

RICS | Response of Inflation to the Climate Stress *Evidence from Azerbaijan*

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Is inflation back, and in which form?
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The views expressed in this working paper are those of the author and do not necessarily represent the official views of the Central Bank of the Republic of Azerbaijan.

| Motivation

1. The unexpectedly high inflation of the post-pandemic period,
 2. Unexplainable part of inflation in decomposition models,
 3. Continuously increasing seasonality in agricultural prices
- hustled us to worry about the other factors that Central Banks (CB) left unnoticed, such as climate change.

| Questions

1. Is Climate Change just a leading trending topic only related to “an environmental change,” or is it a real economic threat?
2. If so, what is the impact mechanism of climate on macroeconomic variables?
3. More importantly, will climate significantly affect not only the seasonal part of inflation but also the trend of the overall prices that CBs should maintain their stability?

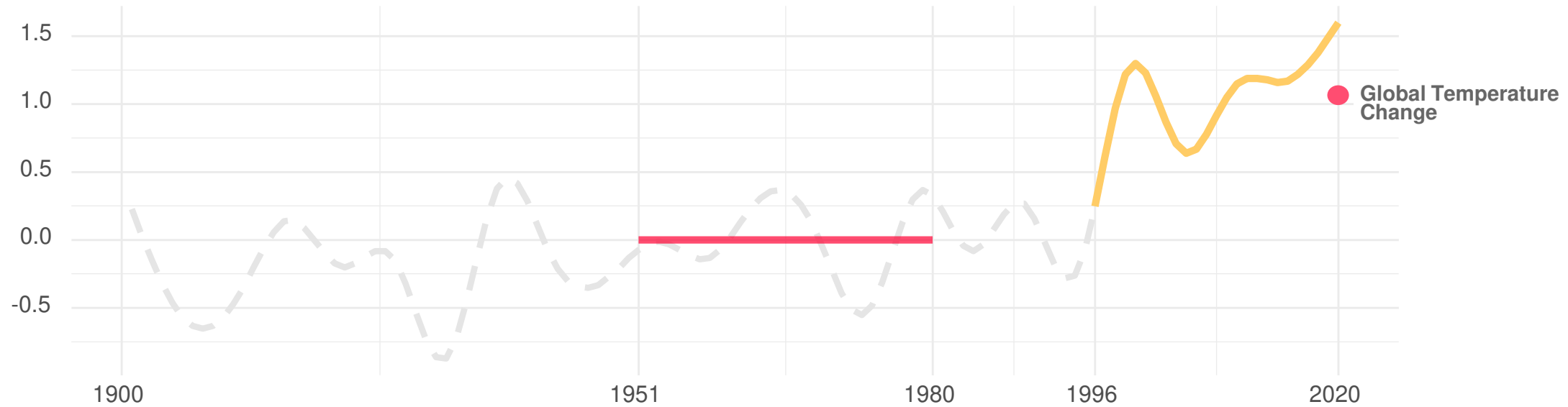
| Hypotheses

1. Climate change affects the trend of agricultural goods' prices.
2. Transition to green energy affects fossil fuel exporters' national currencies.

| What is changed?

Figure 1. Mean Annual Temperature Change in Azerbaijan

relative to 1951-1980 average temperatures



Source: World Bank, NASA

| Impact Mechanism



Climate Scenarios

Figure 2. Mean Temperature (temp)

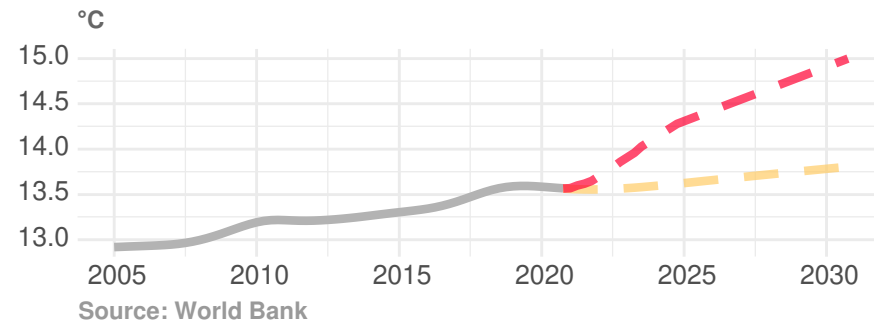


Figure 3. Fallow Land (fl)

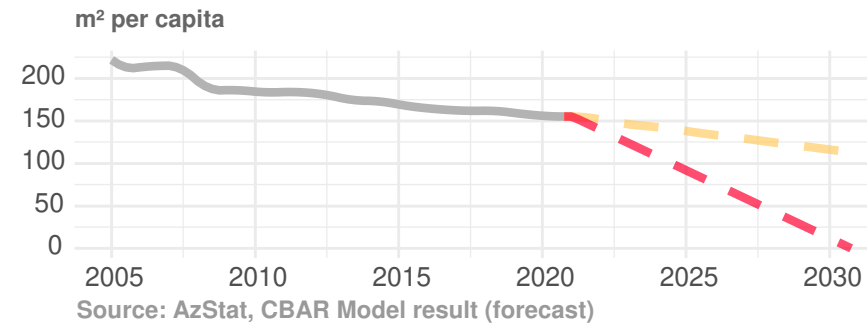


Figure 4. Precipitation (prec)

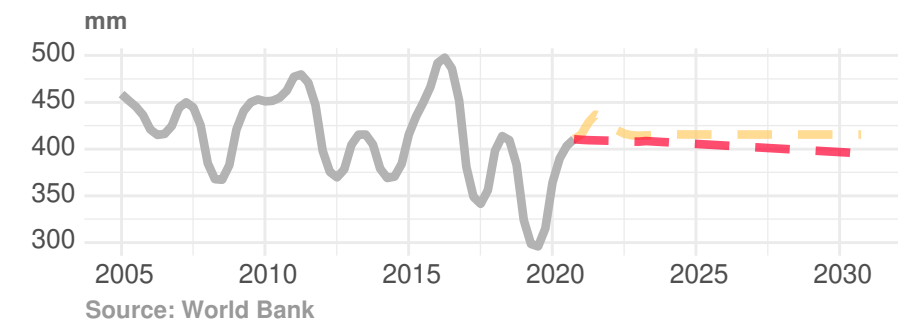


Figure 5. Cereal Productivity (cp)

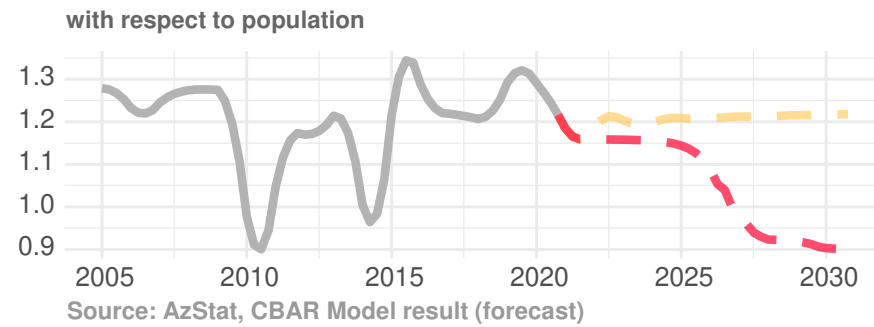


Figure 6. Expenditures on Environmental Protection (eep)

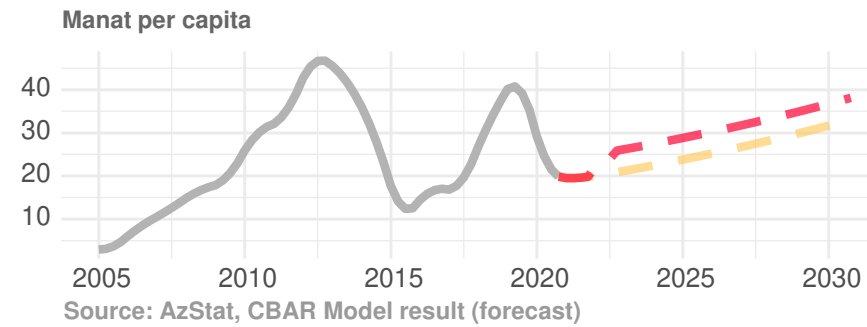


Figure 7. Water Price Inflation (wprc)

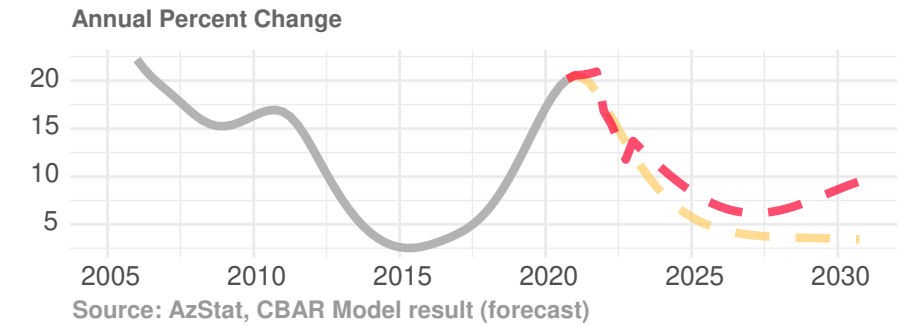


Figure 8. Export Revenue of Fossil Fuel

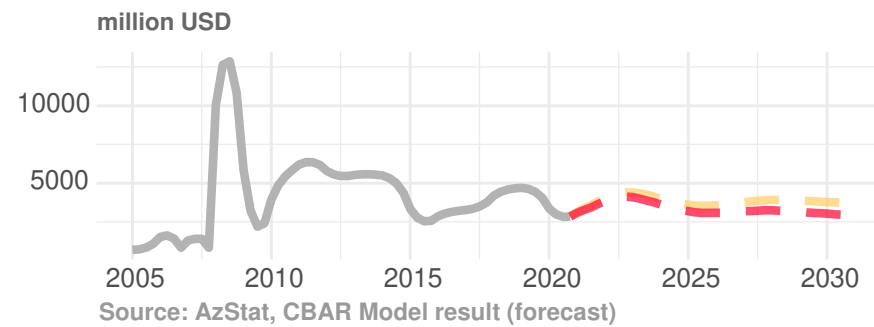
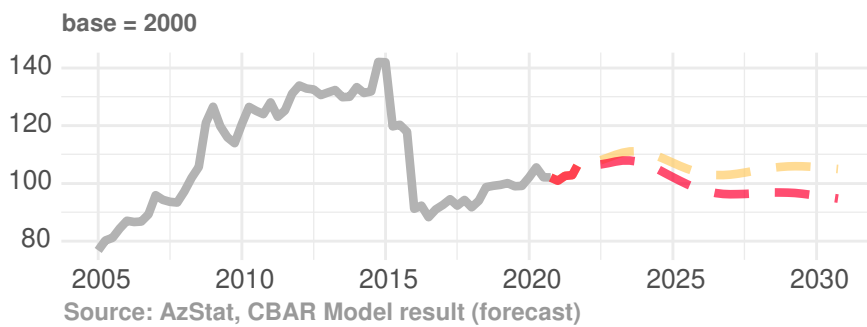


Figure 9. Real Effective Exchange Rate (REER)



worst scenario
normal scenario

| Methodology

The normal scenario variables' forecasts are built on Autoregressive Integrated Moving Average (ARIMA (p, q)) as below:

$$y_t = \Phi_1 y_{t-1} + \Phi_2 y_{t-2} + \dots + \Phi_p y_{t-p} + u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \dots + \theta_q u_{t-q}$$

where y_t is scenario variable (temp; prec; fl; cp; eep; oilr) and u_t is the error term.

On the other hand, the worst scenario encounters international organizations' and researcher's intuitions for the future of exogenous variables.

These scenarios were implemented into the Bayesian Vector Autoregression (BVAR) model built to estimate inflation in Azerbaijan through an agricultural producer price index and REER between 2021 and 2030.

Suppose $Y_t = (Y_{1,t} \ Y_{2,t} \dots \ Y_{n,t})'$ is the random variable vector. Therefore, A VAR(p) model is specified as:

$$Y_t = c + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \dots + \phi_p Y_{t-p} + \varepsilon_t$$

where c is a vector of constants, $\phi_1, \phi_2, \dots, \phi_p$ are lag matrices and ε_t is the white noise terms $\varepsilon_t \sim i. i. d. N(0, \Sigma_t)$.

The BVAR hyper-parameters

- $\lambda_0 = 1$ (overall tightness of covariance matrix prior),
- $\lambda_1 = 0.2$ (overall tightness of coefficient priors on the first lag),
- $\lambda_3 = 1$ (lag decay) and
- $\lambda_4 = 100$ (control variable on constant)

maximize the marginal likelihood.¹⁰ Moreover, the Gibbs sampling algorithm is used to find marginal posterior distributions by setting the prior with initial observations and the sum of coefficient dummies.

Results

1. Shock to the climate change-related factors causes a shift in inflation trend, indicating that climate change is a driver for headline inflation, which should not be ignored.
 2. The worst scenario is 1 pp higher than the history-based normal scenario, implying that climate change is not only the determinant of seasonality but the trend of inflation.
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3. The transition to a low-carbon environment with the Paris agreement harms REER.
 4. Starting from 2024, REER would not be able to be the bumper; moreover, it would give an additive contribution to inflation.

Figure 10. Climate Change's Contribution to Inflation
Through Agricultural Producer Price Index

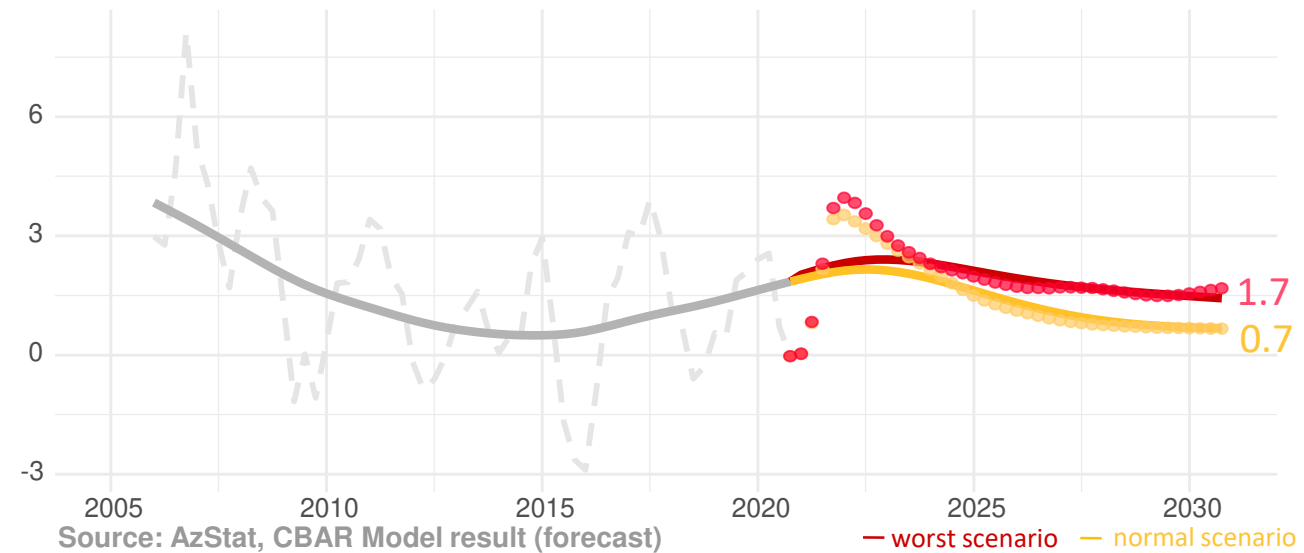
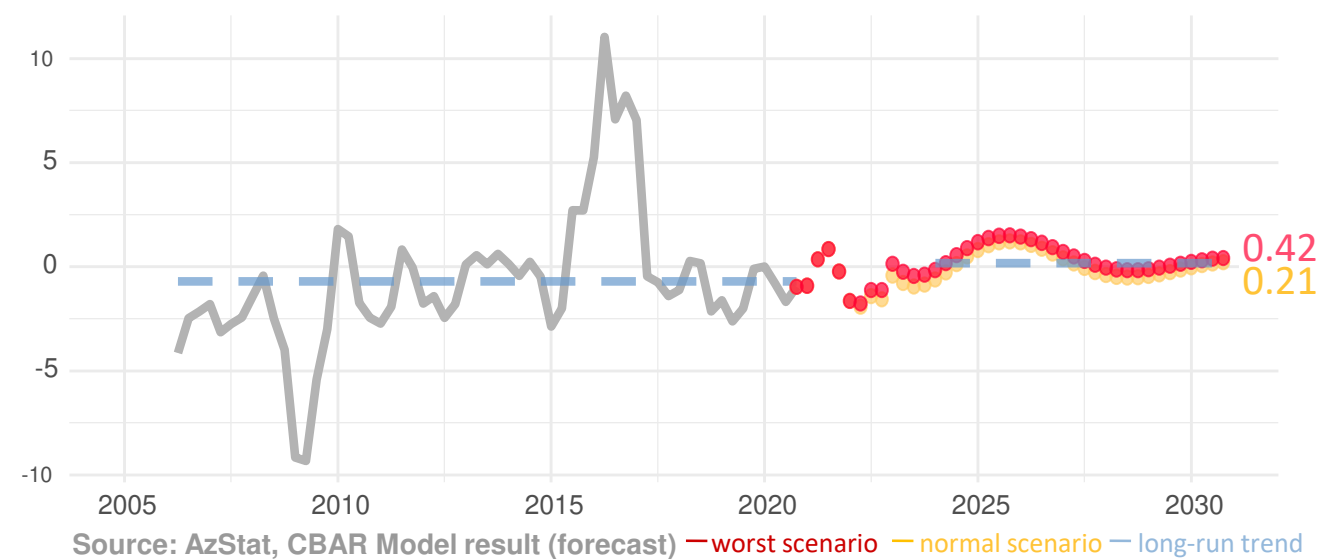


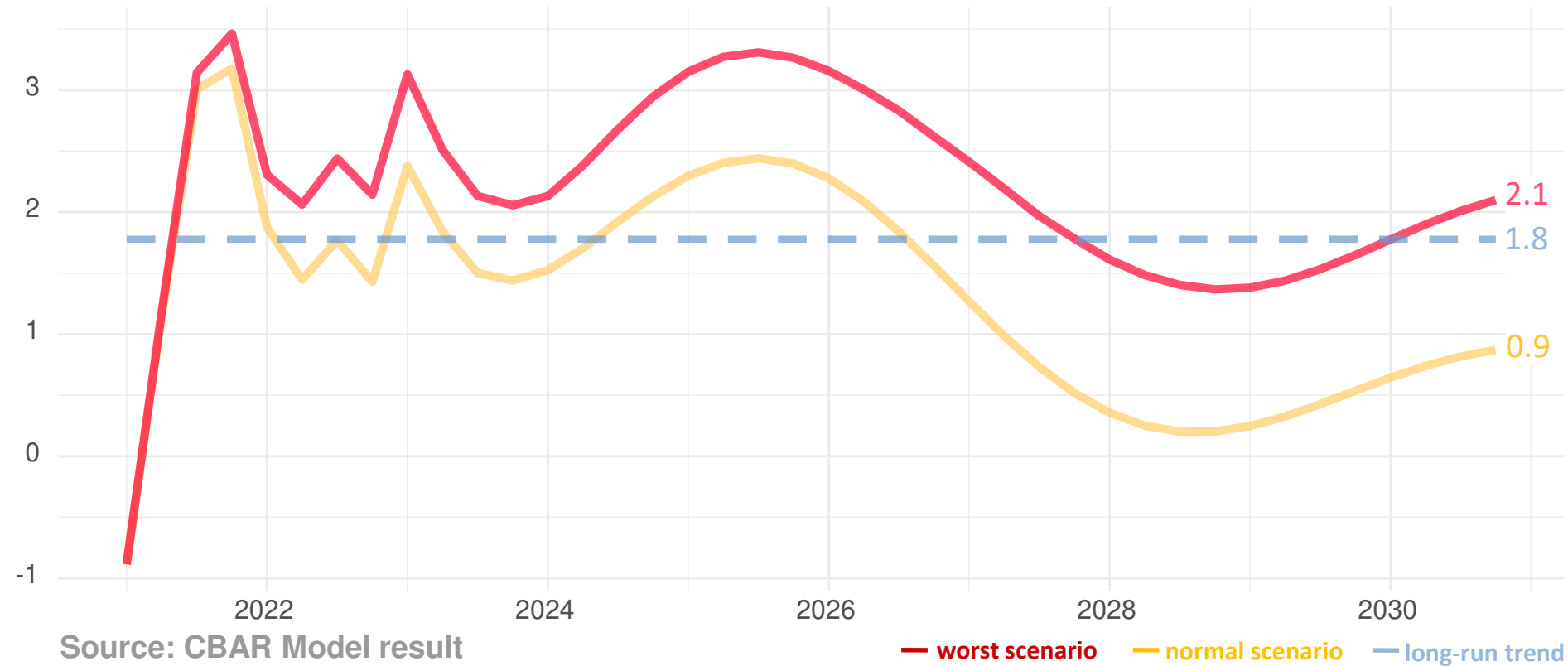
Figure 11. REER's Contribution to Inflation



Conclusion

Figure 12. Response of Inflation to the Climate Stress

Aggregate contribution of climate change and the oil revenues to the inflation



1. Inflation's response to climate stress is alerting, according to 1.8 pp additional contribution of climate to inflation as the long-run trend while considering the inflation target.
2. With this aspect in mind, adding a climate action plan to its agenda could increase CBAR's future policy effectiveness until it has the mandate to maintain price stability and the value of the local currency.

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Thanks for your *attention*.

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