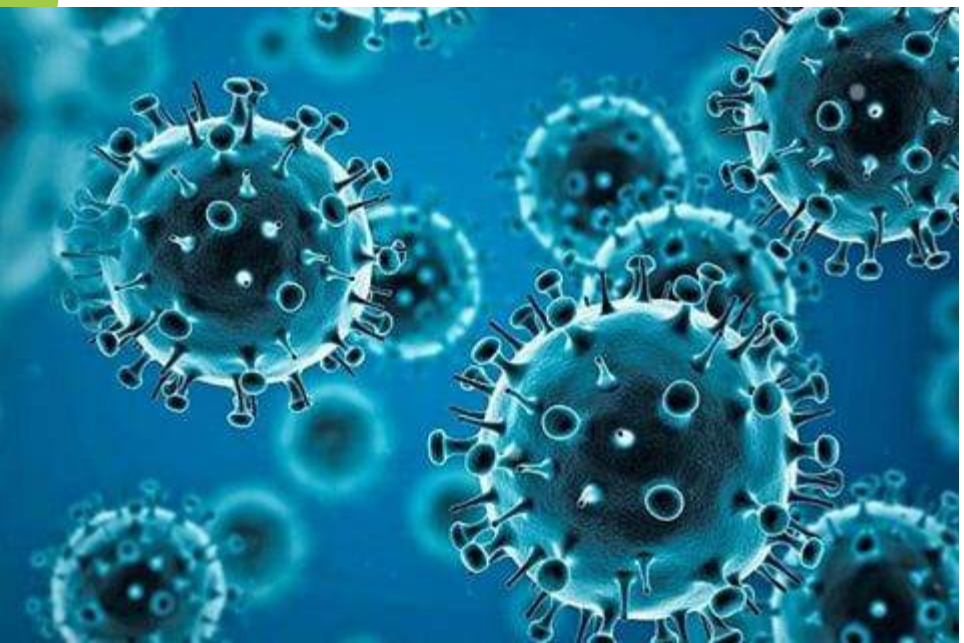
DRIVERS OF LOCAL FOOD PRICES INFLATION IN THE KYRGYZ REPUBLIC



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Why Is This Topic Important?

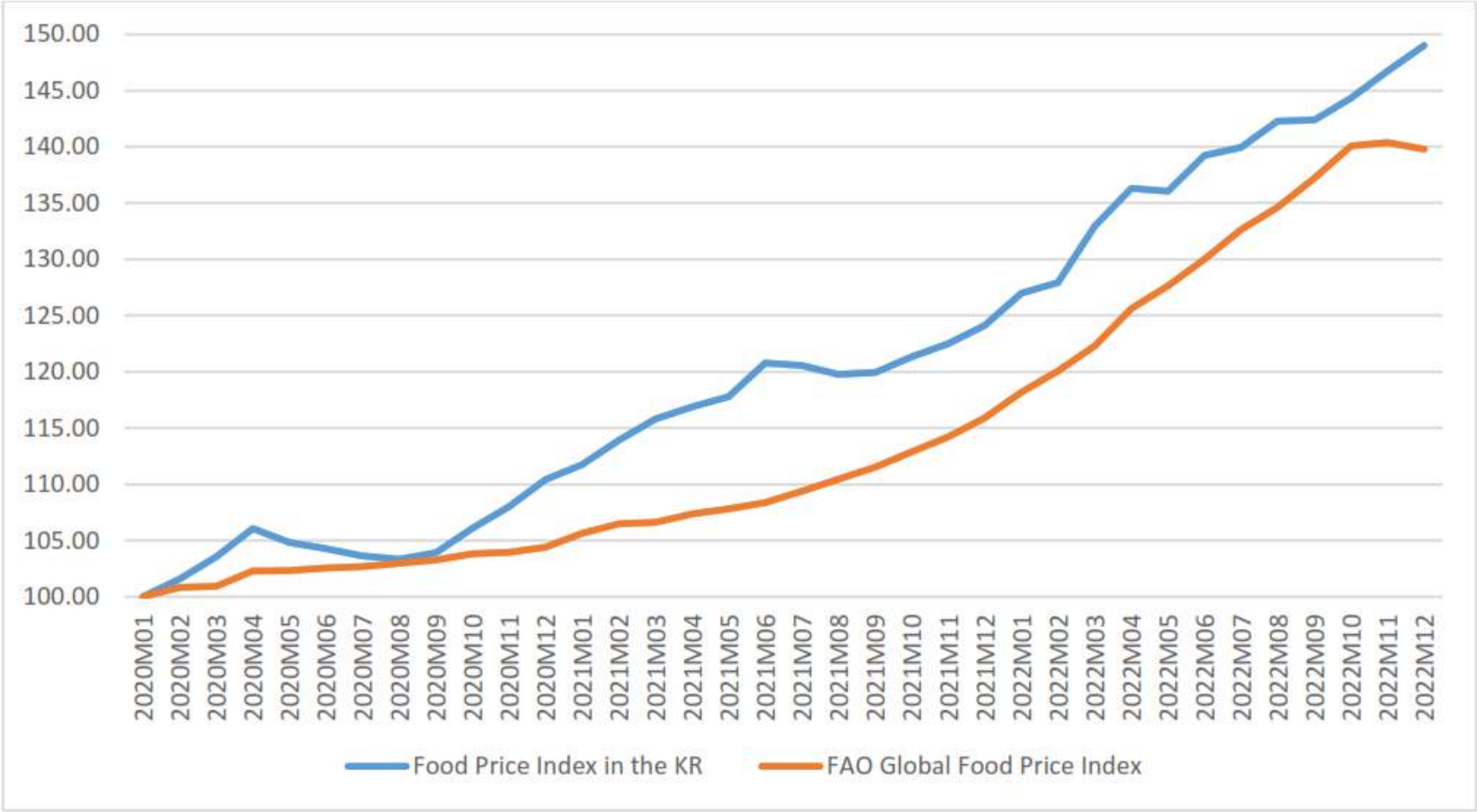
- Since the beginning of 2020, the global food prices has increased by about 40%, while the food prices in the KR has increased by approximately 50% (in December 2022) (FAO data). Since December 2019, the food products increased about 2.3-fold than the services did, 52.48% vs 22.97% (NBKR data).

- When the food prices inflation (in September 2022) in the KR is compared to 203 world countries since the beginning of 2020, it accounts for 51.21%, which is in the *top 10%*.

- The average household welfare falls in 43 out of 53 sampled countries, and average household real income loss accounts for 1.5%. The KR households are among the most affected ones with over 5% real household income loss (Artuc et al., 2022)

Why Is This Topic Important?

Figure 1: The Dynamics of Global and Local Food Prices (in the KR) during January 2020 – December 2022



Source: FAO (https://www.fao.org/worldfoodsituation/foodpricesindex/en/) and NBKR data (https://www.nbkr.kg/index1.jsp?item=137&lang=ENG)

Why Is This Topic Important?

Table 1: Food Prices Inflation in the World Countries and Kyrgyz Republic since December 2019

Country	Food Price Inflation, %	Rank
Venezuela	33,747.33%	1
Lebanon	5,384.54%	2
Zimbabwe	2,560%	3
Sudan	1,632.63%	4
Syria	384.79%	5
…	…	…
Kyrgyzstan	51.21%	19
…	…	…
Switzerland	3.17%	199
British Virgin Islands	2.96%	200
Saint Lucia	1.51%	201
China, mainland	1.05%	202
Comoros	-1.92%	203

Source: FAO. Consumer Price Indices (https://www.fao.org/faostat/en/#data/CP)

Why Is This Topic Important?

- A severe increase in food prices disrupts real incomes of consumers and hinders the access to sufficient food for most household members, which in turn increases poverty in the households to the serious levels (Unsal et al., 2020; Shabalin, 2022; Euronews, 2022). These impacts can be more drastic for poorer households as they spend a larger proportion of their incomes on food products (Ivanic et al., 2012)

- Access to food has become more challenging due to climate change, and thus more than ¼ of the people are about to starve (FAO et al., 2021).

- In order to design policies that enable improving food security and precisely forecast the food price inflation, it is preliminarily vital to determine and to detect the *factors of food prices*.

Aim and Contribution of the Research

- The study aims to estimate the macroeconomic factors of food price inflation by using the NARDL model by Shin et al. (2014), and thus to recommend policy implications for controlling food price rises and mitigating food insecurity among households in the KR during January 2000 – December 2022.

Aim and Contribution of the Research

- The contributions of the study:
  - Contrary to limited number of factors of food prices covered in previous studies, this is one of the first studies that focuses on all possible drivers, including even the most recent and important phenomena such as COVID-19 and Ukraine-Russia war, of food prices in a country,
  - Furthermore, an important strength of this paper is to use more sophisticated empirical methods such as NARDL rather than the conventional methods like VAR, VECM etc. in order to analyze the asymmetric responses of food prices to the variables of interest,
  - Contrary to most studies, where the local food prices has been used as a regressor, the opposite associations in which the food prices are indeed a dependent variable will be estimated here.

Literature Review

Author(s)	Country and Period	Aim and Method	Main Findings
Okou et al. (2022)	15 SSA during Jan 2012-Sep 2021	To analyze the external and local factors of staple food products price inflation via using the FE panel data model.	The net import dependence, consumption share of staples, global food prices, and real effective exchange rates are key factors of the local staple food prices. Relative staple food prices typically rise sharply after natural disasters and wars. The price effects of these drivers have been amplified during the COVID-19 period. The average real cost of staple foods is lower in large cities.
Samal et al. (2022)	India during Jan 2006-Mar 2019	To examine the impact of macroeconomic factors on the food price inflation by using ARDL model and Granger causality.	SR, LR: $Y^{pc}, M2, P^{food\_w}, W^{farm} \overset{+}{\Rightarrow} P^{food}$; SR, LR: $q^{food} \overset{-}{\Rightarrow} P^{food}$; $E \overset{0}{\Rightarrow} P^{food}$. SR: $Y^{pc}, E, q^{food} \Leftrightarrow P^{food}$; $P^{food\_w} \Rightarrow P^{food}$; $M2, W^{farm} \overset{0}{\Rightarrow} P^{food}$.
Kargbo (2005)	West Africa during 1960-1998	To analyze the impacts of numer of variables on food prices bu using VECM.	An increase in money supply is found to increase food prices, while an increase in the food production and exchange rates are found to decrease food prices. However, real income had no significant effect on food prices.

Literature Review

Author(s)	Country and Period	Aim and Method	Main Findings
Furceri et al. (2016)	34 advanced and 50 emerging economies during 1960-2012	To examine the impacts of nom.GDP, M2, global/local food prices, country dummy, and food import share on local inflation by using FE/RE, GMM, and panel VAR models.	The positive association between global food prices and domestic inflation dies away by time as this relationship stays stronger in developing countries than it is in the advanced countries. Inflation expectations are more anchored in advanced than in emerging economies, which can also contribute to a smaller impact in advanced economies.
Agyei et al. (2021)	SSA	To investigate the effect of COVID-19 on the imported rice, local rice, maize, and sorghum prices in by using the dynamic GMM model.	The initial lockdown at the start of COVID-19 leads to the rise only in maize prices and the crude oil prices, exchange rate, and inflation exert a destructive effect on the commodity prices. The authors recommend that the governments should increase infrastructural investments to improve efficiency in the food supply chain during the pandemic.
Wong & Shamsudin (2017)	Malaysia during 2000q1-2016q2	To analyze the effect of crude oil price, exchange rates, and real GDP on Malaysian food price fluctuations by adopting NARDL model.	$Asym\ LR: E, Y \Rightarrow P^{food}; Sym.LR:\ P^{oil} \Rightarrow P^{food}.$ $SR: E, Y \Rightarrow P^{food}; P^{oil} \overset{0}{\Rightarrow} P^{food}.$

Research Methodology

- Period: Jan 2020 – Dec 2022.
- The variables and their sources:

Variables	Source and Transformation*
P^{food} (dep.var.)	FAO; log
Y^{agr}	FAO; log, deaggregated (by nominal GDP)
P^{glob}	FAO; log
π	NBKR
P^{oil}	WB; log
Y	NBKR; log, deaggregated (by nominal GDP)
W^{min} and W	NBKR; log, deaggregated (by W)
$M2$	NBKR; log
USD and RUB	NBKR; log
i and i^{agr}	NBKR
BB	NSCKR
War	Generated
COVID-19 indicators	OWD; log

*In the deaggregation of variables, Chow-Lin (1971) method is used. Deseasonalization is also performed.

Research Methodology

Authors	Comments
Dickey & Fuller (1979), Phillips & Perron (1988), & Kwiatkowski et al. (1992)	ADF, PP, and KPSS unit root tests are used to avoid from the spurious regression.
Keynes (1936)	The substitution of a downward for an upward tendency often takes place suddenly and violently, whereas there is, as a rule, no such sharp turning point when an upward is substituted for a downward tendency.
Kahneman & Tversky (1979) and Schiller (2016)	Asymmetries in models should be modelled as nonlinearity is indigenous to social sciences and asymmetry is essential to the human-being condition.
Schorderet (2001; 2003)	The effect of downturns on unemployment is larger (in absolute value) than that of economic upturns.
Granger & Yoon (2002):	The cointegration relationships could be identified by positive and negative components of model variables.
Lee (2000), Virén (2001), and Borenstein et al. (1997)	Partial sum decompositions are studied.
Shin et al. (2014) (main paper)	NARDL model to analyze the output-unemployment relationship during Feb 1982 – Nov 2003 in the USA, Canada, and Japan. They show that the unemployment rate gives more responses to the business cycle busts then it does to the booms.

Research Methodology

- The NARDL model: $\Delta y_t = \rho \xi_{t-1} + \sum_{i=1}^{p-1} \gamma_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \left(\pi_i^{+T} x_{t-i}^{+} + \pi_i^{-T} x_{t-i}^{-} \right) + e_t$

- where $\pi_0^+ = \theta_0^+ + \omega,\ \pi_0^- = \theta_0^- + \omega,\ \pi_i^+ = \varphi_i^+ - \omega^T \lambda_i,$ and $\pi_i^- = \varphi_i^- - \omega^T \lambda_i$

- Assumptions about the model: (i) $e_t \sim iid(0, \sigma_e^2)$, (ii) x_t is a *k*1* vector of I(1) independent variables, (iii) $\rho < 0$ enables the dynamic stability of the model. Under these assumptions, the OLS estimators and long-run coefficients are $\sqrt{T}$ and T consistent with asymptotic N and MN distributions, respectively.
- Robustness tests?
- Asymmetric LR relationship test 1: $H_0: \rho = 0$ vs $H_0: \rho < 0$ (Banerjee et al., 1998).
- Asymmetric LR relationship test 2: $H_0: \rho = \theta^+ = \theta^- = 0$ vs $H_0: \rho \neq \theta^+ \neq \theta^- \neq 0$ (Pesaran et al., 2001).
- Asymmetric SR relationship test: $\sum_{i=0}^{q-1} \pi_i^+ = \sum_{i=0}^{q-1} \pi_i^-$.

Research Hypotheses (Literature Review)

Expected Impact	Regressors
Positive effect	Global food prices, local inflation, crude oil price, minimum/mean wages, agricultural loan interest rates, money supply, COVID-19 pandemic, and the war.
Negative effect	Agricultural production level and real GDP.
Ambiguous effect	USD and RUB exchange rates, loan interest rate, and government budget balance.

Response of $\log(P^{food})$	Regressors
Asymmetric	To the changes in oil prices, mean wages, global food prices, local inflation, money supply, USD exchange rate, war, and mean population stringency.
Symmetric	The changes in the agricultural production level, real GDP, RUB exchange rate, interest rates, government budget balance, and other COVID-19 indicators.

Empirical Model Results

	Long-run causality
	Asymmetric long- and/or short-run responses
	Symmetric long- and/or short-run responses
	Significant robust test result

- All variables except inflation and government budget balance are I(1).
- Table 6a: Dynamic asymmetric regression model results

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*	*Model 7*	*Model 8*	*Model 9*
Ind. Variable	*log_Y_agr*	*log_Y*	*log_P_oil*	*log_W*	*log_W_min*	*log_Pfood_fao*	*Inf*	*log_M2*	*log_USD*
L_{x+}	0.317*	-0.0636	0.1274***	0.48162***	0.40264	1.2685 (0.093)	-0.1344*	0.2524**	0.9806*
L_{x-}	-0.0294	0.329	0.8842***	0.9882***	1.8317	0	0.1695**	1.3832***	0.3849
W_{LR}	1.13	0.52	12.86***	3.2 (0.0736)	0.8	2.83 (0.0926)	7.39**	9.52**	0.4
S_{dx+}	-0.0317	-0.0154	0.0355	0.2365*	0.3607*	0.163	0.014***	-0.01041	0.0529
S_{dx-}	-0.0748*	-0.0578 (0.093)	-0.1054	-0.0197	-0.2741	-2.083	0.0118***	-0.1178	0.2456 (0.0613)
W_{SR}	1.25	5.45 (0.0657)	6.27*	4.78 (0.0916)	20***	14.23***	0.41	1.15	2.38
t_{BDM}	-2.15*	-1.35	-1.43	-1.75 (0.097)	-1.1	-0.99	2.48*	-3.09**	-1.41
F_{PSS}	5.65	3.92	3.28	3.41	4.64	1.73	32.8***	12.75**	5.5
N	270	270	270	270	270	270	270	270	270
R-sq	0.520	0.430	0.216	0.441	0.410	0.193	0.874	0.532	0.387
adj. R-sq	0.181	0.028	-0.338	0.046	-0.006	-0.231	0.786	0.202	-0.045
$CHI\text{-}SQ_{SC}$	9.945 (0.0768)	8.994 (0.11)	6.898	8.978 (0.11)	9.546 (0.0892)	8.387	6.685	14.99**	14.872**
$CHI\text{-}SQ_{FF}$	0.32	1.63	0.16	1.16	0.74	0.52	1.93	1.09	2.74 (0.0828)
$CHI\text{-}SQ_{NOR}$	0.796	-0.348	0.425	-1.41	-1.519	0.847	-1.155	-0.624	-0.632
$CHI\text{-}SQ_{HET}$	0.53	0.05	4.82*	1.7	0.71	0.34	0.01	0.37	1.16

Empirical Model Results

	Long-run causality
	Asymmetric long- and/or short-run responses
	Symmetric long- and/or short-run responses
	Significant robust test result

- All variables except inflation and government budget balance are I(1).
- Table 6b: Dynamic asymmetric regression model results

	Model 10	*Model 11*	*Model 12*	*Model 13*	*Model 14*	*Model 15*	*Model 16*	*Model 17*	*Model 18*	*Model 19*
Ind. Variable	*log_RUB*	*i*	*i_agr*	*BB*	*War*	*log_case_kr*	*log_death_kr*	*log_str_kgz*	*log_case_W*	*log_death_W*
L_{x+}	0.0227	0.2114*	0.1923	0.4214	1.2944	0.12103	0.1446	0.17724***	0.3245	0.77507
L_{x-}	1.0954	0.154	0.8585	0.96482	0	0	0	0.07324***	0	0
W_{LR}	0.32	0.11	0.1	0.08	0.11	0.77	0.95	5.67*	0.81	0.09
S_{dx+}	0.05845	0.05445 (0.1012)	0.0482	-0.0392	-0.0201 (0.1093)	-0.0129	-0.01121	0.04393	0.0393	-0.08191
S_{dx-}	-0.0805	-0.00945	-0.0984 (0.0548)	-0.16687	0	0	0	0.01364	0	0
W_{SR}	1.66	3.9	15.3***	0.46	2.56 (0.1093)	0.55	0.57	0.46	1.02	0.71
t_{BDM}	-0.56	-0.84	-0.36	-0.87	-0.3	0.96	0.95	2.2	-0.59	0.31
F_{PSS}	2.66	2.82	7.38 (0.0607)	1.67	6.72*	1.07	1.16	4.93	3.4	0.81
N	270	270	270	270	270	270	270	270	270	270
R-sq	0.331	0.350	0.407	0.308	0.321	0.112	0.123	0.484	0.205	0.133
adj. R-sq	-0.141	-0.109	-0.011	-0.181	0.015	-0.288	-0.272	0.120	-0.153	-0.257
$CHI\text{-}SQ_{SC}$	7.763	3.823	9.921 (0.0775)	5.03	5.779	6.957	6.586	20.186**	3.857	3.642
$CHI\text{-}SQ_{FF}$	0.07	2.2	1.03	1.32	0.44	0.42	0.26	1.33	1.14	0.22
$CHI\text{-}SQ_{NOR}$	-0.826	-0.174	-1.962	1.11	0.592	-1.635	-1.61	-2.513	-0.687	-0.437
$CHI\text{-}SQ_{HET}$	0.16	0.32	0	0.2	0.01	0.77	0.67	1.86	0.07	0.28

Conclusion

- The agricultural production, mean wage, M2 money supply, local inflation rate, agricultural loan interest rate, and Ukraine-Russia war contribute positively to the food prices in the long-run.
- The food prices gives *more long-run responses to the declines* in oil prices, mean wage, money supply, and inflation rate than the increases in these variables. Nevertheless, it gives *more responses to the rises* in the population stringency and global food prices than the declines in these variables,
- While the local food prices gives *more short-run responses to the decreases* in the real GDP, oil price, global food prices, and interest rate on agricultural loans than the increases in these variables, it gives *more responses to the rises* in both avr/min.wages and the war than the declines in these variables,

Conclusion

- Regarding the *symmetric responses*, it gives significant responses to the changes in agricultural production both in long- and short-runs, in USD exchange rate and loan interest rate in the long-run, and in local inflation rate in the short-run,
- Only the fact that the stringency index is associated with the food prices in the long run means that the devastating effect of COVID-19 has disappeared. Yet, the citizens have not forgotten the incidence of the Black July.
- Even though the Ukraine-Russia war affects the food prices in the short-run, it has a massive effect on the food prices within a year.

Policy Implications

- The Kyrgyz Republic government should:
  - improve infrastructure, provide education and training to farmers, provide cheap-loans to farmers, and directly intervene in the agricultural sector for boosting agricultural productivity,
  - consider increasing investment in the sectors of economy and implementing policies that encourage labor market flexibility to improve productivity and boost wages,
  - implement social protection programs to support vulnerable populations, and promote competition in agricultural markets.

Policy Implications

- The NBKR:
  - can tighten monetary policy by reducing money supply or raising reserve requirements for banks and following more restrictive exchange rate policies to reduce inflation and stabilize the value of the currency,
  - should also monitor local food prices before aiming its inflation target to mitigate its disruptive effects on real incomes of households,
  - should give no respite to commercial banks that just aim their own revenues rather than the public welfare by monitoring them in following (at least) the Basel II capital requirements by Basel Committee on Banking Supervision (n.d.).

Thank You Very Much!

Any Questions?