“The impact of inflation targeting on macroeconomic indicators in Ukraine”

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THE IMPACT OF INFLATION TARGETING ON MACROECONOMIC INDICATORS IN UKRAINE

Abstract

The correlation between macroeconomic dynamics and the inflation rate is the subject of many economic studies. The principles of monetary policy are developed in classical economics studies, which are based on the theories of Keynes, Phillips, Campbell, etc. However, classic approaches require practical validation, especially with regard to modern economic trends in times of crisis and emerging economies. Therefore, the purpose of the paper is to investigate and summarize the impact of inflation targeting and other key monetary policy instruments on fundamental economic indicators in Ukraine during periods of stability and crises. An empirical analysis is based on official statistics from Ukraine for 2011–2019. This study uses econometric methods (multivariate regression and simultaneous equation model), which are applied for the general and transmission impact of inflation on the estimation of economic growth. The results prove that inflation does not affect (less than 0.46 linear correlation) fundamental economic indicators during periods of real GDP growth and a quarterly CPI level of less than 2%. On the other hand, there are significant simultaneous regressions (more than 0.8 coefficients of determination) between unemployed, spending on real final consumption, hryvnia exchange rate and monetary policy instruments (discount rate, international reserves, amount of government bonds, M3 monetary aggregate) for periods when the quarterly CPI (consumer price index) is more than 2%. Therefore, the traditional monetary policy implications are discussed for emerging economies.

Keywords inflation, monetary policy, growth, emerging economy, regression, simultaneous equation

JEL Classification E31, E52, E58

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INTRODUCTION

The global financial crisis of 2008–2009 had a great impact on the advanced and, especially, emerging economies. The rules of monetary regulation have undergone significant changes in the post-crisis period. For example, banking regulation requirements were significantly revised, and Basel III was approved. The fundamental principles of economics under the current conditions also require revision and confirmation of practical significance. This has become very important for emerging economies with monetary policy rules. Ukraine, as an emerging economy, sharply experienced a post-crisis economic recession, since it turned out to be much deeper than in other countries of the world. The main problem was the coordination of instruments for regulating financial stability by the Central Bank and the positive impact of the Government on macroeconomic dynamics. Therefore, the results of the global 2008–2009 financial crisis showed that the traditional monetary policy instruments had to be improved.

However, there is the problem of choosing the optimal monetary policy for most central banks in many countries of the world. First, maintaining a stable exchange rate through the use of the foreign exchange market interventions and key policies affects money supply and bal-

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ances the price level, which indicates the need to avoid contradictions between the exchange rate stability and the stability of the national economy. Second, monetary instruments affect inflation, unemployment, GDP growth, etc. (Mishkin, 2008). Therefore, it becomes necessary to determine this influence on the financial and economic dynamics.

Sarel (1996), who analyzed data from 87 countries in 1996, proved that inflation alone over 8% had a negative impact on economic growth. On the other hand, the relationship between these indicators is not statistically significant, especially in emerging economies. Sweidan (2004) showed the other impact of inflation on GDP growth in Jordan's economy. He concluded that the correlation between these indicators tends to be positive, but only when the inflation rate does not exceed 2%. Otherwise, the impact of inflation on economic growth becomes negative (Sweidan, 2004). However, other researchers do not so explicitly support these opinions. For example, Chugunov, Pasichnyi, and Nepytaliuk (2019) propose to divide the market economy with different effects of inflation targeting in advanced and emerging economies during periods of stability and crises. The authors proved that the adoption of fully-fledged inflation targeting improved macroeconomic performance and had a positive impact on per capita GDP growth, especially for emerging economies (Chugunov, Pasichnyi, & Nepytaliuk, 2019). Therefore, the problem of using the monetary instrument to regulate the real economy processes is an urgent area of traditional and latest scientific investigations.

Thus, today there is no consensus that there is a correlation between inflation and economic growth, undoubtedly the fact that inflation, which is unpredictable and exceeds the limits, leads to significant economic losses. Nevertheless, the past 20 years were a time of new financial and monetary rules for the world and national economies, especially for emerging economies. They are accompanied by the transformation of the entire financial sector. Socioeconomic and political problems in Ukraine in recent years have led to an economic downturn in 2014–2017. This was not due to world economic trends. Therefore, it is of particular interest for studying the effects of monetary policy on the financial sector and the economy of Ukraine as an emerging economy.

1. LITERATURE REVIEW

Traditional financial literature provides many definitions and approaches to explain the essence of the monetary policy concept. A significant percentage of authors associate any monetary measures of the state with this, including those implemented without the participation of central banks.

Phillips (1958) and Branson (1975) are among the first classic studies on the impact of inflation and monetary policy instruments on economic performance. The classical investigation of Phillips (1958) showed that the relationship between unemployment and the rates of change of nominal (under inflation) wage rate in the UK correlated with a significant level. In 1975, Branson (1975) showed related theoretical results for GNP deflator and key monetary regulation instruments. That paper discussed the traditional principles of monetarism and convergences of the Keynesian-Phillips's results.

According to latest research, the problems of using monetary instruments and inflation targeting models are still relevant. Observers are increasingly inclined to declare the demise of the Phillips curve, that is, flattening its slope to zero for the US labor market, but this effect is still alive for the wage Phillips curve. However, the results suggest that reports of the death of the Phillips curve may be greatly exaggerated (Hooper, Mishkin, & Sufi, 2020). The authors prove that in Ukraine, the Phillips' "inflation-unemployment" effect on the cumulative CPI index is still observed (Baranovskyi, Kuzheliev, Zherlitsyn, Sokyrko, & Nechyporenko, 2019). The related studies also show a significant correlation between fundamental macroeconomic indicators and prove that Phillips' effects for advanced and emerging economies are different.

Monetary policy includes all government measures affecting the money supply in circulation. There is a set of regulatory actions aimed at changing the amount of money in circulation and intended to

directly affect the business activity and liquidity of the banking system (C. Campbell, Dolan, & R. Campbell, 1988). However, this approach does not sufficiently characterize the economic side of monetary policy and defines it as an integral part of the overall economic policy. Thus, the monetary policy instruments are the most popular; with their help, the government of a market economy regularly influences economic growth, not only in terms of GDP and employment, but also of the overall level of rise or fall in prices (Mishkin, 1999). The disadvantage of this interpretation is that the essence of monetary policy, in this case, is determined by its specific strategic and tactical goals. Mishkin (1999) did not specified that they may vary depending on the specific historical period, the national interests of the state, possible challenges and threats, etc. Later, Mishkin identified four main types of intermediate monetary policy goals: monetary aggregate targeting, currency exchange rate, inflation targeting, and non-rated policy (Mishkin, 2008). The introduction of these regimes contributes to improving the effectiveness of the monetary policy in ensuring the state's financial security. Each of these regimes has both positive aspects that enhance financial security, and weaknesses that reduce the effectiveness of their application for financial security.

Hsing Yu and Hsieh use a nontraditional econometric analysis method to show the system influence of financial trends on various components of economic growth, which is based on the simultaneous equation model (Hsing, 2016; Hsing Yu & Hsieh, 2017). The authors find that India's real GDP has a positive relationship with real depreciation during 1978–2002, the government debt/GDP ratio, the real stock price, the growth rate of US real GDP, and a negative relationship with real depreciation during 2003–2014, the real lending rate and the expected inflation rate (Hsing Yu & Hsieh, 2017). The results show the complex effect of monetary policy instruments on the financial sector trends and macroeconomic indicators. Thus, these studies need to be continued in other emerging economies and for other periods.

To achieve strategic goals consistently, central banks define intermediate inflation targets, which should be understood as an intermediary between specific monetary instruments and strategic goals of monetary and economic policies. The choice of intermediate targets is highly dependent on the current macroeconomic and institutional conditions for the emerging economies. Therefore, the problem of the effectiveness of inflation targeting policy instruments and the related aims of this paper are relevant for the modern economics and practical research.

Over the last 20 years, Ukraine, as an emerging economy, had a lot of opposing economic trends. Therefore, the Ukrainian economic statistics give a better opportunity to investigate the effects of monetary policy during the internal crisis or stability. The fundamental economic indicators of the country in 2014–2015 had a downward trend (real GDP had declined more than 15% to 2010 Q4), and the inflation rate significantly exceeded 2% per quarter. During the crisis, the Central Bank had activated monetary instruments, especially the amount of government bonds and the key policy rate, to regulate inflation. The stabilization effect in the financial market was achieved quickly, in less than a year. However, the systematic impact of monetary policy on fundamental macroeconomic indicators (real GDP growth rate, unemployment, etc.) require further study.

Aims

The purpose of the paper is to investigate and summarize the impact of inflation targeting and other key monetary policy instruments on fundamental economic indicators in Ukraine during the periods of stability and crises.

2. METHODS

The investigation is based on classical methods of linear multiple regression modeling. As in Kuzheliev (2015) and Halushchak, Kuzheliev, Melnyk, Myhovych, and Zhytar (2020), the regression model evaluates parameters as follows:

$$y = \beta_0 + \sum_{i=1}^{n} \left(\beta_i \cdot x_i \right) + \varepsilon, \qquad (1)$$

where y – dependent variable (monetary and economic indicators); β_0 – intercept coefficient (unregistered factors influence); β_i – factor's coefficients $i = \overline{1..n}$; ε – level of normal error evaluation.

For further research, the classical multiple regression methods are used, based on relationships between CPI and fundamental economic indicators of

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GDP growth. Coefficient performances of the proposed models are presented and estimated by the Akaike information criterion (AIC), adjusted multiple R-squared, F-statistic, the variance inflation factor (VIF), *p*-value for studentized Breusch-Pagan test, etc. (Sethi & Acharya, 2019; Kuznyetsova, Misiats, & Klishchuk, 2017; Kuzheliev & Britchenko, 2016; Kozmenko & Savchenko, 2013).

The systematic correlation level between the inflation rate, economic indicators, and monetary regulation instruments will be based on simultaneous equation models (Hsing, 2016; Hsing & Hsieh, 2017; Henningsen & Hamann, 2007). These simultaneous equation models will be formulated as a result of the previous regression analysis of monetary policy effects.

Further research is based on the same assumptions and includes the following monetary factors of the inflation targeting model, which were selected to analyze its impact on economic growth (Table 1).

Table 1. Input and output variables for the effect of inflation targeting on macroeconomic indicators

Source: Estimated by the authors using the statistics of the NBU (February 28, 2020) and the State Statistics Service of Ukraine (February 28, 2020).

Variable	Description (variable and group of variables)
GDP and inflation indicators	
gdpR	Real GDP, % to 2010 Q4
gdpN	Nominal (monetary) GDP, UAH mln
cpi	Inflation or consumer price index, % to the previous quarter
cpiCum	Cumulative consumer price index, % to 2010 Q4
Key economic indicators	
unemp	Unemployed, ths. people.
consR	Real final consumption expenditure, % to 2010 Q4
consN	Nominal (monetary) final consumption expenditure, UAH bln
exp	Gross export, USD bln
inv	Investment position, USD mln
curr	Hryvnia exchange rate, UAH per 1 USD
cred	Average weighted interest rate, %
Monetary instruments of the central bank (National Bank of Ukraine)	
res	Ukraine's international reserves, USD bln
rate	The key policy rate of the National Bank of Ukraine, %
m3	The amount of M3 monetary aggregate, UAH bln
shr	The amount of government bonds, UAH bln

3. RESULTS

3.1. Monetary regulation efficiency and economic indicators

In Ukraine, as an emerging economy, the dynamic analysis of CPI and GDP growth rate for 2011–2019 provides an opportunity for analytical confirmation of the classical inflation targeting hypotheses (Figure 1). Over the past ten years, the country has seen both positive and negative trends in real GDP levels and the consumer price index. For example, an increase in the inflation rate is accompanied by a decrease in the real economic growth rate. On the other hand, the situation in the period from 2011-Q4 to 2014-Q1 and from 2016-Q4 to 2019-Q4 is completely opposite. Inflation and economic growth trends coincide with the classical hypotheses during relative stability. Thus, further research is divided into two statistical periods: the stability period (where $gdpR < 0$ or $cpi >= 2\%$) and the crisis period (opposite).

The main hypothesis of the paper is that the inflation rate has simultaneous transmission effects on unemployed, final consumption expenditure, gross export, investment position, and hryvnia exchange rate. This effect can be regulated by the following monetary instruments: the level of Ukraine's international reserves, the key policy rate of the central bank, the amount of M3 monetary aggregate and the amount of government bonds.

The related econometric estimation and previous assumptions are confirmed in Table 2. Table 2 shows the linear relationship between key model variables using the Pearson correlation method. These data are based on the dynamics of the Ukrainian economy and changes in financial and monetary indicators from 2011 Q1 to 2019 Q4.

Table 2 shows a significant correlation between real GDP rate (*gdpR*) and *CPI* dynamics (–0.7120). The same result shows the correlation coefficients for the period of time when *gdpR* is less than 0, but the level of linear correlation is a little bit higher (–0.8658) and becomes not significant when *gdpR* is greater than 0 (only –0.2249). The same result is shown for a period of time when *cpi* is greater than 2%, and there is a significant linear

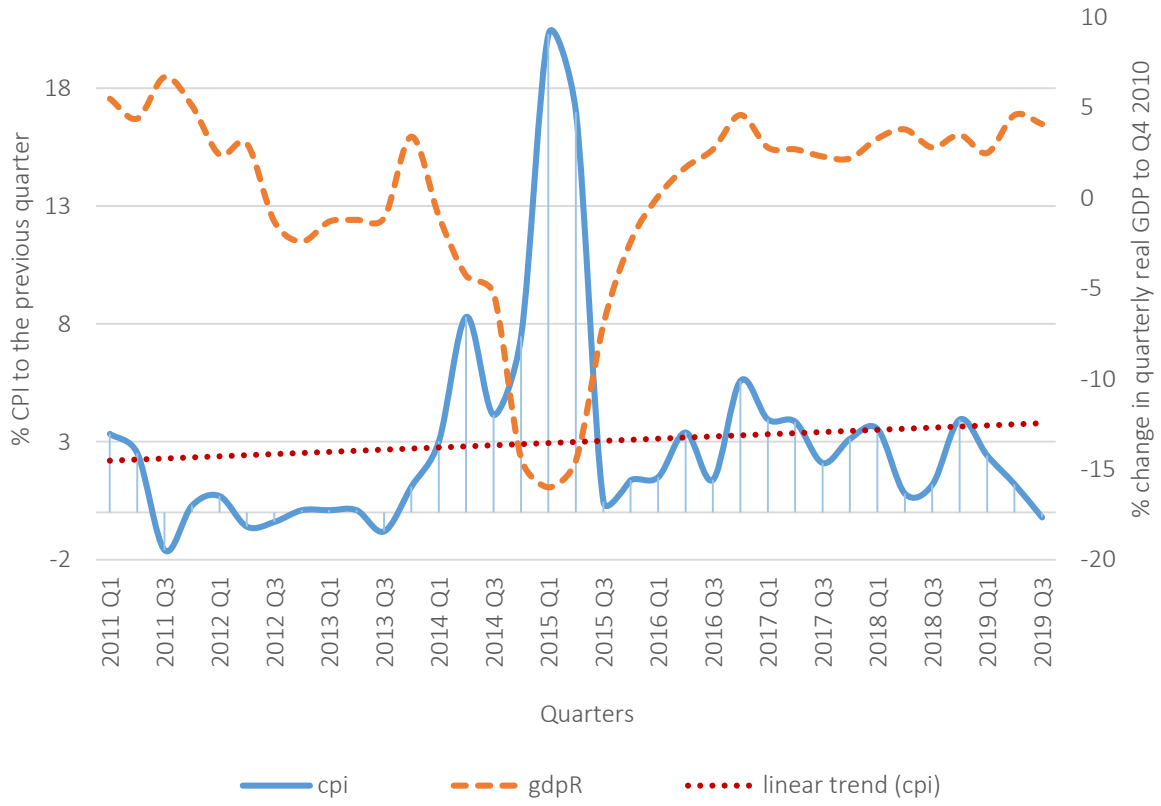

Figure 1. Real GDP (*gdpR*) and consumer price index (*cpi*) in Ukraine, 2011 Q1 – 2019 Q4

correlation between *cpi* and *gdpR* (–0.8408). The Pearson's correlation coefficient for *gdpN* with the *cpiCum* has different results for all periods. The correlation equals 0.8121 when *gdpR* is less than 0, and it equals 0.9270 when *gdpR* is greater than 0. Thus, the classical hypotheses are confirmed for Ukraine as an emerging economy.

The classic transmission mechanism provides for the regulation of economic indicators through the level of inflation and monetary policy instruments. Therefore, Table 3 shows a linear relationship between CPI and key model variables using the Pearson's correlation method.

Table 3 shows a significant correlation between the inflation rate (*cpi*) and real final consumption expenditure (*constR*) for all data (from 2011 Q1 to 2019 Q4), but for the periods, when *gdpR* was less than 0, *cpi* correlations were as follows: (–0.72) for *constR*; (–0.62) for *exp*, and (0.60) for *curr*. Therefore, the analysis of statistics for the period of the fall of real GDP in Ukraine shows a correlation between inflation and economic and monetary indicators (only using the linear

Table 2. The correlation matrix between GDP and CPI variables of the Ukrainian economy for 2011 Q1 – 2019 Q4

Source: Estimated by the authors.

Variable	gdpR	gdpN	cpi	*cpiCum*
All data				
gdpR	1.0000	0.2983	–0.7120	0.2115
gdpN	–	1.0000	–0.0850	0.9291
cpi	–	–	1.0000	0.0778
cpiCum	–	–	–	1.0000
For periods when *gdpR* < 0				
gdpR	1.0000	–0.2487	–0.8658	–0.5681
gdpN	–	1.0000	–0.0008	0.8121
cpi	–	–	1.0000	0.4594
cpiCum	–	–	–	1.0000
For periods when *gdpR* >= 0				
gdpR	1.0000	–0.1588	–0.2249	–0.3218
gdpN	–	1.0000	0.1934	0.9270
cpi	–	–	1.0000	0.3498
cpiCum	–	–	–	1.0000
For periods when *cpi* >= 2%				
gdpR	1.0000	0.3956	–0.8408	0.3483
gdpN	–	1.0000	–0.3258	0.9154
cpi	–	–	1.0000000	–0.1949
cpiCum	–	–	–	1.0000

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Pearson's test). However, subsequent analysis (not only pair linear correlation) shows a greater level of significance for the studied indicators for periods when *cpi* > %2. Therefore, for further research, economic data in Ukraine for that period (where *cpi* > %2) are used.

Table 3. The correlation matrix between CPI and key variables and the Ukrainian economy for 2011 Q1 – 2019 Q4

Source: Estimated by the authors.

Variable	cpi			
	All data	For periods when *gdpR* < 0	For periods when *gdpR* >= 0	For periods when *cpi* > 2%
unemp	0.1676	0.2100	–0.0666	0.3235
consN	–0.0683	0.0962	0.1907	–0.3179
consR	–0.6691	–0.7214	–0.3059	–0.8373
exp	–0.4222	–0.6245	–0.4893	–0.3835
inv	–0.3951	–0.3923	–0.5371	–0.1221
curr	0.2452	0.5981	0.4836	0.0023

Some other models should be formulated based on the impact of the inflation transmission on the economic situation in Ukraine. First, inflation (*cpi*) and linear regressions of key economic indicators will be estimated. Second, key economic indicators and monetary instruments of the central bank's linear regressions will be evaluated. Thirdly, this will be confirmed by the simultaneous equation model of inflation targeting mechanisms within the system impacts of key economic indicators and monetary policy instruments.

The results of modeling are stated below. The linear dependencies and accuracy results for key variables using the r-programming language instruments are based on model (1). The optimality criterion for the model selection is the Akaike information criterion (AIC).

Table 4 summarizes the linear dependencies and accuracy results of the *cpi* dependence models. The multiple regression method shows a significant level of the model and coefficient performances for all models, but adjusted R-squared is the highest, and *p*-values for factor's coefficients are the smallest for model 1.3. So, Model 1.3 will be used for the following analysis.

The CPI level for periods when *cpi* > 2% shows a strong dependence on unemployed, real final consumption expenditure, and hryvnia exchange rate. The first and second of those factors are the traditional economic variables; the third is the monetary indicator. Therefore, the inflating targeting policy is linked to both purely financial performance and key macroeconomic processes.

Table 4. Summary statistics for CPI regression models

Source: Estimated by the authors.

Variable	cpi					
	Model 1.1 (periods when *gdpR* < 0)		Model 1.2 (periods when *gdpR* < 0)		Model 1.3 (periods when *cpi* > 2%)	
	Coefficient (Std. Error)[2]	VIF[3]	Coefficient (Std. Error)	VIF	Coefficient (Std. Error)	VIF
(Intercept)	43.5885	x	37.7099	x	–19.2541	x
unemp	0.0757 (0.0238)*	1.3406	0.06151 (0.0218)*	1.0512	0.0386 (0.0109)**	3.1248
consR	–0.4820 (0.0839)***	1.3129	–0.4333 (0.0775)***	1.0452	–0.3095 (0.0441)***	1.0828
inv	0.0020 (0.0016)	1.6718	x	x	x	x
cred	–2.8555 (0.8822)*	1.2801	–2.33117 (0.80986)*	1.0061	x	x
curr	x	x	x	x	0.4458 (0.1239)**	2.9858
AIC	34.28		34.77		29.73	
Adjusted R-squared	0.7770		0.7609		0.8233	
F-statistic	11.45 on 4 and 8 DF		13.73 on 3 and 9 DF		25.85 on 3 and 13 DF	
p-value for BP test[1]	0.9334		0.5946		0.6563	

Note: [1] *p*-value for the studentized Breusch-Pagan Heteroskedasticity test. [2] *p*-value for coefficient levels: matches less than 0.001 – '***', less than 0.01 – '**', and less than – 0.05 '*'. [3] The variance inflation factor for multicollinearity test.

Table 5. Summary statistics for transmission models of inflation targeting in Ukraine (periods when *cpi* > 2%)

Source: Estimated by the authors.

Variable	*unemp* Model 2.1		*consR* Model 2.2		*curr* Model 2.3	
	Coefficient (Std. error)[2]	VIF[3]	Coefficient (Std. error)	VIF	Coefficient (Std. error)	VIF
(Intercept)	870.0257	x	–23.9863	x	1.0287	x
res	x		1.0583 (0.1814)***	1.5060	0.1539 (0.0705)*	1.1780
rate	3.3784 (1.4200)*	1.1665	–1.0039 (0.2155)***	1.4756	x	x
m3	–0.4849 (0.0524)***	1.1665	x	x	x	x
shr	x	x	0.0399 (0.0062)***	1.2628	0.0323 (0.0022)***	1.1780
AIC	123.47		56.11		21.22	
Adjusted R-squared	0.8418		0.8643		0.9479	
F-statistic	43.55 on 2 and 14 DF		34.96 on 3 and 13 DF		146.6 on 2 and 14 DF	
p-value for BP test[1]	0.8922		0.2575		0.9395	

Note: [1] *p*-value for the studentized Breusch-Pagan Heteroskedasticity test. [2] *p*-value for coefficient levels: matches less than 0.001 – '***', less than 0.01 – '**', and less than – 0.05 '*'. [3] The variance inflation factor for multicollinearity test.

The next step is to estimate parameters for transmission models of inflation targeting in Ukraine. Table 5 shows dependent variables (unemployed, real final consumption expenditure, and hryvnia exchange rate) and the external factors (key monetary policy instruments).

Table 5 shows that all of the identified economic indicators are significantly dependent on the following monetary regulation instruments: Ukraine's international reserves, the key policy rate, the amount of M3 monetary aggregate, and the amount of government bonds. Thus, the systematic transmission models of the fundamental economic indicators' dependences are:

$$\begin{aligned} &unemp = 870.0257 + 3.3784 \cdot rate - \\ &-0.4849 \cdot m3, \\ &consR = -23.9863 + 1.0583 \cdot res - \\ &-1.0039 \cdot rate + 0.0399 \cdot shr, \\ &curr = 1.0287 + 0.1539 \cdot res + \\ &+0.0323 \cdot shr, \end{aligned} \quad (2)$$

and for the model of inflation targeting results:

$$\begin{aligned} &cpi = -19.2541 + 0.0386 \cdot unemp - \\ &-0.3095 \cdot consR + 0.4458 \cdot curr. \end{aligned} \quad (3)$$

Equations (2) and (3) show the transmission models of inflation targeting, but the simultaneous equation method should be used to determine the correlation of the level of the internal and external factors.

3.2. Simultaneous equation model of inflation targeting

The final stage of this study is to build a simultaneous equation model to estimate the mutual influence of the factors. The related variables are defined in equations (2) and (3). The model estimation is based on "systemfit" instruments and "two-stage least squares" (2SLS) method (Henningsen & Hamann, 2007; Balcerzak, Kliestik, Streimikiene, & Smrcka, 2017; Shkolnyk, S. Kozmenko, O. Kozmenko, & Mershchii, 2019). The system of inflation targeting with simultaneous equations has the following estimates:

$$\begin{cases} cpi = -27.3271 + 0.0516 \cdot unemp - \\ -0.3091 \cdot consR + 0.5717 \cdot curr, \\ unemp = 870.0239 + \\ +3.3811 \cdot rate - 0.4850 \cdot m3, \\ consR = -22.9025 + 1.0362 \cdot res - \\ -1.0623 \cdot rate + 0.0403 \cdot shr, \\ curr = 0.8930 + 0.1697 \cdot res + \\ +0.0322 \cdot shr. \end{cases} \quad (4)$$

Table 6 summarizes the statistics for the models' system (4). Table 6 shows that McElroy's R-squared

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Table 6. Summary statistics for the system of inflation targeting models with simultaneous equations in Ukraine (periods when *cpi* > 2)

Source: Estimated by the authors.

Equation number	SSR	MSE	R-squared	Adjusted R-squared
eq1	68.0453	5.2342	0.8399	0.8029
eq2	17033.7467	1216.6962	0.8615	0.8418
eq3	289.6528	22.2810	0.8891	0.8635
eq4	41.7569	2.9826	0.9543	0.9477
system	17433.2	164697.0	x	0.9386*

Note: * McElroy's R-squared.

value is 0.9386; adjusted R-squared for all equations is greater than 0.8. Therefore, system parameters estimates have a significant dependency.

Thus, equations (2), (3), and (4) of inflation targeting models prove the following results.

Inflation rate (*cpi*) increases with the growth of the unemployed, an increase in the hryvnia exchange rate and a decrease in the real final consumption expenditure. Thus, this proves the results of classical studies with significant inflation for Ukraine as an emerging economy.

Monetary policy instruments have different correlations within the fundamental economic indicators in the period when *cpi* is greater than 2%. Firstly, the number of unemployed increases with an increase in the key policy rate and a decrease in the M3 monetary aggregate. Secondly, the real final consumption expenditure has a direct correlation with Ukraine's international reserves and the amount of government bonds, and an inverse correlation with the key policy rate. Thirdly, the hryvnia exchange rate in crisis years increases with an increase in Ukraine's international reserves and the amount of government bonds. It should be noted that these results are inherent in the economic decrease. As Table 2 and Table 3 show, during the period of economic growth, inflation is not so significant for the level of real GDP, but a nominal (monetary) GDP level has a greater correlation with the inflation rate, especially for cumulative CPI, for all investigated periods.

The monetary policy instruments have a transmission effect on CPI. For example, if the key policy rate of the National Bank of Ukraine increases by 1%, it leads to a rise in unemployed for 3.3811 thousand people (equation (2) in system (4)), and reduces the real final consumer expenditure for 1.0623% (equation (3) in system (4)). These results for the economic indicators lead to a positive change in the consumer price index (equation (1) in system (4)) approaching 0.5% (0.1745% for the *unemp* factor, 0.3284% for the *consR* factor).

A graphical assessment of the impact of inflation targeting model and real GDP rate, which is based on model (3), is presented in Figure 2.

Figure 2 shows that the inflation targeting model accurately reflects actual changes in quarterlies' CPI rates. It is obvious that a significant drop in real GDP is due to a rapid rise in inflation (from 2014 Q2 to 2015 Q2). However, there is a significant correlation between inflation targeting and the real GDP trend in relative stability periods, when quarterly CPI is greater than 2% (from 2016 Q4).

Thus, the inflation index is a traditional monetary indicator, which is regulated by the central bank's administrative instruments. However, these monetary policy instruments have a significant impact on key economic indicators: real GDP and unemployed, and on national currency exchange rate, real final consumption expenditure, gross export, and so on. The level of inflation indices is a major indicator of the economic downturn. Thus, inflation targeting policy instruments can be used as a method of regulating key economic indicators. Economic and monetary policy instruments must be coordinated, especially when the quality CPI index is greater than 2% in an emerging economy (such as Ukraine).

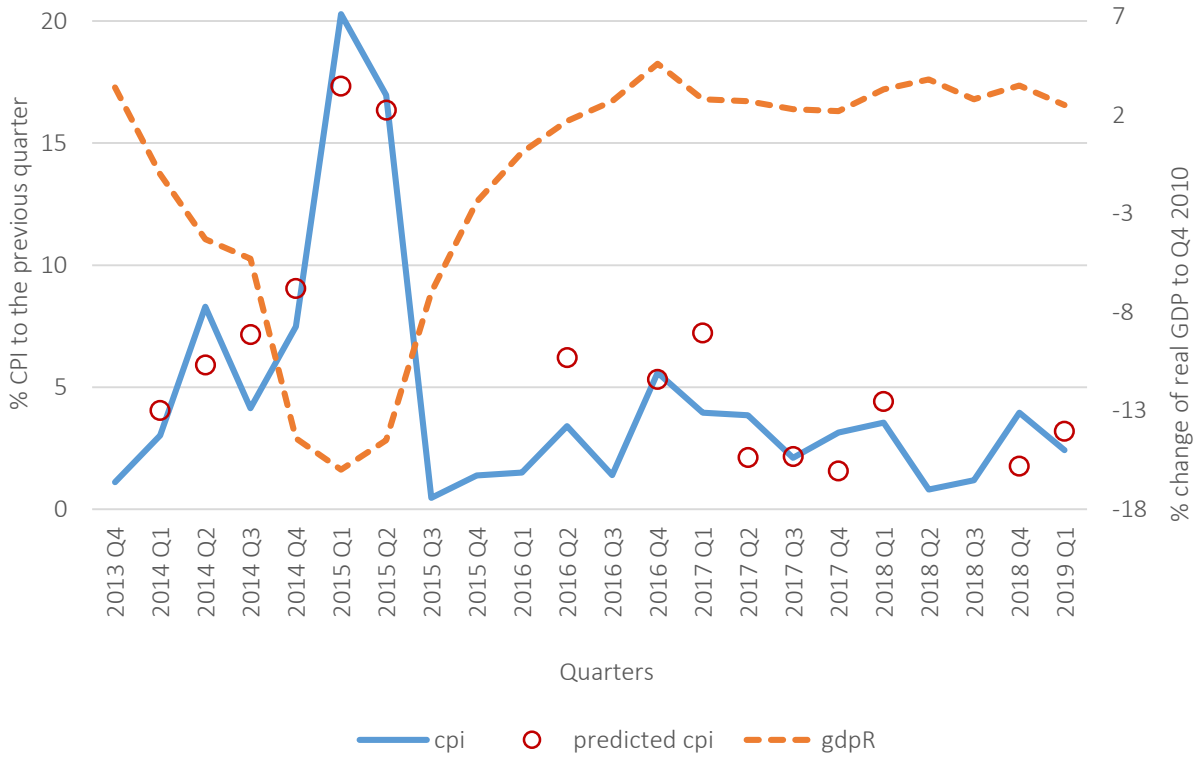

Figure 2. The model of the result of inflation targeting and the real GDP rate in Ukraine for 2013 Q4–2019 Q1, %

4. DISCUSSION

Over the past twenty years, many countries of the world have intensified the methods of monetary policy regulation of financial and economic processes. The global financial crisis of 2008–2009 has changed the approach to the level and extent of direct government intervention in financial markets. There is no consensus today that there is a correlation between inflation and economic growth; it is no doubt that rapid inflation rises, which is unpredictable and exceeds the margins, leads to significant economic losses. The empirical analysis in Ukraine, as an emerging economy, provided limited evidence of the effects of monetary policy on fundamental macroeconomic indicators.

The results prove that for periods when the CPI is not so high there is no clear understanding of its correlations in the fundamental economic indicators. It is still being debated whether inflation is a regulator of economic growth and recession or vice versa –real economic processes affect inflation trends. The current world monetary system does not imply strict correspondence of the volume of the money supply to certain material resources, as it was during the time of the gold standard. The results prove the significant correlation between inflation, real GDP, and other economic indicators in an emerging economy, but the direction of the appropriate influence is still an open question (unclear). Inflation and real GDP levels play a key role in solving this problem. For example, there is a great potential in inflation targeting policy instruments to regulate real economic trends in Ukraine and some other countries, when quarterly CPI is not greater than 2%, and real GDP does not decline. However, it is impossible to use only traditional administrative instruments of a central bank (e.g., the key policy rate, the foreign exchange market interventions, etc.) to regulate unemployment, especially when quarterly CPIs exceed 10%. Thus, the scope of such regulation and the consistency with other instruments of state administration are still under discussion.

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CONCLUSION

The inflation index is a statistically significant factor that affects real GDP. Therefore, the development of an inflation targeting mechanism is an urgent perspective in the economy and economic practice. However, during the crisis, the following factors had a greater effect on real GDP in Ukraine: unemployment, exchange rate, real final consumption expenditure, etc., which have a significant correlation with CPI. In particular, this correlation is significant if the quarterly CPI is more than 2% and there is a fall in real GDP. For example, the Phillips' classical effect on unemployment and other inflation targeting impacts are not observed in emerging economies during the periods of relative stability.

The study reveals that the following instruments have the largest simultaneous effects on economic growth indicators in emerging economies: key policy rate, international reserves, the amount of government bonds, and M3 monetary aggregate. As a result, this paper shows that certain monetary factors, such as the national currency exchange rate, have a great impact on real GDP in Ukraine.

The results of the study make it possible to propose directions for reforming both economic and monetary policies in emerging economies. Therefore, particular attention should also be paid to the interest rate policy of the central banks, the exchange rate of the national currency, and the total volume of government bonds to model the development of the economic and financial sectors.

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