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Inflation Determinants in Kazakhstan

A tale of (at least) two stories

Gregorio Impavido

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Inflation Determinants in Kazakhstan. A tale of (at least) two stories

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ABSTRACT: This paper assesses the relative contribution of domestic and external factors to headline inflation in Kazakhstan. We confirm earlier results that inflation is primarily imported, and we provide novel details on the sources of imported inflation and its transmission channels. We find that domestic factors like fiscal policy and more recently utility tariff increases are the key determinants of domestic inflationary pressures. We provide new information on the likely determinants of inflation expectations through which domestic and external factors affect inflation. We find that monetary policy has only been partially successful at containing domestic and external pressures with insufficient liquidity sterilization, likely contributing to weakening of the interest rate transmission channel. Finally, we find that shocks are highly persistent and bringing back inflation to its target is likely to be a difficult and long process for the Central Bank.

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Prepared by Gregorio Impavido[1]

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1 Introduction

Inflation in Kazakhstan remains far from target. Headline inflation increased from 8½ to more than 21 percent between January 2022 and February 2023; the highest level since 1997. It has declined since then but discouragingly slowly: as of July 2025, headline inflation was 11.8 percent, far from its medium-term target of 5 percent.

Inflation dynamics in Kazakhstan have been impacted by a series of external shocks. The COVID-19 pandemic in 2020 led to large fiscal and monetary stimulus across the globe to support the economy and protect lives. The strong post-pandemic recovery resulted in supply chain dislocations and surging energy and food prices. The latter were reinforced by the breakout of the war in Ukraine in February of 2022. With Russia accounting for over 40 percent of imports prior to the war, the conflict had a particularly strong effect on Kazakhstan, transmitted through the sharp depreciation of the Tenge against the ruble as well as a shift to more expensive import sources. The reversal of these developments has contributed to the decline of inflation from the peak in early 2023. The role of the exchange rate has likely increased over time: after the floating of the Tenge and the adoption of inflation targeting in 2015, the Central Bank of the Republic of Kazakhstan (NBK) frequently intervened in the FX market but has drastically reduced its interventions in the last few years with consequent increased exchange rate volatility. More recently, high inflation in Russia, the Tenge depreciation, and diversification of import partners, have all contributed to increasing external inflationary pressures.

Inflation dynamics in Kazakhstan have also been impacted by a series of domestic shocks. In 2019, price increase of utility tariffs was frozen by decree and domestic inflationary pressures greatly decreased. In 2020, domestic inflationary pressures started accelerating on the back of large increases in utility prices, also to compensate for the 2019 freeze. During COVID-19, the government implemented a package of (on and off-budget) measures estimated at around 9 percent of GDP to support the economy. Some of this stimulus was withdrawn in the following years as COVID-19 related spending receded and non-oil revenue collections improved. Monetary policy remained accommodative during the height of the pandemic and the *ex-ante* real policy rate was allowed to become highly negative. The NBK started raising the policy rate in 2021, but a big adjustment (700 basis points) took place in 2022. The rise in inflation was mirrored by consumer inflation expectations, which have remained significantly above the inflation target. The labor market has remained tight. Unemployment has stayed below 5 percent while real wages saw large gains during 2021-22 but reversed to inflation growth after then: in 2025Q1 real wages grew by 1.2 percent. In 2023, the execution of the "tariff increase in exchange for investment" program caused the contribution of regulated utilities to inflation to increase from 1 to 2 percentage points over the year. The program foresees an average increase in utility tariffs for electricity, gas, heating fuels, and water of 20-20 percent per year until 2029 and it is expected to increase inflationary pressures by about 2 percentage points per year. It is aimed not only at the development of electricity generation, but also at the transmission of all utilities: i.e., grids. This is similar to an earlier program of "tariff in exchange for investment" during 2009-2015

which was aimed at the development of electricity generation by increasing the investment attractiveness of energy sector facilities. Over the whole period, domestic consumption has also been supported by loose fiscal policy and sustained growth in bank consumer lending and since external leakages are very high, strong domestic consumption translates into high import demand and high imported inflation.

This paper assesses the relative contribution of domestic and external factors to headline inflation in Kazakhstan. It adds to this tale of two stories the following: (i) it provides a plausible explanation for the slow decline in headline inflation since 2023; (ii) it develops a parsimonious model to identify the channels of transmission of domestic and external shocks distinguishing between direct channels to inflation and indirect channels through the reaction function of the monetary authority and the formation of inflation expectations, (iii) it constructs a novel measure of external price pressures that allows for more granular information on the sources of imported inflation by importing partners, on the role of import country diversification, and on the relative contribution of exchange rate passthrough and inflation in trading partners, (iv) it provides information on the contribution of the monetary authority to headline inflation through liquidity management, especially during COVID-19, at the onset of the RUS-UKR war, and through its gold purchase program, and (v) it decomposes inflation expectations between its backward and forward-looking components and it identifies the determinants of its data generating process.

The remainder of this paper is structured as follows: the next section lays out the empirical strategy to disentangle the contribution of domestic and external factors to headline inflation, the following section uses historical decomposition of inflation to better gauge the cumulative impact of shocks and to account for both their direct and indirect contributions, and conclusions follow.

2 The baseline model

Several papers have aimed at understanding the main drivers of consumer price inflation (see, for example, Galí and Gertler 1999). Some studies have focused on external factors like food and oil prices (Blanchard and Galí 2010). Other studies explored the importance of exchange rate changes (Bursteing and Gopinath 2014). Other studies focused more explicitly on the impact of monetary policy on real aggregates in economies of imperfect competition and price rigidities (Galí and Monacelli 2005). In general, the literature uses some modified version of the Philips curve suited to explain the issue at hand, which it then proceeds to estimate (Galí et al. 2001 and 2003). For an application to Kazakhstan, Hajdenberg (2023) provides a useful benchmark.

The empirical strategy followed in this paper to uncover the role of domestic and external factors in determining inflation consists of two stages. The first stage relies on a variant of a standard New Keynesian Phillips curve augmented with variables that serve as proxies for domestic and external inflationary pressures. After establishing the statistical significance of

the inflation determinants, the second stage explores the historical contribution of domestic and external factors to inflation dynamics.

Formally, we start by estimating the following OLS regression for the period between August 2016, after the country floated the currency and adopted the IT regime, and February 2025.[1]

$$\pi_t = \alpha + \beta E_t \pi + \gamma X_t + \delta Z_t + u_t \tag{1}$$

where, π_t is the headline inflation, $E_t\pi$ are the inflation expectations at twelve months, X_t is a matrix of domestic factors, and Z_t is a matrix of external factors.[2]

Domestic factors are proxied by the monetary policy stance, defined here as the ex-ante real policy rate $ms_t = \left(r_t - \frac{1}{n}\sum_{i=1}^{n} \pi_{t+i}\right)$ with equally weighted inflation projections for the following twelve months,[3] and by the fiscal stance fs_t, defined here simply as the log difference between revenues and expenditures of the general government.

The external factors are proxied by an index capturing external price pressures focusing on imports from key trading partners. This index is defined as the log difference in the import weighted producer price index from the ten largest trading partners, converted to local currency using the nominal effective exchange rate, plus a proxy price pressure from the rest of the world.[4,5] I.e.:

$$epp_t = \Delta ppi_t^* + \Delta neer_t^* \tag{2}$$

The change in the import-weighted foreign producer price index is given by:

$$\Delta ppi_t^* = \sum_{i=1}^{10} \omega_{i,t} \Delta ppi_{i,t} + \omega_{row,t} \Delta ppi_{us,t} \tag{3}$$

where ω_i is the import share of country i in total imports at time t, $ppi_{i,t}$ is the natural logarithm of the producer price index of country i at time t, and Δ is the first difference operator.

The change in the nominal effective exchange rate is constructed as the change in the

[1]The choice of sample is dictated by data availability and the desire to skip enough observations at the beginning of the sample after the adoption of the IT regime and the switch to floating exchange rates to allow for model parameters to stabilize.

[2]See Appendix III for a detailed description of the data used in this paper.

[3]The Central Bank communicates inflation projections and its revisions to the public as a way to anchor inflation expectations which is separately listed among the regressors. We also omitted deviations from the constant long term neutral rate as this represents a mere scaling factor.

[4]The impact from the rest of the world beyond the largest ten trading partners is proxied by the US producer price index and the nominal exchange rate between the Tenge and the dollar implicitly assuming that all trade with the rest of the world is conducted in US dollars. Given the small share of imports from the rest of the world beyond the ten largest trading partners, these approximations are not deemed to materially affect results reported in this paper.

[5]We decided not to measure external price pressures in relation to changes in the GDP deflator because, despite the high exchange rate passthrough in Kazakhstan, passthrough within the same month to a broad measure of domestic prices such as the GDP deflator is likely to be limited.

bilateral exchange rate of each trading partner vis-à-vis the Tenge, weighted by their import shares in total imports (Gopinath 2015 and Carriere-Swallow et al. 2016):

$$\Delta neer_t^* = \sum_{i=1}^{10} \omega_i \Delta e_{i,t} + \omega_{row} \Delta e_{us,t} \tag{4}$$

where $e_{i,t}$ is the natural logarithm of the bilateral exchange rate (expressed in Tenge per local currency, so that an increase denotes a depreciation of the Tenge), and Δ is the first difference operator.

A regression like (1) has a series of problems including: (i) inflation, inflation expectations, and the proxies for the macro policies stances are endogenous; and (ii) inflation expectations capture both backward- and forward-looking expectations.

We take care of (ii) by running a regression of expected inflation on lagged inflation and taking the residual as a proxy of the forward-looking component of inflation expectations ($E_t\pi_{t+1}$) as follows:

$$\begin{aligned} E_t\pi &= \alpha + \beta\pi_{t-1} + u_t \\ E_t\pi_{t+1} &= \hat{u}_t \end{aligned} \tag{5}$$

We take care of (i) by estimating a constrained seemingly unrelated regression (C-SUR) system with four equations, one for each endogenous variable:

$$\begin{aligned} \pi_t &= \alpha_1 + \beta_1\pi_{t-1} + (1-\beta_1)\, E_t\pi_{t+1} + \gamma_1 ms_t + \delta_1 fs_t + \zeta_1 epp_t + \varepsilon_{AS,t} \\ ms_t &= \alpha_2 + \beta_2 ms_{t-1} + \gamma_2\pi_{t-1} + \delta_2 usxvol_{t-1} + \zeta_2 liq_t + \varepsilon_{MP,t} \\ fs_t &= \alpha_3 + \beta_3 fs_{t-1} + \gamma_3 oil_t + \varepsilon_{FP,t} \\ E_t\pi_{t+1} &= \alpha_4 + \beta_4 E_{t-1}\pi_t + \gamma_4 ms_t + \delta_4 fs_t + \zeta_4 usx_t + \kappa_4 tf1_t + \lambda_4 tf2_t + \varepsilon_{EP,t} \end{aligned} \tag{6}$$

The first equation in (6) is the Phillips curve variant in which inflation is assumed to react directly to domestic factors (ms_t and fs_t, previously defined), external factors (epp_t, defined in equation (2)), and backward- and forward-looking components of expectations (π_{t-1} and $E_t\pi_{t+1}$, respectively, defined in equation (5)). Regarding the partial equilibrium signs of the parameters, we expect a tightening of the monetary (ms_t) and fiscal (fs_t) stances to reduce inflation, an increase in the index capturing external price pressures from key trading partners (epp_t) to increase inflation, and an increase in the backward- and forward-looking components of inflation expectations (π_{t-1} and $E_t\pi_{t+1}$, respectively) to increase inflation. In the Phillips curve, the parameters of backward-looking expectations (β_1) and forward-looking expectations ($1-\beta_1$) are constrained to add up to one.

The second equation in (6) is the monetary reaction function of the monetary authority. The monetary authority is assumed to react directly to second round effects of inflation, proxied by the lagged inflation (π_{t-1}), and to exchange rate volatility ($usxvol_{t-1}$), defined as the lagged fifteen months moving standard deviation of the log of nominal exchange rate

with the USD.[6] In addition, the monetary stance is also assumed to be a function of the excess liquidity generated in the economy (liq_t), proxied by the log difference between real other bank deposits at the NBK and its trend. Regarding the signs of parameters, we expect higher inflation and exchange rate volatility to lead to a tighter monetary stance, while we expect an increase in excess liquidity to be associated with a loosening of the stance.

The third equation in (6) assumes that the fiscal stance is directly affected by the oil price (oil_t), given the large share of fiscal revenues associated with oil exports. Everything else equal, we expect higher oil prices to lead to higher revenues and to a tighter stance.

The last equation in (6) assumes that the forward-looking component of inflation expectations ($E_t\pi_{t+1}$) is a function of domestic and external factors. Domestic factors include the monetary and fiscal stances, as well as the principal component of electricity, gasoline, central heating, and hot water supply price inflation (tf_t) capturing the inflationary impact of utility tariff increases since 2023. External factors are proxied by the log of the nominal exchange rate with the US dollar (usx_t), representing an additional indirect channel through which the exchange rate impacts the monetary policy reaction function. Regarding the signs of parameters, we expect tighter monetary and fiscal stances to decrease inflation expectations, while a depreciation of the Tenge relative to the USD or increases in controlled utility tariffs to lead to higher inflation expectations. Notice that this equation deals exclusively with the forward looking component of inflation expectations. The backward looking component is defined by $\beta_1\pi_{t-1}$ in the Phillips curve equation in (6) which captures "everything else". For instance, it captures measures of perceived inflation over the past 12 months and broader set of price factors such as services and food products, which survey respondents often identify as a key driver of inflation expectations.[7]

2.1 Estimation results

Results from the C-SUR displayed in equation (6) are reported in Table 1 where variables with parameters non significantly different from zero have been omitted. Estimation results yield the following takeaways:

- The data generating process of our four endogenous variables has a large autoregressive component. In other words, shocks are highly persistent and dissipate only very slowly over time.
- In the modified Phillips curve, inflation expectations are positively correlated with inflation and have a strong backward-looking component. This is to be expected as generally, inflation expectations tend to become highly backward looking at high levels

[6] Incorporating exchange rate volatility into the monetary policy reaction function is warranted because of the recent adoption of the inflation targeting regime, the gradual strengthening of the Central Bank's credibility, and general fear of floating, which is common among many emerging markets.

[7] A larger structural model would be needed to assess the relative importance of these subset of expectations determinants.

of inflation. A tightening of the monetary and fiscal stances is associated with a decrease in inflation. External inflationary pressures are positively associated with domestic inflation.

- The monetary stance is directly impacted by lagged inflation, supporting the idea that the monetary authority reacts to second round effects of inflation. Exchange rate volatility appears with a positive, and significantly different from zero, sign suggesting that the monetary authority reacts to limit the exchange rate passthrough to inflation or because of fear of float. Finally, excess liquidity reduces (the effectiveness of) the stance, as expected.

- In the fiscal stance equation, oil price inflation directly increases the overall balance as oil revenues tend to increase when the oil price increases.

- In the forward-looking inflation expectation equation, a tighter monetary stance directly decreases forward expectations, higher utility tariffs directly increase expectations, and a depreciation of Tenge relative to the US dollar directly increases expectations.

- The model has strong in-sample predicting power as displayed in Figure 1: equation specific RMSEs are very low, and the joint significance of structural parameters is high, as reported in Table 1. However, the model underestimates inflation towards the end of the sample suggesting that new unidentified inflationary pressures are emerging towards the end of 2024.

Alternative specifications have been explored. We separated the external price pressures from the largest ten trading partners (epp_t) in the Phillips curve equation between the import weighted PPI inflation factors (epp_{p_t}) and the nominal effective exchange rate factors (epp_{x_t}) and concluded that the former statistically dominate the latter (shown in Table 1). We find that the output gap (not shown) has little information about inflation suggesting that the Phillips curve is rather flat (Impavido 2024 and 2025). We did not find measures of exchange rate volatility to have a significant direct impact on inflation. In order to keep the model parsimonious, explicit proxies for domestic demand have been omitted as already captured by the impact of the fiscal stance on inflation through managing demand. For the same reason, proxies for external demand have not been directly included as already captured by the impact of the PPI inflation in trading partners.

3 Historical decompositions

The structural parameters alone reported in Table 1 provide only a partial assessment of the domestic and external determinants of inflation. For instance it is debatable that the monetary and fiscal stances are the only domestic determinants of inflation. For instance, the recent increase in global food prices has stimulated a surge in exports of certain Kazakhstani products, such as meat and sunflower oil, while simultaneously reducing their availability in the domestic market. This dynamic has contributed to higher domestic prices for these goods.

The C-SUR set up allows us to capture both direct and indirect contributions through the estimation of the β_1 parameter.[8] In addition, the endogenous variables are autoregressive and therefore, it makes more sense to assess the historical/cumulative, rather than the immediate, contribution of inflation determinants.

We use a historical decomposition of inflation to better gauge the cumulative impact of shocks and to account for both their direct and indirect contributions. Figure 2 displays the direct contribution to inflation of forward-looking inflation expectations, domestic factors, and external factors stemming from the following solution via forward iteration of the difference equation for inflation appearing in (6):[9]

$$\underbrace{\pi_t}_{\text{Inflation}} = \underbrace{\hat{\beta}_1^t \pi_0}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_1^{t-j}(1-\hat{\beta}_1)E_t\pi_{j+1}}_{\text{Forward expectations component}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_1^{t-j}(\hat{\gamma}_1 ms_j + \hat{\delta}_1 fs_j)}_{\text{Domestic determinants}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_1^{t-j}\hat{\zeta}_1 epp_j}_{\text{External determinants}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_1^{t-j}\hat{\varepsilon}_{AS,j}}_{\text{Unexplained residuals}} \tag{7}$$

Several things can be noted:

- The historical contribution of the initial condition in (7) is large and only very slowly converging to zero. This is due to the following two things: (i) inflation at $t = 0$ is very high, and (ii) inflation expectations are highly backward-looking, as reported by the estimated parameter in front of lagged inflation $\hat{\beta}_1$. The historical contribution of the initial condition is part of the forward iteration solution and unfortunately, beyond signaling that shocks are highly persistent, and that series have long memory, it has no economic interpretation.

- Forward looking expectations are deflationary in the first part of the sample and become inflationary starting with the second quarter of 2022. Both external and domestic factors contribute to the worsening of inflation expectations including in particular, as we will see later in more details, the increased uncertainty after the Russian invasion of Ukraine, and the program of utility tariff liberalization stating in 2023. Towards the end of the sample, forward looking expectations were contributing about 1½ percentage points of headline inflation.

- Domestic determinants are deflationary until the end of 2019 and inflationary afterwards. This, as we will see in more details next, is mainly due to the progressive deterioration of the fiscal stance, to the liquidity generation by the Central Bank at

[8] The model is parsimonious as it tries to focus on the key direct and indirect determinants. A larger structural model, beyond the scope of this paper, would be needed to capture additional nuances in inflation dynamics.

[9] See derivation of equation (A.7) in Appendix II for details.

various times over the sample, and to the loosening of the monetary stance in the aftermath of the Russian invasion of Ukraine after several years of being broadly neutral. Towards the end of the sample, the fiscal stance was contributing about 7 percentage points of headline inflation while the monetary stance was contributing about minus 6 percentage points making domestic factors marginally inflationary.

- External determinants are inflationary throughout the sample confirming known priors that inflation in Kazakhstan has a sizable external component (Hajdenberg 2023). Towards the end of the sample, external factors were contributing about 4 percentage points of headline inflation.

3.1 Domestic factors

Figure 3 displays the direct contribution to inflation of domestic factors: the fiscal and monetary stances.

The overall balance of the general government has been deteriorating over the full sample, trending from minus 5 percent to minus 10 percent between Aug-2016 to Feb-2025 (Figure 4). As a result of these consecutive fiscal impulses, the fiscal stance is contributing about 7 percentage points of headline inflation at end 2024. Given the narrow fiscal perimeter considered in this model, the inflationary impact of fiscal policy is likely to be underestimated: preliminary estimates suggest that the fiscal periphery is contributing an additional 20 percent to fiscal impulses on average or about 3 percentage points to inflation (Heng and Piontek 2025).

The role of the monetary stance is more complex. Figure 5 displays the direct contributions of domestic and external factors to the monetary stance and therefore, its contribution to inflation through the first equation appearing in (6). The decomposition of domestic and external factors to the monetary stance are given by the following solution to the monetary stance difference equation appearing in (6), where the dependent variable has been "demeaned" by bringing the intercept to the left-hand-side ($ms_t^* = ms_t - \sum_{j=1}^{t} \hat{\beta}_2^{t-j} \hat{\alpha}_2$):[10]

$$\underbrace{ms_t^*}_{\text{Monetary stance}} = \underbrace{\hat{\beta}_2^t ms_0}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_2^{t-j} \left(\hat{\gamma}_4 \pi_{j-1} + \hat{\delta}_2 usxvol_{j-1} \right)}_{\text{Other determinants}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_2^{t-j} \hat{\zeta}_2 liq_j}_{\text{Excess liquidity determinants}} + \underbrace{\sum_{j=1}^{t} \hat{\beta}_2^{t-j} \hat{\varepsilon}_{ms,j}}_{\text{Unexplained residuals}} \tag{8}$$

Few things can be noted:

[10] See derivation of equation (A.8) in Appendix II for details.

- The contribution of the initial condition suggests persistence of shocks, reflecting the high estimated autoregressive parameter $\hat{\beta}_2$. However, it is not large, given the low initial value of the monetary stance.

- Past inflation is the largest determinant of the monetary stance. As expected, the monetary authority reacts to second round effects of inflation by raising the policy rate the higher is past inflation.

- The monetary authority reacts to exchange rate volatility, here proxied by the fifteen-month moving standard deviation of the log of the exchange rate with the USD. An increase in the exchange rate volatility is associated with a tightening of the monetary stance. There are four distinct periods when volatility increased (Figure 6): (i) in 2018, when the depreciation of the Tenge accelerated and the NBK intervened in the FX market selling about net USD ½ billion in connection with the State support provided to Halyk bank for the purchase of Kazkommertzbank,[11] and other liquidity support for banks,[12] (ii) starting with February 2020, when the depreciation of the exchange rate accelerated in the first year of the COVID-19 shock, several liquidity support mechanisms where introduced,[13] and the NBK intervened in the FX market at various points selling about net USD 3½ billion, (iii) in 2022, when the depreciation of the exchange rate accelerated in the first year of the RUS-UKR war and the NBK introduced a subsidy on Tenge deposits to prevent increased dollarization, and intervened in the FX market at various points selling about net USD 1.4 billion, (iv) starting with 2024Q4, when the depreciation of the exchange rate accelerated again reflecting increased demand for foreign currency amid constrained supply, forcing the NBK to intervene in the FX market selling about net USD 1.8 billion.

- The monetary stance is negatively affected by increases in liquidity here proxied by log deviation of banks' real other deposits at the NBK from its trend. Since 2011, the NBK has been buying refined gold from local producers[14] without sterilizing the corresponding liquidity injection and only in 2025, did it start mirroring the purchases of gold with sales of FX to mop up such creation of liquidity. For 2025, planned sterilization at current prices is estimated at USD 6 billion. In addition, there are several instances in the sample when the NBK contributed to increasing liquidity in

[11] The government spent KZT 2 trillion (USD 6 billion, 4 percent of GDP) to purchase assets from the largest bank, Kazkommertzbank (KKB), to facilitate its acquisition by the second-largest bank, Halyk. The operation was financed by transfers from the NFRK (50 percent) and issuance of government securities (50 percent).

[12] Long-term, low-interest rate subordinated loans under the NBK's "Bank Recovery Program," under which five large banks received financing of KZT 650 billion (USD 2 billion) to invest in NBK notes, have been a factor behind the liquidity increase.

[13] These included several measures linked to decrees No.285 of the President of the Republic of Kazakhstan "On Imposition of the State of Emergency in the Republic of Kazakhstan" dated 15 March 2020 and No.286 "On Measures to Ensure Social and Economic Stability" dated 16 March 2020, including soft loan programs to support to SMEs, and temporary suspension of loan principal and associated fees for SMEs with deteriorating financial standing. https://www.whitecase.com/sites/default/files/2020-05/COVID-19-Kazakhstan-Governmental-Support-for-Companies_200507.pdf

[14] On Certain Issues of Exercising the Priority Right to Purchase Refined Gold. Public information messages. National Bank of Kazakhstan

the system and these generally correspond to instances when the exchange rate started depreciating rapidly (Figure 6 and Figure 7). For instance, a large stock of liquidity was created during and after the global financial crisis, in the aftermath of the financial crisis of 2014 to support and bail out banks, and during COVID-19 (Figure 7). The excess liquidity in the system reduces the effectiveness of the interest rate channel of the monetary transmission mechanism. More recently, the operational target of the NBK, the TONIA rate,[15] has been falling towards the bottom of the policy interest rate corridor (Figure 8) suggesting the need for reducing excess liquidity and re-calibrating liquidity management tools. Currently, the NBK announces deposit auctions[16] almost daily, making them similar to a standing facility. Reducing the frequency of deposit auctions, increasing the level of reserve requirements, issuing long term notes could all help the NBK to absorb structural liquidity in the system, encourage banks to trade liquidity with each other, build the yield curve, and create a collateral pool for other instruments.

In summary, the monetary stance has been successful at offsetting domestic inflationary pressures until 2019. After then, the cumulative impact of fiscal, exchange rate, and liquidity shocks caused the ex-ante real policy rate to become largely negative during 2022 (Figure 9) after several years of being broadly neutral. After 2022, the monetary stance has been increasingly tighter in order to offset increasing inflationary pressures and enabling a rapid decline of inflation from its peak of February 2023. More recently, with ever increasing domestic and external pressures, the monetary stance is finding it more difficult to control second round effects of shocks. Towards the end of the sample, it contributed to minus 6 percentage point of headline inflation making the direct contribution of domestic factors marginally inflationary.

3.2 External factors

Figure 10 displays the direct contribution of external factors to inflation. Imported inflation averaged about 5 percentage points of headline inflation over the full sample. External inflationary pressures decreased during the COVID-19 period when PPI inflation in trading partners was low and increased in late 2022 primarily driven by high inflation in Russia and the weakening of the Tenge against the Ruble. Overall, Russia contributes more than 50 percent of imported inflation despite its decreasing share in total imports. At the same time inflationary pressures from China have been decreasing and recently turned negative due to the low PPI inflation in the country and despite its increasing share in total imports. Inflationary pressures from Europe have been decreasing while the contribution of US trade to inflation has always been minimal, due to the low share of imports from this country.

[15] Tenge Over Night Index Average, is the risk-free operational target for the NBK. It's calculated as the weighted average of overnight repo transactions on the Kazakhstan Stock Exchange among also other financial corporations.

[16] The main liquidity operation used recently, the 7-day deposit auction, has been actively utilized to partially sterilize excess liquidity in the system at the policy rate.

Notably, imported inflation from the rest of the world has been increasing, supporting the idea of increasing diversification of import sources. In particular, inflation imported from Turkey and Uzbekistan has been increasing in line with the import shares of these countries (Figure 11).

3.3 Inflation expectations

Figure 12 displays the direct contribution to forward-looking expectations of domestic and external factors. This is essentially the following solution to the fourth difference equation appearing in (6):[17]

$$\underbrace{E_t\pi_{t+1}}_{\text{Inflation expectations}} = \underbrace{\hat{\beta}_4^t E_0\pi_1}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t}\hat{\beta}_4^{t-j}(\hat{\gamma}_4 ms_j + \hat{\kappa}_4 tf_j)}_{\text{Domestic determinants}} + \underbrace{\sum_{j=1}^{t}\hat{\beta}_4^{t-j}\hat{\zeta}_4 usx_j}_{\text{External determinants}} + \underbrace{\sum_{j=1}^{t}\hat{\beta}_4^{t-j}\hat{\varepsilon}_{EP,j}}_{\text{Unexplained residuals}} \tag{9}$$

Few things can be noted:

- The contribution of the initial condition is barely noticeable due to the low value of the initial condition of forward expectations and relatively low estimated autoregressive parameter $\hat{\beta}_4$.
- The exchange rate with the USD has contributed on average about 1 percentage point of forward-looking expectations over the sample. The experience with the 2014 crisis or the fact that some contracts are *de facto* indexed to the USD are likely explanations for this positive contribution.
- Starting with 2023, the "utility tariff increase for investment" program has been the strongest contribution to expectations. Generally, the contribution to inflation of regulated tariffs was higher in 2023 than in 2024. For instance, in 2023 and 2024, electricity prices increased by 18 and 17 percent, respectively, while tariffs for central heating increased by 23 and 20 percent, respectively. Towards the end of the sample, utility tariff increases indirectly accounted for about 3 percentage points of headline inflation.
- The direct contribution of monetary policy to forward expectations follows the same pattern of its direct contribution to inflation. It contributed negatively to expectations until mid-2022, when the monetary authority allowed the ex-ante real policy rate to become negative. With the tightening of the monetary stance starting with 2023, it

[17] See derivation of equation (A.9) in Appendix II for details.

appears to have managed to contain forward expectations supported by utility tariff increases and bring the overall impact of forward expectations to inflation back to about zero by end 2024. Towards the end of the sample, utility tariff increases indirectly accounted for about minus 3 percentage points of headline inflation.

3.4 Putting it all together

Figure 13 provides a comprehensive view of both direct and indirect contributions to inflation of all the aforementioned factors. This is derived by substituting equation (9) for the historical decomposition of forward-looking expectations into equation (7) for the historical decomposition of inflation and aggregating as needed direct domestic and external factors.[18] Relative to the previous analysis of only direct effects, it is worth noticing that:

- The contribution of domestic factors has not changed after accounting for the indirect factors through forward looking expectations. The fiscal stance continues to contribute about 7 percentage points to headline inflation at end-2024 as the forward expectations equation (9) does not contain the fiscal stance as one of the regressors. Domestic factors now include the additional impact of utility tariff increases from equation (9), additionally contributing about 2½ percentage points to headline inflation at end-2024. However, this is offset by the indirect contribution of about minus 2½ percentage points of monetary policy stemming from equation (9). Towards the end of the sample, the direct and indirect contribution of domestic factors to inflation remain at about 1½ percentage points.
- The contribution of external factors has increased after accounting for indirect factors through forward looking expectations. At end of 2024, external price pressures contribute directly 4 percentage points to headline inflation and indirectly, through forward looking expectations, another 1 percentage point.
- Unexplained residuals moderately increased in 2024 and the first two months of 2025, bringing their direct and indirect contribution to headline inflation to about 2 percentage points to headline inflation.

4 Conclusions

This paper assesses inflation determinants in Kazakhstan between August 2016 and February 2025. Key takeaways from this analysis are:

[18] For simplicity of exposition, the indirect contributions of the oil price and nominal effective exchange rate volatility stemming from the fiscal and monetary stance equations have been omitted. Their inclusion does not change the qualitative nature of results.

- The data generating process of inflation and inflation expectations exhibit a large autoregressive parameter, indicating that these series possess long memory, that shocks are highly persistent, leading to slow mean reversion. Consequently, even without inflationary shocks and everything else equal, bringing inflation to its target becomes notably challenging for the Central Bank, as the adjustment process is inherently sluggish.

- Domestic factors have had an inflationary impact since 2020H2. The contribution of fiscal policy has plateaued at about 7 percentage points of inflation since mid-2021. Stating with 2023, additional pressures of about $2^1/_2$ percentage points to headline inflation per year were due to the "utility tariff increases per investment" program. Monetary policy has barely managed to contain inflationary pressures with the notable exception of 2022H2 when the ex-ante real policy rate was allowed to become negative. In addition, excess liquidity was created during the banking crisis of 2014, the COVID-19 period, and at the onset of the RUS-UKR war, and through the gold purchase program since 2011, and it has not been fully re-absorbed. This has weakened the interest channel of monetary policy and more recently, it has weakened the link between the policy rate and the Central Bank operational target. Overall, towards the end of the sample, domestic factors including the monetary stance were contributing about $1^1/_2$ percentage points to inflation.

- External factors are the key determinants of inflation in Kazakhstan, primarily imported through trade channels with key trading partners. On average, the contribution of inflation from trading partners appears to dominate bilateral exchange rate movements. Direct contribution to inflation from external factors amounted to about 4 percentage points at end-2024, with three quarters coming from Russia and despite its decreasing share in total imports. Trade with China, despite the increasing share of imports from this country in total imports and despite the yuan appreciation during 2024, has recently had a deflationary impact due to PPI inflation in the country being negative since the end of 2022, underscoring an important potential additional source of future inflation should China's growth rebound. Imported inflation from the rest of the world has recently been increasing suggesting disruption of supply chains and import routes diversification as a consequence of geopolitical fragmentation, in particular from Uzbekistan and Turkey. Finally, an additional 1 percentage point in inflation stems from forward looking expectations, and it is linked to the US exchange rate.

- Towards the end of the sample, increasing residuals suggest new inflationary pressures not captured by the model. While still contained at 2 percentage points of headline inflation, their increasing trend suggests the need for careful monitoring of inflationary pressures by the Central Bank.

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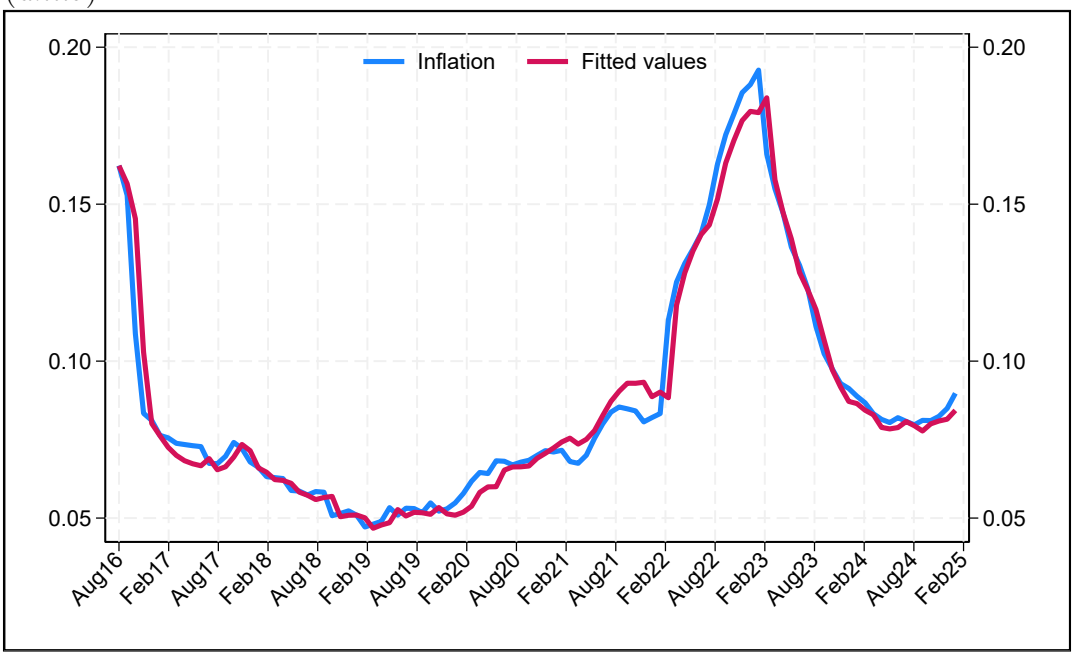
Appendix I: Tables and Figures

Table 1: Constrained SUR estimates

Equation	**Obs.**[1/]	**Parms.**	**RMSE**	**W**	**Pval**
π_t	103	4	0.007	49.021	0.000
ms_t	103	4	0.005	4507.601	0.000
fs_t	103	2	0.018	2380.294	0.000
$E_t\pi_{t+1}$	103	4	0.012	176.289	0.000
$\boldsymbol{\pi_t}$	$\hat{\boldsymbol{\beta}}$	**s.e.**	**z**	**Pval**	**Sig.**[/2]
π_{t-1}	0.960	0.015	64.822	0.000	$***$
$E_t\pi_{t+1}$	0.040	0.015	2.722	0.006	$***$
ms_t	-0.049	0.026	-1.851	0.064	$*$
fs_t	-0.027	0.010	-2.687	0.007	$***$
epp_t	0.024	0.008	3.085	0.002	$***$
epp_p_t	0.026	0.009	2.767	0.006	$***$
epp_x_t	0.020	0.012	1.706	0.088	$*$
$\boldsymbol{ms_t}$	$\hat{\boldsymbol{\beta}}$	**s.e.**	**z**	**Pval**	**Sig.**[/2]
ms_{t-1}	0.975	0.016	60.611	0.000	$***$
π_{t-1}	0.065	0.012	5.498	0.000	$***$
$usxvol_{t-1}$	0.016	0.010	1.588	0.112	
liq_t	-0.003	0.001	-2.595	0.009	$*$
c	-0.006	0.001	-4.729	0.000	$***$
$\boldsymbol{fs_t}$	$\hat{\boldsymbol{\beta}}$	**s.e.**	**z**	**Pval**	**Sig.**[/2]
fs_{t-1}	0.993	0.021	47.978	0.000	$***$
oil_t	0.012	0.005	2.639	0.008	$***$
$\boldsymbol{E_t\pi_{t+1}}$	$\hat{\boldsymbol{\beta}}$	**s.e.**	**z**	**Pval**	**Sig.**[/2]
$E_{t-1}\pi_t$	0.576	0.074	7.827	0.000	$***$
ms_t	-0.188	0.059	-3.197	0.001	$***$
usx_t	0.001	0.000	1.913	0.056	$*$
tf_t	0.030	0.009	3.239	0.001	$***$

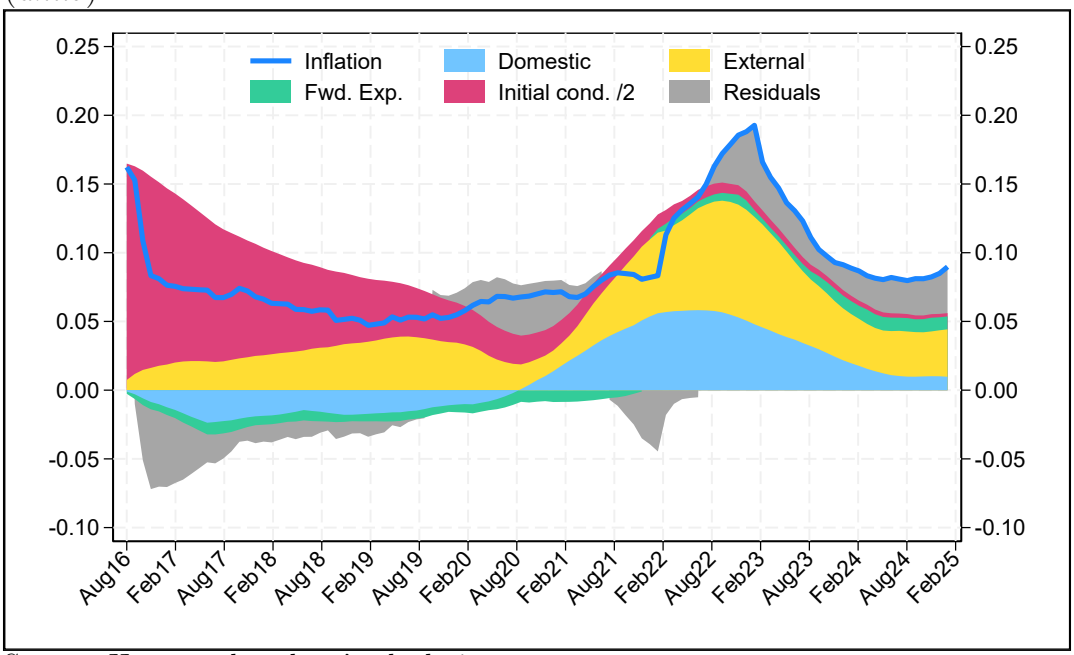
Source: Authors' calculations.
1/ Estimation sample spans from August 2016 – February 2025. 2/ $***$ = Pval $<$ 0.01. $**$ = 0.01 $<=$ Pval $<$ 0.05. $*$ = 0.05 $<=$ Pval $<$ 0.10.

Figure 1: In sample predicted inflation from the baseline model (*units*)



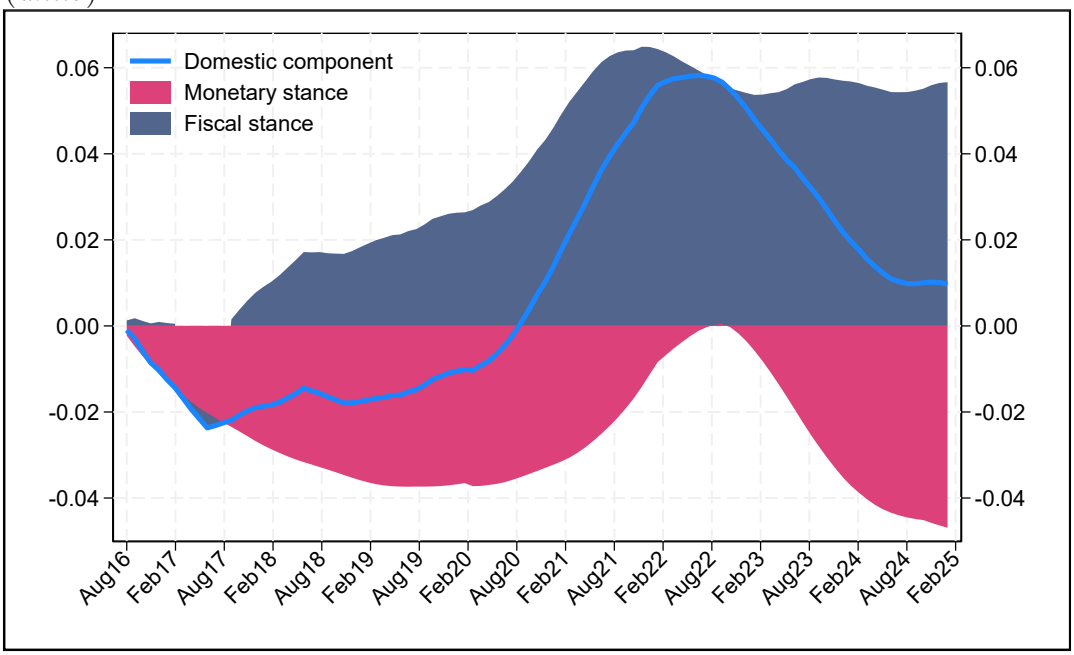
Source: Haver and authors' calculations.

Figure 2: Direct contributions to headline inflation[1/] (*units*)



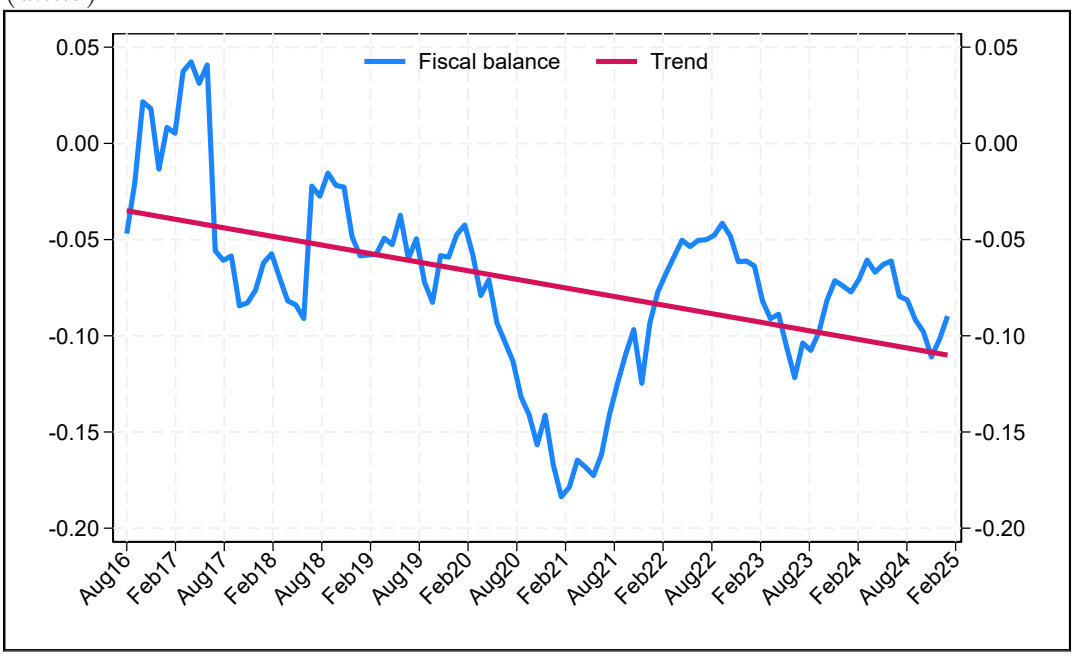
Source: Haver and authors' calculations.
/1 Graphical representation of equation (7). /2 $\pi_0 = \pi_{jan2016}$.

Figure 3: Direct contributions to headline inflation – domestic components[1/]
(*units*)



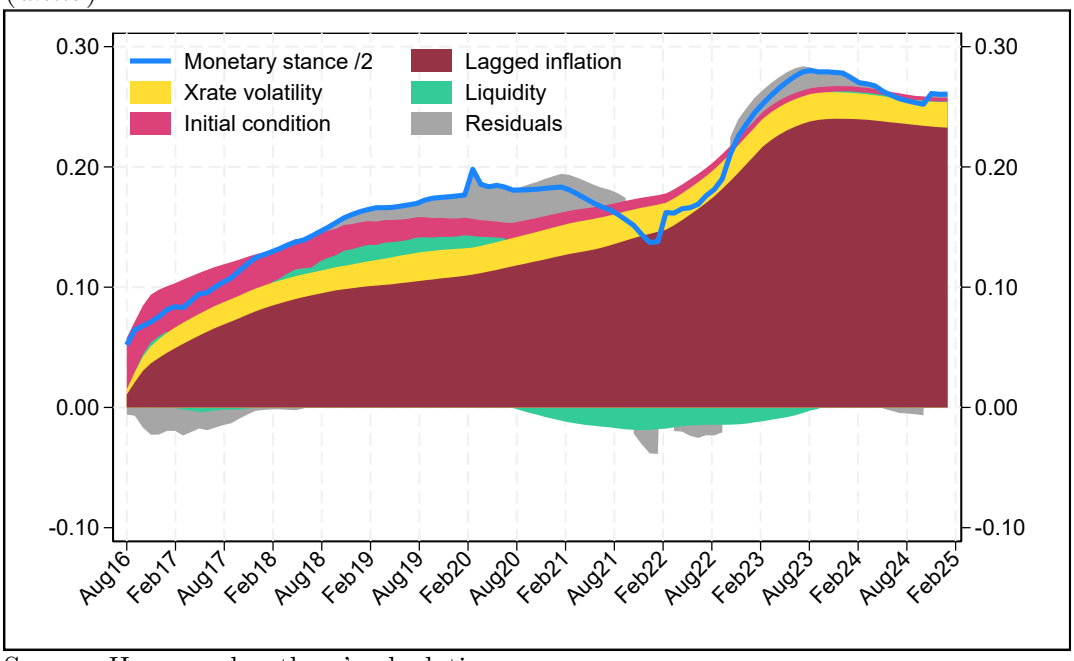
Source: Haver and authors' calculations.
/1 Graphical representation of domestic determinants appearing in equation (7).

Figure 4: Overall balance of the general government
(*units*)



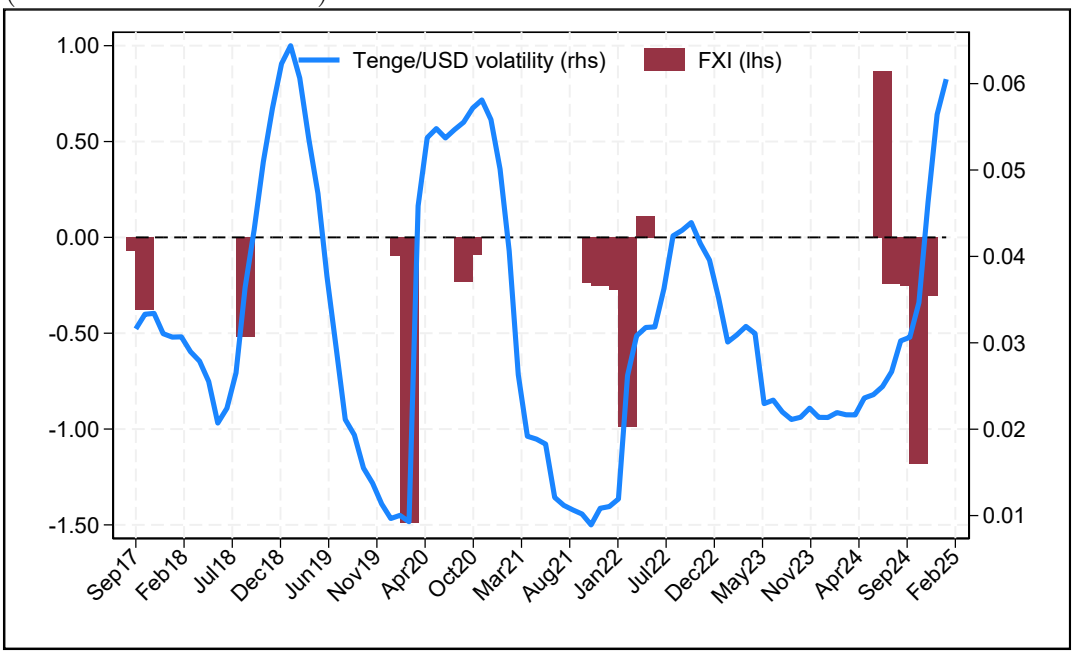
Source: Haver and authors' calculations.

Figure 5: Direct contributions to the monetary stance[1/]
(*units*)



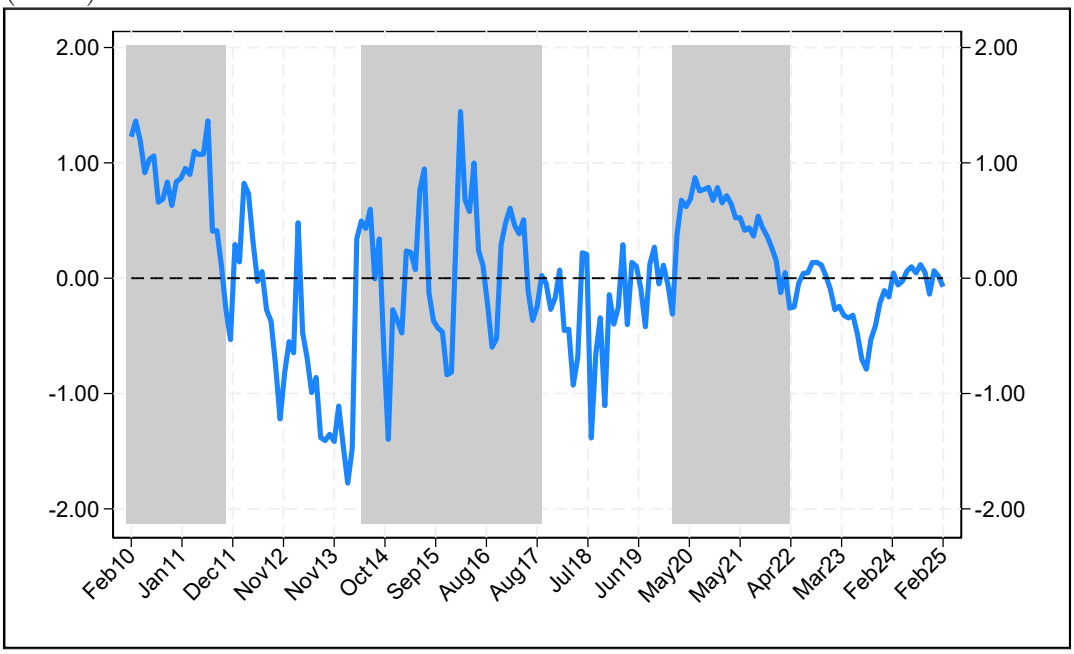
Source: Haver and authors' calculations.
/1 Graphical representation of equation (8). 2/ Including intercept component $\sum_{j=1}^{t} \hat{\beta}_2^{t-j} \hat{\alpha}_2$.

Figure 6: Exchange rate volatility and NBK FXIs
(*units and USD billion*)



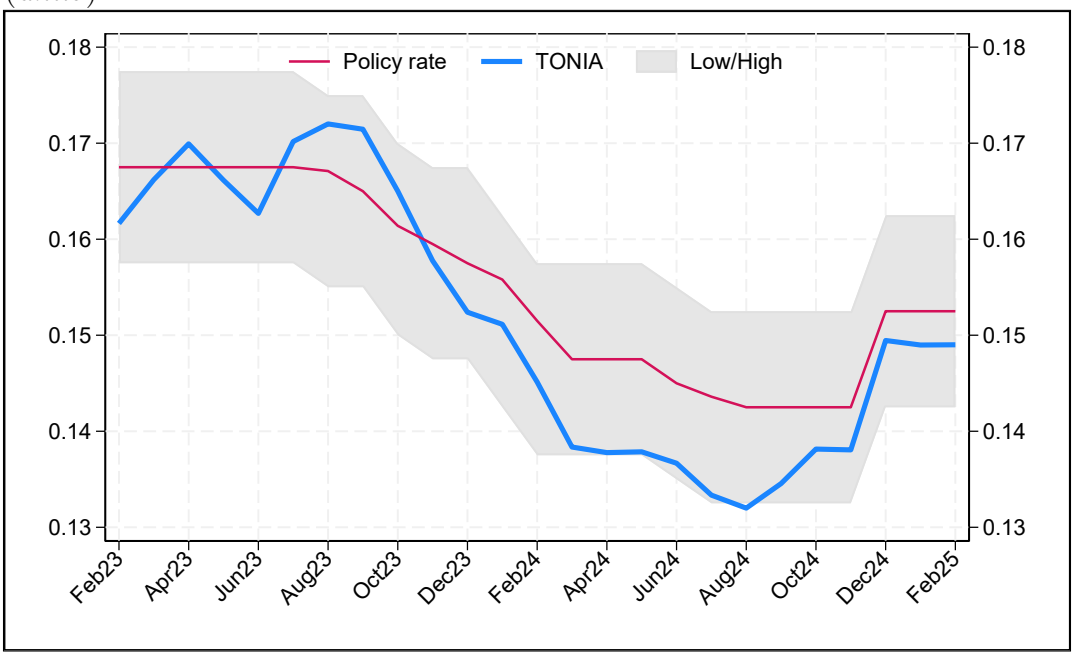
Source: Haver and authors' calculations.

Figure 7: Liquidity creation by the NBK
(*units*)



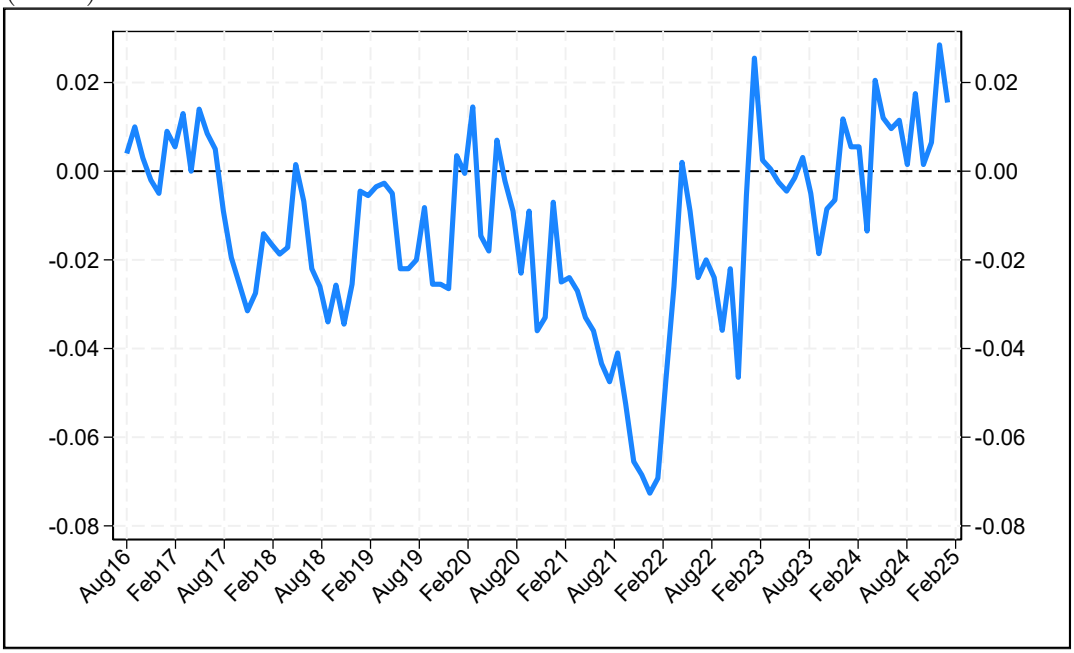
Source: Haver and authors' calculations.

Figure 8: TONIA rate falling at the bottom of the interest band
(*units*)



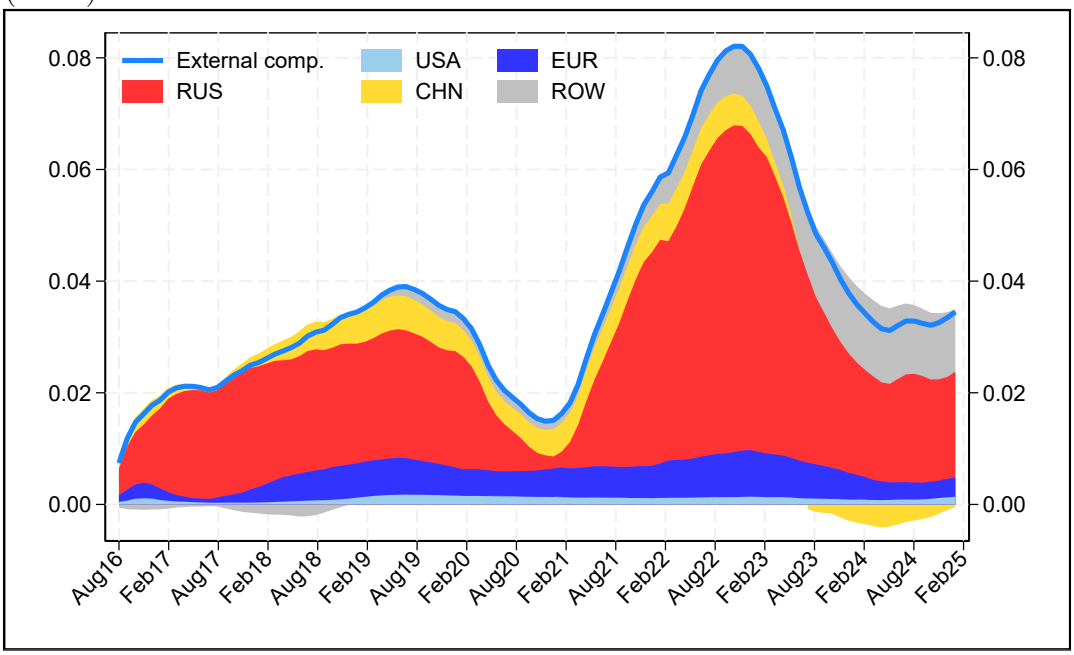
Source: Haver and authors' calculations.

Figure 9: Ex ante real policy rate[1/]
(*units*)



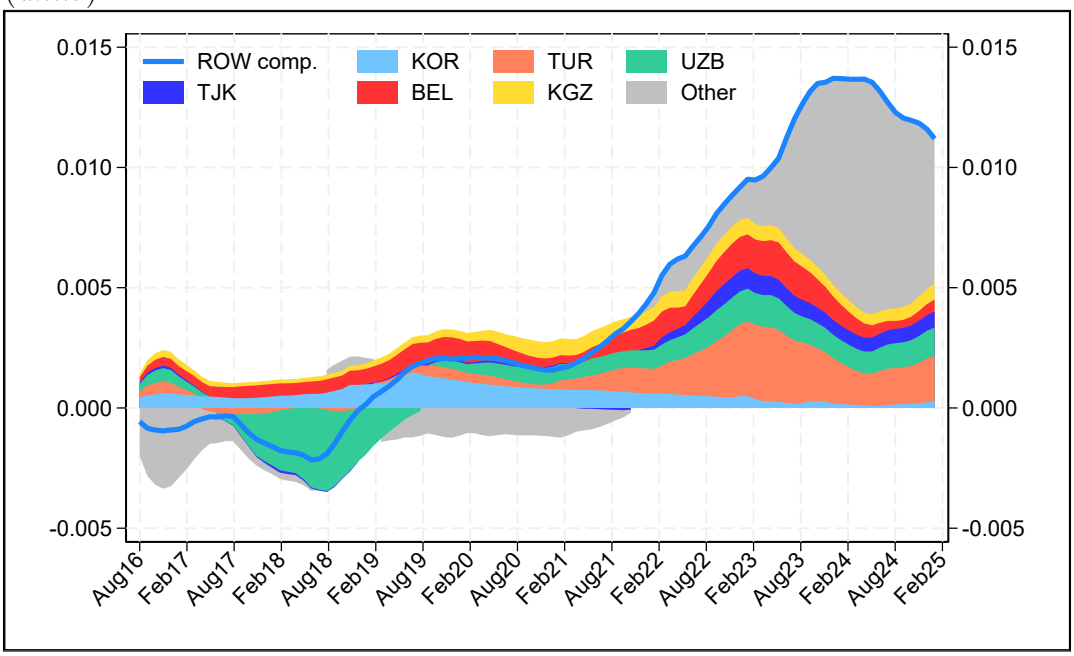
Source: Haver and authors' calculations.
1/ Defined as the difference between the policy rate and inflation expectations at 12 months.

Figure 10: Direct contributions to headline inflation – external components[1/]
(*units*)



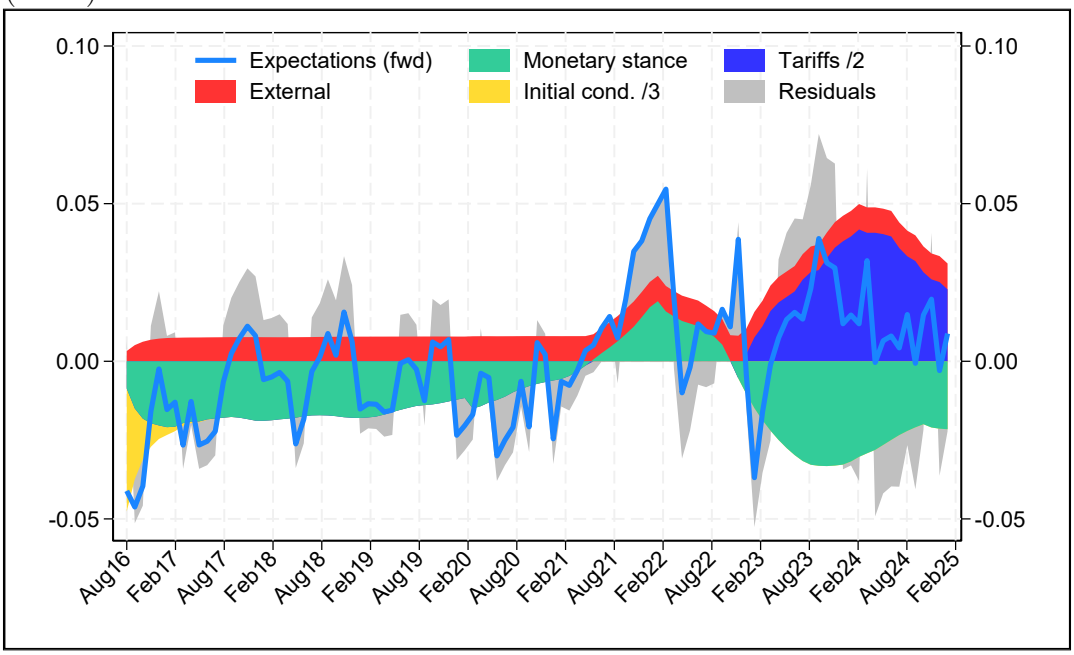
Source: Haver and authors' calculations.
1/ Direct contributions of the largest four trading partners in the first equation of (6).

Figure 11: Direct contributions to headline inflation – rest of the world[1/]
(*units*)



Source: Haver and authors' calculations.
1/ Direct contributions of the smaller trading partners in the first equation of (6).

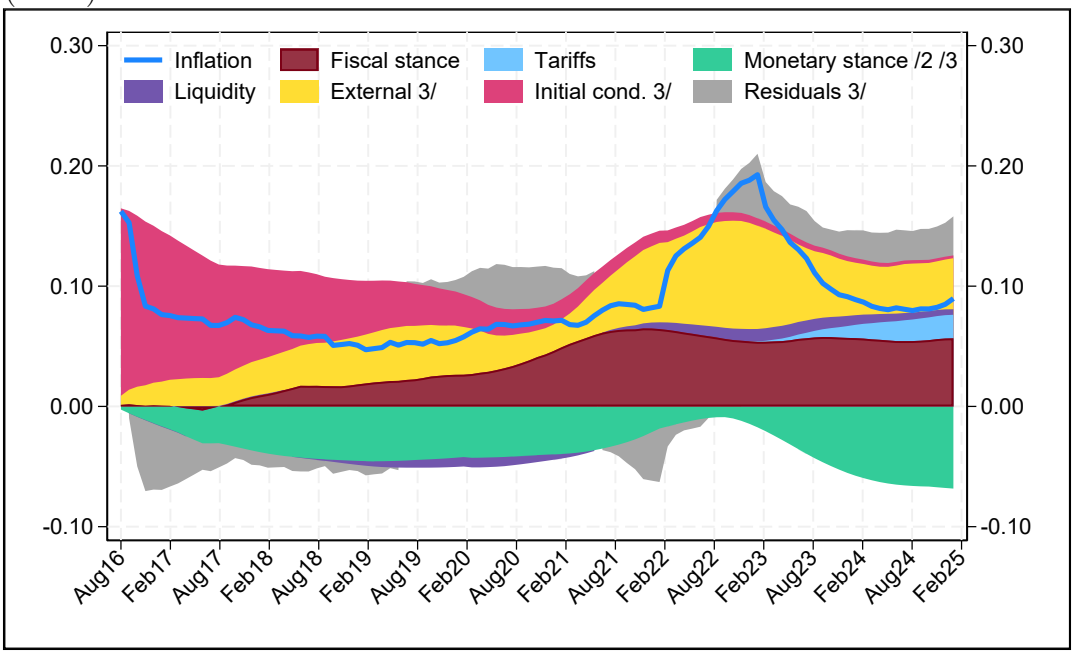
Figure 12: Direct contributions to forward-looking expectations[1/]
(*units*)



Source: Haver and authors' calculations.
1/ Graphical representation of equation (9). 2/ $\sum_{j=1}^{t} \hat{\beta}_4^{t-j} \hat{\kappa}_4 tf_j$. 3/ $E_0\pi_1 = E_{Jul2016}\pi_{Aug2016}$.

Figure 13: Direct and indirect contributions to headline inflation[1/]

(*units*)



Source: Haver and authors' calculations.

1/ Graphical representation of equation (7) after substituting the indirect contributions from the second and fourth equation in (6). 2/ Excluding liquidity component from the second equation in (6). /3 Including indirect contributions from the fourth equation in in (6).

Appendix II: Derivation of historical decompositions

A linear, first order, autonomous difference equation has the following general form:

$$y_{t+1} = ay_t + b \quad \forall \quad t = 0, 1, \cdots \tag{A.1}$$

where a and b are known constants. (A.1) can be solved forward by iteration if we know the initial condition y_0. The solution for $a \neq 1$ is:

$$\begin{aligned}
y_0 &= y_0 \\
y_1 &= ay_0 + b \\
y_2 &= a\left(ay_0 + b\right) + b \\
y_3 &= a\left[a\left(ay_0 + b\right) + b\right] + b \\
&\cdots \\
y_t &= a^t y_0 + \sum_{j=0}^{t-1} a^j b \\
&= a^t y_0 + b\left(\frac{1 - a^t}{1 - a}\right) \\
&= a^t\left(y_0 + \frac{b}{1 - a}\right) + \frac{b}{1 - a}
\end{aligned} \tag{A.2}$$

where $\frac{b}{1-a}$ is the steady state value of y.

A linear, first order, non-autonomous difference equation has the following general form:

$$y_{t+1} = a_{t+1}y_t + b_{t+1} \quad \forall \quad t = 0, 1, \cdots \tag{A.3}$$

The solution via forward iteration is given by:

$$\begin{aligned}
y_0 &= y_0 \\
y_1 &= a_1 y_0 + b_1 \\
y_2 &= a_2\left(a_1 y_0 + b_1\right) + b_2 \\
y_3 &= a_3\left[a_2\left(a_1 y_0 + b_1\right) + b_2\right] + b_3 \\
&\cdots \\
y_t &= \prod_{i=0}^{t} a_i y_0 + \sum_{j=0}^{t-1}\left(\prod_{i=j+1}^{t} a_i\right) b_j + b_t
\end{aligned} \tag{A.4}$$

The equations for the endogenous variables in (6) are "partial" non-autonomous difference equation. They have a constant coefficient (the autoregressive parameter) but variable intercepts (the other variables and error term). Hence, its solution is a combination of the

solutions of autonomous and non-autonomous difference equations just derived. Starting from (A.4) and taking $a_i = a \ \ \forall i$:

$$\begin{aligned} y_t &= \prod_{i=0}^{t} a_i y_0 + \sum_{j=0}^{t-1} \left(\prod_{i=j+1}^{t} a_i \right) b_j + b_t \\ &= a^t y_0 + \sum_{j=0}^{t-1} a^{t-j} b_j + b_t \\ &= a^t y_0 + \sum_{j=1}^{t} a^{t-j} b_j \end{aligned} \tag{A.5}$$

The historical decomposition of inflation in the first equation in (6) can be derived by substituting its determinants appearing on the right-hand-side into (A.5):

$$\begin{aligned} \pi_t &= \beta_1 \pi_{t-1} + (1-\beta_1) E_t \pi_{t+1} + \gamma_1 ms_t + \delta_1 fs_t \ + \zeta_1 epp_t + \varepsilon_{AS,t} \\ &= \beta_1^t \pi_0 + \sum_{j=1}^{t} \beta_1^{t-j} (b_j) \\ &= \beta_1^t \pi_0 + \sum_{j=1}^{t} \beta_1^{t-j} \left(\gamma_1 ms_j + \delta_1 fs_j + \zeta_1 epp_j + \varepsilon_{AS,j} \right) \end{aligned} \tag{A.6}$$

which can be rearranged into:

$$\begin{aligned} \underbrace{\pi_t}_{\text{Inflation}} = \underbrace{\beta_1^t \pi_0}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t} \beta_1^{t-j} (1-\beta_1) E_t \pi_{j+1}}_{\text{Forward expectations component}} + \underbrace{\sum_{j=1}^{t} \beta_1^{t-j} (\gamma_1 ms_j + \delta_1 fs_j)}_{\text{Domestic determinants}} + \\ \underbrace{\sum_{j=1}^{t} \beta_1^{t-j} \zeta_1 epp_j}_{\text{External determinants}} + \underbrace{\sum_{j=1}^{t} \beta_1^{t-j} \varepsilon_{AS,j}}_{\text{Unexplained residuals}} \end{aligned} \tag{A.7}$$

Similarly, using the second equation in (6), it is possible to derive the historical decomposition of the monetary stance as follows:

$$\begin{aligned} \underbrace{ms_t^*}_{\text{Monetary stance}} = \underbrace{\beta_2^t ms_0}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t} \beta_2^{t-j} (\gamma_4 \pi_{j-1} + \delta_2 usxvol_{j-1})}_{\text{Other determinants}} + \\ \underbrace{\sum_{j=1}^{t} \beta_2^{t-j} \zeta_2 liq_j}_{\text{Excess liquidity determinants}} + \underbrace{\sum_{j=1}^{t} \beta_2^{t-j} \varepsilon_{ms,j}}_{\text{Unexplained residuals}} \end{aligned} \tag{A.8}$$

Similarly, using the fourth equation in (6), it is possible to derive the historical decomposition of the monetary stance as follows:

$$\underbrace{E_t\pi_{t+1}}_{\text{Inflation expectations}} = \underbrace{\beta_4^t E_0\pi_1}_{\text{Initial condition}} + \underbrace{\sum_{j=1}^{t}\beta_4^{t-j}(\gamma_4 ms_j + \kappa_4 tf_j) + \sum_{j=1}^{t}\beta_4^{t-j}\zeta_4 usx_j}_{\text{Domestic determinants}} + \underbrace{\sum_{j=1}^{t}\beta_4^{t-j}\varepsilon_{EP,j}}_{\text{External determinants}} \quad \text{Unexplained residuals} \tag{A.9}$$

Appendix III: Data description and sources

We build a dataset of monthly observations over the 2016m8-2025m2 interval. This includes domestic and external factors affecting headline inflation like the forward-looking component of inflation expectations, oil prices, proxies for inflation in trading partners, and proxies for the monetary and fiscal stances.

π_t **Headline inflation**. Headline inflation is calculated as the 12-month difference in the log of the seasonally adjusted monthly CPI index. The CPI series is seasonally adjusted by Haver and published with the code S916PC.

ms_t textbfMonetary stance. Defined as the average ex-ante real policy rate with equally weighted inflation projections for the following twelve months. The monthly average policy rate is published by the Central Bank and reported by Haver with code N916RTAV.

fs_t **Fiscal stance**. Defined as the difference between the logs of the GG 12 month running sum of revenues and expenditure reported by Haver with codes Y916FTRX and Y916FTEX, respectively.

epi_t **Inflation expectations**. As published by the Central Bank and reported by Haver with code N916VMPE.

epp_t **External price pressures**. Defined as the sum of import weighted twelve-month log change in the bilateral exchange rate and the import weighted twelve-month difference in the log of the producer price for the ten largest exporting partners to Kazakhstan and a residual rest of the world category trading in USD.

oil_t **Oil price inflation**. Defined as the twelve-month difference in the log of the monthly average Brent crude oil spot price reported by Haver with code PEBRTAS.

usx_t **US dollar exchange rate volatility**. Defined as the twelve-month rolling standard deviation of the US dollar exchange rate.

tf_t **Utility price inflation**. Defined as deviation form the trend of the the principal component of electricity, central heating, gasoline, and hot water supply price inflation reported by Haver with codes S916PCPE, S916PCPH, S916PCTF, S916PCH1, respectively.

liq_t **Excess liquidity**. Defined as the log difference between banks' real other deposits at the NBK and its trend reported by Haver with code N916FOPF.

PUBLICATIONS

Inflation Determinants in Kazakhstan: A tale of (at least) two stories

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