

# Modeling Outcomes of Unconventional Monetary Policy

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**Abstract:** The paper presents a study of the outcomes of the unconventional monetary policy methods that the central banks of developed countries have been applying during and after the global financial crisis. Before the crisis central banks used the interest rate policy as their main tool. But the recent financial crisis has demonstrated the inefficiency of traditional methods (especially after the base interest rate has reached zero). Therefore in response to the global financial crisis, central banks of many countries have taken unconventional measures to overcome the crisis.

The paper aims to study the main outcomes of unconventional monetary policy measures of the developed countries and formulate the recommendations for the developing countries.

The following objectives are being met in the paper: to reveal the essence of the main mechanisms for implementing the unconventional monetary policy; to evaluate the efficiency of unconventional monetary policy in the US, Japan, United Kingdom; to model the impact of monetary policy of the European Central bank on the consumer price index in the Eurozone countries.

**Research methods:** method of comparative analysis is used to evaluate the efficiency of the unconventional monetary policy in the US, Japan, European Union and the United Kingdom. The model of the monetary policy impact on the consumer price index is based on econometric analysis and is constructed using the least squares method. The studied model includes both traditional and non-traditional methods. Observation period - quarterly data from 1999 to the second quarter of 2019.

The results of the analysis show that unconventional monetary policy methods of the central banks of the developed countries reached major goals - to prevent bankruptcies of large financial institutions in national economies. Moreover, the results of the suggested model show that the European Central Bank policy has also reached its inflation target that supposed to stimulate economic growth; the most significant effect is observed in the first years after the launch of an unconventional monetary policy.

At the same time the unconventional tools of monetary policy stimulate the extreme increase of the securities prices, which led to the "overheating" of the US stock market and the EU national bonds markets with the negative yield on government securities of several countries, which may become a trigger for a new global crisis in the future.

The result of the analysis of monetary policy in Ukraine shows the limitations of the use of non-traditional measures for the developing countries.

**Keywords:** central banks, unconventional tools of monetary policy, developed countries, securities, consumer price index, financial systems.

## I. INTRODUCTION

The global financial crisis has radically changed the views on the monetary policy. Monetary policy aims to ensure price stability, and its main tool is a short-term interest rate. Short-term rates are a signal for money markets, and this impulse is transmitted to the entire economy through various channels. However, due to economic shocks that began in August 2007, financial instability impedes the development of money markets. With the fall of Lehman Brothers in September 2008, the financial crisis turned into a global crisis.

The central banks reacted to the crisis phenomena by lowering official interest rates, but lowering the discount rate also has a limit; the discount rate can be reduced until it reaches the zero lower bound. Eventually, countries were stuck in a liquidity trap. In this regard, central banks had to use other tools to overcome instability in the financial market and stimulate real economic revival.

Due to the inability of the traditional monetary policy instruments to cope with the crisis phenomena that have emerged, the central banks of the world's advanced countries have begun to use completely non-standard tools. Unconventional financial policy methods include:

1. Quantitative easing. With the QE, central bank exogenously increases its monetary base by generating electronic money and providing financial institutions with liquidity in exchange for some long-term assets, usually a combination of government bonds and high-rate and high-risk corporate bonds. This, in turn, supports the offer of credit.

2. Credit easing. This method consists of liberalizing the conditions for commercial banks refinancing: in extending the terms for granting loans, expanding the composition of central banks acceptable loan collateral, providing loans on an unsecured basis, and lowering interest rates on loans.

3. Negative interest rates. It is a monetary policy maintaining nominal short-term interest rates below zero.

The described above tools in the economic literature are called unconventional monetary policy.

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But Borio and Disyatat [1] also determine, since these politics change the scale or central bank balance composition, they can be called “balance politics”. These researchers also emphasize that the difference between traditional and non-traditional policies can be very slight.

Engen et al. (2015) suggest that the net stimulus to real activity and inflation was limited by the gradual nature of the changes in policy expectations and term premium effects, as well as by a persistent belief on the part of the public that the pace of recovery would be much faster than proved to be the case [2]. Boeckx et al. (2016) emphasize that balance shocks have a positive effect on economic activity and prices [3]. Eser, Schwaab (2016) assess the yield impact of asset purchases within the European Central Bank's (ECB) Securities Markets Program (SMP) in five euro area sovereign bond markets from 2010–2011. A dynamic specification points to both transitory and long-run effects. Purchases improved liquidity conditions and reduced default-risk premium, while the signaling of future low interest rates did not play a role [4].

Gambetti and Musso (2017) in their paper provide empirical evidence on the macroeconomic impact of the expanded asset purchase program (APP) announced by the European Central Bank (ECB) in January 2015. The effect on real GDP appears to be stronger in the short term, while that on Harmonised Index of Consumer Prices (HICP) inaction seems more marked in the medium term [5].

The results of Yakubovskiy et al. (2019) analysis showed the significant impact of foreign investment income on external positions of emerging market economies amid of unconventional monetary policy of the developed countries [6, 7].

Abidi and MiquelFlores (2018) studied corporate quantitative easing (QE). The study revealed that the impact is mostly noticeable in the sample of Corporate Sector Purchase Programme (CSPP)-eligible bonds that are perceived as high yield from the viewpoint of market participants; bond yield spreads decline by around 15 basis points at the announcement of the program and, the CSPP seems to have stimulated new issuance of corporate bonds [8].

However, there are less positive signals. De Mertzis and Wolff (2016) [9] argue that further policy measures are unlikely to bring significant benefits.

## II. PROPOSED METHODOLOGY

This study aims to analyze the impact of the unconventional monetary policy of the central banks of the developed countries on national economies. Central banks used both traditional and unconventional methods of monetary policy to stimulate economic development.

In previously analyzed works, scientists used VAR and OLS models. These models allow analyzing a large set of data, simulating changes in policy responses and studying the effect of policies in dynamics. In this study, the main methodology is an econometric analysis using the OLS method. In general, the model is presented in the following form:

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_n x_n + e_i \quad (1)$$

where is  $y$  – the endogenous, dependent, investigated variable,  $x_1, x_n$  – exogenous variables of the model,  $\beta_1, \beta_n$  – are the regression coefficients,  $e_i$  – the model error vector.

In the paper the following model which determines the impact of the traditional and unconventional monetary policy methods on the consumer price index in the euro area is suggested:

$$\begin{aligned} \text{CPI} = & \text{const} + \beta \text{REPO} + \beta \text{Y10} + \beta \text{Ratereserves} + \beta \text{MRO} \\ & + \beta \text{SMP} + \beta \text{LTRO} + \beta \text{TLTRO} + \beta \text{QE} \\ & + \beta \text{NIR} + \varepsilon_i \quad (2) \end{aligned}$$

where: CPI- Consumer Price Index;

REPO- REPO operations;

Y10 - yield on 10-year Eurobonds;

Ratereserves - rate of reserves;

MRO - Main Refinancing Operations;

Dummy variables that reflect the main non-traditional methods of monetary policy of the ECB is also introduced in the model:

SMP - Longer-term sovereign bond purchase program;

LTRO - Long Term Refinancing Operations;

TLTRO Targeted Longer-term sovereign bond purchase program;

QE - quantitative easing;

NIR - negative interest rates.

These indicators reflect unconventional policies and take on the value of one during the program realization. Observation period is monthly data from 1999 to the second quarter of 2019.

## III. RESULTS AND DISCUSSION

### A. The developed countries

For the first time, the central bank of Japan began to use innovative methods of non-traditional monetary policy in the late 90s of the last century. During the global financial crisis the US Federal Reserve System, the Bank of England, the European Central Bank began to use these methods, and some of the instruments were used by central banks of Denmark, Sweden and Switzerland.

Researchers identify two different approaches to the application of unconventional monetary policy. The first is a consistent approach, which is mainly used by FED, BOJ and BOE. Unconventional monetary policy is considered to be a substitute for conventional monetary policy. When the interest rate drops and reaches a zero low bound, unconventional monetary policy is used to provide further incentives.

Most researchers focused on studying the impact of innovative monetary policy on financial markets [10]. But there are relatively few studies that measure their effect on real activity and inflation. Weale and Wieladek (2014) suggest that inflation and output are significantly higher in the UK, USA and the euro area due to their asset purchase programs. An asset purchase announcement of 1% of GDP leads to a statistically significant rise of 0.58% (0.25%) and 0.62% (0.32%) rise in real GDP and CPI for the US (UK). The transmission channels differ in the two countries [11].

Short-term interest rates were limited to almost zero, the past decade, and as a result the Fed was forced to resort to an unconventional monetary policy. The Fed used the two main tools of this policy: forward guidance and quantitative easing. The Federal Reserve, announcing its intentions to change monetary policy, using forward guidance, sought to directly affect the yield of long-term bonds and the prices of other financial assets [12].

These tools, certainly, contributed to the recovery of the US economy, while simultaneously led to a sharp increase of stock indexes (S&P 500 and DJIA), which could lead to negative consequences in the future.

The ECB has struggled with imbalances in the economy by using both traditional and non-traditional methods. From 2010 to present, the following measures of the European Central Bank can be distinguished:

1. The implementation of the program for the purchase of bonds from commercial banks in the secondary debt market (SMP) since May 2010.
2. Increasing interest rates from 1.00% to 1.25% and to 1.5% in July 2011 due to the risk of inflation and the temporary suspension of the SMP program (from April to July 2011).
3. Conducting 3 year LTRO operations at a fixed rate
4. Reducing the refinancing rate (MRO) to 0.75% in August 2011
5. Launching of the second coated government bond purchase program (CBPP)
6. Conducting two ultra-long-term refinancing operations (VLTRO) with a 36-month maturity, in December 2011 and in February 2012.
7. Implementation of the government bonds repurchase program - Outright Monetary Transactions (OMT) since September 2012.
8. Reduction of the refinancing rate to 0.25% in November 2013.
9. Application of forward guidance in order to effectively manage the expectations of financial markets since 2013.
10. Further decrease in MRO to 0.15% in June 2014
11. Start of the implementation of the program of targeted long-term refinancing (TLTRO) in the summer of 2014 in order to stimulate lending to the real sector.
12. Beginning of the Asset-backed securities purchase program (ABSPP) and Third covered bond purchase program (CBPP 3) in September 2014 to further support the real sector and overcome deflationary trends.
13. Announcement by the ECB of the launch of a quantitative easing (QE) program in January 2015 and the Public Sector Purchasing Program (PSPP), which envisages monthly purchases of sovereign bonds of Eurozone governments, European institutions and national agencies in the amount of up to 60 billion by the end of September 2016.
14. June 2014, the beginning of the policy of Negative interest rates, the ECB reducing the deposit rate to -0.1% [5, 10, 13].

The main goal of the ECB's unconventional monetary policy was to increase inflation to 2%.

Data for analysis and models were taken from the official websites of the ECB.

The first step in the analysis is to evaluate the correlation matrix of the equation (2), in order to identify correlations between explanatory variables (table 1).

**Table I. Correlation coefficients, using the observations 1999:1 - 2019:2**

REPO	R10Y	Ratereserves	MRO	SMP	
1.0000	-0.1338	-0.1818	0.0485	0.2888	REPO
	1.0000	0.8315	0.6032	0.0847	R10Y
		1.0000	0.6161	-0.1760	Ratereserves
			1.0000	-0.0101	MRO
				1.0000	SMP
LTRO	TLTRO	QE	NIR	CPI	
0.3096	-0.0694	-0.1248	-0.0575	0.4301	REPO
-0.4089	-0.8611	-0.7849	-0.8713	-0.8313	R10Y
-0.5363	-0.6396	-0.5798	-0.6532	-0.8106	Ratereserves
-0.3882	-0.6769	-0.6444	-0.6764	-0.5536	MRO
0.3113	-0.1939	-0.1752	-0.1985	0.2114	SMP
1.0000	0.1412	0.1406	0.1475	0.6595	LTRO
	1.0000	0.9039	0.9767	0.6322	TLTRO
		1.0000	0.8829	0.5801	QE

			1.0000	0.6437	NIR
				1.0000	CPI

Source: prepared by authors.

Based on the data in the table, a high correlation indicator is observed between the explanatory variables «Ratereserves», «TLTRO», «R10Y», «QE», «NIR», «MRO». In order for this correlation not to influence the interpretation of the coefficients when building the model, they were excluded except for R10Y, since this indicator has the highest degree of correlation with the dependent variable (-0.8313). It is also necessary to exclude the SMP indicator from the model, which has the smallest correlation value with the dependent variable (0.211). As a result, the following model is obtained (3)

$$CPI = const + \beta REPO + \beta Y10 + \beta LTRO + \epsilon_t \quad (3)$$

The results of the evaluation of the model are presented in table 2

**Table II. Model OLS, using observations 1999:1-2019:2 Dependent variable: CPI**

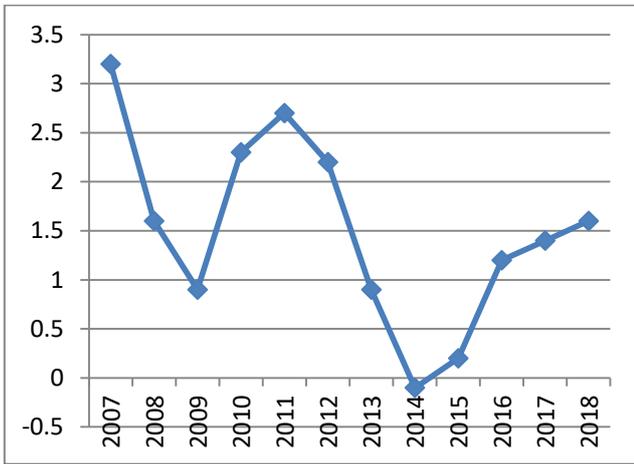
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.21374	0.909009	106.9447	0.0000
REPO	5.18E-06	5.30E-07	9.767474	0.0000
R10Y	-4.45675	0.171735	-25.95130	0.0000
LTRO	9.70E-06	8.44E-07	11.48302	0.0000
R-squared	0.867133			
F-statistic	513.4050			
Durbin-Watson stat	1.273616			

Source: prepared by authors

According to the results presented in the table, we can conclude that the model is significant R-squared is 0.8671, which means that this model explains 86 % of the changes occurring in the consumer price index. All three explanatory variables are significant at the model. The highest impact is observed for the the variable yield of ten-year government bonds - -4.456. There is an inverse relationship, which indicates that if the yield on 10-year eurobonds increases by 1%, this will cause a decrease in the consumer price index by 4 points. A smaller fluctuation in inflation will be caused by changes in the PEPO and Long Term Refinancing operations. Based on the data obtained, it can be said that both traditional and unconventional measures of monetary policy have an impact on inflation.

It is necessary to look at the inflation rate in the euro area for a complete understanding of the effectiveness of unconventional methods (see Figure 1).

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**Fig. 1 Inflation rate in the Euro area (%)**  
Source: [14]

As a result of the analysis, it turned out that unconventional measures affect the level of inflation in the EU. In figure 1 we see that from 2010 to 2012 the inflation rate increased more than 2 percent, in subsequent years this indicator decreases and in 2014 a deflationary process is observed and then the ECB launched a new wave of unconventional methods and still applying them. The inflation rate is not as high as expected, but there is a positive growth trend.

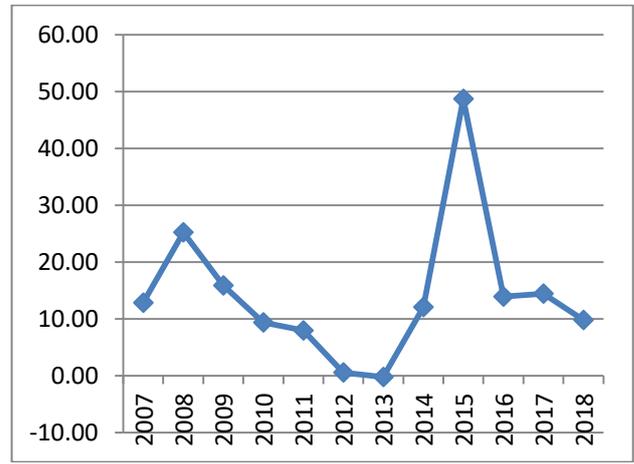
### B. Emerging market economies (case of Ukraine)

Today, Ukraine is a country which actively undertaking reforms, including reforms in monetary policy. The National Bank of Ukraine (NBU) uses mostly conventional monetary policy instruments, the main of which is the central bank's interest rate. The country also has a mode of inflation targeting, which is understood as the establishment inflation targets, which in the medium term is compulsory for monetary policy regulators.

In 2000, a well-known economist, Frederic S. Mishkin concluded that "although inflation targeting is not a panacea and may not be appropriate for many emerging market countries, it can be a highly useful monetary policy strategy in a number of them". Therefore inflation targeting monetary policy regime has been widely adopted in both developed and emerging economies.

As can be seen in fig. 2, the inflation rate in Ukraine is quite high. From 2008 to 2013, there has been a decrease in this indicator to almost zero. But in subsequent years, inflation increases and in 2015 reaches the highest level for the study period - 48%. The central bank managed to reduce it in subsequent years.

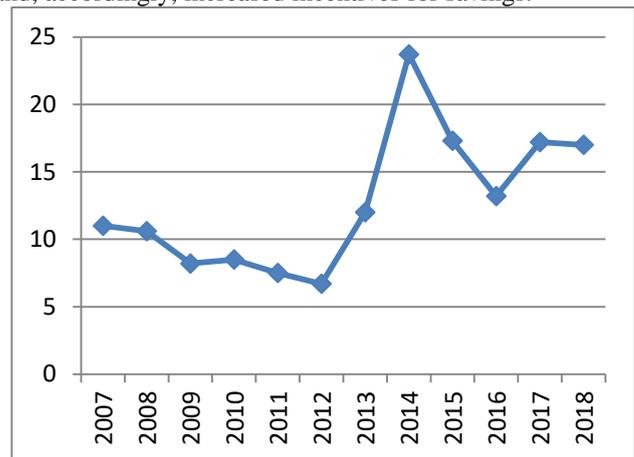
In 2018, consumer inflation decelerated to 9.8% (from 13.7% in 2017) - the lowest level over the past five years. The slowdown in base inflation in 2018 was moderate (to 8.7 percentage points). The reversal of the inflation trend observed in 2017 is primarily a result of the tight monetary policy of the National Bank by regulating the NBU discount rate



**Fig.2 Inflation rate in Ukraine (%)**

Source: [15]

The NBU's interest rate for the period 2007-2017 (Figure 3) as a whole has a similar dynamics to the inflation. From 2007 to 2012, the NBU discount rate tended to decline, but in the following years the rate was increasing, and in 2014 it reached its peak of 23.7%. Since 2015, the National Bank has reduced the level of the discount rate, and in 2017 it was 17.2%. Since October 2017, the National Bank raised the discount rate six times - a total to 15.5 % per annum. This led to an increase in market interest rates hryvnya (UAH) and, accordingly, increased incentives for savings.



**Fig. 3. The discount rate of the National Bank of Ukraine (%)**

Source: [15]

Despite the inflation reduction, the NBU's target of  $6\% \pm 2$  per cent had not been achieved by the end of 2018. The National Bank deliberately chose a long way to return inflation to its target, in order to minimize losses for economic growth. Such a balancing between the need to bring inflation to the goal and support for economic growth is a reflection of the inflation targeting regime flexibility.

For Ukraine, rapid economic growth is more important than ever. In this regard, the NBU must ensure the flexibility and effectiveness of its activities through the use of conventional and unconventional methods. This is possible on the basis of simultaneous implementation by the NBU of several monetary policy objectives (price stability and economic growth) and the use of several tools for their achievement.

However, under current conditions, implementation of quantitative easing policies is impossible in Ukraine, as rapid discount rate reduction can not be achieved (it reduced from 18% to 17.5% (25.04.19)) and this holds inflation at the target rate (5% in 2010). It is essential to understand that inflation in Ukraine differs significantly from inflation in most developed countries. It is mostly related to the economic crisis and the lack of overall economic stability and consistency in the chosen direction of development.

#### IV. CONCLUSION

The Fed, the ECB, the BOE and the BOJ have used unconventional monetary policies to stabilize financial markets and prevent the consequences for the real economy. Monetary policy began to focus on financial stability and growth, rather than price stability. The use of unconventional monetary policy has allowed to expand the balance sheets.

The ECB applies many different unconventional monetary policies to stimulate economic growth. These measures were successful and affected the inflation rate in the eurozone, especially the first years of their application. Today, the inflation target of 2% per annum has not been achieved, but there is an upward trend. In general, the results of this study are consistent with the results obtained previously by researchers.

However, it should be noted, that the use of unconventional monetary policy methods have led to dangerous overheating of stock markets, in particular in the USA, which can lead to a new global crisis in the future.

These tools, certainly, contributed to the recovery of the US economy, while simultaneously led to a sharp increase of stock indexes (S&P 500 and DJIA), which could lead to negative consequences in the future.

Ukraine still needs to actively struggle with the shadow sector of the economy in order to reduce the yield of government bonds and level of speculation with securities.

In Ukraine the traditional instruments of monetary policy are dominant. The use of unconventional methods of monetary regulation is limited, as the security market practically does not function; the external financial markets and the global financial environment, the low level of trust to the NBU and the banking system as a whole are strongly influenced by the financial system and the economy as a whole.

Most of the unconventional methods are difficult to apply to Ukraine, but the method of preliminary guidance could be implemented over time. This will increase the transparency of the NBU monetary policy and the level of confidence in the banking system as a whole. In turn, this would enable households and enterprises to plan their activities for a longer period and be sure of the economic situation of the country. It is feasible to study the possibility of applying as monetary policy targets such indicators as a hryvnya (UAH) real effective exchange rate and interest rates for final borrowers. It was the targeting of a national currency real effective exchange rate and interest rates for final borrowers used by countries that actively stimulated economic growth after the 2008 crisis (China, India, Malaysia, Indonesia).

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## Modeling Outcomes of Unconventional Monetary Policy

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