in subsequent periods.

Key Words: capital structure, operational efficiency, return on assets, owners' equity, corporate sector, state-owned enterprises, administrative microdata, Kazakhstan.

JEL Classification: D22, D24.

1. Preamble

The impact of capital structure on company performance is central to corporate finance and economics. For developing economies, this topic is of particular significance because of the relatively high cost of external finance, limited financial market depth, significant role of bank lending, and elevated macroeconomic volatility.

In Kazakhstan, the discourse of corporate sector issues often revolves around the lack of and high cost of debt finance. Implicit in this interpretation is the assumption that external finance, once provided to capital starved corporates, ensures sustainable improvement in operational efficiency. Meanwhile, the capital structure reflects a much broader set of enduring attributes of the firm, such as the viability of the business model, management quality, founders' commitment, the structure of corporate incentives, and the effect of long-term company selection mechanisms.

From this perspective, high capitalization may reflect both the owners' initial expectations regarding the project's quality and the subsequent decisions to retain earnings within the firm. Consequently, weak capitalization may reflect shareholders' lack of confidence in the enterprise's prospects.

Such issues take on particularly significance in economies with substantial state participation. For state-owned enterprises, the relationship between profitability, capitalization, and financial survival may differ significantly from that of the private sector due to soft budget constraints, distorted incentive structures, the burden of imputed social functions, and expectation of budgetary support. Under such conditions, the observed capital structure of companies may reflect not only the firm's financial decisions but also broader institutional differences between different segments of the corporate sector.

This study examines capital structure not so much as an isolated financial decision, but rather as part of a stable configuration of a company's financial health. The primary focus is on how companies are distributed in the profitability and capital structure space, how these distributions are and how they differ between non-state private (non-state) companies and state-owned enterprises.

The main question of this research is: How is capital structure related to operating performance of companies in the real sector of Kazakhstan? Unlike much of the existing literature, our work is concerned not so much with estimating the linear effect of debt or equity on profitability, but rather with analyzing the stable structure of the joint distribution of companies' financial health.

Specifically, the study focuses on the following questions: How are the companies distributed in the space of profitability and capital structure? Is there a relationship between equity capital and operating performance? How stable is this relationship over time and how dependent on other factors? How heterogeneous is the corporate sector by company size? To what extent are standard linear models able to describe the observed data structure?

By focusing on these questions, we simultaneously abandon the assessment of marginal effect of financial decisions and instead attempt to characterize the distribution and stability of companies' financial states.

This approach is particularly important for Kazakhstan, where a significant portion of companies are privately held, market discipline is weak, creditor rights are unevenly enforced, and state-owned companies play a significant role in resource allocation.

This study brings a number of novel aspects to corporate sector analysis. It utilizes a broad array of administrative microdata for 2009–2023, covering virtually the entire population of large and medium-sized enterprises in the real sector, as well as a significant sample of small companies. Unlike the studies based solely on public companies, this dataset allows for the analysis of a significantly wider range of enterprises, albeit at the cost of lower data quality.

The methodological and analytical novelty stems from the fact that, unlike existing studies that focus on estimating average values and linear coefficients, this study analyzes the joint distribution of profitability and capital structure. This approach demonstrates the information limitations of standard linear models when applied to heterogeneous and massive corporate data. Quantile and percentile approaches prove somewhat more informative when analyzing stable distributions of financial states of companies.

This methodology revealed persistent heterogeneity between the non-state and state-owned corporates. State-owned enterprises exhibit substantially different relationship between capital structure and operating efficiency. This study also demonstrates the analytical value of administrative statistical reporting for studying the corporate sector in countries with shallow capital market.

Notwithstanding extensive data and the robust patterns identified, these results warrant careful interpretation. This study documents robust associations rather than establishing causal links between capital structure and operating performance. This is partly driven by the fact that the underlying factors are not directly observable, and the available data does not allow for mitigating endogeneity, controlling for reverse causality, or accounting for market selection effects. Consequently, the identified relationships should be interpreted primarily as persistent empirical configurations of companies' financial positions, rather than as evidence of capital structure directly causing profitability.

The paper is organized as follows. The second section examines theoretical approaches to the relationship between capital structure and corporate operating performance, discusses the characteristics of state-owned enterprises and soft budget constraints. The third section describes the data used, the sample selection procedure, and the methodological approach of the research. The fourth section presents the results of the descriptive and distributional analysis of the corporate

sector. The fifth section contains the results of regression analysis and an interpretation of the identified relationships. The sixth section discusses the limitations of the study, institutional interpretation of the results, and possible directions for further analysis. The conclusion summarizes the main findings of the study.

2. Literature Analysis

Mechanisms Linking Capital Structure and Profitability Empirical research in corporate finance demonstrates that a company's capital structure and metrics of operational efficiency are highly stable over time. Mechanical change of the liability structure without a change in corporate governance, operational competencies, internal institutional processes, and a host of other unobservable factors cannot be expected to change operational efficiency in a significant and sustainable way.

Some companies are born more stable and conservative. They accumulate capital faster, use debt more cautiously, and are generally consistently profitable. Others systematically rely on debt and external finance, have weaker operational discipline, and are otherwise more vulnerable. With this interpretation, high equity ratio is not a direct cause of efficiency. Rather, both reflect differences in the internal, unobservable structure of companies, which manifest themselves as differences in financial metrics. This interpretation is particularly relevant to our work, as the administrative data shows stable distributions and configurations of companies' financial metrics, but do not allow to establish direction of causality between them.

Modern corporate finance literature has three strands to explain persistence in company's internal structure.

Lemmon, Roberts, and Zender (2008) empirically demonstrate that a company's financial leverage is stable over decades. Highly indebted companies remain financially strapped, while low-indebted companies maintain a conservative profile, with this trajectory already established before their IPO. Traditional factors that link profitability and investment opportunities explain only a small part of the dynamics. The main driver are the time-invariant fixed effects.

Bebchuk & Roe (1999) postulates path dependence whereby corporate structure and performance are rigidly determined by initial conditions and historical legacy. A corporation is viewed as a system of interconnected, complementary elements. Changing the capital structure without restructuring the corporate culture, organizational structure, and business processes does not produce the expected improvement in efficiency. The system tends to return to its start.

Leland & Pyle (1977) emphasize the signaling role of capital structure. The founder knows the business model and profitability of the project, but external investors do not. The percentage of shares the founder retains for himself/herself becomes a strong signal of the project's quality. The market interprets the founder's high share of ownership as a signal of high quality, which increases the overall valuation of the company. A similar model is used by Ross (1977), where debt is a signal of confidence. In this model, the founders know the company's true condition and yet accept debt obligations under threat of bankruptcy. In practice, however, this argument proves fragile.

The literature on the hierarchy of sources of finance, beginning with the model of Myers & Majluf (1984), shows that if a profitable company issues new shares to outside investors, the market automatically discounts their value. A company with a profitable business model always chooses internal finance, then debt, and only then external equity. Empirical studies of startups and IPOs confirm that founders' financial behavior at the inception stage is a powerful signal of business survival (Johnson, 1997; Vismara, 2016, 2022; Ahlers et al. 2015). In early-stage investments, the founder's financial participation influences the success and pricing of the round. Founders retain maximum control and do not seek to immediately dilute their stake, tend to attract external capital faster and survive better.

An alternative mechanism is based on the motivational role of equity. A high equity ratio can strengthen incentives for cost management, liquidity preservation, limiting inefficient investments, prevention of inefficient investments, and maintenance of sustainable profitability. Conversely, high debt burdens and weakens shareholders' incentives. The drawback of the motivational story is the assumption of independence of capital structure decisions and the operating decisions. Empirically, this theory is testable as a dependence of operational efficiency on capital structure, traceable in time series with individual company level data.

The mechanisms underlying the relationship between capital structure and company performance in emerging economies may deviate substantially from those in developed countries. In less developed countries, the incentives of the management and shareholders take on a greater role than in the developed markets, while the theory of capital structure as a signal begins to falter. In developing countries, external investors find it more difficult to check the veracity of founders claimns, while the risk of outright fraud, expropriation, or asset stripping is much higher. In the absence of sophisticated analytical agencies, low-quality audits, and weak regulators, the market becomes blind. Even if the founder sends a costly signal, the market may ignore it. As a result, the linkages between capital structure and operational performance may potentially be better explained by motivation and be less amenable to signalling interpretation.

State-Owned Enterprises. One of the most persistent findings in countries with large public sector is the inefficiency of state-owned enterprises. This phenomenon is linked to two theories. One is a better for companies that compete with and displace the private sector. The second focuses on infrastructure companies.

Kornai (1986) introduces the concept of a soft budget constraint, where the government assumes responsibility for covering the losses of state-owned companies. Kornai, Maskin, and Roland (2003) explain this choice as the inability to abstain from bailing out state-owned companies. Shleifer and Vishny (1994) showed that politicians can use state-owned companies to reallocate resources to their constituencies. A company can continue to operate over long periods of low profit and continued financial deterioration.

In the context of infrastructure monopolies, Buchanan & Tullock (1962) and Stigler (1971) demonstrate that low return on invested capitel acts as the long-term cost of maintaining the stability of the current social contract, a form of hidden taxation and quasi-budgetary rent redistribution. Low tariffs provide public support, but lead to the erosion of monopolies' capital stock, creating an inefficient, but politically stable equilibrium.

3. Data and Methodology

Source. The study is based on administrative microdata from the Bureau of National Statistics of the Republic of Kazakhstan for 2009–2023. Data from statistical forms 1-PF, “Profit and Loss Statement of an Enterprise”, and 2-MP, Statement of a Small Enterprise Performance”, are used. Form 1-PF covers large and medium-sized enterprises and essentially represents a general population of the corresponding categories of companies in the economic sectors studied. Form 2-MP is a sample survey of small businesses. The study included 16 of the 21 consolidated industries of the CCEA. Public administration, education and healthcare, household activities, extraterritorial organizations, and certain types of non-profit activities were excluded from the analysis. This limitation is driven by the fact that accounting profitability and capital structure in these sectors significantly underestimate market operating efficiency.

The data used is anonymized. Each respondent is assigned a unique identifier, enabling to track the company's dynamics over time without disclosing information about specific enterprises.

The dataset provides broad coverage of the corporate sector. Unlike most capital structure studies based on samples of public companies, this study covers a significant portion of enterprises in the real sector of the economy, most of which are private. This is important for Kazakhstan,

where the equity capital market is limited, bank financing plays a dominant role, and most companies do not publish financial statements.

However, the use of administrative reports is also associated with a number of limitations. Unlike the financial statements of public companies, statistical reports are uneven in quality, employ methodological simplifications, and contain technical errors. Therefore, a significant portion of the research methodology involves data cleaning and filtering. The final sample after data cleaning is halved and includes 274,425 observations from 90,544 companies.

Building Up a Data Panel. The source datasets were combined into a single panel database using unique respondent identifiers and dates. Observations of ROA and ER were indexed by company and year.

Return on assets (ROA), defined as the ratio of net income to assets at the beginning of the year, is used as the indicator of operational efficiency. Using assets at the beginning of the period partially reduces the mechanical dependence between the numerator and denominator that arises when using end-of-period values.

Capital structure is reflected in the equity-to-asset ratio (ER). Bank liabilities, financial liabilities, and individual debt ratios are also analyzed. The primary interest in the study lies in the ER, as this indicator reflects the company's capitalization, accumulated capital preservation capacity, and potential resilience to financial shocks.

The study also utilizes stable company characteristics: the size of the company as an employer, its industry, and its type of ownership. Ownership type is particularly important, as it allows for an analysis of the differences between private and state-owned enterprises.

Data Cleaning. The primary data contains a significant number of technical errors, extreme values, and accounting anomalies. The data was cleaned in several stages. First, data with gaps in accounting identities, negative assets, extremely high values, other obvious technical errors were excluded from the sample. Then we excluded observations with extreme values of ROA and ER (5th and 95th percentiles for small companies and 1st and 99th percentiles for medium-sized and large companies) as significantly out of the range that can be economically interpreted. Data cleaning allowed to reduce noise poor quality reporting. After cleaning, the averages of the indicators did not changed meaningfully, while the variance was significantly reduced and estimates became more stable.

Methodology. The central element of this study is a distributional approach to the corporate sector analysis. Unlike standard capital structure studies, which focus primarily on estimating average linear effects, this paper focuses on the distributions of companies' financial positions, the joint distribution of profitability and capitalization, and the persistent heterogeneity of the corporate sector.

To this end, univariate distributions of indicators, decile and percentile structures, joint distributions of ROA and ER, and differences between groups of companies are analyzed. This approach allows examining not only the average relationship between variables but also the persistent configuration of the corporate sector.

To reduce the impact of extreme observations and highly skewed distributions, ROA and ER were additionally transformed into global percentiles within the overall sample. The percentile representation helps analyze the relative positions of companies within the distribution and to compare different groups of companies more accurately, which is particularly useful in the presence of data heterogeneity and heavy tails.

In addition to the distributional analysis, basic linear models, nonlinear specifications, and quantile regressions are used. Regression analysis is used primarily as a tool for describing statistical relationships between indicators, rather than as a means of strict causal identification. The primary focus is on the stability of coefficients, heterogeneity of relationships between groups of companies, and the ability of various models to describe the observed data structure.

The methodology used has a number of fundamental limitations. First, the study does not allow establishing the causal direction of the relationship between capitalization and operating performance. Higher capitalization may both contribute to a company's stability and be a result of cumulative profitability. Second, there is the problem of endogeneity. Capital structure and profitability can be concurrently influenced by unobservable factors, such as management quality and business models. Third, the accounting measures used reflect the cumulative effect of past decisions and may contain inertial effects.

Furthermore, the administrative data does not contain a number of important corporate characteristics: detailed ownership structure, corporate governance quality, asset market value, and financing strategies. Therefore, the study results should be interpreted primarily as a description of consistent empirical patterns in the corporate sector, rather than as proof of strict causal effects.

4. Narrative Statistics

Sample General Characteristics. The study is based on administrative microdata from the Bureau of National Statistics of the Republic of Kazakhstan for 2009–2023. After combining 1-PF and 2-MP reports, clearing, and filtering the data, the final sample consisted of 274,425 observations from 90,544 companies. The database used represents the general population of large and medium-sized enterprises in the covered economic sectors, as well as a large and stable sample of small businesses.

The quality and balance of the data varies significantly depending on company size. Large and medium-sized enterprises are required to submit reports annually. Over 90% of large enterprises and approximately 84% of medium-sized enterprises are represented in the sample as a continuous series. The sample of small enterprises is less stable: only slightly more than half of the small companies in the sample have reports for more than one year. Each year, a random sample of 30% of registered small companies required to submit reports is selected. However, the share of small companies represented in the sample for several consecutive years significantly exceeds the figures that could have arisen by chance.

The quality of annual reporting at any date, without regard to continuity, is also significantly better for large and medium-sized companies than for small ones. After applying filters, the average values of the indicators remained virtually unchanged, but their dispersion decreased significantly.

Distribution of ROA and ER. The distribution of return on assets (ROA) demonstrates high heterogeneity in the financial performance of companies in the real sector of Kazakhstan. A significant proportion of observations across all enterprise categories are characterized by negative profitability. After data clearing, negative ROA is observed for approximately 29% of large, 31% of medium-sized, and 36% of small enterprises.

Moreover, the distributions of large and medium-sized enterprises are relatively close to each other, while the distribution of small enterprises is significantly more spread out and characterized by significantly greater variation. Small companies simultaneously exhibit both higher positive profitability values and deeper negative values.

This configuration indicates a high degree of heterogeneity among small businesses. Within this category, both fast-growing and highly profitable companies coexist, as do those with chronically weak operating performance and unstable financial positions. In contrast, large and medium-sized enterprises appear more homogeneous and concentrated around moderate profitability levels.

Despite some fluctuations from year to year, including a noticeable deterioration in indicators during the periods of macroeconomic instability, the ROA distribution pattern remains generally stable over time. This suggests that the high proportion of low-profit and unprofitable companies is not a temporary exception, but a persistent characteristic of the studied population of enterprises.

The distribution of equity as a share of assets (ER) also exhibits significant heterogeneity. Negative equity is observed in approximately 15% of large, 16% of medium-sized, and approximately 20% of small companies.

Particularly important is the fact that the share of negative equity companies persists over a long period of time. That is, a significant proportion of companies continue to operate after actual loss of equity. This may reflect a combination of factors: evergreening, zombi lending and other forms of creditor forbearance, , lending from shareholders , corporate defenses, inefficient corporate bankruptcy and the lack of other mechanisms to enforce market discipline.

Small businesses again exhibit far greater heterogeneity, with the much greater proportion of companies with negative equity and companies funded almost exclusively by equity.

The large and medium-sized companies are much closer to their averages.

Table 1

Distribution of ROA and ER

	ROA				Equity ratio			
	All	Large	Medium-sized	Small	All	Large	Medium-sized	Small
Number of observations	274425	15307	28982	230136	274425	15307	28982	230136
% of observations " ≤ 0 "	34%	27%	31%	35%	20%	15%	17%	21%
% of observations " $= 0$ "	-	-	-	-	2.4%	0.4%	0.5%	2.7%
Percentile								
Min	-0.78	-0.29	-0.35	-0.78	-28.24	-28.5	-31.38	-28.24
10 th	-0.17	-0.08	-0.11	-0.19	-0.21	-0.08	-0.13	-0.23
20 th	-0.06	-0.02	-0.04	-0.07	0.00	0.04	0.01	0.00
30 th	-0.01	0.00	0.00	-0.01	0.07	0.16	0.11	0.06
40 th	0.01	0.02	0.01	0.01	0.21	0.29	0.24	0.19
50 th	0.04	0.04	0.04	0.04	0.38	0.41	0.39	0.38
60 th	0.08	0.08	0.07	0.09	0.58	0.54	0.54	0.59
70 th	0.16	0.12	0.12	0.17	0.76	0.67	0.69	0.78
80 th	0.29	0.18	0.19	0.33	0.90	0.79	0.83	0.92
90 th	0.60	0.29	0.31	0.69	0.99	0.90	0.95	0.99
max	2.42	0.62	0.71	2.42	1.00	1.00	1.00	1.00

Joint Distribution of ROA and ER. The most important results of the study emerge in the analysis of the joint distribution of profitability and capital structure. For this purpose, ROA and ER values were transformed into decile groups, after which a joint distribution matrix of observations was constructed. Two stable areas of elevated density are clearly identifiable. The larger area lies along the diagonal, where a higher proportion of equity is systematically associated with higher return on assets. In other words, low-equity companies are less profitable and unprofitable, while high-equity companies are more profitable. The relationship is robust: it is observed for all size, years, industries and before and after data cleaning.

The second area of elevated density is a combination of high equity and low profitability. This area is largely explained by state-owned enterprises. Thus, the joint distribution points to at least two distinct operating regimes : market discipline, where equity share and profitability are closely linked, and soft budget constraint, where high equity – mostly government funded – is linked to low profitability.

Distributional analysis allows for a clearer understanding of this heterogeneity and demonstrates not only the average relationship between variables but also a stable structure of company placement within the financial status space.

The Role of the Type of Ownership. Ownership type appears to be a key factor distinguishing the two high density areas of financial states. Privately owned companies are distributed along the main diagonal of the joint distribution: higher ER is more often associated with higher ROA. State-owned companies better explain the second area of concentration. State-owned companies are more likely to be in the high-capitalization, low-profitability range. For these companies, high equity is more often associated with low profitability. The revealed heterogeneity shows that ownership type is one of the most significant factors determining the configuration of the relationship between capitalization and operating performance.

The Effect of the Size: Large, Medium and Small Businesses. The large and medium enterprises have more in common with each other than with small businesses. The joint distribution of profitability and capitalization for large and medium enterprises are similar in shape and variance. Small businesses exhibit significantly greater heterogeneity across virtually all dimensions. This may reflect lower barriers to entry and exit, diversity of business models, greater heterogeneity in management quality and funding sources.

5. Results

Basic Linear Specifications. As a starting point, we estimated basic linear models linking operating efficiency to capital structure. The results are presented in Appendix 2 and can be characterized as follows:

1. Capital structure (ER) explains approximately 1.0-1.4% of variation in profitability in the overall panel. Firm fixed effects (company-specific and unchangeable factors, but unobservable by the analyst) explain 41%, 38%, and 58% of variation in profitability for large, medium-sized, and small companies, respectively. Fixed effects of the period (macroeconomic or period specific shocks common to all companies) explain 1-2%. The remaining variation is explained by company-specific dynamics. Thus, variation in profitability is split roughly equally between the variation in company averages and the company-specific time variation.

2. ROA of large/medium-sized companies is statistically linked with ER: on average ROA=7% at ER = 0 and rises to ROA=9-10% at ER = 1. ROA of small companies is on average 13-16%, but its relationship with ER is not statistically significant.

3. The relationship between ROA and ER for large/medium-sized companies is evident in pooled unstructured observations (pooled, GLS, GMM) with a coefficient of 2.4-2.7%, as well as when taking into account period effects, fixed and random, with a coefficient of 2.8%.

4. The relationship ceases to be significant when cross-sectional fixed effects (CSFE) and first-difference regression (CSFD) were introduced.

These results show that the relationship between ER and ROA is primarily inter-firm and static rather than intra-firm and dynamic. That is, companies with higher ER are more likely to be more profitable, but a change in ER for a given company does not lead to changes in ROA.

These results however do not distinguish between several possible mechanisms. Higher levels of equity capital may reflect the accumulated results of past profitability, persistent differences in management quality, the viability of the business model, the incentive structure for owners, or the willingness to retain resources within the company. However, ER losing significance when controlling for company specific fixed effects is consistent with the interpretation that the relationship between ROA and ER is largely driven by persistent, company-specific attributes not observed by the analyst.

One possible theoretical interpretation of this result relates to the signaling role of equity and owner commitment. If founders or key owners have better information about the quality of the business model, expected profitability, and risks of the company, then their willingness to invest and retain equity signals project quality and long-term commitment. In this sense, the results are consistent with the signalling logic of Leland & Pyle, as well as with the literature on the role of founder participation, insider ownership, and financing structure in early-stage companies.

However, this interpretation should not be taken as the only one possible or supported by data. The data do not allow for direct observation of founders' decisions, initial capital structure, corporate governance quality, or the company's business model. They support the idea that ER is part of a firm's sustainable financial health and is associated with stable company heterogeneity, although they do not prove that the founder's initial choice is the primary source of this relationship.

Of particular interest is the fact that a positive correlation is observed not only among the most successful companies, but also across a significant portion of the distribution of financial wealth. This suggests that equity is associated not just with isolated episodes of high returns, but rather with more persistent underlying factors of firm performance.

Neither do the results suggest or deny that an increase in equity automatically improves operating efficiency, as in the theory about motivational role of equity.

Instead, the picture is consistent with both explanations: the motivational effect of equity within the operational process (ex post) and the selection mechanism, whereby financial decisions are made before operations (ex ante). At the same time, the robustness of the observed distributions, the limited effect of linear models, but a significant fixed effect, and the stability of firm-level characteristics indicate that the persistence of heterogeneity is at least as important as the motivational effect.

Group Heterogeneity. Despite the robustness of the overall positive relationship between equity and profitability, the strength of this relationship varies across individual company groups. The most notable differences are observed between privately held and state-owned companies. For the private sector, an increase in ER is accompanied by a significantly greater increase in expected profitability than for state-owned enterprises.

This result is consistent with the findings of the distributional analysis. In the private sector, capitalization and profitability form a relatively stable mutual structure, whereas among state-owned enterprises, there is a significant concentration of companies with high equity ratio and low profitability at the same time. Ownership type is not just another company attribute, but a factor that redefines the very nature of the relationship between operating efficiency and capital structure.

From a conceptual perspective, this means that equity does not have a universal economic content for all companies. Same level of equity can reflect different mechanisms for shaping a firm's financial condition, depending on the institutional environment and incentive structure.

Quantile Regression on ROA and ER Percentiles. To test robustness of the results, specifications allowing for a non-linear relationship between capitalization and profitability were additionally estimated. The results show the presence of some non-linearity, but its economic importance turns out to be much less significant than the heterogeneity of distribution of companies as a whole. Changing the functional form allows for a slight improvement in the statistical description of the data, but does not address the fundamental problem: companies are distributed extremely unevenly across the financial state space.

This has important methodological implications. The primary limitation of linear models stems not so much from the potential non-linearity of the relationship between ROA and ER, but rather from the fact that average effects conceal the existence of different groups of companies operating under different institutional and economic regimes. The results of the basic linear specifications confirm presence of a statistically significant relationship between equity and profitability. However, low values of the coefficient of determination suggest that standard linear models describe only a small portion of the observed variation in operating efficiency.

For these reasons, cumulative distribution curves were used to as the non-linear transformation for each indicator. In other words, ROA and ER values were transformed into percentiles within the entire sample. A quantile (median) regression of the ROA percentile (PROA) on the ER percentile (PER) was then estimated.

The results differ significantly from baseline linear estimates (Table 4, Appendix 2). The coefficients for the ER percentiles are significantly larger and statistically robust across all firm size groups. The difference is particularly noticeable for small firms, where linear specifications revealed an extremely weak relationship between equity capital and profitability, while quantile regression reveals a significantly stronger correlation.

This result has several important implications. It confirms that the underlying relationship between equity and profitability is distributional rather than linear. Quantile regression is less sensitive to extreme observations and the highly skewed distributions typical of corporate data. This is particularly important for the sample studied, as a significant proportion of firms exhibit either negative equity or negative profitability, and the distributions are heavy tailed. The results confirm the robustness of the corporate heterogeneity structure, namely, that companies with higher capitalization are systematically located in higher segments of profitability distribution, even if the linear average relationship between absolute values of indicators turns out to be relatively weak.

Interpretation. The results indicate a robust relationship between capital structure and operating performance of companies in Kazakhstan's real sector. However, the nature of this relationship requires careful interpretation. The most robust empirical finding of the study is not so just a positive coefficient in the linear regressions, but rather the structure of the company distribution within the financial state space itself. The joint distribution of ROA and ER reveals that companies are systematically clustered in specific areas rather than randomly distributed. The private sector is characterized by a relatively consistent "diagonal" distribution structure: higher equity is associated with higher profitability, lower equity is linked with operational losses.

This configuration is consistent with several theoretical mechanisms. Both characteristics may reflect the existence of underlying different types of firms. More resilient and productive types demonstrate higher profitability, higher equity, use debt cautiously, and are better able to survive in the long-term.

With this interpretation, the observed relationship reflects not a single financial mechanism, but rather deeper differences in management quality, productivity, growth strategy, and business model sustainability. The results also show that the relationship between capitalization and profitability varies significantly by ownership. For state-owned enterprises, this relationship between capital structure and operational efficiency is much weaker.

A large portion of state-owned companies are concentrated in the high-capitalization category with low profitability. This is consistent with the hypothesis of soft budget constraints and a greater role of social and other non-financial objectives pursued by state-owned enterprises. In the public sector, equity levels are shaped not only as accumulated operational efficiency, but also as administrative support mechanisms, pricing policy, asset transfers, or other forms of external and government finance.

The quantile and distributional approaches prove significantly more productive. They show that the relationship between capital structure and operational efficiency manifests itself primarily as a stable distribution of companies across different financial states.

However, the study does not find a meaningful causal effect of capital structure and profitability. Furthermore, the accounting indicators themselves may reflect the cumulative effects of past decisions and shocks, not just the current state of the firm.

More broadly, the results obtained rather point to the existence of stable corporate regimes and development trajectories. Companies in Kazakhstan's real sector systematically differ in their combination of profitability, capitalization, financial stability, and likelihood of long-term sustainability. This stable segmentation of the corporate sector appears to be one of the most important findings of the study.

6. Discussion of Results

Sustainable Financial Positions of Companies. The obtained results show that the distribution of financial indicators of Kazakhstan's companies is characterized by two a relatively stable areas in the space of financial states.

Companies are systematically concentrated in certain areas in the financial state space. Low equity is associated with low profitability, while high equity is associated with higher profitability. State-owned enterprises also have a large additional area of high capitalization and low profitability.

These facts remain true over time and after data cleaning, among large and medium-sized companies, across all industries. They suggests that capital structure and operating efficiency reflect some inherent properties of a company that are more stable than year-to-year fluctuations in financial indicators.

The study also suggests that capital structure can be interpreted not only as a financial indicator but an indicator of its unobservable factors that shape its operational performance. For companies with large equity and high profitability, this conclusion is entirely natural, as profitability reflects a company's ability to accumulate resources, its long-term survival, and shareholder interest in its further existence.

A paradoxical consequence of the stability of financial positions of the entire sample over time and the consistently high proportion of companies with negative equity is that a similar conclusion must be drawn in respect of companies with negative equity. This may indicate either that creditor claims are difficult to enforce or that creditors are not interested in enforcing them. In the former case, this suggests that insolvency resolution institutions are weak (Miller & Kabdulov, 2022). In the latter case, debt obligations may have some hidden equity or hybrid features.

One of the most consistent findings of the study is the distinction between state-owned enterprises and the private sector. For private companies, equity and profitability are closely related. For state-owned enterprises, this relationship is much weaker. High levels of equity in this group are not necessarily accompanied by high operational efficiency. Moreover, the study results alone do not allow separating inefficiency from the performance of non-market objectives. Low profitability of state-owned companies does not necessarily mean a lack of economic utility, as some such enterprises may perform infrastructural, social, or stabilization functions. However, the heterogeneity identified points to the existence of different institutional modes of operation of the corporate sector.

The results also demonstrate the limitations of standard linear specifications when analyzing corporate heterogeneity. Despite statistically significant coefficients, basic OLS models explain only a relatively small portion of the variation in company profitability. This means that average linear effects obscure a significant portion of the distribution structure. Quantile and percentile approaches prove to be more informative, as they allow analyzing companies' positions within the overall financial status space, rather than just the average relationship between absolute values of indicators.

More broadly, results of the study demonstrate that Kazakhstan's corporate sector is characterized by high structural heterogeneity, poorly described by a single average coefficients.

These findings open several avenues for further analysis. First, studying the dynamics of company transitions between different financial states appears promising. It would allow to assess sustainability of the identified corporate trajectories and the likelihood of transitions between them. Second, the phenomenon of the long-term existence of companies with negative equity and low profitability requires separate analysis. Such enterprises may be associated with the problem of the so-called "zombie companies" and inefficient resource allocation. Finally, the use of more complex dynamic models appears promising, allowing for a closer analysis of the causal mechanisms underlying the relationship between capital structure, stability, and operational performance.

7. Conclusion

This study analyzes the relationship between capital structure and operating performance of companies in the real sector of Kazakhstan using a broad array of administrative microdata for 2009–2023.

The results demonstrate that Kazakhstan's corporate sector is characterized by high and persistent heterogeneity in the financial state. The most important empirical finding of the study is the statistical relationship between equity and profitability, observed in their joint distribution.

For the private sector companies, the relationship between the equity ratio and return on assets is positive and statistically and economically significant. State-owned enterprises are characterized are more likely to exhibit a combination of high equity and low profitability, a sign of weak external discipline that supports the positive relationship between financial stability and operating performance.

The results are consistent with the notion of distinct institutional environments that affects the joint distribution of financial states.

However, a word of caution regarding the interpretation. The study does not establish a causal relationship between capital structure and companies' operating performance. Higher equity may be a factor in firm stability, as well as a result of cumulative profitability, corporate governance characteristics, or the long-term selection of more resilient companies.

More broadly, the study points to the existence of steady corporate trajectories and segmentation of companies' financial states, rather than to the impact of a single universal mechanism through which the capital structure exerts influence on performance. Such research could contribute to a deeper understanding of the factors that affect stability, productivity, and resource allocation in Kazakhstan's corporate sector.

References

1. Bebchuk, L. A., & Roe, M. J. (1999). A theory of path dependence in corporate governance and ownership. *Stanford Law Review*, 52(1), 127–170. doi.org
2. Buchanan, J. M., & Tullock, G. (1962). *The calculus of consent: Logical foundations of constitutional democracy*. University of Michigan Press.
3. Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Sociological Review*, 49(2), 149–164. doi.org
4. Johnson, J. M. (1997). Insider ownership and the long-run performance of initial public offerings. *The Journal of Financial Research*, 20(2), 183–201. doi.org
5. Kornai, J. (1986). The Soft Budget Constraint. *Kyklos*, 39(1), 3–30.
6. Kornai, J., Maskin, E., & Roland, G. (2003). Understanding the Soft Budget Constraint. *Journal of Economic Literature*, 41(4), 1095–1136.
7. Leland, H. E., & Pyle, D. H. (1977). Informational asymmetries, financial structure, and financial intermediation. *The Journal of Finance*, 32(2), 371–387. doi.org
8. Lemmon, M. L., Roberts, M. R., & Zender, J. F. (2008). Persistence and the cross-section of corporate capital structure. *The Journal of Finance*, 63(4), 1575–1608. doi.org
9. Miller&Kabdullov, (2022). *Corporate Bankruptcy in Kazakhstan: Problems and Solutions*. Working Papers of the National Bank of Kazakhstan.
10. Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2), 187–221. doi.org
11. Ross, S. A. (1977). The determination of financial structure: The incentive-signalling approach. *The Bell Journal of Economics*, 8(1), 23–40. doi.org
12. Shleifer, A., & Vishny, R. W. (1994). Politicians and firms. *The Quarterly Journal of Economics*, 109(4), 995–1025. doi.org

13. Stigler, G. J. (1971). The theory of economic regulation. *The Bell Journal of Economics and Management Science*, 2(1), 3–21.
14. Vismara, S. (2016). Equity crowdfunding: Choose wisely who you stand with. *Small Business Economics*, 47(3), 583–600. doi.org

Annex 1

Table 1

Joint distribution of ROA and ER. All companies

Decile of ER	Decile of ROA										Total:
	1	2	3	4	5	6	7	8	9	10	
10	0.9	0.9	0.9	1.1	0.8	0.7	0.7	0.9	1.1	1.9	27 379
9	0.7	0.8	1.0	0.9	0.9	0.9	1.1	1.1	1.2	1.4	27 440
8	0.7	0.8	0.8	0.7	0.9	1.0	1.1	1.3	1.3	1.2	27 483
7	0.7	0.8	0.8	0.7	0.9	1.1	1.3	1.3	1.3	1.0	27 442
6	0.7	0.8	0.8	0.8	1.0	1.2	1.3	1.3	1.3	0.8	27 486
5	0.7	0.8	0.9	0.9	1.1	1.3	1.3	1.2	1.0	0.7	27 469
4	0.7	0.9	1.0	1.3	1.4	1.3	1.2	0.9	0.8	0.6	27 387
3	0.8	0.8	1.0	1.6	1.6	1.1	0.8	0.7	0.6	0.7	26 856
2	1.3	1.6	1.6	1.2	0.9	0.8	0.7	0.7	0.7	0.8	28 042
1	2.5	1.7	1.2	0.7	0.5	0.6	0.6	0.6	0.7	0.9	27 441
Total:	27 443	27 442	27 443	27 442	27 442	27 443	27 442	27 443	27 442	27 443	274 425

Table 2

Joint distribution of ROA and ER. Companies with government participation

Decile of ER	Decile of ROA										Total:
	1	2	3	4	5	6	7	8	9	10	
10	3.6	5.7	4.8	7.9	2.6	1.7	1.4	1.2	1.0	0.7	4182
9	1.9	3.1	4.0	5.0	2.2	1.3	1.0	0.6	0.5	0.3	2723
8	1.3	2.2	2.5	3.0	2.0	1.3	1.3	0.7	0.5	0.3	2032
7	1.0	1.1	1.5	2.1	1.2	1.2	0.9	0.6	0.5	0.2	1402
6	0.8	0.9	1.2	1.4	1.0	0.8	0.5	0.4	0.4	0.2	1017
5	0.5	0.6	0.8	0.8	0.6	0.5	0.4	0.2	0.2	0.1	638
4	0.3	0.3	0.6	1.1	0.5	0.4	0.2	0.2	0.1	0.1	504
3	0.1	0.2	0.4	1.1	0.3	0.1	0.1	0.1	0.1	0.1	351
2	0.6	0.7	0.6	0.6	0.2	0.1	0.1	0.1	0.1	0.1	451
1	0.7	0.4	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	340
Total:	1473	2093	2262	3157	1491	1036	789	574	472	293	13640

Table 3

Joint distribution of ROA and ER. Large privately-owned companies

Decile of ER	Decile of ROA										Total:
	1	2	3	4	5	6	7	8	9	10	
10	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	105
9	0.1	0.3	0.4	0.5	0.6	0.7	0.9	1.0	0.6	0.0	673
8	0.2	0.6	0.6	0.7	1.3	1.9	1.9	2.3	1.9	0.0	1498
7	0.2	0.7	0.9	1.0	1.4	2.1	2.6	2.5	2.0	0.0	1735
6	0.2	1.0	1.0	1.1	1.8	2.7	3.1	2.9	2.2	0.1	2076
5	0.4	1.0	1.1	1.1	2.2	2.6	2.9	2.3	1.6	0.0	1972
4	0.4	1.1	1.1	1.1	2.0	2.3	2.0	1.6	0.9	0.0	1614
3	0.3	0.7	0.9	1.5	1.5	1.3	1.0	0.7	0.5	0.0	1107
2	0.7	1.4	1.5	1.0	1.1	1.1	0.9	0.8	0.5	0.0	1162
1	1.0	1.6	1.1	0.5	0.6	0.6	0.6	0.7	0.7	0.0	970
Total:	457	1087	1121	1131	1640	2003	2073	1944	1414	42	12912

Note. The tables present the joint distribution of ROA and ER by deciles. The ROA and ER decile values are listed in Table 2. The marginal frequency of ROA by decile is shown in the bottom row. The marginal frequency of ER by decile is shown in the rightmost column. The joint distribution is presented in normalized form as the ratio of the joint frequency to 1/100 of all observations, so that values greater or less than one reflect a greater or lesser probability than in a homogeneous (independent of sampling criteria) and independent distribution of ROA and ER.

Table 4

Joint distribution of ROA and ER. Medium-sized privately-owned companies

Decile of ER	Decile of ROA										Total:
	1	2	3	4	5	6	7	8	9	10	
10	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.0	432
9	0.1	0.4	0.5	0.6	0.6	0.9	1.3	1.3	0.9	0.1	1711
8	0.3	0.7	0.8	0.8	1.2	1.6	1.7	2.1	1.6	0.2	2802
7	0.4	0.8	0.9	0.8	1.3	1.9	2.4	2.2	1.8	0.2	3233
6	0.5	1.0	1.1	0.9	1.3	2.1	2.2	2.2	1.8	0.2	3399
5	0.5	1.1	1.2	1.0	1.7	2.3	2.1	1.8	1.4	0.2	3418
4	0.5	1.0	1.3	1.5	2.0	2.2	1.7	1.3	0.8	0.1	3159
3	0.4	0.9	1.2	1.8	2.1	1.4	1.0	0.8	0.7	0.1	2662
2	0.8	1.7	1.6	1.3	1.1	1.0	0.8	0.7	0.5	0.1	2430
1	1.4	2.0	1.3	0.6	0.5	0.7	0.7	0.8	0.7	0.1	2278
Total:	1291	2496	2563	2400	3113	3597	3632	3435	2621	376	25524

Table 5

Joint distribution of ROA and ER. Small privately-owned companies

Decile of ER	Decile of ROA										Total:
	1	2	3	4	5	6	7	8	9	10	
10	0.9	0.7	0.8	0.9	0.8	0.7	0.8	0.9	1.2	2.3	22660
9	0.8	0.8	0.9	0.8	0.8	0.9	1.1	1.1	1.3	1.7	22333
8	0.8	0.8	0.7	0.6	0.8	0.9	1.0	1.2	1.3	1.5	21151
7	0.8	0.8	0.7	0.6	0.8	1.0	1.1	1.2	1.2	1.3	21071
6	0.8	0.8	0.8	0.7	0.9	1.0	1.1	1.1	1.2	1.0	20994
5	0.8	0.8	0.9	0.8	1.0	1.1	1.1	1.2	1.0	0.8	21441
4	0.8	0.9	1.0	1.3	1.4	1.2	1.1	0.9	0.8	0.7	22110
3	0.9	0.9	1.0	1.7	1.6	1.1	0.8	0.7	0.7	0.9	22736
2	1.5	1.6	1.6	1.3	0.9	0.8	0.7	0.7	0.7	0.9	23999
1	2.8	1.8	1.2	0.7	0.6	0.6	0.6	0.6	0.8	1.0	23853
Total:	24222	21766	21497	20754	21198	20806	20948	21490	22935	26732	222348

Annex 2

Table 1

Regressing the ROA on the ER. Large enterprises

Method:	Pool	GLS CSw	GMM	GMM CSw	GMM CSFE	GMM CSRE	GMM CSFD	GMM PFE	GMM PRE
C	0.070**	0.053**	0.071**	0.070**	0.081**	0.075**		0.071**	0.070**
ER	0.025**	0.024**	0.027**	-0.002	0.001	0.014*	-0.007	0.028**	0.028**
Obs	15307	15307	13551	13551	13551	13551	11965	13551	13551
R-sq	0.0096	0.0136	0.0081	-0.0007	0.4117	0.0004	NA	0.0143	0.0085
F	148.6	210.7	NA	NA	NA	NA	NA	NA	NA

Table 2

Regressing the ROA on the ER. Medium-sized enterprises

Method:	Pool	GLS CSw	GMM	GMM CSw	GMM CSFE	GMM CSRE	GMM CSFD	GMM PFE	GMM PRE
C	0.065	0.060	0.065	0.064	0.086	0.072		0.065	0.063
ER	0.027**	0.024**	0.027**	0.015**	-0.032**	0.005	0.058	0.028**	0.028**
Obs	28982	28982	25106	25106	25106	25106	21729	25106	25106
R-sq	0.0117	0.0184	0.0145	0.045	0.3846	0.0013	NA	0.0215	0.0151
F	342.1	544.2	NA	NA	NA	NA	NA	NA	NA

Table 3

Regressing the ROA on the ER. Small enterprises

Method:	Pool	GLS CSw	GMM	GMM CSw	GMM CSFE	GMM CSRE	GMM CSFD	GMM PFE	GMM PRE
C	0.161	0.161	0.131	0.133	0.132	0.150		0.131	0.112
ER	0.001**	0.001**	0.001*	-0.002	0.000	0.000	-0.001	0.001	0.001
Obs	230136	230136	145224	145224	145224	145224	97709	145224	145224
R-sq	0.0002	0.0071	0.0003	-0.0301	0.5768	0.0001	NA	0.0101	0.0003
F	57.08	1642.5	NA	NA	NA	NA	NA	NA	NA

Note. 1. Pool - Pooled OLS. 2. GLS CSW – GLS Cross-sections weighted. 3. GMM - Generalized method of moments. 4. GMM CSW – GMM Cross-sections weighted. 5. GMM CS FE – GMM Cross-section fixed effects. 6. GMM CS RE – GMM EGLS Cross-section random effects. 7. GMM CS FD – GMM Cross-section fixed first differences. 8. GMM PFE – GMM EGLS Period fixed effects. 9. GMM PRE – GMM EGLS Period random effects.

*, ** - significance of 95% and 99%

Table 4

**The median of regressing the percentile of ROA on the percentile of ER.
Dependent variable PROA (percentile of ROA)**

	Large	Medium-sized	Small	Government participation	Private
Observations	15307	28982	230136	13640	260785
C	42.61**	38.67**	32**	35.75**	31.55**
PER	0.19**	0.24**	0.36**	-0.02**	0.41**
Pseudo R-squared	0.01	0.02	0.04	0.00	0.05
S.E. of regression	22.50	23.76	29.58	22.37	28.67

Estimating at q=0.5. Huber Sandwich Standard Errors & Covariance, Sparsity method: Kernel (Epanechnikov) using residuals