Assessment of the Quantitative Impact of the Russian Ruble Exchange Rate on Particular Indicators Characterizing the Development of the RA Agriculture

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ABSTRACT

Among the factors influencing the indicators characterizing the development of agriculture in the Republic of Armenia (RA), the exchange rate of the Russian ruble stands out, given that a significant portion of Armenia's agricultural exports and the import of essential material resources are directed to and sourced from Russia. A comprehensive understanding of the impact of the Russian ruble exchange rate on these indicators is impossible without a quantitative assessment. This aspect has so far received insufficient attention in the economic literature. In this article, such an assessment was carried out using a regression model. As a result, indicators were identified – namely, the gross output value of agriculture, the level of marketability, and the import volume of product of agricultural origin – that exhibit a statistical relationship with the Russian ruble exchange rate. Additionally, a regression-correlation analysis was performed to characterize the individual impact of this factor, and appropriate conclusions were drawn based on the results. At the same time, substantiated approaches were proposed to mitigate the negative effects of fluctuations in the Russian ruble exchange rate on specific agricultural development indicators in the RA. These approaches include the development of certain types of local agricultural production, import substitution, and the diversification of both supply and export markets.

Introduction

It is known that the exchange rate plays an important role in the economic activity of any country. It is quite acceptable that "The exchange rate is an important factor in the development of the national economy of any state. In addition to the financial market, this factor also affects other sectors of the economy, since financial means themselves are the only measure of the value of goods and services"

(Shilets, et al., 2018). Moreover, the role of the currency exchange rate gains greater importance due to its impact on the export sector of the economy, domestic production, services, investments, as well as the pricing of goods within the country (Burnusuzyan, 2014). As for the result of the exchange rate impact, it is acceptable that the effect of the exchange rate in a given country is determined by the characteristics of its economy: the composition of exports and imports, the level of development of financial markets, the debt burden in foreign currency, and the availability of unused production resources. Herewith, it should be considered that economic conditions are not immutable, the nature and extent of the exchange rate impact can change significantly under the influence of structural changes (for example, as a result of implementation of economic reforms: the change of the currency exchange rate regime, the introduction of budgetary rules, etc.) and external factors (sanctions, interaction with economic unions) (Babakin, 2022). The exchange rate of the Russian ruble of interest to us is no exception, the impact of which is felt not only within the territory of the Russian Federation, but also to a certain extent outside its borders. That external influence, of course, is not equivalent to the influence of the US dollar. It is correctly stated, that the Russian ruble does not occupy the same positions in the international arena as the American dollar. Currently, it is classified as a domestic currency, circulating mainly within its own country. The Russian ruble doesn't have high international demand also because of the insufficient capacity of the financial market in Russia (Vsyakikh, et al., 2015).

Moreover, the Russian economy is currently experiencing a significant weakening of the Ruble (Vsyakikh, et al., 2015). Highlighting the necessity to strengthen the ruble exchange rate, some authors consider sanctions from Western countries, which may result in continued capital outflows, as well as changes in the currency regulation of the Russian market, as obstacles to this. In their opinion, strengthening the ruble requires maintaining high oil prices and attracting new investors from the markets of friendly countries (Zhihong, 2022).

Despite the relatively limited scale of the impact of the Russian ruble exchange rate, its impact on the economies of the EAEU countries is still quite noticeable. Our republic, which has quite close economic ties with the Russian Federation, is no exception. Moreover, most of the RA foreign trade turnover falls on that country. In this context, the sensitivity of Armenia's open economy, characterized by limited resource capabilities compared

to many countries of the world, to fluctuations in the Russian ruble exchange rate, becomes understandable. The impact of these fluctuations is felt on the entire economy, its particular spheres, sectors, and indicators. This impact is particularly significant on agriculture, a considerable portion of the export of product and the import of necessary material resources of which falls on Russia. The mentioned impact is not limited to export and import volumes and also applies to other indicators, especially production, investment volumes, profitability. In this context, it is important to identify not only the direction of that impact on the specified indicators, but also to determine its magnitude through quantitative assessment. The latter allows to form a more complete picture not only of the mentioned impact, but also to separate those indicators on whose magnitude fluctuations in the Russian ruble exchange rate have greater impact. In this context, the assessment of the quantitative impact of the Russian ruble exchange rate on the magnitude of particular indicators characterizing the development of the RA agriculture becomes relevant.

Materials and methods

We have considered the Russian ruble exchange rate as a factor indicator and have tried to separately examine its impact on various indicators characterizing the development of the RA agriculture.

Within the framework of the research, the problem is posed to clarify the range of indicators between which and the Russian ruble exchange rate there is a statistical relationship, as well as to perform a regression-correlation analysis characterizing the influence of the mentioned factor (which we carried out using the MS Excel program).

The econometric calculations we performed show that there is a statistical relationship between not all output indicators important for the RA agriculture and the Russian ruble exchange rate. Therefore, we focused on those indicators in case of which that connection exists. We are talking about gross output value of agriculture, marketability level, import volume of product of agricultural origin. We have examined the quantitative impact of the Russian ruble on the listed performance indicators using the long-term data (2004-2024) presented in Table 1, reflecting their values.

The separated quantitative impact of the Russian ruble on the performance indicators reflected in Table 1 was assessed using a regression model, as a result of calculating the correlation, regression, and determination coefficients.

Table 1. Russian ruble exchange rate, gross output value of agriculture, marketability level and import volume of product of agricultural origin, 2004-2024*

Years	Average annual exchange rate of 1 Russian ruble, dram[1]	Gross output value of agriculture, billion drams[2,3]	Marketability level of agriculture, %[4]	Import volume of product of agricultural origin, thousand US dollars[5]
	Indicators			
2004	18.52	504.1	55.7	278173.5
2005	16.19	493.0	55.8	315939.5
2006	15.29	555.9	54.2	343274.4
2007	13.36	633.9	57.3	538386
2008	12.35	628.1	54.6	755836.2
2009	11.50	555.7	56.2	611950
2010	12.32	636.7	55.8	675977.7
2011	12.70	795.0	56.0	781227.3
2012	12.94	841.5	56.1	812549.9
2013	12.88	919.1	56.4	845956.1
2014	10.98	993.5	56.2	810763.2
2015	7.89	945.4	58.6	658086.9
2016	7.19	878.5	57.3	633672.3
2017	8.28	908.6	56.7	726667.5
2018	7.73	892.9	56.5	804431.1
2019	7.43	853.3	56.3	872598.7
2020	6.79	833.3	57.2	834229.9
2021	6.84	934.4	57.0	964620.9
2022	6.48	1021.7	57.3	1366641.5
2023	4.66	948.3	57.2	1306833.5
2024	4.25	958.8	57.1	1488787.9

Note: 1. Socio-economic situation. 2005.-page 151; 2006.- page 143; 2007.- page 134; 2008.- page 131; 2009.- page 125; 2010.- page 127; 2011.- page 131; 2012.- page 127; 2013.- page 125; 2014.- page 130; 2015.- page 124; 2016.- page 124; 2017.- page 127; 2018.- page 134; 2019.- page 137; 2020.- page 141; 2021.- page 145; 2022.- page 152; 2023.- page 172; 2024.- page 174; 2025.- page 157.

2. Statistical yearbook of Armenia. 2008.- page 275; 2010.- page 298; 2015.- page 290; 2020.- page 344; 2023.- page 363; 2024.- page 371.

3. Socio-economic situation. 2025.- page 22.

4. Realization (Use) of Agricultural Product... 2007.- page 2; 2011.- page 2; 2016.- page 2; 2020.- page 4; 2025.- page 4.

5. Socio-economic situation. 2005.- page 149; 2007.- page 130; 2009.- page 122; 2011.- page 125; 2013.- page 120; 2015.- page 119; 2017.- page 122; 2019.- page 132; 2021.- page 140; 2023.- page 157; 2025.- page 141.

*Composed by the author based on data from the SC of the RA, www.armstat.am.

Results and discussions

First, let us present the results of the assessment of the quantitative impact of the average annual exchange rate of the Russian ruble on the gross output value of agriculture, which are reflected in Table 2.

Table 2. Results of the regression-correlation analysis of the impact of the average annual exchange rate of the Russian ruble on the gross output value of agriculture*

Indicators	Results
Correlation coefficient	$R=-0.795$
Coefficient of determination	$R_2=0.632$
Regression model	$\hat{y}_t = 1159.8-35.208x_t$
Elasticity coefficient	$E=-0.456$
Significance of the regression coefficient	a_1 (p-value=1.68E-05)
Model significance	$F=32.56$ (signif.=1.68E-05)

*Composed by the author based on the results of regression-correlation analysis conducted using MS Excel.

Analyses show that an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the gross output value of agriculture of the Republic of Armenia by 35.208 billion drams. That is due to the increase in the prices of imported material resources necessary for agricultural production (in particular, fertilizers, pesticides, diesel fuel, etc.) and a certain decrease in the physical volumes of their import as a result of the appreciation of the Russian ruble.

The connection between the analyzed indicators is strong and inverse (R=-0.795) (Eliseeva, et al., 2010). According to the coefficient of determination (R²=0.632), 63.2% of the fluctuations in the gross output value of agriculture are due to fluctuations in the average annual exchange rate of the Russian ruble, and the rest are due to not being included in the model and other random factors. The model is significant (signif. F<0.05).

Let us also present the elasticity coefficient: E=-0.456 %. Thus, a 1% increase in the average annual exchange rate of the Russian ruble leads to a decrease in the gross output value of agriculture by 0.456 %.

The impact of the Russian ruble exchange rate on the gross output of agriculture of RA is caused by the increase or decrease in the volumes of exports and production of agricultural products, the corresponding impact of the appreciation or depreciation of that foreign currency on the prices of imported material resources necessary for agricultural production and the physical volumes of their import. The relationship between the gross output of agriculture of RA and the Russian ruble exchange rate is obvious from this impact. In connection with the mentioned impact, let us add that the appreciation or depreciation of the Russian ruble also affects the volume of exports of material resources necessary for agricultural production from the Russian Federation to our country or the volume of imports of Armenian agricultural products to the Russian Federation. In this context, it is acceptable that "The decline in the national currency exchange rate leads to a decrease in the prices of national goods in the world market, which contributes to the growth of exports. The prices of foreign goods expressed in the national currency become high, as a result of which imports are reduced" (Shibaeva et al., 2007).

The results of the assessment of quantitative impact of the average annual exchange rate of the Russian ruble on the marketability level of agriculture are reflected in Table 3.

Analyses show that an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the marketability level of agriculture by 0.163 percentage point. Under conditions of the Ruble

appreciation, the prices of imported material resources necessary for agricultural production rise, which in turn reduces the physical volumes of imports and, as a result, the volumes of agricultural production reduce. The latter in turn has an adverse effect on the marketability level.

The relationship between the analyzed indicators is average and inverse ($R=-0.656$) (Eliseeva, et al., 2010).

According to the coefficient of determination ($R^2=0.430$), 43.0% of the fluctuations in the marketability level of agriculture are due to fluctuations in the average annual exchange rate of the Russian ruble, and the rest are due to not being included in the model and other random factors. The model is significant (signif. F<0.05).

The elasticity coefficient: E =-0.030 %. So, a 1% increase in the average annual exchange rate of the Russian ruble leads to a decrease in the marketability level of agriculture by 0.030%.

The impact of the Russian ruble exchange rate on the marketability level of agriculture of RA is caused by the impact on the prices of imported material resources necessary for agricultural production, the physical volumes of their import and the volumes of mentioned production, which influences the marketability level of the sector. As noted, under conditions of the Ruble appreciation, the prices of imported material resources necessary for agricultural production rise, because of this the physical volumes of import decrease and, as a result, the volumes of agricultural production reduce.

Table 3. Results of the regression-correlation analysis of the impact of the average annual exchange rate of the Russian ruble on the marketability level of agriculture*

Indicators	Results
Correlation coefficient	$R=-0.656$
Coefficient of determination	$R^2=0.430$
Regression model	$\hat{y}_t = 58.14 - 0.163x_t$
Elasticity coefficient	$E=-0.030$
Significance of the regression coefficient	a_1(p-value=0.001)
Model significance	$F=14.39$ (signif.=0.001)

* Composed by the author based on the results of regression-correlation analysis conducted using MS Excel.

Table 4. Results of the regression-correlation analysis of the impact of the average annual exchange rate of the Russian ruble on the import volume of product of agricultural origin*

Indicators	Results
Correlation coefficient	$R=-0.802$
Coefficient of determination	$R^2=0.643$
Regression model	$\hat{y}_t = 1444313.6 - 64200.9x_t$
Elasticity coefficient	$E=-0.846$
Significance of the regression coefficient	a_1(p-value=1.22E-05)
Model significance	34.29 (signif.=1.22E-05)

*Composed by the author based on the results of regression-correlation analysis conducted using MS Excel.

The latter has an adverse effect on the marketability level. Under the condition of the depreciation of the Ruble against the Armenian dram, the exact opposite occurs. From the above-mentioned impact of the Russian ruble exchange rate on the marketability level of the agriculture of RA the relationship between them is obvious.

Let us present the results of the assessment of the quantitative impact of the average annual exchange rate of the Russian ruble on the import volume of product of agricultural origin, which are reflected in Table 4.

Analyses show that an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the import volume of product of agricultural origin by 64200.9 thousand US dollars. This is explained by the increase in the price of imported Russian product due to the appreciation of the Ruble, giving preference to similar or local product of other countries.

The relationship between the analyzed indicators is strong and inverse (R=-0.802) (Eliseeva, et al., 2010).

According to the coefficient of determination (R^2=0.643), 64.3% of the fluctuations in the import volume of product of agricultural origin are due to fluctuations in the average annual exchange rate of the Russian ruble, and the rest are due to not being included in the model and other random factors. The model is significant (signif. F<0.05).

The elasticity coefficient: E=-0.846%. So, a 1% increase in the average annual exchange rate of the Russian ruble leads to a decrease in the import volume of product of agricultural origin by 0.846%.

The impact of the Russian ruble exchange rate on the import volume of product of agricultural origin is manifested in the corresponding decrease or increase in the volume as a result of the appreciation of that foreign currency or its depreciation against the Armenian dram. The relationship between the import volume of product of agricultural origin and the Russian ruble exchange rate is obvious from this impact.

The results of the constructed regression models are considered important for the development of substantiated approaches to mitigate the negative impact of Russian ruble exchange rate fluctuations on particular indicators characterizing the development of agriculture of the RA and to make the most of the opportunities provided by the positive ones. Making the most of the mentioned opportunities isn't possible without the development of certain types of local agricultural production, import substitution, diversification of supply and export markets. The development and import substitution of certain types of local agricultural production (in particular, poultry and pork, grain crops, their seeds, compound feeds, etc.) makes it possible to reduce import dependence and the risks of negative impacts of fluctuations in the Russian ruble exchange rate. All of this can be significantly contributed to by state-private sector cooperation, the development of local seed and feed production within the framework of support programs aimed at local agricultural production and import substitution, etc.

In the event of an appreciation of the Russian ruble exchange rate as a result of diversification of supply markets, it becomes clearly expedient to import the same product from other countries at more affordable prices, and in the event of a decrease in the exchange rate as a result of diversification of export markets, it is more profitable to export products with export potential.

Conclusion

As a result of the regression-correlation analysis of the quantitative impact of the Russian ruble exchange rate on indicators characterizing the development of agriculture of the RA, we have come to the following conclusions, as well as proposed approaches aimed at mitigating the risks associated with that exchange rate:

- The performed calculations and analyses have shown that an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the gross output value of agriculture of the Republic of Armenia by 35.208 billion drams. Such dependence is due to the increase in the prices of imported material resources necessary for agricultural production (in particular, fertilizers, pesticides, diesel fuel, etc.) as a result of the appreciation of the Russian ruble. The latter in turn has an adverse effect on the gross output value of the sector. According to calculations, 63.2% of the fluctuations in the gross output value of agriculture are due to fluctuations in the average annual exchange rate of the Russian ruble.

- According to calculations, an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the marketability level of agriculture by 0.163 percentage point. 43.0% of the fluctuations in the marketability level of agriculture are due to fluctuations in the average annual exchange rate of the Russian ruble.

- According to the results of econometric research, an increase in the average annual exchange rate of the Russian ruble by 1 dram leads to a decrease in the import volume of product of agricultural origin by

64200.9 thousand US dollars (as a result of a 1% increase in the exchange rate, the decrease in this indicator is 0.846%). 64.3% of the fluctuations in the import volume of product of agricultural origin are due to fluctuations in the average annual exchange rate of the Russian ruble.

• Research show that the risks associated with the Russian ruble exchange rate can be mitigated as much as possible by ensuring favorable conditions for the development of certain types of local production, import substitution, diversification of supply and export markets.

References

1. Babakin, K. (2022). Heterogeneity of the Ruble Exchange Rate's Impact on Output in a Regional Context. Bank of Russia // Series of reports on economic research. - N94/April, - p.8. https://www.cbr.ru/statichtml/file/134924/wp_94.pdf (viewed: 25.03.2025) (in Russian).

2. Burnusuzyan, M. A. (2014). An assessment of the influence of the exchange rate on the national economic structure: the case of the Republic of Armenia// Works of MIPT. - Volume 6, N2,- p. 142. https://cyberleninka.ru/article/n/otsenka-vliyaniya-valyutnogo-kursa-na-strukturu-natsionalnoy-ekonomiki-na-primere-respubliki-armeniya/viewer (viewed: 22.03.2025) (in Russian).

3. Eliseeva, I. I., Egorova, I. I., Kurysheva, S. V., Laptev, V. I., Nikiforov, O. N., Flud, N. A., Burova, N. V., Gordeenko, N. M., (2010). Statistics: textbook.-M.: Prospect, - p. 80 (in Russian).

4. Shilets, E. S., Pilipenko, V. V., Chentsova, Yu. O. (2018). The influence of the dynamics of the Russian ruble exchange rate on the economy of the Russian Federation // Bulletin of the Institute of Economic Research. - N2(10), - p.56. https://cyberleninka.ru/article/n/vliyanie-dinamiki-kursa-rossiyskogo-rublya-na-ekonomiku-rossiyskoy-federatsii/viewer (viewed: 19.03.2025) (in Russian).

5. Shibaeva N. V., Maksimenko Ya. A. International Economics: Textbook. – Kharkov: NTU "KhPI", 2007. – p.115. https://repository.kpi.kharkov.ua/server/api/core/bitstreams/f8e2e2bc-5f58-446a-b60b-0974e00824ec/content (viewed: 28.03.2025)

6. Vsyakikh, Yu. V., Neizhmakova, V. I. (2015). The Impact of Exchange Rates on the Russian Economy// Electronic scientific journal "Apriori. Series: Humanities". - N4. - p.5. https://cyberleninka.ru/article/n/vliyanie-valyutnyh-kursov-na-ekonomiku-rossii/viewer. (viewed: 28.03.2025) (in Russian).

7. Zhihong, N. (2022). The Impact of the Ruble Exchange Rate Dynamics on Economic Growth of Russia//Financial Markets and Banks. - N11. - p.33. https://cyberleninka.ru/article/n/vliyanie-dinamiki-obmennogo-kursa-rublya-na-ekonomicheskiy-rost-rossii/viewer (viewed: 30.03.2025).

8. www.armstat.am. Socio-economic situation of the Republic of Armenia in January-December 2004-2024.

9. www.armstat.am. Statistical yearbook of Armenia, 2008; 2010; 2015; 2020; 2023; 2024.

10. www.armstat.am. Realization (Use) of Agricultural Product by Individual (Rural) Households for 2006; 2010; 2015; 2019; 2024.