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The Impact of the Nominal Exchange Rate Pass-Through on Inflation in Kazakhstan

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Abstract

Studying the effect of exchange rate shocks on inflation is a particularly important aspect of economic research, especially for countries with developing markets. Evaluating the pass-through effect is of special significance for Kazakhstan due to the country's economic characteristics, such as a freely floating exchange rate, an active trade position, and high demand for imported goods. This topic also gains further importance in the context of inflation targeting, where examining factors that influence inflation becomes crucial.

This paper analyzes the presence, degree, and dynamics of this effect in Kazakhstan, aiming to provide a deeper understanding of the interaction between external economic factors and domestic inflation. The results of the vector autoregression models and impulse response functions indicate the existence of a transmission of fluctuations in the nominal exchange rates of the tenge against the Russian ruble and the US dollar onto inflation in Kazakhstan.

Keywords: *inflation, pass-through effect, vector autoregression model, impulse responses, vector autoregression.*

JEL- Classification: *E30, E31, F31*

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1. Introduction

Since 2015, the National Bank of the Republic of Kazakhstan (hereinafter – NBRK) has implemented an inflation targeting policy, meaning that the primary focus of monetary policy is to achieve a specific level of inflation. In the context of inflation targeting, analyzing the factors affecting inflation is crucial for making timely and well-founded decisions. Thus, inflation targeting requires in-depth analysis and monitoring of factors influencing inflation.

Studying consumer prices is one of the key tasks of the NBRK as it is directly related to the goal of ensuring price stability. Given the country's active involvement in international trade and strong domestic demand for imported goods, assessing the impact of exchange rate fluctuations on domestic prices is a highly relevant topic. Confirming the presence of, as well as understanding the magnitude and dynamics of, the pass-through effect can be useful for a better understanding of inflation factors and its analysis.

This paper examines the response of consumer prices to nominal exchange rate shocks of the tenge against the Russian ruble and the US dollar, analyzing the overall Consumer Price Index (CPI), CPI components, and individual goods using vector autoregression (VAR) models. The main endogenous variables include the overall CPI, specific CPI components, and the nominal exchange rates of the tenge against the Russian ruble and the US dollar. Exogenous variables include the overall CPI and CPI components in Russia, the FAO index for cereals, and Brent crude oil prices, as external factors strongly correlated with the economy of Kazakhstan.

The results indicate the significance of exchange rate dynamics for the overall CPI, as well as for food and non-food components of inflation. At the same time, inflation in the services sector did not show a significant dependence on exchange rate fluctuations, though individual services exhibited specific dependencies on different currencies. Recent estimates suggest an intensification of the pass-through effect to the US dollar and a weakening effect towards the Russian ruble. An asymmetry in the pass-through effect was also observed, manifesting as more significant responses to the depreciation of the tenge against foreign currencies compared to the appreciation of the tenge by a similar magnitude.

The paper consists of several sections. The first chapter serves as the introduction. The second chapter reviews literature and the experience of other studies on the pass-through effect. This is followed by a chapter consisting of two sections describing data selection and methodology. The first section of the chapter outlines the data and economic variables based on the literature review. The second section describes the chosen analysis methodology, selected based on existing research and expert opinion. The next chapter discusses the results of the analytical work, divided into four parts, each addressing different aspects of the study. These aspects include: the presence and magnitude of the pass-through effect, the impact of the exchange rate regime on the pass-through effect, the evolution of the pass-through effect, and its asymmetry. The final, fifth section will outline conclusions drawn from the results of the constructed models and their comparison with findings from other studies.

2. Literature review

The pass-through effect of exchange rate shocks on inflation is an extremely relevant and multifaceted topic. Various studies have explored this area, focusing particularly on factors affecting the presence, speed, and magnitude of the effect. For instance, the publication developed by the World Bank, "Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies" (Ha et al., 2018), in the chapter dedicated to the pass-through effect, investigates developing countries and concludes that the pass-through effect is less pronounced in countries practicing inflation targeting. This view is supported by numerous other studies, including the thematic report of the Eurasian Development Bank (Kuznetsov et al., 2019) and a study by the Bank of Russia (Zhurakovsky et al., 2021), where inflation targeting is cited as a factor reducing the pass-through effect.

Regarding alternative factors influencing the pass-through effect, studies conducted by the World Bank (Ha et al., 2018) and the International Monetary Fund (IMF) identify dollarization levels, trust in the central bank, and communication as factors with significant impacts on the effect. According to these studies, the pass-through effect intensifies with increased dollarization, while effective communication and the central bank's credibility reduce the effect. Several studies emphasize trust in the central bank as a key factor affecting the pass-through effect (IMF), (Kuznetsov et al., 2019), (Ha et al., 2018), (Rahimov et al., 2017). Notably, a study conducted by the Bank of Canada (Bailliu and Fujii, 2004) explains the difference in the magnitude of the pass-through effect during inflation stabilization episodes in the 1980s and 1990s by noting that monetary policy in the 1990s enjoyed greater trust compared to the 1980s, leading to a more effective reduction in the pass-through effect.

Ha et al. (2018) and Zhurakovsky et al. (2021) also mention that the structure of imports and consumption is another factor shaping the pass-through effect dynamics. The authors conclude that a high share of imported goods in the country's consumption structure leads to a stronger manifestation of the pass-through effect.

In addition to different approaches to selecting the studied countries and samples, there are many methodological variations for conducting research on this topic. In a study conducted by the European Central Bank (Ca’ Zorzi et al., 2007) a vector autoregression model was used to compare the pass-through effect between developing and developed countries in Asia, Latin America, Central and Eastern Europe, and the hypothesis that the pass-through effect is generally stronger in developing countries was disproven. VAR is one of the most popular approaches to studying the pass-through effect, and many studies, including (Zhurakovsky et al., 2021), (Rahimov et al., 2017), and (IMF), use this model in their research.

Alternative specifications include the Structured Vector Autoregression (SVAR) used by (Kuznetsov et al., 2019) and the Factor-Augmented Vector Autoregression (FAVAR) used by (Ha et al., 2018). There are also many variations in the frequency of data and model variables. Among the studies mentioned, (Ca’ Zorzi et al., 2007), (Ha et al., 2018), and (Kuznetsov et al., 2019) use quarterly data, while (IMF) and (Zhurakovsky et al., 2021) use monthly data.

Several studies focusing on Kazakhstan have identified the presence of a pass-through effect. (Kuznetsov et al., 2019) mention that the transition to a floating exchange rate and inflation targeting explains the low amplitude of the pass-through effect in Kazakhstan relative to other EDB countries. According to the study, Kazakhstan has the second-lowest inflation response to an exchange rate shock over 4 quarters (0.26 p.p.), after Russia (0.17 p.p.), whereas the results for other countries are 0.28 p.p. (Armenia), 0.37 p.p. (Tajikistan), 0.43 p.p. (Belarus), and 0.48 p.p. (Kyrgyzstan). Similar numerical results were obtained by (Rahimov et al., 2017), who confirmed the presence of a pass-through effect in Kazakhstan of 0.28, and (Colicev et al., 2019), who recorded the pass-through effect in Kazakhstan in the range 0.25-0.34 p.p.. According to these results, a 10% appreciation of foreign currency is expected to lead to an average inflation increase of 2.6 p.p. (Kuznetsov et al., 2019), 2.8 p.p. (Rahimov et al., 2017), and 2.5-3.4 p.p. (Colicev et al., 2019), respectively.

It is also noteworthy that (Rahimov et al., 2017) mention that the pass-through effect on non-food inflation in Kazakhstan not only exceeds the effect on food inflation but also surpasses the corresponding parameter in Russia and Azerbaijan. According to the results, the pass-through effect on overall inflation was 0.28 p.p. in Kazakhstan and Azerbaijan, and 0.32 p.p. in Russia. Meanwhile, the pass-through effect on food inflation was 0.20 p.p., 0.26 p.p., and 0.36 p.p., respectively. The highest pass-through effect recorded for non-food inflation in Kazakhstan was 0.52 p.p. among the group of countries, while the lowest for service inflation was 0.07 p.p.

An IMF publication focusing specifically on the Republic of Kazakhstan concluded that the pass-through effect is present in the country. According to the study, the effect is initially insignificant but significantly intensifies 2-3 months after the exchange rate shock. Additionally, the study predicts that a 10% depreciation of the tenge is expected to lead to a 3 p.p. increase in consumer prices.

Besides the existence and magnitude of the pass-through effect, its evolution may be another avenue of research on this topic. One technique for assessing changes in the pass-through effect over time is the "expanding window" method, which expands the model's sample from a certain period, incorporating and showing changes in the pass-through effect. This method allows for the identification of periods of stability and the determination of significant structural changes that may alter the effect magnitude. The expanding window method for studying the evolution of the pass-through effect was detailed in the document "Inflation Review[2]." This approach will serve as the theoretical basis for analyzing changes in the pass-through effect over time in this study.

Asymmetry in the pass-through effect is another popular aspect of studying the pass-through effect. The presence of asymmetry in the pass-through effect was found in Kazakhstan according to (Kuznetsov et al., 2019), which notes that the effect of depreciation is greater than the effect of appreciation. A similar result was also found by (Zhurakovsky et al., 2021) when studying the pass-through effect in Russia. (Macedo de Assis et al., 2023), on the other hand, arrived at the opposite conclusion about asymmetry. According to their study of Brazil, the effect of currency appreciation on inflation was stronger than the effect of depreciation. The IMF study, which examined the pass-through

[2] Inflation Review. April 2020

effect in Kazakhstan in the context of inflation targeting, found no evidence supporting asymmetry in the pass-through effect. Factors explaining the reason for pass-through asymmetry include various macroeconomic conditions, such as the phase of the economic cycle, inflation and inflation expectations, the degree of economic openness, and the direction of exchange rate changes (Kuznetsov et al., 2019). The Bank of Russia's study notes that asymmetry in the pass-through effect arises from imperfect competition and greater price rigidity when prices fall compared to when they rise (Zhuravkovsky et al., 2021).

It is also worth noting that the IMF and Macedo de Assis et al. used similar methods to assess pass-through asymmetry, which involved dividing data into series containing only depreciations and appreciations and subsequently comparing the magnitudes of the effects. In particular, (Macedo de Assis et al., 2023) divided data on exchange rate changes into logarithmic form, separating movements up and down. This method facilitated regression analysis and was replicated in this study.

3. Data and Methodology

3.1 Data

The model includes monthly data from January 2011 to October 2024. Additionally, supplementary models with an expanding dataset were examined, starting from January 2011 through early 2016, and then expanding the sample with a one-month step. This approach is used to assess changes in the pass-through effect over time.

Endogenous factors chosen for the model include: the nominal exchange rates of the tenge against the Russian ruble and the US dollar, broad money supply, the producer price index in manufacturing, the overall Consumer Price Index (CPI), inflation by components, and inflation for specific commodity groups.

Exogenous factors included the import price index, Brent crude oil price, the overall CPI and CPI components in Russia, and the FAO index for grains.

Seasonally affected data (all except exchange rates and broad money supply) were adjusted using the Census X-12 seasonal adjustment filter. Due to the presence of autocorrelation in the variables, first differences were used for most variables. Additionally, to evaluate dynamics in percentage terms, natural logarithmic transformation of the variables was applied.

3.2 Methodology of Analysis

To estimate the pass-through effect, a Vector Autoregression (VAR) model was used, followed by obtaining impulse response function estimates of the Consumer Price Index (CPI) to exchange rate shocks. Estimates were obtained for both the overall CPI and its components over different time periods.

VAR models allow for the analysis of dynamic impacts of shocks on a system of selected indicators and are the most well-known method for assessing price responses to exchange rate shocks. Vector autoregressions consist of a system of equations where the

value of each endogenous variable is determined by past values of not only itself but also other endogenous variables in the system. This approach also facilitates the analysis of causal relationships between indicators and provides quantitative estimates of the effects being studied. These procedures are implemented based on the analysis of impulse response functions from the VAR model, results from variance decomposition of forecast errors, and calculation of pass-through effect coefficients.

This approach to estimating the pass-through effect has been applied in several previously mentioned studies. For instance, the study conducted by the European Central Bank (Ca' Zorzi et al., 2007) assessed the pass-through effect in developing and developed countries in Asia, Latin America, Central, and Eastern Europe. VAR models were also used in the works of (Zhurakovsky et al., 2021) in their report for the Bank of Russia, (Rahimov et al., 2017), and (IMF).

The general form of the model is presented as follows:

$$y_t = \sum_{j=1}^{p} A_j \cdot y_{t-j} + B_t x_t + C d_t + \varepsilon_t$$

where y_t is a k-dimensional vector of endogenous variables, x_t is a vector of exogenous variables, d_t is a vector of dummy variables, A_j, …, A_p, B_t, C are matrices of coefficients to be estimated, ε_t is a vector of residuals.

The pass-through effect for the period 2011-2024 is presented as the result of estimating the cumulative impulse response function of inflation 12 months after a 1% depreciation of the exchange rate. It is expected that, in the context of a freely floating exchange rate and inflation targeting, the pass-through effect should be weaker. This assumption is based on studies such as (Ha et al., 2018), (Kuznetsov et al., 2019), and (Zhurakovsky et al., 2021).

To assess changes in the pass-through effect compared to other periods, the cumulative impulse response functions will be compared using an expanding window approach. This method is suitable for detecting changes in historical trends and will be applied to track changes in the dynamics of the pass-through effect.

The analysis will start from January 2011 to January 2016, and then the sample will expand with a one-month step until October 2024. This practice is expected to capture changes in the pass-through effect in the context of significant structural shifts, such as changes in the exchange rate regime or other external shocks.

To evaluate the asymmetry of the pass-through effect, the method of comparing impulse responses to currency depreciation and appreciation will be used. The data will be separated as exemplified by (Macedo de Assis et al., 2018) as follows:

$$rate_{up} = \begin{cases} ln(rate), if\ \Delta ln(rate) > 0 \\ 0 \quad , if\ \Delta ln(rate) \leq 0 \end{cases}$$

$$rate_{down} = \begin{cases} ln(rate), if\ \Delta ln(rate) < 0 \\ 0 \quad , if\ \Delta ln(rate) \geq 0 \end{cases}$$

Where *rate* stands for nominal exchange rates of tenge against rouble and US dollar, Δ indicates the variable's difference with the previous period's value, and log denotes the natural logarithmic transformation of the variable. The nominal exchange rate data in logarithmic expression will be compared with the previous period. If the rate moves up (the foreign currency appreciates against tenge), i.e. its current value is higher than the previous one, then Δln(rate) will be positive, and the logarithmic value of the rate for the given period will be added to the rate_up series, which contains only observations of the exchange rate weakening. Similarly, if the rate moves down (the foreign currency depreciates against tenge), the difference between the current and previous values will be negative, and the value for the period will be added to the rate_down series. If the rate remains unchanged, the difference will be zero.

4. Results

4.1 Pass-through effect

According to the results, the first impulse responses appear in the second month after the currency shock. The maximum effect of price adjustments in response to changes in the nominal exchange rate of the tenge occurs in the first 2-3 months. A similar peak dynamic in the 2-3 month period was also described in an IMF study. Six months after the shock, its influence fades.

The results indicate that changes in the nominal exchange rate of the tenge against the Russian ruble and the US dollar affect the overall CPI and its main components. Specifically, the accumulated 12-month pass-through effect of a 1% currency shock on the overall CPI is 0.1 and 0.14 p.p. for the Russian ruble and the US dollar, respectively. Thus, the model results suggest that a 10% depreciation of the tenge would lead to an inflation increase of 1 and 1.4 p.p. after 12 months. These figures indicate that currency fluctuations have a moderate impact on the overall price level in the economy.

For the food component of the CPI, the accumulated pass-through effect of the currency shock is 0.08 p.p. for the ruble and 0.09 p.p. for the US dollar. This result suggests relatively low sensitivity of food prices to currency fluctuations, which might be related to the relatively low share of food products in the import structure (about 20% on average from 2011 to 2022) and the fact that a large portion of local food demand is met by domestically produced goods.

Currency shocks have the greatest impact on the non-food component of the CPI. The accumulated pass-through effect in this case is 0.15 and 0.24 p.p. for the Russian ruble and the US dollar, respectively. This data indicates a high sensitivity of non-food goods to currency shocks, which may be related to the larger share of non-food goods in the country's import structure (about 60% on average from 2011 to 2022). Given that the share of imported goods among non-food products is significantly higher compared to food products, the difference in the magnitude of the pass-through effect is confirmed by studies. (Ha et al., 2018) and (Zhurakovsky et al., 2021) state that the degree of economic openness and the significance of imports for an economy are directly related to the

magnitude of the pass-through effect. Therefore, sectors of the economy where import presence is more significant will be more affected by exchange rate movements.

As for the services component, the pass-through effect is minimal, amounting to 0.02 and 0.04 p.p. for the Russian ruble and the US dollar accordingly.

4.2 Effect of pass-through and exchange rate regime

In this study, a comparative analysis of the accumulated pass-through effects of currency shocks on inflation, taking into account changes in the exchange rate regime, was conducted using an expanding window method. The results align with expectations outlined in studies (Ha et al., 2018), (Kuznetsov et al., 2019), (Zhurakovsky et al., 2021). It is anticipated that Kazakhstan's transition to inflation targeting and a floating exchange rate will be accompanied by a weakening of the pass-through effect.

To maintain statistical significance, the analysis was conducted from January 2016, despite the transition to a floating exchange rate occurring five months earlier. It is expected that the impact of the regime change on the pass-through effect will be reflected in the initial periods of the analysis.

According to the data presented in Table 1 and Figure 1, at the beginning of the analyzed period, the pass-through effect of the nominal exchange rate of the US dollar to the tenge was significantly higher (0.15 p.p.) compared to subsequent months. During the inflation targeting period, the pass-through effect of the dollar exchange rate decreased and remained at a relatively low level (0.11-0.12 p.p.) until the beginning of 2022, confirming the hypothesis of a negative correlation between inflation targeting and the pass-through effect.

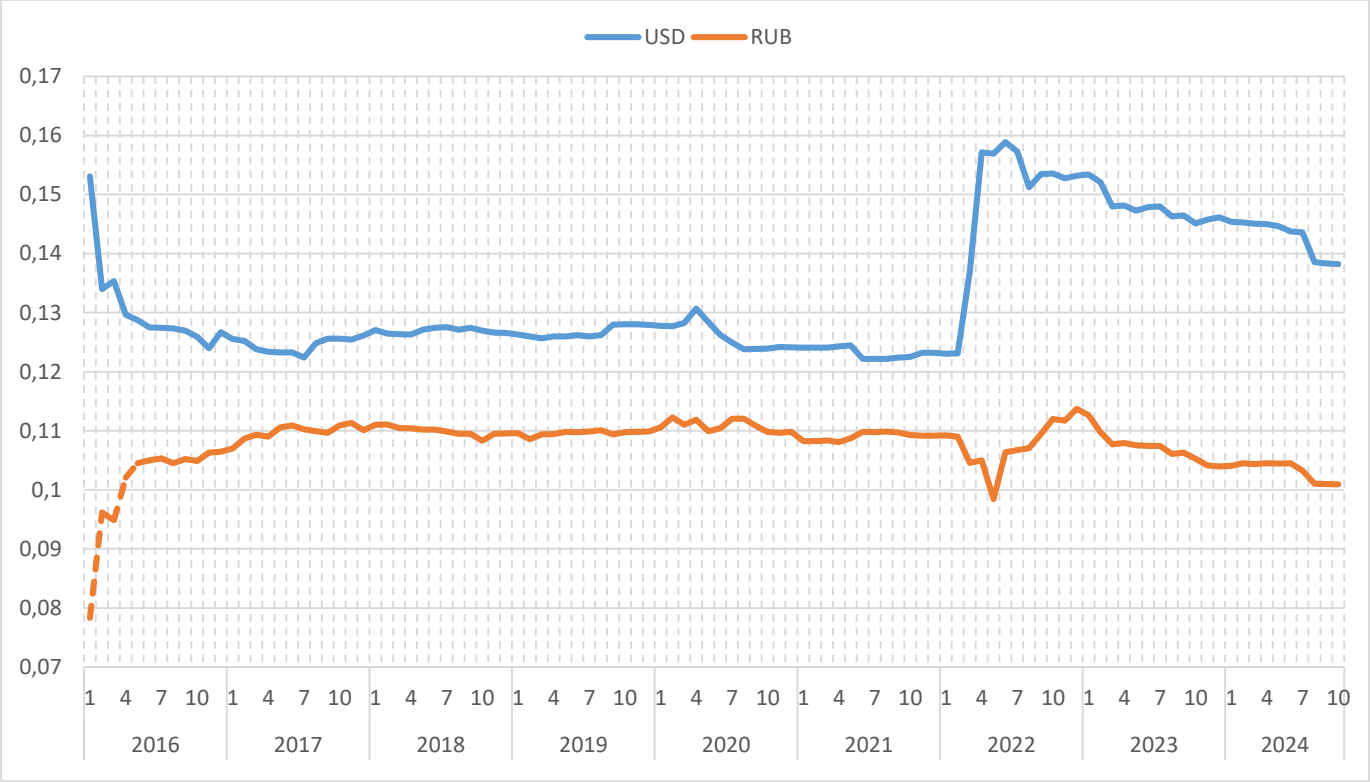
The dynamics of the pass-through effect for the Russian ruble exchange rate, in turn, did not show statistically significant results at the start of the analyzed period (indicated by a dotted line in figure-1), and remained stable during the rest of the period (around 0.11 p.p.). However, this indicator may result from other factors contributing to the stability of the effect. Close relationships between the countries, particularly in trade and energy, and similar exposure to global economic shocks might lead to a more stable pass-through effect.

Table 1. Comparison of impulse responses with the results of previous estimates.

	2011-2015m12		2011-2019m12		2011-2024m02	
	USD	RUB	USD	RUB	USD	RUB
All goods and services (CPI)	0,15	0,08	0,11	0,11	0,14	0,10
Food products	0,13	0,07	0,10	0,10	0,08	0,09
Non-food products	0,28	0,13	0,21	0,16	0,24	0,15
Services	0,06	0,06	0,02	0,04	0,04	0,02

Source: author's calculations

Figure 1. Changes in cumulative pass-through effect with expanding sample, p.p.



Source: author's calculations

As a result, it can be concluded that the mechanism of influence of currency shocks (US dollar) on inflation in Kazakhstan has somewhat decreased with the transition to inflation targeting. The transfer of fluctuations of the US dollar exchange rate to the level of domestic prices has become more stable and moderate. However, it is difficult to draw conclusions about the influence of the currency regime on the effect of the ruble exchange rate pass-through due to the obtained results.

4.3 Changes in the dynamics of the pass-through effect

Comparing current estimates of the pass-through effect with those from previous periods shows an increase in the pass-through effect to the US dollar starting from 2022. This may be related to changes in the import structure, where the share of goods denominated in US dollars has risen. This assumption is based on the works of Ha et al. (2018) and Zhurakovsky et al. (2021), which linked a higher share of imports to a stronger pass-through effect.

According to the analysis of the pass-through effect evolution using the expanding window method, for most of the time since the transition to a floating exchange rate, the pass-through effect of the US dollar remained in a stable range of about 0.12-0.13 p.p. However, starting from February-March 2022, the pass-through effect of the US dollar exchange rate on inflation in Kazakhstan significantly increased (Figure 1). This shift can be explained by changes in the structure of trade partners and supply chains for imported goods, driven by the onset of military actions in Ukraine, which led to a greater presence of US dollar-denominated goods and a reduction in Russia's share in Kazakhstan's overall

imports (Figure 1 in the appendix). It should be noted that despite the sudden shift, the dynamics of the pass-through effect to the US dollar continue to decrease. This may be related to the restructuring and adaptation of the economy to the new situation. Additionally, ongoing inflation targeting also helps to reduce the impact of exchange rate shocks on inflation.

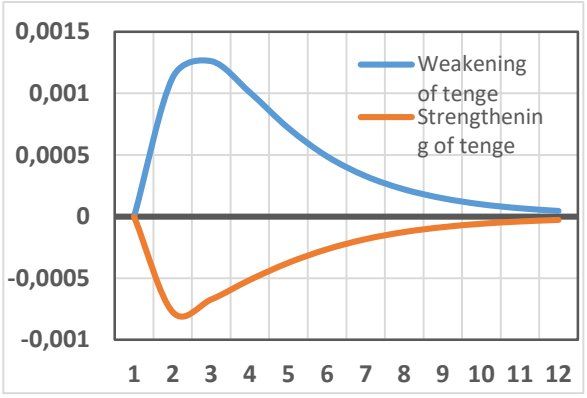
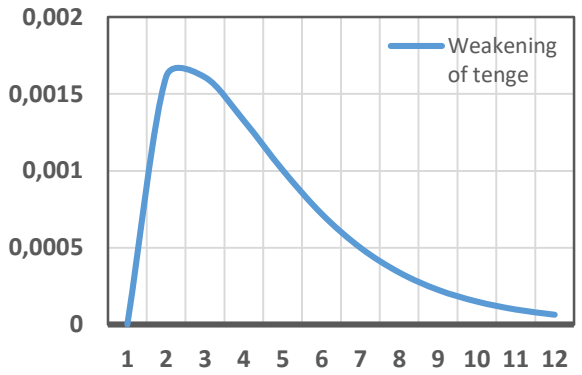
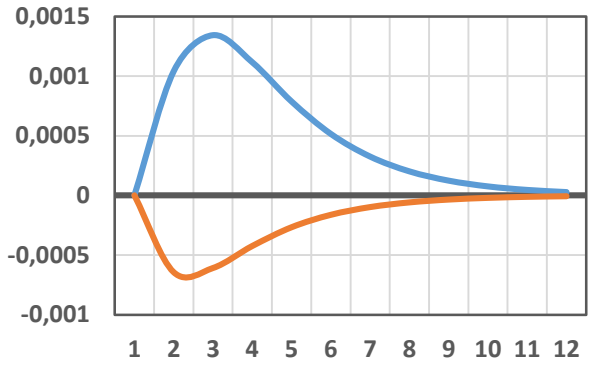
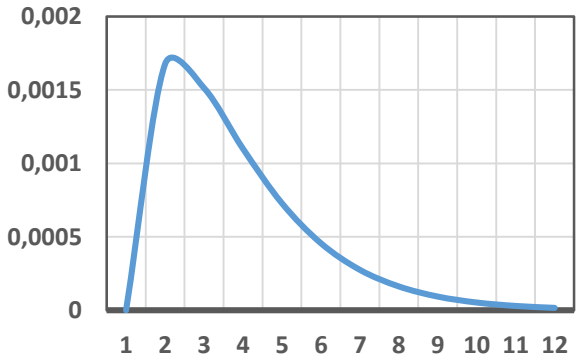
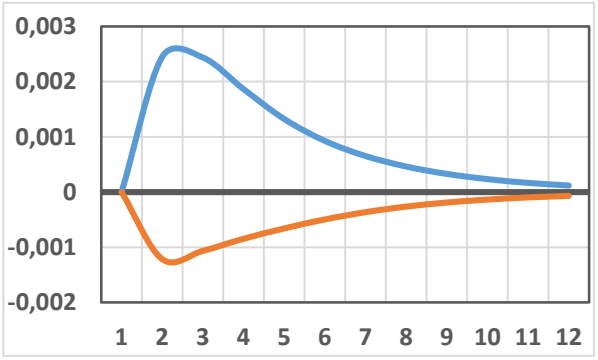
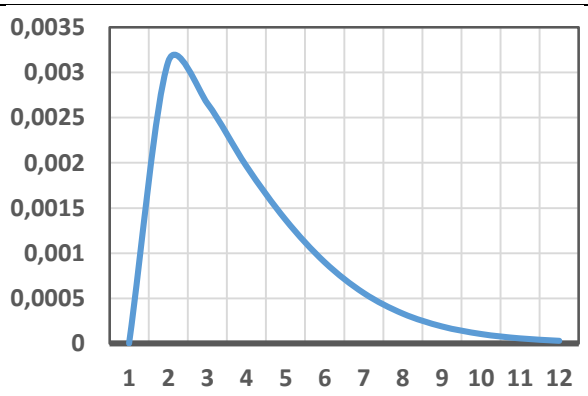
At the same time, despite the increased volatility of impulse responses to the Russian ruble from February 2022 to March 2023, the pass-through effect has currently returned to its average levels (0.10 p.p.) compared to previous estimates. This is because, although Russia's share in the import structure has been steadily decreasing from 43% in 2021 to 27% in 2023, it still remains significant.

4.4 Asymmetry of exchange rate pass-through

The results of the impulse response analysis of inflation to positive and negative shocks in the exchange rates of the Russian ruble and the US dollar against the tenge indicate the presence of asymmetry in the pass-through effect (Table 1). According to impulse response charts, when the nominal exchange rate of the tenge weakens, inflation in Kazakhstan increases faster than it slows down when the exchange rate strengthens. Specifically, the effect of an appreciation of the tenge against the ruble is statistically insignificant, while the impulse response functions for the depreciation of the Russian ruble are statistically significant for the overall CPI, as well as for the food and non-food components of inflation. The impulse responses of inflation to the US dollar exchange rate are statistically significant in both cases: when the tenge strengthens and when it weakens against the dollar. It is also worth noting that the magnitude of accumulated impulse responses to an appreciation of the dollar against the tenge exceeds the pass-through effect of the depreciation of the dollar against the tenge by an average of 2-3 times. This result is consistent with the findings of Kuznetsov et al. (2019), which describe that price adjustments in response to a weakening of the tenge are greater than to its appreciation.

One possible explanation for the presence of asymmetry could be the impact of high and volatile inflation expectations in Kazakhstan. In countries with high inflation expectations, an appreciation of the exchange rate does not always lead to a decrease in prices. This is because economic agents, expecting future cost increases, perceive the currency appreciation as a temporary phenomenon and do not revise their price expectations. Thus, the presence of high and volatile inflation expectations in Kazakhstan may contribute to the tenge's appreciation not having as significant an effect on reducing inflation as might be expected under stable inflation expectations. This thesis is also proposed in the study by Kuznetsov et al., which suggests that in countries with high inflation expectations, economic agents tend to view currency appreciation as a temporary event, complicating the reduction of inflation through exchange rate channels.

Table 2. Statistically significant impulse responses of inflation and its components to positive and negative shocks of the nominal exchange rate to tenge

	USD-KZT	RUB-KZT
CPI		
Food Products		
Nonfood Products		

**- statistically insignificant impulse responses are not presented in the graphs (services, strengthening of the tenge against the Russian ruble)*

Source: author's calculations

5. Conclusion

The results of estimating the VAR models and the impulse response function confirm that changes in the dynamics of the exchange rate of the tenge to the Russian ruble and the US dollar significantly affect the overall CPI, as well as food and non-food inflation. The first responses are observed in the second month after the shock, the maximum effect is achieved in 2-3 months and fades after 6 months. Similar dynamics were also recorded in the IMF study. Non-food products demonstrate a stronger response to exchange rate shocks, while food products are less susceptible to the influence of

exchange rate shocks. This result is explained by the fact that the greater importance of imports leads to greater sensitivity to exchange rate fluctuations, and, therefore, non-food products, which make up the bulk of imports to Kazakhstan, demonstrate greater susceptibility to the pass-through effect (Ha et al., 2018) and (Zhurakovsky et al., 2021).

This study also found a shift in the dynamics of the exchange rate pass-through in two time periods: during the transition of the Kazakh economy to inflation targeting and a free-floating exchange rate in the second half of 2015 (early 2016), and in the period between February and March 2022. During the period of the change in the exchange rate regime, the pass-through effect significantly decreased for the US dollar (from 0.15 p.p. to 0.12-0.13 p.p.) and remained at a relatively low level until the shocks in 2022, indicating stabilization and weakening of the effect after the transition to inflation targeting.

Starting from March-April 2022, the magnitude of the impact from shocks related to the US dollar increased, while the effect from the Russian ruble diminished. The heightened pass-through effect to the US dollar can be explained by the increased presence of the US dollar in payment structures with trading partners and in the supply chains of imported goods, driven by the deterioration of the geopolitical situation. Over time, as the economy adapted to the new realities, the pass-through effect to the US dollar began to weaken but still remains above the levels observed before the beginning of 2022.

Also, during the analysis of the impulse response function divided into cases of strengthening and weakening of the exchange rate, an asymmetry in the pass-through effect was recorded, with a stronger impact of the weakening of the tenge on inflation in Kazakhstan. The reason for this inequality is probably high and volatile inflation expectations of the population. The high level of inflation expectations in Kazakhstan contributes to the fact that the strengthening of the exchange rate does not always lead to lower prices, since economic agents expect an increase in costs in the future and perceive the strengthening of the exchange rate as a temporary phenomenon. According to the study by Kuznetsov et al., in countries with a characteristically high level of inflation expectations, the strengthening of the exchange rate may not lead to a decrease in prices, since economic agents take into account the expected increase in costs in the future and see the strengthening of the exchange rate only as a temporary phenomenon.

Thus, the results of the study indicate the need for further monitoring and analysis of factors influencing the effect of exchange rate shock pass-through. It is important to continue to anchor the inflation expectations of the population to further reduce the effect of pass-through for the implementation of a more effective monetary policy.

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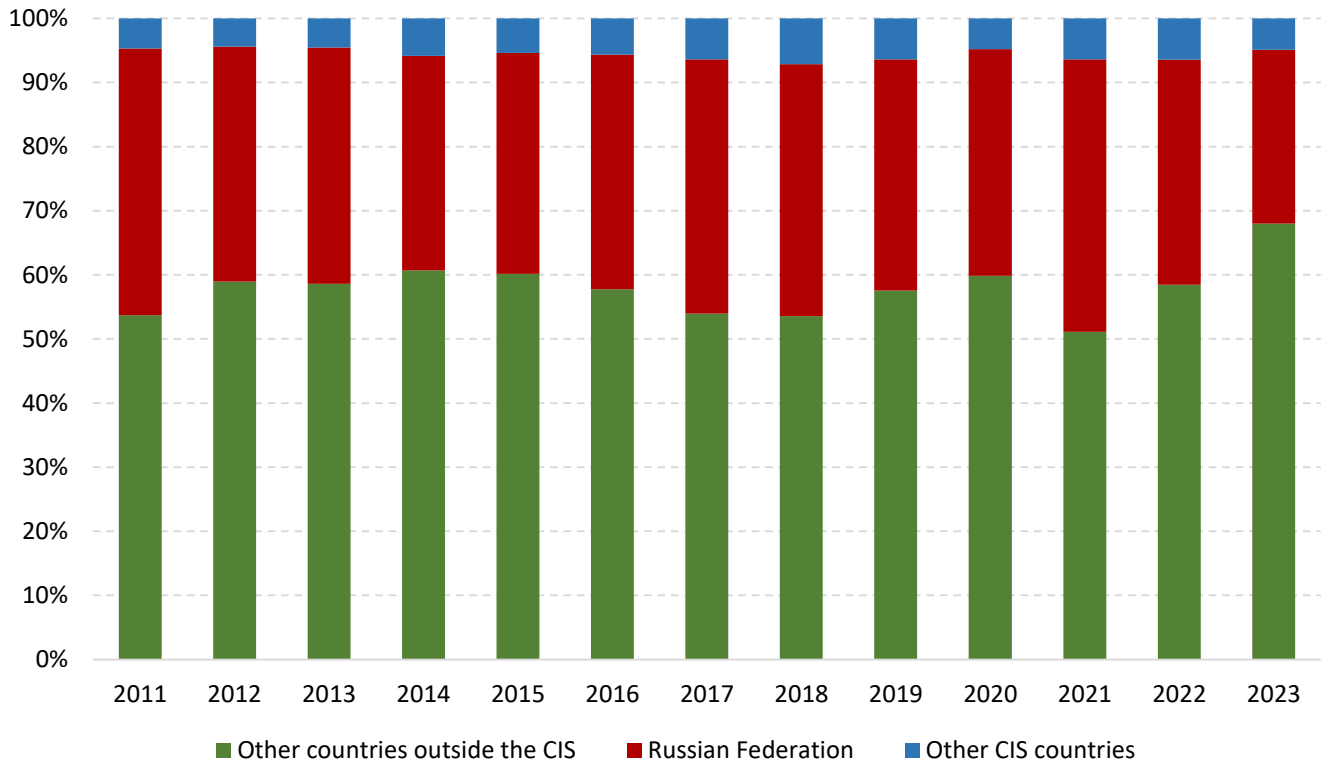
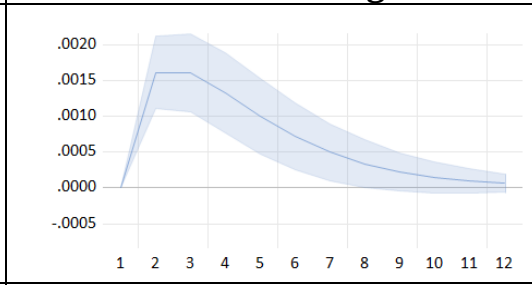
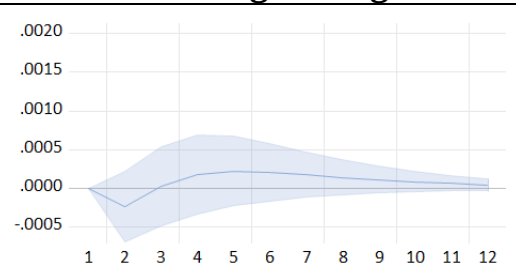
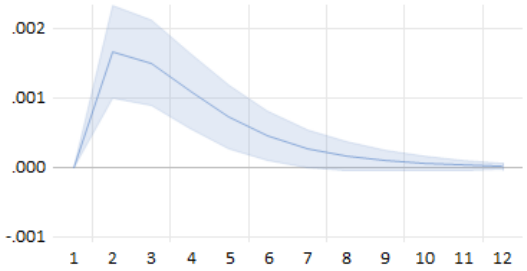
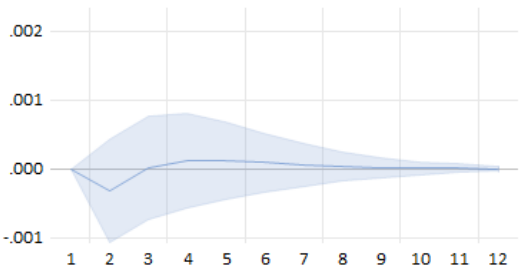
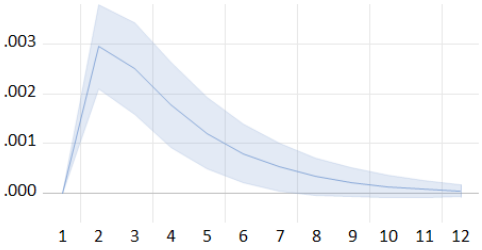
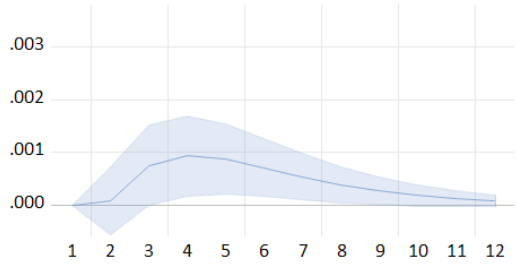
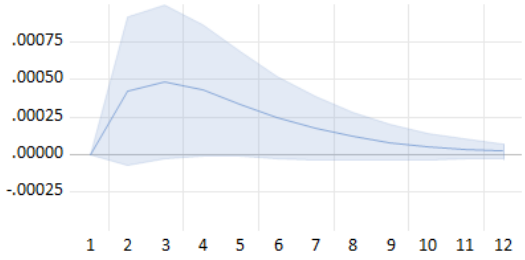
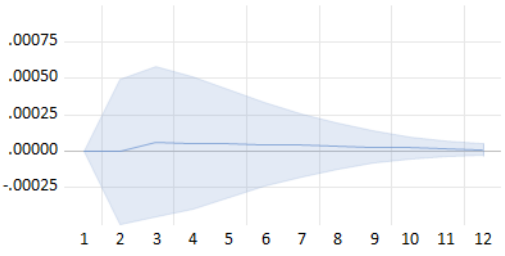
Appendix

Figure 1. Changes in the import structure from 2011 to 2023



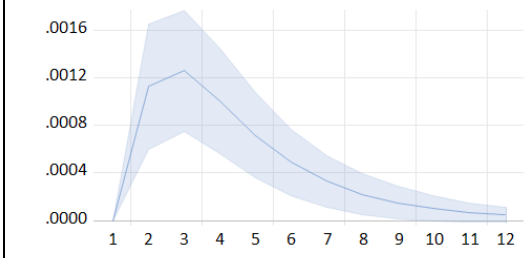
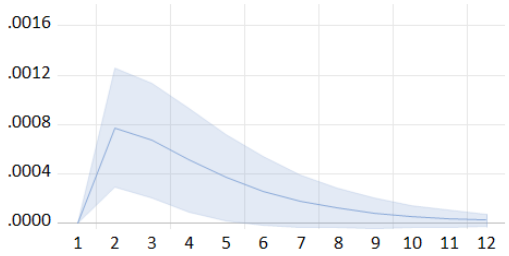
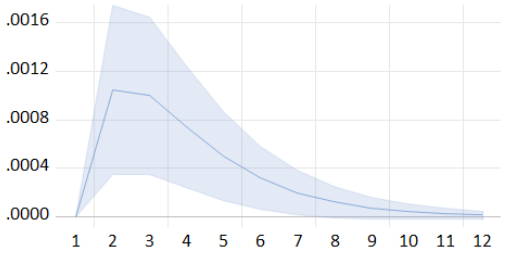
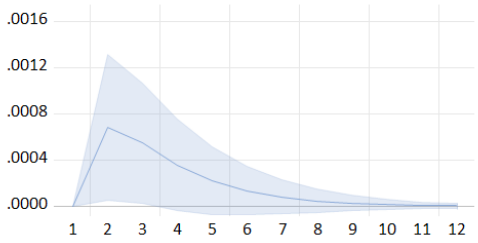
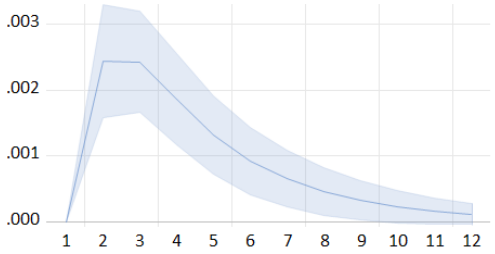
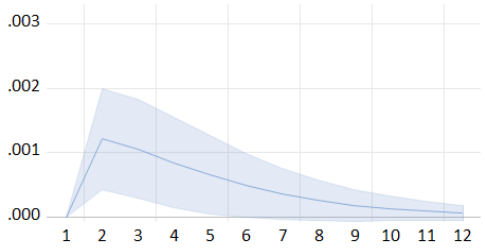
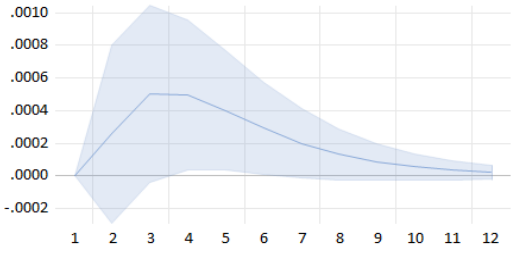
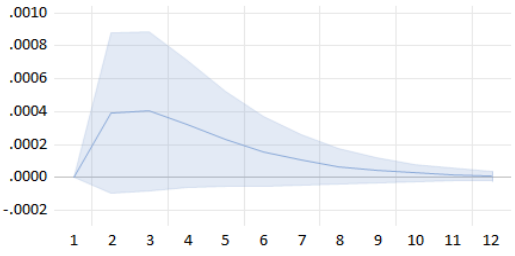
Source: author's calculations

Table 1. Impulse responses of inflation and its components to positive and negative shocks of the nominal exchange rate of the ruble to the tenge

	RUB-KZT	
	Weakening	**Strengthening**
CPI		
Food Products		
Non-food Products		
Services		

Source: author's calculations

Table 2. Impulse responses of inflation and its components to positive and negative shocks of the nominal exchange rate of the US dollar to the tenge

	USD-KZT	
	Weakening	**Strengthening**
CPI		
Food Products		
Non-food Products		
Services		

Source: author's calculations