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Research Article

THE ROLE OF CENTRAL BANK INDEPENDENCE IN PRICE STABILITY

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ABSTRACT

This study aims to determine the relationship between inflation and the independence of central banks in post-Soviet, developed, and developing countries. The hypothesis of a negative statistical relationship between the inflation rate and the values of the CWN and GMT central bank independence indices and their constituent subindices for post-Soviet, developed, and developing countries for 2001–2020 was tested. Based on the results of the econometric assessment, the paper finds that high values of the central bank independence indices and their sub-indices help to keep inflation in a certain corridor: if inflation is high, central bank independence reduces it, and if inflation is low, it helps to keep inflation at a low level. The impact of central bank independence on inflation weakens as inflation decreases.

Keywords: Central Bank Independence, Inflation, CWN and GMT Indices, Post-Soviet Countries, Monetary Policy, Central Asia.

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INTRODUCTION

Central bank independence (CBI) is the central bank's ability to control monetary instruments. CBI is a set of restrictions on the influence of the government on the management of the central bank's monetary policy. CBI can be limited or strengthened by personnel, financial and political independence. The first dimension, personnel, refers to how a bank governor is appointed and dismissed. As the government's influence on the governor's term of office increases, the central bank's degree of independence decreases. The government can also influence the personnel of the central bank by controlling the membership of the central bank's board. Financial independence refers to the ability of the government to fund its spending. If the government has direct access to central bank credit, it is more likely that monetary policy will be subordinated to fiscal policy. The limitation on the government's ability to finance itself with monetary instruments reflects the higher degree of CBI. Finally, political independence reflects the powers of the central bank to formulate and implement monetary policy.

The concept of central bank independence is not strictly formulated. Various indices reflect, to some extent, the central bank's independence in developing and implementing monetary policy. The most widely used indices are GMT-index (Grilli et al., 1991) and CWN-index (Cukierman, et al., 1992), named after the authors' last names in capital letters.

CWN-index is a method for assessing the degree of independence of a central bank, developed based on a weighted average of sixteen criteria that are responsible for certain criteria for independence, grouped into four groups: personnel autonomy, development of monetary policy, priorities and objectives of the central bank, restrictions on state budget financing.

In the GMT index, the central bank's independence is considered in the context of its political and economic independence. Political independence refers primarily to the procedure for appointing the leadership of the central bank, independent of the government, as well as its autonomous functioning. In turn, economic independence is determined by the possibility of lending by the central bank to the government and the involvement of monetary authorities in supervising commercial banks.

This paper aims to analyze and assess the role of CBI in price stability. In particular, the study aims to determine the relationship between inflation and the independence of central banks in developed, post-Soviet, and developing countries. Higher levels of inflation in all country groups, especially developing economies, make the study relevant. To achieve the study's goal, the authors put forward hypothesis H0: A negative statistical relationship exists between the inflation rate and the values of the CWN and GMT central bank independence indices and their constituent sub-indices. Based on econometric assessments, the paper finds that higher levels of the CBI contribute to a reduction of prices and high values of the CBI indices and their sub-indices help to keep inflation in a certain corridor.

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LITERATURE REVIEW

Systematic literature review

There is still no precise definition of the CBI concept. Most authors understand the CBI as the economic and political independence of the bank in implementing monetary policy. The GMT and CWN indices are used to evaluate the CBI, which occupy a central place in most studies and include economic and political criteria.

Most studies on CBI analyze and evaluate the impact of the degree of independence on achieving inflation targets. Doyle and Weale (1994) show that there is fairly strong evidence that high central bank independence is associated with lower inflation. Of course, this does not mean that central banks should be free to pursue targets of their choice, but rather that they should use monetary policy to achieve a target set by parliament.

Mas (1995) notes that creating an independent central bank may not bring the claimed benefits in developing countries with underdeveloped financial markets, where the scope for a truly independent monetary policy is limited. The benefits of an independent central bank may be eroded by conflicts between fiscal and monetary policy and internal problems of the central bank's institutional structure so that the problems of dynamic inconsistency associated with monetary policy are not resolved, but simply transformed. Less developed countries wishing to move to a low-inflation path should focus on fiscal policy reforms that strengthen inflation resistance and on institutional arrangements that directly impose discipline on fiscal policy rather than indirectly through monetary policy.

Piga (2000) shows that central bank independence arises from the need for politicians to maximize rent extraction from private counterparties who engage in political transactions to obtain subsidies. The author also notes that Milton Friedman opposed an independent central bank. His argument was eminently libertarian, fighting against the concentration of power and warning against the possibility of central bank corporatism.

Moiseev (2018) provides many criteria for CBI in his review study. These criteria include the ability of the central bank to independently apply monetary policy instruments, the characteristics of the rules, the limited influence of the government on monetary policy, and the independence of purpose and instruments. The author reviews many studies showing that a high degree of CBI can keep inflation low. Moreover, additional advantages of CBI are cited, such as the ability of CBI to strengthen fiscal sustainability. It should be noted that the CBI minimizes the impact of the political cycle on inflation. Thus, the CBI is recognized as one of the key principles of monetary policy. However, strengthening the CBI was a global trend during the global financial crisis of 2007-2009. The balance between fiscal and monetary authorities has changed.

Crowe and Meade (2007) note that the measurement of central bank independence tends to focus on legal characteristics derived from the institution's charter. These legal characteristics refer to four aspects of the central bank's independence from the government. First, independence is greater when bank management is protected from political pressure by sufficient tenure and independent

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appointment. Second, the central bank enjoys more freedom when the government cannot participate in or override its decisions. Third, CBI is higher when the central bank's legal mandate clearly states the objective of monetary policy. Finally, the central bank's financial independence depends on government lending restrictions. The authors also confirm the general conclusions of most economists that CBI leads to low inflation. However, additional arguments are given that this phenomenon is not always observed in developing countries. The authors conclude that independent central banks with clear mandates, a good communication strategy, and experienced, technocratic management teams can calm the markets and reduce the economic costs of political crises or mistakes.

According to Reis (2013), even though many experts advocate CBI, consideration of more specific issues leads to ambiguous conclusions. The author argues that sticking to a stable long-term nominal anchor can reduce the cost of price uncertainty, and this policy is completely different from maintaining a certain level of inflation. Research shows that a flexible price target can reduce the dispersion of inflation and real activity. Moreover, the release of the central bank from the obligation to increase seigniorage to transfer funds to the fiscal authorities does not mean that the central bank can take on greater risks through uncontrolled lending policy.

Levenkov (2018) shows that CBI can help countries achieve lower inflation rates, mitigate the impact of political cycles on business cycles, enhance financial system stability, and increase financial discipline without any cost in terms of output volatility or reduced economic growth. The author notes a positive relationship between central bank independence and economic growth.

Trunin et al. (2010) note that the central banks of countries with emerging markets are still deprived of the legal, economic, and political independence characteristic of developed countries' central banks. In turn, the position of central banks in the CIS countries varies from absolute dependence on the executive branch to relative autonomy in decision-making. According to the results of their study, the banks of Eastern Europe and the Baltic countries turned out to be the most independent. The least independent are the central banks of Belarus, Ukraine, and Uzbekistan. At the same time, it can be assumed that the results obtained reflect only the formal independence of the Central Bank. In particular, if the high level of independence of the Central Banks of the Baltic States is not in doubt, then the comparable level of independence of the Central Banks of Kyrgyzstan and Tajikistan does not look very convincing. As for the place of Russia and Kazakhstan, the Bank of Russia and the National Bank of Kazakhstan are characterized by an average level of independence among the countries considered. The authors explain that the trend of decreasing independence of the Central Bank of the Russian Federation creates obstacles to reducing inflation in Russia. Considering that the Russian economy is currently struggling to get out of the crisis, the country's authorities can use the low level of CBI to solve current problems. Even though such solutions can stabilize the situation in the economy in the short term, their effectiveness in terms of long-term economic development may turn out to be insignificant.

Based on a survey study, Berger et al. (2001) showed that the negative relationship between CBI and inflation is strong. Klomp and De Haan (2010) performed a meta-regression analysis using 59 studies examining the relationship between

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inflation and CBI. The authors show that the studies reviewed differ greatly in terms of the CBI indicator used, the sample of countries, the period covered, and the model specification. The authors concluded that the relationship between CBI and inflation is strong. Thus, the generally accepted argument of most researchers is that the CBI can keep inflation low.

Based on their assessments, Baumann et al. (2021) questioned the generally accepted fact that the CBI keeps inflation low. The authors concluded that, in general, there is only a weak, if any, causal relationship between independence and inflation. These results are obtained based on a statistical approach, which has not yet been used to analyze macroeconomic processes. The authors propose their own method for assessing the impact of the CBI on inflation. In particular, the researchers propose a method of long-term target maximum likelihood estimation (Longitudinal targeted maximum likelihood estimation). The evaluation procedure includes machine learning algorithms and is designed to solve problems associated with complex macroeconomic panel data. To describe and eliminate relevant confounding structures, the possible reasons that motivate a country's decision to accept a certain degree of central bank independence are taken into account; they range from the country's political institutions, political instability, history of inflation, and international pressure. Moreover, the authors use 17 measured variables, including money supply, energy prices, economic openness, institutional variables such as central bank transparency and monetary policy strategies, and political variables. The study was conducted for 60 countries at various stages of development between 1998 and 2010. The authors come to the important conclusion that the CBI does not have a clear effect on inflation; moreover, one cannot exclude even the impact that promotes the growth of inflation.

According to Haldane (2020), central bank independence has contributed to two important outcomes, such as low and stable inflation at no cost in an environment of output volatility and safe and sound banks. At the same time, central banks and central bank independence face new challenges. Not least, this is due to the rapid growth of central bank balance sheets over the past decade. This has contributed to a loss of understanding and perhaps some confidence in the role of monetary policy and the extent to which it is separated from government action.

Bibliometric analysis of literature

For the bibliometric analysis of the literature, a selection of scientific articles from the Scopus database was used, found in the search results for the keyword "central bank independence". Until March 2022, 762 publications were found in the database for this keyword.

Articles are analyzed against annual scientific production, important sources, relevant institutions, a network of coincidences, and thematic mapping and evolution to understand trends in the central bank independence body of knowledge. Bibliometric analysis was carried out using the R-package Biblioshiny tool.

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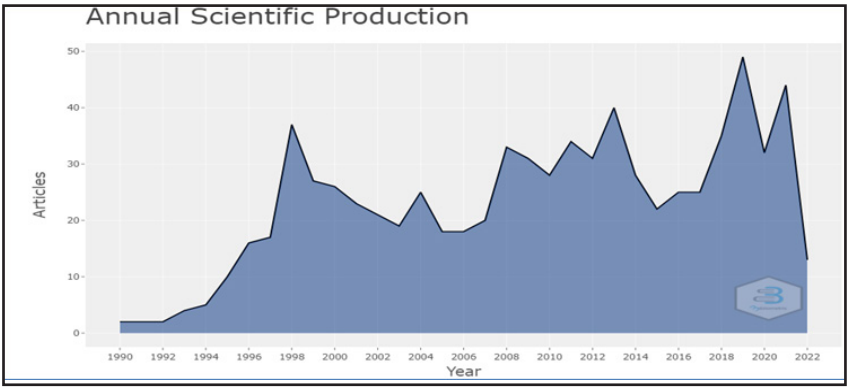
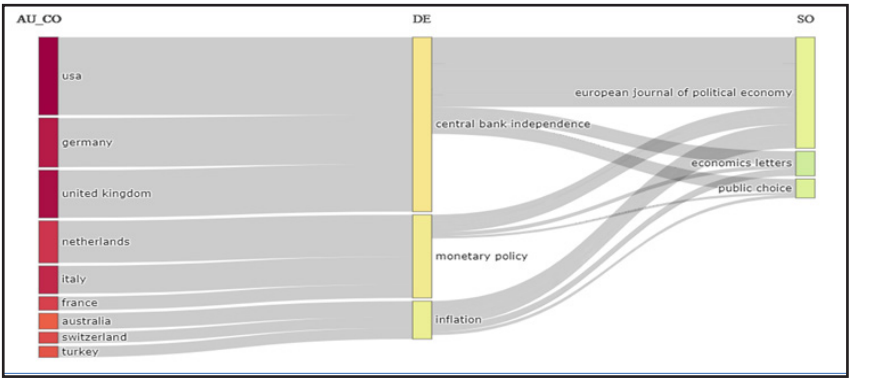
Figure 1. *Annual Scientific Production*



Source: The authors' compilation

Figure 1 shows the annual production of academic research on central bank independence. As can be seen in the Figure, research on this topic began to be published in 1990, when 2 articles were published. Since 1993, there has been a noticeable increase in articles until 1998, when the number of studies reached 37. The highest publication activity is observed in 2019 – 49 articles were published during the year. In 2020, this indicator decreased, it can be assumed that the reason for the decrease in the number of studies on the independence of central banks was the pandemic. The scientific interests of many researchers have shifted towards research into the causes and consequences of the pandemic. In 2021-2022, an increase in publications is again noticeable, for 3 months of this year 13 works have already been published.

Figure 2. *Three Fields Graph (Country – Keywords – Source)*



Source: The authors' compilation

On the three-field graph, one can see the relationship of the attributes of publications. For example, Figure 2 shows which countries and journals are most involved in the study of central bank independence. Most of the articles came from the US, Germany and the UK. The relationship between central bank independence and inflation is most studied in France, Australia, Switzerland and Turkey. From this, we can conclude that mainly developed countries are involved in the study of the subject. Figure 2 also shows the top 3 journals that have published the most articles on central bank independence.

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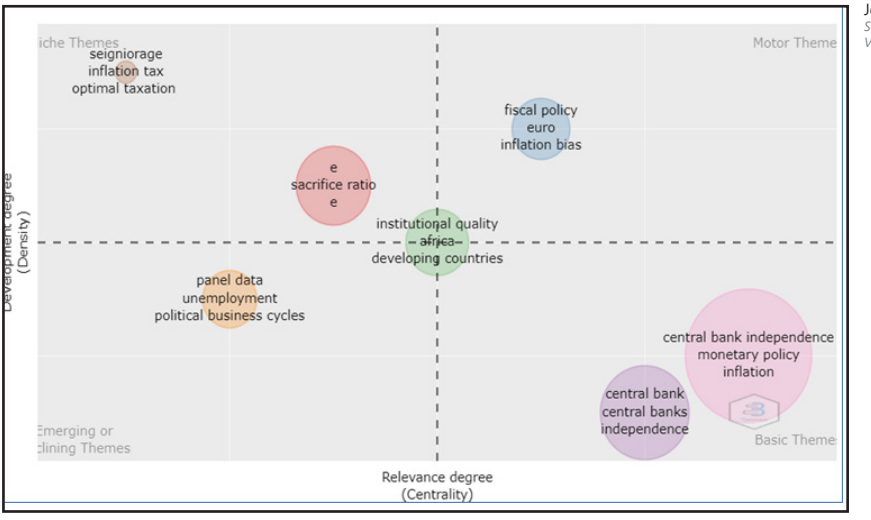
Figure 3. *Thematic Map*



Source: The authors' compilation

Figure 3 shows the state of the art in research on central bank independence. The author's keywords were used to obtain a thematic map, and a minimum clustering frequency of 5 points was set.

Among the central clusters, the largest is "central bank independence", which includes such frequently occurring keywords as "monetary policy" and "inflation". The cluster "quality of institutions" along with the keywords "Africa", and "developing countries" is about to become a central theme. That is, in developing countries, more and more attention is paid to the study of this topic.

As for the movement topics, the only cluster "fiscal policy" belongs to this category. Peripheral topics are "taxation" and "electronic crime".

A network of matches was also formed based on the author's keywords with the Louvain clustering algorithm.

There are three main clusters in the coincidence network. The base, central, and also the largest cluster is the "Central Banks Independence". "Inflation" is the second largest node, following the CBI node. "Inflation" is located inside the CBI node, which means that these two concepts are closely related to each other. Therefore, it is quite possible that most of the ongoing research explores these two concepts in conjunction. The same applies to "Monetary Policy", which is also within the borders of the CBI node. Other nodes in the same cluster, close to the central theme of the CBI, are "price stability", "inflation targets", "financial stability", "federal reserve", "panel data", and "European Central Bank". It can be assumed that all these topics are current research areas in connection with the CBI.

In addition to the current state of research, the thematic map shows changes in the temporal development of the topic. For thematic evolution, a complete sample of 762 articles was used. This dataset was split into quadruple slices. Time slices were selected according to the degree of publication activity. The

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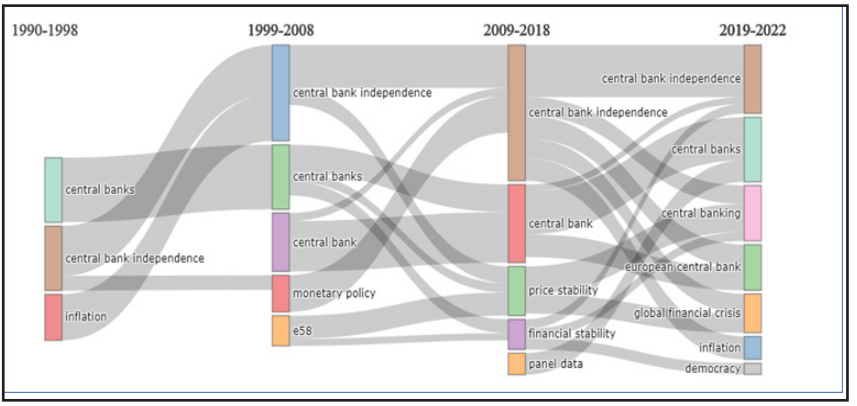
Figure 4. Thematic Evolution for 1990-2022



Source: The authors' compilation

first time slice (1990–1998) shows increasing publication activity (Figure 1), while the second (1999–2008) and third (2009–2018) time slices indicate the volatility of publication activity. As for the fourth time interval (2019–2022), it is characterized by the largest increase in publication activity.

Thematic evolution shows the expansion of research areas. The independence of central banks was initially studied in terms of price and financial stability. In the last 3 years, the relationship of central bank independence with topics such as the global financial crisis, inflation and democracy has been actively explored.

METHODOLOGY

To test the H_0 hypothesis, data on CBI were collected for three groups of countries according to the UN version for 2021 (UN, 2021):

– 10 post-Soviet countries, excluding Latvia, Lithuania, Estonia, Uzbekistan, and Turkmenistan: Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, and Ukraine. Latvia, Lithuania, and Estonia were excluded from the calculations because these countries have been part of the European Union since 2004 and belong to the category of developed countries. Uzbekistan and Turkmenistan were excluded from the calculations because there is no inflation data for these countries on the consumer price index;

– 18 developed countries, for which at least three editions of the Laws (acts) on the Central Bank are available: Canada, Australia, Belgium, Croatia, Cyprus, Estonia, Finland, Hungary, Latvia, Lithuania, the Netherlands, Portugal, Romania, Slovakia, Iceland, Norway, Switzerland, UK;

– 32 developing countries for which Central Bank Laws (acts) and inflation data are available: Zimbabwe, Cape Verde, Ghana, Nigeria, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Mongolia, Philippines, Vietnam, Bangladesh, Bhutan, Bahrain, Iraq, Israel, Oman, Qatar, Yemen, Dominican Republic, Guatemala, Nicaragua, Panama, Ecuador, Tanzania, Lesotho, Mauritius, Botswana, South Africa, Sudan, Egypt, Libya.

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The study's limitation is that there are no laws (acts) on the Central Bank in the public domain for many countries. For post-Soviet and developed countries, it was possible to find several versions of the Laws to trace the dynamics of change, and for developing countries, it was difficult to find even one version of the laws.

Data for assessing the independence of the central banks of these countries according to CWN and GMT indices were obtained from the Laws (acts) of the Central Bank of each country.

For each country, inflation data for 2001-2020 was collected from the official website of the World Bank (World Bank, 2022).

Variable designations have been introduced for all central banks:

inf01, inf02, ..., inf20 – inflation rate in the year 2001, 2002, ..., 2020, respectively,

cwn – CWN index,

cwn1 – personnel autonomy,

cwn11 – term of office of the central bank's management,

cwn12 – the institution that appoints the governor of the central bank,

cwn13 – early removal of the governor of the central bank from office,

cwn14 – the ability of the governor of the central bank to perform other functions in the government,

cwn2 – development of monetary policy,

cwn21 – the institution engaged in the development of monetary policy,

cwn22 – the institution that has the last word in conflict resolution,

cwn23 – central bank involvement in developing fiscal policy,

cwn3 – priorities and main objectives of monetary policy,

cwn4 – restrictions on financing the state budget deficit,

cwn41 – restrictions on the issuance of direct loans to the government,

cwn42 – purchase of government securities,

cwn43 – credit terms,

cwn44 – potential borrowers from the bank,

cwn45 – limits on lending by the central bank,

cwn46 – maturity of loans,

cwn47 – interest rates on loans,

cwn48 – transactions with government securities in the primary market,

gmt – GMT index,

gmt1 – GMT-sub-index of political independence,

gmt11 – the governor of the central bank is appointed without government intervention,

gmt12 – the governor of the central bank is appointed for a term of more than 5 years,

gmt13 – the board of the central bank is appointed without the participation of the government,

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gmt14 – members of the board of the central bank are appointed for a term of more than 5 years,

gmt15 – no mandatory presence of government representatives on the board of the bank

gmt16 – no need to approve the main directions of monetary policy by the government,

gmt17 – fixing price stability in the legislation as the main goal of the central bank,

gmt18 – availability of legal support from the central bank in case of conflict with the government,

gmt2 – GMT-sub-index of economic independence,

gmt21 – there is no automatic procedure for issuing loans to the government,

gmt22 – the central bank does not participate in the initial placement of government securities,

gmt23 – the central bank independently sets interest rates for its operations,

gmt24 – supervision of banks is not included in the functions of the central bank.

CWN index: calculated based on sub-indices using the formula:

$$cwn = 0.2cwn1 + 0.15cwn2 + 0.15cwn3 + cwn4$$

The sub-indices included in this formula are calculated according to the sub-indices of the next level using the formulas:

cwn1 = 0.25cwn11+0.25cwn12+0.25cwn13 +0.25cwn14,

cwn2 = 0.25cwn21+0. 5cwn22+0.25cwn23,

cwn4 = 0.15cwn41+0.1cwn42+0.1cwn43 +0.05cwn44+0.025cwn45+0.025 cwn46+ +0.025cwn47+0.025cwn48.

The sub-indices included in them are calculated based on their sub-indices, for example,

cwn11 = cwn111+0.75cwn112+0.5cwn113 +0.25cwn114,

where, if the term of office of the central bank governance is from eight years, *cwn111 = 1,* if from six to eight years, then *cwn112 = 1*, if five years, *cwn113 = 1,* if four years, *cwn114 = 1,* and 0 otherwise. All other sub-indices are calculated similarly.

A count index a GMT is easier than calculating the CWN index. It is equal to the sum of sub-indices of political and economic independence of the central bank:

$$gmt = gmt1 + gmt2$$

and each of them is equal to the simple sum of the values of their sub-indices.

Many publications take it for granted that higher central bank independence helps to reduce inflation (Berger et al., 2001; Klomp and De Haan, 2010; Levenkov, 2018). To test this statement, you can use the methods of correlation analysis and multiple regression. The linear regression model has the form:

where – a column of inflation rates for a sample of countries, – a matrix of values of explanatory variables, such as the values of CWN, GMT, or their sub-indices and constants, – a column of coefficients for model variables, is a column of random regression terms.

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It was planned to build multiple linear regressions of the inflation rate for all years from 2001 to 2020 and for all indices and sub-indices. Data of CWN and GMT for 20 years were collected directly from central banking laws. They are weakly changeable since changes are rarely made to these laws. Therefore, the study included only countries for which at least three versions of the law on the central bank were found for the period 2001–2020.

The weak variability of CWN and GMT over the years explains the failure of attempts to build multiple regression models. Therefore, further, we limited ourselves to the study of pairwise relationships between the inflation rate and all indicators of the independence of central banks based on their correlation coefficients. Correlation, in this case, shows the statistical relationship between inflation and the indicator of the independence of the Central Bank. By using correlations to analyze, we keep in mind that there are other inflation factors.

Since the data are correlated over the years and change little, averaged data were used for 4 five-year intervals for 2 ten-year and 20-year intervals. They provide the same information about the relationship between the inflation rate and the central bank independence index or sub-index as paired linear regressions.

For example, the study used a pairwise linear regression model when there is only one explanatory variable, such as CWN or GMT. A statistically significant, negative value of the coefficient for this explanatory variable will confirm the hypothesis H_0, i.e., will correspond to the fact that there is a negative statistically significant linear relationship between the increase in the central bank independence index or its sub-index and the inflation rate. Paired linear regression corresponds to pairwise correlation coefficients between dependent and explanatory variables. In this case, it is necessary to consider only those of them that are statistically significant, at least at the 5% level.

The influence of the independence of central banks on inflation can be assessed not only by their ability to influence the inflation rate but also by their ability to keep the inflation rate within a given corridor. The binary choice model, in this case, estimates the probability of inflation going beyond this corridor. The probit model is estimated based on the standard normal distribution. The probability distribution functions determine the probability that the dependent variable will take the value 1. Unlike linear regression models, a binary choice model requires more observations to obtain statistically significant relationships. Therefore, the probit model was evaluated using combined data for post-Soviet, developed, and developing countries. In total, a sample of 60 countries is obtained.

RESULTS AND DISCUSSION

Post-Soviet countries

Since the data on CWN and GMT are slightly variable over the years and there are no changes in these indicators between some neighboring years, we consider their average values for each country over five-year intervals 2001–2005, 2006–2010, 2011–2015, 2016–2020. Accordingly, the inflation values are also averaged. Four time periods remain, between which there are changes in CWN and GMT.

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The fact that in Table 1 for inf01-05 all correlations (except for *cwn*) are about -0.70, and they are all marked with (*), means that there is a negative statistical relationship between the indicators and the annual average inflation rate inf01-05, and a significant at least at the 5% level. There may be positive correlations, but they were not statistically significant even at the 10% level and therefore are not shown in Table 1.

Figures 5–6 show graphs of the values of the CWN and GMT indices and inflation rates averaged across countries. Although these are averages, it can be seen that the rise in CWN and GMT corresponds to a decrease in the inflation rate.

If we look at the next interval 2006–2010 in Table 1, then in the corresponding column all cells are empty, i.e. all coefficients are insignificant even at the 10% level. The global financial crisis of 2008-2009 falls within this interval. It caused jumps in the inflation rate in many countries, and the statistical relationship between CWN and GMT and the inflation rate in this interval was broken.

The influence of central bank independence manifests itself at long time intervals. In Figures 5–6, for the post-Soviet countries, as can be seen, an increase in the CBI corresponds to a declining inflation trend. Deviations from the trend are explained by the influence of other factors of inflation. Their influence on inflation may distort and override the influence of central bank independence. This explains the presence of empty cells in Table 1, as well as positive values in some cells. In these cases, we explain this by the fact that the influence of other factors on inflation turned out to be stronger than the downward influence of the CBI.

Table 1. *Pair correlation coefficients for indicators of central banks of post-Soviet countries on 5-year, 10-year and 20-year intervals*

	inf01-05	inf06-10	inf11-15	inf16-20	inf01-10	inf11-20	inf01-20
cwn							
cwn42	-0.70*		-0.73*		-0.64	-0.83*	-0.72*
cwn48	-0.70*		-0.69*		-0.64	-0.77*	-0.72*
gmt	-0.68*				-0.68*		-0.61
gmt15	-0.67*				-0.65	-0.55	-0.59
gmt2	-0.68*				-0.61		-0.65
gmt21	-0.70*				-0.64		-0.72*
gmt22	-0.70*		-0.69*		-0.64	-0.77*	-0.72*

Source: The authors' calculations

All values given in Table 1 are negative, i.e. in some years, the gmt index and some sub-indices are negatively correlated with the inflation rate:

cwn42 – purchase of government securities,

cwn48 – transactions with government securities in the primary market,

gmt – GMT index,

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gmt15 – no mandatory presence of government representatives on the board of the bank

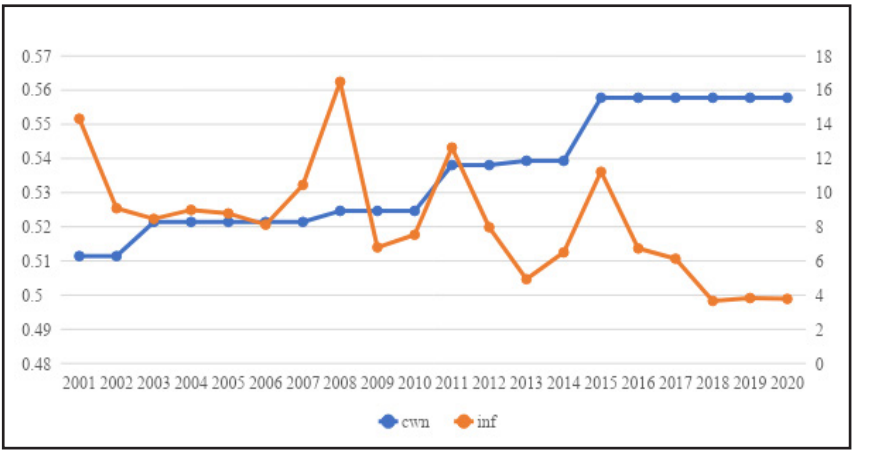
gmt2 – GMT-sub-index of economic independence,

gmt21 – there is no automatic procedure for issuing loans to the government,

gmt22 – the central bank does not participate in the initial placement of government securities.

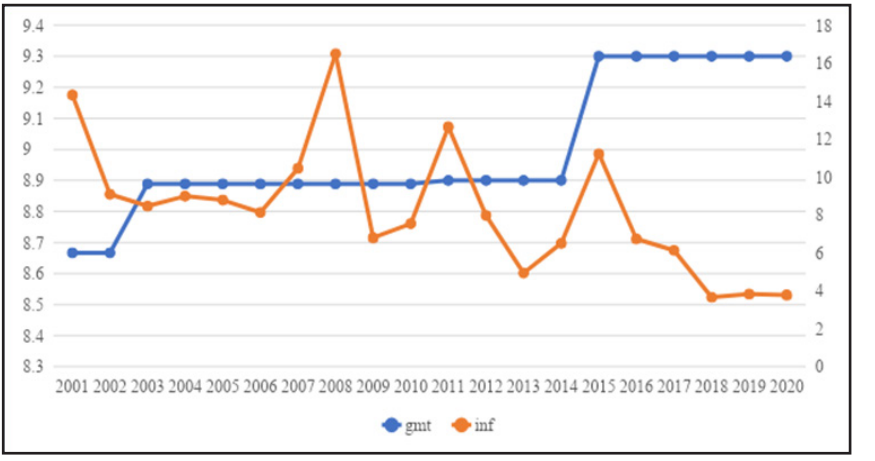
The increase in these indicators in some time intervals was accompanied by a decrease in inflation. However, there is no statistically significant negative relationship between the inflation rate and the CWN and GMT indices or their sub-indices for all intervals.

Figure 5. *CWN index (left axe) and inflation rate (right axe) in post-Soviet countries*



Source: The authors' compilation and the World Bank (2022)

Figure 6. *GMT index (left axe) and inflation rate (right axe) in post-Soviet countries*



Source: The authors' compilation and the World Bank (2022)

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Table 2. *Pair correlation coefficients for indicators of central banks of developed countries on 5-year, 10-year and 20-year intervals*

	inf01-05	inf06-10	inf11-15	inf16-20	inf01-10	inf11-20	inf01-20
cwn	0.58*				0.46		0.40
cwn2			0.60*	0.47*		0.56*	
cwn22			0.58*	0.49*		0.58*	
cwn4	0.44						
cwn47	0.62*						
gmt	0.42						
gmt1	0.44						
gmt13	0.42				0.43		0.42
gmt24			0.41				

Source: The authors' calculations

Index coefficients *gmt*, subindices *gmt15* and *gmt2*, which are significant at the 5% level in the first 5-year interval from 2001 to 2005, turn out to be insignificant at the subsequent second, third, and fourth 5-year intervals. They are also not significant at the 5% level over the last 10-year interval from 2011 to 2020 and at the full interval from 2001 to 2020. We believe that this is due to relatively high inflation in the first 5-year interval compared to subsequent intervals.

Developed countries

Also, as for the post-Soviet countries, correlation coefficients were calculated for 5-year intervals 2001-2005, 2006-2010, 2011-2015 and 2016-2020, for 10-year intervals 2001-2010 and 2011-2020, and finally, for the full interval 2001-2020 according to the averaged data for each interval. The results are shown in Table 2.

In Table 2, all correlation coefficients for developed countries are positive, while in Table 1, for post-Soviet countries, all coefficients are negative. In other words, the increase in the independence of central banks, which is associated with an increase in the CWN or GMT indices and their sub-indices, for developed countries, unlike the post-Soviet countries, did not have a downward effect on inflation over time intervals of 5, 10 and 20 years. This seems counterintuitive.

Figures 7 and 8 show that in the first five years, inf and cwn and inf and gmt move in the same direction in most cases. This corresponds to the positive signs of the correlation coefficients in the inf01-05 column of Table 2. In the remaining columns, inf06-10, inf11-15, and inf16-20, the cells corresponding to cwn and gmt are empty, i.e., their correlation coefficients are insignificant at the 10% level.

Here we put forward the following hypotheses: 1) CBI has a downward effect on the inflation rate, and the direction of movement of the CBI index is not significant; 2) the downward effect of CBI on inflation weakens when inflation is low, and it is more affected by other factors.

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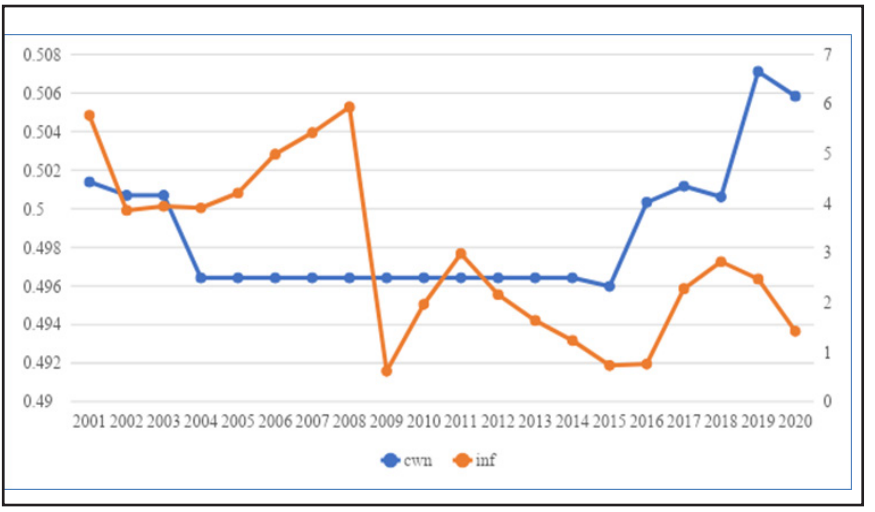
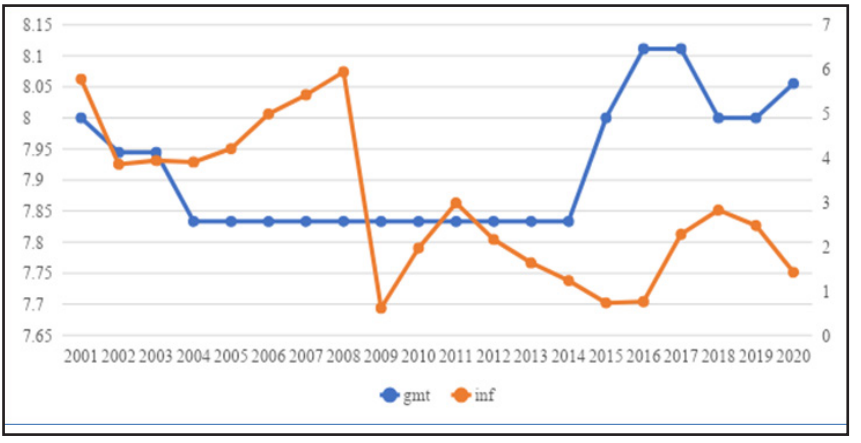
For developed countries, at the beginning of the first five-year interval, the inflation rate was at the level of 6% (Figures 7 and 8). Sufficiently high values of cwn and gmt contributed to its decrease. Then the impact of other factors, including the 2007-2009 Global Financial Crisis, led to spikes in the inflation rate. Since 2009, the average inflation rate has been in the range of 1 to 3 percent. There was no further decrease in the inflation rate below this corridor. The impact of COVID-19 can explain some decrease in the inflation rate in 2019 and 2020.

Figure 7. *CWN index (left axe) and inflation rate (right axe) in developed countries*



Source: The authors' compilation and the World Bank (2022)

Figure 8. *GMT index (left axe) and inflation rate (right axe) in developed countries*



Source: The authors' compilation and the World Bank (2022)

Hence, it can be argued that the effect of central bank independence on inflation weakens as inflation falls.

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For developed countries, the average inflation rate in 2009–2020 was low at 1–3 percent, although cwn and gmt increased markedly, and the variations were not small, around 2 percentage points (Figures 7 and 8).

Thus, the CBI contributes to the formation of a downward trend for inflation, which may deviate from it under the influence of other factors, such as the global financial crisis, pandemic, and shocks to the global oil price.

Developing countries

The initial sample contains 87 developing countries for which the latest revisions of central bank laws are found. However, it turned out to be problematic to find previous editions of these laws on the Central Bank during the entire time interval 2001-2020. Therefore, for further analysis, from the general sample of developing countries, data were used for 32 countries for which the latest version of the law on the Central Bank was no later than 2010. For these securities, the values of the CWN, GMT and their sub-indices are unchanged throughout the entire interval from 2011 to 2020. Table 3 shows the pair correlation coefficients for developing countries based on averaged data at 5-year intervals for 2011-2015, 2016-2020, and at a 10-year interval for 2011-2020. Only those coefficients are shown, the significance of which is not lower than 10%, and coefficients significant at the 5% level are marked (*).

As can be seen in Table 3, for developing countries, the correlation coefficients of the cwn or gmt indices with inflation rates are not significant at the 5% level and even at the 10% level at all time intervals. Only some sub-indices have non-zero values. This means that the correlation coefficients are insignificant for the rest of the sub-indices, even at the 10% level. These sub-indices did not significantly correlate with the inflation rate at any time. This means that for developing countries, according to Table 3, we can also conclude that there is no statistically significant general relationship between the CWN or GMT indices and their sub-indices and the inflation rate in all years from 2011 to 2020.

Table 3. *Pair correlation coefficients for indicators of central banks of developing countries on 5-year and 10-year intervals*

	infl11-15	infl16-20	infl11-20
cwn			
cwn21	-0.33	-0.54*	-0.57*
gmt			
gmt11	0.38*		
gmt13	0.43*		
gmt16		-0.44*	-0.45*

Source: The authors' compilation and the World Bank (2022)

However, subindex cwn21 "the institution engaged in the development of monetary policy" had a significant negative relationship with the inflation rate at all considered time intervals. Subindex gmt16 "No need to approve the main directions of monetary policy by the government" also had a negative significance at 5% level of relationship with the inflation rate in the last 5-year interval and over the entire 10-year interval. At the same time, sub-indices gmt11 "the governor of the central bank is appointed without government intervention," and gmt13 "the board of the central bank is appointed without the

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participation of the government" in the first 5-year interval from 2011 to 2015 showed a significant 5% level but has a positive relationship with the inflation rate.

Binary Choice Models. Probit-model

We define the variable inftr5_m1 as equal to 1 if the inflation rate inf1120 is greater than 5 percent or less than minus 1 percent, and equal to zero in other cases. The Probit model makes it possible to estimate the probability that central banks will keep the inflation rate within the range from minus 1 percent to 5 percent. Table 4 shows the results of evaluating the Probit model with the explanatory variable cwn. The p-values show that both the coefficient of this variable and the constant are insignificant even at the 10% level. The same result can be obtained for a linear regression model.

Table 4. *Probit-model. Dependent variable inftr5_m1*

Variable	Coefficient	P-value
const	0.69	0.35
cwn	-2.23	0.14

Source: The authors' compilation

The Probit model, estimates for which are given in Table 5, differs from the previous model only in that the variable cwn2 is chosen as the explanatory variable. For this model, the coefficient at the variable cwn2 is negative and significant at the 5% level. This means that an increase in cwn2 reduces the probability that the inflation rate will surpass the interval [-1, 5].

Table 5. *Probit-model. Dependent variable inftr5_m1*

Variable	Coefficient	P-value
const	0.54	0.171
cwn2	-1.97**	0.012

Source: The authors' compilation

The result of trying to narrow the range from minus 1 percent to 3 percent is shown in Table 6. The dependent variable inftr3_m1 takes on a value of 0 within this interval and a value of 1 outside of it. As can be seen, both the constant and the coefficient at the explanatory variable cwn2 turn out to be statistically insignificant. It turns out that the newly chosen interval for the inflation rate is too narrow to keep inflation within its limits with an acceptable probability.

Table 6. *Probit-model. Dependent variable inftr3_m1*

Variable	Coefficient	P-value
const	0.79	0.200
cwn2	-1.43	0.215

Source: The authors' compilation

Table 7 presents the results of the evaluation of the Probit model for the dependent variable inftr5_m1 and the explanatory variable gmt21, for which the coefficient turned out to be negative and significant at the 1% level.

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Table 7. *Probit-model. Dependent variable inftr5_m1*

Variable	Coefficient	P-value
const	0.55	0.130
gmt21	-1.20***	0.004

Source: The authors' compilation

Discussion

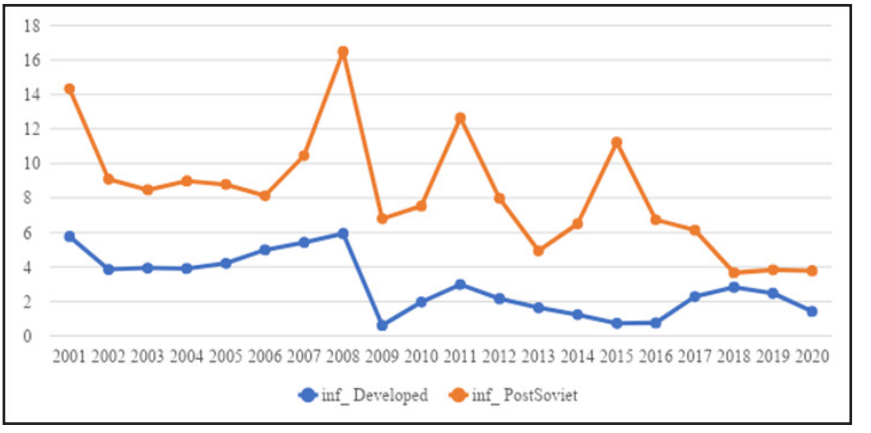
Let's pay attention to the signs of the correlation coefficients in Tables 1-3. For the post-Soviet countries in Table 1, all correlation coefficients over time intervals are negative, including coefficients that are significant at least at the 10% level.

A completely different picture is for developed countries. In Table 2, all correlation coefficients calculated from averaged data over time intervals are positive. It turns out that the increase in the corresponding sub-indices created conditions for increasing of inflation.

For developing countries in Table 3, the situation is intermediate between post-Soviet and developed countries. It has both positive and negative coefficients.

Figure 9 shows the average inflation rate in post-Soviet and developed countries for 2001-2020. On average, inflation in developed and post-Soviet countries was declining, and its rate in post-Soviet countries was several times higher than in developed countries.

Figure 9. *Average inflation rate in post-Soviet and developed countries*



Source: The authors' compilation and the World Bank (2022)

The above differences in the signs of the coefficients in Table 1 for the post-Soviet countries and in Table 2 for developed countries can be explained by the difference in average inflation rates in these countries and suggest that the relationship between central bank independence and inflation weakens as it decreases.

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CONCLUSION

For 10 post-Soviet countries, 18 developed countries, and 32 developing countries, we tested the hypothesis of a negative relationship between the independence of central banks and inflation based on average data over 5-year, 10-year, and 20-year time intervals. Although several authors favor this hypothesis, other researchers question it. The CWN and GMT indices are most widely recognized as criteria for the independence of central banks.

Econometric analysis has shown the absence of a general negative relationship between these indices and their sub-indices and inflation in certain years in developed, post-Soviet, and developing countries. Moreover, in some cases, on the contrary, their positive relationships were revealed.

The constructed tables of their pair correlation give a complete picture of the relationship between these indices, their sub-indices, and inflation rates. Although they showed the presence of a negative correlation in some cases, in general, it should be recognized that there is no statistically significant negative impact of the independence of central banks, measured by the CWN and GMT indices and their sub-indices, on inflation in developed, post-Soviet and developing countries, which is true throughout the entire time interval.

Based on the result of the binary choice model, we can conclude that high values of the CBI indices and their sub-indices help to keep inflation in a certain corridor.

For post-Soviet countries, all significant coefficients in Table 1 with indices or sub-indices CWN and GMT are negative, i.e. their increase helps to reduce the inflation rate. And for developed countries, such coefficients in Table 2 are all positive. This can only be explained by the fact that in the post-Soviet countries, the inflation rates in the considered time interval were significantly higher than in developed countries.

This fully confirms the main conclusion of the study based on quantitative assessments: the impact of central bank independence on inflation weakens as inflation decreases. Moreover, the results of this study allow us to conclude that the influence of central bank independence is manifested in the long run, and if inflation is high, CBI reduces it, and if inflation is low, CBI helps to keep inflation at a low level.

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REFERENCES

Baumann, Philipp, Rossi, Enzo, and Schomaker, Michael **(**2021). *Central bank independence and inflation: Weak causality at best.* Retrieved from: https://voxeu.org/article/central-bank-independence-and-inflation. Accessed: 05.03.2023.

Berger, Helge, De Haan, Jakob, and Eijffinger, Sylvester (2001). Central Bank Independence: An Update of Theory and Evidence. *Journal of Economic Surveys,* 15(1): 3-40.

Crowe, Christopher, and Meade, Ellen E. (2007). The Evolution of Central Bank Governance around the World. *Journal of Economic Perspectives,* 21(4): 69–90.

Cukierman, Alex, Webb, Steven B., and Neyapti, Bilin (1992). Measuring the independence of central banks and its effect on policy outcomes. *The World Bank Economic Review,* 6(3): 353-398.

Doyle, Christopher and Weale, Martin (1994). Do we really want an Independent Central Bank? *Oxford Review of Economic Policy,* 10(3): 61-77.

Grilli, Vittorio, Masciandaro, Donato, and Tabellini, Guido (1991). Political and Monetary Institutions and Public Financial Policies in the Industrial Countries. *Economic Policy,* 13: 341–392.

Haldane, Andy (2020). *What Has Central Bank Independence Ever Done for Us?* Retrieved from https://www.bankofengland.co.uk/-/media/boe/files/speech/2020/what-has-central-bank-independence-ever-done-for-us-speech-by-andy-haldane.pdf. Accessed: 02.04.2023.

Klomp, Jeroen, and De Haan, Jakob (2010). Inflation and Central Bank Independence: a Meta-Regression Analysis. *Journal of Economic Surveys,* 24(4): 593-621.

Levenkov, Artem (2018). The Concept of Central Bank Independence: Theory and Practice. *Bank Gazette,* 18–25.

Mas, Ignacio (1995). Central Bank Independence: A Critical View from a Developing Country Perspective. *World Development,* 23(10): 1639-1652.

Moiseev, Sergey R. (2018). Central Bank Independence: Concept, Valuation Methods and the Impact of the Global Financial Crisis. *Journal of the New Economic Association,* 4(40): 110–136.

Piga, Gustavo (2000). Dependent and Accountable: Evidence from the Modern Theory of Central Banking. *Journal of Economic Surveys,* 14(5): 563-595.

Reis, Ricardo (2013). Central Bank Design. *Journal of Economic Perspectives,* 27(4): 17–44.

Trunin, Pavel V., Knyazev, Dmitriy A., and Satdarov, Alexandr M. (2010). Independence of the Central Banks of the CIS and Eastern Europe. Institute for the Economy in Transition. Scientific works No. 133R, 1-76.

UN (2021). World Economic Situation Prospects. Statistical Annex, pp. 125-126.

World Bank (2022). World Development Indicators. Retrieved from https://databank.worldbank.org/ source/world-development-indicators. Accessed: 10.12.2022.